

Presented to the Staple Inn Actuarial Society

on 22nd October 1996

**QUANTIFYING THE SUCCESS OF A LIFE OFFICE –
COST OF CAPITAL AND RETURN ON CAPITAL**

by

Shyam Mehta

Glossary

Definitions used in this paper are as follows:

Appraisal value	The present value of projected future cash flows attributable to shareholders, assessed using a discount rate(s) appropriate to the risk profile of the cash flows.
Assessed value	The value placed on the various components of appraisal value.
Asset pricing model	A model which predicts the price of or expected return from an asset based on its risk and other characteristics.
Capital employed	Share capital and reserves, net cash flows from in-force policies, assets backing mathematical reserves, human capital as well as intangible assets such as the name and reputation of a company.
Earned profit	Value derived from one year's new business sales.
Economic profit, profit	Increase in assessed value less the amount of net capital injected.
Entrepreneurial capital	The ability of senior managers, executives and shareholders to identify and implement new types of project which enhance value, beyond those which arise in the normal course of running a business.
Equity	An ownership interest in a business, with consequent expectations of profit and assumption of risk. For a with-profit office equity is held by the with-profit policyholders as well as shareholders.
Existing structure	The existing sales and marketing infrastructure, including the effect of a company's name and reputation in the market.
Gross investor	An investor who invests his funds on a tax-free basis.
In-force business	In-force life assurance policies, together with the assets backing mathematical reserves.
Market value, value	Estimated price at which the proprietors' interest could be sold, based on a notional "willing buyer willing seller" transaction.

Net investor	An investor subject to UK corporation tax on income, and capital gains tax net of indexation relief on realised gains.
Net worth	Share capital and reserves and, for a non-profit office, long-term surplus.
Opportunity cost	An estimate of the market value achievable by reasonably efficient alternative management, who may make better or worse use of the existing corporate infrastructure than the existing management.
Opportunity cost of capital	The rate of return available on alternative investments of similar risk. It can be measured either as the expected rate of return or as the return achieved for a given period, as circumstances demand. The cost will vary depending on the tax status of the investor.
Rate of return	Economic profit divided by either replacement cost, market value or opportunity cost according to context.
Replacement cost	Estimated cost, based on the existing management and corporate infrastructure, of replicating projected future cash flows attributable to shareholders.
Required return	A rate of return appropriate to the risk profile of the cash flows being valued or considered.
Return	Depending on the context, this is synonymous with profit or with rate of return.
Systematic risk	That proportion of the variance of returns on an investment which is related to the volatility of stock market returns or other economy wide factors. The distinction between systematic and non-systematic risk is important because the effect of the latter can be eliminated through the holding of a diversified portfolio of investments.
Weighted average cost of capital	The average cost of servicing a company's issued capital (debt plus equity). The cost can be measured from the corporate perspective or from the perspective of the company's shareholders.

Abstract

Insurance company executives need to know how well their office is doing and what targets to strive for.

This paper is designed to help answer these questions, and others such as:

- What return on capital can I expect?
- What return have I achieved?
- What profit do I need in order that this project is worthwhile?

In the author's view, existing actuarial techniques enable value and value added to be measured but fail to provide a coherent framework of whether the results achieved are 'good' or 'bad', better or worse than those available on alternative investments. In practice, offices do use a variety of techniques, for example, embedded values, to help manage their business. Conclusions reached can be tested for robustness using the approaches set out in this paper.

Building Upon Success

All offices face more or less competitive environments and have concerns for their future development.

The techniques outlined in this paper can be applied, for example in :

- Management reporting and goal setting. Implementation of a measurement system such as that described here enables management to assess more effectively how units and functions are performing relative to prior expectations and relative to goals. Overall rate of return targets can be developed and efficiency standards can be set for the individual cash flows which contribute to total value.
- Designing an incentive scheme. Incentive schemes encourage the creation of wealth, through the relationship between remuneration and increase in appraisal value, through focusing on activities generating wealth and because of the improved motivation and morale that result. If necessary, values can be calculated keeping constant elements of the experience which it is felt should not impact remuneration.
- Evaluating strategic opportunities. For example, entering into or exiting from a particular distribution channel.

In developing new approaches, the author believes that there are several ingredients that need to be incorporated. Three crucial components are: need for a new methodology, robustness of the methodology proposed and communication to key decision-makers. The author hopes that he has addressed the first two aspects but recognises that more work is required with regard to communication.

To summarise, the result of using the new approaches should be an increase in the likelihood that the office will:

- manage its existing business effectively
- undertake new projects profitably
- improve motivation and morale of staff through building upon success.

Outline of Paper

The first Section of this paper is descriptive and defines success in terms of a project, division, or business which achieves a positive value net of the cost of capital invested. A number of summary management statistics are suggested to indicate whether:

- value is being created
- results exceed required returns
- returns are higher or lower than those achieved by other similar companies.

Crucial to measuring success is a careful examination of capital employed. Section two considers the types of capital employed by a life office and how monetary values, and replacement and opportunity costs, can be assigned to each.

The cost of servicing the suppliers of capital is considered in Section three. The section examines ways of assessing return requirements for corporate debt and equity generally, and also specifically for non-profit, unit-linked and with-profit business.

The final Section describes, with the aid of some numerical examples, how the increase in value can be compared with the amount of capital employed and the cost of capital, in order to develop a useable management tool. Some of the practical issues to be considered when making a decision of whether or not to invest are discussed.

Contents

Glossary

Abstract

	<u>Page Number</u>
1. Defining Success	01
1.1 Introduction	01
1.2 Success	01
1.3 Profit.....	02
1.4 Assessed Value	03
1.5 Capital Employed	04
1.6 Measures of Success	05
1.7 Conclusion.....	06
2. Capital Employed	07
2.1 Introduction	07
2.2 Net Worth	07
2.3 In-Force Business	09
2.4 Existing Structure: Replacement Cost	09
2.5 Existing Structure: Assessed Value	10
2.6 Existing Structure: Opportunity Cost	11
2.7 Entrepreneurial Capital	11
2.8 Conclusion.....	12
3. Cost of Capital.....	13
3.1 Introduction	13
3.2 Cost of Capital	13
3.3 Asset Pricing	15
3.4 Assessing the Cost of Capital	16
3.5 Insurance Business	17
3.6 Non-Profit Business.....	19
3.7 Unit-Linked Business	20
3.8 With-Profit Business	23
3.9 Conclusion.....	23
4. Quantifying Success	24
4.1 Introduction	24
4.2 Net Worth and In-Force Business	24
4.3 Existing Structure	25
4.4 Entrepreneurial Value	28
4.5 Target Profitability	28
4.6 Deciding whether to Invest	29
4.7 Managing Risk.....	30
4.8 Conclusion.....	30

Acknowledgements

References

Appendix: Implementing a Measurement System

1. Defining Success

1.1 Introduction

In order to assess success, returns to shareholders, for a proprietary office, and to policyholders, for any office, can be considered in relation to risks borne and to the amount of capital employed. The theory is developed with the interests of shareholders in mind although a similar analysis could be conducted having regard to policyholders, as discussed in 1.2 below.

This first Section defines the terms "success", "profit", "assessed value" and "capital employed" as used in this paper.

1.2 Success

The activities of a life office consist of innumerable transactions and decisions each of which contribute to "success". A business for which value generated exceeds the cost of the capital employed is termed successful.

The outcome of a transaction can be considered successful if both parties feel "better off" as a result. In practice, policyholders, shareholders and management will have different criteria for success. These may range from purely monetary criteria such as policy benefits, profits or salaries, to attributes such as size, growth or capital strength and extend to qualitative factors such as working environment, reputation or innovativeness.

Utility theory provides a general framework for measuring and comparing the relative attractions of alternative outcomes. However, it is normal and not unreasonable to restrict attention to the cash flows resulting from the transaction, to their amount and their risk characteristics. A measure of value is given by the present value of the cash flows, discounted using a risk adjusted rate of return. A successful transaction is one which achieves a positive present value. Similar observations apply in regard to successful decisions.

For a company as a whole, or a business segment, the outcome of decisions and transactions also needs to be viewed in comparative terms, for example in relation to prior expectations, or to the performance of other companies, and not just as an absolute amount. For example, the achievement of a particular level of profit in a year could be regarded as a success if better than expected or as a failure if below the level of profit attained by other similar companies.

When considering success from the viewpoint of shareholders, it is natural to examine returns and risks attributable to and borne by shareholders. This is the standpoint taken in this paper. A very similar analysis can be undertaken in order to assess returns and risks for policyholders. For example, the with-profit policyholders in a mutual office can be viewed as having a 100% ownership interest in the office in much the same way that shareholders could have a 10%, or policyholders a 90% ownership interest, in a proprietary with-profit office.

Any individual shareholder or policyholder will have his own risk and return preferences. Further, the risks and returns derived from a life office investment or policy contract will vary from person to person according to their tax position and the type of instrument or contract held. It is often convenient to derive values and measures of success for a "typical" shareholder or policyholder or to use an external benchmark, such as the risk/return profile of traded securities or the alternative investment opportunities available to policyholders. Performance can be measured and judged in terms of the return on capital employed. The numerator, profit, is considered next.

1.3 Profit

In this paper, economic profit or profit of a business segment in a period is defined as the increase in the assessed value of the business segment during the period, less the amount of net capital injected into the segment. A business segment could be any part of a company's business, for example the life assurance business in-force on a particular date, or business expected to be sold through a particular distribution outlet in the future, or it could be the whole of the company. The term "assessed value" is considered below.

This value based definition of profit leads to consistency between profit and value maximisation and is in accord with the general principles of modern financial theory. Accounting measures of profit incorporate numerous artificial and subjective elements (profit using US GAAP will be very different from profit based on UK statutory, Lifo based profit will differ from a Fifo approach, etc.) and fail to adequately account for risk and the time value of money.

Profit, that is increase in value, arises from:

- Unwinding of the discount rate(s) used to assess value at the start of a period. Values at the beginning of a period are smaller than at the end because of the effect of discounting

- Net cash flows in the period to the extent that these differ from the expected cash flows used to assess value
- Changes in expectations of future cash flows, since this affects the value at the end of the period
- Variation in the discount rate(s) used to assess value at the beginning and end of the period.

Management is unable to influence the first of these four factors but exerts a greater or lesser degree of control over the remaining three factors. The first factor represents the reward to proprietors for forgoing consumption opportunities and for bearing risk. Variations in value arising as a result of the last three factors are unanticipated and occur because future cash flows and rate of return requirements are uncertain.

1.4 Assessed Value

The proprietors of a company value the future cash flow or other benefits arising from their interest in the company. The value of the company to them is at least as high as its "market" value, as otherwise they would presumably dispose of their interest. Market value is taken to equal the price at which the proprietors' interest in the company could be sold. In assessing the value of the proprietors' interest it may be appropriate to have regard to the possible sale price, and to alternative opportunities for the investment of their capital. The traded securities markets provide benchmarks of value against which the risk/return trade-off underlying any investment or sale can be assessed. This aspect is considered further in Section 3.

Generally, assessed value will differ from market value for a variety of reasons, even if an essentially market valuation basis is used to value the underlying cash flows. To take just two examples, a detailed appraisal may incorporate information unavailable to participants setting market values, and any bid premium embedded in market prices may be excluded. In the author's view, assessed value is a particularly valuable concept if made specific to a transaction or potential transaction. For example, one could refer to the assessed value to a particular investor of a specific shareholding in the company, or to existing investors as a whole.

1.5 *Capital Employed*

The capital employed by a life office in the running of its business includes not just share capital and reserves, but also assets backing the mathematical reserves, future premiums expected from existing policies, human capital as well as intangible assets derived, for example, from historic successful marketing efforts.

The monetary value or cost of this capital can be quantified:

- **Historic Cost.** This is the sum of past shareholder capital injections and earnings retained within the company.

The definition of retained earnings is a matter for debate. Should the effect of establishing actuarial or accounting reserves and provisions be considered? If reserves are taken into account, how can the effect of differing reserving strengths be allowed for? In the author's view, historic cost accounting conventions are necessarily arbitrary to a greater or lesser extent. They are not considered further in this paper.

- **Replacement Cost.** This is the estimated cost, based on the existing management and corporate infrastructure, of replicating projected future cash flows attributable to shareholders. For new projects, replacement cost is the same as cost. Estimating replacement cost is useful because it provides a guide as to whether it is cheaper to develop in-house or to buy externally and whether value would be created. If assessed value exceeds replacement cost management should consider investing in other similar projects with a view to generating additional value. However, disinvestment is not necessarily always appropriate if replacement cost exceeds assessed value. In either case, investment or disinvestment, a detailed risk/return analysis is required.
- **Assessed Value.** This is defined here as the value placed on the proprietors' interest in projected future cash flows. With suitable choice of assumptions, an assessed value may form a reasonable proxy for market value. In particular, for quoted securities, proprietors may choose to value their investments at market value. Assessed value provides proprietors with a benchmark with which to evaluate alternative business opportunities for the purpose of maximising wealth.

An office which achieves an increase in assessed value in a year greater than that implied by the discount rate used to determine assessed value has had a successful year relative to prior expectations.

- **Opportunity Cost.** This is defined as the assessed value achievable by alternative management who may make better or worse use of the existing corporate infrastructure than the existing management. A consideration of the value/capital relationships achieved or achievable by reasonably efficient alternative management is particularly useful. Opportunity cost measures are useful to management because they provide an indication of the value that competitor firms are achieving for a given level of resources.

1.6 Measure of Success

Management is creating shareholder value if it achieves an assessed value in excess of the amount they would require to replace the structure, and is more successful than its peers if it achieves assessed value in excess of opportunity cost. The ratios of assessed value to replacement and opportunity costs are therefore important indicators of corporate efficiency.

Overall Guide to Corporate Efficiency	
Management is Adding Value	<div>Assessed value</div> <div>----- > 1</div> <div>Replacement Cost</div>
Management Success, Relative to its Peers	<div>Assessed Value</div> <div>----- > 1</div> <div>Opportunity Cost</div>

Success in relation to a particular period of operation can also be measured as a rate of return:

- **Replacement Cost Return.** A ratio of profit to replacement cost in excess of the required return for the business segment is indicative of a management which is creating value.
- **Assessed Value Return.** If the ratio of profit to opening assessed value exceeds the required return, the result of trading activity in the period has been favourable relative to prior expectations.
- **Opportunity Cost Return.** The ratio of profit to opportunity cost provides an indicator of whether shareholders are achieving higher or lower returns compared to those achieved by management's of other similar companies.

Replacement Cost Return	
Management is Adding Value	Profit ----- > Required Return Replacement Cost
Assessed Value Return	
Results are Better than Expected	Profit ----- > Required Return Assessed Value
Opportunity Cost Return	
Shareholders' Returns Higher than Achieved by other Companies	Profit ----- > Alternative Achieved Return
	Opportunity Cost

In the next Section the various types of capital employed by a life office are explored in more detail.

1.7 Conclusion

Profit has been defined here as the increase in assessed value, net of capital injected into the business during the period. Success is measured in relative terms, based on profit compared with the cost of capital or value compared with capital employed.

2. Capital Employed

2.1 Introduction

Life companies possess a variety of types of capital:

- Share capital and reserves and, for a non-profit office, long term surplus ("net worth")
- The in-force policies and assets backing mathematical reserves ("in-force business")
- Goodwill arising from historic successful marketing activity and associated with sales activity ("existing structure")
- Entrepreneurial capital.

A monetary value can be placed on each of these types of capital, and replacement and opportunity costs assessed, in order to measure success.

2.2 Net Worth

This is defined here as the excess of the market value of assets over liabilities in the other than long term funds, for example in the shareholders' funds. For a non-profit office surplus held in the long term fund can also be included since all such surplus is ultimately being used for the benefit of the proprietors.

Net worth may need to be adjusted when calculating assessed value, and the replacement or opportunity cost:

- The tax treatment of the life office investment returns derived from the assets backing net worth may differ from the basis implicit in the market valuation of similar quoted securities.
- A discounted cash flow valuation is also appropriate for assets bearing a below market return and to allow for investment costs or other expenses borne by shareholders. For example, consider a fund size related fee of $\frac{3}{4}\%$ pa deducted from assets yielding 5%. The value of assets yielding $4\frac{1}{4}\%$ pa is 85% of the value of a similar income stream of 5% pa and the application of a 15% discount to face value is then warranted.

It is interesting to note that investment trusts typically trade at significant discounts to the market value of their underlying assets, perhaps in part reflecting the level of investment expenses (as discussed in Mehta et al. (1996)).

- A stochastic projection, allowing for the possibility of losses from the in-force business, may suggest applying a discount. This is because, in the absence of net worth, the losses may be borne by policyholders (or by the rest of the life industry, as a result of the Policyholders' Protection Act!). The value derived by shareholders from the assets backing net worth differs from similar assets held directly because the former are subject to insurance risk. In taking this view, one needs to be careful not to double count risk, as the value of the in-force business should also be assessed net of an allowance for insurance risk.

The factors listed above are likely to support a discount rather than premium. However, other factors may support a premium:

- A company with high net worth is generally "safer" and may be able to transact its business (with its bankers, staff, policyholders, reinsurers, agents or intermediaries) on finer or more favourable terms.
- Illiquid assets may be stated at a premium to market value if the investor does not require marketability from these assets.
- If future new business is profitable, a high net worth may help to ensure that this source of value is not lost in the event of adverse developments on the in-force business.

It is, of course, necessary to ensure that the value placed on net worth is consistent with the value placed on the remaining elements of capital employed. Not all of the factors may be appropriate for all of the bases. For example, some clear thinking will be required when assessing which of the discount and premium factors should be taken into account in a replacement or opportunity cost valuation. These bases of valuation are considered further in the next few Sections.

2.3 *In-Force Business*

Generally, appraisal value and asset pricing techniques can be applied in order to assess the value of the shareholders' interest in the in-force business of a life office.

Some modification to assessed value may be appropriate for a replacement or opportunity cost basis of valuation. Consider an office which is able to recruit additional salesmen at a total cost of £1 million in order to generate product cash flows with a risk adjusted present value of £2 million. The replacement cost in-force value is 50% of its assessed value.

An alternative management may be able to administer the in-force business more or less efficiently than the existing management and accordingly an opportunity cost estimation of value may differ from assessed value.

2.4 *Existing Structure: Replacement Cost*

Existing structure value, that is the value of future new business, arises particularly from:

- the sales ability and product development of a company
- a company's name and reputation in the market.

The product development, sales and marketing function can be analysed with a view to assessing replacement cost connected with:

- recruitment and training of sales agents, managers and inspectors
- establishment of a branch office network and the supporting head office functions
- development of the marketing and training infrastructure, and of the product development skill set.

In addition, the cost of attaining the company's position in the market can be assessed by determining the:

- premium rate subsidy or additional commission required to gain market share
- advertising and marketing needed to develop name or product awareness

- other marketing attributes needed, for example reputation for efficient servicing and good investment performance.

Some offices may employ a significant level of capital and surplus in support of their new business sales and marketing activities. This capital facilitates sales, in that potential customers and also brokers will be more prepared to place business with a company which is seen to be financially strong. This source of value will already be reflected in the assessment of replacement costs since the latter depends on sales volume. The value of the capital can therefore be assessed using the considerations outlined in 2.2 and 2.3 above.

In practice, the quantification of replacement cost of existing structure (as also the estimation of assessed value or opportunity cost) is necessarily somewhat subjective. Despite this, reasonable working rules of thumb can be established in order that realistic business planning and goal setting can be achieved. A pragmatic view is needed when running any business: the author believes that good decision making often requires taking a reasoned view, and therefore consideration of replacement cost issues is one externally based logical framework which merits investigation.

2.5 Existing Structure: Assessed Value

The value of future new business is often calculated by assessing the value of one year's new business, projecting this forward allowing for new business growth and then discounting the series back to the valuation date using a risk rate of return. The discount rate used prior to the point of sale differs from the rate used to assess value once the business has been sold, in recognition of the different levels of risk borne once a contract is in-force compared with the risk of not achieving the projected volume and profitability of new business. The analysis of risk can be taken a stage further, if it is recognised that:

- new business acquisition overhead costs are not subject to the same degree of sales risk as new business sales, and
- first year lapse risk affects gross product margins but not initial expenses.

This analysis suggests that four discount rates can be used to assess existing structure value; rates to allow for the riskiness of:

- profit margins from the point of sale, that is once the business is on the books but in respect of cash flows arising in the future

- future acquisition overhead costs, discounting between the valuation date and the point of sale
- initial costs not recouped on early lapse
- achieving gross, pre acquisition cost, profit margins prior to the point of sale.

A numerical example illustrating the approach is set out in 4.3; the underlying rationale is explored in detail in Mehta (1992).

2.6 Existing Structure: Opportunity Cost

The opportunity cost of existing structure can be assessed by considering the values of comparable sales and marketing infrastructures. In some circumstances it may be appropriate to also examine liquidation values or the values which might be obtained if the company were to be broken up into its constituent parts. The opportunity cost will differ from assessed value, depending on differences in productivity, cost structure, and in the variability of sales. Values can be gauged by analysing market prices of appropriate quoted companies, and prices paid for insurance company acquisitions. Appraisal value techniques as outlined in 2.5 can also be used.

2.7 Entrepreneurial Capital

The shareholders, executives or managers of a company create value by identifying and undertaking projects which generate positive shareholder value. Such projects have a positive net present value when evaluated using a rate of return corresponding to the level of risk resulting from the project.

It is convenient to distinguish between investment required to maintain in-force business value and the real earnings capability of the existing structure, and out of the ordinary investments which could not reasonably be anticipated in the normal business plan.

For example, a company which is expanding its sales force will incur additional recruiting, training, marketing and other costs. Such costs can be excluded from ordinary expenses incurred in the year and set off against the value expected to be generated. However, this is a planned activity and the resulting value needs to be included in the calculation of existing structure value. The taking advantage of an opportunity, for example the purchase of a sales force at a discount, generates “entrepreneurial” capital and the expectation that shareholders will benefit from similar or other opportunities in the future. Entrepreneurial capital arises from an expectation that executives will seek out opportunities beyond those that arise in the normal course of running a business.

2.8 Conclusion

The capital employed in a life office consists of both tangible and intangible assets. These assets generate value which can be measured using market value estimation, appraisal value and asset pricing techniques. This value can be compared with replacement and opportunity cost, in order to quantify value being added by management.

3. *Cost of Capital*

3.1 *Introduction*

The cost of capital is the cost of servicing the suppliers of capital. This cost can be measured both from the point of view of the company issuing the capital or from the viewpoint of the proprietors of the company. Different types of insurance business have different risk characteristics and need to be considered separately. Capital tied up in insurance business generates future cash flows. Discounting these cash flows using the cost of capital corresponding to their risk characteristics results in a value at which investors can earn appropriate risk rates of return.

3.2 *Cost of Capital*

A common method of assessing return requirements is to compute a company's "weighted average cost of capital", as set out in Copeland, Koller & Murrin (1995). For example, consider a company which has a target level of debt of 30% of its total capital. Its debt costs 10% pa to service and the company assesses the total rate of return on its shares (net dividend plus capital growth) at 14% pa. Its after tax weighted average cost of capital can be computed as follows:

Cost of Capital - Company Standpoint

	Capital Base (Market Value)	Servicing Cost % pa	Tax Relief %	Cost of Capital % pa
Debt	30	10.0	33	6.7
Equity	70	14.0	0	14.0
Total	100			11.8

The cost of capital can also be adjusted to reflect the tax position of the underlying shareholders in the company.

Consider two investors, a gross pension fund and a net corporation. The gross fund recovers tax credits on the dividend payments (1% pa if the gross dividend is 5% pa and lower rate of income tax is 20%). The net investor pays corporation at say 33% tax on the indexed gain - if the indexation allowance is 5% pa, the indexed gain could average 5% pa (15% pa gross return less 5% pa dividend component less 5% pa indexation) and tax payable would be 1.7% pa. The cost would then be calculated as:

Cost of Capital - Underlying Shareholder Standpoint

	Capital Base (Market Value)	Net Investor % pa	Gross Investor % pa
Debt	30	6.7	6.7
Equity	70	12.3	15.0
Total	100	10.6	12.5

The return requirement on a project with similar risk to that for the company as a whole can be assessed using either basis. Appropriate allowance for tax in determining project returns needs to be made:

Assessment of Project Value

Basis of Measurement of Capital Cost	Allowance for Tax in Calculating Net Cash Flows
Weighted average	Corporation tax only
Weighted average (net investor)	Corporation tax plus allowance for tax on indexed gains
Weighted average (gross investor)	Corporation tax less allowance for the tax credits reclaimed on dividend payments

Whichever approach is used, the cost of total capital is likely to vary over time along with changes in the expected costs of servicing the debt and equity capital.

For any individual project, use of the total company cost of capital may be inappropriate because project risk is likely to differ from the riskiness of the company as a whole. The average cost of capital will change if projects of differing risks are undertaken and this change needs to be attributed back to the individual projects. The process required to do this is discussed further in the next Section.

It should be noted that the cost of capital may not necessarily vary with corporate structure. A company with a higher level of debt will have higher debt and equity percentage servicing costs (other things being equal) because, with the higher gearing, risk for both the debt and equity holders has increased. However, the average cost may not change:

Corporate Financing Structure

	Company A		Company B	
	Capital Base	Cost of Capital % pa	Capital Base	Cost of Capital % pa
Debt	30	6.7	40	6.8
Equity	70	12.3	60	13.2
Total	100	10.6	100	10.6

The total company risk has not changed. The main risk is borne by the smaller base of shareholders and there has been a small transference of risk to the holders of the corporate debt. In practice, the average cost of capital may vary with corporate structure, for example because of tax effects. Standard textbooks on finance set out formulae required to allow for tax, and discuss the detailed issues behind the corporate financing decision (for example, a good guide to the practical issues is provided by Copeland and Weston (1988) and by Bennett Stewart (1991)).

3.3 Asset Pricing

To assess the cost of capital for an individual project or asset it is normal to use an asset pricing model. These models relate project required returns to project riskiness by comparison, for example, with the risks and returns available from marketable securities.

There are in fact many different asset pricing models. These allow the value of an asset to be assessed, given a knowledge of the underlying cash flow distribution, and, in particular, its risk profile.

For example, the Capital Asset Pricing Model, CAPM, postulates a relationship between risk and return for any asset. Total risk is measured by the variance of returns on the asset. Under CAPM, risk is divided into a "systematic" component, being that part of return variability which is related to movements in an index of market returns, and an unsystematic

component of diversifiable risk. The return expected from an asset is related to its systematic risk so that an asset which is uncorrelated with the market index (its beta factor equals zero) will be priced to provide investors with a return equal to that on a risk free asset. An asset which is perfectly correlated with the equity market index but has only half the variability of this index will have a beta factor of one half and will provide an expected return in between the risk-free rate and the expected return on equities.

Unsystematic risk diminishes to zero for an investor who has a diversified portfolio of investments. Accordingly, under CAPM, such risk is not associated with an additional return requirement.

Some cash flows have a non-symmetric distribution of possible outcomes. For example, the cash flow on a corporate bond at maturity is normally its face value but could be less in the event of default. The existing structure value of a life office could be substantial but for many reasonable management decisions will have a floor at zero. Option pricing theory is needed to value such cash flows if they are subject to systematic risk - standard CAPM and net present value analysis cannot be used.

This paper does not discuss the asset pricing process in detail but assumes that a model or valuation method is available and utilised, or that an approximate method is used. The process will define the "required" rate of return for any cash flow. A detailed description of how life office cash flows can be valued is set out in Mehta (1992). Bride and Lomax (1994) discuss the valuation of non-life cash flows. Smith (1996) and Mehta et al (1996) sets out how financial theory can be used in the context of valuing unit trust and PEP business cash flows.

3.4 Assessing the Cost of Capital

For "simple" assets and liabilities, ones which resemble debt or equity securities or a combination of both, discount rates can be assessed by interpolation between the cost of debt and the cost of equity capital. Approximate techniques can be used for more complex assets. For example, consider the future premiums arising from the in-force business of a life office. The premiums based on expectations of future lapse rates and mortality can be projected and

compared with the coupon and maturity payments from bond investments of similar term. However, the premiums are not certain because of the possibility of unexpected variations in lapse and mortality rates. An order of magnitude estimate of the discount rate required to value the future premiums can be found by assessing the standard deviation of unexpected variations in lapse rates. The following table illustrate this based on a standard deviation of 1% and observing that the value of the premium asset reduces by 1% for each 1% increase in the lapse rate.

Approximate Assessment of Discount Rates

Asset	Standard Deviation of Cash Flow % pa	Excess Return Compared with Bond Investment % pa	After Tax Discount Rate % pa
Equities	15	5.6	12.3
Bonds	0	0	6.7
Premium asset	1	0.4 (= 5.6/15)	7.1

As an alternative to applying an approximate method such as suggested above, one of the standard asset pricing models can be used.

3.5 Insurance Business

The techniques described briefly in the preceding sections can be applied to assess the cost of capital for insurance business. Although the net future cash flows generated by life assurance products have typically rather complex risk characteristics, the individual cash flows making up the net cash flows are generally simpler. Because of this it is easier to assess the cost of capital for the individual components rather than for the overall net cash flows, for which there are no equivalent traded securities and therefore no means of assessing their value. Incidentally, it is important to note that the key driver in the valuation process is cash flow, rather than distributable profit. As implied by Modigliani & Miller (1958), distributable profit is distorted by accounting (or actuarial) conventions and has only second order (for example, tax) effects on value.

Once the cost of capital has been assessed, it is possible to value the individual components of cash flow and then add them together in order to determine total in-force value or profitability.

Life assurance business written in the UK can broadly be divided into three categories:

- Non-profit business. Shareholders assume all risks, and payments to policyholders are guaranteed
- Unit-linked business. Shareholders assume certain risks; other risks (for example investment risks) are borne by policyholders. Profits not contractually accruing to policyholders accrue for the benefit of shareholders who therefore have a 100% "equity" interest in the business, as for non-profit products
- With-profit business. Profits are distributed via the bonus mechanism, with transfers to profit and loss generally determined as a proportion of surplus arising. Shareholders have a partial interest in the equity of the business, and share risks and returns with the with-profit policyholders.

The following Sections illustrate the approach for each of these businesses. A detailed methodology is set out in Mehta (1992).

3.6 Non-Profit Business

Consider as an example an office writing non-profit endowment assurances. The cash value scales are not guaranteed but are not expected to change because the interest basis is set on a sufficiently conservative basis. In the following table, separate costs of capital are assigned to the individual elements of cash flows:

Cost of Capital for Existing Non-Profit Business

Cash Flow	Comment	Cost of Capital * % pa	Discounted Value of Expected Cash Flows
Investment returns	Corporate bonds yielding 10.5% pre tax (7.9% investment return net of "I-E" tax at the policyholders' rate)	7.0	1,000
Future premiums	Fixed payments	6.7	2,000
Maturity proceeds	Guaranteed payment	6.7	(2,000)
Maintenance expenses	Expenses net of tax relief	6.7	(200)
Death benefits	Guaranteed payments	6.7	(300)
Surrender benefits	Guaranteed payments	6.7	(1,000)
Reserve movements	Reserves backed by assets	7.0	1,000
Total	Approximate equivalent aggregate cost of capital	7.9	500

- * Illustrative rates for a net investor. The equivalent aggregate rate is the return which equates the overall assessed value of 500 to the present value of the future net cash flows.

In practice the assessed costs of capital may need to be adjusted to reflect factors such as:

- The term structure of interest rates
- Lapse and mortality risks (see 3.4)
- Inflation risk - expenses may need to be discounted at a lower rate than fixed payments since the latter vary in real terms and are more risky.

These adjustments are likely to be relatively small; the main factors which will dominate the selection process are:

- Whether a net or a gross investor assumption is adopted (the table assumes net).
- The investment policy likely to be adopted - this will determine the investment returns expected and also the cost of capital selected to value these returns.
- Irrespective of investment policy, the life office will need to meet its policyholder and other obligations. The cost of capital required to value these payments will be only fractionally higher than the rate required to value high quality bonds of similar term. A substantial risk premium, as for a low rated corporate bond, is unlikely to apply because of the strength of the Appointed Actuary system in the UK - reserves are likely to be established at a level which will ensure that the life office will be able to honour its promises.

3.7 Unit-Linked Business

For unit-linked products, shareholder profits can be assessed as the sum of:

- Premium margins. The portion of future premiums not allocated to the unit funds is an asset, with an opportunity cost close to a bond rather than equity rate of return.
- Expense and mortality margins. Expense and mortality charges need to be considered together with the corresponding costs, unless variations in costs will not be reflected in charges. Generally, systematic unexpected variations in these items are relatively small compared with the risks incurred by investing in equities.

- **Unit fee income.** For a typical unit-linked contract, there is a management charge levied periodically on the amount of the unit fund. The amount of the charge depends on the value of the unit fund, which builds up as premiums are allocated, and varies in line with the value of the underlying investment portfolio. The unit fund can be treated as a series of unit funds, one for each premium payment. The +charge for each of these funds is exposed to risk from fluctuations in the value of the investments from the date of allocation of the premiums but to only risk of non-payment of premiums, prior to unit allocation. Typical profit-test systems need to be modified if this two-tier discount rate is used to calculate the value of the unit charge. Alternatively, an approximate aggregate discount rate can be selected. For example, if the bond rate is 6.7% pa and the discount rate corresponding to the riskiness of the asset portfolio is 11% pa, the cost of capital for the unit fee income asset could average 9% pa.
- **Lapse profits.** An increase in ultimate lapse rates will have an effect on the amount of the surrender benefits paid and on the excess (or shortfall) of the benefit relative to the accumulated fund. There may be some correlation between the amount of the excess payment and the lapse rates. For example, a stock market fall may result in a reduction in unit fund values, a corresponding reduction in the surrender value penalty if this is expressed as a proportion of the unit fund, as well as an increase in the lapse rates. This correlation needs to be taken into account when assessing the cost of capital attributable to the lapse profit asset. The simplest approach for this is to assess the reduction in the value of the lapse profit asset for any given reduction in stock market levels, so that a comparison of riskiness can be obtained. For example, if a market fall of 15% results in a reduction in lapse profit value of 10%, the cost of capital for this asset can be assessed as two-thirds (10/15) in between the bond (6.7% pa) and equity (12.3% pa) rates, that is 10.4% pa.
- **Tax.** Life offices in the UK are charged tax on life business investment income and chargeable gains less expenses, and on pension business profits. For life business, a higher rate of tax generally applies to taxable income which is covered by shareholder profit arising. For life business unit-linked policies it is normal to recoup a part or all of the tax liability, by making a "tax" deduction from the unit funds based on the amount of investment income and gain credited to these funds. The cost of capital for the resulting net tax asset or liability can be found by using the costs of capital ascribed to the underlying investment income (9% pa) and the expenses (6.7% pa). Tax payable on profit needs to be allowed for by scaling back the various elements of profit noted above.

- Non-unit reserves and surplus. Assets which back non-unit reserves and surplus generate after-tax investment income and gains. The cost of capital for these depends on their riskiness, as discussed previously.

The following table brings together these elements of profit for two types of unit-linked product, a regular premium endowment plan and a single premium investment bond.

Cost of Capital for Unit-Linked Business

Cash Flow	Cost of Capital* % pa	Discounted Value	
		Regular Premium Endowment	Single Premium Bond
Premium margins	6.7	100	0
Sterling investment income less tax	7.0	40	0
Policy fee	6.7	100	0
Mortality charge	6.7	50	0
Unit fund fee	9.0	0	300
Expenses less tax relief	6.7	(200)	(200)
Mortality cost	6.7	(40)	0
Surrender penalty	10.4	100	100
Sterling reserve movements	7.0	50	0
Total		200	200
Equivalent aggregate cost of capital, %pa		8.7	12.0

* Illustrative rates for a net investor.

In the table, the costs of capital are shown illustrated for a net corporate investor. The equivalent aggregate cost has been calculated as a weighted average rather than as an internal rate of return. It can be seen that the equivalent aggregate cost of capital can vary widely depending on product structure and the pattern of future cash flows.

3.8 With-Profit Business

With-profit business in the UK has many complex aspects, but its essential features are relatively straightforward. Premium income and investment returns are used to meet guaranteed benefits, expenses and commissions with the balance available for bonus distribution and transfer to profit and loss. The following table illustrates how the aggregate discount rate for net cash flows relates to the cost of capital for the individual cash flows:

Cost of Capital for Unitised With-Profit Business

Cash Flow	Cost of Capital * % pa	Discounted Value of Future Cash Flows
Investment income and reserve movements	11.0**	2,000
Premium income	6.7	3,000
Guaranteed benefits and non-bonus surrender payments	6.7	(3,000)
Expenses, commissions	6.7	(200)
Bonus/P&L loading	11.5	1,800
P&L transfers	11.5	180

* Illustrative rates for a net investor.

** After tax rate of return on the asset portfolio.

3.9 Conclusion

The risk profile of individual cash flows can be compared with that for quoted securities in order to determine estimates of the cost of capital for insurance business.

4. Quantifying Success

4.1 Introduction

The increase in assessed value during a year, together with information on replacement and opportunity cost, can be analysed in order to assess 'success'.

4.2 Net Worth and In-Force Business

The percentage change in assessed value of the share capital and reserves and the in-force business can be compared with the discount rate used in the calculation of value, as in the following table:

Successful Management of Net Worth and In-Force Business

		Net Worth	Business In-Force at t-1
A.	Assessed value at t-1	100	1,000
B.	Surplus arising in t	(100)	100
C.	Dividend paid at t	100	-
D.	Assessed value at t	110	1,050
E.	Economic profit, D-A+B-C	10	150
F.	Achieved return, E/A	10%	15%
G.	Required return	9%	13%
H.	Excess return, F-G	1%	2%
I.	Absolute excess return, A x H	1	20
J.	Opportunity cost at t-1	100	1,250
K.	Opportunity cost return, E/I	10%	12%
L.	Return achieved by competitors	9%	14%
M.	Excess return, K-L	1%	(2%)
N.	Absolute excess return, J x M	1	(25)

In the table, the value of net worth at t-1 was assessed at a risk rate of 9% and the value of the in-force business at 13%. Profit achieved of 160, (row E), exceeds the amount based on an unwinding of the risk rate, 139 (rows G times A). In other words, values have increased more than expected and the company has had a successful year.

The opportunity cost value of the in-force business at t-1 was assessed at 1,250, higher than 1,000 because a detailed investigation demonstrated that other companies achieve a higher level of profitability from the existing business than expected to arise for this company, and that this higher level of profitability could be attained. The profit for the year is 24 short of the return achieved by other companies (row N).

Further analyses can be undertaken to divide the in-force business into lines of business, and to apportion the excess return between, for example, investment, expense, mortality etc. This analysis will feed back into the experience analyses used as input into the appraisal value assumptions. Maximum benefit from the detailed line of business breakdown is obtained if accompanied by an investigation into risk. For example, the existence of overhead costs introduces a level of gearing into the variability of overall results. Such costs can be treated separately, as a separate line of business with a low required rate of return (corresponding to their low systematic variability).

4.3 Existing Structure

The return from the sales and marketing activity in the year is the increase in existing structure value plus the increase in in-force value attributable to new business.

As an example, consider a company with a total sales force of 1,000. The cost of developing (replacing) a sales force of this size could amount to £20 million. Allowing for other costs required to support the sales effort, the total capital needed to build a life operation with a sales force of 1,000 may be of the order of £25 million. Net of tax relief this amounts to say £20 million.

The assessed value of the existing structure, that is the present value arising from future expected new business, is £42 million, derived as follows:

Assessment of Existing Structure Value

	Contribution to Profit	Discount Rate	Growth	Multiplier	Existing Structure Value
	£m	% pa	% pa	x	£m
Earned profit gross of initial expenses	16	12	5	14.3	229
Marginal initial expenses	(10)	11	5	16.7	(167)
Acquisition overhead costs	(1)	9	4	20.0	(20)
	5	17.1	5.2	8.4	42

In the table the multipliers were assessed as the present value of an infinite series of 1 per annum, increasing at the growth rate specified and valued using an illustrative discount rate which reflects riskiness of the series of payments. The net cash flows have a higher level of risk than the individual components, resulting in an overall multiplier lower than might otherwise be expected. To the extent that downside risk is limited by an ability to cease writing new business, existing structure value contains an option like component which may necessitate using option pricing theory. A more detailed analysis is set out in Mehta (1992).

An investigation of the productivity levels and cost structure of other similar sized sales forces suggests that a 10% productivity improvement with an increase in marginal initial expenses of 6% may be attainable. Applying these increases gives rise to an assessment of opportunity cost of £55 million ($229 \times 1.1 - 167 \times 1.06 - 20$) and an annual earned profit of £6 million. The implied aggregate discount rate reduces from 17.1% pa to 16.1% pa as the multiplier increases with the improved cost structure.

If the assessed value is calculated at both the beginning and end of the year, the following table of return on capital can be constructed:

Successful Management of Existing Structure

		Earned Profit Gross of Initial Expenses	Marginal Initial Expenses	Acquisition Overhead Costs	Total
A.	Assessed value at t-1	229	(167)	(20)	42
B.	Earned profit in year	17	(11)	(1)	5
C.	Assessed value at t	250	(190)	(20)	40
D.	Economic profit, C-A+B	38	(34)	(1)	3
E.	Achieved return, D/A	17%	20%	5%	7%
F.	Required return	12%	11%	9%	17%
G.	Excess return, E-F	5%	9%	(4%)	(10%)
H.	Absolute excess return, A×G	11	(16)	1	(4)
I.	Opportunity cost at t-1	252	(177)	(20)	55
J.	Opportunity cost return, D/I	15%	19%	5%	5%
K.	Return achieved by other companies	13%	11%	9%	21%
L.	Excess return, J-K	2%	8%	(4%)	(11%)
M.	Absolute excess return, I×L	5	(14)	1	(8)
N.	Replacement cost at t-1	-	-	-	20
O.	Replacement cost return, D/N	-	-	-	15%
P.	Excess return, O-F	-	-	-	(2%)
Q.	Absolute excess return, N×P	-	-	-	(0)

Economic profit in the year, £3 million, is £8 million short of the opportunity cost requirement. The shortfall arose primarily from an expectation of higher marginal initial expenses in the future, offset by an expectation of improved future productivity.

The valuation of existing structure is necessarily something of an art and somewhat subjective but analysis along the lines suggested can be used to gain a deeper understanding of the types of risk to which existing structure is subject. Reasonable measures of value can be developed so that success attributable to sales and marketing activities can be gauged.

4.4 Entrepreneurial Value

Replacement cost returns are often a guide to the value generated from new capital investment in the company. They do not, however, replace the need to analyse expected returns and risks, compared with required returns, from new capital investments in specific business opportunities. As noted before, the value generated from such opportunities represents the "entrepreneurial" contribution to corporate value.

In an efficient market, differences between replacement cost, market value and opportunity costs are likely to be relatively small. Entrepreneurial value is also likely to be small. Although an analysis of excess return on entrepreneurial value can be undertaken as in 4.2 and 4.3, it should be recognised that the achievement of positive entrepreneurial values is itself a mark of success.

4.5 Target Profitability

The analysis set out in 4.3 can be turned around to answer the question, what level of new business profitability should be targeted?

To achieve an opportunity cost existing structure value of £55 million, based on sales growth of 5% pa, requires an earned profit of £6 million per annum, or £7 million before overhead expenses. In this example, initial commissions based on 100% of the LAUTRO indemnity commission scale could amount to £15 million per annum. The company would need to achieve profitability of 40% of LAUTRO indemnity commissions (47% before overhead costs) in order to attain full value from the capital it employs.

4.6 Deciding Whether to Invest

Future revenues and profit depend on the detailed decisions which are made. For example, volumes of sales will depend on price and the marginal value added will vary according to the decisions taken.

Example: The Sales Volume/Price Relationship

Decision	Do	Redesign	Increase
	Nothing	Product	Price
A Price	100	100	110
B Volume	1,000	1,200	600
C Value of future gross margins less variable costs	10	10	20
D Project costs	-	1,000	500
E Marginal value added, B x C - D	10,000	11,000	11,500

Sometimes the 'do nothing' decision is the least risky and the option which requires the least (for example, zero) investment in time and resources. Risk in this sense relates the relative certainty of the distribution of future outcomes compared with the alternatives of changing the product design or price. Even though other options may provide higher expected values with no difference in systematic risk, there are practical reasons to assign some utility to a decision which provides relative certainty. Comparisons between alternatives are also made difficult because the decision to invest may result in a loss of flexibility. Doing nothing keeps open the possibility that advantage can be taken of any even better opportunities which emerge over time, and of more information which emerges about existing opportunities.

Traditional net present value analysis cannot be used to assess the value of flexibility, nor more generally, where the distribution of possible results is non-symmetric and where systematic risk factors are present - option pricing theory is needed and the reader is referred to Dixit & Pindyck for a detailed analysis of a variety of practical investment decisions.

In the absence of a detailed analysis of the value of flexibility using option pricing theory, the approach adopted by most businesses is to use a "low" payback period or "high" discount rate when considering the option to invest. Not only does this indirectly allow for the value of the option to wait and monitor developments but also for the wide range of risks and pitfalls which may not be foreseen when assessing the project. A naive observation that this discount rate is too high may simply result from omitting to take account of the option value, or of the high gearing effect of project costs on whether net revenue is achieved.

4.7 Managing Risk

This paper has focused on the measurement methodology needed by a life office in order to optimise management decision taking. There is another aspect which also needs to be considered. Management's need to examine and measure company risk in order that risk can be controlled and capital set aside to ensure solvency. The risk measurement process will involve the building of a detailed company level cash flow model allowing for the individual cash flow interrelationships and characteristics. For example, a "value at risk" model could be determined to assess the frequency distribution of large losses, as commonly used by the investment banks. This distribution would be used to gauge suitable capital requirements, alongside other factors such as market norms, regulatory standards and the cost on benefit of holding spare capital.

Ideally, the frequency distribution could be divided into two components, one representing losses arising from systematic economy wide factors and the other random fluctuations unrelated to market movements. Under standard asset pricing theory very different risk/return relationships apply to these two types of risk and the types of insurance or derivatives protection which could be used to minimise losses will also vary.

Having identified and studied risk characteristics and capital requirements, and introduced control systems, management may also wish to limit the types or magnitude of certain risks, or accept more risk if there is a favourable opportunity. In the current environment there are a range of regulatory and tax risks which need careful consideration and treatment.

The subject of managing risk is not considered further in this paper.

4.8 Conclusion

The increase in assessed value in a period, economic profit, expressed as a proportion of initial assessed value can be compared with the required rates of return used to assess value in order to measure whether performance has been above or below expectations. Economic profit expressed as a proportion of opportunity cost can be compared to the required rate of return to assess performance relative to other companies. A pragmatic approach is needed in order to determine whether or not investment opportunities should be taken advantage of.

Acknowledgements

The author wishes to thank Neil Arora, Evelyn Bourke, Andy Cherkas, Jon Exley, Chris Fordham, Janice Hall, Pat Rawlins, Andrew Smith, Steve Taylor-Gooby, and Geoff Westall for their advice and help during the preparation of this paper. The responsibility for any errors rests with the author.

References

- Bennett Stewart, G. (1991). *The Quest for Value*, Harper Business.
- Bride, M. & Lomax, M.W. (1994). Valuation and Corporate Management in a Non-Life Company, *J.I.A.* 121, 363-441.
- Chalke, S. (1991). *MacroPricing: A Comprehensive Product Development Process*, Society of Actuaries. Vol XLIII.
- Collins, S. A. & Keeler, D.J. (1993). *Analysis of Life Company Financial Performance*, Staple Inn Actuarial Society.
- Copeland, Koller & Murrin (1995). *Valuation*, Wiley.
- Copeland, T.E. & Weston, J.F. (1988). *Financial Theory and Corporate Policy*, Addison Wesley.
- Dixit, A.K., & Pindyck, R.S., (1994) *Investment Under Uncertainty*. Princeton University Press.
- Lewin, C.G., Carne, S.A., De Rivaz, N.G.C., Hall, R.E.G., McKelvey, K.J., Wilkie, A.D. (1995) , *Capital Projects*, B.A..J. 1, 155-249.
- Mehta, S.J.B. (1992). Allowing for Asset, Liability and Business Risk in the Valuation of a Life Office, *J. I.A.* 119, 385-455
- Mehta, S.J.B., Abbott, M.G., Addison, D.T., Dodhia, M., Hitchen, C.J., Oddie, A.J., Poulding, M.R., & Riddington, D.M. (1996). *The Financial Management of Unit Trust and Investment Companies*, B.A.J.
- Modigliani, F. & Miller, M.H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment, *American Economic Review*, 48, 261-297.
- Smith, A.D. (1996). *How Actuaries Can Use Financial & Economics*, B.A.J.
- Smith, C.W. (1990). *The Modern Theory of Corporate Finance*, McGraw Hill.

Appendix

Implementing a Measurement System

This Appendix outlines the key steps required to implement a measurement system.

The following steps are required:

- Identify the business segment(s) to be analysed. This could be a whole company or any separately identifiable unit, function or class of business
- Construct a model to project forward future cash flows attributable to the business segment
- Analyse historic experience and assess best estimate assumptions as to future operating experience, relative to factors such as lapse and mortality rates, expenses and taxation, and their variability
- Set economic assumptions as to future inflation rates and investment returns
- Examine the risk characteristics of the cash flows attributable to the business segment, and select risk rates of return consistent with these risk characteristics and the overall economic assumptions. The analysis required is set out in Section 3.
- Estimate the value of cash flows attributable to shareholders using the selected risk rates of return, at the beginning and end of the period under consideration
- Assess replacement and opportunity costs in accordance with the principles outlined in Section 2.

The analyses set out in Section 1 and 4 can then be used to quantify success, and communicate results.