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TECHNIQUES FOR PROJECT ANALYSIS FOR CAPITAL BUDGETING DECISIONS

A REPORT TO THE DEPARTMENT
OF REGIONAL ECONOMIC EXPANSION

April 1977

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I EXECUTIVE SUMMARY

The recommended methodology to be used to evaluate projects is to construct a net cash flow in current dollars, using inflation factors to adjust the major components of the cash flow. At a minimum this procedure of adjusting for inflation must cover the construction costs. The current dollar net cash flow would then be deflated using the expected future values of the G.N.P. implicit price deflator. The resulting net cash flow in constant dollars would be used to compute an expected internal rate of return, which would be compared with the appropriate hurdle rate.

Hurdle rates must be established recognizing the risks associated with the business sector, the location of the venture and the level of uncertainty of the proposal. Replacement type ventures, dealing with known technology and markets, need not command as high a rate of return as discretionary projects. A single hurdle rate for all ventures has no acceptability in the business community. Even the logical concept of real versus nominal rates of return is not a generally accepted practice.

The argument that a rigorous financial analysis, one that takes into account increased operating costs and shifts in selling prices, should not require the adjustment of the hurdle rates, is theoretically correct. However there are severe difficulties in accurately estimating changes in prices and costs over a ten to twenty year period. These problems will also increase the uncertainty of the estimated internal rate of return. This uncertainty will cause any experienced business executive to demand an increased expected rate of return and accordingly use higher hurdle rates. This factor should be reflected in any approach D.R.E.E. adopts.

As a result of the many uncertainties involved in long-term forecasting, sensitivity analysis should be conducted for all projects, with the variation of the assumed inflation rates as a key element in the process.

The final assessment of the viability of any capital expenditure proposal must be based on a review of the technical support data and the analytical results of the financial analysis. No major capital expenditure decision can be based solely on a mechanical decision-making process.

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The analytical methodology required by D.R.E.E. must be acceptable to the private sector, as well as conforming to the practices, procedures and controls in effect in the Department of Regional Economic Expansion. The internal rate of return obtained from the current dollar net cash flow provides this common measure.

II OBJECTIVES AND APPROACH

Objectives

The objectives of this study were to:

1) Review the thesis prepared by Glenn P. Jenkins and comment on the relevance of his findings to the analysis of capital investment opportunities in the private sector.
2) Define an appropriate method to determine the private rate of return which would be necessary to attract private capital to an investment opportunity.
3) Define, according to generally accepted business principles, an appropriate analytical model to evaluate capital projects.
4) Apply the analytical model to two case situations to highlight the features of the model.

Approach

P.S. Ross & Partners' role in this study was to develop a model which was both theoretically acceptable and suitable for practical application in the business world. In so doing, we had to capitalize on all existing theoretical arguments as well as our understanding of the business community and generally accepted business principles.

To achieve the study objectives, we approached the business community for input on the current "state of the art". This assessment included analysis of the capital evaluation techniques and acceptable rates of return of a sample of companies drawn from a cross section of industries, including the chemical, utilities, transportation, pulp and paper, oil, heavy manufacturing and primary metals industries. We were, therefore, able to develop a methodology and model which was not only based on sound theory, but also acceptable to the business community as being practical and consistent with good business practice.

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Work Program

The work program consisted of five (5) phases, which were in accordance with the four objectives already established, as follows:

1) A detailed review of Jenkins' thesis, which considers the measurement of rates of return and taxation from private capital in Canada.

This review included an analysis of his methodology and conclusions, an in depth study of his thesis and his research, and an interview with Dr. Jenkins to discuss this material.

2) The definition of an appropriate method to determine the private rate of return which would be necessary to attract private capital to an investment opportunity.

This work included the survey of the current practice in establishing the minimum rate of return for each capital project.

3) The definition of an appropriate methodology and analytical procedure to use in evaluating capital projects.

This model had to take into consideration such factors as inflation, debt interest, income taxes, depreciation, working capital, capital structure, interest during construction, and discounting techniques. Our analysis also included an assessment of the many implications of inflation in capital project analysis, including the question of real versus nominal rates of return.

4) The application of the model (rate, methodology and analytical procedures), to the two specific case situations included in the terms of reference.

5) Preparation of the final report which was to contain a brief summary of 2 or 3 pages, as well as complete documentation of the first 4 phases.

III FINDINGS

The findings have been drawn from three basic sources:

1) the survey of companies
2) the analysis of Dr. Jenkins' thesis
3) the review of basic research material on capital budgeting.

In presenting the findings and the analytical model, it is assumed that the reader of this report has a sound familiarity with the basic principles and procedures of project analysis. In view of this, this report will not dwell on issues of a basic nature nor describe in detail any of the basic procedures. These issues are well developed in the following standard reference material:

1) Capital Budgeting and Company Finance
(2nd Edition, 1973) - H.J. Merratt and A. Sykes

2) The Capital Expenditure Decision
G.O. Wuinn
Quirin (?)

3) A Practical Manual on the Appraisal of Capital Expenditures
E.C. Edge

4) The Capital Budgeting Decision
(4th Edition, 1975) - H. Bierman, Jr. and Seymour Smidt.

The Survey

The survey covered 12 companies who are active in capital investment activities. A detailed review of the survey is presented in Appendix A but a synopsis of the key findings is as follows:

- long range strategic plans (3-5 years) identify most major capital investment requirements;

- mandatory projects represent 10-15% of average annual capital expenditures, replacement projects 20 to 50%, the balance are discretionary.

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- financial analysis is only one element of the screening process for capital expenditure proposals and it may be the least important aspect.

- most corporations use more than one financial measure to assess a proposal.

- the principal financial measure employed is the internal rate of return.

- most companies use year end - discounting in calculating discounted cash flow.

- financing issues are generally treated separately from the issue of the viability of a project.

- hurdle rates used by companies vary by the type of project - typically 12-14% for replacement projects and 18-20% for discretionary projects.

- a significant element in establishing the hurdle rates is the company's cost of capital.

- sensitivity analysis is the basic technique used to assess the impact of risk.

- inflation is normally only taken into account in estimating construction costs - operating flows are expected to be maintained at an assumed relationship of selling prices and costs (margin).

Dr. Jenkins' Thesis

Dr. G.P. Jenkins' thesis, "Analysis of Rates of Return From Capital in Canada", uses data from the Department of Industry, Trade and Commerce and Revenue Canada to create current value accounting statements based on data aggregated according to the standard industrial classification. Using this information Dr. Jenkins computes a private rate of return on capital employed by each industrial sector, as presented in Appendix B. The returns calculated for Dr. Jenkins are accounting returns in the sense that they are annual profits divided by total capital employed. Having eliminated inflationary distortions in standard financial statements by the use of price indexes, the returns obtained by Dr. Jenkins are reasonable estimates of the real private rate of return realized in those years. These returns provide one basis for establishing hurdle rates that may be appropriate for capital expenditure proposals presented to D.R.E.E.

During our discussions, Dr. Jenkins expressed that the returns obtained are an aggregate result of all capital expenditures undertaken by a given industrial sector, including major expansions and new business ventures, and therefore, it should not be necessary to adjust the private rate of return for these different types of investments.

We do not concur with the use of this approach in measuring risk. The major risk factors associated with any project arise from the location of facilities, the rate of technological change, market seasonality, swings in the business cycle, and competitive forces acting on the markets. A thorough and rigorous analysis of these factors should be reflected in the expected rate of return associated with any capital expenditure proposal.

This dichotomy in point of view towards risk is more apparent than real. The arguments put forward by Dr. Jenkins are theoretically correct. However, in the practical analysis of a given capital expenditure proposal, the financial analyst has to rely on unit prices, costs and other assumptions, that have been developed for the firm's existing operations and almost all seasoned business executives are well aware that these prices and costs may not apply to either new

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facilities or new business ventures. Thus, their response is to discount the financial analysis by applying a higher hurdle rate - a practical solution to the analytical problems involved.

The information generated by Dr. Jenkins' work may be most appropriately viewed as establishing the historical real cost of capital. This cost of capital reflects the different business risks associated with activity in a given industrial sector. This is clearly reflected in the range of private rates of return obtained. In fact, the size of the ranges indicates that the use of any single hurdle rate is of limited utility. A more appropriate procedure would be to use a specific hurdle rate for each of the business sectors involved. The hurdle rate must reflect the aspects of risk associated with the business sector, but in addition it must reflect the risk associated with location and uncertainty. Our survey suggests that normal adjustments for this latter factor, for example moving from replacement to discretionary projects involves a shift in the hurdle rate of 6%.

Finally, because of the wide range of projects that come to D.R.E.E.'s attention and the relative dichotomy in points of view, as expressed in Dr. Jenkins' work and as expressed in the findings from our survey, it will be necessary for the methodologies used in D.R.E.E.'s financial analysis to be able to generate results acceptable to the private sector while also conforming to the measures, standards and procedures developed within D.R.E.E. This may imply preparing different measures of the economic viability of any proposal.

Other Research

The additional reference research we did for this study and our experience with respect to the most effective techniques of project analysis for capital budgeting decisions, are reflected in the model itself.

IV THE ANALYTICAL MODEL

Introduction

The appraisal, analysis and final decision to proceed with a capital expenditure proposal is a multi-faceted process. The appraisal involves a thorough review of the location, the quantity and quality of the resource materials available, and the technology required to process these resources. It must include an analysis of the product's markets, the distribution channels to be used, the stability of market demands and the competitive forces acting on these markets. Based on this analysis the financial estimates will be prepared for the investment required, the processing and distribution costs to be incurred and selling process to be commanded in the market place.

The financial data is then used to generate proforma cash flow statements, income statements and balance sheets. From this analysis, various financial measures are generated. These financial results are then submitted, with the supporting technical data, to the appropriate levels of senior management for a final review and decision.

In the generation of the financial data, the effects of inflation have become an important consideration. It is now becoming necessary in any analysis to explicitly allow for anticipated inflationary effects. However the methodology to be used for this is in the very early stages of development.

At present, virtually all corporations use the discounted cash flow (D.C.F.) internal rate of return as the primary measure of a project's economic worth. For large capital projects, requiring the commitment of extensive capital, proforma income statements and balance sheets will also be created and analysed. We concur that this is the most appropriate approach to be used and this is the basis of our model.

The methodology discussed here will modify the basic D.C.F. approach but we will only discuss the changes themselves, not the basic model which has been adequately discussed in other resource material. These principles will then be illustrated in Chapter V and in the Appendices, using the two sample problems provided by D.R.E.E.

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Cash Flow Analysis in Current Dollars

Cash flow analysis should incorporate the anticipated effects of inflation. The first step in the analysis therefore would be to generate a net cash flow in current dollars, reflecting year by year the impact of anticipated inflation. This general approach will be modified by practical considerations, but let us first address the issue in theory. The construction of these net cash flows in current dollars requires some special attention. The basic principle is outlined in the following extract from the book The Capital Budgeting Decision by Harold Bierman, Jr. and Seymour Smidt. (the extract is taken from page 310)

> "Although the idea of an average price level is a useful tool, it is important to be aware of its limitations. The statisticians who construct price-level indexes must decide what goods to include in the index and what weight to assign to each. A commonly used index, the consumer price index, is designed to measure the average price of the goods consumed by an average-sized middle-income urban family. It is a reasonable measure for this purpose, but the price level it records may not accurately reflect the buying habits of large low-income rural families or of a business enterprise. Many families and almost all business organizations will have important components of their revenues or expenses whose movements are not closely tied to the average price level of consumer goods in the short run, or even in the long run. In these circumstances careful consideration of the prices of specific goods and services of particular importance to the decision makers is required. In evaluating capital budgeting decisions a businessman must consider not only the possible effects of inflation, but also the effect of long-run trends in the relative ~~process~~ prices of his products and of his important categories of expenditures.
>
> This point is particularly important because the prices of many of the most important goods and services purchased by businessmen are not directly included in the commonly used price indexes. Labour is the prime example. Wage and salary payments are a major expense item for almost every business. Yet wage rates are not directly included in price indexes used to measure the rate of inflation or deflation. However, labour costs are reflected in the costs of the consumption goods and services that are included in the price indexes."

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To follow the above suggested procedure has a number of practical limitations. Normally, for major capital expenditures the planning period will cover a ten to twenty year horizon. Success in forecasting specific price level changes with any degree of reliability is highly unlikely. There are some reasonable estimates of inflationary rates that may be applied to specific components, at least for the early years of the analysis period. As a matter of practicality a general price level factor may have to be used for the balance of the planning horizon. The one exception to this would probably be the salary and wage component. This component should be adjusted at a rate above the general rate of inflation in line with past historical patterns.

We recommend that at a minimum specific inflation rates be applied to the costs to be incurred during the construction period. The cost of construction has increased in the past few years at a rate well above the general level of inflation and the expectation is that this component will continue to increase at a faster rate than the general level of inflation. This adjustment should be made in all cash flow projections.

Similarly, if in a given project subsequent investments can be identified as being necessary, these should be included as capital outflows at their estimated current value at the time of the investment.

The inflation rate to be applied to selling prices should be estimated using the market analysis information generated as part of the overall assessment of the project's feasibility. Similarly, operating costs should be restated, possibly using different inflation rates for each of the major components of the operating costs. For example, if energy consumption were an important component in the cost of the operation of the facility and it is expected that the cost of energy will continue to increase at a rate higher than the general level of inflation, then a separate inflationary factor should be used for this component.

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In estimating the working capital component of the investment that will be required, operating cash balances, accounts receivable and accounts payable should be increased at a rate equal to the general rate of inflation. Sensitivity analysis could be used to test the effect of a slowing-down of payments on this investment in working capital. The treatment for inventories is a little bit more complex and would probably vary from project to project. If the major component of inventory is in the form of finished goods, then the recommended procedure would be to establish inventory as a percentage of the level of cost of products sold. These inventories would then be priced out at the then current price for these products. On the other hand if inventories are primarily in the form of raw materials, then they should be priced out at the then current cost of these raw materials, which might be a present cost restated for expected price changes.

Depreciation

The treatment of the tax savings that arise from capital cost allowances (C.C.A.) merits special consideration. There are essentially two approaches to these tax savings. For some corporations the full tax saving is credited to the project. This is done irrespective of whether the project itself would be able to absorb the total C.C.A. or not. The argument in favour of this practice is that other segments of the corporation's business will generate sufficient taxable income to allow the full C.C.A. to be used.

Other corporations will only credit to the project the amount of C.C.A. that can be absorbed by that project. The argument here is that if C.C.A. is routinely credited for all projects and the full tax savings credited to these projects, the corporation may well wind up in a position where the total allowable C.C.A. may not be claimed in any one year.

The differences between these two practices is closely related to the capital intensity of the business and the level of the corporation's capital expenditure program during the last few years. The selection of the most appropriate method must be made in the light of each corporation's position. The tax savings which will arise from capital cost allowances are already expressed in current dollars and do not require any inflationary factors to be applied to them.

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Financing Considerations

The treatment of debt for the purpose of the cash flow analysis deserves some attention. This issue will be discussed under three headings: bridge financing, long-term debt and leases.

For purposes of a cash flow analysis, the after tax cost of the debt financing should only be credited to the project if the debt incurred is specifically backed by the assets being created. This may be the case for bridge financing. It is not likely to be the case for long-term debt. If the long-term debt component is backed by the general assets and profit record of the corporation involved, that is if the long-term debt is simply a component in the total capital resources of the firm, then the interest charges associated with the debt cannot be legitimately included in the cash flow associated with the specific project. When the debt financing charges are included, it is the after tax cost of long-term debt which should be included in the cash flow.

The treatment of leases is a special case and the recommended procedure here would be that the after tax cost of leases should be capitalized and regarded as a capital investment. The argument in favour of this treatment is that leasing is essentially asset - specific debt financing. Therefore, if the leases are not capitalized the total capital employed is underestimated and this will have the effect of creating an unrealistically large internal rate of return on the investment.

The rate at which the after tax cost of the lease payments should be capitalized varies. For financial leases where the initial term of the lease is set at an agreed price, say for a period of five to ten years, then this portion of the lease should be capitalized at the cost of long-term debt. The lease in this case represents in fact a contractual commitment similar to long-term debt. Subsequent option periods for which lease payments are to be negociated should be incorporated in this capitalization but the capitalization rate should be larger than the after tax cost of long-term debt, primarily because of the uncertainty as to the magnitude of the lease payments involved. The recommended procedure would be to capitalize leases during these periods at the estimated cost of capital. Essentially the same argument applies to operating leases except in this case the after tax cost of the annual lease payments should be capitalized at the estimated cost of capital.

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Salvage Values

The remaining major component used to generate a net cash flow on current dollars would be a salvage value and here again the salvage value included in the net cash flow should be the estimated current value at the time of sale, or at the end of the analysis period. This salvage may generate a capital gains tax which will be in current dollars and therefore does not require any inflationary adjustment factor.

Constant Dollar Cash Flow

Having generated a net cash flow in current dollars, this cash flow would now be discounted at the expected rate of inflation over the planning horizon. After discounting for inflation, the internal rate of return on the project may be computed.

The discounting technique to be used does not appear to be critical. Year-end discounting is the most common form, although mid-year discounting is encountered and there is a technical argument in favour of using continuous discount factors. The argument for continuous discount factors is that continuous compounding is used to account for inflation and therefore continuous discount factors should be applied.

Sensitivity Analysis

The construction of the initial cash flow in constant dollars and the calculation of an internal rate of return is the first step. Following this a sensitivity analysis would be required to determine the effects of different inflation rates, shifts in the market price of the products or changes in the cost of construction, the length of the construction period, operating costs, and sales volumes. All of these factors will affect the estimated profitability of the project under review. This is a critical aspect of any analysis, as highlighted in the next Chapter where we apply the principles of this model - using different assumptions about only one parameter -the assumed inflation rate.

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V CASE PROBLEMS

We will now use "sample problem no. 1" to illustrate many of the concepts discussed in the previous Chapter.

This case situation is a proposal to modernize an existing plant. This modernization will consist of the installation of new equipment, and the incremental operating earnings will be realized by reduced labour requirements. The capital required will be drawn from the total financial resources of the corporation. The following project conditions also apply:

A. Project conditions

1. Project life is 10 years.
2. Capital cost is $100,000 for equipment (in constant 1976 $); no salvage value at end of project life.
3. Working capital is $20,000 (in constant 1976 $), detailed as follows: $20,000 of accounts receivable, $20,000 of inventory and $20,000 of accounts payable.
4. Assume all cash disbursements and receipts are made at year-end (December 31 of each year).
5. Annual profits before interest, depreciation and corporate income taxes (EBDIT) are $25,000 (in constant 1976 $).
6. Corporate income tax rate is 45%.
7. Book depreciation rate is 10% SL for equipment.
8. C.C.A. depreciation is a 2-year write-off for equipment.
9. General inflation rate is 8% or 10%, specific rate for labour is 9%.

Four cases were run and the results are summarized below.

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Sample Problem No. 1

Typical Current Business Practice

Case No. 1

Assumptions
(i) General inflation rate - 0.0%
(ii) Full allowable CCA was credited to the project

Results
IRR - 12.5%
Project probably approved

Case No. 2

Assumptions
(i) General inflation rate - 0.0%
(ii) Only the CCA that could be absorbed by the project was credited to it.

Results
IRR - 10.5%
Project probably deferred.

Recommended Procedures

Case No. 3

Assumptions
(i) General inflation rate - 8.0%
(ii) Full allowable CCA
(iii) EBDIT was escalated at 9.0%

Results
IRR on current dollar cash flow - 21.8%
IRR on constant dollar cash flow - 10.9%

Case No. 4

Assumptions
(i) General inflation rate - 10.0%
(ii) Full allowable CCA
(iii) EBDIT was escalated at 9.0%

Results
IRR on current dollar cash flow - 21.8%
IRR on constant dollar cash flow - 8.5%

The detailed cash flow statements are shown in Appendix C.

For problem No. 2, the following situation was created.

This project represents the creation of a new company, either as a wholly owned subsidiary or a joint venture.

In our analysis the following project conditions were assumed:

B. Project Conditions

1. Project study period is 10 years of commercial production plus 2 years of construction. It is assumed, however, that the physical life of the assets is in the order of 20 years from start of production.
2. Initial capital cost of $250 million, including $30 million of escalation for inflation in building and equipment costs ($10 million in year 1 and $20 million in year 2) and $10.5 million of interest during construction based on 12% interest rate on average debt outstanding during the year.
3. Working capital of $25 million (in constant 1976 $), including $1 million minimum of operating cash, detailed as follows: $20 million of accounts receivable, $20 million of inventory, $1 million of cash and $16 million of accounts payable. Assume no bank loan will be required.
4. Equity of $125 million in common shares.
5. Long-term debt of $125 million to be paid in ten equal annual payments of $12.5 million plus 12% interest charge on loan outstanding during the year, starting in year 3 (first year of commercial production).
6. All cash disbursements and receipts are made at year-end (December 31 of each year).
7. Annual profits before interest, depreciation and corporate income taxes (EBDIT) are $60 million (in constant 1976 $).
8. Corporate income tax rate is 45%.
9. Additional investments of $5 million in constant 1976 $ in equipment for project modifications after start-up for each of the first 2 years of production.
10. Book depreciation rates are 5% SL for buildings and 10% SL for equipment.
11. CCA rates are 5% DB for buildings and 2-year write-off for equipment.

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In addition to these conditions the following assumptions were used:

1. The general rate of inflation would be 8%.
2. Land values would escalate at 3%.
3. Working capital requirements would escalate at 8%, starting at the beginning of the first year of construction.
4. Earnings before depreciation, interest and taxes (EBDIT) would not escalate during the first operating year. This reflects increased operating expenses due to initial "start-up" problems. During the balance of the analysis period EBDIT would escalate at 7% annually. A lower escalation rate was used here to reflect the effect of similar, newer and more efficient plants that would be built. Thus, current operating margins would have to decline, or additional down stream investments would be required.
5. The salvage value at the end of the analysis period was estimated by capitalizing the tenth year's cash flow from operations at 14% over the remaining ten years. Land value, accumulated working capital and undepreciated CCA were deducted yielding a current value of plant and equipment. Then the capital gains taxes on the sale of the assets were deducted.

Three cases were run and the results are summarized as follows:

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Sample Problem No. 2

Case No. 1

Typical current corporate practice.

Assumptions

(i) General inflation rate - 0.0%
(ii) Inflation is included for construction period
(iii) Residual value is the total of land, working capital and unclaimed CCA.
(iv) Long-term debt service charges are included in the cash flow

Results
IRR (ROI) - 8.2%
IRR (ROE) - 13.3%

Case No. 2

Assumptions

(i) General inflation rate - 0.0%
(ii) Inflation included during construction period
(iii) Residual value of plant and equipment is net present value @ 14% of next ten year's cash flow from operations, less taxes paid on sale of assets
(iv) Long-term debt service charges are included in the cash flow

Results
IRR (ROI) - 10.2%
IRR (ROE) - 15.6%

Case No. 3

Assumptions

(i) General inflation rate - 8%
(ii) Specific inflation rates applied to components of the net cash flow are as outlined in the text described earlier
(iii) Residual value is obtained using the procedure in case No. 2
(iv) Long-term debt service charges are included in the net cash flow

Results
IRR (ROI in current dollars) - 14.7%
IRR (ROI in constant dollars)- 6.4%
IRR (ROE in current dollars) - 20.8%
IRR (ROE in constant dollars)- 12.0%

A P P E N D I X A

Report on the Survey of 12 Companies

We interviewed a selection of companies, principally located in the Province of Quebec, to determine what was the current "state of the art" for the techniques of project analysis for capital budgeting decisions. The interviews were unstructured but addressed the issues outlined in the "guideline notes to interviews" to be found at the end of this Appendix.

In selecting the participants, the criteria was one of selecting companies who were active in the area of capital investment. In no way did we attempt to find companies that could be called typical of the industry nor did we try to build a sample which was representative of Quebec industry.

The following companies participated in the survey:

Alcan Aluminium Limited
Bell Canada
British Petroleum of Canada Ltd.
Canron Limited
Consolidated Bathurst Limited
Canadian Industries Limited
Canadian Pacific Limited
Dominion Textiles Limited
Domtar Limited
Genstar Limited
Steinberg's Limited
Texaco Limited

Capital Expenditure Policy

Without exception, all the corporations interviewed had a strategic planning system. This system normally had a planning time frame of 5 years, although there was one exception to this where the planning period was three years. The specific structure of this strategic planning system was of course dictated by the organizational structure and management style of the corporation involved.

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This strategic planning process defined the needs for specific capital expenditure proposals. If the proposals represented a major capital investment in the expansion and/or construction of new facilities, then this was identified at least two or three years before actual commitment was required. This lead time enables the corporation to explore all possible alternatives to ensure that the most economical way of acquiring the use of expanded or new facilities is identified.

Capital Budgets

The development of annual capital budgets would evolve from the strategic planning system. The projects itemized in the capital budget would typically be classified along the following lines:

(i) mandatory projects required to meet legal requirements such as pollution abatement, safety, etc.
(ii) replacement projects which represent a replacement or maintenance of existing machinery, equipment and buildings.
(iii) discretionary projects such as the expansion of existing facilities, the acquisition of new facilities or the diversification of the company's current business lines.

The breakdown of the total capital expenditure program to be undertaken in any one year would run approximately as follows:

(a) mandatory projects would represent 10 to 15% of total capital expenditures.
(b) the maintenance and replacement types of projects would represent another 20 to 50% of the total capital expenditures.
(c) the balance of the capital expenditures would be devoted to discretionary projects.

Several of the corporations pointed out that the estimation of capital expenditures required by mandatory projects was difficult for two reasons:

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(1) if a corporation is going into a facility to meet mandatory requirements, then they will also undertake the replacement projects at the same time because this is the most efficient way of carrying these out, while construction crews and personnel are at this facility. These different projects are frequently regarded as a single project with several components.
(2) in the case of expansion or new facilities, the mandatory requirements are built into the engineering design of the facilities and are not separately identified.

Once a capital budget is assembled, listing the capital expenditure proposals, the items are reviewed and examined by appropriate technical support people and by senior and operating management to assess their feasibility, their necessity and their compatibility with the overall direction of the corporation. At this stage, before any financial analysis has been performed, many of the projects, initially included in the capital budget, are eliminated or deferred. Two of the companies included in the survey are starting to use integer programming techniques to assist management in the selection of an appropriate "portfolio" of projects to be included in the annual capital budget.

At this stage an acceptable capital budget has been developed and is presented to the Board of Directors for their approval in principle. Once this approval is obtained then specific projects are identified by the operating divisions.

Appraisal of Capital Expenditure Proposals

When a specific capital expenditure proposal is prepared, by means of an appropriation request or some other internal mechanism, it is given a very thorough review. This review initially takes the form of a qualitative review involving financial analysts, technical support staff and operating management staff. The review is designed to assess the overall feasibility of the proposal and determine if this proposal really solves the problem it is intended to address. After this review, a financial analysis of the proposal is carried out.

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All companies surveyed use several financial measures in this analysis. The following table identifies the number of measures used by these companies:

NUMBER OF MEASURES MENTIONED	NUMBER OF COMPANIES USING THIS MEASURE
3	6
4	4
5	2

The most frequently used measures were rate of return measures, as shown in the following table:

FINANCIAL MEASURE	FREQUENCY OF USE
Internal rate of return	11
An accounting return on total capital	9
Payback	7
Net present value	6
DCF return on equity	5
Cost of benefit ratios	4
Discounted payback	1
Baldwin rate of return	1

It should be noted that the tables represent an average pattern and the number of measures used tends to increase as the size of the project increases. However, all the companies included in our survey do have one principle measure. For 11 companies the internal rate of return is their principle measure of economic worth. The one company that does not use internal rate of return, uses net present value as its primary criteria.

In the calculation of net present values or internal rates of return, a number of discounting techniques can be used. In our survey, 9 companies mentioned year-end discounting; 3 use mid-year discounting; and, 3 use continuous discounting. The total number exceeds the number of companies surveyed because some of the companies use different discounting techniques for different projects, depending on the characteristics of the specific proposal under review.

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Interest during construction is handled in a variety of ways. Seven of the companies capitalized interest during construction; three of these companies treat the interest during construction as a direct outflow; and two ignore interest during construction.

When a project is very large or a joint venture or an acquisition, or is to be set up as a separate subsidiary, the generation and analysis of proforma income statements and balance sheets assumes an increasing importance. It is for these types of projects that return on equity is given increased weight. However, return on capital employed remains the primary financial measure.

In the preparation of these proforma financial statements, the interest income that may be generated by residual cash balances, is treated in a variety of ways: 7 of the companies ignore this interest as far as the analysis of the proposal is concerned; 3 credit the interest generated by these cash balances to the income flows and, 2 credit the income flows at a rate equal to their estimated cost of capital.

Several of the companies expressed the opinion that the consistency in the type of financial analysis they do is as important as the specific techniques applied. Project comparability is an important feature.

Financing Considerations

In preparing the cash flow analysis, all the companies regarded the financing of the proposal as a separate issue. As a result they generally would not include the tax savings relating to the debt interest as an element of the cash flow. The one exception to this would be for very large projects or projects involving new facilities which would be set up as a subsidiary company. For this type of project, where debt financing is specifically related to the assets to be acquired, the tax savings arising from the cost of long-term debt would be recognized in the cash flow analysis.

.../6A

Leasing is generally regarded as an "asset-specific" form of debt financing and therefore the after tax cost of the lease is capitalized, based on the period for which the lease payments are known. The payments to be incurred during option periods, when the lease payments are to be negociated, would be incorporated as annual cash outflows in the cash flow statement.

Hurdle Rates

When assessing the economic worth of a capital expenditure proposal, all the companies surveyed used the hurdle rates. These hurdle rates are set by senior management, based on experience and adjusted from time to time.

In most cases there is more than one set of hurdle rates used. The hurdle rates that would be applied to the maintenance/ replacement type of project will be much lower than the hurdle rates applied to discretionary projects. The reason for this is that the perceived risk involved in projects designed to maintain and improve the productive efficiency of existing operating entities is much lower than the risk associated with the major expansion and/or creation of new facilities. Similarly, if a project is essentially a diversification venture, then even higher risk considerations are applied. Typical hurdle rates in use are 12 to 14% for low risk projects and 18 to 20% for discretionary projects. Projects that represent diversification efforts or are perceived to have unusually high locational risks, require an even higher expected rate of return.

One of the inputs used to establish these hurdle rates was the cost of capital for 10 of the companies. The companies compute a cost of capital as the weighted average cost of equity, long-term debt and sometimes working capital. The cost of long-term debt and working capital is the after tax interest cost for these funds.

The cost of equity is estimated using a variety of techniques. Some corporations use the ratio of earnings to share price as the cost of equity; some use the dividend yield plus dividend growth model; and, one company uses the beta theory model.

.../7A

An interesting result of the survey is that, regardless of the methodology used to estimate the cost of capital, the estimated cost of capital ranged from 12 to 14%. There was one exception to this, where the estimated cost of capital was about 7%.

Clearly, based on the procedures currently used to estimate the cost of capital, some inflationary component is included in the estimates generated. The magnitude of this inflationary component will be influenced by the approach used. If the corporation uses the current marginal cost of capital, the estimate will contain a larger inflationary component than if the corporation is using its recent historical cost of capital.

Treatment of Risk

When assessing the risk inherent in capital expenditure proposal, the most common technique used by the companies, was a sensitivity analysis. In this analysis, the key components that make up the net cash flow are changed to determine the sensitivity of the internal rate of return to these variables. Not only is the level of the dollar values changed, but the timing is also modified, especially for the construction period, and for changes in the business cycle.

The effect of a cost overrun in the construction period is also examined. This technique alerts management to those facets of the project that are sensitive and allows management to assign the appropriate level of managerial and technical control to these phases of the project.

Nearly all the companies included in our survey also had the capability of carrying out a risk analysis using one methodology or another, and while this is sometimes done, it has not become the common practice. The reason for this is that sensitivity analysis gives more information that can be used than does the results of risk analysis.

.../8A

The final assessment of risk inherent in a given capital expenditure proposal is a judgement decision made by the appropriate senior members of management. They receive and review all the technical data, financial information and form an overall assessment. It is at this point that they will apply a hurdle rate. The hurdle rate used will of course be determined by their overall assessment of the total business risk involved in the proposal.

Treatment of Inflation

For the companies included in our survey, the methodology used to incorporate the effects of inflation in the analyses is in the preliminary stages of development. The most common current practice is to build inflation factors into the construction period but to use current price/cost relationships and apply these relationships to the physical volume flows estimated in the project. Sensitivity analysis is used to yield insight into the impact of changes in these current price/cost relationships.

One of the companies in our survey constructs all cash flows, including the construction cost, in today's dollars and does not incorporate the effect of inflation except by means of sensitivity analysis. A couple of the companies do build inflation factors into all the key components of the cash flow up to the end of the construction period. At this point they freeze the then current price/cost relationship for the remainder of the analysis period. One company consciously builds in inflation factors for each of the key components used to generate the net cash flow. These inflation factors are applied throughout the analysis period. However, in general, these corporations have not as yet developed methodologies that will specifically account for the loss of purchasing power and its effect on working capital, tax shields arising from CCA or depreciation reserves that will become inadequate to finance the replacement required at the end of the economic life of the equipment. A closely related problem for the multinational corporations, especially for the primary resource industries, is the effect of shifting currency exchange rates. For some of these companies, these currency exchange factors are built into their analysis of a capital expenditure proposal.

In addition, for these multi-national corporations, tax treaty arrangements, regulations controlling the repatriation of profits, and the social/political stability of the region concerned are at least as important as the effects of inflation within the Canadian economy, and are thus taken into consideration on a judgemental basis.

.../9A

Overall, there seems to be two phases of analysis that are emerging. The first would be to improve the quality of the net cash flow estimates in current dollars by making appropriate adjustments for those fixed dollar items that are normally included in the cash flow statement, and computing an internal rate of return on the current dollar net cash flow.

The second approach is to take this net cash flow in current dollars and discount it by the consumer price index. After discounting, an internal rate of return would be computed and this would be compared with an estimated real cost of capital. Again, the comparison must allow for the perceived level of risk associated with the project.

The concept of a real rate of return, especially in an historical context, is not one that has much support in practice today.

.../10A

GUIDELINE NOTES FOR CORPORATE INTERVIEWS

A) CAPITAL EXPENDITURE POLICY

1. What are the objectives of your major capital expenditures?

   a) Growth with profitability a strong constraint?
   b) Profitability, with growth an important secondary consideration?

2. Does your company find it necessary, from time to time, to make major capital expenditures which have little if any economic return, but are required for non-quantifiable reasons, such as, pollution control, employee safety and moral, assurance of continued services, etc.?

B) CAPITAL BUDGETS

Major Capital Expenditure Proposals:

1. Capital expenditure proposals may arise in at least the following two methods; which of these occurs more frequently for your company:

   a) From an evolving need to increase manufacturing capacity, adjust to shifting, market locations, requirements, etc.?
   b) Or the realization there exists a profitable investment/ acquisition opportunity, which should be acted upon?

2. When considering major capital expenditure proposals, do longer range strategic objectives play a critical role and therefore these expenditures are planned well in advance of actual approval of the project?

.../11A

C) APPRAISAL OF CAPITAL EXPENDITURE PROPOSALS

1. Are investment proposals classified into broad groups?
   - these groups may be one or more of the following:

   a) by function, such as
      - replacement (low risk)
      - expansion (medium risk)
      - diversification (high risk)
   b) by division, department, or functional area
      - marketing
      - distribution
      - manufacturing
      - computer operations
   c) by size of expenditure

2. For financial evaluation of major projects, which yard-sticks do you use?

   - Payback
   - ROI
   - DCF (IRR)
   - DCF (NPV)
   - Cost/Benefit ratios (Probability indices)
   - Other (specify)

3. Which discounting technique do you use in DCF/NPV analyses i.e. year-end, mid-year, continuous?

4. How do you treat interest during construction (I.D.C.) in your ROI cash flow analyses?

5. How do you treat financial leases in your economic evaluation?

6. How do you treat, in your ROI/ROE calculations, interest income that is generated by residual balances of a project?

7. Does your company consider after tax DCF-ROI more important or less important than DCF-ROE, when evaluating the economic worth of a project?

8. Should the analysis be made on a pure unlevered ROI (no debt financing) or on a levered ROI, having a lower income tax due to debt interest?

.../12A

D) FINANCING CONSIDERATIONS

1. Do you include financing alternatives as an integral part of the analyses, i.e. equity funds, long-term debt, bridge financing, etc.?

2. Do you use hurdle rates? If so, how are these rates determined, and how do you use them?

3. Do you compute a cost of capital:

   - in constant or current dollars?
   - if you use conventional financial statements, how do you handle the mixture of constant and current dollar items contained in these statements?
   - in your opinion, is the E/P ratio (reciprocal of the P/E multiple) equal to the cost of equity capital?
   - does this E/P ratio take inflation expectations and accounting distortions into account?

4. If the cost of capital is the weighted average of the cost of debt and equity, and the D/E structure of your firm is not the same as the D/E structure of the project, what are the implications for the projects analysis?

5. What is the appropriate discount rate when the project is a joint venture of two or more firms, or if the investing firm is foreign?

6. What are the implications when the DCF-ROI is greater than the cost of capital, but the DCF-ROE is less than the cost of equity (or vice versa)?

.../13A

E) TREATMENT OF RISK

1. How does your firm assess the inherent risk in a project?
   - possible answers are as follows:

   a) by a meeting of senior executives, who are there to voice their concern or doubts about the underlying assumptions used to generate the "least estimates" used in the analysis.
   b) by adjusting hurdle rates. If hurdle rates are adjusted, then by whom, and on what basis is the adjustment made?
   c) by using several sets of input data to determine the sensitivity of key variables.
   d) by conducting a probabilistic analysis:
      - may be an independent random selection of variables over a pre-defined range;
      - may be random selection of variables, with some variables constrained by the random choice made for other variables, i.e. the Herty Methodology;
      - or the random selection of variate values may be constrained by the imposition of a frequency distribution over a predefined range;

2. Is it appropriate to use a discount rate with a lower risk premium on expected cash flows, which are obtained from a probabilistic analysis?

.../14A

F) TREATMENT OF INFLATION

1. Does your company make specific allowances for the impact of inflation, when appraising the economic worth of a capital expenditure proposal?

2. If so, is your analysis made in constant or current dollars?

   - Hence, do you use a real or nominal discount rate?

3. How does the discount rate used relate to your firm's expectations of rates of return from investments?

4. In a current dollar cash flow analysis, how should the various components of working capital (inventories, cash, etc.) be derived to reflect the diminishing purchasing power of the dollar under inflationary pressures?

   - How would you relate this working capital to constant dollar values of working capital?

5. Similarly, how should CCA tax shields, and depreciation reserves be adjusted to reflect loss of purchasing power due to inflation?

6. What are some typical rates of return required to justify projects for expansion or new facilities?

7. Are there other key issues in financial analysis of capital projects?

8. In your opinion, what is the degree of accuracy in the analytical results?

9. What is the methodology you use to convert results of cash flow analysis into proforma financial statements, to obtain aggregate D/E ratios, profit contributions, earnings per share, etc.?

A P P E N D I X B

Survey of Rates of Return presented in Dr. Jenkins' Thesis

PRIVATE RATE OF RETURN
1965-1969

SECTOR	CURRENT VALUE OF FIXED ASSETS AND WORKING CAPITAL	PRIVATE RATE OF RETURN FROM CAPITAL
	(millions)	(average from 1965 to 1969)
Foods and Beverages	3,707,614	7.99
Tobacco Products	340,705	6.96
Rubber Products	545,379	5.15
Leather Products	181,722	5.19
Textile Mills	1,417,978	4.89
Knitting Mills	175,201	6,21
Clothing	401,494	6.57
Wood Industry	1,323,094	6.98
Furniture	268,481	6.62
Pulp and Paper Mills	4,538,682	4.57
Other Paper and Allied	466,264	6.73
Printing	431,746	8.28
Publishing	324,298	2.36
Primary Metals	4,986,476	6.02
Metal Fabricating	2,012,382	6.51
Machinery Industries	1,558,500	9.10
Aircraft and Parts	523,908	4.22
Motor Vehicles	1,380,384	11.45
Miscellaneous Transportation	431,952	4.05
Electrical Industrial Equipment	601,180	5.54
Other Electrical Products	1,090,749	7.03

Non-Metallic Mineral Ind.	1,421,058	6.09
Mineral Fuels and Refineries	6,955,520	5.34
Chemical Industries	2,354,276	6.33
Miscellaneous Manufacturing	718,014	6.47
Building Contractors	1,441,734	4.92
Highway and Building Const.	510,385	6.33
Air Transport	521,860	3.49
Water Transport	2,031,488	1,78
Railways	5,795,666	1.03
Truck Transport	591,146	9.08
Pipelines	2,065,336	6.56
Grain Elevators	330,916	3.27
Storage and Warehouses	106,773	6.05
Radio and Television	322,835	5.71
Telephones	3,788,720	7.00
Electrical Power	1,049,708	4.97
Gas Distribution	1,118,415	6.32
Wholesale Trade (corporate)	6,007,716	7.72
Retail Trade (corporate)	4,605,472	7.58
Trade (non-corporate)	3,425,020	7.68
Finance, Insurance & Real Estate	21,598,100 (b)	6.74
Total Services	3,801,310	9.88
Mining	4,320,910	7.36
Forestry	222,500	12.20
Total Industrial Activities + Mining	101,903,067	6.21
Rental Housing	18,550,100	5.38
Owner Occupied Housing	39,063,900	5.38
Total Housing	57,694,000	5.38
Agriculture	20,608,356	4.47

Source: "Analysis of Rates of Return From Capital in Canada " - Glenn P. Jenkins.

A P P E N D I X C

Worksheets for Case Problems

Sample Problem no. 1 (Cash Flow Statement in ($'000))
Case no. 1 Inflation rate: 0.0%

Full C.C.A. credited to this Project

YEARS	0	1	2	3	4	5	6	7	8	9	10
Capital Investment:											
Equipment	(100.00)										
Inventory		(20.00)									
A. Total Investment	(100.00)	(20.00)									
Operating results:											
E.B.D.I.T.		25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Less: C.A.		50.00	50.00								
Taxable earnings		(25.00)	(25.00)	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Less: Taxes paid		(11.25)	(11.25)	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25
Operating earnings		(13.75)	(13.75)	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75
Add back non-cash items		50.00	50.00								
B. Cash Flow from operations		36.25	36.25	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75
Net cash flow (A+B)		16.25	36.25	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75

Sample Problem No. 1 (Case No. 1)

(Inflation rate = 0.0%; Debt Financing is non-asset specific; Total allowable CCA credited to project)

(year ending Dec. 31)

Capital Investments	1	2	3	4	5	6	7	8	9	10	11
Equipment	(100.0)										
Inventory		(20.0)									
Operating Results											
EBDIT	0.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Less: CCA	(50.0)	(50.0)									
Taxable Income	(50.0)	(25.0)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Less: Taxes paid	(22.5)	(11.25)	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25
Income From Operations:	(27.5)	(13.75)	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75
Add Back:											
(Non-cash items - CCA)	50.0	50.0									
Cash Flow from Operations	22.5	36.25	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75
Net Cash Flow	(77.50)	16.25	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75	13.75

IRR = 12.5%

Sample Problem No. 1 (Case No. 2) (% inflation)

Debt Financing is non-asset specific

(only CCA claimed that will maybe be absorbed by project)

(year ending Dec. 31)

	1	2	3	4	5	6	7	8	9	10	11
Capital Investments											
Equipment	(100.0)										
Inventory		(20.0)									
Operating Results											
EBDIT	0.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Less CCA		(25.0)	(25.0)	(25.0)	(25.0)						
Taxable Income		0.0	0.0	0.0	0.0	25.0	25.0	25.0	25.0	25.0	25.0
Less Taxes Paid		0.0	0.0	0.0	0.0	11.25	11.25	11.25	11.25	11.25	11.25
Income from Operation		0.0	0.0	0.0	0.0	13.75	13.75	13.75	13.75	13.75	13.75
Add Back: CCA		25.0	25.0	25.0	25.0						
Cash Flow from Operations		25.0	25.0	25.0	25.0	13.75	13.75	13.75	13.75	13.75	13.75
Net Cash Flow	(100.0)	5.0	25.0	25.0	25.0	13.75	13.75	13.75	13.75	13.75	13.75

IRR = 10.5%

Sample Problem No. 1 (Cases 3 & 4) ($M)

(Inflation rates = 8% and 10% respectively; Full allowable CCA credited to project; EBDIT escalated at 9%; Inventories escalated at 8%)

(year ending Dec. 31)

	1	2	3	4	5	6	7	8	9	10	11
Capital Investments											
Equipment	(100.0)										
Inventories		(23.33)	(1.87)	(2.02)	(2.18)	(2.35)	(2.54)	(2.74)	(2.96)	(3.20)	(3.45)
Operating Results											
EBDIT (9% inflation)	0.00	29.70	32.38	35.29	38.26	41.93	45.70	49.81	54.30	59.18	64.51
Less taxable expenses: CCA	(50.00)	(50.00)									
Taxable Income	(50.00)	(20.30)	32.38	35.29	38.26	41.93	45.70	49.81	54.30	59.18	64.51
Less taxes paid	(22.50)	(9.13)	14.57	15.88	17.31	18.87	20.57	22.41	24.43	26.63	29.03
Income from Operation	(27.50)	(11.17)	17.81	19.41	21.15	23.06	25.13	27.40	29.87	32.55	35.48
Add Back:											
(Non-cash items - CCA)	50.00	50.00									
Cash Flow from Operations	22.50	38.83	17.81	19.41	21.15	23.06	25.13	27.40	29.87	32.55	35.48
Net Cash Flow (current dollars)	(77.50)	15.50	15.94	17.39	18.97	20.71	22.59	24.66	26.91	29.35	32.03
8% deflation:	IRR = 21.8	.8573	.7938	.7350	.6806	.6302	.5835	.5403	.5002	.4632	.4289
(P.V. Factors yrs 2-11)											
Net Cash Flow (constant dollars)	(77.50)	13.29	12.65	12.78	12.91	13.05	13.18	13.32	13.46	13.59	13.74
	IRR = 10.9%										
10% deflators (yrs 2-11)		.8265	.7513	.6830	.6209	.5645	.5132	.4665	.4241	.3855	.3505
Net Cash Flow (constant dollars)	(77.50)	12.81	11.98	11.88	11.78	11.69	11.59	11.50	11.41	11.31	11.23
	IRR = 8.5%										

Sample Problem No. 2 (Case 1, $MM)

(Inflation rate = 0%; Inflation is included during construction period; Service charges on long-term debt included)

(year ending Dec. 31)

	1	2	3	4	5	6	7	8	9	10	11	12
Capital Investments												
Land	1.0											
Building	22.5	16.0										
Equipment	100.0	100.0	5.0	5.0								
IDC	1.5	9.0										
Sub-total	(125.0)	(125.0)	(5.0)	(5.0)								
Working Capital:												
Cash			(1.0)									
Net of A/P & A/C			(4.0)									
Inventories			(20.0)									
W.C. sub-total			(25.0)									
Operating Results												
EBDIT			60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Less: Interest (L.T.D.)			15.0	13.5	12.0	10.5	9.0	7.5	6.0	4.5	3.0	1.5
CCA			45.0	46.5	48.0	49.5	38.8	1.5	1.5	1.4	1.3	1.3
Taxable Income			0.0	0.0	0.0	0.0	12.2	51.0	52.5	54.1	55.7	57.2
Less taxes paid			0.0	0.0	0.0	0.0	5.5	22.9	23.6	24.3	25.1	25.7
Income from Operations			0.0	0.0	0.0	0.0	6.7	28.1	28.9	29.8	30.6	31.5
Add Back:												
(Non-cash items: CCA)			45.0	46.5	48.0	49.5	38.8	1.5	1.5	1.4	1.3	1.3
Cash Flow from Operations			45.0	46.5	48.0	49.5	45.5	29.6	30.4	31.2	31.9	32.8
Residual Value:												
Land												1.0
Working Capital												25.0
UCCA												24.0
Total												50.0
Net Cash Flow on Capital	(125.0)	(125.0)	15.0	41.5	48.0	49.5	45.5	29.6	30.4	31.2	31.9	82.8
	IRR (ROI) = 8.2%											
Deduct Principle Repayment			12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Net Cash Flow on Equity	(100.0)	(25.0)	2.5	29.0	35.5	37.0	33.0	17.1	17.9	18.7	19.4	70.3
	IRR (ROE) = 13.3%											

Sample Problem No. 2 (Case No. 2, $MM)

(Inflation rate = 0.0%; Inflation included during the construction period; Service charges on long-term debt included)

(year ending Dec. 31)

	1	2	3	4	5	6	7	8	9	10	11	12
Capital Investment:												
Land	1.0											
Building	22.5	16.0										
Equipment	100.0	100.0	5.0	5.0								
IDC	1.5	9.0										
Sub-total	(125.0)	(125.0)	(5.0)	(5.0)								
Working Capital:												
Cash			1.0									
Net of A/P & A/C			4.0									
Inventories			20.0									
W.C. sub-total			(25.0)									
Operating Results												
EBDIT			60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Less: Interest (L.T.D.)			15.0	13.5	12.0	10.5	9.0	7.5	6.0	4.5	3.0	1.5
CCA			45.0	46.5	48.0	49.5	38.8	1.5	1.5	1.4	1.3	1.3
Taxable Income			0.0	0.0	0.0	0.0	12.2	51.0	52.5	54.1	55.7	57.2
Less taxes paid			0.0	0.0	0.0	0.0	5.5	22.9	23.6	24.3	25.1	25.7
Income from Operations			0.0	0.0	0.0	0.0	6.7	28.1	28.9	29.8	30.6	31.5
Add Back:												
(Non-cash items: CCA)			45.0	46.5	48.0	49.5	38.8	1.5	1.5	1.4	1.3	1.3
Cash Flow from Operations			45.0	46.5	48.0	49.5	45.5	29.6	30.4	31.2	31.9	32.8
Residual Value:												
Cash Flow (excluding interest charges)												33.6
NPV at 14% for 10 years												175.3
Less: Land												1.0
Working Capital												25.0
UCCA												24.0
Taxable Value of Plant												125.3
Tax on sale of Plant												(56.4)
Net Residual Value												118.9
Net Cash Flow on Capital	(125.0)	(125.0)	15.0	41.5	48.0	49.5	45.5	29.6	30.4	31.2	31.9	151.7
	IRR (ROI) = 10.2%											
Deduct Principle Repayment			12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Net Cash Flow on Equity	(100.0)	(25.0)	2.5	29.0	35.5	37.0	33.0	17.1	17.9	18.7	19.4	139.2
	IRR (ROE) = 15.6%											

Sample Problem No. 2 (Case No. 3, $MM)

(Inflation rate =8%; Inflation included during the construction period; Service charges on long-term debt included)

(year ending Dec. 31)

	1	2	3	4	5	6	7	8	9	10	11	12
Capital Investment:												
Land (3% inflation)	1.0											
Building	22.5	16.0										
Equipment	100.0	100.0	5.0	5.0								
IDC	1.5	9.0										
Sub-total	(125.0)	(125.0)	(5.0)	(5.0)								
Working Capital: (8% infl.)												
Cash			1.3									
Net of A/P & A/C			5.0									
Inventories			25.2									
W. C. sub-total			(31.5)	(2.5)	(2.7)	(2.9)	(3.2)	(3.4)	(3.7)	(4.0)	(4.3)	(4.7)
Operating Results												
EBDIT (7% infl. yr. 2 on)			60.0	64.2	68.7	73.5	78.6	84.2	90.0	96.3	103.1	110.3
Less: Interest on debt			15.0	13.5	12.0	10.5	9.0	7.5	6.0	4.5	3.0	1.5
CCA			45.0	50.7	56.7	63.0	12.4	1.5	1.5	1.4	1.3	1.3
Taxable Income			0.0	0.0	0.0	0.0	57.2	75.2	82.5	90.4	98.8	107.5
Less taxes paid			0.0	0.0	0.0	0.0	25.7	33.8	37.1	40.7	44.5	48.4
Income from Operations			0.0	0.0	0.0	0.0	31.5	41.4	45.4	49.7	54.3	59.1
Add Back:												
(Non-cash items: CCA)			45.0	50.7	56.7	63.0	12.4	1.5	1.5	1.4	1.3	1.3
Cash Flow from Operations			45.0	50.7	56.7	63.0	43.9	42.9	46.9	51.1	55.6	60.4
Residual Value:												
Cash Flow (excluding interest charges)												61.2
NPV at 14% for 10 years												319.2
Less: Land												1.4
Working Capital												62.9
UCCA												24.0
Taxable Value of Plant												230.9
Tax on sale of Plant & Land												(104.0)
Net Residual Value												215.2
Net Cash Flow on Capital												
(current dollars)	(125.0)	(125.0)	8.5	43.2	54.0	60.1	47.1	39.5	43.2	47.1	51.3	270.9
IRR (ROI) = 14.7%												
8% deflator (PV factor, yrs 3-12)			.7938	.7350	.6806	.6302	.5835	.5403	.5002	.4632	.4289	.3971
Net Cash Flow on Capital												
(constant dollars)	(115.0)	(105.0)	6.7	31.8	36.8	37.9	27.5	21.3	21.6	21.8	22.0	107.6
Repayment of Debt			(12.5)	(12.5)	(12.5)	(12.5)	(12.5)	(12.5)	(12.5)	(12.5)	(12.5)	(12.5)
DCF on Equity (IRR=20.8%)	(100.0)	(25.0)	(4.0)	30.7	37.5	47.6	34.6	27.0	30.7	34.6	38.8	257.4
(constant $)	(92.0)	(21.0)	(3.2)	22.6	25.5	30.0	20.2	14.6	15.4	16.0	16.6	102.6
IRR (ROE) = 12.0%												