

# **General Insurance Convention October 1994**

## **Asset Liability Matching and Modelling**

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## **Introduction**

This Working Party was formed to make a start on identifying the asset related issues that are likely to be important to the successful management of a general insurance operation. There is growing support for the view that in due course actuaries working in general insurance will be required to widen their areas of activity from reserving, pricing and business management to include asset strategy and related risk issues.

Initial support for the Working Party failed to materialise and in practice only two members participated. Recognising this resource limitation, and the relatively little practical work currently done on the asset side by actuaries within general insurance organisations, this paper has the following limited objectives:

1. Identify the key issues for effective Asset/Liability Management, including risk related return
2. Provide information on published research
3. Provide information on some practical work undertaken by actuaries
4. Stimulate discussion, interest and support for further research.

## **The Asset Challenge**

In increasingly competitive insurance markets, investment performance is critical to achieving competitive advantage. A survey of chief executive officers of general insurers in North America in 1994 highlighted the following widely held opinions:

- increased competition and financial performance are two of the most important issues facing the industry over the next 5 years
- improved asset/liability management is a primary need to maintain or enhance margins.

It would be surprising if similar comments did not apply in the United Kingdom and elsewhere.

An initial benchmark for asset strategy for a general insurance operation could be determined, in theory at least, by generating the expected cashflow out on claims payment from a portfolio. The cashflow would be estimated by considering:

- each type of business separately

- the expected incidence of payments
- the expected size of payments
- the variability of both the incidence and size of payments
- the major influences on the size and incidence of payments including price inflation, social inflation, economic activity etc
- any correlations between relevant factors for different classes of business.

In principle, the benchmark asset strategy would be determined by attempting to match the cash outflow by an appropriate mix of assets with relevant characteristics including income, capital growth and the variability of these. If close matching of cashflows for assets and liabilities could be achieved, the asset portfolio might be viewed as a risk free benchmark for the liability subject to appropriate consideration of security of the investments. Then alternative investment strategies might be considered seeking higher return but accepting higher risk of not meeting the liabilities.

In practice, the process would become complex when allowances are made for:

- new business
- changes in the mix of business or claims settlement policies
- the impact of reinsurance, both in the price paid and the cover purchased
- the capital backing the operation and how it is invested
- the unmatchability of some liability cashflows.

Currently many general insurance operations concentrate assets in fixed interest and short term deposits, recognising the relative short term nature of many of their liabilities and the need to be able to raise money within a short timeframe if a major unexpected event occurs. Practice does vary however, particularly depending on the level of overall capital backing the business. In Lloyd's the short term focus on reinsurance to close, and other rules, result in a strong emphasis on short term liquid investment.

Historic experience shows that equity-type investment over the long term provides the highest returns, but the most volatile, relative to inflation. Accordingly, it would appear to be logical to invest assets backing long term liability reserves in an equity concentrated strategy provided that there was sufficient capital to cover short term volatility of capital values.

## **Risk Based Capital**

A key issue in asset strategy is solvency or capital adequacy. The requirements of regulators in terms of free capital relative to business volumes and reserves clearly has a major impact on asset strategy. Regulators are empowered to (and do in practice) instruct management of general insurance operations about asset mix in cases where there is concern over solvency and the regulator places the organisation under close scrutiny.

There have been significant developments in the related subject of risk based capital where minimum capital requirements are set by reference to the volume and nature of the business written. In the US regulations are now in force, Lloyd's is actively working on the issue and a number of insurers in various markets have used the principles to identify their own internal capital allocation needs and to set targets for risk related returns on that capital.

The basic risk based capital approach includes an element of asset risk but this is not focused on asset strategy relative to the risks underwritten - it addresses mainly security and diversification risk. Nevertheless, the logic of analysing the nature of the business written to determine minimum capital requirements should be carried over to how asset strategy is determined.

## **Current Practice**

We have not been able to undertake any significant research into how UK general insurance operations determine asset strategy. Anecdotal evidence suggests that assets backing reserves are typically invested in fixed interest bonds of similar term to liabilities with additional capital invested in a mixed portfolio of equities and bonds in a similar way to a pension fund. There are material variations according to solvency levels and the nature of business but the process does not appear to be very scientific. Indeed, it appears that the asset and liabilities are managed independently with little interaction.

There is scope for further research here to provide a base for attempting to quantify the potential benefits from managing both aspects in a coordinated manner.

## **Published Material**

The appendix summarises the published material that we identified and considered to be relevant to the subject. It has been drawn from a variety of sources including a number outside the UK.

We emphasise that the list is not comprehensive or exhaustive and we encourage others to notify the working party of other suitable material.

## **Involvement of Actuaries to Date**

Again we have not been able to undertake any significant research in this area and therefore rely on anecdotal information.

The primary focus of work done to date appears to be in the area of forecasting claim cashflow payments for business written. The cashflow projections rely on experience-based payout patterns and typically sensitivity to potential variation from the assumed pattern is shown, increasingly on a stochastic basis. In addition various catastrophe scenarios are modelled to determine the need for large volumes of cash over a short period. The cashflow projections are typically supplied to the investment managers of the insurance operation who then devise appropriate strategies according to capital available. The cashflow projections can be complex particularly where allowance for reinsurance is made and the sensitivity analyses are important to demonstrate potential variations in outcome. Actuaries typically do not get involved in determining mix of assets or analysing asset characteristics.

However, a number of actuaries have been involved in projects that extend into a full projection of a company's financial results including liabilities, assets, investment income, tax, profits and balance sheets. An efficient frontier of surplus, profits, solvency etc against alternative asset mixes is derived together with illustrations of the sensitivity of results to the uncertainties of underwriting cycles, interest rates and inflation. Internal consistency between assumptions used for inflation etc is necessary for both asset and liability projections.

## **The Way Ahead**

Considerable work has been done by actuaries on asset liability matching/management for pension funds and life insurers. The basic concepts of matching cashflows and developing efficient frontiers for asset mixes against return/solvency/cost etc have been developed.

Inevitably, there is some debate about which economic or asset model is superior but the concept is established as is the scope for actuaries to add value. Accordingly, for actuaries in general insurance who wish to participate in this area, the key issue appears to be to quantify the claim cashflows, together with their variability, in a manner that management can use effectively to develop asset strategies appropriate for the insurance portfolio.

Also, the increasing sophistication of financial instruments, including insurance based derivatives, makes it more realistic to design assets with characteristics closer to the needs of general insurers. Correspondingly, certain insurance futures may have some appeal to the financial market investors looking for instruments that have zero correlation with normal stockmarket based financial investments. Accordingly, there may be mutual benefit for both insurers and financial markets in developing better understanding and skills in this area. There is a natural follow

on to pricing of business and how the general insurance operation is managed, particularly as evolving financial instruments increasingly offer insurers the potential to construct assets that meet their expected liability cashflows. This is not a straightforward task given the typical volatility of general insurance business. However, the work done on risk based capital may provide a sound base for development.

## **IDEAS FOR DISCUSSION**

- a simple survey of general insurance operations in the UK on the asset/liability strategy they follow, how they determine it and the extent of actuaries involvement;
- developing links with actuaries with direct experience in this area both in the UK and overseas; and
- some simple modelling, using an established asset model, concentrating on cashflows, their variability and sensitivity to external economic influences for the liabilities.

# Appendix

## ASSET LIABILITY MANAGEMENT REFERENCES

### a) From the Institute of Actuaries Library

■ "Practical Risk Theory for Actuaries" (Chapter 8 in particular)	C D Daykin 1994 T Pentikäinen M Pesonen
■ "Insurer Financial Solvency"	Casualty Actuarial Society Discussion paper 1992
■ "Valuation Issues"	Casualty Actuarial Society Special Interest Seminar 1989
■ "Fair Rate of Return in Property- Liability Insurance"	J D Cummins 1986 S E Harrington
■ "Managing the Insolvency Risk of Insurance Companies"	J D Cummins 1991 R A Derrig
■ "Assessing the Solvency and Financial Strength of a General Insurance Company"	C D Daykin 1987 G D Bernstein S M Coutts E R F Devitt G B Hey D I W Reynolds P D Smith
■ "Assets and Matching Workshop"	P N Downing GIRO 1992
■ "Asset Liability Management: How matched is this Company?"	K Fireman AFIR 1991

# Appendix

## ASSET LIABILITY MANAGEMENT REFERENCES

### b) North America

The following articles are currently on the Casualty Actuarial Society's syllabus of examinations:	
■ "Asset/Liability Management Strategies for Property/Casualty Companies"	P D Norris Morgan Stanley 1985
■ "Asset/Liability Management"	W H Panning Financial Analysis of Insurance Companies CAS Discussion Paper Program 1987
■ "Asset/Liability Matching for Property/Casualty Insurers"	S Feldblum Valuation Issues CAS Special Interest Seminar 1989
The following articles are not on the CAS Syllabus of examinations but are suggested as useful reading.	
■ "Duration: Its Development and Use in Bond Portfolio Management"	G O Bierwag G G Kaufman and Alden Toevs Financial Analysts Journal July-August 1983
■ "The Matching of Assets and Liabilities"	J Tilley Transactions of the Society of Actuaries
■ "Measuring Corporate Bond Mortality and Performance"	E I Altman The Journal of Finance Vol XLIV No 4 Sept 1989
■ "A Guide to Quantifying C-3 Risk"	J A Mereu Transactions of the Society of Actuaries 1989
■ "Asset/Liability Management for Property/Casualty Insurance Companies"	D J Oakden M Lombardi C Carlton Canadian Insurance Accountants Professional Development Committee Education & Technical Information Circular 1993-2

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