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**ANALYSIS OF LIFE COMPANY
FINANCIAL PERFORMANCE**

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Analysis of Life Company Financial Performance

1. Introduction

Measuring the financial performance of a life company, and producing information to highlight the products, functions or business divisions which are performing well or badly is not an easy task. Until recently, actuarial techniques and appropriate software to calculate meaningful profits, viewed from the shareholders' perspective have not existed. It is not surprising, therefore, that the industry has tended to measure success in terms of measures such as new business sold or assets under management, and has tended to neglect "bottom line" measures such as the profit margin on new sales, or the profit from the management of in-force business.

Techniques developed by actuaries for analysing profit (or surplus) have been primarily developed to support the actuarial valuation, which in turn is better suited to demonstrating solvency than determining profit. The analyses traditionally produced do not naturally provide the general management with the information required to manage business for profit maximisation in the same way as would be considered normal in many other industries.

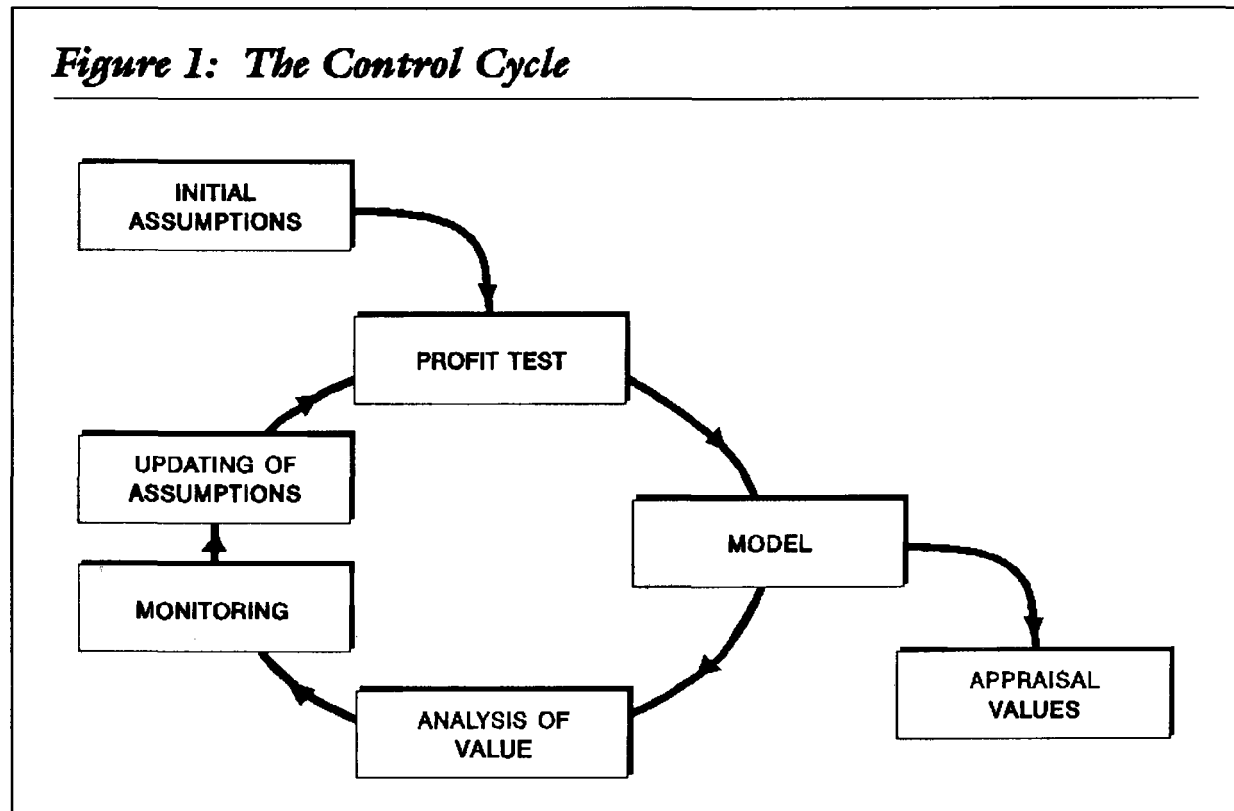
This paper has two themes. Firstly, it describes how traditional actuarial techniques for analysis of surplus can be extended and adapted to apply to modern concepts of profit for life assurance business, such as accruals or embedded value profits. The second theme concerns the presentation of results and describes some ways in which results can be made more readily accessible by general management. This is done by concealing a level of detail which generally serves to emphasise the technical difficulty of the analysis rather than communicating the main messages that the results indicate.

Control Cycle - Review

It is useful briefly to review some of the key principles in Goford's control cycle (1985). This will provide a frame of reference from which to take a detailed look at financial analysis.

Goford's control cycle is shown in Figure 1. It envisages that the financial operation of a life office follows a continuous path which, for a mature office, has no defined starting or finishing point.

However, for ease in providing a brief summary of the steps in the cycle, the setting of the assumptions is assumed to occur first.



Briefly, the cycle consists of the following:

- a) first, the initial assumptions are set for each major product of the office and using these, profit tests are calculated for the same products
- b) a projection of the company's business is then constructed on a seriatim basis or alternatively by building a model of the major product lines.
- c) the company's actual results are then analysed to uncover reasons why its value increased or decreased over the accounting period
- d) this analysis then extends to a comparison between the actual and expected results identifying

the reasons for any differences, a process referred to by Goford as monitoring.

e) this monitoring process could have several outcomes:

- updating assumptions used in the projection to reflect actual experience
- initiating management action to achieve consistency between actual and expected results
- initiating management action to eliminate or add products, to enter or leave particular markets or to change distribution strategy.

It is the last three steps shown above, and referred to as Analysis of Surplus, Monitoring and Updating of Assumptions, that are the subject of the remainder of this paper.

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2. Analysis of Surplus

Introduction

All companies are required to produce statutory accounts on a periodic basis and in a prescribed format. While fulfilling their primary objective in being concerned with the solvency of an enterprise, they are not an adequate reflection of the economic value of an organisation and do not represent a "true and fair" financial picture. However, further analysis of the results, beyond what is required in the statutory financial statements, can be useful to aid understanding of the key sources that contribute to statutory profits.

In this section we will briefly outline and present an example of the traditional approach to analysing statutory surplus, namely an analysis of the gains by source measured against the statutory reserve basis. An alternative approach to analysing the increase in surplus will also be presented. Under this approach, sources of profit are measured against the pricing basis as opposed to the statutory basis. Lastly, a comparison of actual to expected results will be presented.

These analyses will then be used in subsequent sections of the paper to support analyses of results in a format that can be readily understood by the general management of a life office.

Traditional Analysis of Surplus

Table 1 contains a presentation of a company's pre-tax annual results on a statutory basis. The office is assumed to write only non-profit life policies in the example provided. Key assumptions regarding the examples used in this paper are given in Appendix A.

Table 1: Annual Statutory Results

	£
Reserves brought forward	213,878
Premiums received	68,403
Interest and gains received	22,765
Expenses incurred and commissions paid	(20,881)
Death claims paid	(16,912)
Surrender values paid	(15,140)
Amounts paid on maturity	0
Reserves carried forward	247,133
Profit during year	4,980

From this presentation the source of statutory profits remains unclear and there are a number of questions unanswered, for example:

- What was the contribution from new sales?
- Were actual expenses lower than those anticipated?
- Was the investment return higher than expected?
- Did surrenders make a positive contribution to profits?
- Were death claims higher or lower than expected?
- What was the impact of the reserving basis on profits?

One can answer these questions by referring to the basis and methodology used to calculate mathematical reserves. This is the traditional actuarial analysis of surplus. Its major purpose is to provide a check on the valuation data and the valuation process; accordingly, it has an inward focus of supporting the valuation actuary. The value of such an analysis to the general management of the company is limited, as the sources of profit are typically related to conservative (or artificial)

assumptions regarding future experience.

For completeness we have included an example of such an analysis in Table 3. In order to see how the sources of profit are derived from the results in Table 1, it is necessary to analyse the increase in mathematical reserves into its component pieces.

Table 2: Statutory Reserve Development

	£	£
Reserves brought forward		213,878
Premiums received	68,403	
Required interest for policyholder liabilities	12,014	
Implicit allowance for expenses	(3,441)	
Reserve decrease for deaths	(23,704)	
Reserve decrease for surrenders	(20,017)	
Reserve decrease for maturities	<u>0</u>	
Subtotal	33,255	
Reserves carried forward		247,133

As shown in Table 2 the increase in reserve of £33,255 comprises the receipt of premiums collected plus interest on the mathematical reserves less the amount of reserves no longer needed for policies that surrendered, matured or resulted in death claims during the year.

The reserve decrease for death is equal to the expected death strain (calculated on the valuation mortality basis) plus the actual release of reserves on death. In our example the expected death strain on the valuation basis was £21,591 and there was a release of reserves on death of £2,113 giving the total reserve decrease for deaths of £23,704.

In Table 3, we have substituted this composition of the increase in reserves and grouped revenue items to derive sources of statutory profit (measured against the reserving basis and assumptions).

Table 3: Sources of Profit, Statutory Basis

	£	£
a. Gain from interest:		
-- Interest and gains received	22,765	
-- Required interest for policyholder liabilities	<u>(12,014)</u>	
		10,751
b. Gain from loadings:		
-- Valuation basis loadings in premium rates	3,441	
-- Expenses incurred and commissions paid	<u>(20,881)</u>	
		(17,440)
c. Gain from mortality:		
-- Reserve decreases for deaths	23,704	
-- Death claims paid	<u>(16,912)</u>	
		6,792
d. Gain from surrender:		
-- Reserve decreases for surrenders	20,017	
-- Surrender values paid	<u>(15,140)</u>	
		4,877
e. Profit during year		4,980

In a traditional analysis of surplus, it would be normal to respread some of the gain from interest to the gains from mortality and surrender to reflect their impact on interest earned on cash flows.

The analysis shown in Table 3 tells a familiar story:

- The company made a significant profit from excess investment return (over the valuation rate of interest).
- Owing to the conservatism in the statutory valuation basis, there is only a small difference between the valuation premium and the gross premium. This is the loading available to cover expenses and commissions.
- The significant mortality profit demonstrates that the mortality assumption underlying the valuation basis is considerably in excess of the office's actual experience.
- The company makes a profit on surrender, as cash values paid are lower than the statutory reserve.

The analysis would normally be carried out separately for business in-force at the start of the year and for new sales made during the year. Naturally, this requires the availability of revenue account and valuation reserve information in suitable form. This is shown in Table 4 and provides interesting additional information on the cost of putting business on the books on a statutory basis. Appendices B, C and D provide more detail on the results presented in Table 4.

Table 4: Sources of Profit, Statutory Basis

	New Sales £	In-force at Start of Year £	Total £
a. Gain from interest	(700)	11,451	10,751
b. Gain from loadings	(12,395)	(5,045)	(17,440)
c. Gain from mortality	445	6,347	6,792
d. Gain from surrender	<u>345</u>	<u>4,532</u>	<u>4,877</u>
e. Profit during year	(12,305)	17,285	4,980

The analyses presented in Tables 3 and 4 are not especially useful to the general management of a life office since they do not provide any information regarding the company's actual experience against the assumptions made when the products were priced or the assumptions used in the current business plan. This analysis does not provide information on the following:

- the difference between the expenses the company expected to incur and the actual expenses, ie the "real" gain from expenses
- the amounts the office realistically expected to earn in mortality and surrender profits.
- the profit margin assumed when the products were priced.

In summary, the gains shown in Tables 3 and 4 are measured against an artificial basis and do not tell the real story of the office's financial performance.

Alternative Analyses of Surplus

It is reasonable for management to ask how actual profits compare with those expected on the

pricing basis or with those expected in the business plan. The analyses presented in Tables 3 and 4 do not address this question, but can readily be modified to do so.

- *comparison with pricing basis*

A source of profit analysis carried out against the pricing basis will show additional items such as the gain from profit loading and the impact of the reserving basis. Thus, from an analysis against the pricing basis, we may expect to see:

- a. Gain from interest.
- b. Gain from expenses.
- c. Gain from mortality.
- d. Gain from surrender.
- e. Impact of reserving basis.
- f. Gain from profit loading.

In this analysis

- i) the gain from interest is obtained by comparing the investment return actually earned against the expected income calculated by applying the pricing basis interest rate to policyholder liabilities and cashflows.
- ii) the expected death strain is calculated using the pricing mortality basis rather than the valuation mortality basis.
- iii) the expected surrender profit will need to be calculated as it is likely that the pricing basis will anticipate a certain level of surrenders.
- iv) the gain from profit loading is the annual profit contribution expected when the product was priced, adjusted for differences between actual experience and that anticipated in pricing.

In order to quantify the impact of the reserving basis we introduce the concept of the "natural" valuation basis. The reserve (or Fund) obtained on the "natural" valuation basis is obtained by accumulating premiums received after deducting expected outgo (commission, expenses, surrender

payments, death claims) using the pricing interest rate. Alternatively, reserves can be calculated on a prospective basis using pricing assumptions and allowing for all future claims, expenses and profit loadings. There is a question as to how to allow for the emergence of the profit loading. In our example, we have allowed the profit loading to emerge as a constant proportion of premium. The impact of the reserving basis would be equal to the sum of two items,

- the increase in reserve on the "natural" valuation basis less the increase in reserve on the statutory valuation basis.
- interest (at the pricing rate) on the excess of statutory reserves over the "natural" reserves.

In order to illustrate the impact of the reserve basis we have made a simplifying assumption that investment returns, mortality and surrender rates, and expense levels are consistent with the pricing basis. The results are given in Table 5.

Table 5: Illustration of Impact of Reserve Basis

	New Sales £	In-force at Start of Year £	Total £
Impact of reserve basis	(13,250)	11,769	(1,481)
Gain from profit loading	<u>945</u>	<u>5,516</u>	<u>6,461</u>
Statutory profit during year	(12,305)	17,285	4,980

The analysis of profit given in Table 5 highlights the impact of the reserve basis on the emergence of statutory profit. The separation of the contributions from business in-force at the start of the year and the contribution from new sales, demonstrates the "new business strain" incurred at policy issue which is repaid over the lifetime of the contract. In this type of analysis the influence of the reserving basis on profit is separated from the differences in actual experience compared with the assumptions assumed in the pricing basis.

In our example, however, since actual experience is assumed to be the same as that assumed in the pricing basis, there are no contributions to profit from investment return, mortality, surrenders or expenses.

The message presented in Table 5 is very different from that presented in Table 4. The actual revenue account is the same one, but the presentations address very different questions.

- comparison with the business plan forecast

Most companies prepare business plans for the year. A natural part of the process at the end of the year is to explain how actual results compare with those forecast by the business plan. Over time, the assumptions used in the pricing basis may no longer represent management's view of likely future experience. One would, therefore, wish to quantify sources of profit measured against the experience assumptions used in the business plan.

As new sales are unlikely to be consistent with the business plan, the first stage in the process would be to recalculate the plan using actual sales. Thereafter it would be possible to compare actual and expected sources of profit. An example of such a comparison is contained in Table 6.

In this constructed example experience is as follows:

Interest rate	as expected
Expenses	as expected
Mortality rates	111% of expected
Surrender rates	125% of expected

Table 6: Statutory Sources of Profits: A Comparison of Actual vs Expected Results (per Business Plan)

	New Sales (£)	In-force at Start of Year (£)	Total (£)
a. Gain from interest	(4)	(67)	(71)
b. Gain from expenses	0	0	0
c. Gain from mortality	(96)	(1,391)	(1,487)
d. Gain from surrender	<u>69</u>	<u>904</u>	<u>973</u>
e. Subtotal	(31)	(554)	(585)
f. Planned profit	<u>(12,274)</u>	<u>17,839</u>	<u>5,565</u>
g. Statutory profit during year	(12,305)	17,285	4,980

The gain from interest can be the result either of a variance in the actual earned investment return (expressed as a proportion of invested assets), or of a variance in the average amount of invested assets during the year. We refer to the contribution from any variance in the rate of investment return as a "rate variance" and we refer to the contribution from a variance in the average amount of invested assets as a "volume variance".

In Table 6 the variance in interest is a volume variance entirely due to the effect of increased death claims on interest income, since, in the examples used, the earned rate of interest and the valuation interest rates are the same as forecast. This is confirmed in Table 7 in respect of business in-force at the start of the year. Further details regarding the forecast business plan results are contained in Appendices F, G, H and I.

Table 7: Derivation of Rate and Volume Variance of Gain from Interest on Business In-force at Start of Year

	Asset Base	Interest Rate	Interest Income
Volume Variance Analysis			
Expected results			
-- Interest income received	257,130	9.0%	23,142
-- Required interest	258,306	4.5%	<u>11,624</u>
-- Interest profit			11,518
Expected results (adjusted for asset base)			
-- Interest income received	256,336	9.0%	23,070
-- Required interest	258,205	4.5%	<u>11,619</u>
-- Interest profit			11,451
Volume variance			(67)
Expected results (adjusted for asset base)			
-- Interest income received	256,336	9.0%	23,070
Actual results			
-- Interest income received	256,336	<u>9.0%</u>	<u>23,070</u>
Rate variance		0.0%	0

In the business plan, the company forecast interest income of 23,142 being an investment return of 9% on average invested assets of 257,130 (the reserves brought forward plus office premiums less expenses less 50% of death claims taken from the In-force at Start of Year column of Appendix F); of this interest income some 11,624 was required to support the statutory reserve development being 4.5% of average reserves of 258,306 (the reserves brought forward plus office premiums less loadings less 50% of reserve decreases for deaths taken from the In-force at Start of Year column of Appendix G). In practice average invested assets were 256,336 (from Appendix B) and average reserves were 258,205 (from Appendix C).

In our example, the interest volume variance is caused by a difference in mortality rates, since deaths are assumed to occur evenly throughout the year and surrenders are assumed to occur at the end of the year. Table 8 is a restatement of Table 6 after reallocating volume variances to the appropriate cause but retaining interest rate variances (which in this example are zero) under "gain from interest".

Table 8: Sources of Profit: Expected Basis After Adjusting for Rate and Volume Variances

	New Sales £	In-force at Start of Year £	Total £
a. Gain from interest	0	0	0
b. Gain from expenses	0	0	0
c. Gain from mortality	(100)	(1,458)	(1,558)
d. Gain from surrender	<u>69</u>	<u>904</u>	<u>973</u>
e. Subtotal	(31)	(554)	(585)
f. Planned statutory profit	<u>(12,274)</u>	<u>17,839</u>	<u>5,565</u>
g. Actual statutory profit	(12,305)	17,285	4,980

A similar analysis into a rate variance and a volume variance can be carried out on the gain from mortality and gain from surrenders. For example, the gain from surrenders may arise from higher rates of surrender, or from surrender values paid out being a lower proportion of statutory reserves than expected (or modelled). It may be difficult to capture the necessary statistical and accounting data to perform this analysis, but if this can be done the results can be very useful in identifying consistent differences between actual and expected surrender payments.

Summary

In this section we have described three different means of analysing statutory profit, each designed to address a different set of questions.

The traditional analysis of surplus provides a check on the valuation data and the valuation process. An analysis against the premium basis allows an explanation of how actual profits compare with those expected on the pricing basis - albeit in respect of that particular year. Finally, an analysis

against the experience assumptions underlying the business plan explains how actual profits differ from those forecast in the business plan.

However, even though these analysis provide a detailed look at the current year's statutory results compared with the pricing basis and with the results that management expected, they are deficient since they do not provide any insight on whether new business written during the year meets profit targets, or whether the value of the total company is increasing or decreasing. They capture the financial operations of a life policy over a single period and no insight is gained about the profits that a set of contracts is expected to generate over its entire lifetime.

For example, the results in Table 8 show a higher contribution to statutory profit than was expected because surrenders were higher than expected. Generally, however, higher surrenders will result in lower future profits to an office although this is not apparent from the analyses provided.

In the next section an alternative accounting method will be described. Use will be made of the analyses in this section to understand the annual "profit" achieved under this alternative accounting method.

3. Embedded Value Accounting Method

Overview

In recent years many UK companies have adopted alternative accounting methods, such as embedded value and accruals basis accounting, to overcome flaws perceived in statutory accounting. Statutory accounting, with its primary objective focused on solvency of life offices, was not felt to provide a realistic view of the operation of a life office. The purpose of the remainder of this paper is not to debate the merits of either of the alternative methods but to provide some useful insight and approaches into analysing the change in the embedded value (or shareholders' accrued interest) between the beginning and the end of the year. As will be shown, the process of analysing the change in embedded value over the year automatically results in the identification of the differences between actual and expected results.

The primary focus will be related to the embedded value accounting method, but the principles and approaches, with slight adjustments, are transferable to the accruals basis.

For the purpose of this paper the embedded value of a life office, at a particular valuation date, is taken to be the sum of the shareholders' net assets and the value of the business in-force at the valuation date. The value of in-force business at the valuation date is the present value of future profits expected to emerge from policies already written. The value of business written after the valuation date is not included in this definition.

Companies which calculate embedded values generally have methods and techniques in place that will generate the value of business in-force at the valuation date. This is then added to the shareholders' net assets to arrive at the embedded value. Methods or techniques that will assist the company in understanding the change in embedded value over the year are less formalised and, in many cases, absent - in spite of the useful information that can be gained from this process.

Embedded Value Formula

As a first step it is useful to document a formula that can be used to derive consecutive embedded values. A simplified version of the formula is set out below; a more detailed formula is given in Appendix J.

$$\begin{aligned}
 & \text{Embedded value at the beginning of the year} \\
 + & \text{Interest on shareholders' net assets} \\
 + & \text{Contribution from in-force business} \\
 + & \text{Contribution from new business} \\
 + & \text{Change of basis} \\
 + / - & \text{Capital adjustments} \\
 = & \text{Embedded value at the end of the year}
 \end{aligned}$$

A brief explanation of each of the above items follows. The impact of a possible change of basis is discussed under the contribution from in-force business item.

Interest on Shareholders' Net Assets

Interest on shareholders' net assets is the after-tax investment return earned by the assets that support shareholders' net assets. It is not unusual for this rate of return to be substantially below the return earned on assets supporting insurance liabilities because of asset allocation techniques used by companies. It is common to assign non-interest-bearing assets or lower-yielding assets to support shareholders' net assets and to allow the higher-yielding assets to back policyholder liabilities.

Contribution from In-force Business

The contribution from in-force business can be separated into several parts:

- a) the planned return on the value of in-force business at the beginning of the year;
- b) the difference between
 - statutory profits earned during the year
 - and
 - those anticipated from the beginning of year embedded value calculation;

- c) the difference between
- the value at the end of the year of business which was in-force at the start of the year (and is still in-force at the end of the year).
 - and
 - the expected value of in-force business at the end of the current year as anticipated from the beginning of year embedded value calculations.

Item a), the planned return on the value of in-force business at the beginning of the year is the amount resulting from applying the risk rate of return to the value of in-force business brought forward.

For item b) above, the analysis process is the same as that for the statutory profits described in the preceding section, where the analysis is performed against the basis used in the calculation of the embedded value at the beginning of the year; in our example, we have calculated the embedded values using the business plan assumptions regarding future experience. To gain maximum information, the analysis should separate the current year's actual and expected profits into individual sources of profit: eg, investment return, mortality, surrender and expense. In conducting this analysis a company can readily see the factors that influence the year-by-year profits earned on its business, and whether the contribution from any of the factors is materially different than expected.

There is likely to be a contribution under item c) to the extent that the volume and mix of business still in-force at the end of the year differs from the expected volume, owing to variations in actual mortality and lapse experience during the year. The other contribution to item c) is the impact of any changes in assumptions regarding future experience which may have been made in calculating the value of in-force business at the end of the year.

If changes in assumptions regarding future experience are made, care needs to be taken that these do not hinder the investigation of the impact of variances in experience during the year. The impact of the changes in assumptions regarding future experience could either be calculated at the start of the year by recalculating the opening value, or by calculating the value of in-force business at the end of the year on two bases.

The decision as to which approach to use is likely to be practical ease of calculation. However, if

the intention is to compare actual performance with expected performance, then it is more appropriate to calculate the effect of the change of basis on the closing value of in-force business. In this case, the value of in-force business at the end of the year should be calculated using the same assumptions as were used to calculate the equivalent value at the start of the year. This allows the investigation of the impact of variations in experience during the year on the value of in-force business at the end of the year to be quantified. Secondly, the impact of each change in assumption regarding future experience is separately calculated by making one change at a time and recording the impact on the value of in-force business until each change has been made.

The order in which the changes are made will make a difference to the results. In presenting the results of changes in assumptions regarding future experience, one may wish to present the total impact as one number. Alternatively, a change in assumptions relating to future expense levels may reflect the company's operating experience, and should perhaps be separated from changes to future investment returns (and the risk rate of return) which reflect changes in the company's operating environment.

The assumptions used to calculate the value of in-force business could change for many reasons, for example, to reflect higher or lower maintenance expense levels, to reflect changes in outlook regarding investment returns, to reflect changes in mortality levels or changes in corporate tax rates or rules.

Contribution from New Business

The contribution from new business has several components, which are similar to those described for the in-force contribution. The components are:

- a) the value of new business at the point of sale, plus the risk rate of return earned on this value between the point of sale and the end of the year.
- b) the difference between
 - statutory profits earned during the year
 - and
 - those anticipated in the projection of new business;

- c) the difference between
 the value of the new business still in-force at the end of the year
 and
 the expected value of the new business that was expected to remain in-force at the end
 of the year

The value of business issued during the year first enters the embedded value through the contribution from new business. Since, in our example, sales of new business are assumed to take place at the beginning of the year, it is appropriate to include the planned return on this value as part of the contribution from new business. The planned return is calculated in the same manner as the planned return on the value of business in-force at the start of the year; it is the risk rate of return multiplied by the value of new business.

The descriptions of items b) and c) for new business are analogous to the corresponding descriptions for the contribution from in-force.

The impact of actual volumes of new business differing from those included in the business plan should be calculated by producing a revised business plan using them, followed by the above analysis. In this way any variances that emerge relate to differences between actual and expected experience on the same business, and not to differences caused by varying amounts of production. Similarly, to the extent that an office's product pricing or experience varies by distribution channel, values can be calculated and results analysed by distribution channel in order to gain maximum insight into the financial mechanics of the business.

Capital Adjustments

A final adjustment is necessary to reflect cashflows in and out of the company during the period - that is to say the payments of dividends to shareholders or any capital contributions made to the company during the year. The timing and amount of the transfers can influence whether or not an interest adjustment is appropriate on them. In the example provided it has been assumed that no new capital has been contributed during the year and that there is a dividend payment of £8,000 at the end of the year.

Presenting and Understanding Results

Assuming a company has sufficient records to track all the information necessary to complete the analysis of in-force and new business envisaged above, a presentation of results similar to that shown in Tables 9 and 10 can be prepared. The results are based on the actual and expected results given in the previous section. For completeness, information regarding the actual and expected values of the business are given in Appendix K.

Table 9: Illustrative Movement in Embedded Value (£)

	Shareholders' Net Assets	Value of In-force	Total Embedded Value
Embedded value brought forward	10,000	172,383	182,383
+ Investment return on shareholders' net assets	500		500
+ Contribution from in-force business:			
-- planned return on value of in-force	-	18,962	18,962
-- expected profits during year	17,839	(17,839)	n/a
-- variance between actual and expected experience during year	(554)	(2,916)	(3,470)
-- impact of changes in assumptions regarding future experience on value of in-force business carried forward	-	-	-
+ Contribution from new business:			
-- value of new business at point of sale	-	2,731	2,731
-- planned return on value of new business		300	300
-- expected profits during year	(12,274)	12,274	n/a
-- variance between actual and expected experience during year	(31)	(566)	(597)
-- impact of changes in assumptions regarding future experience on value of business carried forward		-	-
Subtotal	15,480	185,329	200,809
+ Capital adjustments	(8,000)	-	(8,000)
Embedded value carried forward	7,480	185,329	192,809

Table 9 contains a presentation of the movement in embedded values from the beginning to the end of the year. The presentation corresponds to the formula presented in Appendix J. From a presentation point of view, one could simplify the table by dropping the first two columns. The Embedded Value has increased from £182,383 to £200,809 before payment of the dividend. This represents a rate of return of 10.1% on the opening value.

From this analysis some key financial data can be obtained:

- The extent to which actual results over the year differed from those that were expected, including a comparison of the actual and expected profits during the year as well as a comparison of the actual and expected value of the in-force business at the end of the year
- The value added by new sales during the year
- The individual contributions to shareholders' net assets and to the value of in-force business over the year.

This analysis, however, does not provide any insight into the particular areas where actual results differed from those that were expected. To get this insight, the variances must be analysed into the form given in Table 10.

Table 10: Variance Analysis (£)

Source of variance	Impact on Profit During Year	Impact on Value of In-force Business	Total
In-force business at beginning of year:			
Variances arising during year			
-- interest	0	-	0
-- expense	0	-	0
-- mortality	(1,458)	(80)	(1,538)
-- surrender	904	(2,836)	(1,932)
New business:			
Variances arising during year			
-- interest	0	-	0
-- expense	0	-	0
-- mortality	(100)	0	(100)
-- surrender	69	(566)	(497)
Change in assumptions regarding future experience:			
-- risk rate of return	-	-	-
-- interest	-	-	-
-- expense	-	-	-
-- mortality	-	-	-
-- surrender	-	-	-

From Table 10 the sources of the variances between actual and expected results, on both the current year's profits and the year-end values of in-force business, are given. The sources of variance on profit during the year are the same as shown in Table 8. The variances in the end of year values were estimated from the projections used. In the examples used, no changes to assumptions were made before calculating the final year-end values.

These two presentations provide management with the tools necessary to understand the key financial factors affecting profitability and value of the business, and to understand where current experience differs from that which was expected. The following information is apparent from the analysis.

- Actual mortality and lapse experience during the year was worse than expected. Investment returns and expenses were as expected
- The deterioration in mortality reduced statutory profits for the year and reduced the value of the business overall
- The deterioration in lapses resulted in higher current earnings but overall has reduced the value of the business.

If one wanted to focus on key information for management, it is likely that Table 10 would only be shown with the one column headed "total".

Until now, the analysis presented has been fairly mechanical. The areas where actual results differ from those that were expected are known, but the reasons for such variance are not. The process now enters a discovery and documentation phase. During this, the reasons for the difference between actual and expected results are researched. The discovery process could expose one or more of the following:

- Economic or actuarial assumptions that are conservative or optimistic
- Previous undiscovered errors in the company's administrative, accounting or investment systems

- Previous undiscovered errors in the methodology or systems used to calculate the values of in-force and new business
- Identification of areas where actual transactions differ from stated company practice (possibilities include payment of policyholder benefits or refunding of policy premiums and agent commissions)
- Identification of areas of good or bad performance (for example, poor underwriting, or profits and losses arising from mismatched investments).

The analysis becomes more meaningful according to the extent that a company completes this analysis for each major operating division and for major products within each division. It can offer insights as to which products are profitable, which products need to be repriced or areas from which the office may wish to withdraw, enabling company management to take appropriate action. Finally, if trends are observed over a period of time, this process can indicate required revisions in pricing or embedded value assumptions.

4. Practical Considerations

The process of calculating and analysing the change in embedded value is complex and can be time consuming. Although as shown in Appendix J the formulae produce a consistent picture, the order of calculation in practice is such that the balance sheet numbers - that is the opening and closing embedded values - are usually calculated first. The difference between actual and expected profit, in total, is generally readily available, but the split between business issued during the year and business in-force at the start of the year may be more difficult to obtain if the company's systems do not support this analysis. Similarly, some of the other elements in the movement during the year may need to be calculated on an approximate basis, at least initially. Over time the objective should be for accounting systems to support the analysis.

This section opens with some remarks on our simplified example. The remainder then summarises some practical considerations that may arise in performing the calculations and analyses.

Extension of Simplified Example

The example used in Sections 2 and 3 to illustrate the points made is a simple one, where only conventional non-profit business is written. If the example included unit-linked business or with-profit business then typically the same factors would affect results but the underlying calculations may differ.

For unit-linked business the key items of company income to be monitored are

- the amount of annual management charges deducted from the linked funds
- the expense deductions made from the linked funds
- the amount of premiums collected not invested in linked funds
- the deductions made from the linked funds to cover mortality and morbidity risks
- the deductions made from the linked funds to cover the company's liability to tax
- the amount of surrender penalties levied on surrendering policies.

Each of these key items of income would need to be related to expected income according to the business plan.

The variance analysis may be affected by the impact of changes in the statutory valuation basis. This naturally affects the profit reported during the year, but it will also affect the value of in-force business.

The proposed format of the presentations given in Tables 9 and 10 are still appropriate, but one would expect several of the above items to appear in Table 10 under the variance analysis.

For with-profit business, the value of in-force business will be the sum of the value of future shareholders' transfers generated by future bonus declarations, and the value of the shareholders' interest in the balance of the long term fund. As the first item is dependent on the cost of future bonus declarations, one factor appearing in the analysis of results may be the impact of the actual bonus declaration. It is suggested that a separate analysis of variance is carried out on the value of future shareholder transfers and the value of shareholders' interests in the balance of the long term fund. This will make it simpler to calculate and verify. Examples of Tables 9 and 10 for with-profit business are contained in Appendix L.

Complications

There are a number of potential complications which affect the calculations or the analysis of the movement in embedded value. These can affect the opening or closing embedded values or affect values at some stage during the year. Depending on the nature of these changes and their impact on the results, it may be useful to restate the value of in-force business brought forward in order to make the analysis more meaningful.

The reasons which can cause a revision to the opening value include:

- Prior year adjustments in an accounting sense (eg the impact of a settlement of tax computations with the Inland Revenue)
- Changes in methodology (eg, introduction of an allowance for the need to maintain solvency margins)
- Changes to the software used

- Changes to the model of the business (if a model is used to perform the calculations).

Mid-year complications may include:

- Repricing of existing contracts (eg, changes to annual management charges, or policy fees)
- Changes in the tax law
- Changes in commission structures
- Capital adjustments, eg, dividends paid out or new capital put in
- Acquisition or disposal of blocks of business.

A number of changes can be made which affect closing embedded values. These include alterations in assumptions relating to future experience and changes to the risk discount rate. Generally, these are not troublesome since they are made after the analyses for the year have been completed.

When changes are made, regardless of their timing, it is important for their impact to be quantified so that their contribution to the change in embedded value can be separately identified from the other sources of profit. In practice, this requires that, for each change, the value of in-force business is calculated with and without the change at the date on which the change becomes effective. The size of the change's effect should, of course, be checked for general reasonableness. In certain circumstances, it may be possible to estimate the impact of the change, rather than carry out detailed calculations.

Data Collection

The difficulty in gathering the information necessary to support the analyses developed in Sections 2 and 3 will depend on a variety of factors, eg:

- The separate business segments within which the company desires to monitor its operations, eg, individual life, individual pensions, group pensions, disability

- The product line splits that may be made within each business segment
- Accounting treatment of subsidiaries, eg, are they charged with their full actual expenses or some other amount and, if so, the accounting treatment of the difference
- The company's accounting systems and its ability to produce the required information and, most importantly, the availability of this information analysed between the desired business segments
- The sophistication and composition of the in-force and new business models.

Certain information on actual company results is likely to be readily available by business segment and by product within that segment, eg, premiums received, commissions, and change in statutory reserve. Other information will be more difficult to allocate, eg, expenses, policy benefits, tax. For unit-linked companies, required information may include the separation of claim payments into the linked fund component and the non-linked balance (which is necessary for a comparison of mortality experience) or the amount of premiums received not invested in units. Additionally, the split of actual results between items attributed to business issued during the year and business in-force at the start of the year will be easy for some items and difficult for others.

Some companies allocate expenses to operating lines of business on a marginal basis and fixed or overhead costs are retained in a "corporate" line of business. Such companies manage their operating lines of business on a contribution to overhead basis. An embedded value is calculated for the corporate line of business as well as for the operating lines of business. This approach works well in catering for temporary expense overruns.

Other areas where use may be made of a corporate line of business in the analysis of results include the treatment of taxation and the effect of an active investment policy. In respect of taxation, the analysis of results for the operating lines of business are calculated using notional tax rates applicable to that line of business and the difference between the company's actual tax liability and the tax liabilities included in the operating lines of business is the amount of tax (or tax saving) attributed to the corporate line of business.

Some companies analyse the gain from interest into the contribution from investment policy and

the contribution from the active management of the portfolio within the guidelines set by that policy. This separation may be particularly relevant where investment management is treated as a separate profit centre within the company or group.

In the early years of conducting these analyses, it is unlikely that the company will be able to split all revenue account items that it wishes to allocate to business units on an actual basis, and the splits will need to be estimated. However, as time goes by, it is useful to work towards a plan whereby the company's administrative and financial systems produce the information necessary to conduct the analysis in the required level of detail.

As far as the projection of the new and in-force business is concerned, the split of the in-force business into segments, and by product within those segments, should be relatively easy - assuming the company's administrative systems support this data. An area that may present difficulties, however, is the composition of the statutory change in reserves. If the software system used does not supply this information, estimates can be used. Such estimates can be derived from the underlying profit tests, a sample of the in-force and new business and an understanding of the statutory reserve basis. However, a better way is to revise the output to include information either on the statutory composition of the reserve increase or on the gains by source directly.

Level of Detail and Consistency with Other Internal Reports

Judging the level of detail in which to perform or present the analysis is a key issue. In order to address this issue one must look to the reasons why such analyses are carried out and the role such analyses play in communicating the financial progress of the company to senior management. The level of detail in a given presentation will depend on the audience, but the level of detail underlying the analyses will depend more on the use to which they are put.

If a life office desires to monitor its performance on an embedded value basis (using either pricing assumptions or current expected assumptions), the analyses should be consistent with the way the office monitors its financial condition - eg, if an office reviews results by major business unit (ordinary life, pension, disability) and by major product line within each unit (eg, non-profit and unit-linked), an embedded value analysis should be completed for each subdivision. Similarly, if an office monitors its performance by distribution channel, this distinction should also be incorporated into the embedded value analyses.

If the company uses embedded values and associated analyses to monitor its financial performance, as opposed to calculating an estimate of its economic value, the level of detail underlying the projections should necessarily be greater and will vary according to the diversity of the company's portfolio. Generally, there should be sufficient detail that the projection can be judged to be a reasonable representation of the company's business, ie it is consistent with historic trends (unless there are valid reasons why it should differ).

Senior management and the Board will receive various reports on the financial progress of the company, such as the Appointed Actuary's report, financial projections and business plans, and a product pricing report. Each of these will be written for a different purpose and may relate to either current or expected experience of the company. The reports may well be generated by combining the office's in-force and forecast levels of new business, with an expected set of future assumptions which could well be different for each report. As one can imagine, it can be quite a challenge for the reports' authors to produce coherent documents that complement each other and which are internally consistent. The potential for confusion is great. Nevertheless, in an ideal situation, they should be consistent and, if not, the differences readily identifiable and understandable.

Frequency of Analysis

For most offices sufficient information to complete these analyses will be available at the end of the financial year, so that a detailed analysis of profit by source can be carried out. At other times during the year, the ability to carry out such a detailed investigation will depend on the availability of data from the management information systems. For most companies, some of the necessary information will need to be estimated if interim analyses are carried out. In order to avoid surprises, companies will generally want to complete the analyses, on at least an approximate basis, on the half yearly results.

Use of Estimates

Many companies will not capture all the relevant data necessary to complete the analyses so, if it does not exist, how worthwhile is it to use estimates? As previously stated, it is likely that certain revenue account and balance sheet data will need to be estimated (at least in the early years) in order to carry out this analysis in all the desired segments. Even if this is the case, the insight that can be gained through the use of this process usually outweighs any temporary disadvantages from

the use of estimates. However, when estimates are used, care should be taken in the interpretation of the results.

The calculation of the expected basis against which actual results will be monitored is less likely to be an issue, assuming the office's administrative systems can split the business in-force into all the desired segments and that a projection system exists. One issue that could arise, however, is the office's ability to produce experience analyses for all the desired segments. In some cases, it may be acceptable to use a less detailed analysis for a particular assumption.

An example of this approach relates to the surrender rate assumption. An investigation into the difference between actual and expected surrender payments may reveal differences in actual payments or differences in the decrement rate. Irrespective of whether a per policy projection system or a modelling system is used, it is unlikely that the projection will reflect timing delays accurately. Provided that the reasons for the difference are understood, it is unlikely that greater insight will be gained by more detailed investigation.

Over time administrative and accounting systems may be improved and analyses of experience are likely to be developed to support the calculations.

5. *Conclusion*

As competition within the financial services industry increases, management's need to understand its financial condition, including its primary sources of profit and requirements for capital, also increases. This understanding is crucial to management's ability to make well-informed decisions regarding the future direction of the company. The techniques for analysing sources of profit against the pricing basis and against future expected results presented in this paper should provide management with the tools necessary to carry out this challenging task.

The effectiveness of the analysis of results is dependent on the skill with which the results are communicated to senior management. Care needs to be taken not to obscure the message; for example by avoiding the presentation of too many numbers, or by spending too much time on secondary details. This requires the actuary to consider written reports from the viewpoint of the reader, rather than to regard them as documentation of the processes undertaken. As a profession we do not have a good track record for effective communication; in the future, we must improve to retain our influence on management.

Appendix A
Key Assumptions for Examples

Contracts: Non-profit, 25 year contract.

Assumptions:

- Net earned interest rate equals 9%.
- Valuation interest rate equals 4.5%
- Actual mortality is 111% of expected in the first projection year; otherwise actual equals expected.
- Actual lapses are 125% of expected in the first projection year; otherwise actual equals expected.
- Risk discount rate used is 11%.

Timing of cashflows in model:

- Premiums received and expenses incurred at the beginning of the calendar year.
- Deaths occur evenly throughout the calendar year.
- Lapses occur at the end of the calendar year.
- Statutory profits are distributed annually at the end of the calendar year.

Appendix B
Statutory Results, Actual

	New Sales	In-force at Start of Year	Total
Reserves brought forward	0	213,878	213,878
Premiums received	10,000	58,403	68,403
Interest and gains received	(305)	23,070	22,765
Expenses incurred and commissions paid	(12,898)	(7,983)	(20,881)
Death claims paid	(983)	(15,929)	(16,912)
Surrender values paid	(1,014)	(14,126)	(15,140)
Amounts paid on maturity	0	0	0
Reserves carried forward	<u>(7,105)</u>	<u>(240,028)</u>	<u>(247,133)</u>
Profit during year	(12,305)	17,285	4,980

Appendix C
Statutory Reserve Development, Actual Results

	New Sales	In-force at Start of Year	Total
Reserves brought forward	0	213,878	213,878
Premiums received	10,000	58,403	68,403
Required interest for policyholder liabilities	395	11,619	12,014
Expense loadings	(503)	(2,938)	(3,441)
Reserve decrease for deaths	(1,428)	(22,276)	(23,704)
Reserve decrease for surrenders	(1,359)	(18,658)	(20,017)
Reserve decrease for maturities	<u>0</u>	<u>0</u>	<u>0</u>
Reserves carried forward	7,105	240,028	247,133

Appendix D
Sources of Profit, Statutory Basis, Actual Results

	New Sales	In-force at Start of year	Total
a. Gain from interest			
-- Interest and gains received	(305)	23,070	22,765
-- Required interest for policyholder liabilities	<u>(395)</u>	<u>(11,619)</u>	<u>(12,014)</u>
	(700)	11,451	10,751
b. Gain from loadings			
-- Valuation basis loadings in premium rates	503	2,938	3,441
-- Expenses incurred and commissions paid	<u>(12,898)</u>	<u>(7,983)</u>	<u>(20,881)</u>
	(12,395)	(5,045)	(17,440)
c. Gain from mortality			
-- Reserve decreases for deaths	1,428	22,276	23,704
-- Death claims paid	<u>(983)</u>	<u>(15,929)</u>	<u>(16,912)</u>
	445	6,347	6,792
d. Gain from surrenders			
-- Reserve decreases for surrenders	1,359	18,658	20,017
-- Surrender values paid	<u>(1,014)</u>	<u>(14,126)</u>	<u>(15,140)</u>
	345	4,532	4,877
e. Profit during year	(12,305)	17,285	4,980

Appendix E
Natural Reserve Development

	New Sales	In-force at Start of Year	Total
Reserves brought forward	0	50,696	50,696
Premiums received	10,000	58,403	68,403
Required interest for natural reserves and cashflows	(305)	8,384	8,079
Commission and expense allowances	(12,898)	(7,983)	(20,881)
Death claims	(983)	(15,929)	(16,912)
Surrender values	(1,014)	(14,126)	(15,140)
Amounts paid on maturity	0	0	0
Profit margin	<u>(945)</u>	<u>(5,516)</u>	<u>(6,461)</u>
Reserves carried forward	(6,145)	73,929	67,784
Interest on excess of statutory reserve over "natural" reserve	0	14,686	14,686

Note: the difference between actual interest received of 22,765 and the required interest on the "natural" reserves and cash flows of 8,079 is the interest earned on the excess of the statutory reserves over the "natural" reserves.

Appendix F
Statutory Results, Expected Results

	New Sales	In-force at Start of Year	Total
Reserves brought forward	0	213,878	213,878
Premiums received	10,000	58,403	68,403
Interest and gains received	(301)	23,142	22,841
Expenses incurred and commissions paid	(12,898)	(7,983)	(20,881)
Death claims paid	(885)	(14,336)	(15,221)
Surrender values paid	(811)	(11,309)	(12,120)
Amounts paid on maturity	0	0	0
Reserves carried forward	<u>(7,379)</u>	<u>(243,956)</u>	<u>(251,335)</u>
Profit carried forward	(12,274)	17,839	5,565

Appendix G
Statutory Reserve Development, Expected Results

	New Sales	In-force at Start of Year	Total
Reserves brought forward	0	213,878	213,878
Premiums received	10,000	58,403	68,403
Required interest for policyholders liabilities	395	11,624	12,019
Implicit allowance for expenses	(503)	(2,938)	(3,441)
Reserve decrease for deaths	(1,426)	(22,074)	(23,500)
Reserve decrease for surrenders	(1,087)	(14,937)	(16,024)
Reserve decrease for maturities	<u>0</u>	<u>0</u>	<u>0</u>
Reserve carried forward	7,379	243,956	251,335

Appendix H
Sources of Profit, Statutory Basis, Expected Results

	New Sales	In-force at Start of Year	Total
a. Gain from interest			
-- Interest and gains received	(301)	23,142	22,841
-- Required interest for policyholders liabilities	<u>(395)</u> (696)	<u>(11,624)</u> 11,518	<u>(12,019)</u> 10,822
b. Gain from loadings			
-- Valuation basis loadings in premium rates	503	2,938	3,441
-- Expenses incurred and commissions paid	<u>(12,898)</u> (12,395)	<u>(7,983)</u> (5,045)	<u>(20,881)</u> (17,440)
c. Gain mortality			
-- Reserve decreases for deaths	1,426	22,074	23,500
-- Death claims paid	<u>(885)</u> 541	<u>(14,336)</u> 7,738	<u>(15,221)</u> 8,279
d. Gain from surrenders			
-- Reserve decreases for surrenders	1,087	14,937	16,024
-- Surrender values paid	<u>(811)</u> 276	<u>(11,309)</u> 3,628	<u>(12,120)</u> 3,904
e. Profit during year	(12,274)	17,839	5,565

Appendix I

Comparison Actual vs Expected, Statutory Gain by Source

	Actual	Expected	Difference
a. New Sales			
-- Gain from interest	(700)	(696)	(4)
-- Gain from loadings	(12,395)	(12,395)	0
-- Gain from mortality	445	541	(96)
-- Gain from surrender	<u>345</u>	<u>276</u>	<u>69</u>
Subtotal	12,305	(12,274)	(31)
b. In-force at start of year			
-- Gain from interest	11,451	11,518	(67)
-- Gain from loadings	(5,045)	(5,045)	0
-- Gain from mortality	6,347	7,738	(1,391)
-- Gain from surrender	<u>4,532</u>	<u>3,628</u>	<u>904</u>
Subtotal	17,285	17,839	(554)
c. Total			
-- Gain from interest	10,751	10,822	(71)
-- Gain from loadings	(17,440)	(17,440)	0
-- Gain from mortality	6,792	8,279	(1,487)
-- Gain from surrender	<u>4,877</u>	<u>3,904</u>	<u>973</u>
Total	4,980	5,565	(585)

Appendix J

Formula for Successive Embedded Values

Embedded value brought forward	Shareholders' Net Assets	Value of In-force	Total Embedded Value
+ Investment return on shareholders' net assets + Contribution from in-force business: -- risk rate of return on value of in-force -- profits during year -- variance between actual value of in-force carried forward and expected value of in-force carried forward + Contribution from new business: -- value of new business at point of sale -- risk rate of return on value of new business -- profits during year -- variance between actual value of in-force carried forward and expected value of in-force carried forward + Capital adjustments	BV_t $i * BV_t$ - Profits IF_t - $Profits NB_t$ - $BV_{t+1} - BV_t - i * BV_t$ $-(Profits_t^{IF} + Profits_t^{NB})$	IF_t - $j * IF_t$ $- Profits IF_t^{1_t}$ $IF_{t+1} - (IF_t * (1+i)) - Profits IF_t^{1_t}$ NB_t $j * NB_t$ $- Profits NB_t^{1_t}$ $NB_{t+1} - (NB_t * (1+i)) - Profits NB_t^{1_t}$	$BV_t + IF_t$ $i * BV_t$ $j * IF_t$ $Profits IF_t - Profits IF_t^{1_t}$ $IF_{t+1} - (IF_t * (1+i)) - Profits IF_t^{1_t}$ NB_t $j * NB_t$ $Profits NB_t - Profits NB_t^{1_t}$ $NB_{t+1} - (NB_t * (1+i)) - Profits NB_t^{1_t}$ $BV_{t+1} - BV_t - i * BV_t$ $-(Profits_t^{IF} + Profits_t^{NB})$
Embedded value carried forward	BV_{t+1}	$IF_{t+1} + NB_{t+1}$	$BV_{t+1} + IF_{t+1} + NB_{t+1}$
where: • t and $t + 1$ refer to beginning and end of year respectively • i equals the after-tax net investment return earned on shareholders' net assets • j equals the risk rate of return • Profits IF_t are actual profits on business in-force at beginning of year • Profits $IF_t^{1_t}$ are expected profits on business in-force at beginning of year • Profits NB_t are actual profits during year from current year's business • Profits $NB_t^{1_t}$ are expected profits during year from current year's business			
• IF_t is the value of business in-force at beginning of year • IF_{t+1} is the value of business in-force at the end of the year which was in-force at the start of the year • NB_t is the value at point of sale of new business sold in the year from t to $t+1$ • NB_{t+1} is the value of business sold in the year calculated at the end of the year based on actual business remaining in-force • BV_t is the value of shareholders' net assets at the beginning of the year • BV_{t+1} is the value of shareholders' net assets at the end of the year			

These formulae assume that the value of in-force business and the value of new business have been calculated in a manner which makes it appropriate to apply the risk rate of return (j) to the values. If, on the other hand, the values of in-force business and new business allowed for surplus to emerge throughout the year, the above formulae would need to be amended to reflect the timing of the surplus distributions. In particular in the Table the risk rate of return has been applied for a full year to the value of new business. This is only appropriate as in our example new business is sold at the beginning of the year; otherwise, the appropriate allowance depends on the incidence of the new business sales.

Appendix K
Values of Business

- Expected values, beginning of year:

-- New sales	£2,731
-- In-force at Start of Year	£172,383

- Values, end of year:

	Actual	Expected	Variance
-- New sales	£14,739	£15,305	£(566)
-- In-force at Start of Year	£170,590	£173,506	£(2,916)

Appendix L

With-Profit Business

The example used throughout this paper concerns a company which writes only conventional non profit products. This Appendix contains suggested amendments to the presentation of Tables 9 and 10 which could be used for a company writing with-profit business.

For a with-profit fund, the value of in-force business is the sum of

the value of future shareholder transfers generated by future bonus declarations,
and

the value of the shareholders' interest in the balance of the long term fund surplus to that required to provide for the bonuses mentioned above.

The assumptions regarding future experience which are used to calculate the above values include an assumption regarding future levels of reversionary and terminal bonus (even if that assumption was zero).

The balance of the long term fund after allowing for expected claims, expenses, taxes and shareholders transfers is referred to as excess assets in this Appendix. The value of shareholders' interests in these excess assets will depend on the methodology used in the embedded value calculation.

The amended presentations of Tables 9 and 10 separate the column related to value of in-force business into two columns as shown below.

The table of variances demonstrates that certain assumptions relating to future experience, such as surrender rates, affect both the value of future shareholder transfers and the value of shareholders' interests in the excess assets, whereas other assumptions (eg maintenance expenses) only affect the amount of excess assets unless the variance is accompanied by a change in current or future bonus declarations.

Table 9 (Amended): Illustrative Movement in Embedded Value of a With-Profit Company (£)

	Shareholders' Net Assets	Value of Shareholders' Transfers	Shareholders' Interest in Excess Assets	Total
Embedded value brought forward	X	Y	Z	X+Y+Z
+ Investment return on shareholders' net assets	X			X
+ Contribution from in-force business:				
-- risk rate of return on shareholders' transfers		X		X
-- investment return on excess assets			X	X
-- expected profits during year	X	(X)		-
-- variance between actual and expected experience during year	X	Y	Z	X+Y+Z
-- impact of changes in assumptions	-	-	-	-
-- changes in proportion of excess assets attributable to shareholders			X	X
+ Contribution from new business:				
-- value of new business at point of sale		X	Y	X+Y
-- risk rate of return on shareholders' transfers		X		X
-- expected profits during year	X	(X)		-
-- variance between actual and expected experience during year	X	Y	Z	X+Y+Z
-- impact of changes in assumptions	-	-	-	-
-- change in proportion of excess assets attributable to shareholders			X	X
Subtotal	X	Y	Z	X+Y+Z
+ Capital adjustments	-	-	-	-
Embedded value carried forward	X	Y	Z	X+Y+Z

Table 10 (Amended): Variance Analysis of a With-Profit Company (£)

Source of variance	Shareholders' Net Assets	Value of Shareholders' Transfers	Shareholders' Interest in Excess Assets	Total
In-force at beginning of year and new business:				
Variances arising during year				
-- interest	n/a	-	X	X
-- expense	-	-	X	X
-- mortality	-	X	Y	X+Y
-- surrender	X	Y	Z	X+Y+Z
-- bonus declaration	X	Y	Z	X+Y+Z
-- change in reserve basis	X	Y	Z	X+Y+Z
Change in assumptions regarding future experience:				
-- risk rate of return	-	X	Y	X+Y
-- interest	-	-	X	X
-- expense	-	-	X	X
-- mortality	-	X	Y	X+Y
-- surrender	-	X	Y	X+Y
-- bonus levels	-	X	Y	X+Y
-- change in reserve basis	-	X	Y	X+Y