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Guidelines for Calculating Financial and Economic Rates of Return for DFC Projects

J. Christian Duvigneau and Ranga N. Prasad

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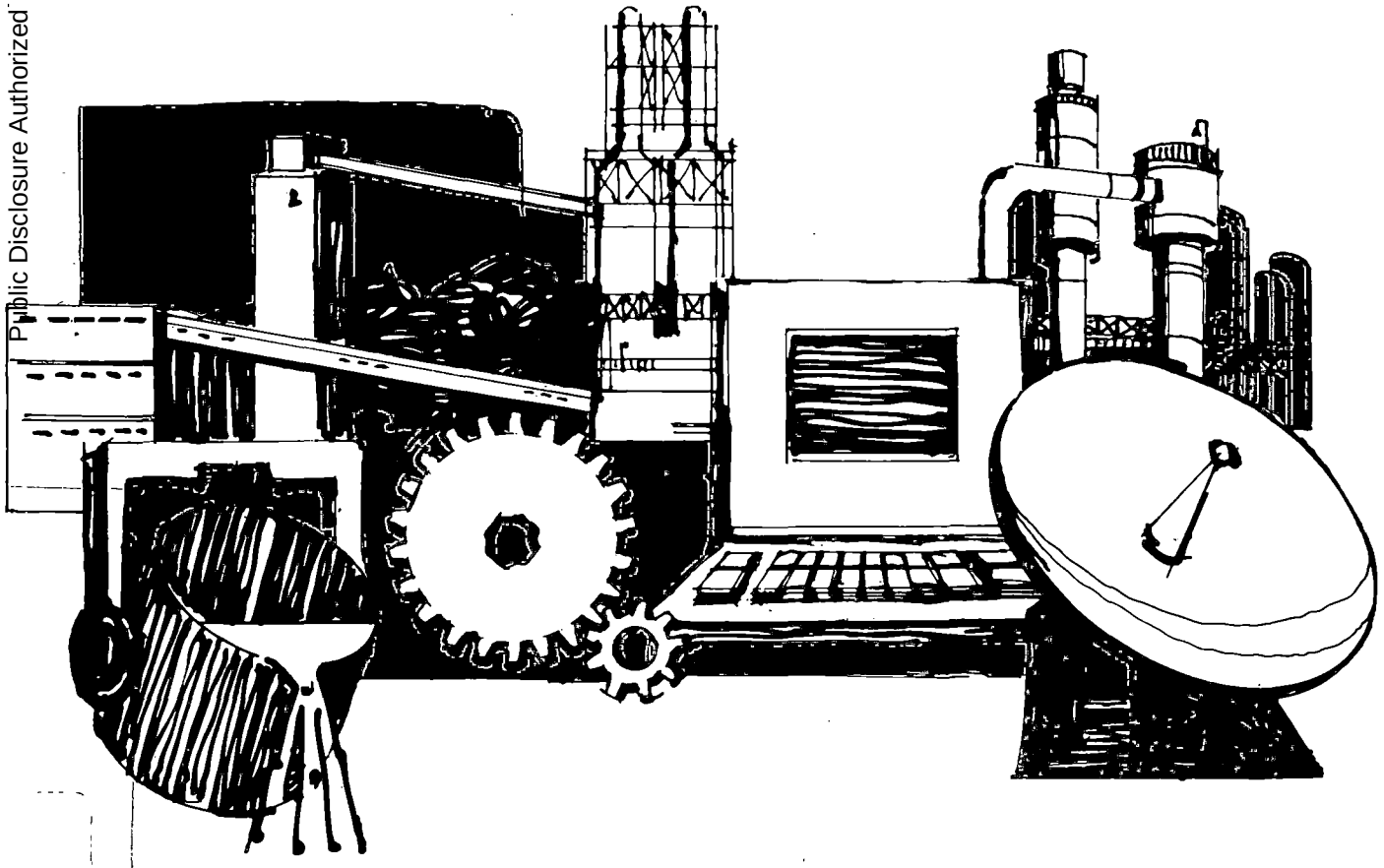

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Guidelines for Calculating Financial and Economic Rates of Return for DFC Projects

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ABSTRACT

These Guidelines, prepared for Bank-assisted Development Finance Companies, explain how to calculate financial and economic rates of return. The approach concentrates on capital productivity and efficiency, and makes no allowance for income distribution effects. The financial rate of return indicates efficiency of resource use in the context of market prices. The economic rate of return indicates efficiency of resource use when prices are adjusted to reflect relative economic scarcities. Traded inputs and outputs are valued at the border, and domestic factors of production are shadow-priced and converted into border prices. The Guidelines offer a series of explanatory notes, standard tables, a note concerning the algebra of the net present value and domestic resource cost measures, illustrative case studies, a glossary of terms and a select bibliogaphy.

CONDENSE

Ces directives, rédigées à l'intention des Sociétés financières de développement bénéficiant d'un appui de la Banque, expliquent comment calculer les taux de rentabilité financière et économique. Elles portent essentiellement sur la productivité et l'efficacité du capital et il n'a pas été tenu compte des effets de répartition du revenu. Le taux de rentabilité financière exprime l'efficacité de l'utilisation des ressources d'après les prix du marché. Le taux de rentabilité économique exprime l'efficacité de l'utilisation des ressources lorsqu'on ajuste les prix pour tenir compte des raretés économiques relatives. Les intrants et les produits commercialisés sont évalués en prix frontière et les facteurs de production locaux sont évalués en prix virtuels et convertis en prix frontière. Ces directives comprennent une série de notes explicatives, des tableaux-types, une note concernant le calcul algébrique de la valeur actuelle nette et du coût en ressources intérieures, des monographies, un glossaire et une bibliographie sélective.

EXTRACTO

En estas normas, preparadas para las instituciones financieras de desarrollo que reciben asistencia del Banco, se explica la forma de calcular las tasas de rentabilidad financiera y económica. El método se concentra en la productividad y eficiencia del capital y no se toman en cuenta los efectos sobre la distribución del ingreso. La tasa de rentabilidad financiera indica la eficiencia del uso de los recursos en el contexto de los precios de mercado. La tasa de rentabilidad económica indica la eficiencia del uso de los recursos cuando se ajustan los precios para que reflejen escaseces económicas relativas. Los insumos y productos comerciados se valoran en la frontera, y se aplican precios sombra a los factores internos de producción, convirtiéndolos a precios en frontera. Se da una serie de notas explicativas, cuadros estándar, una nota referente a los aspectos algebraicos del valor actual neto y el costo de los recursos internos, ejemplos de casos prácticos, un glosario de términos y una bibliografía seleccionada.

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I. INTRODUCTION

A. Objectives of the Guidelines

1.01 As part of its assistance to Development Finance Companies (DFCs), the World Bank, in June 1974, released a short paper [1]/ prepared to show how to compute an economic rate of return for a DFC project. The paper, which came to be known as the "Blue Book" because of the color of its cover, has been distributed widely to DFCs and other agencies. Over time, it became evident that many users within the Bank and in DFCs could benefit from more extensive guidelines than provided in the original brief document. These Guidelines were prepared to meet that need.

1.02 These Guidelines cover preparation of both financial and economic analysis for projects in industry and mining. They follow the same general method as the Blue Book but are more comprehensive in that they cover the analytical framework for both financial and economic analysis, provide an outline for data collection and organization, and include a fuller discussion of financial and economic concepts on which the recommended analysis is based. The Guidelines do not attempt to explain every aspect of financial analysis, but give emphasis to topics that are known to cause difficulties for many analysts in DFCs. Emphasis is on preparation of data, financial analysis of the project, and computation of its financial (internal) rate of return. Substantial coverage is also devoted to the economic analysis, which sometimes raises problems for many analysts who are otherwise proficient in financial analysis.

1.03 The methodology and techniques for calculating financial and economic rates of return suggested in the Guidelines are used by World Bank staff when appraising industrial and mining projects for direct financing, and are consistent with more sophisticated approaches that consider social as well as economic objectives. The cut-off rates used in the Guidelines are not meant to recommend minimum financial and economic rates of return including risk premia to be associated with individual projects and sectors (minimum rates normally used within the Bank range between 10-15%, but may be lower or higher depending on a country's opportunity cost of capital). They are offered simply as illustrations for discussing financial and economic appraisal techniques. The rates of return calculations should serve as a tool for achieving a more consistent and comprehensive analysis of a project. The proposed methodology and analytic techniques cannot substitute for a thorough project analysis based on the judgments of an

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1/ "Guidelines for Calculation of Economic Rates of Return on DFC Subprojects," Central Projects Staff, DFC Department, World Bank, June 7, 1974.

experienced analyst. Instead, they are aimed to provide a widely proven and accepted analytic framework for undertaking a systematic financial and economic appraisal of the project, and to allow the project analyst to undertake the data search, evaluation and analysis necessary to improve project concept and design to the extent feasible.

B. Scope of the Guidelines

1.04 Project appraisal should encompass at least six areas of analyses: (i) sectoral framework; (ii) market; (iii) process technology, project scope, size and design, implementation arrangements; (iv) management and personnel; (v) finance; and (vi) economics. The depth of coverage of these areas is discussed below.

1.05 The analysis of the sectoral framework should assess the mutual impact of (i) the economic sector in which the project is placed (structure, policies, constraints, strategies, linkages to the rest of the economy) on the project, and (ii) the project on the future development and prospects of the sector. In this context, it is particularly important to assess the impact of the incentive structures, policies with regard to foreign trade (tariffs, quotas), pricing policies, as well as other sectoral policies and resulting strategies on the project and, if necessary, to propose appropriate changes. Such analysis is largely outside the scope of these Guidelines. However, financial and economic analyses of the project may reveal shortcomings of sectoral policies such as pricing policies, import tariffs, investment incentives, and taxation policies, which should be dealt with in the appraisal of the project.

1.06 The market analysis of the project should normally (i) assess historic evolution of demand, supply, international trade and consumption of the project's outputs (and possibly also inputs, particularly when traded raw materials or intermediate goods are important); (ii) review domestic and international price regime, historic price evolution and price projections for the project's output and inputs; (iii) develop projections for future demand and supply and potential for international trade of project outputs and inputs, with and without the project; and (iv) analyze the efficiency of distribution and marketing systems. The analysis should be issue-oriented and aimed at developing recommendations for improvements necessary (or desirable) for the sector and/or the project to operate more efficiently. Again, the detailed discussion of such analysis is outside the scope of these Guidelines. However, adequate market analysis is crucial for an appropriate determination of the financial and economic viability of the project.

1.07 The technical or engineering analyses of a project typically deal with (i) process technology, scale of plant, design and layout of facilities, (ii) process flow of inputs and outputs, technical parameters of physical facilities, and process yields, (iii) standards and characteristics of inputs and their supply, of outputs and their storage and disposal, (iv) availability and use of utilities (water, energy), (v) environmental considerations, and (vi) project implementation arrangements, including procurement of goods and services, contractual arrangements and related issues. Again, a detailed discussion of such analyses is largely

outside the scope of these Guidelines. Yet, a thorough appraisal of the appropriateness of project capacities, technical parameters, input and output quantities and other technical data, as well as cost parameters for investment, operations, transport and distribution, form essential inputs for financial and economic analyses.

1.08 The management, manpower and organizational aspects analyzed in the context of project appraisal normally cover (i) the institutional framework of the sector, (ii) availability of, and need for, management with specific technical, financial and marketing know-how, (iii) availability of, and need for, skilled, semi-skilled and unskilled manpower, as a function of chosen technology, (iv) organization and staffing of the project institutions and facilities, (v) staffing costs, and (vi) need for, and cost of, training and technical assistance. The results of these analyses are again important inputs for the financial and economic analyses; however, the details of these analyses are outside the scope of these Guidelines.

1.09 The financial appraisal is one of the two main subjects of these Guidelines. It has four main objectives: (i) to evaluate alternative project configurations to determine the most attractive alternative and course of action; (ii) to develop a sound financing plan to cover expenditures during the implementation phase of the project; (iii) to ensure that financial resources will be available as needed during the operations to ensure timely availability of goods and services and to meet all financial obligations (e.g., service debt); and (iv) to verify that adequate levels of profits will be generated to reward investors for bearing risk and putting equity into the project rather than elsewhere.

1.10 The economic appraisal, the other main topic of these Guidelines, is undertaken to ascertain the overall impact of the project on a country's economy. In the financial analysis the viewpoint is that of a project sponsor. In the economic analysis it is that of a government decision maker concerned with broader economic development objectives of the country. It is here where the linkage of the project with the overall economy is of crucial importance.

1.11 These Guidelines concentrate essentially on the calculation of financial and economic internal rates of return. An internal rate of return (IRR) is defined as that discount rate which reduces the net present value of a series of different cost and benefit streams to zero. (Details in Explanatory Note No. 1 "Mechanics of Discounting".) The cost and benefit streams include cash costs only. Depreciation and interest charges are excluded (para 4.15). The IRR is an important test for assessing the quality of a project in financial and economic terms and is widely used by decision makers in governments, financial institutions and industry to determine whether a project is financially and economically viable. While the financial IRR measures whether a project is likely to be profitable enough to cover the average cost of capital of lenders and sponsors, the economic IRR indicates whether the project is efficiently using the country's resources, i.e., whether its economic IRR is higher than the opportunity cost of capital.

1.12 The Guidelines follow a deterministic approach, as compared to a probabilistic approach which often is desirable and necessary for complex and riskier projects even though it is more difficult to carry out. The deterministic approach means that a "most likely" 2/ set of numbers is chosen for the parameters which must be projected or estimated for the analysis. The resulting financial and economic projections and ratios, as well as financial and economic rates of return, represent one possible outcome of the project in the myriad of other potential outcomes. In such an approach sensitivity tests are essential to test alternative assumptions and determine the level of risk. This rigorous testing of assumptions and values is necessary for sound decision-making.

1.13 An important requirement for sound financial and economic analyses is the correct determination of prices of major inputs and outputs, because financial and economic rates of return of most industrial projects are very sensitive to these prices. Technical and qualitative distinctions among manufactured products and intermediate commodities make it difficult to obtain strict comparability of prices. To determine the correct long-term price of a product may require detailed analyses of the long-term global supply/demand structure of the product and its long-run marginal costs. Yet, such analytic work can be time-consuming and costly, and may not always be feasible for many DFC projects.

1.14 There is no obvious way to get around the difficulty of identifying strictly comparable inputs and outputs for use in project analysis. One must make a vigorous effort to specify the technical features and qualities of the products under consideration, determine their expected prices during the project life and then consider the possibility and level of higher or lower prices. The common approach is to project the appropriate prices after detailed analysis, and use these projections to calculate the expected rate of return; and it is desirable to undertake a sensitivity analysis to determine what would happen to the rate of return if the prices were higher or lower than those used in the base case.

1.15 The techniques recommended in these Guidelines require the analyst to be methodical and orderly. Many assumptions can affect the outcome; these should be explicitly stated for future reference. Without a careful analysis, incorrect conclusions are likely. Standard tables are provided in the Guidelines to help analysts undertake financial and economic analyses of typical industrial projects. When assumptions are clearly spelled out and standard tables are used, review by others is greatly facilitated.

1.16 Rate of return calculations cannot fully quantify and capture the likely development of important aspects such as technology transfer, effects from environmental pollution or degradation, and country risks. Such non-quantifiable costs and benefits must be considered by the decision-makers, in addition to the rates of return themselves.

2/ This "most likely" set may be very subjective and depends on initial assumptions for the estimation of parameters. The analysts should therefore document all underlying assumptions.

1.17 A word of caution is in order about expansion projects, i.e., projects which build on existing facilities. Many projects involve modernization, rehabilitation or expansion of existing plants and often loan applications are based on a "before and after" analysis. In such cases, the correct procedure for the internal rate of return analysis is to measure the net benefit of a project by comparing two future scenarios: one "without" the project under study (i.e., assessing the future of only the existing facilities without the proposed expansion) and another "with" the project (i.e., assessing the future of the expanded facility). This is not the same as a "before-and-after" analysis. It is essential that the analysis be carried out in the "with/without" framework even if it involves some additional effort (for a more detailed discussion, see paras 4.08 and 5.10).

1.18 Finally, it must be emphasized that not all aspects and facets of methodologies, explained in these Guidelines are essential under all situations and for each project, whether small or large, simple or complex, "greenfield" or expansion. Judgement should be used to weigh the benefits of additional, maybe marginal information on a given project against the costs of obtaining it. For example, in situations where the economic benefits of the investment are quite obvious (e.g., investments for debottlenecking or for improvement of energy efficiency of otherwise efficient operations) simple demonstrations of economic merit could be used. Thus, shadow pricing of certain inputs maybe unnecessary given their relatively small weight in overall operating costs. The necessary judgement on what analyses are essential comes with the experience of carrying them out. Sensitivity analysis on a simplified rate of return calculation can help to identify areas where a project is weak or sensitive and therefore requires further probing. Chapter VIII provides some comments on the use of simplified approaches and "short cut methods". Of course, "short cut methods" must be used cautiously and with sound judgement based on experience.

C. Structure of the Guidelines

1.19 These Guidelines are structured into the Main Text, Explanatory Notes, Annexes, Illustrative Case Studies, a Glossary and a Bibliography. Since potential users have widely varying levels of training in finance, economics and experience in project appraisal work, an attempt has been made to make individual chapters, explanatory notes, illustrative case studies, and items defined in the Glossary as self-contained and independent as possible. This should permit quick and ready reference to particular aspects of methodology, concepts or issues.

1.20 Chapter II of the Main Text deals briefly with the objectives and analytical framework of financial and economic appraisal. Chapter III describes typical information requirements for project appraisal and suggests approaches to data collection and organization. Chapter IV discusses the basic concepts of financial analysis, and explains how to establish cash flows for calculating the financial rate of return (IRR). Chapter V deals with the mechanics of IRR calculation, covers different concepts of financial rates of return and describes most common sensitivity analyses. Chapter VI explains the basic concepts behind economic analysis,

and how to calculate economic costs and benefits as opposed to financial cash flows. Chapter VII illustrates how to calculate the economic rate of return and interpret results. Finally, as already mentioned above, Chapter VIII suggests some "short cut methods" to obtain initial, quick assessment of a project's viability.

1.21 Explanatory Notes, which cover in some detail certain concepts and analytical methods, are provided to give explanations and illustrations of key points. Finally, the Glossary at the end of the Guidelines gives brief definitions of the key terms used in the main text.

II. OBJECTIVES AND FRAMEWORK OF FINANCIAL AND ECONOMIC APPRAISAL

A. The Sponsor's Point of View: Increasing Sponsor's Net Income

2.01 The typical DFC project is a profit-oriented venture that manufactures, processes, assembles and/or sells goods and services for sale in a marketplace. The basic objective of financial appraisal is to provide decision makers with the information needed by them to judge the financial viability of a specific project they may wish to sponsor. Thus, for a project sponsor willing to invest his risk capital into the proposed project, the basic objective of the financial analysis is to determine whether the proposed investment would generate a stream of future income sufficient to meet the minimum financial return requirements of the sponsor in a time frame acceptable to him. Since alternative investment opportunities normally are available to most investors, the rational sponsor will place his funds in an activity which promises to generate a future stream of income that meets or exceeds the opportunity cost of capital in alternative investments.

2.02 Many projects supported by DFCs involve the purchase of machinery, equipment and other items to modernize and balance a production line to reduce primarily the future operating costs. The appraisal techniques for such projects are the same as for output-expanding ventures, except that project benefits are now cost reductions rather than revenue increases.

2.03 Investors can use a variety of methods, tests and techniques to measure the potential rewards of placing investment funds into one activity instead of another. The financial objective of investing the funds in any activity is usually the same, viz., to maximize the resulting flow of income while remaining within the level of risk acceptable at that return. A systematic analysis helps to bring out the nature and extent of risk as well as the likely return on investment to be expected.

2.04 The essential question raised by a project sponsor is this: "If I spend $x of my own and other persons' money to build and equip a factory (or other facility), what kind of return can be expected within a reasonable period of time if things go as expected?" The intelligent investor will want to explore alternatives to find those that promise the highest return at the lowest risk. The most important measure of return from the

specific viewpoint of the sponsor who places equity in a project is the after-tax financial rate of return on investment and on equity and not the before-tax financial IRR. The methodology for calculating these measures is explained in paras 5.03 and 5.08.

B. The DFC's Point of View: The Development Banker's Position

2.05 A project sponsor should have performed analyses necessary to have a reasonable assurance of a satisfactory post-tax return on equity, prior to approaching the DFC for a loan. These analyses should indicate to the DFC the project's financial soundness and the sponsor's solvency and creditworthiness. Liquidity during the difficult start-up period of a project and the ability to service debt throughout its life, after having met tax obligations, are among the important tests of a sound project. In that sense the DFC should be concerned about the financial viability of the project and about the financial strengths of the sponsor like any commercial bank. If the DFC is asked to invest equity money as well, this type of analysis is equally important for the DFC.

2.06 However, from the DFC's viewpoint as a development institution, an after-tax financial rate of return on investment may not yet convey enough information on the project's financial viability. Staff analysts may want to look also into a project's fundamental strengths, without regard to specific financing considerations. The financial rate of return on all resources before taxation can be an interesting measure of a project's fundamental soundness since it is not affected by special financial and tax features which may change with time. A DFC therefore should be interested in both the project's financial rate of return before taxes as well as in the return to the investor (i.e., after taxes) and the expected evolution of his financial position during the life of the project. Comparing the two returns can help to distinguish fundamental project strengths and tax breaks.

C. The Country's Point of View: Using the Economy's Resources Efficiently

2.07 Useful as the financial rate of return is, it usually does not give an accurate indication of a project's net impact on a country's economy. To obtain such an indication, one turns to the economic rate of return. This measure determines the economic merit of the project from the country's viewpoint. It therefore treats import duties, sales taxes, profit taxes, and other government levies (or subsidies) as internal transfers within the country and disregards them, since they do not affect the overall wealth of that economy. It also uses "shadow prices" (see para 6.03 below) instead of domestic input and output prices, in case they do not adequately reflect the opportunity costs to the economy. For traded goods shadow prices (or economic prices) are international (or world) prices at the border of the country (border prices), i.e., cif prices (before tariffs and duties) for imports, and fob prices for exports. For nontraded goods (for example, land), the economic cost is defined as the value of net output foregone (when using that good in the best alternative use) as a result of using that good in the project. Use of shadow prices enables one to see beyond the effects of tariffs, exchange rates, interest rates, and wage rates, as well as administered prices, subsidies and sur-

charges that distort a product's true scarcity value. It enables one to measure an investment's efficiency of using the resources of an economy, priced at border prices.

D. Income Distribution

2.08 A few remarks are in order about the measure of economic merit, i.e., the economic internal rate of return. The stream of future income generated by a proposed investment may be spent entirely to purchase items of final consumption; or, alternatively, some of it may be saved. The occupational and income status of the recipients, together with other phenomena, will condition their spending and saving propensities. A poor person is likely to spend marginal income rather quickly for food, clothing, and other necessities of life, whereas a wealthy person may save a considerable proportion because immediate needs are satisfied.

2.09 An investment project can have important distributive effects of the benefits generated. These income effects are of two types: interpersonal (i.e., between different groups) and intertemporal (i.e., between different times). Other things equal, a venture that creates future income for poor people may be considered superior to a venture that does not. Other things equal, a venture that distributes income to people with a high marginal propensity to save may be considered superior to one that does not. The problem is that the two considerations may be mutually exclusive. The poor person who wants to meet his basic needs is likely to consume most of the marginal income. On the other hand, this reduces the amount of savings available to finance future investment, and reduces future income growth potential.

2.10 These interpersonal and intertemporal distributive effects can be important, and in some investment projects it may be important to consider them in detail. For the typical DFC project, however, the "efficiency" appraisal criteria set forth in these Guidelines should suffice. It is a special case of the more general "social" analysis described in other sources,[3/] rather than in contradiction to it. A unit of future income in the hands of one recipient is assumed to be of equal welfare value to that received by any other recipient--rich or poor, private or public. This admittedly simplifying assumption is considered acceptable while analyzing a typical DFC subproject.

E. Analytical Framework

2.11 These Guidelines deal mainly with the calculation of financial and economic rates of return which, by definition, are those discount rates

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3/ A detailed discussion of distributional considerations is contained in a separate World Bank Publication (Economic Analysis of Projects, by L., Squire and H., van der Tak - Reference 2 in the Bibliography). The appraisal process may generate some of the data needed to perform a supplemental test of distributive effects, and a skilled analyst will be able to present the information when it is likely to be of material importance.

which achieve a net present value of zero, when discounting sets of financial and economic cost and benefit streams for a given project. The task of the analyst is to use the cost information for a proposed project from the engineer (capital cost estimates, operating cost estimates, transport and distribution cost estimates) and put them into a systematic and consistent framework to permit projections of cost streams which will be used in the IRR Analyses. Similarly, pricing and sales estimates result from the market analysis of the project and are used to develop projections of likely revenues for the project (benefit streams). The systematic annual projections of the cost and benefit streams are needed to compute a net benefit stream, which, in turn is discounted to calculate the financial internal rate of return (financial IRR). Through elimination of transfer payments and application of appropriate shadow prices to the financial cost and benefit streams with the help of the economist, the financial cash flows are transformed into economic cost and benefit streams, to calculate the economic internal rate of return (economic IRR).

2.12 The analytical framework normally used in the above process is a set of financial tables which is based on the standard projected balance sheet, income statement and cash flow statements for the project. These statements are projected for the life of the project. Cost and benefit streams are extracted from these projections as explained in Chapter IV. The economic IRR is similar in concept to the financial IRR in that it is a measure of the return on the funds invested in the project. However, for the economic IRR all costs and benefits are measured from the viewpoint of the economy of the country as a whole.

III. DATA NEEDS AND DATA ORGANIZATION

A. Feasibility Study

3.01 Projects to be supported by a DFC must be demonstrated to be sound from the market, technical, management, financial and economic points of view. A feasibility study of the project prepared by the sponsors should include data needed to demonstrate the project's soundness. The feasibility report submitted to the DFC for its review should therefore deal with all aspects briefly summarized in paras 1.04 to 1.10. An outline of such feasibility study is given in Annex 3-1. Of course, the costs of preparing the feasibility study must be weighed against the overall costs and benefits of the project. The depth and degree of detail of the feasibility study depend to a large extent on the proposed project's scope, size, complexity and risks. Nevertheless, the feasibility study should include adequate analyses of market, technical, management, implementation, financial and economic aspects to assess the project's expected costs and benefits, and risks.

3.02 The typical feasibility study also contains an executive summary, highlighting main features of the project, major issues, problems and to risks, and an outline of actions proposed to deal with the issues, and minimize risk. For large and complex projects, the main text will have sections on the (i) economic environment in the country and its implications for the project; (ii) industrial sector; (iii) market for the inputs

and outputs of the proposed project; (iv) company and/or sponsor; (v) objectives, scope, process, and technology of the proposed project; (vi) implementation, start-up schedules, procurement and contractual arrangements; (vii) organization, management, staffing, training and technical assistance arrangements; (viii) capital cost and financing plan; (ix) financial analysis; (x) economic analysis; and (xi) recommendations as to special actions required, conditions to be met, etc. The main text of the feasibility study will be supported by appropriate annexes providing detailed backup data, tables, assumptions used and analyses as well as other relevant background material. For smaller projects some of the above sections could be covered within a short paragraph or only a few sentences. However, an adequate coverage of the above points should be included for all projects.

3.03 Under normal circumstances, the DFC should insist that a reasonably comprehensive feasibility study be submitted by the project sponsor along with his formal application for project financing (equity and/or loan). While this study may not contain a detailed economic analysis, it should cover relevant market aspects, project details, personnel-related and technical, as well as financial, information and analyses to enable the DFC to assess the project's strengths and weaknesses, its financial and economic implications, its risks and potential for rewards. The DFC can then itself prepare the economic analysis along the lines suggested in Chapters VI to VIII.

3.04 Often the project sponsors may not be able to prepare by themselves a project, analyze alternatives, and design an appropriate project configuration. In that case the DFC may consider providing guidance for the establishment of the feasibility study by the sponsors, or may finance consultant services to help the sponsors to organize their project ideas, to collect necessary technical and financial information and to set that information into an analytical framework which will permit the systematic project analysis and design of an optimal project scope, configuration, layout and design. Again, the costs for establishing an adequate feasibility study should be in a reasonable relation to the project's investment volume (typically less than 1-2%) and should be justified through a large initial probability that the project is sound.

3.05 The subsequent paragraphs focus on the data necessary for the establishment of a financial and economic analysis. They deal with details of project timing and related schedules, with costs and revenues, necessary to establish financial statements and cost and benefit streams for rate of return calculations. These data should be contained in sufficient detail in the feasibility study provided by the project sponsors, and should be reviewed carefully by the DFC staff as to their reliability.

B. Project Timing and Schedules

3.06 Project schedules are important elements in project analysis and IRR calculations, since the IRR analysis deals with "timed" streams of costs and benefits. Typically the financial analyst needs to distinguish between the (i) schedule of project preparation and implementation up to testing of equipment and start-up of facilities; (ii) the schedule of early

operation and increasing capacity utilization, as the company's staff becomes increasingly familiar with the new facilities and technical "teething" problems are corrected; this period until achievement of "steady state operations" is often referred to as the "learning curve"; (iii) the project life, referring to the expected duration during which the new facilities will be able to produce economically the output for which they were designed; and (iv) schedules of financial nature, such as equity and debt draw down schedules, debt servicing schedules, dividend and tax pay-out timing, etc. Other schedules, such as staffing and training calendars as well as timing of technical assistance contracts, will also affect cost and benefit streams, but to a lesser degree.

3.07 Project preparation and implementation schedules determine the disbursement pattern of investment expenditures and therefore need careful evaluation. These schedules should be based on realistic assessments of foreign as well as local factors influencing them and normally require experienced engineering input. Realistic procurement schedules up to signature of contracts and timed to carry out the optimal sequencing of project implementation are the first important step. Execution schedules for civil works, manufacture and delivery of equipment, as well as erection, installation and testing of equipment need to be closely coordinated to minimize costly project implementation delays. Typically a network plan with identification of the critical path is established for the preparation, implementation, testing and starting of complex projects to assure optimal execution. The timing of different contracts which is governed by physical execution schedules, dictates the schedules of down payments, progress payments and retention payments which, in the aggregate, represent the first years of the capital cost stream of the IRR calculations. A typical project implementation schedule is shown in Annex 3-2. Examples of contractual progress payments, i.e., expenditure schedules, are contained in the Illustrative Case Studies (after the Annexes).

3.08 The learning curve for the start-up and operational phase of a project is influenced by factors such as the experience of personnel with the new technology, experience of starting up a new facility, size and complexity of the new project, quality of equipment and of erection and installation, availability of technical assistance during start-up as well as organization of timely availability of required inputs from outside the plant. Results of this analysis are usually expressed as percentages of capacity utilization over time and will therefore determine the (i) estimated production schedules and resulting revenue projections as well as (ii) input quantity estimates over time and resulting operating cost projections. Typical learning curves for various industries are shown in Annex 3-3. Given the strong impact of initial operational results on cash flow and financial situation of a company, the curves should be estimated reasonably conservatively.

3.09 The economic life of a project is a rather abstract concept for the purpose of IRR calculations, albeit a necessary one. In practice, different components of investment packages are likely to have different physical life expectancies. Thus, the mobile equipment of a venture may have a physical life of only 5 to 7 years and require replacement thereafter, whereas a stationary piece of heavy machinery may last 20 years and

civil works 30 years or more without major rehabilitation or replacement work. However, in economic terms, some components or even the whole project may become obsolete before the end of the physical life of the overall plant due to development of more efficient technologies and increasing competition from newer, more efficient facilities. The IRR analysis requires a common time frame for cost and benefit streams. Therefore, a careful judgment must be made about the overall project life in terms of likely physical and economic life expectancy, taking account of considerations of likely technological evolution, sectoral developments, replacement costs and economies of scale. This judgment should be made by the sectoral specialist. The discounting factors decline over the years so that the impact of cash flows in later years on the project's rate of return becomes less important. Thus errors in judgments of the useful life of projects beyond about 15 years are unlikely to be critical.

3.10 Project implementation period plus project life define the overall time frame for IRR calculations. Cost and benefit streams are established within this time frame (para 3.12).

3.11 Schedules of a financial nature are important for the establishment of pro forma financial statements (income statement, balance sheet, cash flow statement) and are crucial in determining the financial solvency and creditworthiness of the project sponsors. However, in the financial and economic rate-of-return calculation, the method of financing, of debt servicing (interest and principal repayment), depreciation and dividends are unimportant.

C. Cost and Benefits

3.12 The IRR analysis calls for the consistent establishment of all cash cost and benefit streams under the same estimated time frame (project implementation and project life). Typically the analyst must distinguish between (i) capital cost streams, (ii) operating cost streams and (iii) revenue streams (benefit streams). The sum total of costs and benefits for each year results in the "net benefit" for each year. Depending on the absolute size of all costs and benefits for a given year the net benefit can be positive or negative. The stream of annual net benefits is simply referred to as the net benefit stream. One can think of the analytical frame work of the IRR calculation as a matrix consisting of the annual cost and benefit streams (para 4.14 illustrates such table matrix). Desirable standard tables for the required data are shown in Annex 3-4, Tables 1 to 5 and explained in the text below.

3.13 Capital cost estimates should be established for each project configuration and should be grouped into local and foreign costs. They should also distinguish between capital costs for (i) fixed assets, including costs for land, civil works and buildings, equipment and machinery, but also engineering, services and in-plant infrastructure, (ii) outside plant infrastructure, (iii) start-up costs, and (iv) working capital. Total financing required for the project also needs to consider interest during construction which has to be covered by the overall financing plan and will enter projected balance sheets and fund flow statements. If major project components are estimated to require replacement, within the time frame of

the IRR analysis, appropriate "replacement costs" must be accounted for in the capital cost stream (see example on Cement Plant Project: Replacement of Mobile Plant). Annex 3-4, Table 1 shows a typical project capital costs table, resulting in a base cost within the plant. It also lists typical capital cost items for infrastructure facilities often required outside the plant (e.g., links to electricity, transport, and water network). Working capital requirements, for the purpose of the IRR calculation, involve the net incremental working capital, that is, the gradual buildup, over time, of current assets minus the buildup of current liabilities. For this purpose, a working capital schedule should be prepared (example in Annex 3-4, Table 3).

3.14 The base cost estimate of a project is the best judgment of the estimated costs, as of a specified date, and assuming that the quantities of land, works, goods and services as well as prices relevant to the project are accurately known and will not change during implementation and that the project is implemented as planned. The base cost estimates do not reflect changes in quantities and prices that may be expected during implementation. Contingency allowances are an integral part of the expected total costs of the project. Normally, such allowances are necessary for all project items involving significant expenditures. The allowances should reflect physical and price changes that can reasonably be expected to increase a base cost estimate, after it has been prepared to a degree of thoroughness and professional standard appropriate to the type of project under consideration. The allowances are, however, not intended to provide assurance against the effects of all possible adverse events and conditions. Contingency allowances may vary with the nature and components of a project and may need to be calculated separately for each main item included in the project. The estimate of total project cost including contingency allowances represents the best estimate of expected final costs at the time of project completion.

3.15 Physical contingency allowances reflect expected increases in the base cost estimates of a project due to changes in quantities and methods of implementation. Physical contingency percentages may vary for different project components depending on the degree of certainty on which the estimate is based. For example, for items where contracts have already been signed and the likelihood of errors and omissions is small, a 5% contingency may be generous; whereas for a civil works' cost estimate, even a 15% physical contingency might be low, if the estimate is based on a crude design without soil investigation and estimate of required bills of quantities. When suitable physical contingencies would have to be relatively large, say more than 15% to 20% on overall base costs, consideration should be given to further refinement of site investigations and of basic designs in order to reduce uncertainties. Price contingency allowances reflect expected increases in project costs due to changes in unit prices for the various project components beyond the date of the base cost estimates. The overall price contingency allowance is built up by applying expected annual price increases to the base cost estimates of the various project components, expressed in annual amounts of expenditures and including prorated physical contingencies, starting with the date of the base cost estimate. Price contingencies are discussed in more detail in paras 3.22 to 3.24.

3.16 Capital cost estimates should be of a high quality to permit a realistic project assessment and establishment of an adequate financing plan. Comparisons with similar projects elsewhere may be useful but should take account of differences in time, layout, size, local economic and physical conditions, etc.

3.17 The financing plan, while not an essential ingredient for basic IRR calculations, is a vital element in project appraisal. That plan needs to assure that at all times during project implementation, startup and early years of operation, sufficient funds are available to cover capital cost expenditures and incremental working capital needs. That forecast should also take account of conservative estimates of internal cash generation, particularly in the case of expansion projects. Given its importance these Guidelines contain a typical format for a financing plan in Annex 3-4, Table 4. For many DFC projects that simple format will suffice.

3.18 For elaborate and detailed calculations of after-tax IRRs and returns on equity (para 5.08), knowledge of the financing plan and of conditions of financing is necessary. In this context, questions arise frequently concerning the proper treatment of foreign investment and loans (see also para 5.09). In any case, the analyst should try to obtain as much information about the terms and conditions of foreign financing as possible.

3.19 Operating Cost Estimates: Based on input requirements, process flows and resulting input/output coefficients within the proposed plant, and based on estimated production buildup, operating costs can be estimated for the project. It is useful for subsequent financial and economic analyses to distinguish right from the start between (i) local and foreign operating costs, (ii) variable and fixed operating costs. The latter distinction will permit break even analyses (paras 4.11 and 4.12) whereas the former is necessary for an economic analysis involving shadow prices.

3.20 Typically, operating costs are estimated for the "steady state" of plant operation, i.e., at a production level near a realistic level of capacity utilization, once the learning curve has reached a plateau (the steady state). However, due to lower production levels in early years of operation, the total level of annual operating costs is typically lower during earlier years of operations. On the other hand, given a lower efficiency in early operations and the impact of fixed costs on a lower capacity utilization, the average unit cost of operation during early years can be significantly higher than during the steady state situation. In order to take account of these effects, it is useful to establish systematically the annual operating costs on the basis of detailed cost estimates for the steady state situation, grouped by major operating cost components (Annex 3-4, Table 2).

3.21 The benefit streams rely on a calculation of annual revenues for different products. The annual revenue for a given output is calculated by multiplication of the estimated net product price with the projected production quantity. Also financial and economic IRR calculation need to distinguish between financial and economic price. A financial product

price may not be available and will have to be estimated if the product is not yet traded domestically. The market analysis should provide estimates of the financial price at which the projects output would be sold. For a discussion of economic prices see Chapter VI.

D. Price Changes

3.22 Price changes are an important factor affecting projects throughout their implementation and economic life, with respect to capital and operating costs as well as revenues. If all prices increased at the same rate at home or abroad, their relative levels would not change. If, in that case all prices were deflated in order to correct for the general increase in nominal (or current) prices, "real" prices, i.e., prices expressed in constant value terms, would result. In that case, the comparison of costs and benefits of a project for the purpose of calculating its economic and financial IRR should not be affected by changes in the general price level resulting from inflation.

3.23 However, relative price changes do occur in the world. Typically, different cost categories (e.g., energy, labor, raw materials) incur differing rates of change over time. If differences are significant, they should be projected for the period under consideration and be taken into account. For the purpose of IRR calculations, it is important to distinguish whether changes in prices, anticipated during the life of a project, are estimated in real or in nominal terms (para 3.24).

3.24 Up to now, cost and revenue categories described above were estimated in constant prices, as of a specific date (base cost as, for example, for capital costs). Applying different estimated rates of inflation will convert these data into nominal terms. For capital costs, this consideration is particularly important, since the financing plan will have to cover total capital costs expressed in nominal terms. Similarly, financial cash flows should be in nominal prices to determine the financial performance of the project and the creditworthiness of the borrower. For purposes of IRR calculations, however, real terms are preferred since they incorporate relative price changes but disregard inflation. Real term projections are obtained by deflating nominal term projections by the estimated level of general inflation. The financial IRR can be calculated in nominal or in real terms. (As a first approximation, the real financial IRR equals the nominal IRR less the average annual inflation rate expected during the projected period). If general inflation is unimportant the financial IRR is quite acceptable in nominal terms. The economic IRR is always estimated in real terms.

E. Exchange Rate Considerations

3.25 The base cost estimate (para 3.14) as well as operating cost projections have distinguished between local and foreign costs. To express all costs in the domestic currency, normally the prevailing exchange rates are being used for the purpose of financial analysis. However, we have to project costs and benefit streams over a considerable period of time into the future. Thus, applying the present exchange rate to the future cost and benefit streams may be misleading.

3.26 The assumption of a constant exchange rate over time normally implies among other things, that domestic price inflation moves in parallel with that of the country's main trading partners. If this assumption can readily be made, use of the constant exchange rate over time may be justified provided there are no other factors (e.g., balance of payments problems) that would affect relative exchange rates over time. However, in some countries domestic inflation surpasses significantly that of their main trading partners. Then the country can either follow a crawling-peg policy, whereby the exchange rate is adjusted continually according to the amount of inflation differential or it might attempt to postpone devaluation. Postponement of devaluation leads to overvalued exchange rates, distortion of price signals and eventual misallocation of resources in the economy. At some point, a major devaluation will be required to remove those distortions.

3.27 The analyst has to make a judgment with regard to the likely development of inflation domestically and for main trading partners. If the projected inflation differentials are small and one therefore can assume constant exchange rates over time, the task is simple. If, however, the domestic inflation rate is high and inflation rate differentials with major trading partners significant, the exchange rate development matters and must be considered. In the case of a crawling-peg policy environment, the analyst may want to do financial projections in a foreign currency at the projected international rates of inflation and assume that the exchange rate will be adjusted regularly. In this manner, he will be able to make all projections applying the foreign inflation rate to domestic and foreign costs (expressed in foreign currency and converted at the presently prevailing exchange rate). Alternatively, he could apply the foreign inflation rate to foreign currency and the (high) domestic inflation rate to domestic currency. In that case, he would have to estimate an annual projected exchange rate, which is a function of the inflation rate differential. On the other hand, if domestic inflation is high and the government does not have a clear exchange rate policy, further analysis is required. One possibility would be to assume a crawling-peg policy and then to test for sensitivity (see Explanatory Note No. 2 on "Currency Devaluations").

IV. FINANCIAL PROJECTIONS, FINANCIAL COST AND BENEFIT STREAMS

A. Methodology of Financial Projections

4.01 For the purpose of a consistent and comprehensive financial analysis, it is important to use a consistent framework for (i) developing financial projections, (ii) analyzing these projections, and (iii) establishing cost and benefit streams for the IRR calculations. This chapter suggests such a framework. Illustrative Case Studies Nos. 1 to 4 provide examples for different methodologies as explained below.

4.02 The previous chapters discussed the estimation of capital costs, operating costs and revenues on an annual basis. These estimates are then used to develop annual projected income statements, balance sheets and funds flow statements. As a first step these estimates are typically in

constant terms, i.e., as of a certain date. However, since normally price increases are expected to take place over the project life, they should be taken into account in the financial projections, both to ensure coverage of full capital costs by the financing plan, and to evaluate the financial development of the firm and the viability of the project under a realistic set of assumptions with regard to inflation. Often financial projections in current (nominal) terms can be calculated by applying a single rate of inflation to all costs and revenues. But, if the individual cost and revenue categories are expected to undergo significant relative price changes, then the expected differential price changes should be estimated and applied to the different cost and benefit streams.

4.03 Applying a single inflation rate or differential inflation rates to the various cost and revenue categories year by year, will result in financial projections in nominal terms (or current terms). These projections are important to demonstrate that the financing sources (equity, loans, retained earnings) are sufficient to cover total financing required, expressed in current terms.

4.04 However, the inflation rates are only estimates of expected price changes. The further one moves away from the present, the more uncertain will these estimates become. Therefore, for the purpose of financial projections, it may be useful to express all entries in nominal terms up to the point in time when the project is completed and reaches full production. In this way, full capital costs are matched with the overall financing plan, and the financial situation of the firm during the start-up period, which normally has a tight liquidity position, can be evaluated. From there on, projections may usefully be left in constant prices. In most cases, financial projections should suffice for the time period of project implementation plus five years of operations. Typically, a project has reached steady state operations by then and annual debt service payments start declining already. Thus, if five year projections of operations show a reasonable financial position, things should improve thereafter.

4.05 As was discussed in para 3.24, the calculation of the IRR should be carried out in real terms. How do we obtain the necessary cost and benefit streams in real terms, if we have established financial projections in nominal terms? We have to apply an appropriate deflator, which is the estimated average rate of price changes of a given basket of goods. If we had used only a general inflation rate to inflate all costs and revenues, application of the deflator (which will be the same rate) will bring us back to the originally estimated constant prices. In this case, constant and real terms are identical. Illustrative Case Study No. 1 is calculated in constant terms. If however, individual rates of price changes were applied to different categories of costs, application of the general deflator will yield different figures, expressed in "real terms" (as opposed to the original constant terms). An example of this methodology is shown in Illustrative Case Study No. 2.

4.06 For practical purposes, in situations where expected individual inflation rates are not significantly different from the general inflation rate, one can assume real term figures to be identical with the constant

term estimates. The most comprehensive indicator of general price changes in a country is the GNP Deflator, which includes capital-goods prices that are not captured in consumer price indices. Studies have shown that the higher the rate of inflation, the greater is the likely dispersion in the rates of price increase for specific goods and services. Thus, if one anticipates rapid price inflation (say, over 10% per year), shifts in relative prices may be significant. Capital goods prices may rise more rapidly than consumer goods prices, for instance. Normally, analysts assume steady rates of price inflation throughout the projection period and also constant relative prices, but if changes are predictable they ought to be recognized.

B. Pro Forma Financial Statements

4.07 The financial projections carried out for a "greenfield" project include three summary statements: (i) the pro forma income statement; (ii) the pro forma balance sheet; and (iii) the pro forma funds flow statement. Examples of these are shown in Illustrative Case Study No. 2. By converting the cash flow statement into real terms we can now extract the annual cost and benefit streams necessary for the financial IRR calculations.

4.08 For an expansion project the situation is more complex since a comparison is necessary of the existing firm (i) with the expansion project, and (ii) without the expansion project. This comparison is necessary to establish incremental cash flows from the expansion project alone, and involves deduction of annual streams of the "without-case" from the annual streams of the "with case." The incremental projections will subsequently be used to extract costs and benefit streams for the project in order to calculate the "incremental financial IRR." An example is shown in Illustrative Case Study No. 3.

4.09 In situations with expected high inflation and in particular, with expectations for differential inflation rates for different inputs and outputs, the financial projections (income statements, balance sheets, fund flow statements) with the expansion project--and without the expansion project--should be established first in nominal terms, and then deflated back to real terms. In this manner the incremental projections for the expansion project can be derived in real terms.

C. Ratio Analysis

4.10 Once the set of financial pro forma statements has been derived, it is possible to calculate key financial ratios used commonly to evaluate the financial strength of a project. The most common financial ratios are: (i) liquidity ratio (current assets over current liabilities); (ii) debt/equity ratio (long-term debt over shareholders equity); (iii) debt service coverage ratio (sum of net income after taxes, depreciation and interest charges over sum of total debt service payment, for a given year); (iv) net income after taxes as a percentage of total sales; (v) net income after taxes as a percentage of total assets. There are other useful ratios, some of which are listed in Annex 4-1. Key financial ratios for different years, typically calculated on the basis of nominal term data, will permit

the analyst to make judgments about the financial strenth and performance of the project over time. If some of the ratios are considered inadequate, appropriate measures will have to be taken to improve the situation. For example, if debt service coverage is below a level considered prudent for companies with normal business risk, over an extended period of time (e.g., during early plant operations), the financing plan will have to be restructured (higher equity, longer loan maturities, and/or longer grace period), to yield a more comfortable debt burden. Similarly, a low current ratio normally means a tight liquidity situation and can be improved by provision of a larger amount of long-term capital and a reduced reliance on short-term financing (e.g., short-term loans, accounts payable).

D. Break-Even Point Analysis

4.11 A financial break-even analysis should be carried out for any potential venture in the manufacturing sector, in order to assess the relationship between production volume, production costs and profits. The break-even point is that level of business activity (e.g., sales volume), where expected total revenues and costs are equal; thus, at that level the business has zero profits (and zero losses). The detailed break-even analysis would vary depending on what profit type (gross, net, before or after tax) and type of expenses (including or excluding interest, depreciation) one wants to test.

4.12 The break-even point analysis requires grouping of production costs into variable and fixed costs. For the typical break-even point analysis to establish the needed sales volume to achieve a zero profit level, one subtracts variable costs per unit from projected sales revenue per unit to determine the gross earnings available to meet fixed expenses (unit contribution margin). The projected annual fixed costs are divided by the unit contribution margin to yield the volume or number of units that have to be sold in order to break even. The resulting number can be related to full-capacity production volume and expressed as a percentage of capacity (see Explanatory Note No. 3 "Break-Even Analysis"). Sensitivity analyses (variation of sales price, inclusion or deletion of depreciation, taxes, target profits, etc) should be carried out to get an idea of how the project will respond to different scenarios (see also Explanatory Note No. 4 "Liquidity Analysis"). For more detailed discussions of the break-even analysis and liquidity analysis, reference is made to Items 4 and 6 of the Bibliography.

E. Deriving Financial Costs and Benefit Streams

4.13 Above detailed financial analyses and the resultant projected financial statements allow the calculation of the cost and benefit streams in real terms ("simple" for the greenfield project; "incremental" for the expansion project). These streams are, in turn, used to calculate the discounted financial rate of return (IRR).

4.14 For the typical IRR analysis the following general table format is useful:

IRR Analysis: Cost/Benefit Streams

		x		y	z
	Years	Capital Cost Streams	Operating Cost Streams	Benefit Streams	Net Benefit Stream (Y - X)
Project Implementation	1				
	2				
	.				
	m				
Economic Project Life	m + 1				
	.				
	.				
	m + n				

Where m = project implementation time in years; and
n = economic project life in years

The capital cost streams normally consist of investment cost and working capital cost streams; if appropriate, the investment capital cost stream could be broken down further into cost streams for civil works, equipment and services or into investments within the plant and infrastructure outside the plant. The operating cost streams might be grouped into streams for energy costs, labor costs etc, whereas the benefit streams might be split into different revenue streams for different products. This grouping will later permit detailed sensitivity testing of individual cost and benefit streams; but for simple overall IRR calculations, above table format should suffice (see also Annex 3-4, Table 5).

4.15 The amounts and timing of investment costs and working capital costs as well as necessary reinvestments are taken from the pro forma cash flow statement in real terms. Similarly, operating costs are taken from the income statement. Care has to be taken to disregard depreciation and interest charges, in calculating the financial internal rate of return. Depreciation charges are excluded since they do not represent actual cash flows. Regarding interest charges, one could understand the IRR as "the maximum rate of interest that could be paid for the funds employed over the life of an investment without loss on the project" (see also para 5.03). Of course, interest charges must therefore be excluded. In the after-tax financial IRR, income taxes are considered like a cost, since they are not available to the investor. Of course, income taxes can only be calculated in the pro-forma income statement, after allowing for interest and depreciation. The benefit streams are also derived from the pro forma income statements and represent the real term annual revenues for different outputs of the project.

4.16 The time frame for the cost/benefit streams is shown as involving the project implementation time "m" (typically between 1 to 5 years depending on the scope and complexity of the project) and the economic life of

the project "n" (paras 3.09 and 4.14). Typically this time frame goes beyond the time frame of the financial projections which normally need not exceed 10 years, including 5-7 years of initial operations. Therefore, the data for cost and benefit streams need to be extended till the end of the period (m + n). Appropriate assumptions regarding asset replacement (capital cost streams), operating level, operating cost (operating cost streams), output, and revenues (benefit streams) need to be made. Normally, the steady state situation of the last year of the financial projections is continued until the end of the period (m + n), taking, however, into account relative price changes in real terms if any. The underlying assumption is, that the project should be able to produce at the steady state level until the end of its life. This is achieved through appropriate reinvestments, and possibly increasing maintenance cost levels, which will be incorporated in the cost streams.

4.17 At the end of the projection period (m + n) the facilities still exist and normally have a residual value. This residual value may be the value of land and the scrap value of equipment, and useful mobile equipment, less costs for dismantling of the plant and demolition of structures. Alternatively the value could be assumed to be the price expected to be paid by a buyer for the facilities who sees an opportunity to derive future benefits from them. The estimation of an appropriate residual value should be based on the knowledge of the industry and therefore should normally be derived by the sector specialist. Examples of estimated residual values are contained in the Illustrative Case Studies. The residual value is normally entered as a negative cost in the last year of the investment capital cost stream.

4.18 At the end of the projected life of the project, working capital can also be recovered. For example, inventories of spares, supplies, intermediate and finished goods are assumed to be used up to a zero level. Therefore, typically the cumulative working capital, built up early in project operations, is assumed to be recovered in cash at the end of the project life. Consequently the recovered working capital is typically entered as a negative cost into the last year of the (working) capital cost stream.

4.19 With these preparations the analyst can now proceed to calculate the financial IRR as described in Chapter V.

V. CALCULATING THE FINANCIAL RATE OF RETURN

A. Discounting Techniques

5.01 After preparing financial tables and establishing financial cost and benefit streams, two ways are possible to test the financial viability of the project in terms of discounted cash flow analysis: (i) calculation of the project's net present value, and (ii) calculation of the financial internal rate of return.

5.02 The net present value of a project is the summation of the discounted net benefit stream entries. The discount rate used for the dis-

counting is the opportunity cost of capital, expressed in percent of the value of capital. The opportunity cost of capital is the return on investments foregone elsewhere by committing capital on the project under consideration. Also referred to as the marginal productivity of capital, the opportunity cost of capital can be understood as a rate of return that would have been obtained by the last acceptable project. The opportunity cost of capital is normally used as a "cut-off rate" in investment decisions. In principle, a project is financially acceptable to an investor using the net present value criteria, if the project has a non-negative net present value at the investor's opportunity cost of capital. Net present values can be used to compare alternative projects or alternative configurations of a given project.

5.03 The common method for evaluating the financial viability of a project is to calculate the financial internal rate of return (FIRR). It is the discount rate which leads to a net present value of zero when discounting financial cost and benefit streams. Under this criteria a project is acceptable if its IRR equals or exceeds the opportunity cost of capital.

5.04 The discounted cash flow concept and technique are explained in References 2,6 and 7 of the Bibliography, and in the Explanatory Note No. 1 on "Mechanics of Discounting." In summary, each annual entry of the net benefit stream is multiplied by the discount factor for that year, resulting from a chosen discount rate. The summation of all discounted annual entries yields the net present value of the net benefit stream. The discount rate that yields a net present value of zero is the IRR, as per definition.

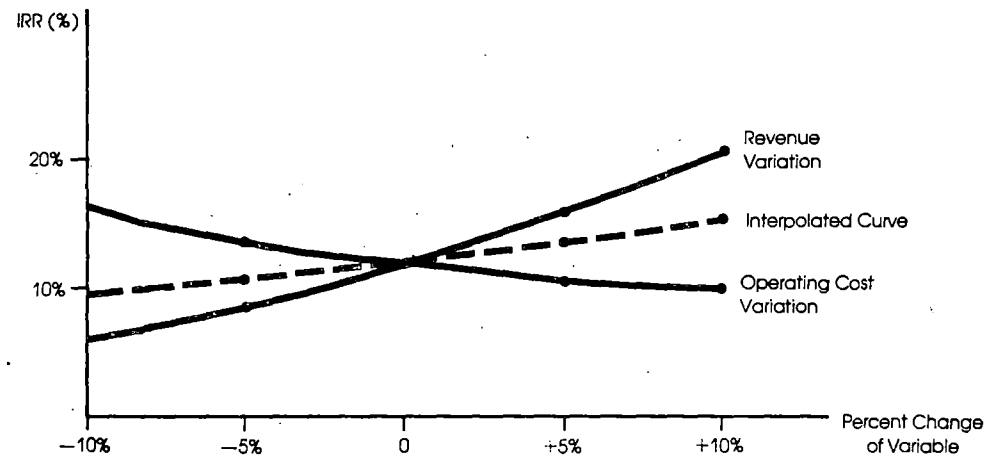
B. Testing for Sensitivity

5.05 The value of the cost-benefit analysis is enhanced through sensitivity tests of major variables. A careful sensitivity analysis can overcome some of the weaknesses of using a deterministic (as opposed to a probabilistic) approach (see para 1.12). The objective of the sensitivity analysis is to modify assumptions on key variables (costs, benefits, time variables, learning curve, capacity utilization, etc.), and to test how the project's internal rate of return, and hence its viability, is affected by these different scenarios. This analysis permits a judgment as to the riskiness of the project under alternative assumptions. The experienced and skillful analyst will be able to assess fairly accurately the strengths and weaknesses of an investment project by testing the most important variables under likely or reasonably possible assumptions (see also para 7.08).

5.06 The most significant impact on manufacturing projects' internal rate of return is normally caused by changes in the output price levels. However, other important variables are investment cost and duration, major operating costs, project life and capacity utilization (output level). The analyst typically asks, "what happens to the financial rate of return if the output price is reduced by 10% (20%) or increased by 5%?" Similarly, operating costs or investment levels are increased (or decreased) by, for example, 5%, 15%. The project start-up might be slipped by a year (operating costs and benefit streams are delayed by one year), capacity utilization is reduced by 10% or the "learning curve" extends over 5 years rather than 3. The one-variable-at-a-time testing will permit to assess

the impact from the change of one variable on the project. Such sensitivity tests will permit development of a curve showing changes of the rate of return, given percentage changes of that variable, along the lines shown below. Plotting, within the same graph, the curves for different variables will permit to approximately assess simultaneous changes of two variables "within one scenario" through interpolation. A computer can permit, with relative ease, more elaborate sensitivity analyses with simultaneous testing of two or more variables.

Sensitivity Analysis:
Testing Revenue and Operating Costs



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5.07 The detailed sensitivity analysis with simultaneous testing of several variables will permit the analyst to "simulate" probable outcomes of the project, an alternative to the one used in the "deterministic" analysis. He can therefore avoid in most cases the need for a complex probabilistic risk analysis and still obtain a fairly reliable indication of the project's risks. This analysis will allow consideration and design of measures to reduce the project's known risks to acceptable levels.

C. Computing Alternative Rates of Return

5.08 As had been discussed in Chapter II, the investors are interested in the return on their investment. They therefore may want to compute the internal rate of return on equity. For this purpose, debt service and profit tax payments must be subtracted from the cost and benefit streams to isolate net benefits accruing on the investors' equity. By further removing payments to foreign shareholders, one can obtain a "national" rate of return (see Explanatory Note No. 5 "Financial Return on Equity").

5.09 Other adjustments are necessary if one were to isolate the effect of foreign loans which would only be available to the country if the project were to go ahead (tied financing). However, it is customary to treat official development aid as untied money (see Explanatory Note No. 6 "Tied Foreign Loans").

D. With/Without Comparison for Projects Affecting Existing Companies (Expansion Projects)

5.10 In the case of an expansion project, two different rates of return can be calculated: (i) the overall internal rate of return which results from accounting for the incremental investment, total sales and total plant operating costs, and (ii) the incremental internal rate of return which results from accounting for the incremental investment, sales and operating costs. The first IRR is misleading since it does not account for the opportunity cost of, for example, selling the existing plant. Thus, the value of the existing plant is treated as zero (sunk costs) yet the high rate of return "benefits" from the output (sales less operating costs) of the existing facilities. The incremental internal rate of return is appropriate since it only takes account of incremental net benefits resulting from the incremental production of the expansion project.

E. Quantifying Direct Foreign Exchange Effects

5.11 Before leaving the financial appraisal, consideration may be given to the direct foreign exchange impact of the project. It should be noted, however, that an investment project has both direct and indirect effects on a country's foreign exchange balance. The most obvious illustration of this point is the project that uses equipment and materials purchased locally from dealers who themselves import the items.

5.12 Apart from such "off-the-shelf" indirect procurement, many of the project inputs that are to be purchased from domestic suppliers require imported inputs. Thus, the total, direct plus indirect, exchange impact of a venture may be quite different from the direct impact alone. Nonetheless, many decision-makers continue to find it useful to see a schedule of the direct foreign exchange effects (see Explanatory Note No. 7 "Direct Foreign Exchange Effects").

VI. ECONOMIC ANALYSIS OF PROJECTS

A. The Concept of Economic Analysis

6.01. The economic analysis in project appraisal evaluates the priority of a project in, and its effect on, the overall economy of the country. In this analysis the economist focusses on three basic questions: (i) Is the project in a sector which deserves priority with regard to allocation of scarce resources? (ii) Within the sector, how will the project contribute to the sector's development? and (iii) Will the project generate sufficient economic benefits to the country to justify the use of scarce resources (capital, management and labor, material inputs, utilities)? All three questions require a thorough sectoral and marketing analysis and a quantification of economic costs and benefits to assess the project's impact on the country's economy and sector. The ultimate purpose is to measure the project's impact in terms of national welfare. An acceptable project should increase discounted national income. Income by itself does not create welfare but leads to the consumption of goods and services which can serve as a proxy for increased welfare.

B. The Economic Internal Rate of Return

6.02 The generally accepted quantitative measure of the economic attractiveness of a project is the Economic Internal Rate of Return (EIRR), which is the discount rate at which the discounted economic benefits of the project are equal to the costs. If the EIRR of a project is equal to, or greater than the opportunity cost of capital in the country, the project is considered acceptable.

6.03 Economic costs and benefits exclude "transfer payments" (such as duties and taxes) and rely on international or border prices for traded goods and "shadow prices" for non-traded goods. (For traded and nontraded goods see Glossary and paras. 6.04 and 6.19, respectively. In the case of goods consumed in the domestic market, the economic value (benefits) of a product equals border price (cif) of a similar imported product plus any differences in local transport and handling costs. On the other hand, if the project exports part or all of its output the fob export price is the correct border price to use for the volume exported. Regarding shadow prices of non-traded goods, see paras 6.19 to 6.24 below, and Explanatory Note No. 8 "Summary of Shadow Pricing Procedures."

C. Pricing Traded Inputs and Outputs

6.04 Traded goods and services create a change in the country's net import or net export position, at the margin. They must be valued at border prices. Imported inputs and import-substituting outputs have an economic value equivalent to their cif prices, with appropriate adjustments for local handling and transport costs (para 6.06). Inputs that reduce a country's net export supply, and exported outputs, should be valued at fob prices. When considering manufactured products and their inputs, a beginning assumption valid in most projects is that a marginal increase in production or consumption in a developing country will not be sufficient to change prevailing world prices. This is especially true of developing country imports. The country's incremental addition to or reduction from the level of world trade is assumed to be absorbed without any appreciable effect on world unit prices. Since this assumption of "infinite elasticity" regarding the supply of imports and demand for exports appears warranted in most DFC projects, world prices can be used for traded inputs and outputs.

6.05 It is unusual for a DFC project to require the purchase or sale of an item in such quantity as to affect the world price. However, the analyst should know what to do if the cif or fob border price of a traded input or output is expected to vary significantly with the amount bought or sold. For details on this, see Explanatory Note No. 9 "Marginal Export Revenue and Import Cost".

D. Fixing Geographic Points of Comparison of Traded Goods

6.06 Several locations must be considered when converting "administered" prices used for the financial analysis to border prices: The project location and the potential or real border point(s) of entry of inputs and the potential or real exit points of outputs. In addition, it

may be necessary to know the geographical source of domestic inputs and the geographic location of target markets. Adjustments are required to the administered prices to capture the transport and distribution costs of moving inputs to site and outputs to markets. The nature of these adjustments ("domestic transfer costs" - see Glossary) are explained below.

E. Origin/Destination of Traded Inputs/Outputs, Domestic Transfer Costs

6.07 To calculate economic prices of traded inputs and outputs, one must begin by identifying the origin of project inputs and the destination of outputs. Project inputs can be imported or purchased from domestic sources. Domestic purchases may cause imports to occur or exports to be diverted to home use. Project outputs can be exported or sold to domestic buyers. Domestic sales may lead to exports or displace imports.

6.08 To calculate economic prices of traded inputs and outputs, their world prices (fob or cif) are adjusted to "border prices" by allowing for "domestic transfer costs." These are costs which would be incurred if one were to move input and output between project site, border and/or target market.

6.09 The importance of the adjustment needed to bring cif and fob values into alignment with project or marketplace values depend on the features of each project. An enterprise may be situated in a country's main port city, purchase inputs locally, and sell entirely within the city. In such cases, adjustments are needed only to cover port storage and handling charges, broker fees, and limited local transportation expenses. In other cases, however, the project may be far from the border point, inputs may be purchased from distant sources, and final products may be sold in several markets.

6.10 It is inappropriate to estimate domestic transportation charges on the basis of general tariff information. Such charges reflect a variety of economic and noneconomic considerations in most countries, and it is advisable to determine them on the basis of specific empirical information. Distance of haul is often less important than constraints on the choice of mode and the number of loadings and unloadings required. The lowest cost alternative for transport and handling needs to be identified and taken into account for determining border prices.

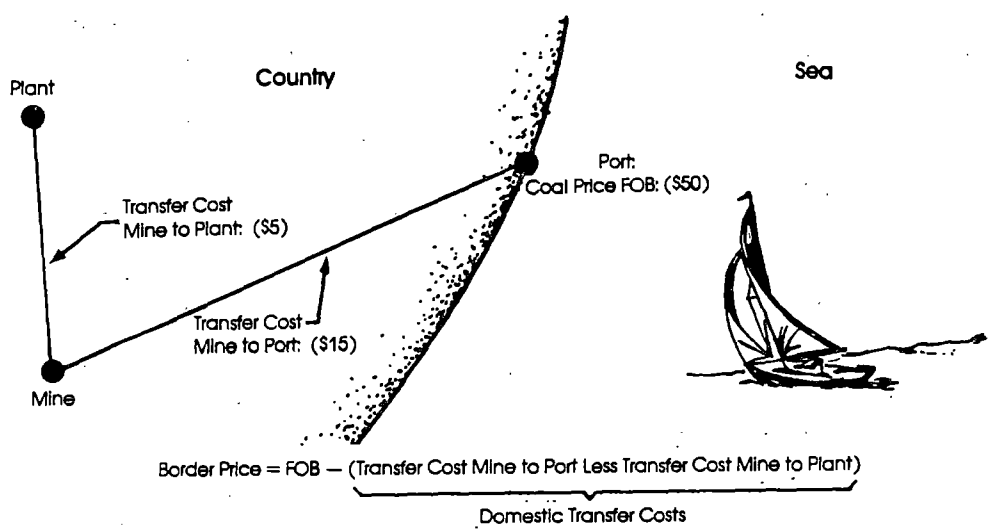
6.11 Similarly, it should not be assumed that one port can be used for all project outputs and inputs. Many countries have several ports or entry points, some of which are specialized with respect to the type of goods or commodities entering or leaving the country. Imported inputs may arrive through one entry and competitive outputs through another a great distance away. Only careful study of the origin and destination of inputs and outputs will reveal the kinds of adjustments needed to make border prices fully comparable with domestic market prices in terms of location.

6.12 To calculate the border price of project inputs the use of which would cause, directly or indirectly, an increase in the country's level of imports, the correct procedure is to determine the cif price of the import and add the cost of moving the input from the port to the project site.

The "domestic transfer cost" may constitute a sizable share of the total factory-gate cost, depending on the nature of the item, distance involved, and handling requirements. Thus, for example, consider a project requiring coal as a fuel. Although the plant may be buying the coal from a domestic firm, its use in the project will increase imports (assuming no domestic coal deposits). Thus the border price for coal would be the cif cost at the closest port, increased by coal handling and transport charges to the plant. These may have to incorporate storage, transshipment and service costs of the coal importer, if traded quantities are too small to permit direct imports to the project.

6.13 To determine the border price of inputs that cause a diversion, at the margin, of the country's exports to home use, one must work backward from the fob price, subtracting the transfer cost between the port and the commodity source and then adding the transfer cost between the commodity source and the project site. Using a coal project example again, think of a country exporting coal in which a proposed project is going to use coal which otherwise could have been exported. The correct border price for that coal (regardless of administered prices) will be the fob price, reduced by the domestic transfer costs involved. These would consist of the cost of moving the coal from the mine to the port (fob), and the cost of moving coal from mine to project site. The following graph illustrates this:

Example: Border Price of Coal (Export Diversion)

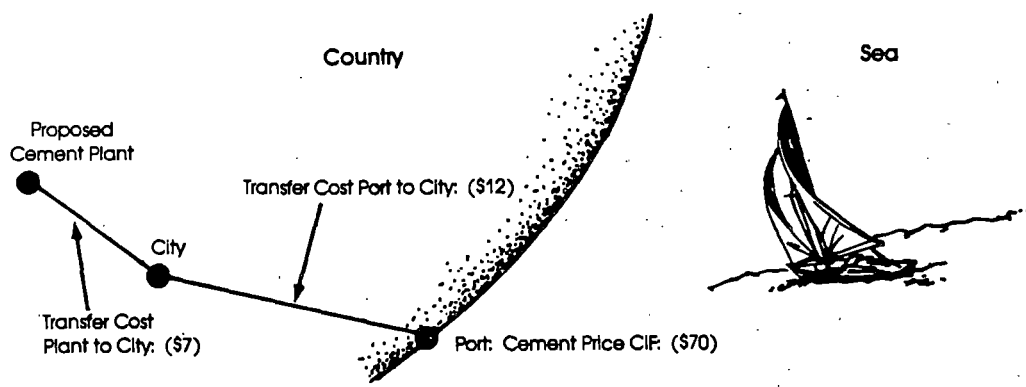


6.14 Consider now the project that would cause an increase in the country's exports. Here one must reduce the fob price of the output by the amount of the transfer cost between the project site and the exporting port.

6.15 Finally, for project outputs that substitute for imports, which is typical of many DFC projects, one must focus on the main domestic marketplace as the geographical point of comparison rather than the project site. Without the project, domestic buyers would pay the cif cost of the import plus the transfer cost between the receiving port and the marketplace (disregarding import duties). With the project, buyers would pay the factory-gate price plus the transfer cost between the factory and the marketplace. Thus, to determine the economic price of the item at the project one must add the transfer cost between the import port and the market to the cif price and subtract the transfer cost between the market and the project.

6.16 As an example of the latter case assume a cement project which would sell essentially to a city which at present must import its cement requirements:

Example: Border Price of Cement (Import Substitution)



Border Price = CIF + (Transfer Cost Port to City Less Transfer Cost Plant to City)

Domestic Transfer Costs

= $70 + $12 — $7 = $75

6.17 It is fairly common to find import-substituting projects located in an urban center that is the main marketing area for their output. In such cases there is no need to worry about adjusting for the transfer cost between project and market. But it is very important that care be taken to ensure comparability. It would be inappropriate, for instance, to compare wholesale and retail prices.

6.18 In practice it can be challenging to achieve full comparability, i.e., that a border price has been adjusted properly for use in project cost and benefit streams. One must be clear as to what the various prices and costs given in the application measure. If they include marketing margins, care must be taken to ensure that either (a) they are adjusted back to a factory-gate price or (b) the border price is raised to include the same kinds of margins. The preferred comparison is between a factory-gate price and a border price after the addition of domestic transfer costs; i.e., prior to any wholesale and retail margins and relevant sales taxes. Measuring costs and prices at the factory gate minimizes the danger of improper comparisons (this is no small problem; marketing margins are often large relative to the factory price).

F. Nontraded Inputs/Outputs

6.19 As already mentioned in para 6.03 above, each input and output is either traded or nontraded. Treatment of traded inputs and outputs has been discussed in sections C to E above. Nontraded items are either tradeable or nontradeable. Nontraded tradeables are not traded by a country for one of two reasons: (i) cost considerations, or (ii) restrictive trade policies (paras 6.20 to 6.22). Nontradeables, on the other hand, are not traded because of their specific nature. They normally include: (a) electricity, (b) water, (c) repairs and maintenance costs, (d) transport and communications, (e) buildings, and land, (f) services, such as, e.g., insurance, advertising, legal services. As discussed in paras 6.23 they require special treatment.

6.20 Nontraded tradeables that are not traded because of cost considerations enjoy natural protection from distant competitors due to their physical nature and the cost of moving them. Their selling price at the point of origin is too high to permit exportation, after allowing for origin-to-border cost, and too low to permit imports to occur, after allowing for border-to-market costs (domestic transfer costs).

6.21 Consider, for example, a stand of timber in the interior of a country, which may be identified as a source of material input to a proposed plywood factory. The country exports logs from coastal forests. It would be incorrect to use the fob price of those logs, adjusted for domestic transfer costs to the project site, as the economic price of the input. The correct approach would be to recognize that the interior forest timber has natural protection from distant competitors and its unit price is too high to permit exportation after allowing for carriage costs to the border. As a nontraded input to the project, therefore, its economic price is the opportunity cost of its use in the absence of the project. This could, for example, be the price of using this timber for construction purposes, as input into a pulp and paper plant or simply as fuel source. The fact that the country imports or exports a good does not by itself mean that the good should be treated as a traded input or output in a project appraisal. Given its location and specific circumstances, it may be like a nontradeable commodity.

6.22 Some nontraded tradeables could be traded were it not for prohibitive tariffs or quantitative restrictions imposed by government. In an economic analysis these should be treated as traded tradeables, implying that the government could change its policy.

G. Decomposing Nontradeable Inputs

6.23 Consider a project that produces a traded output and requires some nontradeable inputs. The project requires, in addition to machinery and equipment, a new factory building. This is a nontradeable input.

6.24 It is possible to "decompose" a factory building into a number of components. Such components can be grouped again into two categories: (a) tradeables, and (b) nontradeables. Under the tradeable inputs, one finds structural steel and cement. Under the nontradeable inputs, one finds sand, gravel,[4]/ overhead expense, and labor which can be divided into skilled and unskilled labor. Since steel and cement are tradeables, one can find border prices for them, as discussed above. Normally sand and gravel can be treated as natural nontradeable inputs. All nontradeables, including overhead (service) and labor input will require adjustment, to derive their economic costs (para 6.31).

H. Conversion Factors

6.25 In order to convert domestic market prices of a nontradeable item into economic "border-equivalent" prices (border prices) conversion factors can be derived. Conversion factors are usually smaller than one. Specific factors can be calculated for specific nontradeables. Among "average" factors, the so-called standard conversion factor (SCF) is the most well known.

6.26 The SCF is meant to be an average ratio of border and domestic market prices. In its simplest form it is a ratio of two versions of a country's foreign trade turnover, one exclusive of and the other inclusive of import taxes and export taxes or subsidies:

$$SCF = \frac{M + X}{(M + T_m) + (X - T_x)}$$

where: M : cif value of imports,
X : fob value of exports,
T_m: all taxes on imports, and
T_x: all taxes on exports.

6.27 Unless export taxes are equal in value to import taxes, the denominator will be greater than the numerator and the factor will be less than one. Thus, when the SCF is multiplied with a domestic market price a lower value will be obtained for the border-priced value.

6.28 The SCF was created to deal with tariffs and taxes that affect a country's foreign trade and permit divergence between border (also known as "world") prices and domestic market prices. By using border prices, one figuratively sweeps away the distortions. For additional explanations, see Explanatory Note No. 10 "Standard Conversion Factor."

6.29 Additional factors can and should be created for nontradeable inputs such as construction, domestic transportation, electricity, etc. Specific factors are derived by establishing border prices through detailed economic analysis of the item under consideration (see para 6.31 below) and dividing by domestic market prices. For most DFC projects a limited amount of decomposition of nontraded inputs and the application of five or six

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4/ Sand and gravel could be further broken down into machinery, fuel (tradeable) and labor, overhead (nontradeable). However, it will be treated here as nontradeable.

specific conversion factors will be adequate. When an item is relatively unimportant as a share of total project cost and/or information is very hard to find, one can use the SCF.

6.30 Each DFC should create a file of specific and average conversion factors for major items so that future applications can be processed more easily. The analyst will have to check to make sure that the proportions of components within a nontraded input are about the same as those used to create the given factor.

6.31 Coming back to our example of a building (paras 6.23 & 6.24), consider that conversion factors have been derived for sand/gravel, overhead, skilled and unskilled labor in a given country. The following table demonstrates the decomposition of the factory building and the use of conversion factors to obtain its border price and its specific conversion factor. By deriving conversion factors for the nontraded items and using the border prices of the traded items (steel and cement), one can obtain a border-priced total cost for the building. To the extent that the proportions of steel and cement and the cement and the other components of this specific building are representative of such proportions in many such buildings in the country, the 0.75 building conversion factor shown in the table can be used in other project appraisals.

Determining the Economic Cost of a New Factory Building

Major Cost Component	Financial Cost	Conversion Factor	Economic Cost
Traded Items			
Steel	120,000	(0.78)	93,000
Cement	40,000	(0.88)	35,000
Nontraded Items			
Sand & Gravel	48,000	0.80	38,000
Overhead	92,000	0.80	74,000
Skilled labor	20,000	1.00	20,000
Unskilled labor	80,000	0.50	40,000
TOTAL BUILDING	400,000	0.75	300,000

I. Economic Pricing of Nontraded Inputs

6.32 Nontraded inputs can be supplied to a project by domestic firms under three scenarios:

(i) project demand for the nontraded input is satisfied by increasing production of the nontraded input elsewhere;

(ii) production of the nontraded input is not increased and project demand is met by diverting supply from existing users; or

(iii) some of the project demand for the nontraded input is satisfied by increasing production and some by diversion.

6.33 In the first scenario, the economic price of the nontraded input should be based on its incremental supply cost--variable cost increases for materials, utilities, wages of new production workers and/or overtime work payments, etc. If capacity will be expanded, capital costs should be included. In the second scenario, the economic price should be based on the price that existing users are willing to pay: the incremental demand price. In the third scenario, the economic price should be based on a weighted average of the incremental supply cost and demand price.

6.34 In the typical DFC project the first scenario applies, of course, since typically input requirements are small in relation to the total market for these inputs. However, if scenarios two or three are applicable, typically the input is also a major cost item, in which case the supply-cost approach may be used.

J. Economic Pricing of Nontraded Outputs

6.35 A similar analysis can be made with respect to nontraded outputs. If a project will produce a nontraded output to satisfy rising demand in the country, the economic price should be based on the price that consumers are willing to pay (the consumers may be other producers if the output is an intermediate or capital good). If the output sales will displace other domestic sellers, the economic price should be based on their avoided costs of production. Finally, it may be necessary to take a weighted average of the two. For practical purposes of most DFC projects, however, particularly in a situation of rapidly rising demand, the first scenario is applicable. For details of another example see Explanatory Note No. 11 "Example of Economic Pricing of Nontraded Output."

6.36 When the economic value of a nontraded output has been determined, it should be multiplied by a conversion factor to express it in border prices. The correct approach is to construct a consumption conversion factor based on a weighted average basket of goods and services. In practice, the SCF is often used to make the conversion. The trade-weighted SCF may not correspond very closely to the consumption-weighted factor in many countries, however, and if the difference is substantial an effort should be made to calculate an appropriate consumption-weighted factor (or at least to calculate an SCF that applies only to consumption goods).

K. Shadow Pricing Land and Labor

6.37 Land and labor inputs require adjustment and conversion into border prices in accordance with the Guideline method. In many DFC projects neither of these two inputs is of major relative importance within total cost, but exceptions can occur.

6.38 The economic cost of land, a nontradeable input, is the value of net output given up as a result of using it in a project, measured in border prices. Explanatory Note No. 12 "Economic Cost of Land" is provided to explain how to determine such a value. If land is relatively

unimportant in total project cost, it is acceptable to multiply the financial cost by a conversion factor applicable to the type of land. Otherwise, one must try to identify the foregone use of the land and then apply a conversion factor.

6.39 The economic cost of labor is the value of net output given up as a result of using it in a project, measured in border prices. Explanatory Note No. 13 "Economic Cost of Labor" explains how to determine such a value. If labor is relatively unimportant in total cost, short-cuts are acceptable. Barring evidence to the contrary, it can be assumed that the wage rate for skilled workers is close enough to the border-priced opportunity-cost wage that no adjustment is required. The wage rate for unskilled workers is often reduced by 50 percent, on the assumption that unemployment is widespread and alternative incremental job generation is limited. If one has doubts about using a shadow price of 0.5 times the unskilled wage bill, two or three values can be tested to see how sensitive the rate of return is to this element.

6.40 If foreign workers are expected to account for an appreciable share of the project wage bill, and that bill is relatively important within total costs, an additional adjustment may provide further clarification. To illustrate, assume that half the unskilled workers will come in from an adjacent foreign country. From the project country point of view, all their remittances and all their expenditure on traded goods (valued in border prices) out of wage income will represent a cost. None of their payment of taxes and only a portion of their expenditure on nontraded items will represent country costs. After estimating the share of these in total wages (one can apply the SCF to the nontraded items), one calculates the weighted factor suitable for application to the foreign workers' wage bill.

6.41 If that weighted factor were, say, 0.75, one could simply adjust the overall conversion factor for unskilled project labor upward from 0.50 to 0.625. A similar procedure could be followed for skilled and managerial workers, but if those types of labor are already costed at the going financial wage rate further adjustment is normally unnecessary.

L. Deducing Border Prices

6.42 In the factory building table in para 6.31, the conversion factors shown for the traded items (structural steel and cement) are enclosed in parentheses. The assumption is that the analyst is able to find cif price quotations for those items, relating to recent import transactions. If the ad valorem import tariffs applicable to the items were known, however, and it could be assumed that those tariffs account for the entire difference between border and market prices (allowing for "domestic transfer costs"), one could deduce cif prices without having to search for actual transactions data.

6.43 For example, if the tariff on steel were 30 percent and the tariff on cement were 15 percent, it could be anticipated that their domestic market prices would exceed cif prices by those percentages if there are no other taxes or subsidies in the domestic market. Put differently, their border prices would be less than their market prices by the amount of the

tariffs. Thus, 120,000/1.30 = 92,300 and 40,000/1.15 = 34,800. These deduced values are close to those obtained from the direct price quotations (93,000 and 35,000).

6.44 It should be emphasized that direct pricing is superior to deducing border prices from nominal tariff information. If one is quite certain that the domestic price exceeds the cif import price by the amount of the tariff, however, it is permissible to resort to deduced prices. In any case, even when having used direct border prices, double checking with the tariff may be useful, given the difficulty of specifying equivalent foreign goods. If imports are significant, the ratio of domestic price over (1 + tariff) is a good maximum estimate of the true border price.

6.45 The implied specific conversion factors for steel and cement, 0.78 and 0.88, respectively, should be recorded in the DFC's file of factors for future reference. Factors could also be estimated for various categories of imports such as capital goods, intermediate goods, and final consumption goods. In time, these deduced prices can be validated by comparing them to actual price data contained in project aplications.

M. Summary Table of Economic Pricing

6.46 The following table should help to pull things together.

Origin, Destination, and Economic Efficiency
Prices of Project Inputs and Outputs

Project Inputs

A. Net Imports of tradeable items (cif plus converted port-to-project costs)

B. Diverted Net Exports of tradeable items (fob minus converted source-to-port and plus converted source-to-project costs)

C. Nontraded Items
   1. Land (converted opportunity cost)
   2. Labor
      a. Skilled (market wage rate)
      b. Unskilled (converted shadow wage rate)
   3. Goods (converted domestic market price plus converted source-to-project costs).

Project Outputs

A. Net Exports (fob minus converted project-to-port costs)

B. Import Substitutes (cif plus converted port-to-market costs and minus converted project-to-market costs)

C. Nontraded Items (converted factory-gate price).

VII. CALCULATING THE ECONOMIC RATE OF RETURN

A. Economic Cost and Benefit Streams, Discounting

7.01 The previous chapter discussed how economic prices were to be obtained for the different inputs and outputs of a project under consideration. Thus the analyst will group inputs and outputs into traded and nontraded items. He then determines border prices (cif or fob depending on direction of goods) for traded inputs and outputs and will adjust for domestic transfer costs (moving items from project site to border or vice versa, or from source of domestic production to market place). This should be straightforward normally, but can involve difficulties as follows: (i) finding comparable goods of similar characteristics in the international market, and (ii) establishing economic transport costs, which might be substantially different from transport tariffs, in that they should reflect inputs for transportation at world prices (in particular fuel, electricity and transport equipment, and shadow prices for labor). If transport costs are significant in the overall cost/benefit framework of the project, detailed analysis should be carried out to adjust administered transport costs to economic prices. Similarly domestic market prices of nontraded goods and services are to be identified and to be converted into border-price equivalents. Depending on the importance of the cost of nontraded items, this may, again, have to involve decomposing of nontraded items into tradeables and nontradeables and proceeding as described in chapter VI to derive border prices for tradeables and shadow prices for nontradeables. While this sounds complicated and normally is quite complex, fortunately with growing experience the analyst will get a "feel" for what items are important and therefore need to be focussed upon more.

7.02 Once economic prices have been established for the project's imputs and outputs, economic costs and benefit streams, with annual entries can be established in a similar fashion as for the financial analysis. It will be helpful to use the same format for economic return calculations as used in the financial cost and benefit streams. The discount rate that sets the discounted economic net benefit stream equal to zero, is the economic internal rate of return. The project is considered acceptable if the EIRR exceeds the country's opportunity cost of capital.

B. Sensitivity Analysis and Interpretation of Results

7.03 Similarly as in the financial analysis, sensitivity tests should be carried out for the most likely important project variables to obtain a better appreciation of the project's strengths and weaknesses and in particular of the project's risks. Thus, economic costs and benefits will be varied in magnitude and with respect to time, to assess the impact of changes on the project's EIRR. In particular the analyst may want to test variables for which the economic valuation assumptions are not very firm.

7.04 An important step in trying to interpret results of EIRR and sensitivity analyses is the comparison with the FIRR and their sensitivity tests. If there is a significant difference between EIRR and FIRR, the analyst should find the underlying reasons. For example, high tariffs, unusually high profit margins due to shortages, or administrative pricing

of a project's output may permit a domestic market price substantially higher than the cif price of a comparable import, resulting in a much higher FIRR than EIRR. The higher "administered" price may be needed to cover initial production inefficiencies in an infant industry or may simply lead to abnormally high profits. Could the venture survive if protection were eliminated, suddenly lowered or gradually reduced? This question could be tested through appropriate sensitivity analysis.

7.05 Similarly, an economic return much higher than the corresponding financial return might result from government price controls leading to unremunerative price levels or from excessive tariffs on intermediate inputs for the project, which need to be imported.

C. Effective Protection Analysis, Domestic Resource Cost

7.06 As above examples illustrate, familiarity with the country's incentive system, tariff structure, price policy are necessary for the analyst in both the economic analysis and in the interpretation of its results. In addition, the effective protection analysis permits a quantification of the level of protection which results from tariffs for both inputs and outputs of a given project. An effective protection rate refers to the percentage by which project value added at domestic prices exceeds value added at border prices. This rate can be higher even if nominal tariffs are low, when value added represents a small share of sales receipts. Conversely, the rate can be low in the presence of high nominal tariffs, when value added represents a sizable share of sales receipts (see Explanatory Note No. 14 "Effective Protection").

7.07 While effective protection measures (there are several variants) are useful indicators of resource-pull incentives in a country, it is generally accepted that they are not reliable indicators of economic efficiency of a project, particularly since they provide a static measure for a given year (see Explanatory Note No. 15 "DRC-type Measures of Project Merit"). If one modifies them sufficiently (by capturing indirect inputs and by shadow pricing domestic primary factors of production), one obtains a measure of domestic resource cost. The relationship between the DRC coefficient and the net present value (or economic rate of return) of a project is explained in Annex 7-1.

D. Project Ranking, Selection and Improvements

7.08 These Guidelines do not deal with project ranking, but a brief Explanatory Note No. 16 "Project Ranking" is provided to convey some of the main considerations. For most DFCs, project applications must be accepted or rejected. Sensitivity analysis is the recommended method for dealing with probable risks and uncertainties (see para 5.05), but of course more sophisticated methods can be used whenever a project appears to warrant deeper investigation. (The two textbooks cited at the beginning of the Bibliography are helpful in this respect.)

7.09 Finally the project analyst is faced with two major tasks: (i) deciding whether to recommend acceptance or rejection of the investment proposal, and (ii) identifying changes that could strengthen the project.

It is also important to identify changes desirable in government policy to help in the better design and operation of the project. If it appears that a substantial portion of the project surplus will lead to a loss of government revenue (through the reduction of import duty collections, etc.), for example, an excise tax might be suggested to redistribute some of the surplus.

VIII. SHORT-CUT METHODS

8.01 Questions are sometimes raised concerning the use of short-cut methods. Can alternative measures of merit--such as effective protection coefficients, net foreign exchange gains, and investment cost per job--take the place of a discounted-cashflow rate of return? Not very often. Studies have shown that such "partial" measures, while interesting in their own right, are not reliable proxies for the economic rate of return. In most countries it will be necessary, therefore, to calculate the economic rate of return (or net present value) in order to obtain a reliable impression of a venture's merit from a country point of view.

8.02 Financial soundness and profitability are very important considerations when one is evaluting DFC projects, and these Guidelines underscore that importance. A high financial return cannot be taken as reliable evidence of a high economic return, however, due to the existence of distortions in most economies and, sometimes also in international prices. Only if one believes that distortions are minimal would it be at all plausible to rely on the financial rate of return as a measure of merit. Where this is the case, viz., where the FIRR is to be the only measure calculated, the financial cashflow should be adjusted to remove import and excise taxes, surcharges and other taxes as well as any government subsidies to the project.

8.03 Could one, then, abbreviate the economic rate of return calculation? Yes, provided certain conditions are satisfied. The general rule that sums up most of such conditions has to do with the relative importance of project parameters and variables and their relative weight with respect to total cost or revenue. A rigorous procedure should be observed for the important items. Short-cuts should be confined to minor things that appear unlikely to be very influential in terms of raising or lowering the rate of return.

8.04 The most common short-cut is found in the treatment of nontraded inputs. Decomposition is limited, and the Standard Conversion Factor is used to determine the border prices. In some cases, it may be feasible to leave land, labor, and nontraded goods in financial prices (as recommended by the 1974 "Blue Book" for a "first approximation"). Finally, border prices of traded items can be deduced from tariff rates or computed by means of average conversion factors, rather than found through direct investigation. Such short-cuts can be often misleading, but if one is quite certain that their effect is to reduce the rate of return they may be acceptable. Of course, a significant reduction of the EIRR might lead to rejection of an otherwise acceptable project. Therefore, here again, only for less important variables should these short-cuts be permitted.

8.05 How can one know that short-cuts will reduce the rate of return rather than raise it? By being familiar with the nature of the project country's and world trade distortions, in addition to classifying the project into one of the following four main types and thus treating it as discussed below:

(i) projects that use mostly traded inputs to produce traded output,

(ii) projects that use mostly traded inputs to produce nontraded output,

(iii) projects that use mostly nontraded inputs to produce traded output, and

(iv) projects that use mostly nontraded inputs to produce nontraded output.

8.06 Many DFC projects produce traded outputs which increase exports or substitute for imports. If the main inputs are also traded, the use of long term fob and cif price forecasts can take one a long way toward a reasonably accurate economic rate of return. The other three types are harder to predict, and projects that make several outputs for both domestic and foreign markets are especially resistant to generalities. However, the typical project of a DFC for the manufacturing industry falls into categories (i) or (iii), and some simplification on nontraded inputs is feasible, once conversion factors have been derived.

8.07 The extent to which an overvalued foreign exchange rate is maintained by trade controls--taxes, tariffs, and non-tariff barriers--influences the extent to which a project's economic rate of return exceeds or falls below the financial rate of return. Government price controls and international price distortions of a temporary nature are also influential. Minimum wage requirements are usually of less significance in the context of DFC projects, but do matter sometimes.

8.08 One must be cautious about generalizing, because projects are affected in different ways by combinations of distortions. Intuitive judgments may be inaccurate. A venture might benefit greatly from effective protection but show a modest financial rate of return due to government price controls on output. Ventures that produce traded outputs and promise handsome economic returns may show much lower financial returns because of requirements to purchase very expensive local inputs or because of peculiar tax practices. Trade quotas, outright bans and dumping can be especially devastating in their impact. Thus, even when using short-cut methods, the analyst must be conscious of major variables' impact on the project. Experience, gathered through detailed analysis of several projects, will help the analyst in making sound judgments on the variables he needs to focus upon to obtain reasonable results. Extensive use of sensitivity analysis will further help him to look behind the characteristics of the project parameters and variables and to understand how they interact. After the analysis he should be in a better position to recommend or advice against implementation of the project.

Explanatory Note No. 1 (see paras 1.11 and 5.04)

Mechanics of Discounting

1. The mechanics of discounting a cashflow are the same for financial and economic rates of return. An internal rate of return is the rate of discount that reduces the net present value of a series of numbers to zero.

2. Inexpensive hand calculators are available which have a rate-of-return capability. One enters the annual cashflow values, presses an "IRR" button, and waits for half a minute to learn the answer.

3. For those who do not have access to such calculators, the procedure is more tedious. An arbitrary discount rate is adopted and used to compute a discounted cashflow series. If the sum of the discounted series is positive, one selects a higher discount rate and tries again. It may take four or five passes to find the discount rate that reduces the net present value of the series to zero (or close to zero).

4. Tables of discount factors can be used to facilitate the computations. One might choose to start with a ten percent rate of discount. The factors at that rate are 1.00, .909, .826, .751, .683, .621, .564, .513, and so forth. Thus, $100 is worth $100 in the base year but only $100 X .909 = $90.91 a year later, $82.64 two years later, etc.

5. Imagine a project that involves the purchase and installation of a large machine and related facilities in the base year, with production and sales commencing a year later and rising smoothly to 90 percent of maximum feasible capacity in the fifth year and holding steady through the tenth year, the horizon year. (In this example the base year is Year 1, but some calculators may require that it be designated as Year 0.) Assuming no terminal asset value, here is the rate of return calculation:

Year	Net Cashflow, $000, Constant Year 1 Prices	Net Present Value at 10% Rate of Discount	Net Present Value at 15% Rate of Discount	Net Present Value at 14% Rate of Discount
1	-400	-400.00	-400.00	-400.00
2	60	54.54	52.17	52.63
3	70	57.85	52.93	53.86
4	80	60.10	52.60	54.00
5	90	61.47	51.46	53.29
6	90	55.88	44.75	46.74
7	90	50.80	38.91	41.00
8	90	46.18	33.83	35.97
9	90	41.99	29.42	31.55
10	90	38.17	25.58	27.68
		66.98	-18.35	-3.28

The 10-percent rate leaves a substantial net present value, the 15-percent rate is too severe, and the 14-percent rate is about right.

Explanatory Note No. 2 (see para 3.27)

Currency Devaluations

1. When the future rate of price inflation in a country is expected to exceed that of the country's main trading partners by a considerable degree, the possibility of exchange rate changes should not be ignored.

2. Holding the exchange rate constant in the face of high differential inflation implies a falling real cost of imports and a falling real value of exports to exporters, other things equal.

3. It is not difficult to perceive the impact of a currency devaluation on a project's financial rate of return. One can compare the with-devaluation case to the without-devaluation case to discover what happens to the financial return.

4. With respect to the economic rate of return, it is sometimes stated that the conversion factor approach of the Guideline should obviate the need to allow for currency change. Starting with the assumption of high domestic inflation relative to other countries, consider the three major alternatives:

a. government takes no action,

b. government moves to preserve local industry by increasing the protection provided by tariffs and other devices, or

c. government devalues the currency.

5. If government takes no action, imports will become increasingly attractive and capture the domestic market. This is not a likely outcome in most developing countries. If protection is increased, which is more likely, domestic producers can remain competitive in a financial sense but not in an economic sense. The project analyst will have to specify conversion factors for each year of the venture's life (rising protection will require decreasing conversion values over time).

6. If it is assumed that base-year levels of protection will be held constant, however, with the exchange rate changing to preserve the relationship between traded and nontraded goods and services, the conversion factors can remain the same throughout the project life. Only one item, the exchange rate, has to be adjusted from year to year.

7. Given the differential inflation, one or both of these policy alternatives should be tested for impact on the economic rate of return. To assume constant protection and a constant exchange rate is likely to be indefensible in many cases.

Explanatory Note No. 3 (see para 4.12)

Break-Even Analysis

1. A financial break-even analysis is a very useful exercise, and should be performed for most projects. The break-even point refers to the volume of output and sales that is sufficient to cover total costs; no profit is generated at that level. The procedure is to subtract variable cost per unit from expected sales receipts per unit to find the residual amount available to meet fixed costs of production. This amount is then divided into projected annual fixed cost to determine the number of units that must be produced and sold in order to break even. The number can be related to full-capacity output volume and expressed as a percentage.

2. Since break-even or "cost-volume" analysis is an excellent way to gain insight into a venture's financial strengths and weaknesses, more discussion is warranted. The essentials can be shown by means of simple algebra and a few numbers. The following notation is adopted:

d asset depreciation accounting charge
e fixed expense other than depreciation
f total fixed cost of production

$$f = d + e$$

p unit sales price
q quantity of units produced and sold
r sales receipts

$$r = pq$$

v variable cost of production, per unit
t total cost of production

$$t = f + vq$$

P profit
* indicates value at break-even point

3. The profit equation is $P = r - t = pq - f - vq$. It can be rearranged to show that sales receipts are equal to total cost plus profit: $pq = f + vq + P$. By definition, there is no profit at the break-even, so $pq^* = f + vq^*$.

4. The difference between the unit price and variable unit cost is the amount available for meeting fixed cost. To find the break-even volume the following steps are taken:

(i) $pq^* = f + vq^*$

(ii) $pq^* - vq^* = f$

(iii) $q^*(p - v) = f$

(iv) $q^* = \frac{f}{p - v}$

Inserting assumed numbers,

$$\underset{p}{\$10} \times \underset{q^*}{1{,}000} = \underset{d}{\$625} + \underset{e}{\$1{,}875} + \underset{v}{\$7.50} \times \underset{q^*}{1{,}000}$$

If capacity volume were 1,250 units per year, the break-even volume of 1,000 units would represent 80 percent of capacity.

5. The break-even volume can be tested for sensitivity to change in the unit sales price. Raising the unit price from $10 to $11, for instance, lowers the break-even volume from 1,000 to 714 units or about 57 percent of capacity:

$$\$11 \times 714.3 = \$625 + \$1{,}875 + \$7.50 \times 714.3$$

$$\$7{,}857.14 = \$2{,}500 + \$5{,}357.14$$

6. The greater the difference between the unit price and variable cost, the lower is the break-even. The same difference could be obtained by restoring the unit price to $10 and reducing the variable cost from $7.50 to $6.50, in which case the break-even volume would still be 57 percent of capacity.

7. Depreciation can be removed from fixed cost to find the minimum volume of production below which operations should be stopped. At a unit price of $10 and variable cost of $7.50 the removal of the $625 depreciation allowance causes the break-even volume to fall to 750 units or 60 percent of capacity (from 80 percent). Sales receipts at that volume just cover the fixed cost of $1,875 (excluding depreciation) and the variable production cost of $5,625.

8. In the above illustrations it is assumed that the unit sales price is invariant with respect to the volume of production and sales, and the fixed cost does not change at all with the postulated changes in output. In some projects these assumptions may not be met, and more elaborate functions will be required. Some costs are neither entirely fixed nor entirely variable, and have to be divided into components before proceeding with the analysis. Generally speaking, however, break-even analysis is worth the effort because it deepens understanding of basic cost-volume-profit relations.

Explanatory Note No. 4 (see para 4.12)

Liquidity Analysis

1. Projecting sources and uses of funds throughout a project's expected useful life is an essential part of financial analysis. The point of the exercise is to ensure that the cumulative cash availability of each year is at least equal to the cash outlay anticipated. The focus is on the synchronization of cash in and out.

2. During the construction phase of a venture the cash provided by owners and creditors is used to acquire plant and equipment and working capital assets. Later, during the operating phase, sales receipts are used to meet operating expenses, service debt, pay profits taxes, and pay cash dividends to owners. In each year the cumulative cash -- i.e., the inflow of that year plus the cash carry-in from the previous year -- should be sufficient to cover the projected cash outflow.

3. Depreciation allowances are not cash charges and are therefore excluded from the exercise. Profits taxes do require cash outlays, however, and cannot be predicted without knowledge of depreciation allowances. For this reason it is necessary to prepare an income statement, based on accrual accounting, in order to determine the tax payments for the cashflow exercise.

4. Since liquidity analysis is concerned solely with the matching of cash in and out, period by period, the projection should be done in current prices (prices that have not been adjusted to eliminate the effect of general price inflation) and in domestic currency. Typically the average foreign exchange rate expected for each year (i.e., the sum of the beginning and ending rates divided by two) will be used to translate foreign exchange flows into domestic currency flows, unless major exchange rate changes are expected. In that case, see Explanatory Note No. 2.

5. The sources-and-uses schedule can be simple, relying on a series of supporting tables about operating costs, debt service requirements, etc., or very detailed -- with all major flows shown. It is very helpful to state the volume and unit price of production and sales (production may diverge somewhat from sales, due to rising inventory, but this is easy to accommodate) in addition to the value of sales receipts, because this facilitates the testing of project liquidity against reductions in price or volume or both. It is also helpful to show the level of production as a percentage of capacity.

6. Illustrative Case Study No. 2 shows a simple version of a typical Sources and Uses of Funds (or Fund flow) Statement in table 11.

Explanatory Note No. 5 (see para 5.08)

Internal Financial Rate of Return on Equity

1. To calculate a financial rate of return on equity, debt service and profit tax payments must be subtracted from the basic cashflow used to find the total return without regard to project financing. The debt service payments can be derived from information about the terms and conditions of borrowing. To determine the tax payments, accounting depreciation charges will have to be estimated and notice taken of any tax concessions or holidays available to the project. Both debt service and tax payments must be expressed in constant base-year prices before deducting them from the basic cashflow.

2. After portions of the project's cash surplus have been removed for the benefit of creditors and government, the remainder belongs to the shareholders. The time dimension of drawings is important, of course, and a dividend pay-out policy will have to be assumed. Accumulated retained earnings left at the end of the project's life will be paid to shareholders, along with any cash realized from the sale of terminal assets.

3. The "equity cashflow" consists of the inflows to the project for the purchase of shares and outflows from the project for cash dividends, distribution of retained earnings, and payment of asset sales proceeds. The signs of the flows can be reversed, since the viewpoint is now that of the shareholders. The internal rate of return that reduces the net present value of the flows to zero is the financial return on equity.

4. The analysis can be extended to calculate the return on national equity. Barring evidence to the contrary, one can assume that shareholder rights are unaffected by nationality. If foreigners contribute half of a project's equity financing, they are entitled to half the equity benefits. Thus, one simply deducts payments made to foreign shareholders from the total equity cashflow and recomputes the internal rate of return.

5. Knowing the amounts paid by the project to foreign shareholders, one can reduce them by any applicable domestic taxes to obtain the net "leakage" out of the project country. These country outflows can then be subtracted from the basic cashflow to find the total national rate of return (available to national shareholders, creditors, and government).

6. These equity returns are on a before-personal-tax basis. One would have to convert into foreign currency and allow for income and capital-gains taxes to find the after-tax return to foreigners. Domestic shareholders would also face taxation on their receipts. The analysis of participating preference shares and other forms of ownership is more complex, but involves the same general procedure outlined above. For additional discussion of foreign-versus-domestic financing, see the note on Tied Foreign Loans.

Explanatory Note No. 6 (see para 5.09)

Tied Foreign Loans

1. Project financing by foreign lenders causes inflows from loan disbursement and outflows for the debt service (repayment of principal, interest charges, and other financial fees). If it is clear that the foreign loans would not be made to the country in the absence of the project, implying that they are "tied" to it, these flows could be introduced into the basic cashflow to find a new rate of return accounting for "tied foreign loans". The new rate may be higher or lower than the original rate, depending on the terms of borrowing.

2. It is customary to treat World Bank Group resources as "untied" money that would be available to the country with or without a specific project. There is nothing sacrosanct about this custom, however, and one can test to see how treating them as "tied" would affect the rate of return.

3. The procedure is to identify each annual cash flow resulting from the loan throughout disbursement and until full repayment, then to deflate each flow into real terms and finally to enter the deflated values into the cashflow and recompute the rate of return.

4. The normal assumption is that "tied" loans from foreigners bring foreign exchange into the country (via disbursements) and subsequently take exchange out of the country (via debt service payments). If there is evidence that the original resources are not related to fresh inflows of foreign exchange, however, no cash inflow should be shown. If there is evidence that the service payments will not lead to an exchange outflow from the country, no cash outflows should be shown.

5. The same kind of analysis applies to foreign equity financing, dealt with in the note on Financial Return on Equity. Many different scenarios can be visualized. A foreign group might be doing business in the project country and decide to use some of its profits to buy shares in the new venture. Should this "inflow" of resources to the project be treated as an infusion of foreign exchange to the country? The answer depends on the details of the situation. If the resources would otherwise have been sent out of the country, their investment in the project represents an avoided exchange outflow, which is equivalent to an inflow. If government has blocked remittance, on the other hand, no inflow would be indicated.

6. It is worth noting that foreign equity and "tied" foreign loans can introduce some rather esoteric considerations into project rate-of-return analysis. If one wishes to compute financial returns to foreign owners, for instance, the annual flows to them (after removing project country taxes) should be inflated to express them in current domestic prices and then deflated by the relevant foreign country's deflator before calculating the real rate of return.

Explanatory Note No. 7 (see para 5.12)

Direct Foreign Exchange Effects

1. An investment project can have both direct and indirect effects on a country's foreign exchange balance. The total impact may be substantially different from the direct impact alone. The economic efficiency approach of the Guideline, which makes use of world prices and conversion factors, generates an economic rate of return that effectively measures the total impact. Some analysts feel strongly that to present additional information concerning the direct foreign exchange effects creates a risk of misleading the decision-maker. Nonetheless, many people continue to find it useful to have a schedule of a project's direct exchange effects as a component of financial projections. The attached table may suffice.

2. Two points should be made. First, it is not customary to try to estimate induced imports expected to occur out of the increased incomes generated by a project. Second, it is customary to include debt and equity financing flows in and out of the country in the exhibit, since the exercise is financial in nature. That is, the concept of "tiedness" is not relevant in this context.

3. Many countries have a chronic shortage of convertible foreign exchange, and it is understandable that DFCs and similar institutions are concerned about the foreign exchange effects of projects they assist. Some import-substituting projects will require a continuing inflow of imported material inputs and spare parts for most of their lives. If a country's balance-of-payments outlook is such that one is skeptical that foreign exchange will be available to cover project input requirements, it may be necessary to reject the project unless special arrangements can be made to ensure the supply of imports.

(Suggested table is on next page.)

SUGGESTED TABLE: PROJECTED DIRECT FOREIGN EXCHANGE EFFECTS
(Millions of U.S. Dollars)

A. Foreign Exchange Inflows

Year	F.o.b. Export Earnings or C.i.f. Import Savings	Foreign Loan Disbursements	Foreign Equity Investments	Total Exchange Inflow
1				
2				
3				
.				
.				
.				
N				

B. Foreign Exchange Outflows

Year	Capital Goods Imports	Recurrent Input Imports*	Foreign Loan Service		Remittances of Dividends & Royalties	Total Exchange Outflow
			Interest	Principal		
1						
2						
3						
.						
.						
.						
N						

C. Net Foreign Exchange Gain

Year	Direct Exchange Inflow	Direct Exchange Outflow	Net Exchange Inflow
1			
2			
3			
.			
.			
.			
N			

*/ If a contractual obligation requires direct foreign-currency payments to foreign employees, or to their bank accounts, enter them here.

Explanatory Note No. 8 (see para 6.03)

Summary of Shadow-Pricing Procedure

1. Project inputs and outputs must be classified according to origin and destination. The shadow (economic) price of traded items is the f.o.b. or c.i.f. border price (domestic transportation and handling are treated as nontraded items and shadow-priced separately).

2. For major traded inputs and outputs, an investigation is made to identify individual border prices. Knowing the border price and the domestic market price of an item, one can compute their ratio to obtain a conversion factor. In this case the conversion factor emerges as a result of the direct price comparison. It can be placed on file for use in future applications.

3. For minor traded inputs and outputs, resort can be made to "average" conversion factors that relate to collections of similar items such as consumer goods, intermediates, machinery, etc. The market cost of the minor item is multiplied by the average factor to obtain an estimated border-priced cost.

4. Major nontraded items should be broken down or "decomposed" into their input components: traded goods, nontraded goods, land, labor, and capital services (profit, tax, and subsidy elements are removed). The traded-goods component is then border-priced as explained above. The nontraded-goods component is either shadow-priced or broken down into its own inputs if its cost is significant (i.e., one goes through a second round of decomposition to achieve greater accuracy). Land is shadow-priced or left in market prices if not a major expense item. Labor, at least unskilled labor, should be shadow-priced. Capital goods are shadow-priced, after which a Capital Recovery Factor can be computed to find annual service charges.

5. Minor nontraded items will normally be shadow-priced by use of "average" conversion factors, as done for minor traded items.

6. The accuracy of the Guideline method of project appraisal is diminished by excessive use of highly aggregative conversion factors. While it is not usually practicable to derive conversion factors for each individual input and output, the use of a number of average factors for the conversion of minor items is preferable to the repeated use of the economy-wide Standard Conversion Factor.

Explanatory Note No. 9 (see para 6.05)

Marginal Export Revenue and Import Costs

1. When pricing traded inputs and outputs for a manufacturing project under consideration, a common assumption is that an increase in production or consumption in a developing country will not be sufficient to change prevailing world prices. This is especially true of developing country imports. The country's incremental addition to (export, import) or deduction from (export diversion, import substitution) the level of world trade is assumed to be absorbed without any appreciable effect on world unit prices. If this assumption of "infinite elasticity" regarding the supply of imports and demand for exports appears unwarranted, one should try to estimate the marginal export revenue or import cost.

2. It is unusual for a DFC project to require the purchase or sale of an item in such quantity as to affect the prevailing world price, but not impossible. If the c.i.f. or f.o.b. border price of a traded input or output is expected to vary significantly with the amount bought or sold, one must adjust the border price before using it to reflect an economic cost or benefit. An allowance must be made for the fact that a higher or lower unit price, at the margin, will raise or reduce the item's average price. If a project will require a very large quantity of an imported input, for instance, one should estimate its marginal import cost to the country. If a project will produce and export a large quantity of an item, the marginal export revenue becomes the appropriate measure.

3. The relevant variables here are the incremental quantity to be purchased or sold, relative to the quantity expected in the absence of the project, and the price elasticity of supply or demand (see Glossary). The formula for the marginal import cost can be written as $P_m[1 + 1/E_s)]$ and that for marginal export revenue as $P_x[1 - (1/E_d)]$, where P_m and P_x represent c.i.f. and f.o.b. unit prices and E_s and E_d refer to the absolute price elasticities of foreign supply and demand. The nature of the project should make it clear when an adjustment is needed in the border price.

Explanatory Note No. 10 (see para 6.28)

Standard Conversion Factor

1. Conversion Factors are used to translate domestic prices into border prices. Specific Conversion Factors can be derived for specific goods. Average Conversion Factors aggregate across groups of goods. The most aggregative conversion factor is the economy-wide Standard Conversion Factor (SCF).

2. The SCF is the average ratio of border prices and domestic market prices. In its simplest form it is a ratio between two versions of a country's foreign trade turnover, one exclusive of and the other inclusive of import taxes and export taxes or subsidies:

$$SCF = \frac{M + X}{(M + T_m) + (X - T_x)}$$

where: M is c.i.f. value of imports,
X is f.o.b. value of exports,
T_m is all taxes on imports, and
T_x is all taxes on exports.

3. To illustrate, assume that a project has been proposed in a country in which the national currency unit, the "rupee", can be exchanged for "dollars" at a rate of 10 rupees per dollar. If the c.i.f. value of imports is 1,000 million rupees, the f.o.b. value of exports is 800 million rupees, import taxes are 150 million rupees, and export taxes are zero, the SCF will be 0.92. That is, to translate domestic market prices into border prices one would reduce them to 92 percent of their stated amount.

4. The SCF is in effect the ratio between an official exchange rate OER and a shadow exchange rate SER. The Guidelines use the SCF to adjust domestic market prices downward to their border-priced equivalents. It is also feasible to adjust border prices upward to domestic market equivalents. The only requirement is that traded and nontraded items must be priced on the same basis. (It should be noted that more complex formulations exist for the SCF and SER, in which price elasticities of export supply and import demand appear.)

5. Using the above illustration, where the OER equals 10 rupees per dollar and the SCF is 0.92,

$$SER = OER/SCF = 10/0.92 = 10.83.$$

Adjusting nontraded items downward by use of the 0.92 multiplier is equivalent to adjusting traded items upward by translating their foreign-currency values into local-currency values by means of a 10.83 shadow exchange rate.

6. The SCF and SER are highly aggregative measures, at the level of the overall economy, and as such are too global to be useful in many project appraisals. Perhaps the most obvious kind of refinement that one might make to the SCF would be to split it into two specific conversion factors, one for imports (CF_m) and another for exports (CF_x). In the above example, $CF_m = 0.87$ and $CF_x = 1.00$.

Explanatory Note No. 11 (see para 6.35)

Example of Economic Pricing of Nontraded Outputs

1. If a project will produce a nontraded output to satisfy rising demand in a country, the economic price should be based on the price that consumers are willing to pay (the consumers may be other producers if the output is an intermediate or capital good). If the output sales will displace other domestic sellers, the economic price should be based on their avoided costs of production. Finally, it may be necessary to take a weighted average of the two.

2. Several combinations are possible, but the Guidelines will describe only one in order to convey what an analyst should take into consideration. Consider a project with a nontraded output. Suppose that the expectation is that the sales price of the project output will be lower than the average domestic sales price in the absence of the project. The analyst will want to recognize this benefit and attribute it to the project. Assume that the without-project supply of 100 units of the output would sell for $10 per unit, whereas the with-project supply would be 125 units at $9 each. The supposition is that when the project begins to offer the good at $9, existing producers will lower their sales price to match.

3. Buyers of the 100 units will gain $1 X 100 = $100 from the price reduction and existing suppliers will lose the same amount. The project will generate a gross benefit equal to its own revenue, $9 X 25 = $225, plus a benefit to consumers equal to roughly half the $25 gain they realize by being able to buy the 25 units at $9 per unit. The assumption here is that they would be willing to pay nearly $10 for the first additional unit but only $9 for the last additional unit, averaging about $9.50 over the 25 units. Thus, about $12.50 should be added to the gross benefit of $225 to obtain a total project benefit, since this consumer gain is not offset by a corresponding producer loss.

Explanatory Note No. 12 (see para 6.38)

Economic Cost of Land

1. The economic cost of land, a nontraded project input, usually differs from its financial cost. The economic cost is the value of net output foregone as a result of using land in a project, measured in border prices.

2. Land is a unique factor of production. It is essentially non-reproducible, has an infinite life (i.e., is a non-depletable resource, in a general sense), and is not very fungible in that a plot of land in one location cannot readily be substituted for a plot in another location. Laws and regulations that permit or prevent different uses are very important to the determination of land's opportunity cost.

3. The financial cost of purchased land appears as a capital outlay and the financial expense of rented land appears as a current operating cost in the project cashflow. Combinations of purchase and rental are also feasible.

4. As a rough rule of thumb, if the financial cost of purchased land represents more than 20 percent of project investment cost or if the rental cost of land represents more than 20 percent of annual operating cost, an effort should be made to estimate the economic cost of land. The effort should also be made in cases where financial cost clearly fails to reflect economic cost (as when land is donated or priced at some nominal sum such as $1). Otherwise, one can assume that the financial cost reflects the opportunity cost of the land and proceed to apply a conversion factor to express it in border prices.

5. When the financial cost of land is significant and/or fails to reflect opportunity cost to the economy, one must try to identify the use of the specific piece of land in the absence of the project. This may be easy in some cases but difficult in other cases. In the literature one finds some of the easier examples, e.g., an acre (or hectare) of cultivable land to be taken out of crop "X" and devoted to the production of crop "Y." The opportunity cost of land is the net value of X-output foregone, viz., the gross market value of X-output minus the cost of inputs required (other than land) to produce the crop.

6. Knowledge of the current use of a plot of land can be helpful, but in project appraisal one must make a judgment about its future use in the absence of the project. Project appraisal is always a forward-looking exercise. It may be that the real (constant-price) value of net output can be expected to rise over time, due to population pressure or other forces.

7. Zoning and other land-use regulations must be taken into consideration. It makes no sense to assume that the foregone use of land is to produce corn if the regulations prohibit agricultural crop production in that location. It is possible, of course, to assume that

making use of the land for one purpose will eventually displace corn land, but trying to go beyond one or two rounds of analysis is not recommended.

8. Continuing with the "X" and "Y" illustration, suppose that a project sponsor has contracted to pay $1,200 per year for the use of a plot. The contract, written for 10 years, stipulates that the annual financial rental charge is to be adjusted upward once yearly to keep up with general price inflation. That is, the $1,200 rental is a real (constant-price) rental throughout the project's life. One simply enters a $1,200 operating cost in each year of the cashflow, which is in constant prices, and proceeds with the rate-of-return computation.

9. Now suppose that the analyst accepts the $1,200 rental as a reasonable base-year proxy for the opportunity cost of the land, but feels that the opportunity cost is likely to rise by 2-3 percent per year as the surrounding area shifts to higher-valued activities. The correct procedure is to enter a rising series of land rental costs into the cashflow: $1,200; $1,230; $1,260; etc. In this fashion one takes account of the increasing opportunity cost to the country of using the land in the project rather than in its likely next-best use.

10. If the land is purchased instead of rented, the analysis is similar but a few additional calculations are needed. Suppose the sponsor pays $6,780 in cash to buy the land. The normal treatment would be to enter that amount in the base year as a capital outlay and again in the terminal year of the project life, on the assumption that the plot will be sold for the original purchase price after allowing for price inflation. The terminal resale value represents a "benefit" in a financial sense, and can have an appreciable effect on the financial rate of return if the project has a short life.

11. When one moves to the economic appraisal, however, a rising opportunity cost of land should lower the rate of return rather than raise it. Trying to capture the increasing cost by adjusting the terminal resale value of the land is awkward. For this reason, it is advisable to translate the purchase price into a series of annual equivalent rental charges. A Capital Recovery Factor can be used to do this (see Glossary). Assuming a 12 percent cost of capital, the annual rental charge is $1,200 for 10 years. Having transformed the purchase price into equivalent annual rental charges, it is easy to adjust the annual charges upward as indicated above.

12. From the project sponsor's viewpoint, the crucial distinction between the financial and economic costs of land purchased rather than rented is that as an owner he does not pay the rising costs. They are costs to society, reflecting foregone opportunities. When the opportunity cost of land rises sufficiently to cause the economic rate of return to fall below an acceptable level, nonetheless, the project sponsor may realize that it is time to consider a new location. That is, it may be financially profitable to sell the valuable plot and buy another one elsewhere.

13. For most projects it will probably be acceptable to assume that the economic price of project land will rise in line with prices in general. Since land is not depreciable, one will enter the financial purchase price in the base and terminal years of the cashflow, as mentioned above. To compute the economic rate of return, however, the entries must be adjusted into border-priced equivalents. The same adjustment is needed in the case of annual rental charges.

14. A correct procedure for revaluing the land cost involves the hypothetical decomposition of a likely alternative output into non-land inputs. If the output were a traded good, it would be multiplied by a border price, f.o.b. or c.i.f. as the case may require. Traded inputs would also be valued at the border. Other inputs would be dealt with in the appropriate fashion. One would then compute the overall conversion factor needed to adjust the domestic opportunity cost of land into a border-priced equivalent value.

15. In practice, it should be acceptable to use an "average" conversion factor applicable to the type of land in question -- e.g., land in the close-in suburbs of large cities, in smaller urban centers, in predominantly rural localities, and perhaps in industrial estates. If an investigation reveals that these factors tend to cluster together, one could average them to obtain a single factor for all kinds of land. Finally, if that single "average" factor for land turns out to be quite close to the country's Standard Conversion Factor, the SCF could be used. A caveat is in order here. One should not use the SCF for land conversion without first checking to see what more specific factors would be.

16. To sum up: if the financial cost of land is not of great importance within total project cost, and if there are no obvious reasons to believe that the financial cost fails to reflect economic cost, simply apply a conversion factor to the financial cost to obtain a border-priced economic cost suitable for use in computing the economic rate of return. Otherwise, take the effort to estimate an economic opportunity cost of project land before converting into border prices. Create and test a few "average" factors for different kinds of land, and if they differ substantially from the SCF use them for the conversion.

Explanatory Note. No. 13 (see para 6.39)

Economic Cost of Labor

1. There are two steps in the process of estimating the economic cost of labor. These two steps are often merged, in practice, but they are conceptually distinct. The first step is to ascertain the value of production that is likely to be lost because of using labor in the project rather than elsewhere in the economy. The second step is to revalue that foregone output, the opportunity cost of labor, to express it in terms of border prices.

2. In a perfect labor market, firms hire workers up to the point where the value of their marginal product equals the wage. The value of the marginal product is the physical product multiplied by the producer price. Labor markets are seldom perfect, however, and the market wage is not a reliable proxy for the value of labor's product in many applications. Direct estimation of the foregone output is usually necessary.

3. Where will the project's workers come from? Is there a sizable pool of unemployed persons in the vicinity of the project? Is the project large enough to attract new migrants from the countryside? These are the kinds of questions that should be raised when trying to estimate foregone output.

4. It may be difficult to identify where a project's workers will come from, especially unskilled workers. If there is heavy unemployment or underemployment in the nearby countryside, the ultimate effect of the new project demand may be to draw people out of agriculture. In highly urbanized societies, the ultimate effect may be entirely urban in nature. A great deal depends on the number of workers required by the project and the financial wage offered.

5. The nature of the foregone output determines the type of adjustment needed to express it in border prices. If it is a traded item, one will use its specific conversion factor to adjust the foregone wage into border prices. If nontraded, more effort will be necessary.

6. In many industrial ventures, the unskilled workers come from many previous occupations implying many foregone outputs. The correct approach is to identify the collection of foregone outputs and construct a weighted average of their specific conversion factors (with the weights reflecting their marginal output values in the total). That is, one estimates the weighted average value of all the foregone outputs and applies a weighted average conversion factor to get into border prices.

7. In practice, analysts often assume an average foregone output equal to 60-70 percent of the project wage and an average weighted conversion factor on the order of 0.75-0.85, resulting in a single adjustment multiplier of about 50 percent to be applied to the project wage bill for unskilled workers. For most DFC projects, such practice is usually acceptable. For skilled workers, which typically are in short supply, the adjustment multiplier may, however, be in excess of 100 percent.

Explanatory Note No. 14 (see para 7.06)

Effective Protection

1. The concept of effective protection gained popularity during the 1970s and is in wide use today. The notion is simple. When a government imposes a tariff (this discussion refers only to ad valorem tariffs, but other protective devices can often be transformed into tariff-equivalents) on an item, the usual result is a higher price to domestic buyers. Domestic producers of the item are shielded from foreign competitors. Local firms that purchase the item as an input are penalized, on the other hand, since their costs are increased. Most companies receive a mixed blessing, enjoying output protection but having to pay more for inputs. It is necessary to consider both aspects to determine the net effect of protection on the value added by the local firms.

2. Letting t indicate the ad valorem tariff rate on an item and p the unit sales price, and letting subscripts d and b refer to domestic and border prices, respectively, a fully-exploited tariff permits a domestic price greater than the border price by the amount of the tariff:

$$p_d = p_b(1 + t).$$

3. A plant located in a port city sells its output at the plant gate for \$150 and pays \$75 for a bundle of imported inputs needed to make one unit of output. The value added (wages, salaries, and benefits paid to labor plus interest and profit on capital) is \$150 - \$75 = \$75. In the absence of a 50 percent tariff on output and an average tariff of 25 percent on inputs, however, the c.i.f. border prices would be only \$100 for the output and \$60 for the inputs. Thus, the value added in border prices is only \$100 - \$60 = \$40. The Value Added Share (VAS) in border prices is 40/100 = 0.4.

4. The Nominal Protection Coefficient on output, NPC_o, is the tariff-inclusive price over the tariff-exclusive price, which is \$150/\$100 = 1.50. Similarly, the Nominal Protection Coefficient on input, NPC_i, is \$75/\$60 = 1.25. The Effective Protection Coefficient (EPC) is the value added in domestic prices over value added in border prices: \$75/\$40 = 1.875. If the tariff rate on output is raised and the rate on inputs is maintained, the EPC will rise. If both tariff rates are set at the same level, the EPC becomes 1 + t. If the rate on output is reduced to a level below the rate on inputs, the EPC will decline and eventually fall below 1.0. An EPC of 1.0 indicates that the protective system has a neutral effect on an activity. An EPC of less than 1.0 indicates that the system is penalizing the activity. Other devices, such as credit subsidies, might be used to offset such a tariff penalty, but one would have to extend the effective protection analysis to capture such effects.

5. An alternative formulation of the EPC equation highlights the importance of the Value Added Share (value added over output) in the calculation:

$$EPC = \frac{NPC_o - NPC_i(1 - VAS_b)}{VASb} = \frac{1.50 - 1.25(1 - 0.4)}{0.4}$$

Explanatory Note No. 15 (see para 7.07)

DRC-type Measures of Project Merit

1. The Domestic Resource Cost (DRC) is defined as the cost of domestic resources used to earn (or save) a unit of foreign exchange. See also Annex 7-1. Several DRC-type measures of project merit exist. Some of them are known by different names, which can cause confusion. There are "Bruno Ratios," "Modified Bruno Ratios," "Simple" and "Refined" DRCs, and "Internal Exchange Rates," to mention some of the more common measures.

2. Most of these indicators rely on single-year data, and represent "snapshots" of projects. The year is usually the first year of full-scale production. Capital costs are estimated on the basis of notional return objectives and capital recovery factors.

3. The so-called "Simple" DRC is computed as follows. Costs are adjusted to eliminate local duties and taxes and divided into local currency ("rupee") and foreign currency ("dollar") categories. If something is purchased directly from a foreign source, it goes down as a dollar cost. Traded output is valued at f.o.b. or c.i.f. border prices to find the "gross" benefit of dollar earning or saving, from which direct dollar outlays for inputs are deducted to obtain a "net" benefit. The ratio of rupee resource cost to net dollar benefit is the cost, in rupees, of earning or saving one dollar. If this DRC is equal to or less than the official exchange rate, the venture is acceptable.

4. The "Refined" DRC, or Bruno Ratio, uses the border-priced cost of locally procured tradable inputs instead of their domestic market cost. If border price is below domestic price, the Refined DRC will be lower than the Simple DRC and the project will appear more attractive. If border price is above domestic price, perhaps because of subsidies and a controlled selling price, the project will appear less attractive. The Refined DRC captures the effects of protection and price controls on domestic inputs.

5. The "Modified Bruno Ratio," also known as the "Internal Exchange Rate," uses data for the entire project life rather than just one year. The rupee and dollar streams are discounted at the opportunity cost of capital. The present value of rupee cost divided by the present value of dollar benefit is the IER. The measure is a "dynamized" Refined DRC.

6. Other variants exist, and care should be taken to understand precisely what is being measured. For additional discussion of DRC analysis as related to the economic rate of return, see Annex 7-1.

Explanatory Note No. 16 (see para 7.08)

Project Ranking

1. Investment projects are said to be independent if the costs or returns of one are not affected significantly by the implementation of another. If the net present value is zero or positive at an appropriate rate of discount, or if the internal rate of return is equal to or greater than an established threshold rate, an independent project is acceptable.

2. Projects can be interdependent. If the acceptance of one venture makes another unacceptable, the two are mutually exclusive. Mutually exclusive projects may be the same venture in different locations, or in different sizes, or begun at different times. If benefits are about the same, the best alternative is the one that has the lowest present-value cost. If benefits vary, the best alternative is the one that has the highest net present value.

3. If one project makes sense only if another is also done, the former is said to be contingent upon the latter (if the dependence is mutual, the two become one project). Cost and return interactions can link projects in a milder fashion than the "either/or" and "if/then" conditions (the costs or returns of one venture may change if another is also done). It can be difficult to identify such interactions, however, if they arise from general externalities rather than specific interindustry effects.

4. Choosing projects when interdependence exists requires ranking them in order of merit. Information about the projects must be available to permit a simultaneous comparison. One must be aware that the net present value and internal rate of return measures can produce conflicting rankings. If two projects have the same $100 investment cost, for instance, but "A" returns $40 per year for five years whereas "B" returns $60 per year for three years, at a discount rate of 10 percent "A" has a higher net present value ($151.63 vs. $149.21) but "B" has a higher internal rate of return (36 percent vs. 28 percent).

5. Ranking on the basis of net present values can give varying results at different rates of discount, and since the net present value is an absolute number it fails to give adequate guidance when dissimilar alternatives are under review. Fortunately, by fixing the same rate and period of discount one can rank projects by their net present value ratio, defined as the net present value over the present value of investment (at the same discount rate).

6. If investment funds are limited, projects become related through the common budget constraint. Spending the money on one project denies spending on others. Analysts may assume that projects are divisible and use linear programming techniques that generate fractional solutions and spend all the available budget. If the projects are indivisible, however, the solutions have to be integral--i.e., a project has to be accepted in its entirety or rejected (this is called a "zero-one condition" in the language of mathematical programming). Integer and dynamic programming techniques can be used when projects are indivisible. Unspent funds can be carried forward to later planning periods, and of course some projects can be rescheduled to later starting dates.

7. In practice, when the amount of budgeted resources is insufficient to finance all projects with positive net present values at an appropriate discount rate, analysts often raise the discount rate. Sometimes a ranking is attempted, using the net present value ratio or the internal rate of return, and funds assigned from the top down. Suboptimization does not assure optimal project selection, of course. One spending unit may reject proposals that are better than those accepted by another unit.

8. One must always keep in mind that projects, whether independent or interdependent, usually exhibit widely differing degrees of variance around the most likely outcome. Depending on the financing authority's attitude toward risk, a project might be chosen over another with a higher present value or rate of return on grounds of risk aversion. Sensitivity testing is the common method of finding out how sensitive a project is to cost increases, price decreases, and other phenomena.

ANNEX 3-1

TYPICAL OUTLINE OF A FEASIBILITY STUDY

I. INTRODUCTION

II. THE SECTORAL SETTING

- A. The Industrial Sector and Linkages to the Rest of the Economy
- B. The Subsector
- C. Issues and Problems
- D. Proposals for Change

III. THE MARKET, PRICING AND DISTRIBUTION

- A. The Market
  - 1. Historic Supply and Consumption
  - 2. Projected Demand and Supply
  - 3. Market for the Proposed Project
- B. Distribution and Marketing
- C. Pricing

IV. THE COMPANY AND ITS SPONSOR

- A. Background
- B. Ownership
- C. Organizational Framework
- D. Management

V. THE PROJECT

- A. Objectives
- B. Scope of the Project
- C. Technical Description
  - 1. Production Facilities
  - 2. Utilities and Infrastructure
  - 3. Ecology

D. Manpower and Training
E. Major Inputs
F. Project Management and Execution
G. Project Timing

VI. CAPITAL COST AND FINANCING PLAN

A. Capital Cost
B. Working Capital Requirements
C. Financing Plan
D. Procurement
E. Allocation of Loan and Disbursement

VII. FINANCIAL ANALYSIS

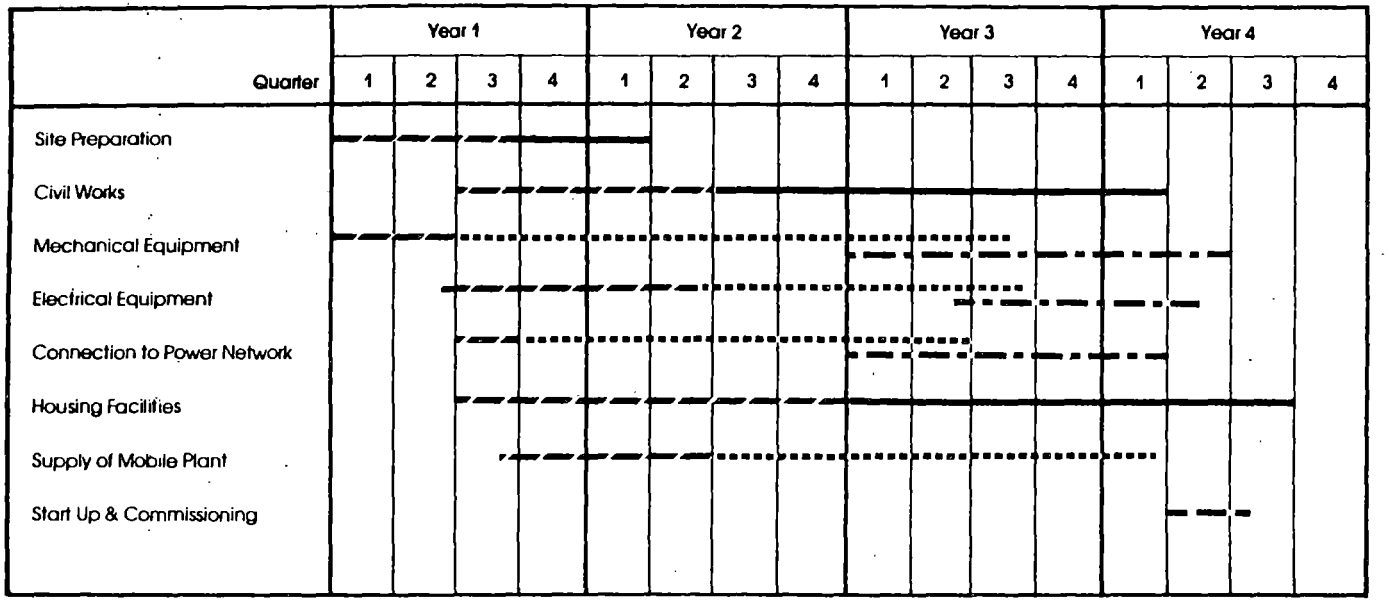
A. Revenues
B. Operating Costs
C. Financial Projections
D. Break-Even Analysis
E. Accounting and Auditing Requirements
F. Financial Rate of Return
G. Major Risks

VIII. ECONOMIC JUSTIFICATION

A. Economic Analysis and Economic Rate of Return
B. Linkages and Employment
C. Foreign Exchange Effects
D. Regional Development Impact

IX. AGREEMENTS

Typical Project Implementation Schedule



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ANNEX 3-3

TYPICAL LEARNING CURVES FOR SELECTED INDUSTRIES

Industry	Capacity Utilization as % of [a]/ Nominal Capacity			
	Year 1	Year 2	Year 3	Year 4
Cement	60	80	95	95
Foundry	35	55	80	90
Brick Plant	65	90	100	100
Textile Plant	65	90	90	90

a/ These learning curves were derived from similar projects in developing countries and are shown here merely for illustrative purposes; they will have to be assessed in detail taking account of specific circumstances of a given project.

ANNEX 3-4

STANDARD TABLES

Standard Table 1: Project Investment Costs

Standard Table 2: Operating Costs

Standard Table 3: Working Capital Schedule

Standard Table 4: Financing Plan

Standard Table 5: Cost/Benefit Streams for IRR Calculations

STANDARD TABLE 1. PROJECT INVESTMENT COSTS[a]/
(Base costs in constant 19__ prices, '000 of local currency)

	Year 1			Year 2			Year 3			...	Total		
	FC	LC	TC[b]/	FC	LC	TC	FC	LC	TC		FC	LC	TC[c]/
1. Land Purchase													
2. Site Preparation, Civil Works, and Structure													
3. Machinery, Equipment, Tools, and Spares													
4. Freight and Insurance													
5. Installation and Start-up Expenses													
6. Technical Assistance and Training													
7. Project Management Expenses													
8. Taxes and Duties													
9. BASE COST as of (Date)													
10. Physical Contingency (as % of line 9)													
11. Price Contingency (as % of lines 9 + 10)													
12. TOTAL PROJECT COST													
13. Working Capital Requirements													
14. Interest During Construction													
15. TOTAL FINANCING REQUIRED													

a/ This table is indicative only and may have to be modified for a specific case.

b/ FC refers to Foreign Currency costs, expressed in thousands of local currency equivalent; (please indicate the Official Exchange Rate used to translate FC costs into their local currency equivalent);
LC refers to Local Currency costs, expressed in thousands of local currency units;
TC refers to Total Costs, expressed in thousands of local currency units.

c/ Total refers to the sum of all investments made for the line item at any time up to and including the final year of the projection period.

STANDARD TABLE 2: OPERATING COSTS [a/]
(constant 19__ terms, '000 local currency)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Production (quantity units)							
Sales Price per unit							
Sales							
Cost of Goods Sold							
Raw Materials							
Power & Fuel							
Salaries & Wages							
Repair & Maintenance							
Stores & Spares							
Miscellaneous Supplies							
Packing							
Total Cost of Goods Sold							
Admin. & Selling Expenses							
Gross Operating Income							
Depreciation							
Interest Charge							
Net Income Before Tax							
Income Tax							
Net Income After Tax							

a/ This table is indicative only and may have to be modified for a specific case.

STANDARD TABLE 3: WORKING CAPITAL SCHEDULE [a/] [b/]
(Constant 19 ___ terms, '000 local currency)

	Year 1	Year 2	Year 3	Year 4
Current Assets				
Cash				
Accounts Receivable				
Inventories:				
Consumable stores				
Spare parts				
Fuel				
Packing Materials				
Raw Materials				
Semifinished Goods				
Finished Goods				
Prepaid Expenses				
Other Current Assets				
Total Current Assets				
Current Liabilities				
Accounts Payable				
Other Current Liabilities				
Total Current Liabilities				
Incremental Working Capital				
Cumulative Working Capital				

a/ This table is indicative only and may have to be modified for a specific case.

b/ The assumptions under which each line item was calculated could be listed next to the line item, enclosed in brackets.

STANDARD TABLE 4. FINANCING PLAN [a/][b/]
(Current terms, '000 of local currency)

	Year 1			Year 2			Year 3			...	Total		
	FC	LC	TC	FC	LC	TC	FC	LC	TC		FC	LC	TC
1. Equity Capital													
a. Common Shares													
b. Preference Shares													
c. Other													
2. Term Borrowings													
a. National DFC													
i. DFC Own Resources													
ii. IBRD/IDA Funds													
iii. Other Funds													
b. Suppliers' Credits													
c. Commercial Bank Credits													
d. Other													
3. Short Borrowings (1 year or less)													
a. Commercial Bank Credits													
b. Other													
TOTAL FINANCING FROM ALL SOURCES													

a/ This table is indicative only and may have to be modified for a specific case.

b/ FC refers to Foreign Currency funds, expressed in thousands of local currency equivalent (please indicate the Official Exchange Rate used to translate FC funds into their local currency equivalent); LC refers to Local Currency funds, expressed in thousands of local currency units; TC refers to Total funds, expressed in thousands of local currency units.

Please enter amounts in years of expected disbursement by source, and indicate by footnote the nature of the arrangement—i.e., amortization period, repayment schedule, interest and commitment charges, etc. To illustrate, Line 1-a might be footnoted as follows: "10,000 common shares at price of 500 Rupees per share." Line 2-a-i might be footnoted as follows: "DFC Rupee loan repayable in 20 equal semiannual installments of principal; no principal grace period due to strong financial position of project sponsor. Interest rate 15 percent per annum. Commitment charge of 1.5 percent per annum applies to undrawn portion of loan."

STANDARD TABLE 5. COST/BENEFIT STREAMS FOR IRR CALCULATIONS [a/]

	Years	(1) Capital [b/] Cost Streams	(2) Operating Cost Streams	(3) Benefit Stream	(4) Net Benefit Stream (3)-[(1)+(2)]	(5) Net Present Value at ___% Discount Rate
Project Implementation	1					
	2					
	•					
	m					
Economic Project Life	m + 1					
	•					
	•					
	m + n					

Where m = project implementation time in years; and
n = economic project life in years

a/ Based on projected cashflow in constant or real prices of year 1, excluding (a) the receipt, repayment, and servicing of financial capital and (b) profit tax payments to government.

b/ Including, working capital, replacement investments, if any, and residual value in year (m+n).

Please indicate by footnote all major assumptions behind the projection—e.g., pace of production build-up, unit costs and prices, and exchange rate.

Note

This table should be prepared for the Financial Internal Rate of Return as well as for the Economic Internal Rate of Return. Conversion from financial cost and benefit streams to economic cost and benefit streams should be explained in a separate sheet.

ANNEX 4-1

FINANCIAL RATIOS

	RATIO	FORMULA FOR CALCULATION
(i)	Liquidity:	
	Current Ratio	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$
	Quick Ratio	$\frac{\text{Current Assets - Inventory}}{\text{Current Liabilities}}$
(ii)	Leverage:	
	Debt to Total Assets	$\frac{\text{Total Debt}}{\text{Total Assets}}$
	L.T. Debt to Equity	$\frac{\text{Total Long-term Debt}}{\text{Net Worth}}$
	Fixed Charge Coverage	$\frac{\text{Earnings before interest \& taxes \& Other Fixed Charges}}{\text{Fixed Charges}}$
	Debt Service Coverage	$\frac{\text{Net Profits+Depreciation+Interest}}{\text{Interest+Principal Due}}$
(iii)	Operating:	
	Inventory Turnover	$\frac{\text{Costs of Goods Sold}}{\text{Average Inventory}}$
	Average Collection Period	$\frac{\text{Receivables}}{\text{Sales Per Day}}$
	Fixed Assets Turnover	$\frac{\text{Sales}}{\text{Fixed Assets}}$
	Total Assets Turnover	$\frac{\text{Sales}}{\text{Total Assets}}$
(iv)	Profitability:	
	Profit Margin on Sales	$\frac{\text{Net Income}}{\text{Sales}}$
	Return on Total Assets	$\frac{\text{Net Income}}{\text{Total Assets}}$
	Return on Net Worth	$\frac{\text{Net Income}}{\text{Net Worth}}$

ANNEX 7-1

THE ALGEBRA OF THE NPV AND DRC MEASURES OF MERIT

1. The present value of a series of annual figures is calculated by discounting each figure, positive or negative, by a discount factor and summing the discounted values.

2. In benefit-cost analysis it is customary to subtract gross costs (outflows) from gross benefits (inflows) to find net benefits for each year before discounting and summing the figures. Benefits and costs are defined according to the needs of the exercise.

3. The discount rate is chosen to reflect the rate of fall in the time value of whatever is being measured. The discount rate that reduces a series of annual figures to a net present value of zero is the internal rate of return of that series.

4. Financial benefits and costs are cash inflows and outflows relating to receipts and expenditures at market prices.

5. Economic benefits and costs reflect increases and decreases of the national income, after adjustment of prices to reflect relative economic scarcities.

6. Letting B and C denote benefits and costs and d the discount factor, with subscript i indicating any year of an n-year time series,

$$NPV = \overline{\underset{i}{\text{Sum}}}\ d_i(B_i - C_i), \text{ with } d_i = (1 + r)^{-i}$$

7. This is the general formula for the net present value calculation. One must specify the meaning of benefits and costs, the prices used to value them, and the rate of discount. The net present value of a series of figures is the sum of the present values of annual net benefits.

8. To compute a financial rate of return, free from the influence of financial leverage and taxation, benefits are defined as cash receipts and costs are defined as all cash expenditures except profit tax payments. The receipt, repayment, and servicing of financial capital used by the project are ignored, since the objective is to find the pre-tax return without regard to financing arrangements. (To the extent that funds are provided by foreigners and are "tied" to the venture, additional rate-of-return computations can be made to determine the return to nationals.)

9. To compute an economic rate of return, financial benefits and costs must be adjusted to reflect economic scarcities within the country.

Border prices are substituted for domestic market prices of traded inputs and outputs, and shadow prices are substituted for domestic prices of factors of production. After all inputs and outputs have been revalued, they are discounted and summed to find the net present value.

10. The gross benefit, B_i, of a project in the i^{th} year is the value of output (provided that if the i^{th} year is the final year of the series no terminal asset values exist):

$$B_i = P_i q_i, \text{ where p is price and q is quantity.}$$

It is convenient to let q be one unit of output. This means that the benefit B_i is simply the unit price P_i.

11. Letting B_i represent net benefits $(B_i - C_i)$ in the i^{th} year,

$$\overline{B}_i = (B_i - C_i).$$

The benefit-cost decision rule is that the sum of the discounted $\overline{B}$ values for all years of the project life must equal or exceed zero if the project is to be accepted.

12. The cost of a project input is the product of its unit price and the quantity purchased. It is convenient to define the unit price in terms of the input quantity required to make one unit of output. Direct inputs include the invested capital K, labor L, traded goods M, land N, and nontraded goods. The nontraded goods can be decomposed into their own inputs, viz., capital K, Labor L, traded goods M, and land N. Such inputs into project inputs can be called "indirect" inputs and identified by a prime superscript. Dropping the i subscript:

$$C = (K + L + M + N) + (K' + L' + M' + N').$$

13. In the above cost equation, K, representing capital invested directly in the project, requires interpretation. It is both a cost of capital and a return to capital. When project benefits and costs are discounted at a rate equal to a country's opportunity cost of capital, the present value of K will be equal to the present value of $\overline{B}$. That is, after meeting the cost of project capital and other inputs, any remaining net benefit can be viewed as a "surplus" return to project capital.

14. Repeating the point, $\overline{B}$ can be interpreted as the net return to direct project capital after allowing for the cost of capital at the going opportunity cost rate. It must be equal to or greater than zero if the project is to be accepted. If the discount rate reduces the net present value of the series to zero, one obtains the following expression:

$$0 = B - (K+L+M+N) - (K'+L'+M'+N').$$

15. Rearranging terms,

$$B - (M+M') = L+L' + N+N' + K+K'.$$

This expression indicates that the net foreign exchange savings or earnings of the project, defined for the economic analysis as the gross output minus the amount of foreign exchange spent to acquire traded inputs, equals the direct and indirect value added by the primary factors of labor, land and capital. The right side of the expression reflects the domestic resource cost of the project.

16. If the domestic resource cost is equal to or less than the net foreign exchange savings or earnings of the project, the DRC coefficient will be one or less than one and the project is acceptable:

$$DRCC = \frac{L+L' + N+N' + K+K'}{B - (M+M')}$$

17. It should be evident that unless $\overline{B}$ is negative when the opportunity cost of capital is used as the discount rate, the DRCC will e equal to or less than one. The DRCC is a project-specific exchange rate. If it is equal to or less than one, the project is an efficient generator of foreign exchange for the country.

18. If the benefits and costs shown in the previous few paragraphs are identified for each year of the project's n-year life, one can discount each annual statement and sum over all years to obtain a present-value equation. It would be obvious that NPV and DRCC formulas are alternative statements of the same benefit-cost rule.

19. The DRCC was originally developed nearly twenty years ago as a short-cut indicator, of use when only one year of project data is available. It is often used in cross-section studies of economic sub-sectors to gain insight into their relative merits. Its accuracy depends heavily on the analyst's ability to adjust a single year's benefits and costs so as to approximate the annuity values of a complete time series. An example will clarify this point.

20. Consider a very simple project, wherein $100 is spent in year 1 to purchase an imported machine. There are gross inflows of $150 per year in years 2, 3, 4 and 5. There is no residual asset value. Gross outflows are $100 in year 1 (to buy the machine) and $110 per year thereafter. Of these outflows, the full $100 is for imports in year 1 (the machine enters duty-free) and half ($55) is for imports of material inputs in years 2, 3, 4, and 5. The schedule is as follows:

Year	Gross Inflow	Gross Outflow	Net Inflow	Imported Inputs
1	0	100	-100	100
2	150	110	40	55
3	150	110	40	55
4	150	110	40	55
5	150	110	40	55

21. If the above net inflows are discounted at 10 percent, the net present value is nearly $27. Raising the discount rate to 20 percent produces a net present value of nearly $4. Finally, a 22 percent discount rate produces a net present value of zero. The internal rate of return of the series is 22 percent.

22. To compute the DRCC, one must remove the cost of imported inputs, shown above in the right-hand column, from gross outflows and add it to gross inflows (as a negative number). The resulting schedule is as follows:

Year	Adjusted Gross Inflow	Adjusted Gross Outflow	Net Inflow
1	-100	0	-100
2	95	55	40
3	95	55	40
4	95	55	40
5	95	55	40

23. These rearranged outflows and inflows can be discounted and compared:

	d = .10	d = .20	d = .22
DRCC =	0.867	0.976	1.002

It can be seen that as the discount rate approaches the project's internal rate of return the DRCC approaches the value of 1.0.

24. If one were to select year 3 of the project's life for a one-year DRC calculation, the correct present values of the rearranged benefits and costs in terms of year-1 prices would be as follows:

	d = .10	d = .20	d = .22
Costs	34.87	28.48	27.43
Benefits	40.23	29.18	27.38
DRCC	0.867	0.976	1.002

Using the raw numbers of Year 3 would produce a DRCC of 0.579 at all three rates of discount. If one were to compute a 22 percent Capital Recovery Factor (see Glossary) to allocate the cost of the $100 machine over years 2 through 5, however, the DRCC would be exactly 1.00 (the CRF would be $40.10).

25. The difficulties of cutting a one-year "slice" through a large number of projects, enterprises, or activities with varying operating characteristics and asset vintages are formidable. If the cross-section comparisons are to serve as accurate guides to relative economic efficiencies, each DRCC must incorporate about the same relative degree of error with respect to the net present value. That is an unlikely prospect in most exercises, and as a result the DRCC rankings can only be taken as rough orders of magnitude.

26. If there are three investment projects under study, with internal rates of return of 10, 15, and 20 percent, respectively, they would be ranked 3-2-1. All three pass the DRCC test at a discount rate of 10 percent, two pass at 15 percent, and one passes at 20 percent. Their rankings do not change, but the accept/reject signal changes with changes in the discount rate.

27. While the purpose of this Annex is simply to demonstrate the algebraic equivalence of the NPV and DRCC measures, an inescapable conclusion is that the NPV and internal rate of return provide the most reliable guidance as summary indicators of project merit.

ILLUSTRATIVE CASE STUDIES

1. The Efficient Cement Company (I):
   Calculation in Constant Terms

2. The Efficient Cement Company (II):
   Calculation in Real Terms

3. The Reliable Cement Company (III):
   Expansion Project: With/Without Analysis

4. The Standard Battery Company:
   Varying Exchange Rates

ILLUSTRATIVE CASE STUDY NO. 1

THE EFFICIENT CEMENT COMPANY (I)
(Calculation in Constant Terms)

1. Our hypothetical project consists of constructing a new greenfield cement plant with a nominal capacity of 500,000 tons per year, in a developing country. It is expected that the plant will produce and sell 250,000 tons of cement in 1987, the first year of operation, 350,000 tons in 1988, and 450,000 tons in 1989 when it reaches steady-state operations.

2. The base capital cost estimate of the proposed project is US$75 million in mid 1982 constant prices. When physical contingency and price contingency allowances are added, the installed costs total to US$100 million. The Project Capital costs are listed in the Capital Cost schedule with the assumptions used listed out separately.

3. The time horizon for the project is assumed to be 24 years (4 years project implementation and 20 years economic project life), with the plant going into production in the 5th year. During the entire 24 year period it is expected that the general level of prices in the country will rise essentially at the same rate as in the U.S. Therefore, the exchange rate is expected to remain constant against the dollar.

4. The selling price is projected at US$75 per ton in mid-1982 constant terms. The selling price is expected to rise at the same rate as the general level of inflation and as a result the selling price remains steady at US$75 in constant terms.

5. By 1989, when the plant reaches steady-state operation the total working capital requirement is projected to be US$11.21 in mid-1982 constant terms. The working capital build-up for the years 1986-1989 along with the assumptions used in arriving at the working capital requirement, are given in the projected working capital schedule.

6. The project shows a projected gross profit of (mid-1982 constant terms) of US$10.37 million in 1987, US$15.71 million in 1988, and US$21.20 million in 1989 when the plant reaches steady-state operations. The actual computation of the sales revenue and the operating expenses are given in the projected operating expenses schedule, with the assumptions used in arriving at these figures listed separately.

7. Having completed the capital costs, working capital build-up, operating costs and revenue projections we can now perform the financial rate of return calculations. The financial rate of return schedule in our example presents all the necessary flows and shows that the proposed project has a financial rate of return of 15.34%. Assuming that the country's opportunity cost of capital is 10% for projects in the same risk category, we would accept the project from a financial viewpoint since the projected financial rate of return is greater than the opportunity cost of

capital (the country's opportunity cost was assumed to be 10% merely for illustrative purposes; it will have to be assessed in detail taking account of the specific circumstances in the individual countries).

8. In order to arrive at the economic rate of return, the cash flows used for the financial rate of return have to be adjusted to eliminate duties and taxes, and to reflect border prices of traded inputs and outputs, and to shadow-price non traded items, in our case labor. We assume that electricity is traded. In our example the adjustments are listed in the schedule of assumption used for the economic rate of return analysis, and a modified table of cash flows for economic rate of return analysis is presented. The economic rate of return of the project was computed to be 12.62%. Since the projected economic rate of return is higher than the country's opportunity cost of capital, the project is viable from an economic viewpoint also.

THE EFFICIENT CEMENT COMPANY (I)

Project Capital Cost Estimate

Assumptions Used

1. All capital costs are estimated in constant mid-1982 dollars. It is assumed that capital expenditures are incurred beginning January 1983 through December 1986.

2. It is assumed that the exchange rate against the dollar is constant throughout the life of the project. Similarly, domestic inflation is assumed to be in line with US inflation.

3. The total cost estimates for each component of capital costs were developed based on expenses that would have been incurred for a similar package of goods and services, at the time that the capital costs were estimated. The breakdown of total costs, by year, was obtained by following a logical sequence of expenditures for each component of capital costs. For example, in the case of the civil works component it was estimated that 25% of the total civil works cost would be incurred in 1983, since there was a 15% mobilization payment to be made to the suppliers and an additional 10% was estimated for work in progress. Typically, in setting up a cement plant the major civil works expenses are incurred in the early years. It was estimated that 40% of the civil works costs would be incurred in 1984 and 25% in 1985. In 1986 there was retention guarantee payment to be made, and this accounts for the remaining 10% of the total civil works costs.

4. For the other categories of investment costs, similar logic was used to arrive at a breakdown of yearly investment expenditures as presented in Table 2.

5. Physical contingencies have been set at 10% of base costs, given the degree of project preparation.

6. Price contingencies have been calculated using the expected annual rates of inflation: 9.1% in 1983, 8.3% in 1984, 7.7% in 1985, and 7.2% in 1986. These rates have been used for both local and foreign costs.

7. The financing plan and interest during construction are being disregarded in this example since the emphasis here is to show the mechanics of calculating the financial and economic rates of return. For treatment of these items refer to example 2 (The Efficient Cement Company II).

THE EFFICIENT CEMENT COMPANY (I)

Operating Costs Estimate

Assumptions Used

1. Capacity utilization is assumed at 50%, 70%, and 90% in each of the three years after start-up. Capacity utilization is assumed to remain at 90% from that point onwards.a/

2. All monetary values are expressed in mid-1982 constant U.S. dollars.

3. The revenue is based on a bagged price per ton of cement at $75.0

4. Raw material consumption per ton of cement for the first two years after start-up are calculated at 115% and 110% of steady state raw material consumption, respectively. Unit costs and consumption parameters are shown in Table 4.

5. Power and fuel consumption per ton of cement for the first two years after start-up are calculated at 120% and 110% of steady state power and fuel consumption, respectively. Unit costs and technical consumption parameters are shown in Table 4.

6. Salaries and wage expenses have been assumed to be fixed at $1.20 million per year. This figure was arrived at by estimating the total number of employees to be 375 at a yearly average wage of $3,200.

7. Repair and maintenance has been assumed to be 1.5%, 2% and 3% of sales for the first three years after start-up, respectively.

8. Stores and spares have been assumed to be constant at $1.05 million per year. This was computed by estimating stores and spares at 3% of gross equipment and stores cost.

9. Miscellaneous supplies expenses were estimated at 3% of sales.

10. Administrative and selling expenses were estimated at 2% of sales.

11. Packing expenses were estimated at $3.00 per ton. This was arrived at by assuming 20 bags per ton, plus 1 bag to account for breakage.

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a/ These rates deviate from rates shown in Annex 3-3 and reflect the degree of expertise in the industry in the given country, as well as technical assistance arrangements and other technical factors.

THE EFFICIENT CEMENT COMPANY (I)

Economic Rate of Return Analysis

Assumptions Used

The economic rate of return calculations for the project are based on the cost and benefit streams used for the financial rate of return calculations with the following adjustments:

1. Selling Price: The CIF cost of imported bulk cement US$70 per ton has been used in valuing the output for the project. A price of US$75 per ton was used for the financial rate of return calculations.

2. Power: The economic cost of power is estimated at $0.08 per KWH. This compares with the financial price of $0.05 per KWH. This results in the cost of power per ton of cement to be $11.04, $10.12, $9.2 in the years 1987, 1988, 1989 (Steady-State operations).

3. Coal: The economic cost of coal is estimated at $50.00 per ton. This was arrived at by taking the CIF cost of imported coal ($47.0) and adjusting for differences in calorific value, local freight and handling. This results in the cost of coal per ton of cement to be $9.00, $8.25, $7.5 in the years 1987, 1988, 1989 (Steady-State operations).

4. Raw Materials: Raw material costs are assumed to be the same as those used in the financial calculations.

5. Salaries and Wages: All labor is shadow priced at 75 percent of its financial cost. This results in an average wage rate of $2,400 per employee.

6. Working Capital: This is reduced by 10% to eliminate taxes and duties.

7. Capital Costs: Taxes and duties amounting to $2.2 million, $2.3 million and $0.5 million were subtracted from the capital cost expenditures for the years 1984, 1985 and 1986, respectively.

THE EFFICIENT CEMENT COMPANY (I)

Capital Cost Estimate [a]
(Base Cost Estimate in mid-1982 Constant US$ million)

	1983			1984			1985			1986			TOTAL			
	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	%
Land & civil works	0.8	3.0	3.8	1.0	4.3	5.3	0.9	3.5	4.4	0.3	1.2	1.5	3	12	15	20
Machinery, equip.& spares	5.0	3.8	8.8	10.0	7.4	17.4	3.3	2.5	5.8	1.7	1.3	3.0	20	15	35	47
Freight & insurance	-	-	-	1.3	0.9	2.2	1.4	0.9	2.3	0.3	0.2	0.5	3	2	5	7
Installation & start-up	-	-	-	0.2	0.2	0.4	1.0	1.5	2.5	0.9	1.2	2.1	2	3	5	7
Engineering	1.1	0.7	1.8	0.7	0.5	1.2	0.8	0.5	1.3	0.4	0.3	0.7	3	2	5	7
Tech. Asst. & training	0.1	0.2	0.3	0.4	0.3	0.7	0.6	0.3	0.9	0.8	0.3	1.1	2	1	3	4
Project mgmt. expenses	-	0.3	0.3	-	0.6	0.6	-	0.5	0.5	-	0.6	0.6	-	2	2	3
Taxes & duties	-	-	-	-	2.2	2.2	-	2.3	2.3	-	0.5	0.5	-	5	5	7
Base cost estimate	7.0	8.0	15.0	13.6	16.4	30.0	8.0	12.0	20.0	4.4	5.6	10.0	33	42	75	100
Physical contingency [b]	0.7	0.8	1.5	1.4	1.6	3.0	0.8	1.2	2.0	0.4	0.6	1.0	3.3	4.2	7.5	10.0
Price contingencies [c]	0.7	0.8	1.5	2.7	3.3	6.0	2.4	3.6	6.0	1.7	2.3	4.0	7.5	10.0	17.5	24.0
Total project costs [d]	8.4	9.6	18.0	17.7	21.3	39.0	11.2	16.8	28.0	6,5	8.5	15.0	43.8	56.2	100.0	134.0

a/ Based on Standard Table 1; however, expressed in US$ rather than local currency. FC refers to Foreign Currency Costs expressed in millions of US$; LC refers to Local Currency Costs expressed in millions of US$ equivalent (constant exchange rate of Rs 10 per $US was used for all years); TC refers to total costs expressed in millions of US$. The assumptions used in calculating the projected capital cost estimates are listed separately.
Example stops short of total investment required which would include working capital and interest during construction. These items are not required in our first example and are therefore disregarded. For treatment of these items refer to example 2.

b/ Physical contingency was computed at 10% of the base cost estimate.

c/ Price contingencies were computed by using inflation rates of 9.1%, 8.3%, 7.7%, 7.2% for the year 1983, 1984, 1985, 1986 respectively.

d/ Excluding working capital requirements and interest during construction.

Table 2

THE EFFICIENT CEMENT COMPANY (I)

Capital Costs: Projected Annual Expenditures by Major Categories

	1983 %	1984 %	1985 %	1986 %	TOTAL %
Land & civil works	25	40	25	10	100
Machinery, equip.& spares	25	50	15	10	100
Freight & insurance	-	45	45	10	100
Installation & start-up	-	10	45	45	100
Engineering	35	25	25	15	100
Tech. asst. & training	5	25	30	40	100
Project mgmt. expenses	15	30	25	30	100
Taxes & duties	-	45	45	10	100

Table 3

THE EFFICIENT CEMENT COMPANY (I)

Projected Operating Expenses
for Financial Rate of Return Calculations [a/]
(In mid 1982 Constant US$ million)

	1983	1984	1985	1986	1987	1988	1989 [b/]
Production (mln. of tons)	-	-	-	-	0.25	0.35	0.45
Sales price (US$)					75.00	75.00	75.00
Sales	-	-	-	-	18.75	26.25	33.75
Cost of goods sold							
Raw materials	-	-	-	-	1.08	1.44	1.69
Power & fuel	-	-	-	-	3.08	3.95	4.61
Salaries & wages	-	-	-	-	1.20	1.20	1.20
Repair & maintenance	-	-	-	-	.28	.53	1.01
Stores & spares	-	-	-	-	1.05	1.05	1.05
Miscellaneous supplies	-	-	-	-	0.56	0.79	1.01
Packing	-	-	-	-	0.75	1.05	1.35
Total cost of goods sold	-	-	-	-	8.00	10.01	11.92
Admin. & selling expenses	-	-	-	-	0.38	0.53	0.63
Gross operating income	-	-	-	-	10.37	15.71	21.20

a/ Based on Standard Table 2; however, costs expressed in US$ rather than local currency. The assumptions used in calculating the projected operating costs are listed separately.

b/ First year of steady state operations (assumed at 90% of capacity).

Table 4

THE EFFICIENT CEMENT COMPANY (I)

Steady State Production Costs (Mid-1982 Terms)
(Per ton of Cement)

	Quantity per ton of cement (tons)	Unit cost (US$)	Cost per ton of Cement (mid-1982 Constant US$) 1989	1988	1987
Raw Materials					
Limestone	1.400	2.00	2.80		
Laterite	0.020	10.00	0.20		
Clay	0.010	-	-		
Fly ash	-	-	-		
Gypsum	0.050	15.00	0.75		
			3.75	4.12	4.31
Power & Fuel					
Coal	0.15	30.00	4.50	4.95	5.40
Power	115 KHw	0.05	5.75	6.33	6.90
			10.25	11.28	12.30

Production Cost Per Ton of Cement (US$) - Mid-1982 Terms

	1987	1988	1989 (steady state operations)
Raw Materials	4.31	4.12	3.75
Power & Fuel	12.30	11.28	10.25

Table 5

THE EFFICIENT CEMENT COMPANY (I)

Projected Operating Expenses [a]/
for Economic Rate of Return Calculations
(In mid 1982 Constant US$ million)

	1983	1984	1985	1986	1987	1988	1989
Production (mln. of tons)	-	-	-	-	0.25	0.35	0.45
Sales price (US$)					70.00	70.00	70.00
Sales revenue	-	-	-	-	17.50	24.50	31.50
Cost of goods sold							
Raw materials	-	-	-	-	1.08	1.44	1.69
Power & fuel	-	-	-	-	5.01	6.43	7.52
Salaries & wages	-	-	-	-	0.90	0.90	0.90
Repair & maintenance	-	-	-	-	.28	.53	1.01
Stores & spares	-	-	-	-	1.05	1.05	1.05
Miscellaneous supplies	-	-	-	-	0.56	0.79	1.01
Packing	-	-	-	-	0.75	1.05	1.35
Total cost of goods sold	-	-	-	-	9.63	12.19	14.53
Admin. & selling expenses	-	-	-	-	0.38	0.53	0.63
Gross operating income	-	-	-	-	7.49	11.78	16.34

a/ Based on Standard Table 2; however, costs expressed in US$ rather than local currency. The assumptions used for calculating the projected operating expenses for the Economic rate of return calculations are listed separately.

Table 6

THE EFFICIENT CEMENT COMPANY (I)

Projected Working Capital [a]/
(In mid 1982 Constant US$ million)

	1986	1987	1988	1989
Current Assets (in millions $US)				
Cash (3% of Sales)	-	.56	.79	1.01
Accounts Receivables (1 month sales)	-	1.56	2.19	2.81
Inventories:				
Consummable stores (4% of sales)	-	.75	1.09	2.81
Spare parts (3% of equipment costs, purchases made in year prior to start up	1.05	1.05	1.05	1.05
Coal (4 weeks supply)	-	.10	.13	.16
Packing materials (7 weeks supply)	-	.04	.06	.08
Raw materials (7 weeks supply)	-	.06	.08	.10
Goods (finished & semi-finished, 10% of sales)	-	1.88	2.63	3.38
Prepaid Expenses (8% of sales)	-	1.50	2.10	2.70
Total Current Assets	1.05	7.50	10.12	12.64
Current Liabilities (in millions $US)				
Accounts Payable (5 weeks cost of sales, excluding salaries & wages)	-	.69	.90	1.09
Other Current Liabilities (1% of sales)	-	.19	.26	.34
Total Current Liabilities	0	0.88	1.16	1.43
Working Capital (cumulative)	1.05	6.62	8.96	11.21
Working Capital (Incremental)	1.05	5.57	2.34	2.25

a/ Based on Standard Table 3, however, expressed in US$ rather than local currency.

This table refers to the projected working capital for the financial analysis and the Financial Rate of Return. In order to express working capital requirements for ERR, refer to schedule of assumptions used for Economic Rate of Return.

Table 7

THE EFFICIENT CEMENT COMPANY (I)

Financial Rate of Return Analysis (Pre-Tax) [a]/
(In mid 1982 Constant US$ million)

	Year	Capital Cost Streams [b]/	Operating Cost Streams	Benefit Stream	Net Benefit Stream
Project Implementation	1983	16.5	0	0	-16.50
	1984	33.0	0	0	-33.00
	1985	22.0	0	0	-22.00
	1986	12.05	0	0	-12.05
Economic Project Life	1987	5.57	8.38	18.75	4.80
	1988	2.34	10.54	26.25	13.37
	1989	2.25	12.55	33.75	18.95
	1990	0	12.55	33.75	21.20
	1991	0	12.55	33.75	21.20
	1992	4.0[c]/	12.55	33.75	17.20
	1993	0	12.55	33.75	21.20
	1994	0	12.55	33.75	21.20
	1995	0	12.55	33.75	21.20
	1996	0	12.55	33.75	21.20
	1997	4.0[c]/	12.55	33.75	17.20
	1998	0	12.55	33.75	21.20
	1999	0	12.55	33.75	21.20
	2000	0	12.55	33.75	21.20
	2001	0	12.55	33.75	21.20
	2002	4.0[c]/	12.55	33.75	17.20
	2003	0	12.55	33.75	21.20
	2004	0	12.55	33.75	21.20
	2005	0	12.55	33.75	21.20
	2006	-16.21[d]/	12.55	33.75	37.41

Pre-tax Financial Rate of Return = 15.34%

a/ Based on Standard Table 5

b/ The investment stream does not include the provisions made for price escalations since all figures are in mid-1982 terms. The Capital Cost Stream includes the Working Capital required. It was assumed that the entire working capital of US$11.21 million would be recovered at the end of the project.

c/ It was estimated that additional capital costs of $4 million would be incurred every 5 years of the project, starting 1992.

d/ It was estimated that the salvage value of the plant and equipment would be $5.0 million at the end of year 2006.

Table 8

THE EFFICIENT CEMENT COMPANY (I)

Economic Rate of Return Analysis [a]/
(In mid 1982 Constant US$ million)

	Year	Capital Cost Streams	Operating Cost Streams	Benefit Stream	Net Benefit Stream
Project Implementation	1983	16.50	0	0	-16.50
	1984	30.80	0	0	-30.80
	1985	19.70	0	0	-19.70
	1986	11.45	0	0	-11.45
Economic Project Life	1987	5.01	10.01	17.50	2.48
	1988	2.11	12.77	24.50	9.67
	1989	2.03	15.16	31.50	14.31
	1990	0	15.16	31.50	16.34
	1991	0	15.16	31.50	16.34
	1992	4.00	15.16	31.50	12.34
	1993	0	15.16	31.50	16.34
	1994	0	15.16	31.50	16.34
	1995	0	15.16	31.50	16.34
	1996	0	15.16	31.50	16.34
	1997	4.00	15.16	31.50	12.34
	1998	0	15.16	31.50	16.34
	1999	0	15.16	31.50	16.34
	2000	0	15.16	31.50	16.34
	2001	0	15.16	31.50	16.34
	2002	4.00	15.16	31.50	12.34
	2003	0	15.16	31.50	16.34
	2004	0	15.16	31.50	16.34
	2005	0	15.16	31.50	16.34
	2006	-15.10	15.16	31.50	31.44

Economic Rate of Return = 12.62%

a/ Based on Standard Table 5. For assumptions regarding conversion of financial costs and benefit streams into economic cost and benefit streams see separate explanations and Table 5.

ILLUSTRATIVE CASE STUDY NO. 2

THE EFFICIENT CEMENT COMPANY (II)
(Calculation in Real Terms)

1. Our hypothetical project consists of the same project that has been described in Illustrative Case Study 1. However, it is no longer assumed that all cost components will rise at the same rate as the general inflation rate. The projected annual price escalation rates for the individual cost components are given in Table 1D. In order to determine the financial and economic rates of return for the project, we now have to express all the cost and benefit streams in real terms.

2. In order to convert the capital costs into real terms we first have to express them in current terms. Therefore, to the individual capital cost components (expressed in 1982-constant terms), we add the physical contingency allowance (in our example we have assumed 10%) and then multiply with individual price escalation rates (given in Table 1D). To determine the total financing required for the project we add the working capital requirement and the interest during construction to the capital cost estimate in current terms. The total financing required for our project is estimated to be US$124.85 million (101.94 + 9.78 + 13.13; current terms). Having expressed the capital costs in current terms (Table 1B) we use a general deflator, based on the general inflation rate to deflate these costs and thereby convert them into real terms (Table 1C).

3. Similarly the projected revenue and operating expenses (constant 1982 terms) are converted into current terms by applying forecast individual price escalation rates to the constant term projections. The current term projections are then deflated by the general deflator based on a general rate of inflation to convert them into real terms.

4. The working capital requirements (in current terms) are determined by applying the assumptions of the working capital schedule to current term projections; these are then deflated by the general deflator to express them in real terms.

5. The financing plan is shown in Table 7A and the financing terms are shown in the appropriate footnotes.

6. Having expressed all the cost and benefit streams in real terms, we proceed as before to compute the financial and economic rates of return. Thus the pre-tax financial rate of return, on the basis of mid-1982 real term projections was determined to be 13.04% and the economic rate of return 8.88%. Note, that based on the new assumptions for individual inflation rates, the economic rate of return has become rather marginal (below 10%). Assuming that the country's opportunity cost of capital is 10% for projects in the same risk category, the project is acceptable from a financial viewpoint. However, from an economic viewpoint, the project is not acceptable since the projected ERR is below the country's opportunity cost of capital and should therefore be rejected. This example demonstrates the importance of making projections in real terms.

Table 1A

THE EFFICIENT CEMENT COMPANY (II)

Capital Cost Estimate [a/]
(In mid 1982 Constant US$ million)

	1983			1984			1985			1986			TOTAL			
	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	%
Land & civil works	0.8	3.0	3.8	1.0	4.3	5.3	0.9	3.5	4.4	0.3	1.2	1.5	3	12	15	20
Machinery, equip.& spares	5.0	3.8	8.8	10.0	7.4	17.4	3.3	2.5	5.8	1.7	1.3	3.0	20	15	35	47
Freight & insurance	-	-	-	1.3	0.9	2.2	1.4	0.9	2.3	0.3	0.2	0.5	3	2	5	7
Installation & start-up	-	-	-	0.2	0.2	0.4	1.0	1.5	2.5	0.9	1.2	2.1	2	3	5	7
Engineering	1.1	0.7	1.8	0.7	0.5	1.2	0.8	0.5	1.3	0.4	0.3	0.7	3	2	5	7
Tech. Asst. & training	0.1	0.2	0.3	0.4	0.3	0.7	0.6	0.3	0.9	0.8	0.3	1.1	2	1	3	4
Project mgmt. expenses	-	0.3	0.3	-	0.6	0.6	-	0.5	0.5	-	0.6	0.6	-	2	2	3
Taxes & duties	-	-	-	-	2.2	2.2	-	2.3	2.3	-	0.5	0.5	-	5	5	7
Base cost estimate	7.0	8.0	15.0	13.6	16.4	30.0	8.0	12.0	20.0	4.4	5.6	10.0	33	42	75	100

a/ FC refers to Foreign Currency Costs expressed in millions of US$; LC refers to Local Currency Costs expressed in millions of US$ equivalent (constant exchange rate of Rs 10 per $US was used for all years); TC refers to Total costs expressed in millions of US$.

(S-24)

Table 1B

THE EFFICIENT CEMENT COMPANY (II)

Capital Cost Estimate [a/]
(In current US$ million)

	1983			1984			1985			1986			TOTAL		
	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC
Land & civil works	.99	3.70	4.69	1.40	5.98	7.38	1.42	5.50	6.92	.54	2.16	2.70	4.35	17.34	21.69
Machinery, equip.& spares	5.89	4.48	10.37	12.65	9.36	22.01	4.51	3.42	7.93	2.51	1.91	4.42	25.56	19.17	44.73
Freight & insurance	–	–	–	1.65	1.14	2.79	1.91	1.23	3.14	.44	.30	.74	4.00	2.67	6.67
Installation & start-up	–	–	–	.28	.28	.56	1.57	2.37	3.94	1.62	2.16	3.78	3.47	4.81	8.28
Engineering	1.31	.84	2.15	.90	.65	1.55	1.12	.70	1.82	.62	.46	1.08	3.95	2.65	6.60
Tech. asst. & training	.12	.24	.36	.53	.40	.93	.87	.43	1.30	1.28	.47	1.75	2.80	1.54	4.34
Project mgmt. expenses	–	.37	.37	–	.84	.84	–	.79	.79	–	.96	.96	–	2.96	2.96
Taxes & duties	–	–	–	–	2.78	2.78	–	3.15	3.15	–	.74	.74	–	6.67	6.67
Total project costs	8.31	9.63	17.94	17.41	21.43	38.84	11.40	17.59	28.99	7.01	9.16	16.17	44.13	57.81	101.94
Working capital [b/]	–	–	–	–	–	–	–	–	–	–	9.78	9.78	–	9.78	9.78
Int. during const.	0.29	0.20	0.49	1.23	0.92	2.15	2.38	1.92	4.30	3.29	2.90	6.19	7.19	5.94	13.13
Total fin. required	8.60	9.83	18.43	18.64	22.35	40.99	13.78	19.51	33.29	10.30	21.84	32.14	51.32	73.53	124.85

a/ Individual components of Capital Costs in current terms were obtained by using the Capital Cost estimates in constant terms, physical contingency allowance of 10% for all components, and price escalation figures in Table ID.

b/ The working capital shown for 1986 also includes $8.37 million which is actually needed in 1987, to ensure that adequate financing is available for working capital.

Table 1C

THE EFFICIENT CEMENT COMPANY (II)

Capital Cost Estimate a/
(In mid 1982 Real terms US$ million)

	1983			1984			1985			1986			TOTAL		
	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC
Land & civil works	.91	3.39	4.30	1.18	5.06	6.24	1.12	4.32	5.44	.40	1.58	1.98	3.61	14.35	17.96
Machinery, equip.& spares	5.40	4.11	9.51	10.71	7.92	18.63	3.54	2.69	6.23	1.84	1.40	3.24	21.49	16.12	37.61
Freight & insurance	-	-	-	1.40	.96	2.36	1.50	.97	2.47	.32	.22	.54	3.22	2.15	5.37
Installation & start-up	-	-	-	.24	.24	.48	1.23	1.86	3.09	1.19	1.58	2.77	2.66	3.68	6.34
Engineering	1.20	.77	1.97	.76	.55	1.31	.88	.55	1.43	.45	.34	.79	3.29	2.21	5.40
Tech. Asst. & training	.11	.22	.33	.45	.34	.79	.68	.341,	1.02	.94	.34	1.28	2.18	1.24	3.42
Project mgmt. expenses	-	.34	.34	-	.71	.71	-	.62	.62	-	.70	.70	-	2.37	2.37
Taxes & duties	-	-	-	-	2.35	2.35	-	2.48	2.48	-	.54	.54	-	5.37	5.37
Total project costs	7.62	8.83	16.45	14.74	18.13	32.87	8.95	13.83	22.78	5.14	6.70	11.84	36.45	47.49	83.94

a/ Capital Cost estimates in real terms were obtained by deflating the Capital Cost estimates in current terms by the general inflation factor. The general inflation rates assumed were 9.1, 8.3, 7.7 and 7.2 percent for the years 1983, 1984, 1985, and 1986 respectively. Using this we obtain discount factors of 1.091, 1.182, 1.273, and 1.364 for the years 1983-1986.

Table 1D

THE EFFICIENT CEMENT COMPANY (II)

Projected Annual Price Escalation Rates For Various Cost Components [a/]

	1983	1984	1985	1986
Capital Costs:				
Land & civil works	12.0%	13.0	13.0	14.0
Machinery, equip. & spares	7.0%	7.5	8.0	8.0
Freight & insurance	7.0%	7.5	8.0	8.0
Installation & start-up	12.0%	13.0	13.0	14.0
Engineering	8.0%	8.5	9.0	10.0
Tech. asst. & training	9.0%	9.5	10.0	10.0
Project mgmt. expenses	12.0%	13.0	13.0	14.0
Taxes and duties	7.0%	7.5	8.0	8.0

	1983	1984	1985	1986	1987	1988	1989
Cost of goods sold:							
Raw materials	5.0%	5.0	5.0	5.0	5.0	5.0	5.0
Power & fuel	12.0%	13.0	14.0	15.0	15.0	15.0	15.0
Salaries & wages	15.0%	15.0	18.0	20.0	20.0	20.0	20.0
Repair & maintenance	7.0%	7.5	8.0	8.0	8.0	8.0	8.0
Stores & spares	7.0%	7.5	8.0	8.0	8.0	8.0	8.0
Miscellaneous supplies	7.0%	7.5	8.0	8.0	8.0	8.0	8.0
Admin. & selling expenses	10.0%	10.0	10.0	10.0	10.0	10.0	10.0
Packing	5.0%	5.0	5.0	5.0	5.0	5.0	5.0
	1983	1984	1985	1986	1987	1988	1989
General Inflation Rate:	9.1%	8.3	7.7	7.2	7.0	7.0	7.0

The selling price of cement is expected to increase annually at the same rate as the general inflation rate.

As can be seen, most costs of production inputs excalate significantly faster than the general rate of inflation.

a/ After 1989, it is assumed that general inflation rates are identical with individual inflation rates.

Table 2A

THE EFFICIENT CEMENT COMPANY (II)

Projected Operating Expenses
for Financial Rate of Return Calculations [a/]
(In mid 1982 Constant US$ million)

	1983	1984	1985	1986	1987	1988	1989 [b/]
Production (mln. of tons)	-	-	-	-	0.25	0.35	0.45
Sales price (US$)					75.00	75.00	75.00
Sales	-	-	-	-	18.75	26.25	33.75
Cost of goods sold							
Raw materials	-	-	-	-	1.08	1.44	1.69
Power & fuel	-	-	-	-	3.08	3.95	4.61
Salaries & wages	-	-	-	-	1.20	1.20	1.20
Repair & maintenance	-	-	-	-	.28	.53	1.01
Stores & spares	-	-	-	-	1.05	1.05	1.05
Miscellaneous supplies	-	-	-	-	0.56	0.79	1.01
Packing	-	-	-	-	0.75	1.05	1.35
Total cost of goods sold	-	-	-	-	8.00	10.01	11.92
Admin. & selling expenses	-	-	-	-	0.38	0.53	0.63
Gross operating income	-	-	-	-	10.37	15.71	21.20

a/ Based on Standard Table 2; however, costs expressed in US$ rather than local currency. The assumptions used in calculating the projected operating costs are listed separately.

b/ First year of steady state operations (assumed at 90% of capacity).

Table 2B

THE EFFICIENT CEMENT COMPANY (II)

Projected Operating Expenses for Financial Rate of Return Calculations (In Current US$ million)

	1983	1984	1985	1986	1987	1988	1989
Production (mln. of tons)	-	-	-	-	0.25	0.35	0.45
Sales price (US$)	81.83	88.62	95.44	102.31	109.47	117.14	125.34
Sales					27.37	41.00	56.40
Cost of goods sold							
Raw materials					1.38	1.93	2.38
Power & fuel					5.88	8.67	11.63
Salaries & wages					2.70	3.24	3.88
Repair & maintenance					.41	.83	1.71
Stores & spares					1.52	1.64	1.77
Miscellaneous supplies					.81	1.24	1.71
Packing					.96	1.41	1.90
Total cost of goods sold					13.66	18.96	24.98
Admin. & selling expenses					.61	.94	1.23
Gross Operating Income					13.10	21.10	30.19

Table 2C

THE EFFICIENT CEMENT COMPANY (II)

Projected Operating Expenses
for Financial Rate of Return Calculations
(In mid 1982 Real terms US$ million)

	1983	1984	1985	1986	1987	1988	1989
Production (mln. of tons)					0.25	0.35	0.45
Sales price (US$)					75.00	75.00	75.00
Sales					18.75	26.25	33.75
Cost of goods sold							
Raw materials					.95	1.24	1.42
Power & fuel					4.03	5.55	6.96
Salaries & wages					1.85	2.07	2.32
Repair & maintenance					.28	.53	1.03
Stores & spares					1.04	1.05	1.06
Miscellaneous supplies					.56	.80	1.03
Packing					.66	.90	1.14
Total cost of goods sold					9.37	12.14	14.96
Admin. & selling expenses					.42	.60	.74
Gross Operating Income					8.96	13.51	18.04

Table 3A

THE EFFICIENT CEMENT COMPANY (II)

Projected Working Capital
(In Current US$ million)

	1986	1987	1988	1989
Current Assets (in millions $US)				
Cash (3% of Sales)	-	.82	1.23	1.69
Accounts Receivables (1 month Sales)	-	2.28	3.42	4.70
Inventories:				
Consummable stores (4% of Sales)	-	1.09	1.64	2.26
Spare parts (3% of equipment costs)	1.41	1.52	1.64	1.77
Coal (4 weeks supply)	-	.20	.29	.39
Packing materials (7 weeks supply)	-	.13	.19	.26
Raw materials (7 weeks supply)	-	.19	.26	.32
Goods (finished and semi-finished, 10% of Sales)	-	2.74	4.10	5.64
Prepaid Expenses (8% of Sales)	-	2.19	3.28	4.51
Total Current Assets	1.41	11.16	16.05	21.54
Current Liabilities (in millions $US)				
Accounts Payable (5 weeks cost of Sales, excl. salaries and wages)	-	1.11	1.60	2.15
Other Current Liabilities (1% of Sales)	-	.27	.41	.56
Total Current Liabilities	0	1.38	2.01	2.71
Working Capital (Cumulative)	1.41	9.78	14.04	18.83
Working Capital (Incremental)	1.41	8.37	4.26	4.79

Table 3B

THE EFFICIENT CEMENT COMPANY (II)

Projected Working Capital
(In mid 1982 Real terms US$ million)

	1986	1987	1988	1989
Current Assets (in millions $US)				
Cash		.56	.79	1.01
Accounts Receivables		1.56	2.19	2.81
Inventories:				
Consummable stores		.75	1.05	1.35
Spare parts	1.03	1.04	1.05	1.06
Coal		.14	.19	.23
Packing materials		.09	.12	.16
Raw materials		.13	.17	.19
Goods (finished & semi-finished)		1.88	2.63	3.37
Prepaid Expenses		1.50	2.10	2.70
Total Current Assets	1.03	7.65	10.29	12.88
Current Liabilities (in millions $US)				
Accounts Payable	-	.76	1.02	1.29
Other Current Liabilities	-	.18	.26	.34
Total Current Liabilities	0	.94	1.28	1.63
Working Capital (Cumulative)	1.03	6.71	9.01	11.25
Working Capital (Incremental)	1.03	5.68	2.30	2.24

Table 4A

THE EFFICIENT CEMENT COMPANY (II)

Projected Operating Expenses [a/] for Economic Rate of Return Calculations (In mid 1982 Constant US$ million)

	1983	1984	1985	1986	1987	1988	1989
Production (mln. of tons)	-	-	-	-	0.25	0.35	0.45
Sales price (US$)					70.00	70.00	70.00
Sales revenue	-	-	-	-	17.50	24.50	31.50
Cost of goods sold							
Raw materials	-	-	-	-	1.08	1.44	1.69
Power & fuel	-	-	-	-	5.01	6.43	7.52
Salaries & wages	-	-	-	-	0.90	0.90	0.90
Repair & maintenance	-	-	-	-	.28	.53	1.01
Stores & spares	-	-	-	-	1.05	1.05	1.05
Miscellaneous supplies	-	-	-	-	0.56	0.79	1.01
Packing	-	-	-	-	0.75	1.05	1.35
Total cost of goods sold	-	-	-	-	9.63	12.19	14.53
Admin. & selling expenses	-	-	-	-	0.38	0.53	0.63
Gross operating income	-	-	-	-	7.49	11.78	16.34

a/ Based on Standard Table 2; however, costs expressed in US$ rather than local currency. The assumptions used for calculating the projected operating expenses for the Economic rate of return calculations are listed separately.

Table 4B

THE EFFICIENT CEMENT COMPANY (II)

Projected Operating Expenses for Economic Rate of Return Calculations (In Current US$ million)

	1983	1984	1985	1986	1987	1988	1989
Production (mln. of tons)					0.25	0.35	0.45
Sales price (US$)	76.37	82.71	89.09	95.49	102.18	109.33	116.98
Sales					25.55	38.27	52.64
Cost of goods sold							
Raw materials					1.38	1.93	2.38
Power & fuel					9.56	14.11	18.98
Salaries & wages					2.02	2.43	2.91
Repair & maintenance					.41	.83	1.71
Stores & spares					1.52	1.64	1.77
Miscellaneous supplies					.81	1.24	1.71
Packing					.96	1.41	1.90
Total cost of goods sold					16.66	23.59	31.36
Admin. & selling expenses					.61	.94	1.23
Gross Operating Income					8.28	13.74	20.05

Table 4C

THE EFFICIENT CEMENT COMPANY (II)

Projected Operating Expenses for Economic Rate of Return Calculations
(In mid 1982 Real terms US$ million)

	1983	1984	1985	1986	1987	1988	1989
Production (mln. of tons)					0.25	0.35	0.45
Sales price (US$)					70.00	70.00	70.00
Sales					17.50	24.50	31.50
Cost of goods sold							
Raw materials					.95	1.24	1.42
Power & fuel					6.55	9.03	11.36
Salaries & wages					1.38	1.56	1.74
Repair & maintenance					.28	.53	1.02
Stores & spares					1.04	1.05	1.06
Miscellaneous supplies					.55	.79	1.02
Packing					.66	.90	1.14
Total cost of goods sold					11.41	15.10	18.76
Admin. & selling expenses					.42	.60	.74
Gross Operating Income					5.67	8.80	12.00

Table 5

THE EFFICIENT CEMENT COMPANY (II)

Financial Rate of Return Analysis (Pre-tax)
(In mid 1982 Real terms US$ million)

	Year	Capital Cost Streams [a]	Operating Cost Streams	Benefit Stream	Net Benefit Stream
Project Implementation	1983	16.45	0	0	-16.45
	1984	32.87	0	0	-32.87
	1985	22.78	0	0	-22.78
	1986	12.87	0	0	-12.87
Economic Project Life	1987	5.68	9.79	18.75	3.28
	1988	2.30	12.74	26.25	11.21
	1989	2.24	15.70	33.75	15.81
	1990	0	15.70	33.75	18.05
	1991	0	15.70	33.75	18.05
	1992	4.00 [b]	15.70	33.75	14.05
	1993	0	15.70	33.75	18.05
	1994	0	15.70	33.75	18.05
	1995	0	15.70	33.75	18.05
	1996	0	15.70	33.75	18.05
	1997	4.00 [b]	15.70	33.75	14.05
	1998	0	15.70	33.75	18.05
	1999	0	15.70	33.75	18.05
	2000	0	15.70	33.75	18.05
	2001	0	15.70	33.75	18.05
	2002	4.00 [b]	15.70	33.75	14.05
	2003	0	15.70	33.75	18.05
	2004	0	15.70	33.75	18.05
	2005	0	15.70	33.75	18.05
	2006	-16.25 [c]	15.70	33.75	34.30

Pre-tax Financial Rate of Return = 13.04%

a/ The Capital Cost Stream includes the working capital required. It was assumed that the entire working capital of US$11.25 million would be recovered at the end of the project.

b/ It was estimated that additional capital costs of $4 million would be incurred every 5 years of the project, starting 1992.

c/ It was estimated that the salvage value of the plant and equipment would be $5.0 million at the end of the year 2006.

Table 6

THE EFFICIENT CEMENT COMPANY (II)

Economic Rate of Return Analysis
(In mid 1982 Real terms US$ million)

	Year	Capital Cost Streams	Operating Cost Streams	Benefit Stream	Net Benefit Stream
Project Implementation	1983	16.45	0	0	-16.45
	1984	30.52	0	0	-32.52
	1985	20.30	0	0	-20.30
	1986	12.23	0	0	-12.23
Economic Project Life	1987	5.11	11.83	17.50	0.56
	1988	2.07	15.70	24.50	6.73
	1989	2.02	19.50	31.50	9.98
	1990	0	19.50	31.50	12.00
	1991	0	19.50	31.50	12.00
	1992	4.00	19.50	31.50	8.00
	1993	0	19.50	31.50	12.00
	1994	0	19.50	31.50	12.00
	1995	0	19.50	31.50	12.00
	1996	0	19.50	31.50	12.00
	1997	4.00	19.50	31.50	8.00
	1998	0	19.50	31.50	12.00
	1999	0	19.50	31.50	12.00
	2000	0	19.50	31.50	12.00
	2001	0	19.50	31.50	12.00
	2002	4.00	19.50	31.50	8.00
	2003	0	19.50	31.50	12.00
	2004	0	19.50	31.50	12.00
	2005	0	19.50	31.50	12.00
	2006	-15.13	19.50	31.50	27.13

Economic Rate of Return = 8.88%

Table 7A

THE EFFICIENT CEMENT COMPANY (II) a/

Project Financing Plan
(In Current US$ million)

	1983			1984			1985			1986			TOTAL		
	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC
1. Equity Capital	2.53	5.68	8.21	5.05	11.36	16.41	3.16	9.47	12.63	1.89	11.36	13.25	12.63	37.87	50.50
2. Term Borrowings															
National DFC:															
i. Own resources		4.15	4.15		10.99	10.99		10.04	10.04		10.48	10.48		35.66	35.66
ii. Foreign funds	6.07		6.07	13.59		13.59	10.62		10.62	8.41		8.41	38.69		38.69
Subtotal			10.22			24.58			20.66			18.89			74.35
Total financing from all sources	8.60	9.83	18.43	18.64	22.35	40.99	13.78	19.51	33.29	10.30	21.84	32.14	51.32	73.53	124.85

a/ Based on Standard Table 4. FC refers to foreign currency funds, expressed in millions of US$; LC refers to Local Currency funds expressed in millions of US$ equivalent (exchange rate of Rs. 10 per $US was used for all years) and TC refers to Total funds expressed in millions of US$.
Equity Capital involves sales of 505,000 common shares at Rs 1000 ($US 100 equivalent) per share.
Both the DFC Rupee loan and the Dollar loan are repayable in 12 years including 5 years principal grace, and bear an interest rate of 10 percent. Repayment is through annual level principal installments.
All equity capital and loan disbursements occur at a constant rate throughout the year.

Table 7B

THE EFFICIENT CEMENT COMPANY (II)

Worksheet for Financing Plan
(In Current US$ million)

	1983	1984	1985	1986
For Foreign Currency				
(1) Total financing needed a/ (excl. interest costs)	8.31	17.41	11.40	7.01
(2) Equity financing	2.53	5.05	3.16	1.89
(3) Loan disbursement required	5.78	12.36	8.24	5.12
(4) Interest expense on loan	0.29	0.62	0.41	0.26
(5) Outstanding loan amount (from previous years)	-	6.07	19.66	30.28
(6) Interest expense on outstanding loan balance	-	0.61	1.97	3.03
(7) Total loan balance at end of year	6.07	19.66	30.28	38.69
(8) Total additional loan taken during year (7) - (5)	6.07	13.59	10.62	8.41
(9) Total interest expense incurred during year (4) + (6)	0.29	1.23	2.38	3.29

a/ The total foreign currency financing needed for each of the years was obtained from the capital cost estimate expressed in current terms (Table 1B).

Table 8

THE EFFICIENT CEMENT COMPANY (II)

Depreciation Schedule
(In Current US$ million)

Cost Category	Depreciation Period in Years	Total Cost	Depreciation For The Year		
			1987	1988	1989
Land & civil works	20	21.69	1.08	1.08	1.08
Machinery, equipment & spares	15	44.73	3.00	3.00	3.00
Freight & Insurance	15	6.67	0.44	0.44	0.44
Installation & start-up	15	8.28	0.55	0.55	0.55
Engineering	3	6.60	2.20	2.20	2.20
Tech. asst. & training	3	4.34	1.45	1.45	1.45
Project Management Expenses	3	2.96	0.99	0.99	0.99
Taxes & Duties	15	6.67	0.44	0.44	0.44
Interest During Construction	5	13.13	2.63	2.63	2.63
TOTAL		115.07	12.78	12.78	12.78
CUMULATIVE TOTAL			12.78	25.56	38.34

Table 9

THE EFFICIENT CEMENT COMPANY (II)

Projected Income Statement
(In Current US$ million)

	1983	1984	1985	1986	1987	1988	1989
Production (mln. of tons)	-	-	-	-	0.25	0.35	0.45
Sales price (US$)	81.83	88.62	95.44	102.31	109.47	117.14	125.34
Sales	-	-	-	-	27.37	41.00	56.40
Cost of goods sold							
Raw materials	-	-	-	-	1.38	1.93	2.38
Power & fuel	-	-	-	-	5.88	8.67	11.63
Salaries & wages	-	-	-	-	2.70	3.24	3.88
Repair & maintenance	-	-	-	-	.41	.83	1.71
Stores & spares	-	-	-	-	1.52	1.64	1.77
Miscellaneous supplies	-	-	-	-	.81	1.24	1.71
Packing	-	-	-	-	.96	1.41	1.90
Sub-total					13.66	18.96	24.98
Gross Profit					13.71	22.04	31.42
Other Operating Expenses							
Admin & Selling Expenses	-	-	-	-	.61	.94	1.23
Depreciation	-	-	-	-	12.78	12.78	12.78
Sub-total					13.39	13.72	14.01
Operating Profit	-	-	-	-	0.32	8.32	17.41
Interest Expense	-	-	-	-	7.44	7.44	6.37
Taxes	-	-	-	-	-	-	-
Net Profit After Tax					(7.12)	0.88	11.04

Table 10

THE EFFICIENT CEMENT COMPANY (II)

Projected Balance Sheet
(In Current US$ million)

	1983	1984	1985	1986	1987	1988	1989
ASSETS							
Current Assets							
Surplus cash	-	-	-	8.37	5.66	4.44	12.85
Cash for operation	-	-	-	-	0.82	1.23	1.69
Accounts receivable	-	-	-	-	2.28	3.42	4.70
Inventories	-	-	-	1.41	8.06	11.40	15.15
Subtotal	-	-	-	1.41	16.82	20.49	34.39
Fixed Assets							
Work in progress	18.43	59.42	92.71	115.07	-	-	-
Gross assets	-	-	-	-	115.07	115.07	115.07
Less accumulated depreciation	-	-	-	-	12.78	25.56	38.54
Net Fixed Assets	18.43	59.42	92.71	115.07	102.29	89.51	76.73
Total Assets	18.43	59.42	92.71	124.85	119.11	110.00	111.12
LIABILITIES							
Current Liabilities							
Accounts payable	-	-	-	-	1.11	1.60	2.15
Other current liabilities	-	-	-	-	0.27	0.41	0.56
Subtotal	-	-	-	-	1.38	2.01	2.71
Long & Medium Term Debt							
Foreign Loan	6.07	19.66	30.28	38.69	38.69	33.16	27.63
Local	4.15	15.14	25.18	35.66	35.66	30.57	25.48
Subtotal	10.22	34.80	55.46	74.35	74.35	63.73	53.11
Capital							
Share capital	8.21	24.62	37.25	50.50	50.50	50.50	50.50
Retained earnings	-	-	-	-	(7.12)	(6.24)	4.80
Subtotal	8.21	24.62	37.25	50.50	43.38	44.26	55.30
Total Liabilities	18.43	59.42	92.71	125.85	119.11	110.00	111.12

Table 11

THE EFFICIENT CEMENT COMPANY (II)

Projected Sources and Uses of Funds
(In Current US$ million)

	1983	1984	1985	1986	1987	1988	1989
SOURCES OF FUNDS							
Cash from Operations							
Depreciation	-	-	-	-	12.78	12.78	12.78
Net profit after taxes and dividends	-	-	-	-	(7.12)	0.88	11.04
Subtotal	-	-	-	-	5.66	13.66	23.82
Capital	8.21	16.41	12.63	13.25	-	-	-
Loans							
Foreign loan	6.07	13.59	10.62	8.41	-	-	-
Local funds	4.15	10.99	10.04	10.48	-	-	-
Subtotal	10.22	24.58	20.66	18.89	-	-	-
Total Sources	18.43	40.99	33.29	32.14	5.66	13.66	23.82
APPLICATION OF FUNDS							
Fixed Assets							
Plant	17.94	38.84	28.99	16.17	-	-	-
Interest during construction	0.49	2.15	4.30	6.19	-	-	-
Subtotal	18.43	40.99	33.29	22.36	-	-	-
Change in Working Capital	-	-	-	1.41	8.37	4.26	4.79
Loan Repayments							
Foreign	-	-	-	-	-	5.53	5.53
Local	-	-	-	-	-	5.09	5.09
Subtotal	-	-	-	-	-	10.62	10.62
Total Applications	18.43	40.99	33.29	23.77	8.37	14.88	15.41
Annual surplus	-	-	-	8.37	(2.71)	(1.22)	8.41
Cumulative surplus	-	-	-	8.37	5.66	4.44	12.85

Table 12

THE EFFICIENT CEMENT COMPANY (II)

Break-Even Point Analysis [a/]

(All Monetary Amounts Expressed in Current US$ Million)

	Breakdown of Expenses In Percentage Terms		Breakdown of Expenses in Dollar Terms		
	Fixed	Variable	Fixed	Variable	Total
Raw Materials	60	40	1.43	0.95	2.38
Power and Fuel	20	80	2.33	9.30	11.63
Salaries and Wages	100	-	3.88	-	3.88
Repair and Maintenance	70	30	1.20	0.51	1.71
Stores and Spares	80	20	1.42	0.35	1.77
Miscellaneous Supplies	50	50	0.86	0.85	1.71
Admin. and Selling Expenses	100	-	1.23	-	1.23
Packing	10	90	0.19	1.71	1.90
Depreciation	100	-	12.78	-	12.78
Financial Charges	100	-	6.37	-	6.37
Taxes	-	-	-	-	-
Total			31.69	13.67	45.36

Variable cost per ton = (Total variable Cost/Total Production)
= 13.67/0.45
= $30.38

Profit Break-even Point = Total Fixed Costs/(Price per ton - variable cost per ton)
= $31,690,000/(125.34 - $30.38)
= 333,719 tons

Profit Break-even Point (% of Capacity) = (333,719)/(500,000) = 67% of Capacity

a/ The break-even point has been calculated on the basis of costs, expressed in current terms, in the year 1989 (when the plant reaches steady state operations of 0.45 million tons with total nominal capacity at 0.50 million tons and sale price in current terms is $125.34 per ton).

ILLUSTRATIVE CASE STUDY NO. 3

THE RELIABLE CEMENT COMPANY (III)
(With/Without Analysis for Expansion Project)

1. The Reliable Cement Company owns and operates a dry-process one-kiln cement plant with a nominal capacity of 850,000 tons per year. The firm's management is contemplating on embarking on a plant modernization program in an effort to improve capacity utilization, energy efficiency and thereby decrease operating costs. The modernization program entails an investment of about $35 million over a one-year period for a precalcination system, upgrading of quarry equipment, modernization of mill, and expenditure for technical assistance. The plant to-date could only achieve steady state production of up to 700,000 tons per year (82.5% of capacity) due to certain technical difficulties and bottlenecks in the raw material preparation and handling. The precalcination equipment is designed to boost capacity from 0.85 million TPY to 1.1 million TPY and to reduce energy consumption considerably. Though the plant uses the dry process to manufacture cement, it is somewhat energy inefficient. Coal consumption per ton to cement is 15 percent higher and power consumption is about 10 percent higher than was originally specified when the plant was new.

2. The modernization program, if implemented, will increase the plant capacity to 1.1 million tons per year and is likely to improve average capacity utilization to above 85 percent of the modified plant capacity. The analysis will, however, only take account of 85% capacity utilization under steady state operations to remain on the conservative side. During the implementation period itself, however, there will be a production loss estimated at about 180,000 tons (3 months of present production level). This is considered to be a conservative estimate, since typically the kiln is shut down for one month each year in any case and some of the plant upgrading work can be done during this time. It is expected that the plant modifications will result in considerable energy savings. Conservatively, it is estimated that coal consumption per ton of cement would drop by 10 percent while power savings per ton may be only around 5 percent after installation of the plant modifications. Reinvestment costs are expected to decline as a result of the modernization program from $1.5 million to $1.2 million incurred once every three years over the remaining life of the plant. No changes are expected in total labor costs or the remaining life period of the plant. The remaining plant life is estimated to be 15 years.

3. Using the projected cost and benefit streams for the Reliable Cement Company, assuming that the project is undertaken and next assuming that the expansion project is not undertaken, we arrive at the incremental cost and benefit streams for the expansion project itself. Based on these streams we find that the projected Pre-tax Financial Rate of Return on the incremental project is 25.63% and the projected Economic Rate of Return is 23.62%. Assuming that the country's opportunity cost of capital is 10% for projects in the same risk category, we would accept the expansion project since both the financial and economic rates of return are greater than 10%.

THE RELIABLE CEMENT COMPANY (III)

Economic Rate of Return Analysis

Assumptions Used

The economic rate of return calculations for the project are based on the cost and benefit streams used for the financial rate of return calculations with the following adjustments:

1. Selling Price: The CIF cost of imported bulk cement US$70 per ton has been used in valuing the output for the project. A price of US$75 per ton was used for the financial rate of return calculations.

2. Power: The economic cost of power is estimated at $0.08 per KwH. This compares with the financial price of $0.05 per KwH. This results in the cost of power per ton of cement to be $10.12 (as against $6.32 used for the financial rate of return calculations). If the plant modernization program is undertaken, the cost of power per ton of cement will be $9.61 after installation of plant modifications (since this would lead to a 5% power saving per ton).

3. Coal: The economic cost of coal is estimated at $50.00 per ton (as against $30.00 used for the financial rate of return calculations). This results in the cost of coal per ton of cement to be $8.63 (as compared to $5.18 used for the financial analysis. If the plant modernization is undertaken, the cost of coal per ton of cement will be $7.76 after installation of plant modifications.

4. Raw Materials: Raw material costs are assumed to be the same as those used in the financial calculations.

5. Salaries and Wages: All labor is shadow priced at 75 percent of its financial cost.

6. Working Capital: This is reduced by 10% to eliminate taxes and duties.

7. Capital Costs: Taxes and duties amounting to $3.5 million were subtracted from the incremental capital cost expenditures for the year 1984.

Table 1

THE RELIABLE CEMENT COMPANY (III)

Projected Income Statement With Project for Financial Rate of Return Calculations
(In Constant US$ Million)

	1984	1985	1986
Capacity utilization (%) (nominal capacity 0.85 mil. tons in 1984, 1.1 mil. tons in 1985, 1986)	65.0	85.0	85.0
Production (mln of tons)	0.52	0.94	0.94
Sales price (US$)	75.0	75.0	75.0
Sales revenue	39.00	80.50	70.50
Cost of goods sold:			
Raw materials	1.95	3.53	3.53
Power and fuel	5.98	10.02	10.02
Salaries and wages	2.00	2.00	2.00
Repair and maintenance	1.17	2.12	2.12
Stores and spares	1.50	1.50	1.50
Miscellaneous supplies	1.17	2.12	2.12
Packing	1.56	2.82	2.82
Total cost of goods sold	15.33	24.11	24.11
Admin. and selling expenses	0.78	1.41	1.41
Gross operating income	22.89	44.98	44.98
Gross profit/sales	0.59	0.64	0.64

Table 2

THE RELIABLE CEMENT COMPANY (III)

Projected Income Statement Without Project
For Financial Rate of Return Calculations
(In Constant US$ Million)

	1984	1985	1986
Capacity utilization (%) (nominal capacity 850,000 tons)	82.0	82.0	82.0
Production (mln of tons)	0.70	0.70	0.70
Sales price (US$)	75.0	75.0	75.0
Sales revenue	52.50	52.50	52.50
Cost of goods sold:			
Raw materials	2.63	2.63	2.63
Power and fuel	8.05	8.05	8.05
Salaries and wages	2.00	2.00	2.00
Repair and maintenance	1.58	1.58	1.58
Stores and spares	1.50	1.50	1.50
Miscellaneous supplies	1.58	1.58	1.58
Packing	2.10	2.10	2.10
Total cost of goods sold	19.44	19.44	19.44
Admin. and selling expenses	1.05	1.05	.05
Gross operating income	32.01	32.01	32.01
Gross profit/sales	0.61	0.61	0.61

Table 3

THE RELIABLE CEMENT COMPANY (III)

Incremental Income Statement of Project
For Financial Rate of Return Calculations
(In Constant US$ Million)

	1984	1985	1986
Incremental production	(0.18)	0.24	0.24
Sales price (US$/ton)	75.0	75.0	75.0
Incremental revenue	(13.5)	18.0	18.0
Incremental cost of goods sold:			
Raw materials	(0.68)	0.90	0.90
Power and fuel	(2.07)	1.97	1.97
Salaries and wages	0	0	0
Repair and maintenance	(0.41)	0.54	0.54
Stores and spares	0	0	0
Miscellaneous supplies	(0.41)	0.54	0.54
Packing	(0.54)	0.72	0.72
Total incremental cost of goods sold	(4.11)	4.67	4.67
Incremental Admin. & selling expenses	(0.27)	0.36	0.36
Incremental gross operating income	(9.12)	12.97	12.97
Incremental gross profit/incremental sales	-	0.72	0.72

Table 4

THE RELIABLE CEMENT COMPANY (III)

Projected Incremental Working Capital [a]/
(In Constant US$ Million)

	1984	1985	1986
Incremental Current Assets			
Cash (3% of incremental sales)	(0.41)	0.54	0.54
Accounts Receivable (1 month inc. sales)	(1.13)	1.50	1.50
Inventories:			
Consumable stores (4% of inc. sales)	(0.54)	1.38	1.38
Spare parts (3% of inc. investment)	1.05	1.05	1.05
Coal (incremental 4 wiiks supply)	(0.07)	0.09	0.09
Packing materials (inc. 7 weeks supply)	(0.07)	0.10	0.10
Goods (finished & semi-finished, 10% of incremental sales)	(1.35)	1.80	1.80
Prepaid Expenses (8% of inc. sales)	(1.08)	1.44	1.44
Total Incremental Current Assets	(3.60)	7.90	7.90
Incremental Current Liabilities			
Accounts payable (5 weeks cost of incremental sales)	(0.42)	0.48	0.48
Other current liabilities (1% of inc. sales)	(0.14)	0.18	0.18
Total Current Liabilities	(0.56)	0.66	0.66
Incremental Working Capital	(3.04)	7.24	7.24
Incremental Working Capital Build-up	(3.04)	10.28	0

a/ This table refers to the projected incremental working capital for the financial analysis and the Financial Rate of Return. In order to express incremental working capital requirements for ERR, refer to schedule of assumptions used for Economic Rate of Return.

Table 5

THE RELIABLE CEMENT COMPANY (III)

Projected Income Statement With Project [a]/
for Economic Rate of Return Calculations
(In Constant US$ Millions)

	1984	1985	1986
Capacity utilization (%) (nominal capacity 0.85 mil. tons in 1984, 1.1 mil. tons in 1985, 1986)	65.0	85.0	85.0
Production (mln of tons)	0.52	0.94	0.94
Sales price (US$)	70.00	70.00	70.00
Sales revenue	36.40	65.80	65.80
Cost of goods sold:			
Raw materials	1.95	3.53	3.53
Power and fuel	9.75	16.33	16.33
Salaries and wages	1.50	1.50	1.50
Repair and maintenance	1.17	2.12	2.12
Stores and spares	1.50	1.50	1.50
Miscellaneous supplies	1.17	2.12	2.12
Packing	1.56	2.82	2.82
Total cost of goods sold	18.60	29.92	29.92
Admin. and selling expenses	0.78	1.41	1.41
Gross operating income	17.02	34.47	34.47
Gross profit/sales	0.47	0.52	0.52

a/ Refer to assumptions used for Economic Rate of Return Analysis, which are listed separately.

Table 6

THE RELIABLE CEMENT COMPANY (III)

Projected Income Statement Without Project
for Economic Rate of Return Calculations
(In Constant US$ Million)

	1984	1985	1986
Capacity utilization (%) (nominal capacity 850,000 tons)	82.00	82.00	82.00
Production (mln of tons)	0.70	0.70	0.70
Sales price (US$)	70.00	70.00	70.00
Sales revenue	49.00	49.00	49.00
Cost of goods sold:			
Raw materials	2.63	2.63	2.63
Power and fuel	13.13	13.13	13.13
Salaries and wages	1.50	1.50	1.50
Repair and maintenance	1.58	1.58	1.58
Stores and spares	1.50	1.50	1.50
Miscellaneous supplies	1.58	1.58	1.58
Packing	2.10	2.10	2.10
Total cost of goods sold	24.02	24.02	24.02
Admin. and selling expenses	1.05	1.05	.05
Gross operating income	23.93	23.93	23.93
Gross profit/sales	0.49	0.49	0.49

Table 7

THE RELIABLE CEMENT COMPANY (III)

Incremental Income Statement of Project
for Economic Rate of Return Calculations
(In Constant US$ Million)

	1984	1985	1986
Incremental production	(0.18)	0.24	0.24
Sales price (US$/ton)	70.00	70.00	70.00
Incremental revenue	(12.60)	16.80	16.80
Incremental cost of goods sold:			
Raw materials	(0.68)	0.90	0.90
Power and fuel	(2.30)	3.20	3.20
Salaries and wages	0	0	0
Repair and maintenance	(0.41)	0.54	0.54
Stores and spares	0	0	0
Miscellaneous supplies	(0.41)	0.54	0.54
Packing	(0.54)	0.72	0.72
Total incremental cost of goods sold	(5.42)	5.90	5.90
Incremental Admin. & selling expenses	(0.27)	0.36	0.36
Incremental gross operating income	(6.91)	10.54	10.54
Incremental gross profit/incremental sales	-	0.63	0.63

Table 8

THE RELIABLE CEMENT COMPANY (III)

Financial Rate of Return Analysis (Pre-tax)
(In Constant US$ Million)

	Year	Incremental Capital Cost Streams [a]	Incremental Operating Cost Streams	Incremental Benefit Stream	Incremental Net Benefit Stream
Project Implementation	1984	31.96	-4.38	-13.5	-41.08
Economic Project Life	1985	10.28	5.03	18.00	2.69
	1986	0	5.03	18.00	12.97
	1987	-0.30 [b]	5.03	18.00	12.67
	1988	0	5.03	18.00	12.97
	1989	0	5.03	18.00	12.97
	1990	-0.30 [b]	5.03	18.00	12.67
	1991	0	5.03	18.00	12.97
	1992	0	5.03	18.00	12.97
	1993	-0.30 [b]	5.03	18.00	12.67
	1994	0	5.03	18.00	12.97
	1995	0	5.03	18.00	12.97
	1996	-0.30 [b]	5.03	18.00	12.67
	1997	0	5.03	18.00	12.97
	1998	-10.74 [c]	5.03	18.00	23.71

Pre-tax Financial Rate of Return = 25.63%

a/ The incremental Capital Cost Stream includes the changes in the amount of working capital required. It was assumed that the entire incremental working capital of US$7.24 million would be recovered at the end of the project.

b/ It was estimated that the project would result in savings in the re-investment needed every 5 years. The savings was estimated at US$0.30 million.

c/ It was assumed that the salvage value of the incremental project would be US$3.50 million at the end of year 1998.

Table 9

THE RELIABLE CEMENT COMPANY (III)

Economic Rate of Return Analysis [a]/
(In constant US$ million)

	Year	Incremental Capital Cost Streams	Incremental Operating Cost Streams	Incremental Benefit Stream	Incremental Net Benefit Stream
Project Implementation	1984	28.76	-5.69	-12.6	-35.67
Economic Project Life	1985	9.25	6.26	16.8	1.29
	1986	0	6.26	16.8	10.54
	1987	-0.30	6.26	16.8	10.84
	1988	0	6.26	16.8	10.54
	1989	0	6.26	16.8	10.54
	1990	-0.30	6.26	16.8	10.84
	1991	0	6.26	16.8	10.54
	1992	0	6.26	16.8	10.54
	1993	-0.30	6.26	16.8	10.84
	1994	0	6.26	16.8	10.54
	1995	0	6.26	16.8	10.54
	1996	-0.30	6.26	16.8	10.84
	1997	0	6.26	16.8	10.54
	1998	-10.01	6.26	16.8	20.55

Economic Rate of Return = 23.62%

a/ For assumptions regarding conversion of financial costs and benefit streams into economic cost and benefit streams refer to assumptions used for Economic Rate of Return Analysis, which are listed separately.

ILLUSTRATIVE CASE STUDY NO. 4

THE STANDARD BATTERY COMPANY
(Varying Exchange Rates)

1. This Case Study describes a hypothetical investment project for the expansion, on the order of 50 percent over the existing enterprise base, of production facilities for the manufacture of electric batteries. It is an output-expanding, import-substituting venture in a small, developing country.

2. The project site is about 50 miles (80 kilometers) west of the capital city, the main marketplace for batteries. The capital city is 150 miles (240 kilometers) west of the country's main port. Ground transportation of project inputs and batteries is by truck.

3. The project will create production of 40 million batteries per year. It is expected that the project will produce and sell 20 million units in Year 4, the first year of operations, 30 million units in Year 5, and 36 million units in Years 6 through 12 (i.e., 90 percent of capacity).

4. The estimated investment cost of the undertaking is Rs 10.1 million (including working capital but excluding interest during construction) in real prices of Year 0, equivalent to US$1 million. When interest charges during the three-year period of construction are added and price inflation and exchange-rate changes are introduced, total financing of Rs 17.4 million is required. Equity financing will provide Rs 6 million, of which Rs 2 million will come from foreigners. The national development bank will provide a loan of US$393,330 in dollars and a loan of Rs 3,713,000 in rupees from its own resources. A private foreign source will provide a loan of US$143,250 and this loan can be considered "tied" to the project.[1/]

5. The projected life of the venture is 12 years. During this period the general level of prices in the country is projected to rise at an average annual rate of 20 percent, and the exchange rate is expected to depreciate against the dollar at a rate of 10 percent per year. The country follows a crawling-rate regime (an exchange rate policy of steady small devaluations to counterbalance the influence of differential inflation rates).

6. The projected selling price at the factory is Rs 2,500 per thousand batteries. Comparable batteries can be imported at a c.i.f. price of Rs 2,083 per thousand. The application of a 20 percent ad valorem import tariff raises this price to RS 2,500 per thousand, at the port. It costs Rs 10 per thousand to clear the port and another Rs 10 to reach the capital city, implying a price of Rs 2,520 per thousand as batteries enter the wholesale distribution system.

1/ The loan amounts specified do not include the interest that is being capitalized.

7. The initial c.i.f. import price of US$208.30 per thousand batteries (Rs2,083) is projected to rise by just over 9 percent per year throughout the project life (assumed to be roughly the same as expected price inflation in the major supplying countries). Since the rupee is expected to depreciate by 10 percent per year against the dollar, the c.i.f. rupee price per thousand batteries (the "border rupee" price) will increase at a rate of 20 percent per year. Since domestic price inflation is projected at 20 percent per year, the constant-price cost of imported batteries remains steady at Rs2,083 per thousand.

8. This Rs2,083 is a benchmark. It is the price the country must pay if it buys batteries from foreign sources.

9. The Rs2,520 price at the capital city wholesale distribution center is another benchmark. It is the highest price that the project can charge for its own batteries at the wholesale distribution center. Since local transportation from the project site to the city distribution center costs about Rs7.50 per thousand and there is an excise tax of 0.5 percent on batteries as they emerge from the factory (0.5 percent of Rs2,500 is Rs12.50), Rs2,500 is the maximum price that can be charged at the factory gate before application of the excise tax.

10. Imported materials sufficient to make a thousand batteries cost US$108 c.i.f. at the port. They are subject to an ad valorem tariff of 15 percent, however, which raises their price to Rs1,242 per lot. It costs another Rs8 per lot to move the imported materials to the project site.

11. Domestic materials cost Rs825 per lot, at the factory, of which about Rs15 reflects transportation costs from scattered sources to the project site.

12. The total cost of imported and domestic materials comes to Rs2,075 per lot sufficient to make a thousand batteries, at the factory gate. This is 83 percent of the factory selling price of Rs2,500 per thousand batteries.

13. Labor is of two types, managerial/skilled and production. It is assumed that the former will account for 12.5 percent and the latter 87.5 percent of the labor costs ascribed to the incremental project. Total labor expense in constant terms is projected to rise from Rs4,000,000 in year 4 to Rs 6,000,000 in Year 5, to Rs8,000,000 in Year 6, after which time it is expected to remain constant.

14. Utility expenses are projected on the basis of a fixed element of Rs1,000,000 and a variable element of Rs25 per thousand batteries. This gives total utility expenses of Rs1,500,000, Rs1,750,000, and Rs2,000,000 in Year 4, Year 5 and Year 6 respectively.

15. An ad valorem tariff of 15 percent applies to imported machinery and material inputs. Since import duties are not costs to the country, they should be excluded from the economic cashflow.

16. Three average conversion factors and a Standard Conversion Factor have been estimated: (a) CF of 0.70 for domestic transportation and handling; (b) CF of 0.75 for the factory building; (c) CF of 0.87 for working capital, contingencies, and domestic machinery; and (d) SCF of 0.80 applied to installation expenses and utilities.

17. Thus, the Rs20 port-to-market and Rs7.50 plant-to-market charges of finished batteries become Rs14 and Rs5.25, respectively. Similarly, the Rs8 port-to-plant charge on imported materials and the Rs15 sources-to-plant charge on domestic materials become Rs5.60 and Rs10.50, respectively.

18. Managerial/skilled labor is priced at its indicated market wage and production labor is priced at 50 percent of its market wage for purposes of economic analysis.

19. Summarizing, here are the rupee costs and prices needed for the financial and economic rates of return calculations (explanations follow):

		Financial	Economic
Investment Costs (thousands rupees)	Yr. 1	1,008	881
	Yr. 2	3,645	3,001
	Yr. 3	5,495	4,614
Per thousand units (rupees)			
Selling Price		2,500	2,092
Imported Materials		1,250	1,086
Domestic Materials		825	715
Labor in Year 4		200	112
Utilities in Year 4		75	60

20. To build the financial cashflow one adds the total cost of imported and domestic materials at the plant gate to the costs of labor and utilities. The resulting subtotal of operating costs is then deducted from the inflow of sales revenues (e.g., production and sale of 20 million batteries in Year 4, at Rs2,500 per thousand, equals revenue of Rs50 million). Finally, one brings in financial investment costs. The cashflow indicates a financial rate of return of 36.0 percent.

21. This may appear to be high, but one must keep in mind that the number refers to the total surplus arising from the venture and not a return to project owners. From this surplus they will have to pay profits taxes to government and interest to creditors.

22. To build the economic cashflow, one inserts the economic costs and prices presented above. Constant-price rupee investment costs are converted by means of the following multipliers: land (100%), building (75%), imported machinery (100%), domestic machinery (87%), installation (80%), transportation (70%), import taxes eliminated, physical contingency (87%), interest during construction eliminated, working capital (87%) and price contingency (87%).

23. The economic selling price per thousand batteries is the c.i.f., price of Rs2,083 plus the converted cost of clearing the port and moving batteries to the city (70% of Rs20) minus the converted cost of moving batteries from the project site to the marketplace (70% of Rs7.50). Thus, Rs2,083 + 14 - 5 = 2,092.

24. The economic cost of imported materials is the c.i.f. price per lot (sufficient to make a thousand batteries), viz., Rs1,080, plus the converted cost of moving them to the project site (70% of Rs8 = 6) or Rs1,086 (rounded).

25. The economic cost of domestic materials is the plant-gate cost of Rs825 per lot minus the portions of supply price and domestic transportation that do not reflect economic resource costs. The Rs810 indicated supply price (Rs825 - 15) converted at 0.87 becomes Rs705, and Rs15 converted at 0.70 becomes Rs10, indicating a total converted cost per lot of Rs715 (rounded).

26. The economic cost of labor is obtained by adding the full financial cost of managerial/skilled labor to half the financial cost of production labor. Given the 12.5/87.5 percentage shares of the two within the total, this is equivalent to multiplying the total cost of labor by a factor of 0.5625.

27. The economic cost of utilities is found by multiplying the financial cost by 0.80.

28. The indicated economic rate of return is 35.2 percent.

29. Tables have been prepared to show the numbers of this project exercise. Following the same assumptions, one should obtain the same rates of return.

30. Although not required by the World Bank, analysts may on occasion find it appropriate to calculate a project's rate of return to nationals. Dealing with "tied" borrowings is fairly straightforward: one simply deflates annual flows of disbursements, repayments, and interest payments from a current-rupee schedule and enters the constant-values into the cashflow. The effect of introducing the tied loan flows (relating to a loan of US$143,250) changes the financial and economic rates of return to 38.3 and 37.8 percent respectively.

31. Dealing with foreign ownership is more difficult. One must go back to conventional financial analysis and take a number of things into consideration in order to estimate payments to foreigners.

32. The assumptions of this exercise are that government imposes a 50 percent tax on profits and a 10 percent withholding tax on remittances to foreigners.

33. One can use the terms footnoted in the Financing Plan to compute a schedule of interest payments.

34. Yearly depreciation expenses have been estimated and are listed in Table 10.

35. An income statement must be projected in order to determine the amount paid out to foreigners. Financial sales receipts will be reduced by amounts paid out for materials, labor, utilities, interest, depreciation, and taxes on imported materials (since the viewpoint is now that of the project, per se) to obtain a pre-tax profit estimate for each year. Profits taxes and loan repayments will then be subtracted to determine the amount "Available for Dividends." A dividend pay-out ratio is assumed, and 33 percent of the total pay-out will be paid by the project to foreign shareholders. The amount must be reduced, however, by the domestic withholding tax on foreign remittances. Only the actual payments received by the foreigners are of concern (the foreign shareholders may be physically resident in the country).

36. Thus, assuming an 80 percent constant dividend pay-out ratio, the amount available for dividends will be multiplied by (.80 X .33 X .90) or 24 percent. That is, for every Rs100,000 available for dividends, Rs24,000 will be paid out of the country (or placed in the hands of resident foreign shareholders and thereby become a claim on the country's foreign exchange reserves).

37. A factor of 30.0 percent (1.0 X .33 X .90) can be applied to retained earnings in Year 12. The assumption is that the venture will be liquidated at that time, in an analytical sense.

38. At this juncture the procedure becomes the same as for foreign tied loans. The equity investment inflow is entered into the cashflow along with the projected payments for dividends and eventual capital repatriation, and a new rate of return is calculated. One must remember to enter an outflow in Year 12 to reflect the portion of residual asset sales receipts that belongs to the foreign shareholders.

39. The combined effect of introducing both the tied dollar loan and the 33 percent foreign equity share into the cashflows raises the rates of return (to nationals) to about 41.6 percent.

Table 1

THE STANDARD BATTERY COMPANY

Capital Cost Estimate [a/]
(Base Costs in Year 0 Constant Terms, 000 Rupees)

	Year 1			Year 2			Year 3			Total		
	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC
1. Land purchase	–	500	500	–	–	–	–	–	–	–	500	500
2. Building	250	250	500	605	1200	1805	–	–	–	855	1450	2305
3. Machinery, equip. & spares	–	–	–	1650	–	1650	2723	1210	3933	4373	1210	5583
4. Installation & start-up	–	–	–	121	–	121	194	286	480	315	286	601
5. Transportation	–	–	–	–	120	120	–	640	640	–	760	760
6. Taxes and duties	–	–	–	–	248	248	–	408	–	–	656	656
7. Base cost estimate	250	750	1000	2376	1568	3944	2917	2544	5461	5543	4862	10405
8. Physical contingency	25	75	100	238	157	394	292	254	546	554	486	1040
(as % of line 7)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
9. Price contingency	27	83	110	549	362	911	1062	926	1988	1638	1371	3009
(as % of lines 7 + 8)	(10)	(10)	(10)	(21)	(21)	(21)	(33)	(33)	(33)	(27)	(26)	(29)
10. Total project cost	302	908	1210	3162	2087	5249	4271	3724	7995	7735	6719	14454
11. Working capital required [b/]	–	–	–	–	–	–	500	1000	1500	500	1000	1500
12. Interest during constn.	8	38	46	194	118	312	683	377	1060	885	533	1418
13. Total financing required	310	946	1256	3356	2205	5561	5454	5101	10555	9120	8252	17372
14. Total investment cost (incl. working capital but excl. int. charges) [c/]	251	757	1008	2196	1449	3645	2761	2734	5495	5208	4940	10148

a/ Foreign currency (FC) costs have been expressed in thousands of Rupees equivalent using projected exchange rates of Rs10, Rs11, Rs12.10 for Year 1, Year 2, Year 3 respectively; local currency costs are in thousands of Rupees.

b/ The working capital required has been expressed in Current Year 3 terms. However, for the rate of return calculations the working capital requirement in Real Terms of Year 0 must be used. In our example this works out to 868 thousand Rupees equivalent.

c/ The total project cost has been expressed in Real Year 0 terms; these figures will be used in our rate of return calculations. The discount rates used to express total project cost in Real Terms are 1.20, 1.44 and 1.73 for Year 1, Year 2 and Year 3 respectively.

Table 2

THE STANDARD BATTERY COMPANY

Projected Operating Expenses
for Financial Rate of Return Calculations
(In Year 0 Constant terms, 000 Rupees)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Production (thousands of units)	-	-	-	20,000	30,000	36,000
Sales price (per thousand units)	-	-	-	2.50	2.50	2.50
Sales revenue	-	-	-	50,000	75,000	90,000
Cost of Goods Sold						
Imported materials (incl. 15% tariff and Rs. 8 per thousand units transportation costs)	-	-	-	25,000	37,500	45,000
Domestic materials (incl. Rs15 per 1000 units transportation costs)	-	-	-	16,000	24,750	29,700
Salaries and wages	-	-	-	4,000	6,000	8,000
Utilities expenses	-	-	-	1,500	1,750	2,000
Total Cost of Goods Sold	-	-	-	47,000	70,000	84,700
Gross Operating Income	-	-	-	3,000	5,000	5,300

Table 3

THE STANDARD BATTERY COMPANY

Project Financing Plan a/
(In Current terms, 000 Rupees)

	Year 1			Year 2			Year 3			Total		
	FC	LC	T	FC	LC	T	FC	LC	T	FC	LC	T
1. Equity Capital (all common shares)	200	400	600	800	1600	2400	1000	2000	3000	2000	4000	6000
2. Term Borrowings												
a. National DFC												
i. Own Resources		546	546		605	605		3101	3101		4252	4252
ii. Foreign Loan	60		60	906		906	4454		4454	5420		5420
b. Foreign Private	50		50	1650		1650				1700		1700
TOTAL FINANCING FROM ALL SOURCES	310	946	1256	3356	2205	5561	5454	5101	10555	9120	8252	17372

a/ FC refers to Foreign Currency funds expressed in thousands of Rupees equivalent (exchange rates of Rs10, Rs11, Rs12.10 were used for Year 1, Year 2, and Year 3 respectively); LC refers to Local Currency funds expressed in thousands of rupees.

Equity Capital involves sale of 6,000 shares at Rs1,000 per share.

DFC Rupee loan is repayable in 8 years and contains 3 years principal grace. Interest rate is 25 percent per annum, and repayment is through annual level principal installments. Interest is capitalized for 3 years.

DFC Dollar loan is repayable in 10 years and contains 3 years principal grace. Interest rate is 15 percent per annum, and repayment is through annual level principal installments. Interest on the loan is capitalized for three years.

The foreign private loan is repayable in 8 years and contains 3 years principal grace. interest rate is 15 percent per annum, and repayment is through annual level principal installments. Interest on the loan is capitalized for 3 years. It is assumed that the disbursements of equity and loan funds take place over the entire year at a constant rate for each given year.

The loan amounts shown under term borrowings also include the capitalized interest. The actual loan amounts (without the capitalized interest) are shown in the individual loan disbursement and repayment schedules.

Table 4

THE STANDARD BATTERY COMPANY

Financial Rate of Return Analysis (Pre-tax) [a]
(In Year 0 Constant terms, 000 Rupees)

	Year	Capital Cost[b] Streams	Operating Cost Streams	Benefit Stream	Net Benefit Stream
Project Implementation	1	1008	0	0	-1008
	2	3645	0	0	-3645
	3	5495	0	0	-5495
Economic Project Life	4	0	47000	50000	3000
	5	0	70000	75000	5000
	6	0	84700	90000	5300
	7	0	84700	90000	5300
	8	0	84700	90000	5300
	9	0	84700	90000	5300
	10	0	84700	90000	5300
	11	0	84700	90000	5300
	12	-5868	84700	90000	11168

Pre-tax Financial Rate of Return = 36.0 percent

a/ Based on projected cashflow in constant prices of Year 0, and excludes (a) the receipt, repayment, and servicing of financial capital and (b) profit tax payments to government. Production and sales commence in Year 4 at 20 million batteries, rising to 30 million in Year 5 and to 36 million in Years 6 through 12.

b/ Including Working Capital required. It is assumed that the entire working capital of Rs868 thousand will be recovered at the end of Year 12. Residual asset value of Rs5000 thousand was estimated at the end of Year 12.

NOTE: Introducing the "tied" foreign loan of US$143,250 into the Cashflow would raise the rate of return to 38.3 percent. Bringing in both the tied loan and the 33 percent foreign equity investment would raise the rate of return to nationals to 41.6 percent. This result is based on a 50 percent rate of profits tax, an 80 percent dividend payment rate, and a 10 percent withholding tax applicable to foreign remittances.

Table 5

THE STANDARD BATTERY COMPANY

Capital Cost Estimate [a/]
for Economic Rate of Return Analysis[a/]
(Base Costs in Year 0 Constant Terms, 000 Rupees

	Year 1			Year 2			Year 3			Total		
	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC
1. Land Purchase	-	500	500	-	-	-	-	-	-	-	500	500
2. Building	187	188	375	454	900	1354	-	-	-	641	1088	1729
3. Machinery, equip. & spares	-	-	-	1650	-	1650	2723	908	3631	4373	908	5281
4. Installation & start-up	-	-	-	97	-	97	155	229	384	252	229	481
5. Transportation	-	-	-	-	84	84	-	448	448	-	532	532
6. Taxes and duties	-	-	-	-	-	-	-	-	-	-	-	-
7. BASE COST	187	688	875	2201	984	3185	2878	1585	4463	5266	3257	8523
8. Physical contingency	22	65	87	207	136	343	254	221	475	483	422	905
9. Price contingency	23	72	95	478	315	793	924	806	1730	1425	1193	2618
10. TOTAL PROJECT COST	232	825	1057	2886	1435	4321	4056	2612	6668	7174	4872	12046
11. Working capital required	-	-	-	-	-	-	435	870	1305	435	870	1305
12. TOTAL INVESTMENT COST (in real price of year 0)	193	688	881	2004	997	3001	2599	2015	4614	4796	3700	8496

a/ Based on investment costs used in the Financial Rate of Return calculations, converted by means of multipliers listed in the write-up. This table was constructed solely for the purpose of determining the Capital Cost Stream to be used for Economic rate of return calculations.

Table 6

THE STANDARD BATTERY COMPANY

Projected Operating Expenses for Economic Rate of Return Calculations
(In Year 0 Constant Prices, 000 Rupees)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Production (thousands of units)	-	-		20,000	30,000	36,000
Sales price (per thousand units)	-	-	-	2.092	2.092	2.092
Sales revenue	-	-	-	41,840	62,760	75,312
Cost of goods sold						
Imported materials	-	-	-	21,720	32,580	39,096
Domestic materials	-	-	-	14,300	21,450	25,740
Salaries & Wages	-	-	-	2,250	3,375	4,500
Utilities expenses	-	-	-	1,200	1,400	1,600
Total cost of goods sold	-	-	-	39,470	58,805	70,936
Gross Operating Income	-	-	-	2,370	3,955	4,376

Table 7

THE STANDARD BATTERY COMPANY

Economic Rate of Return Analysis [a]/
(In Year 0 Constant terms, 000 Rupees)

	Year	Capital Cost [b]/ Streams	Operating Cost Streams	Benefit Stream	Net Benefit Stream
Project Implementation	1	881	0	0	-881
	2	3001	0	0	-3001
	3	4614	0	0	-4614
Economic Project Life	4	0	39470	31840	2370
	5	0	58805	62760	3955
	6	0	70936	75312	4376
	7	0	70936	75312	4376
	8	0	70936	75312	4376
	9	0	70936	75312	4376
	10	0	70936	75312	4376
	11	0	70936	75312	4376
	12	0	70936	75312	10131

Economic Rate of Return = 35.2 percent

a/ Based on projected economic cashflow in constant prices of Year 0, and excludes (a) the receipt, repayment, and servicing of financial capital and (b) all duty and tax payments to government. Traded inputs and outputs are priced c.i.f., at the border and other items are shadow-priced by means of conversion factors.

b/ It is assumed that the working capital of Rs755 thousand will be recovered at the end of Year 12. Residual asset value of Rs5000 thousand was estimated at the end of Year 12.

NOTE: Introducing the "tied" foreign loan of US$143,250 into the Cashflow would raise the rate of return to 38.3 percent. Bringing in both the tied loan and the 33 percent foreign equity investment would raise the rate of return to to 41.8 percent. This result is based on a 50 percent rate of profits tax, on 80 percent dividend payout ratio, and a 10 percent withholding tax applicable to foreign remittances.

Table 8

THE STANDARD BATTERY COMPANY

Net Benefit Streams
Used for the Various Rates of Return Calculations

(In Year 0 Constant terms, 000 Rupees)

Type of Calculation	Net Benefit Streams											
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Financial Rate of Return	-1008	-3645	-5495	3000	5000	5300	5300	5300	5300	5300	5300	11168
Economic Rate of Return	-881	-3001	-4614	2370	3955	4376	4376	4376	4376	4376	4376	10131
Financial Rate of Return (introducing tied loan of US $143,250)	-969	-2586	-5495	2600	4665	5022	5072	5114	5300	5300	5300	11168
Economic Rate of Return (introducing tied loan of US$143,250)	-849	-1942	-4614	1970	3620	4098	4148	4190	4376	4376	4376	10131
Financial Rate of Return (Combined tied loans and foreign equity)	-802	-2030	-4916	2600	4539	4698	4693	4690	4754	4741	7677	7916
Economic Rate of Return (Combined tied loan and foreign equity)	-682	-1386	-4035	1970	3494	3774	3769	3766	3830	3817	3753	6879

Table 9A

THE STANDARD BATTERY COMPANY

Private Foreign Loan: Disbursement and Debt Service Schedule

(Loan amount US$143,250)

8 years term, including 3 years principal grace
interest capitalized for 3 years
level principal payments, annual instalments
15 percent annual interest

Year	Loan disbursement	Principal payment due	Interest payment due	Total payment due	Foreign exchange rate [a/]	Equivalent Rupee amount	Domestic price index	Deflated rupee amount
1.	4,635	-	-	-	10.00	46,350	120.00	38,625
2.	138,615	-	-	-	11.00	1,524,765	144.00	1,058,865
3.	-	-	-	-	12.10	-	172.80	
4.	-	35,590	26,693	62,283	13.31	828,987	207.36	399,872
5.	-	35,590	21,354	56,944	14.64	833,660	248.83	335,032
6.	-	35,590	16,016	51,606	16.10	830,857	298.60	278,251
7.	-	35,590	10,677	46,267	17.72	918,851	358.32	228,804
8.	-	35,590	5,339	40,929	19.49	797,706	429.98	185,522

a/ (US$1= Rs)

Table 9B

THE STANDARD BATTERY COMPANY

DFC Rupee Loan: Disbursement and Debt Service Schedule

(Loan amount Rs 3,713,000)

8 years term, including 3 years principal grace
interest capitalized for 3 years
level principal payments, annual instalments
25 percent annual interest

Year	Loan disbursement	Principal payment due	Interest payment due	Total payment due	Domestic price index	Deflated rupee amount
1.	508,000	-	-	-	120.00	423,333
2.	487,000	-	-	-	144.00	338,194
3.	2,724,000	-	-	-	172.80	1,576,389
4.	-	928,600	1,160,750	2,089,350	207.36	1,007,596
5.	-	928,600	928,600	1,857,200	248.83	746,373
6.	-	928,600	696,450	1,625,050	298.60	544,223
7.	-	928,600	464,300	1,392,900	358.32	388,731
8.	-	928,600	232,150	1,160,750	429.98	269,954

Table 9C

THE STANDARD BATTERY COMPANY

Foreign Loan: Disbursement and Debt Service Schedule

(Loan amount US$ 393,330)

10 years term, including 3 years principal grace
interest capitalized for 3 years
level principal payments, annual instalments
15 percent annual interest

Year	Loan disbursement	Principal payment due	Interest payment due	Total payment due	Foreign exchange rate[a/]	Rupee amount	Domestic price index	Deflated rupee amount
1.	5,565	-	-	-	10.00	55,650	120.00	46,375
2.	76,112	-	-	-	11.00	837,232	144.00	581,411
3.	311,653	-	-	-	12.10	3,771,001	172.80	2,182,292
4.	-	62,432	65,555	127,987	13.31	1,703,507	207.36	821,522
5.	-	62,432	56,190	118,622	14.64	1,736,626	248.83	697,917
6.	-	62,432	46,825	109,257	16.10	1,759,038	298.60	589,095
7.	-	62,432	37,460	99,892	17.72	1,770,086	358.32	493,996
8.	-	62,432	28,095	90,527	19.49	1,764,371	429.98	410,338
9.	-	62,432	18,731	81,163	21.44	1,740,135	515.98	337,249
10.	-	62,432	9,366	71,798	23.58	1,692,997	619.17	273,430

a/ (US$1 = Rs)

Table 9D

THE STANDARD BATTERY COMPANY

Summary of Principal and Interest Payments on Loans

(a) Foreign Loan, US$393,330
(b) Private Loan, US$143,250
(c) Rupee Loan, Rs3,719,000

	Interest		Principal	
	US$	Rs.	US$	Rs.
Year 1				
(a)	-	-	-	-
(b)	-	-	-	-
(c)	-	-	-	-
Year 2				
(a)	-	-	-	-
(b)	-	-	-	-
(c)	-	-	-	-
Year 3				
(a)	-	-	-	-
(b)	-	-	-	-
(c)	-	-	-	-
Year 4				
(a)	65,555	-	62,432	
(b)	26,693	-	35,590	
(c)	-	1,160,750	-	928,600
Year 5				
(a)	56,190	-	62,432	
(b)	21,354	-	35,590	
(c)	-	928,600	-	928,600
Year 6				
(a)	46,825	-	62,432	
(b)	16,016	-	35,590	
(c)	-	696,450	-	928,600
Year 7				
(a)	37,460	-	62,432	
(b)	10,677	-	35,590	
(c)	-	464,300	-	928,600
Year 8				
(a)	28,095	-	62,432	
(b)	5,339	-	35,590	
(c)	-	232,150	-	928,600
Year 9				
(a)	18,731	-	62,432	
Year 10				
(a)	9,366	-	62,432	

Table 10

THE STANDARD BATTERY COMPANY

Calculation of Dividends Received by Foreigners
(Thousands of Constant-price Rupees)

Year	Financial Operating Cash flow Less Interest	Depreciation Allowance	Profit Tax	Debt Repayment	Available for Dividends	Received by Foreigners
1						
2						
3						
4	1,848	498	675	1,077	-	-
5	4,171	415	1,878	950	526	126
6	4,728	346	2,191	840	1,351	324
7	4,932	288	2,322	744	1,578	379
8	5,094	240	2,427	660	1,767	424
9	5,222	155	2,534	259	2,275	546
10	5,264	129	2,568	238	2,330	559
11	5,300	107	2,597	0	2,597	623
12	5,300	89	2,606	0	2,606	625
					(3,006)	(902)

Note:

This table is constructed solely to determine the amount of cash dividends paid out of the country to foreign shareholders. The amount "Available for Dividends is obtained by subtracting debt repayment from after-tax profit. The "Received by Foreigners" is 24 percent of the "Available for Dividends (i.e., 80 percent pay-out ratio multiplied by 33 percent foreign equity share multiplied by 90 percent to allow for a 10 percent domestic withholding tax). There was a shortfall of Rs402 thousand in Year 4. It was assumed this was made up in Year 5. Therefore, Year 5 shows Rs 526 thousand rather than Rs928 thousand as the amount available for dividends. Finally, the amounts shown in parentheses below Year 12 refer to the accumulated amount of retained earnings available for distribution when the project is liquidated. The assumption here is that each year's retained earnings yield enough to maintain their value in constant prices.

GUIDELINES FOR THE CALCULATION OF FINANCIAL AND ECONOMIC RATES OF RETURN FOR DFC PROJECTS

GLOSSARY

(Technical Terms Used in the Guidelines)

Accounting Price. A price that is computed rather than observed in a marketplace. Also called shadow price.

Ad Valorem Tariff. A tax that is expressed as a percentage of the invoice value of an import. Contrasts with specific tariff.

Appraisal. Analysis of a proposed investment to determine its merit and acceptability in accordance with established decision criteria.

Benefits. In the context of DFC projects, benefits refer to the incremental value of product sales or cost reductions attributable to an investment.

Border Price. The unit price of a traded good at a country's border. For exports, the free-on-board price; for imports, the cost-insurance-freight price.

Break-Even Point. The level of product sales at which financial revenues equal total costs of production. At higher volumes of production and sales financial profits are generated.

Capital Recovery Factor. A "CRF" or "Annuity Factor" can be used to convert a sum of money into an equivalent series of equal annual payments, given a rate of interest and total period of time. The annual CRF for $1 at an interest rate of 10 percent and a period of 3 years is 0.402115, as shown in the following schedule:

	Principal	+	Interest	=	Total = CRF
1	0.302115		0.100000		0.402115
2	0.332326		0.069789		0.402115
3	0.365559		0.036556		0.402115
	1.000000		0.206345		1.206345

If a project pays $100 for a capital asset that is expected to last three years, and the appropriate rate of interest or discount is 10 percent per year, $40.21 is the annual capital charge. If the useful life of the asset is 10 years, the annual charge would be only $16.27. The use of CRFs to compute annual capital charges is generally superior to the use of accounting depreciation allowances and interest expenses, for project appraisal purposes.

Cashflow. As used in benefit-cost studies, the net benefit stream anticipated for a project. Net benefits are available for the service of borrowed funds (amortization, interest, and other charges), payments of dividends to shareholders, and the payment of profit taxes. Care should be taken to avoid confusing this concept with that traditionally employed in financial projection analysis which defines cashflow (or cash generation) as after-tax income plus depreciation charges.

C.I.F. The landed cost of an import ("cost, insurance, and freight") on the receiving country's dock, including the cost of international freight charges and insurance, before the addition of domestic tariffs or other taxes and fees.

Constant Prices or Real Prices. Prices that have been adjusted to remove general price inflation.

Conversion Factor. A number, usually less than one, that can be multiplied against a domestic market price of an item to reduce it to an equivalent border price (following this Guideline). The so-called Standard Conversion Factor (simple version, without elasticities) is the ratio between a country's foreign trade turnover before and after import and export taxes (or subsidies). More specific factors are recommended for use in this Guideline.

Costs. Costs are incurred to acquire project inputs such as buildings, machines, materials, labor, and utilities. Certain outlays, such as the payment of profit taxes, are costs to the project but not the country. Such outlays are properly treated as transfers of project surplus rather than costs for the purpose of calculating net present value or internal rate of return.

Crossover Discount Rate. The rate of discount that equalizes the net present value of benefit or cost streams. Often applied to the cost streams of mutually exclusive project proposals. At a lower rate of discount "A" is superior, whereas at a higher rate of discount "B" is superior.

Current Prices or Nominal Prices. Prices that have not been adjusted (deflated to eliminate general price inflation. A tradition in economics is to specify "constant" prices if that is intended; otherwise, the inference is that current prices are intended.

Cut-Off Rate. A rate of return established as a "threshold" below which projects should not be accepted. See "Opportunity Cost of Capital". The World Bank uses 10 percent as a usual cut-off rate.

Decomposition. Breaking a nontraded input down into its main components in order to determine its economic price.

Deflation. The act of adjusting current to constant prices. The arithmetic (division) is the same as for discounting.

Depreciation. The anticipated reduction in an asset's value brought brought about through physical use or gradual obsolescence. Various methods are used: straight line, declining balance, accelerated, etc. The important thing to remember is that depreciation charges do not represent cash outlays and should not be included in financial or economic cashflows.

Direct Tax. Tax imposed directly on incomes and profits, as distinct from an indirect tax applied to inputs (e.g., a payroll tax) and outputs (e.g., an excise tax).

Discount Rate. A rate of interest used to adjust future values to present values. Discounting a future value to the present is the exact opposite of compounding a present value forward to a future value.

Distortion. A distortion exists when the market price of an item differs from the price it would bring in the absence of government restrictions. In the Guideline the principal distortion considered is the trade tariff, which permits domestic market prices to exceed border prices (allowing for domestic transfer costs).

Dollar. A shorthand expression used by project analysts to refer to freely convertible foreign currency; includes but is not confined to the U.S. dollar. Similarly, "Rupee" is used to refer to the currency of the country in which a project is located. Border-rupee prices are border prices converted into local currency at the official rate of exchange.

Domestic Resource Cost. The cost of domestic resources used to earn or save a unit of foreign exchange. See Annex 2.

Domestic Transfer Cost. A term used in this Guideline to mean all domestic costs incurred to move an input or output between the border and the project site or market place. Includes but is not confined to port storage and handling charges, broker fees, and local transportation expenses.

Economic Prices. Also known as "efficiency" prices. Prices believed to reflect the relative scarcity values of inputs and outputs more accurately than market prices, due to the influence of tariffs and other distortions in the latter.

Economic Rate of Return. The internal rate of return of a cashflow expressed in economic prices. Reduces the net present value of the cashflow to zero.

Effective Protection. The protection given to a project or process by tariffs and similar devices, taking into consideration their effect on inputs as well as outputs.

Factor of Production. The inputs required to produce output. Primary factors of production are land, labor, and capital; secondary factors include materials and other inputs.

Financial Prices. Synonymous with market prices.

Financial Rate of Return. The internal rate of return of a cashflow expressed in market prices. Reduces the net present value of the cashflow to zero.

Fixed Costs. Costs that do not vary with changes in the volume of output.

F.O.B. The "free-on-board" price of an export loaded in the ship or other conveyance that will carry it to foreign buyers.

Incremental. Refers to the change in the production or consumption of inputs and outputs attributable to an investment project. Measuring project benefits and costs on a "with/without" incremental basis rather than a "before/after" basis is essential to the approach set forth in these Guidelines.

Interest During Construction (IDC). Interest charges occurred during project execution and normally capitalized up to the point in time when the plant starts commercial operation. However, neither interest during construction nor during operation is included in the internal rate of return calculations.

Marginal Productivity of Capital. The economic productivity or yield of the last available investment dollar spent on the least attractive project. A clear and useful concept that is difficult to measure with precision.

Marginal Propensity to Consume (Save). The percentage of additional income that is consumed (saved). Not to be confused with average propensity.

Mutually Exclusive Projects. Project alternatives that provide essentially the same output; if one is done the others are not needed or cannot be done.

Net Present Value. The sum of discounted future benefits and costs at a stated rate of discount. An absolute measure of project merit.

Nominal Prices. See "Current Prices".

Nontraded. A project input or output that is not traded by a country either because of its production cost or because of restrictive trade practices. See Traded.

Opportunity Cost. Value lost by using something in one application rather than another. The opportunity cost of employing a worker in a project is the loss of net output that worker would have produced elsewhere. The opportunity cost of using good farmland for suburban housing is the net value of the crops foregone. The opportunity cost of investing in one project is the return that could be obtained from another project. The concept of opportunity cost is the cornerstone of benefit-cost analysis.

Opportunity Cost of Capital. The return on investments foregone elsewhere by committing capital on the project under consideration. Also referred to as the marginal productivity of capital, a rate of return that would have been obtained by the last acceptable project. The opportunity cost of capital is normally used as a "cut-off rate" in investment decisions.

Price Elasticity. Price elasticity refers to the relationship between the percentage change in the quantity demanded or supplied of an item with respect to a stated percentage change in the item's unit price. Letting E_d (E_s) represent the coefficient of demand (supply) elasticity with respect to price, if

E_d (E_s) is greater than 1, demand (supply) is "elastic;"
equal to 1, demand (supply) is "unitary;"
less than 1 demand (supply) is "inelastic."

To illustrate, if the quantity Q demanded rises by 2 percent because of a 1 percent reduction in an item's price P:

$$E_d = \%\text{ change } Q/\%\text{ change } P = 2/-1 = -2.$$

An elasticity of 2 (the sign can be ignored) indicates that the demand for the item is responsive to a small price reduction.

Cross elasticity refers to the influence of the price of one item on the demand for another. If a reduction in the price of X leads to increased demand for Y, the two items are "complementary;" if the demand for Y declines, the two are "competitive." Zero cross elasticities indicate perfect complementarity, and infinite cross elasticities indicate perfect substitutability.

Profit. Financial profit is the difference between financial revenues and costs. Economic profit is the surplus of benefits over costs when economic prices are used, after deducting the opportunity cost of capital.

Protection. Measures that protect domestic producers from foreign competitors, including import tariffs, quotas, and administrative restrictions that effectively limit or prevent foreign competition. Most accurately measured as the difference between border prices and market prices, after allowing for domestic transfer costs.

Real Prices. See "Constant Prices".

Sensitivity Testing. A systematic review of the impact that changes in selected benefits and costs have on a project's net present value or internal rate of return.

Traded. A project input or output is said to be traded if its production or consumption will affect a country's level of imports or exports, at the margin. A partially traded item will also affect the level of domestic production or consumption.

Variable Costs. Costs that vary with changes in the level of output, such as, for example, costs for raw material inputs.

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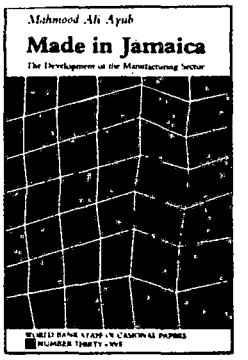

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