

International Management Accounting Statement

Project Appraisal Using Discounted Cash Flow



**International Federation
of Accountants**

IFAC PAIB COMMITTEE EXPOSURE DRAFT
International Management Accounting Statement

REQUEST FOR COMMENTS

The Professional Accountants in Business Committee of the International Federation of Accountants (IFAC) approved this exposure draft, *Project Appraisal Using Discounted Cash Flow (DCF) Analysis*, for publication in March 2007. The background to its development and format is in the Explanatory Memorandum.

Please submit your comments, preferably by email, so that they will be received by **September 12, 2007**. All comments will be considered a matter of public record (unless otherwise requested). Comments should be addressed to:

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Copies of this exposure draft may be downloaded free-of-charge from the IFAC website at <http://www.ifac.org/PAIB>.

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INVITATION TO COMMENT

Guide for commentators

This is an exposure draft of a proposed International Management Accounting Statement on *Project Appraisal Using DCF*. It should be read with the current exposure draft of the proposed Preface to the PAIB Committee's International Management Accounting Statements (IMAS) and International Good Practice Guidance (IGPG). The Preface explains the objective and process of development of these pronouncements.

The PAIB Committee continues to formulate its approach to producing principles-based pronouncements. Receiving responses to the questions for commentators in both this exposure draft, and on the Preface, will help the committee to ensure their usefulness to professional accountants in business. In representing widely accepted good practice and setting a benchmark for professional accountants in business, the Committee does not intend to provide a comprehensive guide to all aspects of applying and using discounted cash flow (DCF). Instead, its emphasis is to provide principles that reflect good practice, supported by guidance to facilitate their application. The signposting to other resources directs professional accountants in business to more detailed information. Appendix B includes one case study example of using DCF in project appraisal. At this stage, more examples have not been included, as the Committee wants feedback on whether cases studies enhance the guidance.

This exposure process also helps the Committee to define topic areas that could form the basis of follow-up IMAS. Specifically in relation to this IMAS, the Committee is considering further IMAS on the calculation and uses of the cost of capital and post- (project) completion review. The Committee's focus on DCF as its first proposed IMAS reflects DCF's importance in supporting disciplined financial management in organizations. Many companies do not use DCF and net present value (NPV) to support investment appraisal and capital budgeting decisions. Those that do could possibly apply it more widely. This IMAS encourages professional accountants in business to promote the use of DCF and NPV to evaluate investments.

The PAIB Committee would like to receive comments on all matters addressed in this proposed principles-based guidance. Anyone offering comments should (a) refer to specific paragraphs, (b) include the reasons for the comments, and (c) where appropriate, explicitly suggest proposed wording changes. The PAIB Committee is particularly interested in comments on the matters set out below:

The principles

- 1. Do the principles cover all the fundamental areas where DCF is used to calculate NPV for project/investment appraisal? Should any principles be deleted or any added?**
- 2. Would the application of the principles by professional accountants in business in organizations help to improve decision making?**

The application guidance

3. Does the application guidance for each principle adequately guide good practice?
4. Would the usefulness of the IMAS in setting a benchmark for practice (in terms of its usability and readability) be improved by reducing (to make it more concise) or extending (to make it more detailed) the application guidance?
5. Is the application guidance that is specific to the public sector and small business useful? Should there be a separate IMAS dealing with project appraisal using DCF in the public and not-for-profit sectors and for smaller business?

The Appendices

6. Are the appendices useful? Could the case study at Appendix B be usefully expanded, or removed to make a more concise document?

Further topic selection for PAIB Committee publications as an IMAS

7. Would you support the publication of follow-up IMAS on using and calculating the cost of capital and/or on post- (project) completion review and audit? Are there other areas you would suggest for the development of an IMAS and how would you prioritize these relative to the two suggestions?

PROJECT APPRAISAL USING DISCOUNTED CASH FLOW

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1. General Overview of Why the Topic is Important

- 1.1 For stronger economies and economic growth, decisions on resource allocation in organizations require a systematic, analytical and thorough approach, as well as sound judgment. Investment appraisals and capital budgeting, which involve assessing the worth of a project, should use DCF as a supporting technique to (a) compare costs and benefits that occur in different time periods, and (b) calculate NPV. NPV utilizes DCF to frame decisions, to focus on those that create the most value.
- 1.2 This IMAS covers DCF analysis, and targets professional accountants in business who evaluate investments for purposes of decision-making in an organization. Investments that are evaluated include major capital spending and strategic investments. Examples are product development, and acquisitions and divestments that shape the future of an organization.
- 1.3 Companies with good records in value creation tend to have better access to capital and a more motivated and productive workforce. This IMAS supports and encourages professional accountants in business to promote disciplined financial management in organizations, and long-term value generation. This allows organizations to focus on decisions that maximize expected value, rather than assessing the short-term impact on reported earnings.
- 1.4 In delivering public and not-for-profit services, the focus is on ensuring that public funds are spent in the most efficient and effective way, and on activities that provide the greatest benefits to society.
- 1.5 In advocating fundamental principles and providing guidance on how to use DCF, this IMAS establishes a benchmark that helps professional accountants to deal with the complexities of practice. A key challenge in using DCF arises from the confusion that often occurs in understanding its theoretical basis and practical application.
- 1.6 This IMAS encourages professional accountants in business to promote the use of DCF and NPV to evaluate investments. Adoption of these techniques will vary depending on jurisdiction and size of organizations. Research shows that although many large companies normally use DCF and NPV in investment appraisal and capital budgeting decisions, a significant number do not, especially companies with low-debt ratios and substantial free cash flow. In smaller organizations, their use is particularly variable, as many rely on relatively simple approaches such as payback criteria and informal rules of thumb. Among larger organizations, those using DCF and NPV tend to combine them with non-DCF approaches, such as earnings multiples.

The Role of the Professional Accountant in Business

- 1.7 The importance of the role of professional accountants in business in supporting information flows in organizations and to its outside stakeholders is highlighted in the IFAC Code of Ethics for Professional Accountants. Paragraph 300.2 states that investors, creditors, employers and other sectors of the business community, as well as governments

and the public at large, may all rely on the work of professional accountants in business. Professional accountants in business may be solely or jointly responsible for preparing and reporting on financial and other information on which both their employing organizations and third parties may rely. To this end, professional accountants in business should (a) apply high standards of DCF analysis, (b) establish safeguards to compensate for risks to the integrity of information flows, and (c) provide objectivity where conflicts of interest could influence a decision. In this context, professional accountants in business are both challenging and contributing to decision-making.

- 1.8 Calculating DCF and the NPV of cash flows incorporates fundamental principles of finance that support disciplined financial management in organizations. Professional accountants in business have a role in promoting and explaining the importance of these principles in their organizations, particularly where the connections between financial principles and related financial theory are not easily understood or accepted.
- 1.9 Professional accountants in business could directly (a) deliver DCF analysis, and (b) ensure the quality of information flows, to support analysis and investment appraisal. They could also promote the use of DCF and NPV in investment appraisal and advise on the appropriateness of other techniques for specific contexts.
- 1.10 Those professional accountants in business working in a finance and accounting function of an organization could participate in interdisciplinary teams, whether at a marketing, research and development or other functional interface, that assess the effectiveness of investments. For example, marketing expenditures with longer-term effects, such as product launch advertising and promotions, could be evaluated using DCF to analyze expenditures and earnings. Some organizations with significant brand investments have used professional accountants in business to develop DCF-based and other supporting tools to provide insights into the effectiveness of these investments. A typical role in this context is helping to frame the decision(s) and the purpose of the analysis, and the most appropriate approach and tools, given the context of the decision and an end user's information requirements.
- 1.11 In capital budgeting, professional accountants in business could participate in (a) recognizing the investment opportunity, (b) determining the alternatives, (c) ensuring that information is considered in a way that leads to the selection of the best alternatives, and (d) subsequent checking to establish whether anticipated benefits have been realized. Many organizations require consideration of at least three alternatives in making decisions.
- 1.12 In addition to using DCF analysis to help an organization improve decision-making, professional accountants in business could encourage a wider assessment of the strategic impact and economic rationale of a potential investment. Organizations should place investment appraisal in a wider strategic context. For example, determining whether acquisition or internal growth is most effective in reaching an organization's strategic objectives requires an understanding of the business environment and an organization's specific situation. A wider strategic analysis might include an assessment of (a) market

economics, (b) economic profitability across markets, products and customers, (c) determinants of sustainable profitable growth and competitive position, and (d) alternative options. In this context, where appropriate, professional accountants in business could encourage consideration of a range of stakeholders in assessing potential investments, stakeholders such as employees, managers, communities, customers, suppliers, the industry, and the general public.

- 1.13 Professional accountants in business could advise on the alignment of investment appraisal and assessments of subsequent managerial performance. For example, management incentivization and rewards based on accounting profit could encourage actions that do not support long-term value generation to shareholders. A potentially good project based on NPV criteria and a wider assessment of strategic importance could have poor accounting returns in its early years.

2. Key Principles That are Widely Accepted Features of Good Practice

Definitions

- 2.1 Investment appraisal (also often referred to as capital budgeting when it relates to capital expenditure on fixed assets) refers to evaluations of decisions made by organizations on allocating resources to investments of a significant size. Typical capital spending and investment decisions include:
- Make or buy decisions; outsourcing certain organizational functions
 - Acquisition and disposal of subsidiary organizations
 - Entry into new markets
 - The purchase (or sale) of plant and equipment
 - Decisions on developing new products or services (or discontinuing products or services), or on related research and development programs
 - The acquisition (or disposal) of new premises or property by purchase, lease, or rental
 - Marketing programs to enhance brand recognition and to promote products or services
 - Restructuring of supply chain
 - Replacing existing assets.
- 2.2 DCF analysis: A financial modelling tool that uses projected cash flows generated by an investment (financial or real). DCF analysis calculates value based on all cash flows related to (a) the investment or project, (b) the life of the investment, and (c) the opportunity cost of investing in a project of similar risk profile (represented by the discount rate).
- 2.3 NPV: A single value representing the difference between the sum of the projected discounted cash inflows and outflows attributable to a capital investment or other project, using a discount rate that properly reflects the relevant risks of those cash flows.

- 2.4 Internal Rate of Return (IRR): The average annual percentage return expected for a project, where the sum of the discounted cash inflows over the life of the project is equal to the sum of the discounted cash outflows. Therefore, the IRR represents the discount rate that results in a zero NPV of cash flows.
- 2.5 Projection: an estimate of value in a future time period.
- 2.6 Terminal value: The residual value of a business or project at the end of a discrete period for which a detailed cash flow projection is prepared.
- 2.7 Working (net) capital: represents current assets (cash, accounts receivable, and inventory) less current liabilities.
- 2.8 Weighted Average Cost of Capital (WACC): the opportunity cost to all capital providers (debt and equity) of investing in an alternative project of similar relevant risk profile, weighted by the projects' relative contribution to a company's total capital, and calculated using market values of debt and equity.
- 2.9 Shareholder value: total return to shareholders in the form of both dividends and share price growth, which in the long term should be equal to the present value of future free cash flows discounted at the WACC, less the market value of debt, plus the market value of non-operating assets.
- 2.10 Capital Asset Pricing Model (CAPM): a tool to calculate the cost of equity capital using several empirical inputs. The risk-free rate represents a return an investor can achieve on the least risky asset in a market, equity beta captures the systematic risk of an investment (reference paragraph 2.11), and an equity market risk premium represents a premium return a perfectly diversified equity investor expects to obtain over the risk-free rate. This model predicts that the expected risk premium for an individual stock will be proportional to its beta.
- CAPM is represented by the formula $R_i = R_f + \beta_i (R_m - R_f)$, where: R_i represents expected rate of return on asset i ; R_f is rate of return on a risk-free asset; R_m represents expected rate of return on a market portfolio, and β_i is a beta coefficient of an asset defined as $\text{Cov}(R_i, R_m) / (\text{Var}_m)$.
- 2.11 Systematic risk: cover the risks associated with holding a market portfolio of stocks for example interest rate rises, rate of inflation and oil price changes. Systematic risk represents the variability in a security or stock's total returns that is directly associated with overall movements in the general market or economy. An investor can construct a diversified portfolio to eliminate the specific risks associated with an individual stock. Therefore, a well-diversified investor investing in additional stocks is exposed only to those risks that contribute to the overall riskiness of the portfolio.
- 2.12 Opportunity cost: the value of the benefit sacrificed when one course of action is chosen over an alternative. The opportunity cost is represented by the foregone potential benefit from the best rejected course of action of similar relevant risk profile.
- 2.13 Sunk or irrecoverable cost: Cost that has been irreversibly incurred or committed and cannot be considered relevant to a decision, such as pre-project work involving market research and development costs.

- 2.14 Cost benefit analysis: Comparison between the costs of the resources used, plus any other costs imposed by an activity such as pollution, and the value of the financial and non-financial benefits.

The Key Principles in Project Appraisal Using DCF

2.15 The key principles underlying widely accepted good practice are:

- A. For multi-period investments, where expected benefits and costs and related cash inflows and outflows arise over time, NPV should be considered the standard approach to evaluating an investment opportunity, and superior to other investment criteria such as payback and average return on book value.**
- B. DCF analysis and NPV reflects the time value of money and the systematic risk of investments, as represented by the opportunity cost of capital (and by the discount rate). The discount rate used to calculate the NPV in the DCF analysis should properly reflect the systematic risk of cash flows attributable to the project being appraised, and not the systematic risk of the entity undertaking the project.**
- C. Cash flows should be estimated incrementally, so that in a DCF analysis only cash flows that could change if the proposed investment is implemented should be considered. The value of an investment depends on all the additional and relevant cash inflows and outflows that follow from accepting an investment.**
- D. At any decision-making point, past events and expenditures (often referred to as costs of goods and services already incurred, or sunk costs), should be considered irreversible outflows (and not incremental costs) that should be ignored, even if they had previously been included in the cash flow analysis .**
- E. All opportunity costs should be considered in DCF analysis.**
- F. A good decision relies on an understanding of both the business and an appropriate DCF methodology. DCF analysis should be considered and interpreted in relation to an organization's strategy, and economic and competitive position.**
- G. All assumptions used in undertaking DCF analysis, and in evaluating proposed investment projects, should be supported by reasoned judgment, particularly where factors are difficult to predict and estimate. Using techniques such as sensitivity analysis to identify key variables and risks helps to reflect worst case, most likely, and best case scenarios, and therefore can support a reasoned judgment.**
- H. A post-completion review of an investment decision should include an assessment of the decision-making process, and the results, benefits, and outcomes of the decision.**

3. Application Guidance on Implementing the Principles

PRINCIPLE A

For multi-period investments, where expected benefits and costs and related cash inflows and outflows arise over time, NPV should be considered the standard approach to evaluating an investment opportunity, and superior to other investment criteria such as payback and average return on book value.

- 3.1 Assuring that scarce resources are appropriately allocated to contribute to shareholder value (stakeholder value in the not-for-profit sector) is the fundamental purpose of investment appraisal. Any investment that demonstrates a positive expected NPV could contribute to shareholder value because the risk and time-adjusted expected cash inflows outweigh the expected cash outflows.
- 3.2 DCF analysis is appropriate for multi-period investments, i.e. where the expected benefit and costs arise beyond one period. For such investments, DCF enables better decision-making than evaluating an investment using payback period or accounting (book) rate of return. It recognizes that an investment has cash flows throughout its expected life, and that cash flow in the early periods of an investment is worth more than later cash flow. Many organizations use several methods for evaluating capital investments, and this is acceptable practice as long as they only supplement a DCF approach.
- 3.3 DCF analysis considers the time value of money, based on the premise that people prefer to receive goods and services now rather than later, and investors prefer to receive money today, rather than the same amount in the future, i.e. a dollar today is worth more than a dollar tomorrow. An investor demands a rate of return even for a risk-less investment, as a reward for delayed repayment. Even the risk-free rate of interest is normally positive because people attach a higher value to money in the present than in the future.
- 3.4 The major limitation of using payback period as an investment criterion is that it may cause organizations to place too much emphasis on short payback periods, thereby ignoring the need to invest in long-term projects that could enhance its competitive position. Payback ignores both the time value of money and cash flows after the payback period. If the payback periods for two projects are the same, the payback period technique considers them equal as investments, even if one project generates most of its net cash inflows in its early years, while the other project generates most of its net cash inflows in the latter years.
- 3.5 The accounting rate of return criterion also ignores the time value of money. Furthermore, this technique uses accounting numbers that depend on the organization's choice of accounting procedures. This method uses net income rather than cash flows, and although net income is a useful measure of profitability, the net cash flow is a better measure of an investment's performance.

- 3.6 Both the NPV and IRR methods are discounted cash flow methods, although NPV is theoretically preferable. IRR indicates a potential project's annual return on investment in percentage terms. For this reason, it can be useful in communicating an analysis of investment choices to employees without financial expertise, and help facilitate decisions where the discount rate is uncertain. However, it can provide misleading results in certain contexts. Calculating the IRR requires identifying the discount rate that results in a zero NPV of cash flows. Comparing the IRR with the target rate of return on an investment can be useful in deciding whether to proceed but it does not indicate the enhancement of a company's monetary value flowing from accepting an investment. Furthermore, the NPV approach can incorporate different discount rates for individual periods and cash flow streams of different systematic risk. This allows a proper reflection of changing macroeconomic conditions (inflation, interest rates), and systematic risk of all projected cash flows. In certain circumstances, such as in multi-period projects where net negative cash flows are followed by net positive cash flows, and then again by net negative cash flow, there may be more than one IRR for which NPV will be equal to zero. Therefore, using the criterion of $NPV > 0$ as a decision-making tool is better than using the criterion of $IRR > \text{cost of capital}$.
- 3.7 For a listed company, using NPV as an aid to making decisions typically ensures the creation or maximization of shareholder value (or the market price of shares). Maximizing shareholder value implies that projects should be undertaken when the present value of the expected discounted cash inflows exceeds the present value of the expected discounted cash outflows.
- 3.8 As with all decisions in an organization, investment appraisal decisions and DCF analysis rely on good quality information. The characteristics of good information include: accuracy, relevance, reliability, consistency, completeness, and timeliness. All of these can be important in DCF analysis, but usually not all can be dealt with in decision-making. Therefore, professional accountants in business are faced with deciding which of these characteristics could be the most important, given a specific context. One of the more difficult issues to deal with is bias (typically optimism bias) affecting information flows. Bias that is inherent in information from parts of the organization feeding into a DCF analysis can influence decisions. It is important first to recognize bias, then to consider necessary adjustments in a DCF analysis to reflect it.

Public and not-for-profit sector application

- 3.9 Governments in some jurisdictions provide guidance to its public sector bodies and authorities on how to appraise proposals before committing significant funds. For example, the United Kingdom, United States, Australian and New Zealand governments provide guidance (see resources at appendix A) on the issues and techniques that should be considered when assessing new regulatory, revenue or capital policies, programs, and projects. Such guidance advises public sector departments and authorities how to undertake conventional DCF-based analysis to calculate NPV (and usually states that most assessments of potential investments require an NPV calculation). As in a commercial setting, the appropriate monetary yardstick for accepting an investment is normally based on a positive NPV and/or an expected NPV that is higher than or equal to

the expected NPV of mutually acceptable alternatives. However, such guidance can offer advice on a broader cost benefit analysis that can be more valuable to the public interest, an analysis in which NPV is only one tool.

- 3.10 Cost benefit analysis is broader than financial analysis because it considers the potential benefits that flow beyond the implementing organization or agency. As well as considering the strategic, financial and economic case for a proposed investment, a cost benefit analysis could include a number of assessments that consider the potential impact on various stakeholder groups such as society, the environment, consumers and employees, including their issues. This helps to establish the total welfare gain over the whole life of an investment. Non-monetary qualitative-based information can help to outweigh a negative NPV in a project assessment, allowing a proposal to proceed.
- 3.11 Investments to improve welfare usually generate benefits that (a) do not have a market price, and (b) are not easily measurable in monetary terms. Therefore, cost-effectiveness measures can be non-monetary units, supported by the use of ratios to link a financial appraisal to the non-monetary benefits arising from an investment. For example, in investing in programs to support the development of countries (in this case for a vaccination program), non-monetary measures can include tests of efficiency and effectiveness, such as the number of people immunized and number of people immunized per dollar (or other unit of currency) invested and cost per immunization delivered.

Small business application

- 3.12 Research shows that large and small companies evaluate investments differently. Many small businesses rely on “gut feel” and the payback period as their primary investment criteria. Only a small number use DCF as a decision metric, or even project cash flows, when making investment decisions. Apart from lack of expertise, small companies take a different approach to evaluating investments for a number of reasons. Owners of small business could choose to balance the goal of wealth maximization against other objectives such as being independent, maintaining viability, and ensuring the business as a going concern. For example, staying in business could rely on the replacement of a machine. Therefore, DCF analysis is not necessarily seen by smaller businesses as useful in justifying investments where there are limited options about how and when to replace equipment.

PRINCIPLE B

DCF analysis and NPV reflects the time value of money and the systematic risk of investments, as represented by the opportunity cost of capital (and by the discount rate). The discount rate used to calculate the NPV in the DCF analysis should properly reflect the systematic risk of cash flows attributable to the project being appraised, and not the systematic risk of the entity undertaking the project.

- 3.13 To calculate present value, estimated future cash inflows and outflows are discounted by a rate of return (termed the opportunity cost of capital or discount rate). Cost of capital

theory supports the calculation of the discount rate. Small changes in the discount rate will have a big impact on the NPV of the project.

- 3.14 The discount rate reflects the time value of money and systematic risks of investments. Systematic risk covers the risks associated with the variability of holding a market portfolio of stocks – when the market moves, each security moves higher or lower. Specific risks are the unique risks associated with an individual asset i.e. risks that represent events affecting cash flows specific to a company. According to the CAPM, although risks associated with investments can be significant, investors do not require a reward for accepting risks that are specific either to a company or to an individual project. When an investor holds a market portfolio, each individual stock in that portfolio is exposed to specific risk, but through diversification the investor's net exposure is only the systematic risk of the market portfolio. Therefore, by holding a portfolio of stocks, investors are able to diversify their investments more easily than companies. On the other hand, diversification of a company's business activities does not necessarily provide it with added value. Calculating the return an investor requires as compensation for investing in a stock requires identifying those risks that are correlated with the market portfolio i.e. every risky stock/asset that is available for investment.
- 3.15 The CAPM is used in many organizations (and widely in the investment community) to calculate the cost of equity capital (and to support the calculation of the WACC) if an organization also has debt. The equity beta factor in this formula measures correlation between movements in an individual company's stock return and the returns on the market as a whole. Companies that expose their equity investors to greater systematic risks than the average company have a beta greater than one; those that expose their equity investors to lower systematic risks have betas below one.
- 3.16 Although many finance directors and investors use CAPM to calculate the cost of equity, some are concerned that CAPM assumes that markets are efficiently priced to reflect greater return for greater risk. Some business commentators and researchers highlight that CAPM is not a good substitute for risk assessment, and one recent study showed that CAPM under-predicts the returns to low beta stocks and overstates the returns to high beta stocks. Consequently, a number of approaches are suggested to improve the application of CAPM, including altering the period over which to measure beta, the frequency of observation, comparator analysis with industry sector betas, and choice of data provider.
- 3.17 Despite the implications of portfolio diversification in CAPM theory (in which investors are considered perfectly diversified), in practice, project and company-specific risks are important considerations in allocating resources. Investors analyze specific risks that can affect the cash flows generated by an investment, although they will not be compensated for taking those risks. Investors typically realize that how well an individual investment performs depends on how well a company manages its investments and specific risks. Therefore, investors also focus on expected cash flows associated with each individual investment, because achieving acceptable financial returns from an individual investment depends on good management of specific risks related to an investment or a project.

- 3.18 However, specific risk, for which investors are not compensated, it should not be reflected in the discount rate. Risk that is specific to an investment or a project should be reflected in an adjustment to the cash flows of the investment or project. For example, diversification by organizations could increase value, but it should not be assumed that diversification will reduce the cost of capital. Diversification may change the average cost of capital of the diversified company, but that cost may decrease or increase depending on the systematic risk of newly added activities. Any additional value, such as from expected synergies flowing from an acquisition, could be reflected in adjustments to expected cash flow and not the discount rate. This is so because portfolio theory suggests that investors should only be compensated for systematic risks that affect the whole portfolio of shares. Furthermore, reflecting risks in cash flows enables managers to better assess how specific risks affect value, and therefore how to manage them.
- 3.19 The discount rate used by an organization to assess an investment opportunity should be calculated separately; it should not necessarily be the same as the overall cost of capital for the company. A potential investment with a high systematic risk will always be risky, irrespective of the investor or the organization. An organization with a perceived lower risk should not use its overall cost of capital to appraise an investment that is potentially more risky.
- 3.20 Organizations considering an investment with high specific risks often use a high investment hurdle rate rather than using the discount rate, therefore departing from a lower cost of capital calculated using the portfolio approach. There is no theoretical basis for setting a very high hurdle rate to compensate for high specific risk or a risk of failure. It is a matter of judgment, which can be supported by calculating the probability-weighted expected value of cash flows of an investment. This is done by (a) developing several scenarios, and (b) assigning them probabilities of realization (including a probability of a project failure if applicable).

Public and not-for-profit sector application

- 3.21 In the public sector and not-for-profit contexts, the time value of money recognizes that society generally prefers to receive services now rather than later, so as to defer costs to future generations. This preference, commonly referred to as the Social Time Preference, is the value society attaches to present as opposed to future consumption, and some governments recommend using it as the standard real discount rate. This allows discounting of future benefits and costs, based on comparing utility across different points in time or different generations. Discount rate schedules for use in appraising investment projects in the public sector are provided in the guidance of many governments – referred to in paragraph 3.9.

PRINCIPLE C

Cash flows should be estimated incrementally, so that in a DCF analysis only cash flows that could change if the proposed investment is implemented should be considered. The value of an investment depends on all the additional and relevant cash inflows and outflows that follow from accepting an investment.

- 3.22 DCF and NPV are stated in terms of after-tax cash flows arising from the investment. Only cash flow is relevant in DCF analysis, not accounting net income. Forecast profit and loss accounts should be converted into cash flow (earnings are usually reported on an accrual basis according to generally accepted accounting principles). Adjustments to profit to derive cash flow include (a) adding back depreciation, and (b) reflecting changes in working capital. That allows the cash flow effect of investment in inventories to be measured by considering whether additional cash has been required at the beginning or end of a year. If cash was released by depleting inventory, the resulting cash flow effect is positive. Therefore, working capital is a typical cash outflow at the beginning of a project, as more cash is required at the beginning of a new investment project. Liquidating working capital at the end of an investment project usually produces a cash inflow.
- 3.23 At any decision-making point, only cash flows that arise in period 0 (period of initial investment) and in subsequent periods should be considered relevant in appraising projects. Incremental cash flow equals cash flow for an organization with the project, less cash flow for the organization without the project. Comparing a potential investment against not doing it facilitates an understanding of the benefits from making the investment. DCF analysis is typically based on years, but it can be conducted based on shorter time periods, such as months or quarters.
- 3.24 A focus on incremental cash flows allows an analysis of the effect of a make or buy decision. In deciding whether to make or buy components or replace machinery, for example, the increased costs associated with the purchase and installation of new machinery/technology should be weighed against the savings.
- 3.25 Inflation should be considered in investment appraisal and DCF analysis. It affects cash flows, and could have a significance where funding a potential investment relies on borrowed financing. Inflation reduces the purchasing power of net cash flows over time. Inflation should be properly reflected in the nominal discount rate through a risk-free component of a formula; it should also be reflected in the projected cash flows, because projecting cash flows in real terms will make it impossible to properly state cash outflows related to tax payments. Care should be taken not to use a real discount rate to discount nominal cash flows, and vice versa.
- 3.26 In practice, there is no universal approach to selecting cash flow projections on real or nominal terms. Real figures can have better meaning because large sums in nominal terms can mislead (because they represent cumulative inflation), and because revenues, costs and interest are generally forecast in real terms. On the other hand, modeling

income statements and balance sheets in real terms leads to complexity, as tax is generally paid on nominal profits and depreciation is normally calculated on nominal asset book values. Nominal terms should be used where tax, depreciation and working capital charges can materially affect the analysis. However, modeling using real rather than nominal figures could be necessary in specific contexts, for example in countries with hyper-inflation.

- 3.27 DCF analysis using nominal prices usually requires an inflation forecast, although forecasting inflation over a long period is not reliable. In this case, the impact of different inflation rates on expected cash flows (and on debt service) can be modeled in a sensitivity analysis [link to principle I]. Where the discount rate is used in nominal terms, cash flows should also be in nominal terms. If inflation is not very high and is consistently applied to nominal cash flows and nominal discount rate, the difference between real and projected inflation rates should not materially affect the NPV. Inflation rates for various variables such as rents, labor, materials, and sales could also be different.
- 3.28 Cash flows should be measured after corporate tax. Where a proposed investment changes the tax liabilities of an organization, the tax effects should be included in a DCF analysis, and incorporated into the cash flow at the correct time. Cash received, and cash paid or committed, have an immediate effect on the amount of cash available to the organization; this immediate impact is referred to as the *direct effect*. An event or transaction can change an organization's tax obligations; this impact on an organization's tax payment for the period is the *tax effect* or *indirect effect*.
- 3.29 Non-cash revenues or expenses that have tax effects also affect cash flows. Non-cash revenue such as a credit sale does not increase the cash available to an organization but does increase its taxable income for the period, thereby increasing the cash needed to pay for taxes. Therefore, non-cash revenue decreases, not increases, the cash available to the organization. The amount of the decrease is equal to the increase in taxes resulting from the non-cash revenue.
- 3.30 On the other hand, an increase in expenses could decrease taxable income, reducing taxes for the period. A non-cash expense, therefore, could increase cash inflow. In some jurisdictions, depreciation is a non-cash expense that does not require a cash payment in the period in which the expense is recognized. The expense, however, reduces an organization's tax payment for the period. This increases cash available for other uses and results in a cash inflow.
- 3.31 Tax incentives offered in particular jurisdictions should be incorporated into the DCF analysis. For example, at the time of publication of this IMAS, qualifying infrastructure projects in China offer foreign investors a tax holiday and exemption from import duty on pre-qualified equipment. The ten-year tax benefit provides a 100 per cent exemption from corporate income tax for the first five years, and a 50 per cent exemption for the next five-year period.

- 3.32 Terminal (residual) cash flows should be considered where plant, buildings and other assets deployed during the investment project have a residual value or cost. Assets could have an alternative use within an organization, in a second-hand market, or as scrap. In other cases, their disposal, perhaps relating to environmental legislation, attracts a cost.
- 3.33 The additional effects of a proposed investment on the rest of an organization should be considered in DCF analysis. This involves considering the effects on after-tax cash flows elsewhere. For example, a new investment might affect sales of other products. It is usually unlikely that cash flows will be ‘normalized’ from period 0. Incidental effects should be considered in the context of overall strategy, so that investment decisions support strategic objectives. A retailer could open a second store in a town, which could detract sales at its first store, or invest in internet sales that could decrease earnings at all its stores. This loss elsewhere becomes a relevant cash flow in appraising the new investment. However, although this investment could be out-ranked in terms of potential NPV by another opportunity, the retailer could decide to acquire a second site for strategic and competitive reasons.
- 3.34 Although NPV is recommended as the standard approach to evaluating investments, it is not flexible in handling follow-on investments linked to an initial investment. Real options analysis is an emerging and evolving area of practice in valuation and investment appraisal. It accommodates real-life scenarios in which cash flows often depend on decisions that will only be made after resolving uncertainties. Real options can enhance DCF analysis by introducing uncertainty and flexibility – often both important aspects of managerial decision-making. Real options that typically represent adjustments that can be made to projects following a decision to invest include the options to:
- *Abandon*
 - *Expand*
 - *Scale-back*
 - *Delay*
 - *Outsource.*

For organizations that utilize this options-based approach, it allows (without a commitment) up-scaling investments if demand warrants; for this reason this approach is more widely used in research- and development-intensive organizations, such as pharmaceuticals, where there is high uncertainty (and most value to gain from using the approach). Real options analysis is usually most beneficial where there is room for management flexibility, and where NPV is low and marginal. It is often applied to significant investments that warrant the additional costs of analysis.

- 3.35 The timing of investments remains an important decision that in every case requires analysis using DCF as well as real option analysis. The benefits of a potential investment could exceed its costs, but postponing it could change the time profile of benefits and costs and hence the investment’s or project’s NPV. Projects generally have two mutually

exclusive alternatives: invest now or later. A decision not to invest could also result from a DCF analysis.

Public and not-for-profit sector application

- 3.36 In the public and not-for-profit sectors, the DCF analysis is from the perspective of the implementing organization or agency. It identifies an investment's net money flows to the implementing organization or entity. Organizations in this sector may receive goods and services free of charge (through donations, or volunteer labor, such as parents performing services for schools). To the local entity this is a genuine advantage, but donated resources still represent a true cost to society. Therefore they should be included (valuing them at market price where possible) when evaluating proposed investments for policy making from society's perspective. In most local decision making, however, viewed from within an organizational unit, principle C dictates that only cash costs be included, though as all resources are limited, there may be an opportunity cost in using volunteers.

PRINCIPLE D

At any decision-making point, past events and expenditures (often referred to as costs of goods and services already incurred, or sunk costs), should be considered irreversible outflows (and not incremental costs) that should be ignored, even if they had previously been included in the cash flow analysis .

- 3.37 Past events and expenditures ('sunk costs') should not affect a decision whether to pursue a potential investment decision, and therefore should be ignored in decision-making. Investments do not necessarily need to be completed solely because of significant past expenditures. An investment project is normally reconsidered whenever the expected future discounted cash inflows exceed the expected future discounted cash outflows.
- 3.38 Sunk costs are always fixed costs, but not all fixed costs are sunk. Examples of sunk costs are investments in equipment which can only produce a specific product, advertising expenditures, and R&D expenditures.

PRINCIPLE E

All opportunity costs should be considered in DCF analysis.

- 3.39 The opportunity cost reflects the best alternative uses to which goods and services could be put. Typically, opportunity costs are difficult to estimate, especially when they arise internally in an organization. When a resource is freely traded, its opportunity cost is equal to its market price. Therefore, the amount an organization pays for process input or receives for a process output is based on actual prices.
- 3.40 Exploring opportunity costs should improve decision outcomes. Proposed investments could divert resources from other projects, and the losses of cash flows from these other projects are opportunity costs that should be considered in decision-making. Costs should

be expressed in terms of relevant opportunity costs. An example is making investment choices in the provision of transport, where there is a (a) choice between method of transport or different routes for road and rail links, (b) engineering choice, for example between tunnels and bridges, (c) choice between approaches to improving transport, such as infrastructure investment versus improved maintenance options, and (d) choice between public and private provision, or a mixture of both.

Public and not-for-profit sector application

- 3.41 The public nature of a product or service sometimes create market distortions. For example, the value to society of clean water is greater than the price people pay. In economies characterized by price distortions, market prices can poorly reflect opportunity costs. Price distortions can be compensated for by using shadow prices that more accurately reflect the opportunity costs and benefits of a potential investment; this can be a common approach in assessing an investment project's contribution to society's welfare. In considering whether to set shadow prices, the cost of their calculation should be weighed against the benefit to the investment appraisal. For investments by donor agencies for example, typical adjustments to prices are made to the prices of tradeable goods, the exchange rate, and the wage rate.

PRINCIPLE F

A good decision relies on an understanding of both the business and an appropriate DCF methodology. DCF analysis should be considered and interpreted in relation to an organization's strategy, and economic and competitive position.

- 3.42 It is important to realize that decisions, especially those taken in a relatively high-risk environment, involve cash flow estimates based on judgement. Hard and fast cash flows do not exist. DCF analysis should probe behind cash flow estimates to understand both the nature of a positive NPV, and the source of profit over the opportunity cost of capital.
- 3.43 The NPV is only one criterion that supports an evaluation of a potential investment. It should be coupled with a review of (a) the investment's strategic importance, or (b) its alignment with the strategic themes and objectives that have been outlined in a strategic plan and/or in a balanced scorecard type framework.
- 3.44 Discussions and judgements on an organization's competitive environment and competitive position could contribute to (a) an understanding of whether an asset might be more valuable in the hands of another, and (b) highlighting significant forecasting and assumption errors. DCF analysis is most useful in evaluating an organization's strategic position so that sources of competitive advantage can be better understood. Describing competitive advantage, such as by identifying superior customer value through product attributes and price, can improve the quality and relevance of financial forecasting.

PRINCIPLE G

All assumptions used in undertaking DCF analysis, and in evaluating proposed investment projects, should be supported by reasoned judgment, particularly where factors are difficult to predict and estimate. Using techniques such as sensitivity analysis to identify key variables and risks helps to reflect worst case, most likely, and best case scenarios, and therefore can support a reasoned judgment.

- 3.45 The quality of a DCF analysis is better judged on the reasonableness of the assumptions and judgements made at the time of the analysis and the degree of discussion and support it received in the organization, rather than on whether a financial forecast was realized.
- 3.46 Assessing uncertainty involves understanding how future risks and uncertainties can affect cash flows, and therefore the choice between potential investment options. The most common way of assessing uncertainty is *sensitivity analysis*, which tests the vulnerability of options to potential events. It assesses risks by identifying the variables that most influence a potential investment's cash inflows and outflows, and by quantifying the extent of their influence. It is one of the best methods to (a) gain consensus on the underlying variables most critical to success, (b) help determine what further information could be useful in the investment analysis, and (c) help expose inappropriate projections. The usefulness of sensitivity analysis as much depends on how it is presented as on how it is conducted. It can help facilitate discussion between key stakeholders and improve communication between managers involved in the decision.
- 3.47 Distinguishing between fixed, variable, semi-variable, and semi-fixed costs helps to enhance sensitivity analysis. Therefore, thorough cost information and an understanding of the cost dynamics (for example, understanding that a cost that is fixed relative to one factor may change with another) is required to support a DCF analysis and investment appraisal.
- 3.48 Risk modelling techniques such as the *Monte Carlo Simulation* allow consideration of multiple combinations of variables. Investment options are typically affected by a range of variables, for example, market share and size, wages, revenues, prices, and assumptions about the transfer of risks. These variables are usually interrelated, so that understanding their interconnectedness can be more useful than isolating the impact of only one variable (as is the case in sensitivity analysis). Often used in simulating research and development investments, the Monte Carlo Simulation models the potential investment, specifying probabilities for forecast errors, and simulating cash flows. The complexity of such tools requires an understanding of the required data, how it is to be used in the model, and how results will be presented and used.
- 3.49 *Decision trees* facilitate the analysis of investments involving sequential decisions. They are useful in assessing situations where the probability of occurrence of particular events depend on previous events. This helps managers identify and present links between today's and tomorrow's decisions, and a strategy that could support the highest NPV.

Decision trees are also widely used to support real options analysis, as described in paragraph 3.34.

- 3.50 *Scenarios* help to consider a range of possibilities. For example, in assessing investments in emerging markets, macroeconomic variables such as inflation and interest rates, foreign-exchange rates, and growth in gross domestic product can be modeled in a range of scenarios that allows consideration of the impact on each component of cash flow such as revenue and expenses.

PRINCIPLE H

A post-completion review of an investment decision should include an assessment of the decision-making process, and the results, benefits, and outcomes of the decision.

- 3.51 Post- (investment) completion reviews facilitate organizational learning and support continuous improvement in the investment and implementation process. It assesses, after the fact, the efficiency and effectiveness of an investment appraisal, and management's decision and implementation. A post-completion review of an investment decision should include an assessment of the decision-making process, and the results, benefits and outcomes of the decision. It should also include a review of assumptions made during the decision-making process, for example assumptions on markets, technology, competition, cost of capital, etc.
- 3.52 Post-completion review/audit monitors and evaluates the progress of capital investment through comparing actual cash flows and other costs and benefits with those originally projected. Where a review cannot measure all cash flows generated by an investment project (for example where it is not possible to split the impact of a project from the remainder of an organization), relative success should be judged on a wider set of business processes or program.
- 3.53 *A complementary IMAS on post (investment) completion review* is being considered; it could include the types of review, scope, allocation of cost and process.

Appendix A – Resources

This list of resources is a brief selection of many available resources on this topic and is not intended to be exhaustive. Use the IFAC KnowledgeNet at www.ifacnet.com to search IFAC and many of its member body websites.

Selected public sector guidance on cost benefit analysis and DCF analysis

UK Government (HM Treasury guidance in its *Green Book*) <http://greenbook.treasury.gov.uk/>

Australian Government (Department of Finance and Administration) Handbook on Cost-Benefit Analysis http://www.finance.gov.au/finframework/fc_2006_01.html

The US Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs <http://www.whitehouse.gov/omb/circulars/a094/a094.html>

New Zealand primer Cost Benefit Analysis
<http://www.treasury.govt.nz/costbenefitanalysis/default.asp>

Selected reference material

Principles of Corporate Finance (2005), Richard A Brealey, Stewart C Myers and Franklin Allen, McGraw-Hill ISBN-10: 0073130826

Corporate Financial Management (2005), Glen Arnold, Financial Times/Prentice Hall ISBN-10: 0273687263

The Chartered Institute of Management Accountants Official Terminology (2005), Elsevier ISBN: 075066827X

The Real Cost of Capital: A Business Field Guide to Better Financial Decisions (2004), Tim Ogier, John Rugman and Lucinda Spicer, Financial Times Press ISBN-10: 027368874X

Fundamentals of Investment Appraisal (2000), Steve Lumby and Christopher Jones, Int. Thomson Business Press ISBN-10: 1861526075

Appendix B – Illustrative Example of Investment Appraisal Decisions Using DCF

This example illustrates three multi-period investment opportunities that are evaluated using the net present value method. For purposes of brevity, a single discount rate has been applied to all three opportunities. In reality, each opportunity might have a different discount rate or even multiple discount rates that reflect the systematic risk of the associated cash flows. A single risk-adjusted discount rate is only appropriate where a project has the same systematic risk at each point in its life. Furthermore, the assumptions used in the analysis are likely to be subjected to a method such as sensitivity analysis that recognizes the uncertainty surrounding some variables. Careful analysis of the risks associated with each opportunity is essential to good practice.

Please note that the way tax is applied in this example might not apply to all jurisdictions. Local tax arrangements should be considered.

World Corporation is a diversified company with several manufacturing plants. The company's Utopia Plant has been supplying parts to truck manufacturers for over 30 years. The last shipment of truck parts from the Utopia Plant will be made December 31, 2006. World's management is currently studying three alternatives relating to its soon-to-be-idle plant and equipment in Utopia.

1. Excel Industries has offered to buy the Utopia Plant for 3,000,000 cash on January 1, 2007.
2. Merit Enterprises has offered to lease the Utopia facilities for four years beginning January 1, 2007. Merit's annual lease payments would be 500,000 plus 10% of the gross sales of all items produced in the Utopia Plant. Probabilities of Merit's annual gross sales from the Utopia Plant are estimated as follows.

<u>Annual Gross Sales</u>	<u>Estimated Probability</u>
2,000,000	.1
4,000,000	.4
6,000,000	.3
8,000,000	.2

3. World is considering the production of souvenir items to be sold in connection with upcoming sporting events. The Utopia Plant would be used to produce 70,000 items per month at an annual cash outlay of 2,250,000 during 2007, 2008, and 2009. The Vice President of Marketing has recommended a selling price of 5 per item and believes the items will sell uniformly throughout 2008, 2009, and 2010.

The book value of the Utopia Plant as of the close of business on December 31, 2006, will be 4,200,000. World has used straight-line depreciation for all capital assets at the Utopia Plant. If the Utopia Plant is not sold, the annual straight-line depreciation charge for the plant and equipment will be 900,000 each year for the next four years. The market value of the plant and equipment on December 31, 2010, is estimated to be 600,000.

World requires an after-tax rate of return of 16% for capital investment decisions and is subject to corporate income tax rates of 40% on operating income and 20% on capital gains.

Valuation of Alternative ProposalsAlternative 1 — Excel Industries

Book value of Utopia Plant	4,200,000	
Proceeds from sale of plant to Excel	<u>3,000,000</u>	3,000,000
Loss on sale of plant	1,200,000	
Applicable income tax rate ¹	<u>40%</u>	
Decrease in income taxes		<u>480,000</u>
After-tax cash flow		3,480,000
Discount factor		<u>1.00</u>
Present value of after-tax cash flows		<u>3,480,000</u>

¹ When net losses exceed net gains, the loss is treated as ordinary income for income tax purposes; thus, the 40% tax rate is used.

Alternative 2 — Merit Enterprises

Cash flows from annual lease payments

<u>Annual Gross Sales</u>	<u>Estimated Probability</u>	<u>Expected Value of Sales</u>	
2,000,000	.1	200,000	
4,000,000	.4	1,600,000	
6,000,000	.3	1,800,000	
8,000,000	.2	<u>1,600,000</u>	
Expected annual gross sales		5,200,000	
Percentage payable to World		<u>.10</u>	
Variable portion of lease payment		520,000	
Fixed portion of lease payment		<u>500,000</u>	
Before-tax cash flow from lease		1,020,000	
Income tax (40%)		<u>408,000</u>	
After-tax cash flow from lease		612,000	
Discount factor		<u>2.798</u>	1,712,376
Depreciation tax shield			
Annual depreciation		900,000	
Tax rate		<u>.4</u>	
Income tax shield from depreciation		360,000	
Discount factor		<u>2.798</u>	1,007,280
Sale of Utopia Plant (12/31/2010)			
Estimated cash value of plant (12/31/2010)		600,000	
Gain or loss computation on sale of plant			
Book value 12/31/2006	4,200,000		
Depreciation (900,000 x 4)	<u>3,600,000</u>		

PROJECT APPRAISAL USING DISCOUNTED CASH FLOW

Adjusted basis 12/31/2006	600,000		
Proceeds	<u>600,000</u>		
Gain/loss		<u>-0-</u>	
After-tax cash flow from sale		600,000	
Discount factor		<u>.552</u>	<u>331,200</u>
Present value of after-tax cash flows			<u>3,505,856</u>

Alternative 3 — Souvenir Items

	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
Revenue (70,000 x 12x 5)	-0-	4,200,000	4,200,000	4,200,000
Annual cash outlays	<u>2,250,000</u>	<u>2,250,000</u>	<u>2,250,000</u>	<u>-0-</u>
Annual cash flows	(2,250,000)	1,950,000	1,950,000	4,200,000
Less income taxes ²	<u>-0-</u>	<u>780,000</u>	<u>780,000</u>	<u>780,000</u>
After-tax cash flows	(2,250,000)	1,170,000	1,170,000	3,420,000
Depreciation tax shield ³	-0-	360,000	360,000	720,000
Salvage ⁴				<u>600,000</u>
Net after-tax cash flows	(2,250,000)	1,530,000	1,530,000	4,740,000
Discount factors	<u>.862</u>	<u>.743</u>	<u>.641</u>	<u>.552</u>
Present value of after-tax cash flows	<u>(1,939,500)</u>	<u>1,136,790</u>	<u>980,730</u>	<u>2,616,480</u>

Net present value of after-tax cash flows:

2007	-1,939,500
2008	1,136,790
2009	980,730
2010	<u>2,616,480</u>
Total	<u>2,794,500</u>

² The income taxes should be recognized in the years in which the sales occur. The amount of tax is based on sales revenue less costs excluding the depreciation. The depreciation tax shield is shown separately; refer to footnote 3. The income tax charge is 780,000 [(4,200,000 — 2,250,000) x .40].

³ The depreciation charge would be included in the calculation of cost of goods sold. Thus, the recognition of the depreciation charge for income tax purposes in 2007, 2008, and 2009 would be deferred one year. The depreciation tax shield for 2007 and 2008 is 360,000 (900,000 x .40). The depreciation recognized for income tax purposes in 2010 would be 1,800,000 which consists of the 2009 depreciation charge included in the 2010 cost of goods sold and the 2010 depreciation charge recognized in 2010 when the plant is presumably being used as a warehouse. Thus, the depreciation tax shield in 2010 is 720,000 (1,800,000 x .40).

⁴ There is no gain or loss on the sale of the plant; thus, the cash flow is equivalent to the proceeds (see Alternative 2).



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