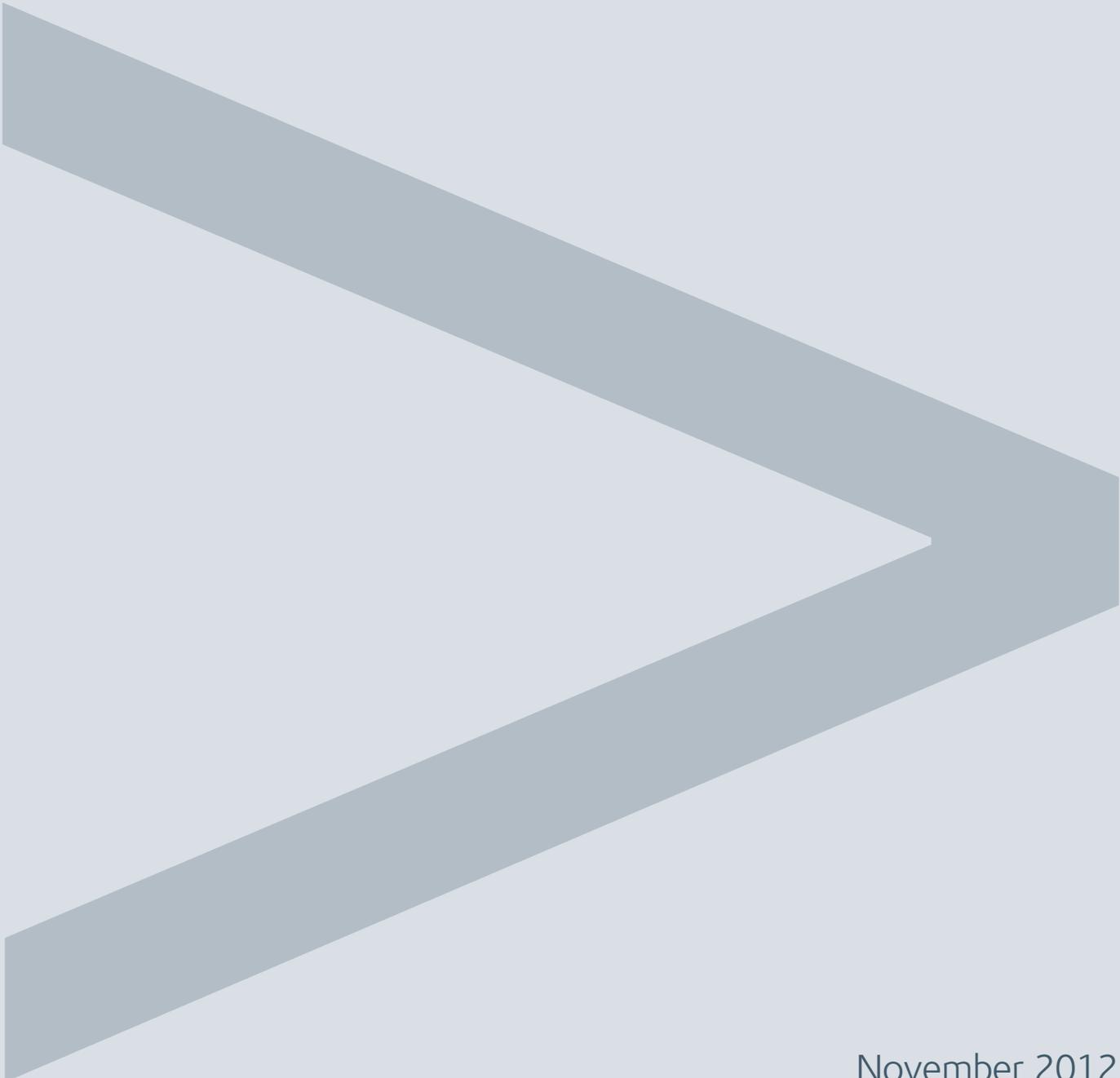




**The Actuarial Profession**

making financial sense of the future

## A Framework for the use of Discount Rates in Actuarial Work



November 2012

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# A Framework for the use of Discount Rates in Actuarial Work

## Introduction and Background

The Institute and Faculty of Actuaries commissioned a working party to undertake a research project on the use of discount rates in actuarial calculations\*. This Discount Rates Steering Committee (DRSC) was set the task of creating a framework by which actuaries, in whatever area of work, might better understand why they use a particular approach to setting a discount rate. This would then allow the creation of a structure by which actuaries might better explain to their clients what they have done.

This paper is intended as a contribution to the debate and to promote thought leadership in this area. Neither this note, nor the framework for discount rates in actuarial work constitutes “technical guidance” to actuaries. Such guidance is the preserve of the Financial Reporting Council (FRC) in the UK, not the Institute and Faculty of Actuaries. For actuaries operating in the UK, actuarial advice to clients is governed by Technical Actuarial Standards (TASs) issued by the FRC. Detailed notes on how the discount rate framework links to the TASs are contained in Appendix 2 of the final update from the DRSC:

[www.actuaries.org.uk/research-and-resources/documents/final-update-drsc-january-2011-recommendations-and-subsequent-discu](http://www.actuaries.org.uk/research-and-resources/documents/final-update-drsc-january-2011-recommendations-and-subsequent-discu)

The purpose of this brief note is to set out some background to the discount rate project and outline the framework proposed by the DRSC. It is aimed at knowledgeable users of actuarial advice, including Government, regulators, academics and other professionals who may find the framework proposals useful when considering the positions taken by members of the Institute and Faculty of Actuaries on discount rates.

For users of actuarial advice who wish to understand more about this research project and the discount rate framework proposed, it is recommended that they seek assistance from the actuary who normally advises them. He or she will be able to explain the relevance of the discount rate framework and how it applies to their actuarial advice.

The framework described in this note does not represent a unique approach to considering discount rates. But the Institute and Faculty of Actuaries believes that widespread understanding of the framework would prove helpful both for actuaries and for users of actuarial advice.

## What are discount rates and why do we need them?

Discount rates are used to calculate the present value of future cash flows.

Actuaries face many types of financial problems. But many problems can be characterised as an analysis of a series of future cash flows, or a comparison between different sets of future cash flows. For example, will a series of future cash inflows (an asset) be adequate to meet a separate series of future cash outflows (a liability)?

The technique of “present values” or “discounted cash flows” is an approach to summarising a series of future cash flows in a more manageable way – to create a summary value in today’s monetary terms. There is a loss of information in moving to an equivalent single present value but, whilst discounted cash flow analysis is not always the best way of analysing or presenting financial data, it is a very useful and widespread tool. In particular, it is fundamental to many financial transactions, for example, the sale of a book of insurance business, or of an individual policy. If a transaction involves the transfer of a series of cash flows, there is a need to establish a transaction value. Even if a transaction is not expected to take place, a transaction value can be a useful piece of information if it exists or can be estimated. However, it is also important to realise that an estimated value of the current transaction price could be a poor indicator of future transaction prices, particularly where transactions rarely take place.

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Despite these difficulties, it is important to have manageable present value numbers to aid decision making by company management and pension fund trustees and for use in communicating information to potential buyers of financial products, holders of insurance contracts and pension scheme members.

There is therefore a wide range of situations where calculations involving discount rates are necessary. The appropriate approach to setting a discount rate for such calculations is normally determined by the purpose and context of the analysis. However, a number of different approaches and methodologies can be employed.

The choice of discount rate can be hugely significant in actuarial calculations (a small change in the discount rate can have a huge impact on the analysis) so it is vital that users of actuarial advice, who are normally non-actuaries, understand the analysis with which they are presented. The common framework for classifying discount rates aims to assist this understanding.

## Overall Framework

The research carried out by the Institute and Faculty of Actuaries\* shows that most actuarial calculations involving discount rates can be separated into two categories - “matching” or “budgeting”.

### Matching Calculations

This is the family of calculations where the liability is valued by reference to market instruments (or models to simulate market instruments) that seeks to match the characteristics of the liability cash flows. Generally, the discount rates used are those implicit in the market prices of the matching market instruments or a reasoned best estimate if there is no deep liquid and transparent market.

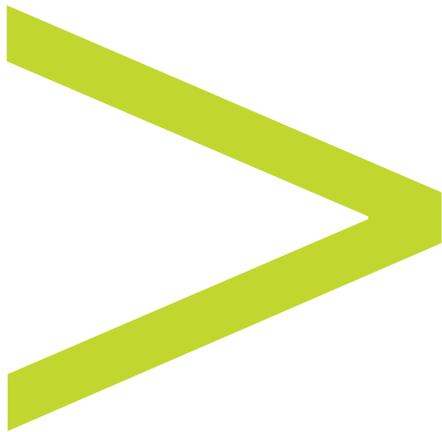
### Budgeting Calculations

This is the family of calculations where the valuation of the liability is approached from the viewpoint of how the liability is going to be financed and so the discount rate is often based on the expected returns from an agreed investment strategy.

Matching calculations can be particularly appropriate for transactional work. This includes the calculation of liabilities for company accounts, solvency reserves, capital adequacy requirements and in circumstances where it is desired to create an investment portfolio to match or hedge a liability. Budgeting calculations can be appropriate in long term financial planning where a portfolio of investments is expected to accumulate to meet a liability. This categorisation is not perfect and there are some situations where a blended approach involving elements of both matching and budgeting calculations may be helpful. Nevertheless, the framework set out in this note provides a structure to help transparent communication of the assumptions underlying a chosen discount rate.

Whether the actuarial analysis involves matching calculations or budgeting calculations the choice of an appropriate discount rate will require the use of “building blocks”. These building blocks show how the discount rate is made up and justify the choice of the discount rate by the actuary. They are described in more detail in the remainder of this note.

\* More details on the research papers from the Institute and Faculty of Actuaries’ discount rate project can be found at [www.actuaries.org.uk/research-and-resources/pages/discount-rates-project](http://www.actuaries.org.uk/research-and-resources/pages/discount-rates-project)



## Matching Calculations

Matching calculations have the common theme of valuing a liability with reference to the discount rate (or curve of discount rates) implicit in the market price of a replicating portfolio of investments or market instruments (normally a portfolio of investments is required to create the matching asset). Such calculations are commonly described as being “market consistent”. The relevant portfolio is one that mirrors the characteristics of the liability cash flows in question.

For example, an insurer has contracted to provide a series of cash flows to policyholders. Suppose that the insurer can find a “replicating portfolio” of bonds whose cash flows exactly replicate those contracted to the policyholders, in all possible outcomes. In that special case, assets and liabilities would be expected to be assessed consistently, since the timing, probability and amount of each payment is identical, so that their respective values are equal. This implies that the market consistent value of the liabilities is the market value of the corresponding replicating portfolio.

However, it is rare to be able to construct an exactly replicating portfolio, so there are limits to this matching process. In such circumstances it can still be possible to develop an appropriate proxy discount rate that is market consistent by the use of “building blocks” that are normally derived from known characteristics and features of investment markets. More information on the “building blocks” of matching calculations is contained in the final report from the DRSC.

### Limitations of Matching Calculations

It is important to note that matching calculations have two key limitations:

- A matching framework does not imply the adequacy of assets to meet liabilities at all times unless the investment strategy provides a perfect match.
- Often there are no assets that replicate the liability cash flows exactly. In such circumstances, where matching calculations develop an appropriate proxy discount rate that is market consistent, it is appropriate to highlight:
  - the subjectivities involved,
  - the assumption that if a portfolio closely replicates the liability cash flows its price will be close to the price of the exactly replicating theoretical portfolio, and
  - the impact of the resulting potential volatility in the calculated results.



## Budgeting Calculations

The family of budgeting calculations covers those where the measurement of the liability is approached from the viewpoint of how the liability is going to be financed. The discount rate used in such calculations is often chosen relative to the expected returns from a particular investment strategy. The discount rate therefore usually retains a much larger element of embedded risk, for example incorporating credit for equity risk premium or some proportion of credit spread. As a result, if circumstances are adverse, relative to the assumptions, the calculated financing cost might appear (and actually prove to be) inadequate. Such calculations generally arise where a long term series of future cash flows needs to be met and resources are accumulated to pay for them. Budgeting calculations do not necessarily provide a value assessment at a particular point in time and are not generally associated with a specific, commercial transaction.

It should be noted that the increased embedded risk (typically) in budgeting calculations puts a greater onus on actuaries to communicate the risks and the implications of adopting a budgeting calculation approach.

In determining the appropriate degree of risk to adopt, a distinction may be drawn between future cash flows that are already determined and future cash flows to which the provider is not yet committed (eg linked to some future discretionary practice that may, in turn, be linked to future investment returns).

### Limitations of Budgeting Calculations

It is important to note that budgeting calculations have two key limitations:

- A budgeting calculation provides no information about the adequacy of assets in the matching framework (either currently or in the future).
- A budgeting calculation provides no information on the transactional value of the future cash flows.



## A simple practical example (contrasting a budgeting and a matching calculation)

John Smith has a house with a mortgage of £250,000. He also has a savings policy, the proceeds of which he intends to use to repay his mortgage in 20 years' time. The savings policy currently has accumulated funds of £50,000.

In assessing how much John should pay into his savings each year (in addition to his interest costs) John carries out a budgeting calculation, which might look as follows:

John's assumed investment return = 7% per annum

Expected accumulated values of savings policy in 20 years  
= £193,484

Shortfall to be funded by additional savings  
= £250,000 - £193,484 = £56,516

Annual payment required to accumulate to meet the shortfall over 20 years = £1,379

Limitations of this budgeting calculation:

- a) It gives no information on the value of the outstanding liability if John wanted to meet it now.
- b) It gives no information on the likelihood that the annual payments will be adequate to meet the mortgage liability after 20 years.
- c) It gives no information on what the potential shortfall might become if the investment strategy does not go to plan.

Of course 'b)' and 'c)' above can be partly addressed by further more sophisticated budgeting calculations (looking at different possible investment returns and their likelihood). However, to address 'a)' above, a matching calculation is required. This matching calculation might simply be:

Value of liability to make interest payments on debt of £250,000 and repay debt in 20 years = £250,000

Value of assets = £50,000

Shortfall = £200,000

The importance of the matching calculation is obvious when a "solvency" or "transaction" question is being asked, for example:

- What is the value of the outstanding liability if John Smith needs to make immediate repayment (e.g. because the house is being sold)?
- What is the overall value of the estate for inheritance tax purposes?
- What is the overall value of the marital assets / liabilities in a divorce situation?

In all of the above situations it is clear that the shortfall calculated on the matching approach (i.e. £200,000) is the appropriate figure for consideration rather than the shortfall calculated on the budgeting approach (i.e. £56,516).

Both the budgeting and matching calculations have their relevance and importance. The key is to ensure that the correct approach is used depending on the question being asked.



## In Conclusion ...

Actuarial calculations that require discount rates to be determined for placing values on cash flows include:

- a) **Solvency** - where the purpose is to assess the assets that might be required to meet the liability cash flows in the absence of any other supporting financial entity.
- b) **Transactions** - where the purpose is to assess a (fair) value of assets to be transacted in exchange for the liability cash flows.
- c) **Funding** - where the purpose is to advise on the accumulation of assets to meet the liability cash flows as they fall due, when the likely sufficiency of the assets to meet the future cash flows (eg following the failure of any supporting financial entity) at any point in the interim can be ignored.

The matching framework will generally be more suitable for type 'a' and type 'b' calculations, whereas a budgeting framework may be more suitable for type 'c' calculations.

When the discount rate framework is being applied it would be good practice, where appropriate, for any material divergence between the values placed on contractual asset or liability cash flows and their corresponding market or market consistent values to be highlighted in actuarial work and analysis, together with an explanation of the main contributors to this divergence. This will aid transparency of actuaries' work.

The framework described in this note is not the only approach to considering discount rates. There may be circumstances where the actuary believes an alternative approach may better meet the needs of their client. In general, however, a widespread adoption of a consistent framework could prove helpful both for actuaries and for users of actuarial advice.

Adoption of this framework would mean actuaries:

- framing their advice on, or choices of, discount rates within the context of matching or budgeting exercises.

- highlighting in their work, where relevant, any material difference between the values placed on contractual asset or liability cash flows and their corresponding market or market consistent values, and explain the main contributors to this difference.
- communicating clearly, when presenting advice involving the use of discount rates, the framework, "building blocks" and embedded risk they have used in assessing the discount rate(s).
- helping users understand the implications of their advice on member/policyholder options/transactions within a matching or budgeting framework.

### The way forward

The framework set out in this note provides a common language by which actuaries (and others) can communicate the reasons behind the construction of a discount rate and the risks/potential consequences of using a particular rate, for any actuarial calculations.

Usage of the discount rate framework is not mandated by the Institute and Faculty of Actuaries. However, it is hoped that widespread usage of the discount rate framework will promote transparency and improve understanding of actuaries' work.

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