

THE VALUATION OF GENERAL INSURANCE COMPANIES

BY J. P. RYAN, M.A., F.I.A., A.S.A., A.C.A.S., M.A.A.A., F.I.R.M.,
A.M.S.I.A. AND K. P. W. LARNER, M.Sc., F.I.A., A.S.A.

[Presented to the Institute of Actuaries, 4 June 1990]

ABSTRACT

The paper presents a theoretical framework for the valuation of a general insurance company to actuaries, but also aims to provide reference work for non-actuarial users of appraised values. It distinguishes between the price that may be paid for an insurance operation from what may be called the economic or appraised value. The paper describes the elements of the appraised value calculation, selection of parameters, the uses of such evaluations and explores the future development into explicit stochastic modelling rather than the implicit methodology. Theoretical and practical considerations are illustrated and example valuations of a single line insurer are given.

KEYWORDS

General Insurance; Appraisal Values; Modelling; Mergers and Acquisitions

1. INTRODUCTION

1.1 Valuation of general insurance companies is an increasingly common feature of actuarial work. Most of the work arises from merger and acquisition activity, although the need for evaluations in other contexts is also significant. There is a great deal of actuarial literature available on this topic, although the bulk of the material is not published within the United Kingdom actuarial community. The authors particularly recommend the papers used in the examinations of the Casualty Actuarial Society for a useful introduction. An extensive bibliography is included at the end of the paper.

1.2 Until recently, there has been a marked lack of general insurance acquisitions in the U.K., possibly as a result of extremely soft markets. However, greater burdens and opportunities are now being placed on the U.K. profession. The increasing amount of interest in Europe probably means that merger and acquisition activity on the continent will increase. It is therefore essential that actuaries fully understand all the concepts; of particular importance is how the different accounting and reserving approaches can affect the values and management of non-life insurance companies. We believe the approach presented here provides a framework for dealing with the challenging problems that lie ahead. It is important, not only that the profession uses appropriate methodology, but also that it explains the peculiarities of the insurance process to other entrants into the insurance market.

1.3 Not all the problems in valuing an insurance company are known, yet alone solved. Nor is it likely they ever will be, since each company is unique.

The authors regard this type of valuation work as an area rich in future research topics and very fulfilling for the actuary. The nature of the judgements needed relates to the total financial condition of the insurance company and therefore allows the full use of an actuary's experience and technical capabilities. The actuary experienced in this field can expect to play a major role in the development of the general insurance industry.

1.4 In the first four sections of the paper, we set up the conceptual framework. We define the appraised value concept in Section 2, but many terms need further explanation. The basic ideas are introduced in Section 3 and developed in a practical context in Section 4. Sections 5 and 6 look at wider issues and, in particular, the different purposes of valuation.

1.5 The later sections focus on the special features of valuations for sale, followed by simplified numerical examples. Finally, we look at other uses of appraisals, future developments and research.

1.6 Sections 1 to 6 and 10 have been written particularly with a wider non-actuarial audience in mind. Appraised valuations must be put into the context of other approaches to valuation that are in general use. Actuaries are well aware of the peculiarities of the insurance industry. It is, however, particularly important that we communicate our approach to the valuation of insurance to those involved in other industries. We, therefore, need to provide them with sufficient theoretical background to understand the nature of the results we produce. This is true, even if the technical details cloud their understanding of the full implications of how we arrive at those results. It is possible to understand a property valuation without being able to measure usable floor area.

1.7 We must be specially careful to explain our terminology. *Appraised value* has a technical actuarial meaning in the U.K. In this paper we also use the term *appraisal* of an insurance company in a much wider sense, including many of the qualitative investigations mentioned in Section 8. An *appraisal* can be more important than the actual *appraised value* calculated. In the United States of America, the term *actuarial appraisal* is used synonymous with our *appraised value*, also various other groups in the market for insurance companies and investment bankers carry out *appraisals* which are valuations. Similarly, much confusion can arise from the use of the word *goodwill*, which has different technical meanings to different groups. Section 5 discusses this issue.

1.8 The authors have been involved in valuing insurance companies for a variety of purposes over many years. They have found that each company presents a unique set of problems, both theoretical and practical, and that a sound theoretical basis is essential for their solution. The authors are convinced that the appraised value approach is sufficiently robust for practical work. They therefore present its methodology, techniques and the practical issues it raises to the profession for its consideration and discussion.

1.9 The authors would like to thank the many other authors who have already written on this and related subjects. Almost all of the non-life actuarial papers that deal with the measurement of profit and company financial dynamics are

relevant. They are, therefore, too numerous to mention without the offence of omitting one. The authors remain debtors to the authors of those papers. We wish to thank our colleagues for their encouragement and help with this paper. We acknowledge that any mistakes are our own.

2. THE APPRAISED VALUE AND OTHER APPROACHES TO VALUATION

2.1 *The Appraised Value Approach*

2.1.1 The appraised value is the sum of present values of future earnings streams generated by the operations of the company at appropriate risk discount rates. It falls into a category of approaches to valuation familiar to actuaries and commonly used by investment analysts.

2.2 *Other Approaches to Valuation*

2.2.1 There are other approaches. Some are widely used outside insurance and some are for special purposes. Having a common framework that is valid and transportable to many different situations and also outside of insurance is very important.

2.2.2 More complex approaches utilising modern portfolio theory and capital asset pricing models, for instance, would typically be based on secondary market share pricing and, whilst extremely valuable in their context, their use for other purposes is problematic. They do, however, suggest that the value of a company is the present value of its future net earnings.

2.2.3 'Rules of Thumb' abound and can be extremely valuable short cuts where data and time are in short supply, but only if their shortcomings are understood.

2.2.4 We examine briefly a list of typical methods used in practice. Most of them are specific to valuations for purchase or sale:

- price/earnings ratio times earnings,
- dividend divided by dividend yield,
- a multiple of premium,
- a multiple of net asset value, and
- secondary market value.

2.2.5 The approach of applying a multiplier or capitalisation factor to current or expected total company earnings or dividends has considerable shortcomings, but does allow a simple comparison between companies. Unfortunately, as is well known, a feature of insurance is the substantial delay in the emergence of declarable profit or loss on written business. Also, there is often considerable uncertainty as to the amount expected to emerge. Separate and detailed consideration of the various insurance, investment and other operations of an insurance company would be an obvious refinement.

2.2.6 In some markets, personal lines insurance companies have been valued at twice published net asset value. In other markets 1.5 times has been used. The

methods of applying multipliers to net asset value or premium clearly rely very heavily on stable implicit assumptions for solvency ratios, profit margins, and company growth, amongst other factors and also that all companies operate and will continue to operate similarly in the market. It is of interest to note that such stability can sometimes exist.

2.2.7 An agreed market price for a company, whether derived from a secondary market price or a company acquisition transaction, is an objective valuation, and as such is of particular importance. Many of the other approaches, indeed, aim at an estimate of this value. A market price may be regarded as a realisation of a process of valuation derived from a deal between a buyer and a seller, or an average of such deals, and as such it is subject to the subjective opinion of the participants in the transaction. Often the value reflects issues other than a company's economic value or its ability to generate future profit. These issues include general market pressures, scarcity value, negotiating skills of the parties, as well as the complex issues of potential synergies or conflicts between the buyer and the company and its current management.

2.3 The Appraised Value as Explicit Modelling

2.3.1 The appraised value approach takes a different tack. It aims to be more structured and is necessarily detailed.

The aim is to reduce the valuation to a model with calculations based on explicit assumptions. These assumptions will be selected largely by judgement following various investigations.

This explicit modelling approach also analyses the detailed financial elements of a company, allowing a better understanding of its potential for generating earnings.

2.3.2 An important feature of the appraised value approach is that, being detailed, much depends on the availability of information to allow sufficient depth of analysis for reasonable assumptions to be made. However, being an explicit calculation, the appraised value can then be tested for sensitivity to change in assumption. Whilst less information necessarily leads to greater uncertainty, the potential influence of further information on the uncertainty is assessable to some extent.

2.4 The Appraised Value Definition

2.4.1 Before clarifying all the concepts, we make a formal definition of an appraised value as a practical calculation of the present value of a company's projected streams of net earnings from all sources at appropriate risk discount rates. The method of calculation seeks to incorporate many concepts such as:

- value as discounted future earnings,
- going-concern basis,
- cost of capital,
- the build-up of value by the addition of each operation in turn,
- delays in the emergence of profit or loss,

- risk profiles and risk discount rates in the context and purpose of the valuation,
- short-term *v.* long-term profitability and cyclical trends,
- risk of sudden and catastrophic adverse experience, and
- under-capitalisation.

The background and development of these and supplementary concepts are dealt with in Sections 3 and 4.

2.4.2 The appraised value may be calculated at the valuation date in sections:

—*Adjusted Net Asset Value*

The balance sheet net asset value is adjusted to allow for the value of any asset or liability not expected to generate net earnings at levels implicit in a market valuation or at realisable value or other chosen valuation basis which may be dependent on the purpose of valuation. An allocation of assets to the insurance liabilities is required, which we call the insurance assets.

—*Other Value arising from Past Written Business*

This includes any surplus or deficit in insurance reserves and requires an assessment on a prospective basis of all claims reserves, premium reserves and insurance funds covering all reserves for both past and future exposure periods representing business written in the past. It also includes the value of future investment income attributable, based on the insurance assets and how they may change as the reserves run off, any expenses not reserved for but attributable to the administration of the payment of net claims, and other expense items arising from the run-off of the balance sheet. First, the timing of the emergence of each of the earnings streams, net of tax attributable, is taken into account; then, discounting is applied at selected risk discount rates appropriate to the insurance operation, after having regard to the capital allocated to the insurance operations and the purpose and context of the valuation.

—*The Value arising from Future Written Business*

The additional value arising from future written business is based on the expected additional net earnings arising from future written business, usually including renewal business discounted at appropriate risk discount rates. The projection of net earnings takes account of each of the elements of profitability, including premium, commission, other expenses, claims, investment income attributable, reinsurance and any other item of revenue. Each element is allowed to vary for short-term structural changes and underwriting cycles. The longer term view of profitability and growth takes account of the company in the context of the market in which it operates and averaging of cyclical profitability.

Typically, the calculations are performed for each main class of business separately and taken net of tax. The timing of the emergence of profit is allowed for, as are the current levels of production and future potential growth. The resultant net earnings stream is discounted at the selected risk discount rates for the insurance operations.

Reductions from this value should be made for the cost of any restrictions to investment policy and the return needed to cover capital allocated to the insurance operation, if judged appropriate. In addition, reductions for under-capitalisation and the risk of adverse catastrophic experience, not incorporated in the projection of earnings above, should also be deducted.

2.4.3 The appraised value is a practical calculation. Sections 3 and 4 present the theoretical background and its development.

2.4.4 The purpose and context of the valuation is critical. Often the possible variation in appraised value to changes of assumption is as important as any single value. This is discussed in detail in Sections 5 and 6.

2.4.5 Depending on the context of valuation, qualitative judgement on issues such as a proven track record of results, quality of management, organisation and systems and their ability to cope with growth, and potential market profitability and growth all need to be considered. This is discussed in Section 8.

3. SOME BASIC CONCEPTS

3.1 In this section we introduce some concepts that are necessary for a full understanding of the issues.

3.2 *Value as Discounted Future Earnings*

3.2.1 Modern portfolio theory and other investment work provides a theoretical basis for the suggestion that the value of a company is the present value of its future net earnings. Indeed, this is an accepted basis of valuation for almost any asset including property, bonds, licences and patents. Present values are taken at risk discount rates appropriate for the level of uncertainty surrounding the various future streams of net earnings and the purpose of the valuation. Earnings are taken net of tax.

3.2.2 It is a simple extension of this concept to define the value of an insurance company as the present value of its future net earnings in exactly the same way. For practical calculations, the appraised value is separated into three constituent parts; adjusted net asset value, other value arising from past written business and the value of future written business. It must always be remembered that the separation into parts is notional to ease the calculation process. It is the total appraised value that is important; the value of each of the parts is of lesser importance. It also needs to be emphasised that this approach values the company as a going concern.

3.2.3 In this context, the market value of an asset, as determined by the Stock Exchange or Government Securities Secondary Markets, represents the present value of the earnings stream, but without the constituent components of net earnings and the risk discount rates being explicitly identified. For appraised value calculations, the approach of valuing net assets at market values is, therefore, usually most appropriate. In certain contexts, a return to first principles is needed and present values of projected earnings at chosen risk

discount rates may be more appropriate, for example, where sharp changes in market values are a distorting influence.

3.3 *Going Concern v. Break-up Values*

3.3.1 It is possible to consider the value of a company on a break-up basis. It should also be realised that companies can have a greater value on a break-up basis than on a going-concern basis. Usually, in these circumstances, management is not doing a good job and unless the situation can be turned around serious consideration should be given to break-up or run-off. Many quoted companies are standing at a discount to their published asset values, which tends to suggest that the break-up values are greater than the appraised values. Economically, this would suggest that the industry is vulnerable to non-insurance related takeover or purchase by non-U.K. insurance predators.

3.3.2 This phenomenon is not confined to the insurance industry. Many industrial companies have current Stock Market valuations which are significantly less than the values defined. This gap between the Stock Market valuation and an appraised valuation implies either that the market considers the returns produced by the industry to be unattractive in relation to the capital employed, or, alternatively, that there is excess capital within the industry. This is something that we discuss further in Section 4. For the rest of this paper we consider companies on a going-concern basis. It is usually not difficult to rework the calculation on a break-up basis. Indeed, it is often easier.

3.4 *Cost of Capital*

3.4.1 Shareholders provide capital for an insurance operation. They will require a larger return on their funds than if they invested them separately. This arises, partly because the capital is being exposed to the risk of loss in the insurance business and partly because it could be used elsewhere. Depending on the levels of solvency carried by the insurance company, investment policy may, or may not, be greatly restricted. In any case, insurance companies may be considered subject to greater investment constraints than the typical shareholder. To some extent, these constraints are less burdensome for a company carrying a higher level of working capital than one carrying a lower level, but operating in the same insurance business lines in a similar way.

3.4.2 In addition to the investment constraints, the shareholders' funds are exposed to risk of loss if unprofitable business is written, or unforeseen calamities occur. This risk must be compensated for by an additional return, which means that the earnings generated by the shareholders' investments must be discounted at a higher rate than if the investments were held separately. Thus, a discount should be applied to the net asset value on a going-concern basis.

3.4.3 This is a significant concept, as it implies that injecting an extra £10 m into an insurance company would increase its value by less than £10 m unless, either the extra capital more than proportionately reduces the risk to the company, or more profitable (volume or quality) business can be written than would otherwise be the case.

3.4.4 We use the term 'cost of capital' to mean the value of the shortfall in net earnings between the risk return required by shareholders and the actual investment return. It should be noted that non-actuaries and actuaries in the U.S.A. have used it to mean the entire risk return required by shareholders. The usage is also not always consistent, however, and some care is needed.

3.5 *Policyholder v. Shareholder Funds*

3.5.1 We introduce the additional concepts of shareholder funds and policyholder funds. This facilitates the understanding of the roles of the various constituents of an insurance company. All the explicit free reserves and capital are regarded as shareholder funds. The balance of the assets is regarded as policyholder funds. Anything that would disappear, if all the liabilities were run off, should be regarded as a policyholder asset. Where there is a delay in the emergence of some of the shareholder funds, the role of the shareholder and policyholder funds is blurred.

The explicit capital base is provided simply to enable the risks of writing the policyholder business to be taken on. Often these funds are invested in equities and property, subject to any necessary liquidity constraints. These constraints are unlikely to be great for a large, established and well-capitalised company. This capital could be provided in any form; a bank guarantee could be sufficient. Some Lloyd's names effectively fund part of their capital requirements in this way. In a break-up, subject to the cost of liquidation and possible tax consequences, all these funds would be returned to the shareholders at market values (having first met policyholder liabilities). Policyholder assets are often invested in short-term fixed interest securities, including deposits.

3.5.2 Confusion often arises over the introduction of shareholder/policyholder funds. There is no ownership issue here; only two different roles. The shareholder funds provide the risk capital and the policyholder funds are a cost accounting function, so that the company may analyse the cost and profits of writing business. It is the analysis of the roles that is important. With conservative claims reserving, a precise separation is impossible. To avoid confusion in the future, we will not use these terms, but will refer to net asset value and insurance funds.

3.6 *Adjusted Net Asset Value*

3.6.1 We need to adjust the net asset value at the valuation date for any assets not shown at market value or which are not earning market rates of interest, or rates at levels not consistent with the chosen valuation basis. We also add in the value of any net earnings or expenses not capitalised into the balance sheet.

3.6.2 Any item of goodwill or the cost of past research and development, which has been capitalised in the balance sheet, is deducted. Cash and current account balances can be taken at face value and current liabilities can be netted with current assets, except under extreme cases, where delays are more significant than generally is the case under U.K. accounting rules.

3.6.3 This is our normal approach for the valuation. There is an alternative

approach to use book values for investments and balance sheet values, for goodwill, research and development, etc. and adjust for the cost of capital arising from the difference to appraised values. The approach is analogous to the treatment of the differences in the best estimates of claims reserves and carried values, mentioned in § 3.8. Some care is required to consider the recognition of the emergence of the profit or loss and taxation under the accounting rules. This approach may be of particular relevance in the U.S.A., where book values for certain investments are mandatory. Obviously this would not be relevant for a valuation on a break-up basis.

3.6.4 Similarly, fixed assets and other assets subject to amortisation according to accounting rules could be valued at their appraised or economic value, with a corresponding adjustment to the accounted depreciation expenses. In practice, such adjustments are often too small to be material.

3.7 Delays in Emergence of Profit or Loss

3.7.1 Because of various accounting conventions, the total declared net earnings arising from a block of business will not appear in the first year it is written, but will be spread over future years. Each element of the net earnings, including tax, will follow a potentially different pattern of recognition in the statutory accounts and this recognition will not necessarily coincide with flows of money. To the extent that an outgo item is accounted for before the outward cash flow and the monies are invested, the investment income is attributable. Thus, if we discount net earnings at the earned investment rate, the present value is independent of the timing of their declaration in accounts. To the extent that higher risk discount rates are applied, then different values arise.

3.7.2 It should also be noted that where, for whatever reason, profits are never recognised (i.e. delayed indefinitely in conservative reserves) and a risk discount rate greater than the investment rate applies, then the profit carries a nil value. In some countries, the emergence of profit is very delayed and risk discount rates have to be considered with particular care. This is usually because of the peculiarities in the relevant taxation system and the flexibility given to management in setting more than adequate reserves. There can be a strong analogy with life assurance here.

3.7.3 It may not be appropriate, in certain circumstances, to use a different discount rate if there is no requirement to take the funds elsewhere or the implicit provisions can be regarded as part of the overall capital base. For example, some German companies publish balance sheets which show capital less than E.C. minimum requirements.

3.7.4 Emergence of profit is a concept that has been analysed extensively in the life assurance field. However, although the concept is more extreme when applied to life assurance, it is by no means restricted to it.

3.7.5 General insurance is an obvious extension, but the concept also applies to a number of other financial institutions, as well as industries such as contracting. Interestingly, the Casualty Actuarial Society's proposed statement

on valuation does not introduce this concept, but we believe it to be of fundamental importance.

3.7.6 It should be noted that delays in the emergence of profit or new business strain distorts the relationship between policyholder and shareholder funds. Because different accounting policies can affect the allocation between shareholder and policyholder, care needs to be taken in their interpretation and it must be realised that any one allocation cannot be taken as absolute. This is another reason why we use the terms net asset value and insurance funds in most of our analysis.

3.7.7 The risk discount rate is usually greater than the rate that can be earned on invested funds, so that, in general, the more conservative the reserving policy, the less valuable the company. This is not an absolute relationship and because shareholders dislike uncertainty in results, a very high discount rate could be appropriate if there were to be no cushion in the reserves. In this latter case, lower reserves could lead to a lower value for the company. Depending on the context of the calculations, the actuary should consider the impact of possible future changes in reserving policy.

3.7.8 Usually earnings, in the context of an appraised value, are equal to the profits in each future year declarable in statutory financial statements. Thus, the concept of delay of emergence of profit or loss is implicit in our approach. In particular, where claims reserves are held undiscounted, as is usual in the U.K., several factors need to be taken into account. These include the investment income generated by assets attributable to these reserves less any future expenses attributable to the settlement of the liabilities and the likely emergence of any other expected redundancy or surplus in reserves. The timing of the emergence needs to be estimated.

3.8 Other Value arising from Past Written Business

3.8.1 The preceding section indicates that the earnings (surplus or deficiency) arising from the insurance liabilities reflected in the balance sheet need to be taken into account. Claims reserves should be assessed on a prospective basis and any surplus or deficit, together with the timing of the release or strengthening, identified. Unearned premium reserves and reserves set up on a three-year accounting basis should be reviewed in terms of the ultimate claims payments expected to be made and the timing of their recognition in the accounts. Investment income generated by assets attributable to reserves and any claims handling expenses need to be projected and valued at an appropriate risk discount rate for the insurance operation.

3.9 Allocation of Assets

3.9.1 Although we have referred to separate shareholder and policyholder funds, it is unusual for this allocation to be made within an insurance company's balance sheet. The assets are usually a mixture and contain some current asset items such as agents' balances; the investments will often include equity investments. The profitability of the insurance business will be affected by the

investment returns (if any) obtained on the assets. The choice of which assets are allocated to policyholders' liabilities is crucial to the analysis of profitability, but much less to the appraisal value. The appraisal value is unaffected, because efficient markets mean that higher-return assets are riskier and therefore require higher discount rates. The treatment of agents' balances will have some impact. Any discount applied to the shareholder funds will also be a function of the asset allocation.

3.9.2 To assess the investment rates properly, the balance sheet assets must be allocated to the liabilities separating, at the least, those attributable to the insurance liabilities and those to free capital or net asset value. This identification of insurance assets is important, as different assets will generate different returns, particularly non-interest bearing assets such as agents' balances. Non-insurance assets enter the calculation usually at market value, whilst insurance assets enter as the present value of the net investment return they generate (including capital gains where applicable) before they are paid out. Risk discount rates need to be chosen correctly so as not to create problems.

3.9.3 In deciding how to undertake the asset allocation exercise, it is helpful to consider what would happen if a company ceased to write any more insurance business. The agents' balances would all eventually become paid, less any bad debt provision. The insurance liabilities would ultimately disappear and the company would normally be left with assets that it would invest long-term, probably along the lines of an investment trust. This would suggest that it would invest in equities, property and the like. It is unlikely that it would invest in any fixed interest securities, except on an opportunistic basis or have any need for liquidity, except for short-term dealing purposes.

3.9.4 The correct approach is, therefore, to allocate all the assets that arise from transacting insurance business to the insurance or policyholder funds. This means that ordinary non-interest bearing assets are first allocated to the policyholders. It would then be appropriate to allocate the short-term fixed interest securities and only allocate any equity or property investment to policyholders if the insurance funds are sufficiently high for this to be necessary. This would then leave the shareholders with the bulk of the equities and property investments. Some further consideration of matching of long-tail lines by equities may be appropriate. It is important that this exercise be carried out in this way, as it allocates the costs of writing insurance to the correct place.

3.9.5 Where the insurance assets exceed the insurance liabilities, then shareholder funds are effectively being invested in the insurance operation. For the purpose of the valuation, this can be treated as a notional loan from the shareholder fund, where the interest on the loan is equal to an appropriate risk discount rate.

3.10 The Value of Future Written Business

3.10.1 A proper valuation of future written business is crucial to an appraised value calculation. Several additional concepts are needed. Section 4 fully develops them and we introduce them here.

3.10.2 We value the net earnings streams by projecting the elements of probability (premium, claim, expense, investment income attributable, etc.) for each class of business with similar characteristics over future periods at appropriate, and potentially different, risk discount rates. The projection must take account of the particular methods of operation assumed for the company (i.e. distribution, administration, systems, etc). The purpose and context of the valuation become crucial.

3.10.3 In the first few years of the projection, significant and often, to a large extent, predictable variations occur in the projection parameters. Variations can occur because of structural changes within the company, especially in expense ratios. This might arise, typically, either from a reorganisation, or cost cutting exercise following a long-term deterioration in expenses ratios, or from an entry into a new market where production levels start at a low level, but are expected to rise very rapidly. Both these examples can be seen to need short-term adjustments in parameters over, say, the first five years of projection.

In addition, variations occur because of changes external to the company. These include the impact of underwriting cycles, which may be different in each class or type of business, and major adjustments to market prices following catastrophic events.

The independence of the cycles becomes important for multi-line companies in dampening cyclical effects and stabilising profitability; much useful work has been done on the prediction of the peaks and troughs of various cycles, and a full discussion of the topic falls outside the scope of this paper.

3.10.4 In the longer run, average profitability over the life of a cycle becomes much more important. The short-term adjustments necessary, because of the company's current profitability within a cycle, are often very small relative to the total value of future written business and the total appraised value. Of more importance, therefore, is to establish a long-term opinion of the market profitability and of the company relative to the general market.

3.10.5 In the last few years, we have had a number of catastrophic events. Their impact on market pricing and profitability can be significant in the short term. For example, the U.K. hurricane in October 1987 was followed by a compensating increase in household insurance rates of around 10%. In terms of appraised values, at the end of 1987, net asset values of many companies had reduced, but the value of future written business increased.

To the extent that such storms are a new, predictable feature, recognised by the market pricing in this class of insurance, then the long-term view of profitability may be unaffected, but there is potential for a short-term adjustment.

Another example is the large Piper Alpha loss of July 1988 and its affect on the marine insurance markets. The market, generally, was at a very low point in its profitability cycle and the excess capacity is believed to have dampened any market price increases.

As these examples illustrate, short-term prediction of market profitability and therefore company profitability, where diversification of risk through multi-line

writing or reinsurance is not significant, is obviously extremely difficult and a range of scenarios needs to be considered.

3.10.6 An explicit modelling approach to earnings projections is possible and often desirable. A less complicated calculation procedure is possible. This is further discussed in Section 7 in the context of a valuation for sale. Growth in production, short- and long-term profitability, uncertainty and the choices of risk discount rates all are important.

3.10.7 Present values are to be taken at risk discount rates appropriate for each of the earnings streams arising from future written business. Different risk discount rates may be applied to different earnings streams, depending upon the uncertainty and quality of those earnings streams. The risk discount rates throughout the appraised value must be chosen on a consistent basis. We return to this issue later in Section 4, but it should be noted here that the choice of risk discount rate is critical to valuing the future written business of an insurance company and is also somewhat subjective.

3.10.8 In a freely competitive insurance market and with no restriction on capital flows, in the long run, the value of the earnings generated by a particular class of business will equate to the cost of capital. This follows from financial theory, which states that the market will not reward diversifiable risk. This suggests that the simplified approach, as described in Section 7, may potentially be more appropriate than a full-scale modelling approach.

3.10.9 In certain markets, lines of business, or where companies are significantly under-capitalised, there is also a risk that future earnings cease to become available or are severely distorted due to a severe shortage of capital, for instance, if the capital falls below minimum solvency margin levels. Where capital is not freely available to the insurance company, then this risk of possible loss of earnings may be significant and needs to be brought into account. Again, we develop this further in Section 4.

3.11 *Goodwill*

3.11.1 Goodwill has a technical meaning to accountants and other non-actuaries, but it is also used by actuaries, particularly life actuaries.

In practice, goodwill for a non-life company is often equated as the value of future net earnings generated by business written in future periods. For direct business in particular, a valuation of renewal business generated from an existing portfolio of policies might be carried out separately from new policies. However, it would be more usual to look at business written in a period as a whole. The distinction between new and renewal is fundamentally different in general insurance when compared with life assurance. Care must be taken in determining what is future business and what is not. If the comparison is made with an industrial company, the issues are clear. We believe that, in most (but not all) cases, the concept of in-force and new business is not a useful one in general insurance. The correct parallel would be with new business and marketing outlets. However, further analysis of this is outside the scope of this paper.

4. DEVELOPMENT OF THE APPRAISED VALUE CONCEPT

4.1.1 To value a company as the present value of the future expected net earnings is a natural approach for actuaries. In this section, we develop more theoretical background and build on the concepts introduced earlier. We also begin discussions of the limitations to the calculations introduced by practical considerations.

Much of this section reflects discussions and developments also seen in other areas of actuarial work and in a wider arena. Many of the ideas presented here are also applicable in areas other than general insurance.

4.1.2 While much of the theory underlying practical appraised value calculations relies on concepts derived from a deterministic view of company net earnings, a stochastic approach does give some additional insight.

4.2 *The Role of the Risk Discount Rates*

4.2.1 The risk discount rates allow essentially for three distinct factors:

- (a) The time value of money. This is a concept which is second nature for actuaries.
- (b) The tying up of capital in restricted classes of investments or other items that could be used elsewhere. In a world with unlimited availability of capital, we would not have to consider this separately from (a), but as there is a scarcity of capital resources, we normally need to add margins to rates in (a).
- (c) Risk of loss. Given that the returns are uncertain and could easily be negative, the capital provider will require an additional return to compensate for this.

4.3 *Choice of Risk Discount Rates*

4.3.1 Conducting an appraised value calculation requires a detailed split of the company into its constituent parts and a separation of written business into major classes. Thus, in general, there will often be more than one discount rate. Apart from differences between shareholder and policyholder funds, it is likely that there will be differences between the various classes. Given that the risks of each class will be different, it is appropriate to use different rates.

4.3.2 The selected risk discount rates are closely related to the quality and uncertainty surrounding the choice of parameters used in any modelling of future profitability. In carrying out his investigations, an actuary should, therefore, not only be seeking to project an expected value of future earnings, but also to assess the levels of uncertainty in those projections.

4.3.3 The allocation of capital between the various lines is a complex task and beyond the scope of this paper. However, we would point out that writing two separate and uncorrelated lines of business is likely to reduce risk, justify a lower

risk discount rate and hence justify a higher appraised value. This potential for diversification of risk can become an important consideration.

4.3.4 It would also, normally, be appropriate to use a different discount rate for valuing the emergence of profits on existing business from that used in determining the value of future written business. Most of the delay in the emergence of future profits will arise from investment earnings on held claims reserves and can be predicted reasonably accurately. This suggests a lower margin for risk. Some care may be required if there is extensive industrial disease exposure or other reserving problems.

4.3.5 For the value of future written business, much depends on the terms of trade on which the company writes business, but will also be affected by its development plans and changes in market conditions. These are clearly more difficult to forecast and subject to greater uncertainty. This suggests that they should, therefore, be discounted at a much higher rate. Experience suggests that this is, in fact, what the secondary markets do when placing their value on companies.

4.3.6 The risk discount rates selected by the actuary, therefore, are necessarily somewhat subjective and chosen from reasonable ranges, rather than exact point estimates. The authors strongly recommend that, as with the other critical parameters of the appraised valuation, the sensitivity to choice of assumption forms an integral part to any investigations.

4.3.7 This suggests that using discounted reserves and best estimate reserves in accounting statements can increase the value of a company. Indeed, the appraised value methodology provides a framework for measuring the cost of conservative reserves. However, this also needs to be considered against the overall capital requirements of the company and the reduction in risk associated with higher capital.

4.3.8 It should be noted that higher volatility or uncertainty does not necessarily imply a higher risk discount rate, however. Much depends on the purpose of the valuation. For example, in a valuation for purchase, the buyer may weight the upside of volatility more than the downside in certain circumstances. He may, therefore, actually prefer a more volatile earnings pattern than a narrowly defined one. However, this may be regarded as more of an exercise in utility theory than in calculation of appraised values for practical use.

4.3.9 The selection of risk discount rate or rates is also heavily dependent on the purpose of the valuation. Where the valuation is for purchase, the risk profile of the buyer needs assessment. Where the valuation is for sale, with no clearly defined buyer, then uncertainty will necessarily remain and calculations based on a range of values should form a vital part of the valuation. Estimation of risk discount rates implied by market values or values from actual transactions are difficult to obtain, but are an extremely useful benchmark. Further research in this area would be very useful, though relationships would, of course, change with market conditions.

4.4 Synergy

4.4.1 Essentially, in valuing a company, we consider the value added to the net assets by the insurance operation and we make assumptions about how the company will manage its operations, including distribution, systems, administration, etc. We consider the company operating in the context of its various markets. The addition of other, possibly non-insurance operations, can be viewed in the same way. In effect, where the addition of a new operation increases value, then there is synergy between the old and new operations and where value decreases, then there is a conflict. This approach to value added is obviously neither restricted to insurance nor new.

4.5 Allocation of Capital to Classes of Business

4.5.1 Some classes of business do need capital, not just as a safety net, but because of strains caused by the accounting conventions. In these cases, allocation of capital to classes of business is not only desirable, but necessary; effectively, this can be regarded as a forced investment or loan to the insurance operation from net assets. The amount of additional capital allocated to a class of business is a matter of judgement. Where the risk discount rate is selected for the net earnings stream by class of business, rather than for more detailed elements of earnings, then the valuation depends heavily on the amount of this allocated capital. To a large extent, the allocation of more capital to a class of business should be compensated for by a reduction in the risk discount rate. Where all the available capital is allocated, then the average risk discount rate over the total company operations is comparable to the internal rate of return on capital required by the owners or controllers of that capital. Alternatively, where minimal capital is allocated to the insurance operations, then a higher risk discount should apply. The increase in value, arising from the insurance operations, should then be viewed as providing the additional return to the owners or controllers of capital, to compensate for the additional risk to, and constraints on, capital.

4.5.2 From the above analysis, the allocation of capital to classes of business can be regarded as merely a mechanism to ease calculation. Whatever capital allocations are made should yield the same answer. The choice of approach depends heavily on the purpose of valuation, the complexity of the operations, which may be non-insurance, and the ease of presentation of understandable results.

4.5.3 In Section 3, we discussed the term cost of capital and how it leads to a reduction of net asset value below market value, due to the restricted investment policy and the application of higher risk discount rates than market rates to allocated capital. However, for presentation purposes, the cost of capital may be placed within the valuation of the insurance operation rather than against net asset value. This can avoid confusion in the presentation of appraised value results, though, with profitability analyses, the reverse can often be the case. However, care needs to be taken with excess capital if it cannot easily be returned

to shareholders or is waiting expansion of the business. Certainly, in any evaluation of the business, the cost of capital needs to be considered against the value of the business it will support. This is discussed in more detail in the stochastic *versus* deterministic section below.

4.6 *Stochastic v. Deterministic Approach*

4.6.1 A feature of general insurance is its capacity for very sudden and adverse or catastrophic reductions in earnings. Particular classes of business are very prone to this. Typical examples are high layer or catastrophic excess reinsurance business, or where gaps or inadequacy in outward reinsurance programmes become exposed by large or aggregation losses.

4.6.2 Investigations can show the exposure to such adverse experience and quantification can also be attempted by testing the insurance portfolio against various scenarios of large loss, but the timing of the adverse experience remains necessarily uncertain. The scenario testing approach should obviously incorporate the special pressures that occur in organisations following such losses, including the financing of adverse cash flows as reinsurance recoveries are made. Virtually all classes of general business carry considerable ability for producing surprises and, to some extent, focusing on catastrophic falls in earnings is the extreme case. In the long term potential diversification through reinsurance and an approach based on averaging profitability can be considered, as explained in §3.10.

4.6.3 A stochastic approach is then indicated in the short run. Essentially, a company can be viewed as a distribution of future net earnings streams based on various scenarios, with an associated probability distribution. In theory, these scenarios include all the possible influences, both external to the company and from the internal management team present or future. Net earnings in a future period will obviously be partially dependent on the track record and decisions in earlier periods. Current restrictions on strategy, arising from a small capital base, may be lifted if good profits are made and conversely. In the extreme, adverse experience may reduce a company to insolvency, and without a strong capital backer with available funds, any future potential for earnings is lost.

4.6.4 With this view, in valuing a company, we are placing a value on the entire distribution of future net earnings 'paths', having regard to the purpose and context of the valuation. In theory, simulation techniques and, perhaps, the application of utility theory, could place a value on the company's operations. In practice, further research and more widely recognised methodology is needed for this approach to have widespread application. Nevertheless, a comparison of this potentially sounder approach with the deterministic approach is useful and can provide valuable results.

4.6.5 Usually, we operate in a deterministic framework and project expected net earnings streams and value using risk discount rates. This approach handles the uncertainty or risk profile within the choice of risk discount rate.

4.6.6 However, the risk discount rate can be viewed as purely notional and

merely a derived number relating the value of the company in, say, a secondary market to a single choice of net earnings stream. The earnings stream is just one realisation from the distribution of potential earnings streams available. The stochastic approach, in effect, unbundles the problem by adding further dimensions to the risk profile.

4.6.7 This also draws attention to the need to clarify which of the net earnings streams is normally being used in the deterministic appraised valuation. It should, perhaps, be noted that the choice of net earnings stream is not critical, provided risk discounts are chosen consistently to give reasonable valuations. This can be important for practical work.

4.6.8 In general, the procedures used in establishing the net earnings streams do not necessarily generate the expected or mean net earnings streams. For example, consider the valuation of a start-up operation, following a high-risk strategy of very high growth, but with a significant chance of failure. The net earnings paths in this artificial example may fall into two clear types of scenario—a high level of earnings and high growth or low earnings and failure. In this example, typically, the actuary may well select near the mean of the higher earnings scenarios, dealing with the risk of failure with a deep discount. The choice made may, therefore, be nearer to the mode of the net earnings paths. Where this differs significantly from the mean, then the procedure for selecting the risk discount rate should be considered. For most companies, however, the above difficulties do not arise and the mean, the mode and the selected earnings stream may be regarded as similar.

4.7 Under-Capitalisation

4.7.1 Under-capitalisation is often regarded as synonymous with a high risk of insolvency. We consider a wider context here. Companies with small capital bases can suffer severe restrictions to their business operations without necessarily risking insolvency. In the U.K. and the European Community, with the relatively strong capital bases imposed by the supervisory authorities, reductions in value for under-capitalisation are likely to be small. Elsewhere, rules are freer and detailed consideration of the issues raised is needed. The deterministic approach to valuation is placed under severe strain. Some modification may be appropriate. Availability of future capital may have to be one of the assumptions made in the appraisal.

4.7.2 With a stochastic approach, a company suffering from under-capitalisation can be considered as being denied either certain net earnings paths, which show positive earnings following negative earnings leading to insolvency, or, at the least, more severe restrictions in the early years of development.

As a starting point, therefore, such restrictions may be treated as a reduction to a deterministic valuation, and perhaps calculated as a proportion of the value of future business. Clearly, there is room for significant judgement in the valuation calculation.

4.7.3 When considering an insurance operation and the range of possible

capitalisations, from the above analysis, under-capitalisation is often synonymous with those companies where the addition of £1 of capital increases their value by more than £1. There is, of course, a point of discontinuity, in that, below a certain level, supervisory authorities will close the company down and it will only have a break-up value. Then £1 less of capital reduces the value of the company by a multiple many times £1.

4.7.4 In addition, the analysis highlights the need to consider a reasonable range of chosen net earnings streams and the potential influences affecting it. Often, knowledge of the volatility of an appraised value to even a small change in assumption is as important as any absolute value.

4.7.5 In practice, reasonable valuations can be made using the deterministic approach in most circumstances with minor modification. This strongly drives the appraised value calculation defined in Section 2.

5. APPRAISED VALUES IN A WIDER CONTEXT

5.1.1 In Sections 2, 3 and 4, we defined the appraised value as a calculation. In the calculation we modelled the value of net earnings, making a large number of assumptions concerning various parameters, which would be based on investigations and judgement. While the phraseology and theoretical framework was very much in a general insurance environment, the approach is of much wider application. We discuss these aspects in this section, together with their use in public statements used by non-actuaries.

5.1.2 The appraised value in general insurance has strong parallels to the appraised value in life assurance, but the constituent parts and the determinants of long-term profitability differ. The approach is also similar to methods employed in the valuation of pension funds. However, the impact of sudden uncertain events, different time horizons and possibly the approach to under-capitalisation differentiate general insurance. In addition, long-term general insurance profitability is much less dependent generally on investment conditions.

5.1.3 The methodology used for insurance company appraisals is beginning to be used for industrial companies (see Section 10). In order to communicate more effectively with the outside world, it is important that the parallels be identified and not hidden in actuarial jargon.

5.2.1 *A Comparison with Life Assurance*

5.2.1 In life assurance, the embedded value is used extensively. It is recognised by the life assurance industry and used within published accounts by some companies, in preference to the more traditional accounting rules. The embedded value represents the adjusted net asset value plus the value of in-force business. This latter value includes the value of renewals of permanent contracts already issued, but allows for lapse or surrender rates.

5.2.2 The equivalent value in general insurance is typically more uncertain and not always available, as renewals are not always clearly identifiable. For certain personal lines contracts, especially where they are for long terms or carry very low lapse or non-renewal rates, and in some very controlled tariff markets, then the equivalent value begins to gain in certainty and use.

5.2.3 The treatment of shareholder funds and cost of capital is different in this life methodology. With the exception of discounting claims reserves, there are usually few implicit margins in a general insurance company. The capital required is, therefore, all shown explicitly and so some cost of capital must be ascribed to shareholder funds. This is often not the case in life assurance and any shareholder funds are usually excess capital. In theory, separate books could be kept in a general insurance operation, but it materially increases the complexity of the operation. It is also important to realise that general insurance companies cannot go down the life route, because of the importance of carrying claims reserves without excessive margins for accounting, profit declaration and, therefore, in non-life rating.

5.2.3 Typically, also, in general insurance, rates for new and renewal business are set in common and the experience of new and renewal business is not separated or separable, e.g. motor policy endorsement. In addition, commissions are generally the same and the allocation of other expenses between new and renewal business can be often only somewhat arbitrary. A further complication would be that, if, at some future date, the lapse rate rose, then company efforts and therefore expenses may well be diverted from new business to renewal. It is, therefore, more appropriate to consider the value of future written business rather than separation into new and renewal. However, the purpose and context of the valuation would again be an important consideration.

5.3 Shareholder Value Added (SVA)

5.3.1 Current management theory is utilising similar techniques to those used in this paper. Shareholder value added (SVA) or economic value, is the name given to the technique and is defined as 'net present value of expected cash flows discounted at the cost of capital'. Cost of capital, here, is the full rent needed to service capital as determined in the market place, rather than the definition used in the appraised value (see § 3.4.4). The object is to concentrate on items of value, the cost of capital and shareholder value, using the discounted cash flow technique making due allowance for uncertainty. As with insurance companies, a gap can arise between such values and stock market values. This often generates unwelcome takeover activity. The reason the junk bond market gave rise to an increase in activity was because these bonds reduced the cost of capital.

5.3.2 SVA, *per se* adds little to the techniques used by actuaries in similar situations. However, it does provide a means of communication with our non-actuarial colleagues. We believe it is important that we do not develop different terminology and create barriers to understanding with the outside world. SVA and the relation to appraisal values is discussed in more detail in Section 10.3.

5.4 Uncertainty and the need for an Actuarial Report

5.4.1 In approaching the appraised value as the sum of three parts, it is clear that some earnings are more certain than others. The additional value added to the adjusted net asset value by past written business and then future written business reflects an increasing level of uncertainty.

5.4.2 With adequate data and proper investigation of quantitative and qualitative matters, a professional actuarial report can remove and explain a considerable amount of the uncertainty. This is especially true with regard to quantifying the surplus or deficit in insurance liabilities, and the investment income attributable to the insurance operation, as the insurance liabilities in the balance sheet run off; namely the first two parts of the calculation. Only by this type of report can the value be determined, as the accounting conventions definitely distort the picture, notwithstanding the judgements needed concerning future exposure periods. In addition, and very importantly, such a valuation can also be tested by calculations and judgements made externally.

5.4.3 As part of any such report, the actuary would necessarily draw attention to sensitivity of the values to reasonable variation in parameters and various future scenarios. In this way, significant insight and intuition can be developed by the users of such reports.

5.5 Goodwill and Uncertainty

5.5.1 Care needs to be taken with the term goodwill. It has a number of meanings to different professions, including its technical meaning to accountants. To some groups and for certain purposes, it is a part of the value of a company that cannot be recognised. This is particularly the case with quoted companies involving public statements and situations arising from takeovers. Actuaries, therefore, should be extremely careful of its use.

5.5.2 Goodwill has been used as equivalent to the value of future written business. This is not necessarily correct in the authors' opinion. Future written business includes renewals of the existing portfolio and, in certain circumstances, as discussed before, the value of the renewals can be predicted with a reasonable level of certainty. The actuary must take care to exercise judgement here, and consider, whether for the purpose and context of the valuation, it is necessary to define goodwill or not.

5.5.3 The actuary must be sensitive to the interpretation which readers of any reports would make. This would be particularly true for reports likely to be used by accountants, merchant bankers, and the Takeover Panel, to whom the term would have an explicit technical meaning.

6. DIFFERENT PURPOSES OF VALUATION

6.1 Valuations may be carried out for a number of purposes. For instance, the valuation may be for a sale or partial sale with the buyer unknown, or it may be for purchase by a known buyer. The valuation may be for a merger transaction

seeking to place two companies on a common valuation basis. In addition, the valuation and projections may be used for internal management accounting and business planning, remuneration of executives, project evaluation and profitability assessment. Each purpose potentially affects the detailed structure of any calculations and the assumptions made. In particular, the approach to selection of risk discount rates can vary substantially.

6.2 *For Sale*

6.2.1 For a valuation for sale or partial sale, the buyer is typically unknown. Also the actuary is likely to have access to much of the company's internal data. Both quantitative and qualitative investigations, including discussions with key company personnel, are usually possible and considerably enhance the quality and usefulness of the calculations.

6.2.2 The valuation is generally of the company within the context of its current on-going operations and future plans. This means, for instance, that where the company is a subsidiary making use of centralised resources, the valuation must make clear the treatment used. Generally, a market valuation of assets is appropriate.

6.2.3 In projecting expected net earnings, any synergies or conflicts with potential buyers are unknown and this needs emphasising to the users of the valuation. Typically, the appraised value, therefore, can understate the actual transaction value, which may contain the value of any synergies recognised, the value of any optimism arising from the negotiating process and any value placed on management control of the company.

6.2.4 It should be recognised that a detailed appraised value report may represent more than just a single value or range of values. It can represent a detailed appraisal of a company's operations and be an extremely valuable tool in developing future business planning.

6.3 *For Purchase*

6.3.1 When the valuation is on behalf of the buyer, the actuary needs to clarify the context and, in particular, whether the valuation is based on the company's current organisation and plans, or whether synergies are to be considered. Different considerations can obviously arise if the valuation is to be used as a reference point in negotiations by both sides.

6.3.2 The basic structure used for the calculations and the assessment of parameters follows closely the principles used when valuing for a seller. For instance, net asset values are adjusted to market values and fully realistic assumptions are sought in the context of an on-going company. The tax treatment may be different, however.

6.3.3 Major differences occur, however, between friendly and unfriendly transactions, or takeover of publicly quoted companies, in the information available to the actuary. Much can be done, based on publicly available

information and, especially, if the actuary has good experience of the markets in which the company operates, but care is needed in presenting a professional opinion, in highlighting the potential shortcomings of the valuation. The professional report can be more of an appraisal, with the appraised value being only a part.

6.3.4 Often such an appraisal, based on readily available information, can form a sound basis for future more detailed professional work. It can be particularly useful for due diligence work, as well as helping begin the post-acquisition business planning process.

6.4 Other Purposes

6.4.1 For many other purposes, the change in the calculated appraised value is possibly more important than the absolute value itself. We commend the approach as useful for management accounting, project evaluation and assessing returns on capital.

Practical problems are encountered, however, arising largely from the sensitivity of the value of future written business to small changes in assumption and the sharp movements in asset market values that can arise. This often leads to a necessity for greater consistency and stability in the structure of calculation and the choice of assumptions over time, than would be required for appraised values for the purpose of purchase or sale. This may affect a number of different areas, including moving away from market values for assets, stabilising risk discount rates, investment rates, inflation assumptions, long-term growth and profitability assumptions, and capital allocations.

6.4.2 A distinction may obviously be drawn between project evaluation and the monitoring of profitability criteria over time. The expected long-term increase in appraised value is but one potential criterion for measuring return on capital. It is very uncertain, and for monitoring purposes, in practice, others, such as insurance profit and increase in the value arising from business written in the period, are less uncertain.

This is especially the case when evaluating new projects and new fresh-field start-up operations. These often need considerable short-term investment in the first few years, followed by a potential for profit and compensating returns in the future.

6.4.3 There are many areas where the appraised value approach has not been used much as yet. In particular, the increase in appraised value or parts of it, may form an appropriate index for remuneration of executives in insurance. The appraised value, or embedded value, has been used in life insurance successfully for this purpose. The key issues arising are, again, the stability of assumptions over time, the uncertainty necessarily remaining in the actual measure of profitability chosen and the proper allocation of the added value to those responsible for its generation. These points are, to a large extent, organisational and structural issues of the company.

7. CALCULATING AN APPRAISED SALE VALUE

7.1 The appraised value is calculated in three parts as given in Section 2. In this section we expand on some of the practicalities of the calculations in the specific case of a valuation of a company for sale.

7.2 *Adjusted Net Asset Value*

7.2.1 The net asset value is generally taken from the balance sheet presented in Companies Act accounts at the valuation date. The adjustments considered are for any assets not stated at market value or generating a higher or lower investment yield than market yields.

7.2.2 The actuary, therefore, needs to understand the accounts and accounting treatment of the various items in the accounts and should seek to make appropriate investigations and seek appropriate advice when unsure.

7.2.3 Market value, here, is assumed to be derived from a reasonably efficient market, as in the U.K., for such assets as shares or government securities and reflects reasonably consistent implicit risk discount rates.

7.2.4 Cash balances and monies on call can be taken at face value. For certain assets, however, the balance sheet value may be distorted and a return to first principles may be appropriate.

7.2.5 In practical work, therefore, for certain assets the actuary must decide on the stream of future earnings, net of tax, and discount this at an appropriate risk discount rate consistent with the level of uncertainty and also with the rates used implicitly and explicitly elsewhere.

7.2.6 An example of an adjustment would be for subsidised loans made to employees. Essentially, the annual subsidy can be estimated over the likely term of the subsidy and a present value taken at an appropriate risk discount rate.

7.2.7 Certain assets, typically tangible fixed assets, do not generate earnings. In theory, the value of the business as an on-going concern should be considered. By this approach, the expense depreciation charge could be replaced by an economic charge for the use of the fixed assets and the fixed asset value adjusted to the present value of these economic charges. In practice, where reasonable depreciation rates are used, the errors arising are likely to be small, otherwise adjustments should be made.

7.2.8 Assets such as goodwill or past research and development costs are normally given a nil value. Their value arises as part of the value of future written business. Their future accounting treatment and the emergence into earnings and tax treatment need consideration.

7.2.9 Net current assets may generally be considered at face value. In practice, loss or gain of interest for delays in receipt of net receivables or payables is usually small.

7.2.10 Property assets and assets at book value or cost should be revalued to market value, or equivalent, by valuing the yield gain above the market yields. All adjustments should be net of tax.

7.2.11 The valuation of deferral of tax, especially where significant tax losses have been built up, is also necessary. The treatment of unrealised gains for U.K. general insurance companies often differs between statutory accounts and returns to the Department of Trade and Industry by a liability of potential deferred capital gains tax. This can be large for some companies and careful consideration of the application of the tax rules, as gains are or may be realised, is appropriate. Both the amount and timing of the emergence of the tax payment are important here.

7.2.12 Some earnings streams, not capitalised into the balance sheet, should be valued, for instance, where premises are sub-let and rental earnings are not capitalised.

7.3 Other Value arising from Past Written Business

7.3.1 We estimate future earnings derived from insurance reserves shown in the balance sheet as they run-off. Assessments are therefore needed of:

- Redundancy or deficiency in held reserves relative to eventual claims payments attributable.
- Future income attributable, in particular investment income, including capital gains both unrealised and realised.
- Future outgoings attributable, in particular, for settling claims, which may include handling costs not fully reflected in reserves. For all the above items the timing of the emergence of earnings, taken net of tax, also needs assessment.

7.3.2 In making these assessments, the actuary generally needs to carry out:

- A thorough claims reserve review, including assessment of the run-off of statutory reserve, and settlement patterns.
- An assessment of other reserves, for claims arising in future periods of exposure to claim, on provisions already established in the balance sheet. Different techniques apply to one-year accounted business carrying unearned premium reserves and three-year business where reserves are represented on a funded basis.
- An allocation of appropriate assets to liabilities.
- An assessment of the appropriate investment yield.
- An assessment of the appropriate expenses attributable.

7.3.3 A large number of important principles arise in these investigations and assessments of both theoretical and practical importance. Further discussion is given in Section 8.

7.4 Value arising from Future Written Business

7.4.1 We value the future written business as the present value of net earnings streams arising. There are a number of different approaches to valuation, but they all follow the same theoretical basis already established. In this section we

outline two such approaches to calculation, one of which can be regarded as a simplification of the other.

In the simplified case, we have found that the presentation given here is one readily understandable by non-actuaries, particularly with regard to the impact of changes of assumption which, in the authors' opinion, forms an integral part of any appraisal. Section 3.10 gives further potential justification for the simplified multiplier approach.

7.4.2 In forming a view as to future levels of net earnings of profitability, the actuary should be clear on the context in which he is selecting his parameters. In particular, within any organisation, there will be synergies and conflicts existing or developing between different elements of the organisation. For instance, there may be growth constraints arising from limited resources, either of management, computer systems, administration systems or distribution systems available to the company. One business line may be in conflict with another line for these resources. For areas where considerable growth is projected, this is often at the cost of higher loss and expense ratios and thus profits. Also, higher growth is often associated with higher levels of uncertainty and thus higher risk discount rates.

7.4.3 Where an actuary is carrying out an appraised valuation of a company in the context of a group, these synergies and conflicts must be identified wherever possible. The value of a company on a stand-alone basis may be very different from one in a group context. For instance, an insurance company owned by a banking operation and retailing insurance through the bank's branch network, might have a severely reduced value if that branch network were not available to it.

7.4.4 Conversely, where an appraised value is being carried out, any synergies or conflicts that may arise following purchase should be identified separately. In practice, these issues are very complex and many elements are interwoven. Different scenarios can give rise to significant changes in a number of parameters of an appraised value.

7.4.5 The authors believe that this is a rich and exciting area for actuaries to work in, but one in which a lack of experience, not only of the financial aspects of insurance, but also of the organisational aspects, can seriously impair the value of any actuarial advice provided. It is also an area where the experience and technical skills of other professionals can prove invaluable.

7.4.6 To assess the net earnings generated from future written business, the actuary will need to assess each of the elements of profitability for each of the classes of business in each future year. We may consider the main parts of this projection process as:

- assessment of the elements of profitability and their likely future changes,
- assessment of business growth rates, and
- assessment of risk discount rates.

7.4.7 In the first approach to calculation, we identify each of these elements

explicitly, whilst in the second approach we consider the second two parts combined, to some extent, using a capitalisation or multiplier factor.

7.5 The Elements of Profitability

7.5.1 For each class of business and future year we need to assess the elements of profitability. For most classes of business these can be considered as:

- gross written premium,
- reinsurance cost,
- claims cost,
- commissions,
- expenses,
- investment income, and
- tax.

7.5.2 Reinsurance cost represents the net cost of reinsurance and, where it is significant, it should also be broken down into its constituent parts. In particular, where direct market rates are, to a very large extent, supported by reinsurance rates, and also where reinsurance profit commissions or sliding premium scales may cause significant distortions to the profitability assessment, then the elements of the reinsurance calculations should be specifically identified.

7.5.3 Each element in the profitability should be assessed, not only to its absolute level, but also the timing, both in terms of its emergence and also with regard to cash flow and availability for investment and the corresponding investment return.

7.5.4 For most direct lines of business, premiums are received with relatively minor delays, possibly net of commissions. Where instalment premiums are received, or there is a significant delay in the receipt of premiums, then the actuary should consider the impact on the level of funds available for investment and investment return.

7.5.5 In practice, for most personal lines of business, there is little significant delay between receipt premiums, payment of commissions, and the payment of the bulk of the administrative expenses, excluding only claims handling expense for the settlement of future claims arising. The major items giving rise to deferral of declaration of profit or loss, and also of funds available for investment will, therefore, be claims costs, investment income arising on deferred profits or loss, and the expenses of handling claims. For a particular company, however, any potential delays should be investigated as far as possible. Also, different countries and different distribution methods do carry different market practices and different subsequent delays.

7.5.6 The claims cost should reflect paid claims plus reserves expected to be established by the company for its statutory statements. These should include both claims reserves, including IBNR estimates, and any premium reserves. For

three-year accounted business, these reserves should be dependent upon the funded basis. Essentially, reserves should follow the company's interpretation of accounting conventions. The timing of claims payments and reinsurance recoveries, where significant, is important in assessing the levels of investment income and future claims handling expenses appropriate to each individual line of business. Margins in reserves will, of course, defer the emergence of profit.

7.5.7 In assessing the future investment income, the actuary should have regard to the allocation of assets to insurance liabilities and the yields on those assets and should reflect any yields on those assets not at full market rate.

7.5.8 The results of the expense investigation and the projection of expense levels in the future are crucial to evaluating the value of future written business. The levels should be consistent with those established for the run-off of existing insurance liabilities, as should the total investment income.

7.5.9 In assessing the tax liability, delay in the payment of tax should be considered. Any future tax losses, which have not been offset against profits generated from the existing insurance liabilities, should be placed against the value of future written business, again adjusting for the appropriate timing of payment.

7.5.10 Assessing the cost of future claims in an insurance operation is, of necessity, subject to considerable uncertainty. Essentially, the actuary will be forming a view as to future loss ratios and needs to be guided, not only by the track record of the company, but also by the company's future development plans, both in rating and growth in production, and also by the impact of market rates and profitability.

7.5.11 Market profitability in different lines of business is often subject to cyclical trends, which are notoriously difficult to predict. Similarly, where a company is expected to make significant productivity gains on its expense level in the future, for instance, in a start-up high growth situation, then expense ratios may be expected to fall. In practice, prediction of values beyond three to five years is almost impossible. Future growth rate assumptions beyond this period in the various lines of business are likely to be unpredictable. Also, earnings further in the future are subject to a greater proportional discount than those produced in the earlier years. This, to some extent, reduces the absolute level of uncertainty in the value of the future written business part of a company.

7.6 The Modelling Approach

7.6.1 In the modelling approach, we take each element of the profitability for each major class of business and for each tranche of business written in each future year. The total earnings stream arising from modelling and aggregating over all classes of business and all future years, taken at the selected risk discount rates, yields the value of future written business required prior to any special adjustments.

7.6.2 Where business is written, which, in any year, gives rise to a strain, or

capital is specifically allocated to the insurance operation, then this should be treated as an allocation of assets to the insurance operation.

7.6.3 Where a split between renewal and new business is deemed appropriate, then separate assumptions can be made, treating these effectively as separate lines of business. A particular area of difficulty, however, is likely to arise in the allocation of expenses. For example, marketing expense allocation may be problematical in that efforts from this area may, in one year, be more biased towards the acquisition of new policies and, in another year, more toward the renewal of an existing portfolio. Also, differences may arise in the relative loss ratios between new and renewal business, although rating decisions may apply to both new and renewal business without distinction. Generally speaking, a separate analysis, with possibly different parameters would be appropriate. However, for the purpose of an appraised sale value, it may be inappropriate, for practical purposes, to separate new and renewal written business.

7.7 The Simplified Approach

7.7.1 In this approach, we approximate to the value arising from future written business, hoping to crystallise the key elements in the process. The approach is largely based upon a simplifying assumption, that the only major deferrals of profit or loss arise from future investment income on reserves and claims handling expenses as claims are settled. Thus, for instance, claims reserves are expected to be established without significant surplus or deficiency; similarly, premium expenses and commissions are expected to be received or paid, generally within the first year of operation of the policy, thus not giving rise to significant distortions between cash flows and declared earnings on the block of business. Whilst this is an approximation, given the levels of uncertainty usually surrounding loss ratio assumptions, expense rate assumptions and investment rate assumptions, the lack of accuracy in the valuation of future written business is often offset by the simplification in the modelling and therefore the enhanced understanding of any reader.

7.7.2 Essentially long-term assumptions are made for each of the items of profitability for, say, beyond three or five years from the valuation date. Changes expected in the elements of profitability over the next three to five years, as appropriate, are considered as variations from the long-term assumptions and valued separately. Example calculations in Section 9 illustrate this.

7.7.3 Using the long-term assumptions, a net profit margin is established per unit of gross written premium (or such other measure of business activity if judged more appropriate) to which a multiplier is applied. The multiplier represents a capitalisation factor based upon expected future growth rates and the risk discount rates appropriate in each future year. For example, consider the valuation at the end of year X , where gross written premium was expected to be 100 in year $(X+1)$, growing at 10% p.a. thereafter, and that the net profit margin for each future year was 5% declared mid-year. We can therefore produce the following table:

Table 7.1. *Goodwill multiplier and value*

Gross written premium in year ($X+1$)		100	
Net profit margin		5%	
Net present value of earnings in year ($X+1$) at the start of year ($X+1$)		5	
Growth rate p.a.	10%	10%	10%
Risk discount rate	15%	20%	25%
Multiplier	21.4	11.0	7.5
Value of future written business	107	55	37

7.7.4 The multiplier, risk discount rate and growth rate are inter-related. The multiplier, in particular, is more dependent upon the difference between risk discount rate and growth rate assumption than on the individual assumptions themselves. This feature means that, in the case of a company with high growth expectations which are uncertain and therefore subject to a high risk discount rate, the margin between risk discount rate and growth rate may be a more stable parameter than either of the other two variables individually. The multiplier may, therefore, be more stable than the variables individually. In the authors' experience this is also borne out in the market place.

7.7.5 Where the assumptions for the long-term profit margin need adjustment in the short-term, this can be illustrated under this approach by using a lower multiplier applied to the difference between the short-term and long-term assumptions netted for tax as appropriate. This is illustrated again in Section 9. Similarly short-term changes in loss ratios can be allowed for.

7.7.6 In the longer term and under competitive conditions, the cost of capital used in the calculation should be considered alongside the value placed on future written business. Section 3.10 discusses this further and may provide both a stronger argument in favour of the multiplier approach and a methodology for placing a reasonable value on longer-term structural market barriers.

8. INTERNAL AND EXTERNAL INVESTIGATIONS REQUIRED

8.1 We consider further the investigations an actuary may need to carry out while undertaking the appraised value calculations for sale purposes outlined in Section 7.

8.2 *The Claims Reserve Review*

8.2.1 A review of the adequacy of reserves held is critical to the accuracy of an appraisal. The timing of the release or strengthening should be based on the assessment of the company's approach to this issue. If reserves are discounted, then future strengthening by the assumed discount rate should be allowed for.

8.2.2 In practice, the reserve review itself, if available to the company, may occasionally cause a significant change in the approach to managing the

reserving level. An extreme case would be where the review indicated a clear need for a capital injection. In such circumstances, the actuary should consider the appropriate professional guidelines. Often, a reserve review for appraised value purposes may not be as detailed as for balance sheet purposes and a projection of a severe deficit may, therefore, merely indicate a need for further investigation.

8.2.3 From the work carried out for the claims reserve review, a view of the likely settlement pattern and also of the uncertainty surrounding both the level of reserve and the timing of payments and receipts can be formed.

8.3 The Review of Premium and Other Retrospective Reserves

8.3.1 Where reserves are established on a formula or retrospective basis, such as for unearned premium reserves or those on a funded basis, assessment of the losses or profits that are expected to arise is necessary. Surplus or deficit, and its emergence, can then be assessed.

8.3.2 Generally, the claims reserve review helps provide a useful historic track record. Premium rating changes, views of market profitability and the rating levels relative to market rates should also be considered. It is, therefore, a key item which affects more than just the balance sheet.

8.3.3 Again, levels of uncertainty and the timing of payments and surplus and deficit release need to be assessed.

8.4 Allocation of Assets

8.4.1 In allocating assets to liabilities, we aim to attribute more accurately investment yield between the three parts of the appraised value. The initial aim, therefore, should be to place assets associated with the insurance operation, such as agents' balances, monies due from reinsurances and the like, against insurance liabilities such as premium, claim reserves and due to reinsurers. The rationale for this is described in Section 2.

8.4.2 If this allocation gives a net balance of insurance liabilities, then appropriate invested assets should make up the balance. For shorter-tailed lines this means cash balances and short-term loans.

8.4.3 Where there is a net balance of insurance assets, which are current assets and not subject to market yields such as agents' balances, then a notional loan or assets should be allocated. The loan rate should reflect the appropriate level of risk. The average investment yield can then be ascertained on the assets allocated to the matching insurance liabilities on this basis.

8.5 Investment Yield Analysis

8.5.1 An average insurance yield can be derived from the schedule of assets allocated to insurance liabilities, but should be adjusted for any expected changes. For instance, if a significant element of insurance-related assets is in respect of recoveries on reinsurances on old business which tend to be much delayed, but nevertheless recoverable, and these balances due bear no interest, then the loss of interest is attributable to past years. The debt due will unwind

over the future and, all else being equal, the net yield on insurance liabilities will rise. In such cases, one approach is to value the loss of interest separately at an appropriate risk discount rate and to enhance the future yield on assets allocated to insurance liabilities.

8.5.2 Similarly, an assessment of the change in funds available for investment at future dates, can be made. This should be considered, not only in the context of valuing the existing insurance liabilities, but also those available to net cash flows on future written business. In practice, average yields may often be assumed without significant distortion. However, timing of claims payments to reinsurance recoveries and such like often gives rise to distortion.

8.5.3 If serious distortions are perceived, then a full cash flow model may be established, identifying reserves and investment yields for each year of account as appropriate.

8.5.4 In practice, this rarely becomes necessary as errors are not large in relation to other uncertainties.

8.6 *Expense Analysis*

8.6.1 A thorough expense investigation is crucial to an adequate appraisal review. The purpose of the review is to establish expenses attributable to each class of business for each year in the future. If renewal business is treated separately from new business, then acquisition expenses also need to be estimated.

8.6.2 The approach to the problem of allocation expenses has been the subject of many papers. As with reserving, each approach generally yields a different answer and, by gaining understanding of the reasons for the differences, the projections can become more accurate.

8.6.3 Expenses may be estimated by unit cost parameters from the historic track record of the company, based on modelling expenses, by a formula or by a more detailed expense analysis of current expenses by line, number of claims, number of new policies and number of in-force policies. For future earnings, productivity gains need to be estimated. This is particularly important if there has been a heavy investment in a new computer system which could transform the company's prospects in a price sensitive line.

8.6.4 A comparison of ratios to those of similar companies should also be considered.

8.6.5 The projection of the organisation by number of staff and function, allowing for growth in business levels and the various appropriate inflation rates, may also be useful.

8.6.6 The most appropriate methods may vary by company and available data. Typically, the availability of credible data severely limits the form of analysis. In this regard, we believe actuaries should encourage companies to maintain adequate data, as proper assessment of profitability of tranches of business is impossible without it.

8.7 Organisational and Systems Analysis

8.7.1 To assess the capabilities of the insurance company to cope with future growth in particular, assessment of the administrative systems, computer systems and also the distribution systems is required to check the reasonableness of parameters entering the appraised value calculation.

8.7.2 Often, such an exercise is carried out alongside an expense investigation, which, naturally, involves an understanding of the organisational structure of the company and also any inter-relation as a member of a group of companies.

8.7.3 This is also an area where experience of, not only the organisation itself, but also other organisations and organisational structures, can play an important part. In particular, where the insurance company is reorganising in some way, then assessment of the impact this will have on each of the elements of profitability, particularly in valuation of future written business, is of critical importance. Again, the authors would emphasise the complexity that arises, in even the simplest example, in the interplay of each of the elements of an appraised value basis. It is vital for the results of any appraised value to be tested against changes of assumptions and, in particular, different scenarios that may occur giving rise to changes in the level of the numbers of different parameters possibly offsetting each other.

8.7.4 Where an organisation is entering new markets particular care needs to be taken. It is not unusual for such entry to be associated with higher loss ratios and expense ratios. These are associated with a learning curve for the organisation as it begins to understand, not only the administration of the new business, but also the new risks, in the context of both the organisation and their unfamiliar market.

8.7.5 This is one area, in particular, where more experienced actuaries will show the worth of their years.

8.8 Market Analysis

8.8.1 It is rare to find an insurance company writing insurance without a competitor. Market rating levels and the profitability of the market, in general, play a significant part in any rating decisions of the company.

It is well known that profitability for different classes of business follows cyclical trends of different periods and amplitudes. Some direct markets are significantly supported by reinsurance rates and by the complex financial arrangements associated with them. In estimating the levels of future loss ratio that may be achieved by a company operating in a particular line of business in a particular market, the actuary will almost certainly have to form a view, both of the profitability of that market and then of the company's rating philosophy within that market profitability. Again, this is another area where the experienced actuary, aided by other professionals, can add significant value to the appraised value calculations.

We draw also attention to the discussion in Sections 3.10 and 7.7 concerning the impact of long-term competition and structural barriers in the market.

9. SOME EXAMPLE CALCULATIONS

9.1.1 In this section we carry out and present some example appraised value calculations. We give a very simple example for a single line insurance company showing high growth and expense productivity gains, then show the appraised values for a number of years after the initial growth phase as the assumptions stabilise.

9.1.2 We present, also, the volatility of the appraised value to changes in assumptions. In professional work, the examination of volatility and its presentation may be regarded as of at least equal importance to the presentation of an appraised value judged most appropriate.

9.1.3 The two methods of calculation described in Section 7 are used and shown to be equivalent in this simple example. The first is the modelling approach, producing revenue and profit and loss account net earnings and balance sheets for future periods. The second uses multipliers or capitalisation factors to value future written business, with the short-term differences between the long-term and short-term assumptions valued as over- or under-runs.

9.2 *The Modelling Approach*

9.2.1 The model used has been developed in a very simplified format for this paper only. In practice a more complicated model may be used. Each company may be regarded as presenting its own set of unique problems.

9.2.2 The following assumptions are made:

Table 9.1. *Modelling assumptions*

Initial capital		million
Written premium:	Year	10.0
	1	3.0
	2	6.0
	3	9.0
	4	11.25
	5 and after	10% annual growth
Expenses ratio	Year	% net written premium
	1	70
	2	50
	3	40
	4	30
	5	27.5
	6 and after	25
Loss ratio	Year	% earned premium
	1	80
	2	75
	3 and after	70

Reserves:

Premiums reserves:	50% of annual written premium excluding 10% acquisition
Claim reserves:	No redundancy or deficiency
Loss settlement pattern:	Development

Year	% paid (accident year basis)
1	50
2	75
3	85
4	90
5	95
6	100

Investment return	10% gross on average funds
Funds at nil investment return	20% gross written premium
Tax rate	30%
Risk discount rate	20%

9.2.3 No capital is allocated to the insurance operation and the chosen risk discount rate is assumed to reflect this. This means that the appraised value is equal to the net asset value plus the present value of net earnings generated by the insurance operation. The alternative is to value the total net earnings stream, but at a lower risk discount rate. For the rationale, see the cost of capital arguments in Section 3.

9.2.4 No reinsurance is included in the model to keep it simple and any spare assets are assumed to be invested in bank deposits yielding the assumed investment rate. No current assets or liabilities are modelled, again for simplicity. No dividends are assumed to be paid; so all net earnings are therefore retained. A further important assumption is that tax losses in the early years are assumed to be immediately relievable, thus credit is given for this in the valuation.

All these assumptions are simplistic and would need refinement in practice, but the simplicity helps elucidate the structure of the calculation.

9.2.5 Appendix 1 illustrates the development of the revenue/profit and loss account and the balance sheets. Because we have fixed our assumptions in the long run as a percentage of premium, either written or earned, then the earnings generated by the insurance operation, over and above the investment return on net assets, will grow in line with the premium.

9.2.6 The revenue account separates the investment income on the insurance funds from shareholder funds. In fact, in the early years, losses are declared which, in an appraised value calculation, can be treated as a notional loan from the shareholder capital and compensated by a risk 'loan' rate. Rather than show this detail, we consider the appraised values after the initial loss period.

9.2.7 The net earnings are projected in the model arbitrarily for 31 years, with business ceasing at that point and the liabilities allowed to run off. We value the net earnings each year.

The growth begins to turn down as the model assumes no dividends. Thus, in

Table 9.2. Value of projected net earnings
(31 year projection of written business)

Time	Net Asset Value (000)	Value of Insurance Earnings (000)	Total (000)	Growth %
3	10,044	12,955	22,999	
4	11,605	14,725	26,330	14.5
5	13,814	16,329	30,143	14.5
6	16,620	17,828	34,448	14.3
7	19,838	19,422	39,260	14.0

the long run, growth will reduce to the net return on the net asset value. The company becomes over-capitalised.

9.2.8 Table 9.3 shows the calculated breakdown of these values into the three parts of: adjusted net asset value; other value arising from past written business; and the balance of the value arising from future written business. Appendix 2 shows the valuation of earnings arising from past written business. These earnings are derived from a series of model runs, setting future business written to nil in years 4, 5, 6, 7 and 8. See Appendices 3A–3E for the first 10 years of projection.

Clearly, the total appraised values equal the values of total projected net earnings. The latter is understated in Table 9.2 by the value of earnings on business written from year 32 onwards, which is adjusted for in Table 9.3.

9.3 The Appraised Value at the end of Year 6

9.3.1 To illustrate the calculation further, we consider the company at the end of year 6.

The assets are all assumed to be at face value, being in bank deposits or agent balances receivable with little delay. The net asset value, therefore, does not require adjustment.

9.3.2 The value arising from past written business arises from the redundancy in premium reserves and future investment income only, as the claim reserves are

Table 9.3. Value of projected net earnings

Time	Adjusted Net asset Value (000)	Past Business (000)	Future Written Business		Appraised Value (000)
			Years 1–31 (000)	32+ (000)	
3	10,044	1,194	11,761	1,173	24,172
4	11,605	1,560	13,165	1,408	27,738
5	13,814	1,790	14,539	1,690	31,833
6	16,620	2,004	15,824	2,028	36,476
7	19,838	2,218	17,204	2,433	41,693

assumed exactly adequate and claims handling expenses are assumed to be fully reserved for. The breakdown is also given in Appendices 3A–3E which lay out the expected future net earnings in each year.

9.3.3 The value of future written business is essentially the value of the expected future net earnings, as it is declared, excluding the net investment income on the net assets and the net earnings attributable to the past business. The simplified alternative presentation of this valuation can be very useful in practice.

9.4 *The Multiplier Approach*

9.4.1 Appendix 4, also derived from Appendix 3, shows the contribution to earnings of business written in years 4 to 7. In this approach, we separate the modelled expenses and incurred losses into those that would arise from our long-term assumptions and those which may be regarded as temporary or short-term over-runs. By year 6 all the over-runs are nil.

9.4.2 For business written in year 6, we can calculate a profit margin equal to the present value of the contribution to net earning, at the risk discount rate, expressed as a percentage of written premium. This is shown in Appendix 4.

9.4.3 The profit margin percentage in our example remains constant for year 6 and onwards. We can estimate a multiplier for a year's profit margin and thus express the value of future written business at year 6 as follows:

Table 9.4 *Value of future written business at year 6*

	(000)
Written business in year 6	13,613
Profit margin percentage	9.9%
Value of year 6 written business	1,352
Multiplier or capitalisation factor	13.2
Value of future written business	<u>17,852</u>

Note: Underlying these values are more decimal places and so there are rounding errors in the values and factors in Table 9.4.

9.4.4 In Table 9.4 we could estimate the multiplier directly by calculating the present value of the profit margin growing at 10%, but discounted at 20%. This is equivalent to the calculation in Table 7.1, but using written business in year X rather than in year $(X+1)$. The presentation in Table 9.4 is worthy of consideration and is useful, even in very much more complicated cases.

9.5 *Over-runs*

9.5.1 At the end of year 4 the long-term assumptions have not yet become appropriate (there is an expense over-run) and we may express the value of future written business as:

Table 9.5. *Value of future written business at year 4*

	(000)
Written business in year 4	11,250
Long-term profit margin percentage	9.9%
Value of year 4 written business based on long-term assumptions	1,118
Multiplier	13.2
Value of future written business based on long-term assumptions (<i>A</i>)	14,754
Net expense over-run in year 3	(394)
Multiplier	0.458
Value of over-run (<i>B</i>)	(181)
Value of future written business (<i>A + B</i>)	14,573

Again, rounding errors are visible in the calculations.

The expense multiplier can be calculated directly by considering the run-off of the over-run and its emergence. The emergence can be quite complicated but, for some work, approximate multipliers can yield satisfactory results in practice.

9.6 Sensitivity

9.6.1 Table 9.6 illustrates the impact of varying individual assumptions on the appraised value at the end of year 6.

9.6.2 It should be noted that the changes to the value of future business, arising from the types of assumption changes 1, 2 and 3, are of a similar type and can be interpreted similarly.

9.6.3 In addition, the approach can be used to understand the impact of different scenarios very quickly, for instance, if the growth in business is slower than projected and if, in its efforts to gain business, worse loss ratios are appropriate and expense ratios remain higher. The first approximation to this is to consider a lower longer-term profit margin multiplier, and higher over-run multipliers for expenses and incurred losses. In this way, intuition can be built rapidly. Of course, a return to the modelling approach becomes appropriate for more accurate verification of results, but the levels of overall uncertainty and reasonableness make quick methods of considerable use in practice.

9.7 Returns on Capital Employed

9.7.1 Finally, we consider profitability measured by various returns on capital employed (ROCE) calculations:

- ROCE using statutory earnings to net asset value,
- ROCE using increase in value from written business to value of past written business including net asset value, and
- ROCE using increase in appraised value to appraised value.

Table 9.6. Appraised value at the end of year 6.
Sensitivity

	Net Asset Value (m)	Value from Liability Run Off (m)	Value of Future Written Business (m)	Total Appraised Value (m)
Base Assumptions	16.6	2.0	17.9	36.5
Change in Assumption				
1 Long-term premium growth rate				
(a) 10% to 12%	16.6	2.0	22.7	41.3
(b) 10% to 5%	16.6	2.0	11.4	30.0
2 Risk discount rate				
(a) 20% to 25%	16.6	1.9	11.3	29.8
(b) 20% to 15%	16.6	2.1	37.6	56.3
3 Multiplier for future written business				
(a) $13.2 \times$ to $6 \times$	16.6	2.0	8.1	26.7
(b) $13.2 \times$ to $20 \times$	16.6	2.0	27.0	45.6
4 Long-term expense ratio				
(a) 25% to 26%	16.6	2.0	16.8	35.4
(b) 25% to 24%	16.6	2.0	18.9	37.5
5 Long-term loss ratios				
(a) 70% to 75%	16.6	1.8	13.9	32.3
(b) 70% to 65%	16.6	2.2	21.8	40.6
6 Claims reserve adequacy				
(a) 20% redundancy at year 6	16.6	3.2	17.9	37.7
(b) 20% deficiency at year 6	16.6	0.8	17.9	35.3
7 Investment rate				
(a) 10% to 12%	16.6	2.2	19.5	38.3
(b) 10% to 8%	16.6	1.8	16.3	34.7

The latter approximates to the external rate of return. Their use is further discussed in Section 10.

9.7.2 We obtain the following table of results derived from Table 9.3 and Appendix 1:

Table 9.7. ROCE
(Annual Rates)

Year	A	B	C
4	15.5	17.1	14.8
5	19.0	18.5	14.8
6	20.3	19.4	14.6
7	19.4	18.4	14.3

In the long run, these rates will tend towards a rate given by the long-term assumptions and will tend to fall towards the net investment rate as the company becomes over-capitalised. This is because it is assumed that no dividends are paid.

9.7.3 In practice, these various rates of return can be used in the context of business planning, project assessment and monitoring profitability. Often the context emphasises the need to consider several measures of return, because of the uncertainty and lack of objectivity in some of the calculations. We discuss this further in Section 10.

10. THE USES OF APPRAISED VALUE CALCULATIONS

10.1 *Valuations for Merger and Acquisition Activity*

10.1.1 In the authors' experience, currently, the main purpose to which appraised values are put in non-life insurance, is to obtain a reasonably objective assessment prior to a purchase, sale or merger.

10.1.2 In undertaking the appraisal value, the potential purchaser may well wish to consider what he would have to do to increase the appraised value to the market value in order to justify purchase. Clearly, if the appraised value is more than the market value, it is likely the transaction will be an attractive one, even if the purchaser can add no extra value. The appraised value methodology allows one to determine the impact of long-term strategies and provides a framework for quantifying different approaches; in particular, the value of risk reduction by means of diversification is an important one that can be evaluated.

10.2 *Other Uses*

10.2.1 There are, however, a number of other uses of appraised values which the authors would like to draw attention to:

- financial evaluation of an insurance operation,
- executive remuneration,
- analysis of financial reinsurance, and
- analysis of the banking and risk functions of insurance.

10.3 *Financial Evaluation of an Insurance Operation*

10.3.1 Financial statements for insurance companies are notoriously difficult to interpret for those not fully experienced in interpretation. The approach of looking at added value on the basis of regular appraised values is often implicit in much of the management accounting information. Historically, major breakthroughs have been made in management accounting and insurance companies by considering investment income as part of the revenue accounts, and also considering surpluses or deficits that may arise on the company's reserving basis. The appraised value brings these elements into a consistent and coherent whole.

10.3.2 While we have introduced the concept of shareholder and policyholder funds, we do not believe that shareholder funds can be taken as a precise

definition of capital employed; at least for the calculation of rates of return. For outside shareholders, the amount of capital subscribed can be determined and with some effort earnings can also be calculated. The ROI (return on investment) can then be factually determined and returns evaluated. This becomes increasingly irrelevant many years after the investment has been made. We, therefore, believe that the appraised value method provides a better approach for monitoring insurance company performance. However, it is not sufficient to come up with a framework just within an insurance company. ROI and ROCE are used to distinguish between investment possibilities in different fields, which could clearly include insurance activities.

10.3.3 By using appropriate definitions of shareholder funds and making appropriate adjustments, these concepts can be unified. Capital employed can be defined as the net asset value using discounted claims reserves at realistic values.

10.3.4 While this is a clear definition which is easy to apply to a capital hungry start-up situation, it becomes much more difficult to apply to over-capitalised well-established operations. Clearly, the more capital put into a company, the less risk there is for shareholders and policyholders alike. Shareholders are unlikely to be able to obtain adequate ROCE for highly capitalised companies. The approach would, therefore, be to eliminate the excess capital (either notionally or actually) and then perform ROCE calculations. The precise amount of capital required would require judgement. It may imply higher (or lower) market capital ratios if the market is believed to be under or over capitalised.

10.3.5 Financial theory is now extending to concepts such as shareholder value analysis (SVA) rather than just calculating ROIs or ROCEs, for example. This approach is written up in the December 1989 issue of the *Harvard Business Review*. This is virtually identical to calculating the appraised value and then comparing the appraised value to the market value. We believe that SVA is going to be increasingly used in general management practice, not just in theory. It will obviously not be confined to the insurance industry. It is therefore timely that the insurance industry moves in this direction. It is particularly important, as many quoted insurance companies are valued on the stock market well below appraisal value. Therefore, unless insurance company management concentrates on an SVA approach and appraised values, we are likely to see more takeover activity in the insurance industry. Obviously, insurance company management has more to do than calculate an appraised value, but the calculation enables management to identify the problem, try to do something about it and maybe even communicate more effectively to the outside world.

10.3.6 It is important to realise that we are not double-counting by discounting future cash flows at a risk rate as well as applying a discount to the shareholder funds. The discounting of the future cash flows only reflects the timing element in those cash flows arising, together with their uncertainty. They have to be related to the overall capital and its cost (see Section 3). However, for the ROCE calculation, no discount will be taken to the shareholder fund, except

possibly for capital gains tax, contingent liabilities and fully discounted reserves without any margins for caution.

10.3.7 It is important to realise that external conditions can have a material impact on the appraised value. This is also true with shareholder value in industrial companies. This is, therefore, not a fault in our approach, but it does need to be considered when using appraised values for management purposes. In particular, a sharp fall in interest rates might imply that one could use a much lower value for discounting future values. This could materially increase the value of future written business (assuming underwriting terms are not identically affected). While this would clearly accrue to the benefit of the shareholders, it is probably not something that management should be given credit for when evaluating its performance. Some of these concepts are explored further in Section 10.4.

10.3.8 To conclude, an ROCE approach can be taken with an insurance company, provided the excess capital can be determined. However, we believe the appraised value or shareholder value approach is the more likely technique to be used in the future for insurance and non-insurance operations alike. In either case, risk needs to be considered and investment returns targeted in relation to policy and risk.

10.3.9 Daykin & Hey (1989) showed the material extra risk arising from investing in the equity market. The appraised value methodology provides a mechanism for evaluating such a strategy.

10.3.10 The criterion to judge management by is the rate of increase in the appraised value rather than its absolute amount. The concept here is the rate of increase in appraised value rather than ROCE. The rate of increase in the appraised value should be related to the risks involved and not compared directly with risk discount rate.

10.3.11 In monitoring the increase in the appraised value, it is important to understand how that increase in value has come about. A sharp increase would occur if the Stock Market doubled and the insurance company had a significant exposure to the equity market. Care would, therefore, be needed in interpreting this increase in value, particularly if it were not possible to sell the insurance company's equity investments.

10.3.12 The methodology also allows one to evaluate the impact of capital injection. As stated earlier, if everything else remains unchanged, then it is likely that the full value of an increase in capital contribution is unlikely to come through in the appraised value. This is the so-called cost of capital referred to in Section 3. Therefore, one should not subscribe further capital lightly to an insurance company.

10.3.13 However, increased shareholder value can occur from a number of areas. Firstly, more business can be written; assuming this can be done profitably, this increases the value of future written business and similarly an ROCE can be calculated for the increase in capital. Instead, the increase in capital may allow the company to take more risk; for example, it may be able to

invest in the equity market, whereas, previously, it would have been constrained only to invest in fixed interest securities. The additional return should eventually be reflected in the increase in appraised value. In terms of our methodology, this could come in by using a lower risk discount rate and, as of day one, these returns would not have come through, although they could be projected.

10.4 *Executive Remuneration*

10.4.1 We believe that the appraised value methodology can make a major contribution to executive performance by being incorporated into remuneration packages. In general, concentration on appraised values will motivate executives better than concentration on other performance measurements.

10.4.2 Their use requires some considerable skill and understanding of the motivations of the company concerned. In general, we do not believe that executives should be remunerated by taking just a specific percentage of the appraised value. This is because some aspects of movements in appraised values are totally outside executives' control. It is, therefore, inappropriate to reward or penalise them to the extent that the circumstances are outside their control. Nevertheless, executives need to be taking decisions against the background of the outside world and this needs to be factored into the equation. Obviously timing of the payments needs to be considered against the uncertainty necessarily contained in future projections.

10.4.3 An obvious example of factors outside of control is the influence of the movement of the Stock Market. How far should the chief executive be compensated because the appraised value has doubled because the Stock Market has doubled? If the Board has laid down a policy that all shareholder funds should be invested in equities and the chief executive has no authority to vary this policy, then it would seem inappropriate to base his remuneration on Stock Market performance and the change in appraisal value should be made on the basis of a neutral Stock Market performance. Conversely, if the chief executive has some control over investment policy, then clearly he should receive some reward for being invested in the Stock Market. Clearly, his performance would be superior to that of his counterpart who deliberately avoided the Stock Market (assuming rising prices). Thus, the remuneration package would need to take into account the chief executive's role in determining investment policy. The investment manager should, perhaps, be rewarded on these lines or at least in relation to how he out-performed (or under-performed) a standard investment portfolio.

10.4.4 Similarly, underwriters can be rewarded on the basis of how they have contributed to an increase in the appraised value. It is important to realise that this enables one to go beyond simply looking at an adjusted profit criterion, e.g. insurance profit taking into account realistic reserves and realistic interest earnings (discounted back to the present day so as not to penalise an underwriter with an expanding book of business). However, the appraised value approach allows one to put extra criteria into the performance measurement, to the extent

that the underwriter is adding long-term value, rather than simply making one year's profit. An example would be the underwriter who is making short-term profits on the back of cheap reinsurance. He is probably not creating long-term shareholder value as his business will disappear when the cheap reinsurance falls away. On the other hand, the underwriter who successfully exploits the reinsurance market will be of more value to his company (assuming no lasting damage is done to reinsurer relations), than an underwriter who is incapable of buying reinsurance cost effectively.

10.4.5 We believe our approach provides a framework within which these two underwriting policies can be evaluated and remuneration devised accordingly. Different companies will devise different solutions. With care, these can be expressed in terms that are understandable to the underwriter and he can be given targets that he can comprehend. The cost of capital concept is important here and this is something that underwriters can understand, particularly when it is explained to them as part of a coherent package for the company as a whole.

10.4.6 We believe this whole area opens up exciting new opportunities for insurance company management. Given that capital gains tax and the top rate of income tax are the same, there is now no longer the same bias towards share option schemes. This means that executives can be remunerated on a basis that relates to their overall objectives and shareholder value, rather than the vagaries of the Stock Market. We believe this is an area where actuaries can significantly help in remuneration work.

10.5 *Financial Reinsurance*

10.5.1 Financial reinsurance has been a major growth industry in recent years, with premiums running well into excess of several billion pounds. These transactions would normally have a very small risk transfer, though there has to be enough to classify the contract as an insurance contract. The appraised value methodology allows us to evaluate the benefit of such a transaction; the decision is how far the appraised value can be increased as a result of this transaction. This reverse question can often be used to verify the appropriateness or otherwise of the risk discount rate used for the emergence of the investment earnings on the reserves.

10.6 *Analysis of Banking and Risk Functions*

10.6.1 The methodology allows us to separate out the financial functions of the insurance transaction from the risk functions. Varying the risk discount rate, according to the actual stochastic risks involved, provides a theoretical framework against which to judge the risk that insurance companies take. This involves extending our analysis into the realms of utility theory and modern financial economics. However, one is then able to determine the impact of increasing retentions on appraised values to the cost of reinsurance transactions. Increasing one's retention should increase one's expected value of profit, because of the requirement of the reinsurer to put in profit margins and also because of

the frictional costs of the transaction. However, the increase in risk would require an increase in the risk discount rate and so may reduce shareholder value. It is likely that this will require the use of stochastic modelling to evaluate fully such an approach, as well as an understanding of the various utility functions. Our methodology can be used to make management decisions as to appropriate retention levels. The indications are that the present Stock Market is extremely risk averse as regards underwriting risk, but not investment risk. This may be a function of accounting policy that appraised value methodology can overcome.

10.6.2 It has been argued by some that investment operations can produce higher volatility of earnings than the insurance operations. In this case, higher discount rates may well apply to the investment earnings rather than the insurance earnings!

11. CONCLUSION

11.1 Professional work must be practical, but based on sound theoretical concepts and structures. Actuarial calculations are often very complex and this complexity can act as a barrier to the understanding of others. These points are especially true in the case of appraised valuation work. Presentation of the results of our work and the background to the results becomes extremely important. The authors hope that the paper will contribute to this.

11.2 *Future Research*

11.2.1 The topic of this paper represents a rich area, both for practical and theoretical research. We draw attention to some areas which the authors believe would benefit most by further work.

11.2.2 Selecting appropriate risk discount rates for different purposes and contexts of evaluation is always difficult. We believe more theoretical work and practical work, particularly in the context of rates implied by secondary market valuations and in different countries, would be invaluable.

11.2.3 In addition, placing the appraised valuation of general insurance companies in direct comparison with similar valuation techniques and values from other industries (including life assurance), we believe, would yield a deeper understanding and, in particular, of the risk profiles of investors and shareholders under different circumstances. Research or case studies in this area would also help broaden the work and roles of actuaries generally.

11.2.4 Finally, further theoretical work is needed in exploring and developing the stochastic view of a company as a distribution of future earnings streams. This view, perhaps linked to risk profile analysis and utility theory, may lead to a development of new techniques and ideas in the valuation of companies.

11.3 *Final Thought*

11.3.1 The authors strongly encourage an exchange of views on the issues raised in the paper, and hope that this paper will also encourage actuaries to work in this area.

REFERENCES

- ABBOTT, W. M. (1981). Some Notes and Various Aspects of Profit Analysis. Unpublished ASTIN paper.
- ABBOTT, W. M. & BOOTH, G. (1976). Solvency. *O.A.R.D.*
- ABBOTT, W. M., CLARKE, T. C., HEY, G. B., REYNOLDS, D. I. W. & TREEN, W. R. (1974). Some Thoughts on Technical Reserves and Statutory Reserves in General Insurance. *J.I.A.* **101**, 217.
- ABBOTT, W. M., CLARKE, T. G. & TREEN, W. R. (1981). Some Financial Aspects of a General Insurance Company. *J.I.A.* **108**, 119.
- ANDERSON, J. C. H. (1959). Gross Premium Calculations and Profit Measurement for Non-Profitability Insurance. *Transactions of the Society of Actuaries*, **XI**.
- BENJAMIN, S. (1976). Profit and Other Financial Concepts in Insurance. *J.I.A.* **103**, 233.
- BENJAMIN, S. (1980). Solvency and Profitability in Insurance. *Transactions of the 21st International Congress of Actuaries*.
- BROWN, A. S. *et al.* (1988). Recognition of Life Assurance Profits. Institute of Actuaries Working Party.
- BRUBAKER, R. E. (1979). A Constrained Profit Maximisation Model for a Multi-Line Property-Liability Company. Casualty Actuarial Society Discussion Paper.
- BURROWS, R. P. & WHITEHEAD, G. H. (1987). The Determination of Life Office Appraisal Values. *J.I.A.* **114**, 411.
- COUTTS, S. M., DEVITT, E. R. & ROSS, G.A.F. (1984). A Probabilistic Approach to Assessing the Financial Strength of a General Insurance Company. International Congress of Actuaries ICA22.
- CUMMINS, J. D. (1988). Capital Structure and Fair Profits in Property—Liability Insurance. Second International Conference on Insurance Solvency.
- D'AREY, S. P. & GARVEN, J. R. (1988). A Synthesis of Property-Liability Insurance Pricing Techniques. (Unpublished.)
- DAYKIN, C. D., BERNSTEIN, G. D., COUTTS, S. M., DEVITT, E. R., HEY G. B., REYNOLDS, D. I. W. & SMITH, P. D. (1987). Assessing the Solvency and Financial Strength of a General Insurance Company. *J.I.A.* **114**, 227.
- DAYKIN, C. D., DEVITT, E. R., KHAN, M. R. & MCCAUGHAN, J. P. (1984). The Solvency of General Insurance Companies. *J.I.A.* **111**, 279.
- DAYKIN, C. D. & HEY, G. B. (1989). Modelling the Operations of a General Insurance Company by Simulation. *J.I.A.* **116**, 639.
- FAIRLEY, W. B. (1979). Investment Income and Profit Margins in Property—Liability Insurance: Theory and Empirical Results. *Bell Journal of Economics*.
- FELDBLUM, S. (1989). Asset Liability Matching For Property/Casualty Insurers. Casualty Actuarial Society Valuation Issues.
- HILL, R. D. (1979). Profit Regulation in Property-Liability Insurance. *Bell Journal of Economics*.
- KRAUS, A. & ROSS, S. A. (1982). The Determination of Four Profits for the Property—Liability Insurance Firm. *Journal of Finance*.
- LEE, R. E. (1985). A Prophet of Profits. *J.I.A.S.S.* **28**, 1.
- LOADER, D. & RYDER, J. M. (1976). How much can we grow? *General Insurance Bulletin*, 1976.
- LOWE, S. P. Discussion of Sturgis, R. W. (1981). Actuarial Valuation of Property-Liability Insurance Companies. *Casualty Actuarial Society*, **LXIX**.
- MICCOLIS, R. S. (1987). An Investigation of Methods Assumptions and Risk Modelling for the Valuation of Property-Casualty Insurance Companies. Financial Analysis of Insurance Companies.
- NORIS, P. D. (1985). Asset Liability Management Strategies for Property and Casualty Companies.
- PENTIKÄINEN, T. & RANTALA, J. (1982). *Solvency of Insurers and Equalisation Reserves*. Helsinki.
- PENTIKÄINEN, T. *et al.* (1989). *Insurance Solvency and Financial Strength*. Finnish Insurance Training and Publishing Company Ltd.
- PLYMEN, J. (1976). Profitability and Reserve Strength of Non-life Insurers. International Congress of Actuaries, ICA20.

- REID, D. H. (1984). Solvency: the Expression of the Relationship between Capital and Insurance Markets? International Congress of Actuaries ICA22.
- RUSHTON, I. L. (1980). An Application of Model Office Techniques to the Solvency Question. A General Insurance Forecasting Model. International Congress of Actuaries. ICA21.
- SMART, I. C. (1977). Pricing and Profitability in a Life Office. *J.I.A.* **104**, 125.
- STATEMENT OF VALUATION PRINCIPLES (1988). Casualty Actuarial Society Committee on Valuation Principles.
- STURGIS, R. W. (1981). Actuarial Valuation of Property-Casualty Insurance Companies. *Casualty Actuarial Society*, **LXVIII**.
- TATTERSALL, O. J. (1976). Expenses in General Insurance. *O.A.R.D.* Paper 16.
- TAYLOR, G. C. (1984). Solvency Margin Funding for General Insurance Companies. *J.I.A.* **111**, 173.
- WENNER, D. L. & LEBER, R. W. (1989). Managing For Shareholder Value—From Top to Bottom. *Harvard Business Review*, 1989.
- WHITEHEAD, G. H. (1989). Appraisal Values for Property and Casualty Insurance Companies for Merger or Acquisition. Casualty Actuarial Society Valuation Issues.

APPENDIX 1

APPRAISED VALUE EXAMPLE
 COMPANY: SINGLE CLASS INSURANCE COMPANY
 REVENUE/PROFIT & LOSS ACCOUNT

	Year									
	1	2	3	4	5	6	7	8	9	10
Written premium	3,000	6,000	9,000	11,250	12,375	13,613	14,974	16,471	18,118	19,930
Acquisition expenses	(300)	(600)	(900)	(1,125)	(1,238)	(1,361)	(1,497)	(1,647)	(1,812)	(1,993)
Net written premium	2,700	5,400	8,100	10,125	11,138	12,251	13,476	14,824	16,306	17,937
Increase in unearned premium reserve	(1,350)	(1,350)	(1,350)	(1,013)	(506)	(557)	(613)	(674)	(741)	(815)
Earned premium	1,350	4,050	6,750	9,113	10,631	11,694	12,864	14,150	15,565	17,122
Claims paid	(540)	(1,789)	(3,230)	(4,728)	(5,994)	(7,033)	(8,000)	(8,950)	(9,925)	(10,939)
Increase in claims reserves	(540)	(1,249)	(1,495)	(1,650)	(1,448)	(1,153)	(1,005)	(956)	(971)	(1,047)
Claims incurred	(1,080)	(3,038)	(4,725)	(6,379)	(7,442)	(8,186)	(9,005)	(9,905)	(10,896)	(11,985)
Other expenses	(1,800)	(2,400)	(2,700)	(2,250)	(2,166)	(2,042)	(2,246)	(2,471)	(2,718)	(2,990)
Investment income										
Insurance assets	67	237	457	688	892	1,058	1,203	1,342	1,482	1,632
Gross insurance result	(1,463)	(1,150)	(218)	1,172	1,916	2,524	2,816	3,116	3,434	3,779
Tax allowance	439	345	65	(352)	(575)	(757)	(845)	(935)	(1,030)	(1,134)
Net result for insurance operation	(1,024)	(805)	(153)	820	1,341	1,767	1,971	2,181	2,404	2,645
Investment income										
Shareholder assets	981	951	962	1,058	1,240	1,485	1,781	2,120	2,506	2,944
Tax adjustment	(294)	(285)	(289)	(318)	(372)	(445)	(534)	(636)	(752)	(883)
Net result on shareholder	687	666	674	741	868	1,039	1,247	1,484	1,754	2,061
Net result	(338)	(140)	521	1,561	2,209	2,806	3,218	3,665	4,158	4,706

BALANCE SHEET

Assets:										
Agents balances	600	1,200	1,800	2,250	2,475	2,723	2,995	3,294	3,624	3,986
Net investments	10,952	12,812	15,578	19,352	23,290	27,558	32,121	37,116	42,657	48,863
Total assets	11,552	14,012	17,378	21,602	25,765	30,281	35,116	40,410	46,281	52,849
Liabilities:										
Claims reserves	540	1,789	3,284	4,934	6,382	7,535	8,539	9,495	10,466	11,512
Premium reserves	1,350	2,700	4,050	5,063	5,569	6,126	6,738	7,412	8,153	8,969
Tax reserve	0	0	0	0	0	0	0	0	0	0
Total insurance liabilities	1,890	4,489	7,334	9,997	11,951	13,660	15,277	16,907	18,619	20,481
Capital	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Retained earnings	(338)	(477)	44	1,605	3,814	6,620	9,838	13,504	17,662	22,368
Net shareholder equity	9,662	9,523	10,044	11,605	13,814	16,620	19,838	23,504	27,662	32,368
Total liabilities	11,552	14,012	17,378	21,602	25,765	30,281	35,116	40,410	46,281	52,849
Check balance	0	0	0	0	0	0	0	0	0	0
Net assets B/F	10,000	9,662	9,523	10,044	11,605	13,814	16,620	19,838	23,504	27,662
Declared result	(338)	(140)	521	1,561	2,209	2,806	3,218	3,665	4,158	4,706
Increase in capital	0	0	0	0	0	0	0	0	0	0
Dividend out	0	0	0	0	0	0	0	0	0	0
Net assets C/F	9,662	9,523	10,044	11,605	13,814	16,620	19,838	23,504	27,662	32,368

APPENDIX 2

APPRAISED VALUE EXAMPLE

COMPANY: SINGLE CLASS INSURANCE COMPANY

INSURANCE RESULTS EXCLUDING EARNINGS FROM FUTURE WRITTEN BUSINESS

Future business ceases at time:	Year of earnings									
	1	2	3	4	5	6	7	8	9	10
3	(1,024)	(805)	(153)	1,166	179	102	57	24	5	0
4	(1,024)	(805)	(153)	820	1,505	250	140	75	31	6
5	(1,024)	(805)	(153)	820	1,341	1,709	303	167	87	35
6	(1,024)	(805)	(153)	820	1,341	1,767	1,907	346	188	97
7	(1,024)	(805)	(153)	820	1,341	1,767	1,971	2,111	385	208

Cumulative present value of the run off from the end of year:	Valuation date									
	0	1	2	3	4	5	6	7	8	9
3				1,194	267	141	67	24	4	0
4					1,560	367	190	88	30	5
5						1,790	439	224	101	34
6							2,004	497	250	112
7								2,218	551	276

APPENDIX 3A

APPRAISED VALUE EXAMPLE
COMPANY: SINGLE CLASS INSURANCE COMPANY

REVENUE/PROFIT & LOSS ACCOUNT

	Year									
	1	2	3	4	5	6	7	8	9	10
Written premium	3,000	6,000	9,000	0	0	0	0	0	0	0
Acquisition expenses	(300)	(600)	(900)	0	0	0	0	0	0	0
Net written premium	2,700	5,400	8,100	0	0	0	0	0	0	0
Increase in unearned premium reserve	(1,350)	(1,350)	(1,350)	4,050	0	0	0	0	0	0
Earned premium	1,350	4,050	6,750	4,050	0	0	0	0	0	0
Claims paid	(540)	(1,789)	(3,230)	(2,957)	(1,387)	(726)	(530)	(378)	(142)	0
Increase in claims reserves	(540)	(1,249)	(1,495)	122	1,387	726	530	378	142	(0)
Claims incurred	(1,080)	(3,038)	(4,725)	(2,835)	0	0	0	0	0	0
Other expenses	(1,800)	(2,400)	(2,700)	0	0	0	0	0	0	0
Investment income— Insurance assets	67	237	457	451	256	146	81	34	7	0
Gross insurance result	(1,463)	(1,150)	(218)	1,666	256	146	81	34	7	0
Tax allowance	439	345	65	(500)	(77)	(44)	(24)	(10)	(2)	(0)
Net result for insurance operation	(1,024)	(805)	(153)	1,166	179	102	57	24	5	0
Investment income— Shareholder assets	981	951	962	1,085	1,240	1,349	1,457	1,569	1,685	1,808
Tax adjustment	(294)	(285)	(289)	(325)	(372)	(405)	(437)	(471)	(506)	(542)
Net result on shareholder	687	666	674	759	868	944	1,020	1,098	1,180	1,266
Net result	(338)	(140)	521	1,925	1,047	1,047	1,077	1,122	1,185	1,266

BALANCE SHEET

Assets:										
Agents balances	600	1,200	1,800	0	0	0	0	0	0	0
Net investments	10,952	12,812	15,578	15,132	14,792	15,113	15,660	16,404	17,447	18,713
Total assets	11,552	14,012	17,378	15,132	14,792	15,113	15,660	16,404	17,447	18,713
Liabilities:										
Claims reserves	540	1,789	3,284	3,162	1,775	1,050	520	142	0	0
Premium reserves	1,350	2,700	4,050	0	0	0	0	0	0	0
Tax reserves	0	0	0	0	0	0	0	0	0	0
Total insurance liabilities	1,890	4,489	7,334	3,162	1,775	1,050	520	142	0	0
Capital	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Retained earnings	(338)	(477)	44	1,969	3,017	4,063	5,140	6,263	7,447	8,713
Net shareholder equity	9,662	9,523	10,044	11,969	13,017	14,063	15,140	16,263	17,447	18,713
Total liabilities	11,552	14,012	17,378	15,132	14,792	15,113	15,660	16,404	17,447	18,713
Check balance	0	0	0	0	0	0	0	0	0	0
Net assets B/F	10,000	9,662	9,523	10,044	11,969	13,017	14,063	15,140	16,263	17,447
Declared result	(338)	(140)	521	1,925	1,047	1,047	1,077	1,122	1,185	1,266
Increase in capital	0	0	0	0	0	0	0	0	0	0
Dividend out	0	0	0	0	0	0	0	0	0	0
Net assets C/F	9,662	9,523	10,044	11,969	13,017	14,063	15,140	16,263	17,447	18,713

APPENDIX 3B

APPRAISED VALUE EXAMPLE
COMPANY: SINGLE CLASS INSURANCE COMPANY

REVENUE/PROFIT & LOSS ACCOUNT

	Year									
	1	2	3	4	5	6	7	8	9	10
Written premium	3,000	6,000	9,000	11,250	0	0	0	0	0	0
Acquisition expenses	(300)	(600)	(900)	(1,125)	0	0	0	0	0	0
Net written premium	2,700	5,400	8,100	10,125	0	0	0	0	0	0
Increase in unearned premium reserve	(1,350)	(1,350)	(1,350)	(1,013)	5,063	0	0	0	0	0
Earned premium	1,350	4,050	6,750	9,113	5,063	0	0	0	0	0
Claims paid	(540)	(1,789)	(3,230)	(4,728)	(4,045)	(1,966)	(1,061)	(732)	(496)	(177)
Increase in claims reserves	(540)	(1,249)	(1,495)	(1,650)	501	1,966	1,061	732	496	177
Claims incurred	(1,080)	(3,038)	(4,725)	(6,379)	(3,544)	0	0	0	0	0
Other expenses	(1,800)	(2,400)	(2,700)	(2,250)	0	0	0	0	0	0
Investment income— Insurance assets	67	237	457	688	631	358	201	108	44	9
Gross insurance result	(1,463)	(1,150)	(218)	1,172	2,150	358	201	108	44	9
Tax allowance	439	345	65	(352)	(645)	(107)	(60)	(32)	(13)	(3)
Net result for insurance operation	(1,024)	(805)	(153)	820	1,505	250	140	75	31	6
Investment Income— Shareholder assets	981	951	962	1,058	1,258	1,450	1,581	1,710	1,842	1,979
Tax adjustment	(294)	(285)	(289)	(318)	(377)	(435)	(474)	(513)	(553)	(594)
Net result on shareholder	687	666	674	741	880	1,015	1,107	1,197	1,289	1,385
Net result	(338)	(140)	521	1,561	2,385	1,265	1,247	1,272	1,320	1,392

BALANCE SHEET

Assets:										
Agents balances	600	1,200	1,800	2,250	0	0	0	0	0	0
Net investments	10,952	12,812	15,578	19,352	18,423	17,723	17,908	18,448	19,272	20,487
Total assets	11,552	14,012	17,378	21,602	18,423	17,723	17,908	18,448	19,272	20,487
Liabilities:										
Claims reserves	540	1,789	3,284	4,934	4,433	2,467	1,406	673	177	0
Premium reserves	1,350	2,700	4,050	5,063	0	0	0	0	0	0
Tax reserve	0	0	0	0	0	0	0	0	0	0
Total insurance liabilities	1,890	4,489	7,334	9,997	4,433	2,467	1,406	673	177	0
Capital	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Retained earnings	(338)	(477)	44	1,605	3,990	5,255	6,503	7,775	9,095	10,487
Net shareholder equity	9,662	9,523	10,044	11,605	13,990	15,255	16,503	17,775	19,095	20,487
Total liabilities	11,552	14,012	17,378	21,602	18,423	17,723	17,908	18,448	19,272	20,487
Check balance	0	0	0	0	0	0	0	0	0	0
Net assets B/F	10,000	9,662	9,523	10,044	11,605	13,990	15,255	16,503	17,775	19,095
Declared result	(338)	(140)	521	1,561	2,385	1,265	1,247	1,272	1,320	1,392
Increase in capital	0	0	0	0	0	0	0	0	0	0
Dividend out	0	0	0	0	0	0	0	0	0	0
Net assets C/F	9,662	9,523	10,044	11,605	13,990	15,255	16,503	17,775	19,095	20,487

APPENDIX 3C

APPRAISED VALUE EXAMPLE
COMPANY: SINGLE CLASS INSURANCE COMPANY
REVENUE/PROFIT & LOSS ACCOUNT

	Year									
	1	2	3	4	5	6	7	8	9	10
Written premium	3,000	6,000	9,000	11,250	12,375	0	0	0	0	0
Acquisition expenses	(300)	(600)	(900)	(1,125)	(1,238)	0	0	0	0	0
Net written premium	2,700	5,400	8,100	10,125	11,138	0	0	0	0	0
Increase in unearned premium reserve	(1,350)	(1,350)	(1,350)	(1,013)	(506)	5,569	0	0	0	0
Earned premium	1,350	4,050	6,750	9,113	10,631	5,569	0	0	0	0
Claims paid	(540)	(1,789)	(3,230)	(4,728)	(5,994)	(4,890)	(2,426)	(1,317)	(886)	(567)
Increase in claims reserves	(540)	(1,249)	(1,495)	(1,650)	(1,448)	991	2,426	1,317	886	567
Claims incurred	(1,080)	(3,038)	(4,725)	(6,379)	(7,442)	(3,898)	0	0	0	0
Other expenses	(1,800)	(2,400)	(2,700)	(2,250)	(2,166)	0	0	0	0	0
Investment income— Insurance assets	67	237	457	688	892	770	433	239	125	50
Gross insurance result	(1,463)	(1,150)	(218)	1,172	1,916	2,441	433	239	125	50
Tax allowance	439	345	65	(352)	(575)	(732)	(130)	(72)	(37)	(15)
Net result for insurance operation	(1,024)	(805)	(153)	820	1,341	1,709	303	167	87	35
Investment income										
Shareholder assets	981	951	962	1,058	1,240	1,492	1,717	1,873	2,026	2,182
Tax adjustment	(294)	(285)	(289)	(318)	(372)	(448)	(515)	(562)	(608)	(655)
Net result on shareholder	687	666	674	741	868	1,044	1,202	1,311	1,418	1,527
Net result	(338)	(140)	521	1,561	2,209	2,753	1,505	1,478	1,506	1,562

BALANCE SHEET

Assets										
Agents balances	600	1,200	1,800	2,250	2,475	0	0	0	0	0
Net investments	10,952	12,812	15,578	19,352	23,290	21,958	21,037	21,198	21,818	22,813
Total assets	11,552	14,012	17,378	21,602	25,765	21,958	21,037	21,198	21,818	22,813
Liabilities:										
Claims reserves	540	1,789	3,284	4,934	6,382	5,391	2,965	1,648	762	195
Premium reserves	1,350	2,700	4,050	5,063	5,569	0	0	0	0	0
Tax reserve	0	0	0	0	0	0	0	0	0	0
Total insurance liabilities	1,890	4,489	7,334	9,997	11,951	5,391	2,965	1,648	762	195
Capital	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Retained earnings	(338)	(477)	44	1,605	3,814	6,567	8,072	9,550	11,056	12,618
Net shareholder equity	9,662	9,523	10,044	11,605	13,814	16,567	18,072	19,550	21,056	22,618
Total liabilities	11,552	14,012	17,378	21,602	25,765	21,958	21,037	21,198	21,818	22,813
Check balance	0	0	0	0	0	0	0	0	0	0
Net assets B/F	10,000	9,662	9,523	10,044	11,605	13,814	16,567	18,072	19,550	21,056
Declared result	(338)	(140)	521	1,561	2,209	2,753	1,505	1,478	1,506	1,562
Increased in capital	0	0	0	0	0	0	0	0	0	0
Dividend out	0	0	0	0	0	0	0	0	0	0
Net assets C/F	9,662	9,523	10,044	11,605	13,814	16,567	18,072	19,550	21,056	22,618

APPENDIX 3D

APPRAISED VALUE EXAMPLE
COMPANY: SINGLE CLASS INSURANCE COMPANY
REVENUE/PROFIT & LOSS ACCOUNT

	Year									
	1	2	3	4	5	6	7	8	9	10
Written premium	3,000	6,000	9,000	11,250	12,375	13,613	0	0	0	0
Acquisition expenses	(300)	(600)	(900)	(1,125)	(1,238)	(1,361)	0	0	0	0
Net written premium	2,700	5,400	8,100	10,125	11,138	12,251	0	0	0	0
Increase in unearned premium reserve	(1,350)	(1,350)	(1,350)	(1,013)	(506)	(557)	6,126	0	0	0
Earned premium	1,350	4,050	6,750	9,113	10,631	11,694	6,126	0	0	0
Claims paid	(540)	(1,789)	(3,230)	(4,728)	(5,994)	(7,033)	(5,642)	(2,818)	(1,529)	(996)
Increase in claims reserves	(540)	(1,249)	(1,495)	(1,650)	(1,448)	(1,153)	1,354	2,818	1,529	996
Claims incurred	(1,080)	(3,038)	(4,725)	(6,379)	(7,442)	(8,186)	(4,288)	0	0	0
Other expenses	(1,800)	(2,400)	(2,700)	(2,250)	(2,166)	(2,042)	0	0	0	0
Investment income— Insurance assets	67	237	457	688	892	1,058	887	495	269	138
Gross insurance result	(1,463)	(1,150)	(218)	1,172	1,916	2,524	2,725	495	269	138
Tax allowance	439	345	65	(352)	(575)	(757)	(817)	(148)	(81)	(42)
Net result for insurance operation	(1,024)	(805)	(153)	820	1,341	1,767	1,907	346	188	97
Investment income— Shareholder assets	981	951	962	1,058	1,240	1,485	1,789	2,050	2,234	2,416
Tax adjustment	(294)	(285)	(289)	(318)	(372)	(445)	(537)	(615)	(670)	(725)
Net result on shareholder	687	666	674	741	868	1,039	1,252	1,435	1,564	1,691
Net result	(338)	(140)	521	1,561	2,209	2,806	3,160	1,781	1,752	1,788

BALANCE SHEET

Assets:										
Agents balances	600	1,200	1,800	2,250	2,475	2,723	0	0	0	0
Net investments	10,952	12,812	15,578	19,352	23,290	27,558	25,961	24,924	25,147	25,940
Total assets	11,552	14,012	17,378	21,602	25,765	30,281	25,961	24,924	25,147	25,940
Liabilities:										
Claims reserves	540	1,789	3,284	4,934	6,382	7,535	6,181	3,363	1,834	838
Premium reserves	1,350	2,700	4,050	5,063	5,569	6,126	0	0	0	0
Tax reserve	0	0	0	0	0	0	0	0	0	0
Total insurance liabilities	1,890	4,489	7,334	9,997	11,951	13,660	6,181	3,363	1,834	838
Capital	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Retained earnings	(338)	(477)	44	1,605	3,814	6,620	9,780	11,561	13,313	15,101
Net shareholder equity	9,662	9,523	10,044	11,605	13,814	16,620	19,780	21,561	23,313	25,101
Total liabilities	11,552	14,012	17,378	21,602	25,765	30,281	25,961	24,924	25,147	25,940
Check balance	0	0	0	0	0	0	0	0	0	0
Net assets B/F	10,000	9,662	9,523	10,044	11,605	13,814	16,620	19,780	21,561	23,313
Declared result	(338)	(140)	521	1,561	2,209	2,806	3,160	1,781	1,752	1,788
Increased in capital	0	0	0	0	0	0	0	0	0	0
Dividend out	0	0	0	0	0	0	0	0	0	0
Net assets C/F	9,662	9,523	10,044	11,605	13,814	16,620	19,780	21,561	23,313	25,101

APPENDIX 3E

APPRAISED VALUE EXAMPLE
 COMPANY: SINGLE CLASS INSURANCE COMPANY
 REVENUE/PROFIT & LOSS ACCOUNT

	Year									
	1	2	3	4	5	6	7	8	9	10
Written premium	3,000	6,000	9,000	11,250	12,375	13,613	14,974	0	0	0
Acquisition expenses	(300)	(600)	(900)	(1,125)	(1,238)	(1,361)	(1,497)	0	0	0
Net written premium	2,700	5,400	8,100	10,125	11,138	12,251	13,476	0	0	0
Increase in unearned premium reserve	(1,350)	(1,350)	(1,350)	(1,013)	(506)	(557)	(613)	6,738	0	0
Earned premium	1,350	4,050	6,750	9,113	10,631	11,694	12,864	6,738	0	0
Claims paid	(540)	(1,789)	(3,230)	(4,728)	(5,994)	(7,033)	(8,000)	(6,355)	(3,180)	(1,703)
Increase in claims reserves	(540)	(1,249)	(1,495)	(1,650)	(1,448)	(1,153)	(1,005)	1,639	3,180	1,703
Claims incurred	(1,080)	(3,038)	(4,725)	(6,379)	(7,442)	(8,186)	(9,005)	(4,717)	0	0
Other expenses	(1,800)	(2,400)	(2,700)	(2,250)	(2,166)	(2,042)	(2,246)	0	0	0
Investment income— Insurance assets	67	237	457	688	892	1,058	1,203	994	550	297
Gross insurance result	(1,463)	(1,150)	(218)	1,172	1,916	2,524	2,816	3,015	550	297
Tax allowance	439	345	65	(352)	(575)	(757)	(845)	(905)	(165)	(89)
Net result for insurance operation	(1,024)	(805)	(153)	820	1,341	1,767	1,971	2,111	385	208
Investment income— Shareholder assets	981	951	962	1,058	1,240	1,485	1,781	2,129	2,429	2,645
Tax adjustment	(294)	(285)	(289)	(318)	(372)	(445)	(534)	(639)	(729)	(794)
Net result on shareholder	687	666	674	741	868	1,039	1,247	1,490	1,700	1,852
Net result	(338)	(140)	521	1,561	2,209	2,806	3,218	3,601	2,085	2,060

BALANCE SHEET

Assets:										
Agents balances	600	1,200	1,800	2,250	2,475	2,723	2,995	0	0	0
Net investments	10,952	12,812	15,578	19,352	23,290	27,558	32,121	30,340	29,246	29,602
Total assets	11,552	14,012	17,378	21,602	25,765	30,281	35,116	30,340	29,246	29,602
Liabilities:										
Claims reserves	540	1,789	3,284	4,934	6,382	7,535	8,539	6,901	3,721	2,017
Premium reserves	1,350	2,700	4,050	5,063	5,569	6,126	6,738	0	0	0
Tax reserve	0	0	0	0	0	0	0	0	0	0
Total insurance liabilities	1,890	4,489	7,334	9,997	11,951	13,660	15,277	6,901	3,721	2,017
Capital	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Retained earnings	(338)	(477)	44	1,605	3,814	6,620	9,838	13,439	15,525	17,585
Net shareholder equity	9,662	9,523	10,044	11,605	13,814	16,620	19,838	23,439	25,525	27,585
Total liabilities	11,552	14,012	17,378	21,602	25,765	30,281	35,116	30,340	29,246	29,602
Check balance	0	0	0	0	0	0	0	0	0	0
Net assets B/F	10,000	9,662	9,523	10,044	11,605	13,814	16,620	19,838	23,439	25,525
Declared result	(338)	(140)	521	1,561	2,209	2,806	3,218	3,601	2,085	2,060
Increase in capital	0	0	0	0	0	0	0	0	0	0
Dividend out	0	0	0	0	0	0	0	0	0	0
Net assets C/F	9,662	9,523	10,044	11,605	13,814	16,620	19,838	23,439	25,525	27,585

APPENDIX 4

APPRAISED VALUE EXAMPLE

COMPANY: SINGLE CLASS INSURANCE COMPANY

INCREASE BY ADDING ONE YEAR'S WRITTEN BUSINESS

Year	1	2	3	4	5	6	7	8	9	10
4				(346)	1,326	148	84	51	26	6
5					(164)	1,458	163	92	57	28
6						58	1,604	179	101	62
7							64	1,765	197	111

Cumulative present value
of one year's business
written in year:

Valuation date:

	0	1	2	3	4	5	6	7	8	9
4				790	1,293	226	123	64	26	5
5					1,049	1,422	249	136	71	28
6						1,352	1,565	273	149	78
7							1,488	1,721	301	164

PROFIT MARGIN FOR EACH YEAR'S BUSINESS

Year	Gross written premium	Present value of net earnings	Profit margin
4	11,250	790	7.0%
5	12,375	1,049	8.5%
6	13,613	1,352	9.9%
7	14,974	1,488	9.9%

ABSTRACT OF THE DISCUSSION

Mr M. Bride (opening the discussion): The single European market is, undoubtedly, the major cause of the increase in general insurance company acquisitions that we have witnessed in recent years. Companies, rightly or wrongly, place great emphasis on size, above all else, as the key to survival. Further, acquisition of small existing operations appears to be the favoured means of market penetration. This influence is likely to continue up to 1992 and beyond. It is, therefore, not before time that we should discuss the methodology involved with the valuation of a general insurance operation and the potential roles of that valuation in the management of the industry.

There are four points arising from this paper which I think are particularly important:

- the concept of cost of capital,
- the absolute appraised value can be of lesser importance than its change over time,
- the concept of inverting the appraised value methodology to determine what circumstances must occur to justify a particular value for a company, and
- the reasons why the appraised value cannot be the sole yardstick for the measurement of general insurance company performance.

Section 2 lists the methods of valuation which are currently found in practice. The paper, quite correctly, highlights that these are approximate approaches and, additionally, that the value paid for a company in an open market sale will take account of many more subjective issues, not least, in the case of Europe, the imbalance of supply and demand. The values derived from these methods may be approximate, but they can still offer useful and quick comparative analyses of companies.

We now come to the basic methodology applied in the paper. The company's value is divided into three parts:

- the net asset value,
- the value arising from past business: that is, the reserve surplus and any investment income on technical reserves that has not already been taken into account, and
- the value arising from business yet to be written, including renewals of existing business.

Initially each of the three constituent parts requires the application of standard actuarial methods, augmented by much intuitive judgement on the part of the actuary. The authors give an extensive list of those areas of which the actuary should be particularly aware. I think that the paper might have benefited from a clearer division of the initial calculations from those areas requiring judgement, since, in some places, both become somewhat confused, making it difficult for the reader to see the wood for the trees.

In Section 3.4 the authors introduce the first important concept—the cost of capital. This is defined as the difference between the value of shareholders' funds on a DCF basis valued at market interest rates (as if they were simply investments), and valued at a higher interest rate, reflecting both the investment risks of the assets and the risks to which they are subjected, as the solvency of an insurance operation. I agree with the cost of capital concept, as there must be such a charge on the assets. However, if in our valuations the net asset value of a company holding £10 million in cash is stated as £8 million, we shall confuse our audience. It might be better to state the net asset value at market interest rates and to give the cost of capital as a separate item, being part of the cost of the insurance operation to be met by the value of past and future business.

The second element of the valuation is the value arising from past business. This is an area where we may encounter problems. We do not, as yet, have a methodology that allows us to estimate accurately claims reserves and run off. Further, we cannot predict the future and, hence, the claims cost on unexpired risks. It is interesting to contrast the appraised value in general insurance with that of life assurance. Certainly, before the arrival of the HIV virus, the mortality of lives assured had proved to be predictable from the trended mean of past experience and demonstrated relatively little variation about the sample mean. This stability simply does not exist in the distribution of general insurance claims costs. The key elements in the calculation of the value arising from future business are the risk

discount rates applicable. Clearly, the variability of a particular class of business must be taken into account. The authors write briefly of the allocation of capital to classes.

I would take issue with the point made in § 3.9.1 that the type of assets allocated to the insurance funds is immaterial, because the risk discount rates of an efficient market reflect the higher risks of high return assets. This may be true for individual securities; however, insurance companies diversify investment risk in the same way as they do insurance risk, by holding mixed portfolios. Allocation of capital is very important, particularly in using the appraised value methodology as a management tool. Capital could be allocated to each class so that an identical risk discount rate is appropriate for all classes. This method naturally takes account of the authors' point in § 4.3.3, that diversification by line increases the appraised value, because greater amounts of business could be supported from the capital available.

The paper highlights the value of an actuarial report. Caution is required. Actuaries are financial experts who, through their understanding of the technicalities of a general insurance company, have much to offer to a range of bodies involved in general insurance. However, actuaries are not, for example, experts in marketing and should, therefore, be wary when commenting on the qualities of this or similar aspects of a company in the course of an actuarial report.

The point is made in § 6.4 that, for many purposes, it is the increase in the appraised value under a constant basis, rather than its absolute value, that is important. Provided that the increase in the value is relatively independent of the basis chosen, then many of the reservations surrounding the methodology are removed. Unfortunately, a sale is one situation where an absolute value is required.

Focussing briefly on the applicability of the methodology to Lloyd's syndicates and companies writing London Market business, the future of much of this business is really a series of short terms. I do not think there are any identifiable long-term levels of profitability. Occasional catastrophic events have drastic effects on the market's pricing mechanism. Can we really predict these events? This, however, does not prevent the use of this methodology, on a comparative basis, to assess varying strategies under different sets of assumptions for the future.

The authors give some simple examples of actual calculations. Table 9.6 is a clear warning to us all as to how sensitive the appraised value is to these assumptions. Where cash is changing hands, all parties must be aware that the actuary can almost double the value of the company at the drop of a few assumptions. It appears that the calculations do not allow for the increased cost of capital that must arise from the growth in business. The cost of capital seems to be fixed, in these calculations, as that prevailing at the point of valuation. Clearly, if the amounts of business are to be increased, the risks to which the capital is subjected must also be increased. Presumably, in this case, an increasing risk discount rate should be applicable to the insurance earnings, in order to compensate for the increasing costs of capital.

The authors raise another key point in § 10.1.2. The methodology can be inverted to assess what conditions must prevail in order to justify a certain purchase price for a company. This approach is not only useful for the recipient of an appraised value, but also as a reasonableness test for the actuary performing the calculations.

Section 10.4 recommends the appraised value for use in executive remuneration scales. Certain aspects of the valuation are directly related to management performance. There are, however, problems:

- In my brief experience of this subject, the methodology required can be difficult to explain.
- The true profitability of business written will not emerge for several years. The personnel involved may be reluctant to wait this long in order to receive their remuneration.
- These executives are already paid high salaries in order to produce results. If such profit-related mechanisms are to be established then it is important that a downside is also included.
- There is a danger that profit-related remuneration may lead to focus on individual rather than corporate goals.

The valuation methods in the paper focus on companies that achieve their return from insurance, with a detailed analysis of the elements of profit of the insurance business. We are increasingly encountering companies who attain their return from taking risk on the asset rather than the liability side of the balance sheet, and I wonder whether this methodology is suitable for valuing such companies, as it treats assets in rather less detail.

The appraised value gives a basis from which management can determine the effectiveness of different strategies covering all aspects of the company. However, I would again like to turn to a comparison with life assurance to illustrate my fourth point: why I believe it cannot be the sole focus of company management. The life assurance embedded value indicates the sustainability of current annual profit releases, and the appraisal value the expected growth of that embedded value. Thus, keeping the appraisal value growth on course allows a life assurance company to achieve all its financial goals. However, the manager of a general insurance company does not have the accounting tools available to a life assurance company to release that embedded value in a smooth pattern as is required. Further, the annual general insurance profit is subject to a cyclicity absent in life assurance. The manager must, therefore, also pay attention to the ability of the operation to meet dividends in the next year. Failure to do this may lead to short-term suppression of the market value and the threat of takeover at an unsatisfactory price for the current owner.

There is much work still to be done in this area, particularly, in my opinion, in the stochastic modelling field, to which the paper pays a brief reference, which has much to contribute to strategic planning and development of companies in the future.

Mr N. D. Hooker: This is an area where actuaries are being called on to an increasing extent to provide assessments of 'value' of an insurance enterprise for both internal and external consumption. I have had some experience of dealing with senior executive incentive schemes based on appraised values, and would like to expand a little on the points made in § 6.4.3. The basis for valuation not only has to be consistent, it also has to be simple, so that all concerned can understand and agree to it. However, enough flexibility has to be given to future valuers so that account can be taken of unforeseen changes of circumstances. The basis has to be less concerned with technical niceties than with avoiding the possibility of unduly favourable results being presented by the top management.

I have some criticisms of the authors' methodology. I think they are wrong in treating the three elements of the appraised value as though they were independent. It is useful, from a conceptual point of view, to make a distinction between net asset value, the value from past written business, and the value from future written business. This distinction identifies the sources of profit, but the distinction is an artificial rather than an intrinsic one. There are also inter-relationships which will be ignored if the elements are valued separately. To the extent that the value of shareholders' funds exceeds market norms, the surplus may be available for immediate distribution. However, it is more likely to be used to support the growth of future business. Future shareholders' funds will depend on retained surplus brought forward, together with retained revenue account earnings. They will depend on the future policy regarding the technical reserves, and on the rate of growth and the profitability of the future business. Therefore, any valuation of a general insurance company—covering the net assets, the value from past written business, and the value from future written business—should take into account both the inter-relationships of shareholders' funds and future profit growth and the distributability of any surplus. The authors' approach deals with distributability only implicitly, by the use of a loading to the discount rate for the cost of locking up capital.

The full interconnecting dynamics of the company can be taken into account only by projecting the revenue account, profit and loss account and balance sheet into future accounting periods. With this approach there is no need to allocate assets to different classes of liabilities, although the future investment behaviour of the management is another element which needs to be modelled. The net profit flows can then be calculated, having regard to the normal solvency margins required by the market, and also having regard to any capital inflows and outflows which may be necessary. Such an approach has obvious links with companies' own corporate planning processes, and is, thus, more presentable to insurance company managers. Indeed, in the context of a valuation for sale or purchase, short-term profit forecasts are already a feature of takeover negotiations. However, it is less than credible to the investment community to continue the modelling process indefinitely. An alternative is to truncate the projection after, say, 10 years. At that time the company could be valued either on a break-up basis or, as the authors suggest in Section 9.4, on a multiple of earnings.

I would have liked to see a glossary of terms used, including those which the authors themselves introduced in the paper. This would have been extremely helpful, not only for ourselves, but also for the future generation of students who, I am sure, will be required to read this paper.

The discussion on risk rates of return in Sections 4.2 and 4.3 was useful, but the authors made no suggestions on how to measure an appropriate differential to the risk-free rate of return to allow for the variability of return and the cost of capital. The paper does not address the question of whether appraised values should be presented instead of, or alongside, more traditional accounts. Any discussion of this matter within the accountancy profession could benefit from contributions from actuaries. The authors failed to mention the paper on corporate planning which was presented at the Institute's General Insurance Convention in October 1988. Amongst other things, that paper discussed some general points relating to planning and modelling and was worth including in the bibliography.

Mr H. E. Clarke: The paper appears to cover very well the points to be considered in carrying out an appraised value and, like the authors, I have carried out a number of such exercises, particularly in recent years. Although my approach has been developed independently from theirs, it is clear that we tackle the exercise in a very similar way. I follow almost the same steps as those described in Section 2, with only minor differences. The main one is the calculation of the cost of capital, referred to in Section 3.4 and elsewhere.

The treatment of risk discount rates and goodwill should be compared with that in life appraisal values. This is particularly important when considering an insurance operation writing both life and general business, as is often the case, but it is also important in starting to set the appraised value in a wider context. I understand that my colleagues involved in life appraisals use one discount rate for a business before it has been sold and a significantly higher one, say five points higher, for the business after it has been sold. This seemed a reasonable approach, and I attempted to develop a comparable approach for general insurance. The starting point was to split the business into two areas, in the same way as the authors: existing business: policies already sold for the balance of the period they remain in force, normally at most a year, but for contractors' all-risks and certain other areas it can be longer; and future business: renewals of existing business and genuine new business. For existing business, my starting point for a risk discount rate is to use the same rate as that for life insurance in force, adjusted as necessary for tax. I then vary it to allow for the differences in the business. Future business I consider to be more risky than life business that has already been sold, since premium rates can change, but less risky than life business before it is sold, since part of it is renewal business. As a compromise, my starting point is half way between the two life rates I referred to earlier—again adjusted for tax. This approach produces a framework for risk discount rates that is comparable to that which would be used for a life appraisal value. Like the authors I do not have a clear distinction between existing and new business, and thus share their concerns with the meaning of the words goodwill and embedded value.

The main difference between myself and the authors is in relation to the calculation of the cost of capital. The authors deal with this by reducing the shareholders' funds to allow for the fact that the risk discount rate is greater than the rate of growth in the shareholders' funds. I adopt a different approach. As the authors mention, claim reserves in general insurance are often established on the basis of future expected outcomes, not cautious outcomes. Whether we like it or not, this is the framework within which we must work. It is accepted, however, that the actual outcome may be worse than expected by requiring a significant solvency margin. This does not refer to the statutory minimum, but the amount the market feels is appropriate. This could, perhaps, be 50% of premium income currently in the United Kingdom. Certain press comments on a recent composite's results suggest that dropping below that level might be undesirable. This is the amount that is generally considered necessary to write the business. If the premium expands, this conceptual solvency margin must also expand. While you continue to write business, this solvency margin is locked in and unavailable for any other use. It is, therefore, undistributable. Further, any growth in it that is required to match the growth in premium income is also undistributable.

This, now, is my analysis of the value of the shareholders' funds, assuming that the growth of the shareholders' funds is greater than the growth in premium income. If it is the other way round, then, sooner or later, you will require more capital. The funds in excess of the solvency margin at the valuation date are adjusted to a market value in the same way as the authors suggest, and then assumed to be immediately distributable, as they are not required to back the business. Of the

remainder, that is the amount initially required to meet the solvency margin, the growth in excess of the growth in premium income is discounted back at the risk discount rate. The initial solvency margin plus the growth in line with the premium income is assumed not to be distributed until the company ceases writing business. If you are projecting infinitely this is assumed to be never, so this quantity will have nil value if you are assuming a lower growth rate of premium income than the risk discount rate. Naturally, this reduction in the value of the solvency margin capital should be offset by the profits to be made from future business. As Mr Hooker said, care has to be taken to allow for both, because this capital cannot be distributed, as it is not available until you stop writing the business that it is required to back. This approach is based on the amount generally felt to be needed. Unfortunately, we, as a body, have not yet properly addressed the question of how to allocate capital by line of business. I hope we will do so.

In Section 6.3, the authors refer to the information publicly available in a valuation for purchase. It is important, not only to look carefully at the statutory returns, but also to read the report and accounts, as they contain much useful information on past events: sales of portfolios of business; problems with asbestos claims, and such like, which can have an important bearing on a company's value.

Mr D. H. Craighead: I find some difficulty in what appears to be an almost complete detachment of appraised value from market value. Market value may be highly volatile; it may depend on whether there are or are not any potential purchasers; nevertheless it must ultimately determine the risk discount rates that are used and, if the appraised value is consistently out of line with the market value, then something must be wrong in the calculation.

On a practical level there are several aspects of the market today which must be borne in mind. Firstly there are now more frequent catastrophes within Europe, notably the October 1987 hurricane and those early this year in the U.K. We have become accustomed to violent storms in the United States of America and can even obtain frequency patterns. We are not accustomed to facing them in the E.C. The effect is a very considerable escalation of claims, not only in direct writing companies, but also in the reinsurance market, which affects all but companies such as pure motor underwriters (and even then they may be involved to some extent). The ingress of this factor has two effects on setting levels for the appraised value: either we must allow for it by keeping specific extra reserves against future catastrophes, which reserves must be built up out of taxed profits or out of excess capital; or we must allow for the possibility of future claims when considering the general level of reserves. In either case, there is also an element of unquantifiable risk, and that factor must be taken into account in the risk discount rate to be used. The possibility of earthquakes, always expected but at unknown dates, adds to the uncertainty. We are beginning to think that they may occur anywhere in the world.

The next factor is what may best be called latent claims. We have already seen the devastating effect on the London Market of asbestosis claims from the U.S.A. and the possibility of very heavy pollution losses lies on the horizon, arising, not only in the U.S.A., but, possibly, also in the U.K. and in the rest of Europe. There are other types of latent claims, particularly from drugs or from product liability generally, which will affect virtually all insurance companies, possibly to a very considerable extent. Once again, this factor, which has had a major effect on market considerations of the value of insurance operations, must be allowed for by use of a high risk discount rate.

The concurrence of these two factors has produced an increased demand for excess loss protections, and rates have hardened considerably. London has always provided a market for whole account excess loss protections and, with the advent of catastrophes, such cover has now become a necessity for virtually all companies up to very high levels of protection. Those levels may quite easily exceed £100m. They must also carry sufficient reinstatement rights to cover several large claim amounts. Furthermore, in order to place the protections, it has now become necessary for most companies, both direct-writing and reinsurance, to accept additional quantities of excess loss protection as inwards business, with all the uncertainties that those acceptances bring to the underwriting portfolio and the results to be expected.

The net effect of these features is that there is now much more uncertainty in the market than existed a few years ago and more unwillingness on the part of buyers to undertake the risks involved.

One result has been a decrease in the number of members of Lloyd's. I doubt whether a discount factor of 20%, which has been mentioned in the paper, but not suggested as being correct, is adequate to meet the needs of the degree of uncertainty existing in the public mind at the present time.

It is not normal practice in the general insurance market to include the internal costs of claim handling in the reserves carried forward. Such costs are not a major feature in a company which is an ongoing concern, although they should be brought into account in the calculations. On the other hand, they can affect, to a material extent, any company which ceases underwriting.

The one feature in the paper with which I would disagree is the suggestion, in § 3.3.1, that in some cases the break-up value of the company may be greater than the appraised value as an ongoing concern. Anyone who has faced the picture of an underwriting company which has ceased to accept new business is aware of the part played by the claims run-off and the cost that it involves. An insurance operation is totally unlike any other industry in that respect. It cannot simply cease doing business and close its doors; it must continue to handle the claims submitted to it, possibly for a very long time. Within a few years, the administrative costs concerned, both the overheads and the claim handling costs themselves, can rise totally out of proportion to the claims being handled. In the current market it is almost impossible to find a buyer who will take over the run-off operations for the cost of the reserve plus a reasonable extra amount for contingencies. We all have in mind the picture of the Outhwaite syndicates in this regard, and the market has become cautious in the extreme. It may be possible to obtain the services of professional run-off companies to look after the business; but, if so, they will simply do so on an own-cost basis or on a claims figure which has a limitation or stop loss point. To handle that position, it is necessary for them to run the operations as a separate entity, so as to be able to track the total claim amounts. Hence the cost is unlikely to be so much lower than the cost of handling the claims directly as to justify the statement that a company may be more valuable in a run-off situation than in an on-going situation.

Dr S. M. Coutts: In the purchase of an insurance company the price paid will be governed, not only by the actuarial or accounting calculations, but the desire of the purchaser to buy the company. However, calculations, such as those put forward in this paper, certainly can act as a starting point for prospective purchasers.

In Section 3.9, the allocation of assets is based on an ongoing company, and there are arguments based on a positive cash flow situation, where companies could be mismatched to allow them more effective investment returns. However, the paper does not deal with this particular problem.

Section 4.6 compares the stochastic and deterministic approaches. I support the stochastic simulation model, not because of the elegant mathematics or the interesting graphs which can be produced, but because the inter-relationship between assets and liabilities—in particular, the handling of share price and claim inflation escalation variations—can be brought out more with this than with the sensitivity test which is suggested in the deterministic model. The authors emphasise the use of stochastic models for catastrophic events; but I believe that the more realistic, mundane variations in future loss ratios and payment patterns can have a greater effect on prices of companies.

In Section 3.4, I do not think that the authors have emphasised enough the importance of how the net assets are used to safeguard policyholders against adverse effects of catastrophic events. The cost of the company can be affected by the present owners of the insurance company having a lower level of probability of ruin than the purchaser. Hence, overcapitalisation is a relative term, and, maybe, the overcapitalisation suggested by the present share price is due, in part, to the probability of ruin assumption and the market's perception as to what they think the probability of ruin should be.

I believe that insurance should be taught to the actuary as one unified cash flow model with different parameters, thereby bringing out the relationship between life assurance, general insurance and pensions. There are numerous examples in the paper which highlight the similarities between the cash flow models. An example which comes out in the paper is the allocation of assets, which can be compared to that in a pension fund when being wound up or merged.

Mr S. J. B. Mehta: Modern portfolio theory suggests that a number of risk factors may be priced in international capital markets. Given this, I would agree with the authors that different lines of business warrant the use of different risk discount rates. For example, a very different rate may be applicable for professional liability classes than, for example, for short-tail domestic contents

insurance. The alternative approach of using a single discount rate to reflect the cost of shareholders' capital, would, in my view, need to have regard to the level of capital, the type of business, as well as the proportion of in-force to goodwill value.

Perhaps another influence on product pricing and the assessment of goodwill is uncertainty of knowledge of the parameters of the underlying claims and frequency distributions. This is an aspect where modern portfolio theory is very weak. I believe that a detailed analysis of transaction and market prices, using the appraised value approach outlined in the paper, could provide some very useful insights into the pricing of risk in markets today.

Professor S. Benjamin: The authors have omitted a major subject of great professional importance, that of the major conceptual difference between life and non-life insurance. There is no mention of the policyholders in this paper, whereas, historically, the first job of the actuary is to safeguard the interests of the policyholders. The life actuary determines the amount of risk capital which should be set aside to give an acceptable level of safety to the policyholders. In non-life insurance, that does not happen. The amount of backing solvency capital for any volume and type of business is set vaguely, according to an informal perceived wisdom, with: no scientific justification; no explicit public justification; no published standards of consistency within any one company from year to year; and no apparent standards of consistency between companies in any one year.

This leads the authors and others into a tortuous and repetitive discussion of risk rates of return or discount rates. I am not criticising them for the necessary repetition within the framework that they have had to follow. What they have had to do is to raise the required rate of return when the backing capital seems low, and vice-versa. Those are, however, discount rates for the shareholder's contract. They are irrelevant to the policyholder's contract. If backing capital were set aside on a professionally agreed and published basis, then those bases would be aiming at a similar standard of risk. I hesitate to use the phrase 'risk of ruin', but, in a sense, that is what I am talking about. The same risk rate of discount would apply across the board, and much of the discussion about risk rates of return would become irrelevant. The basic concepts would be the same as in the modern theory and practice of life assurance. This is important, because banks and other institutions are giving financial guarantees—indeed, they are offering financial guarantees to insurance companies—without an actuarial level of provisions.

The Government, in the last few years, has changed the rules, apparently in order to achieve a level financial playing field, but there is nothing level about different standards of capital backing implying different standards of security for the public at large. I hope that this paper induces the Institute to raise, publicly, the whole subject of standards of balance sheet provisions in different classes of institutions for financial risks involved in making financial promises to the public. I am sorry that the authors narrowed their sights to a point where the wider actuarial and public interests have been omitted from their picture.

Mr R. W. Davies: We have, for some time, needed a formal exposition of an approach that actuaries practising in this field have been using for many years. I am pleased that the authors have avoided some of the pitfalls sometimes seen in the calculation of appraisal values for life insurance companies. Paragraph 2.2.7 makes an important point which it is all too easy to overlook when making actuarial calculations; that an agreed price is an objective valuation, and other methods are simply attempts to estimate it. We would do well to ensure that we do not attempt to claim more than this for the valuation approach described in the paper.

I do not agree with the authors in advocating the avoidance of the term 'goodwill'. Goodwill is a well-understood term among accountants; we are much more likely to be successful in explaining our methods to the accountancy profession if we do so in a language that they understand. To an accountant the meaning of the term goodwill is that it is the value of a business over and above its tangible assets. Providing we ensure that we adjust our valuation of tangible assets to allow for other value arising from past written business as the authors describe, I see no difficulty in using the term goodwill for the value arising from future business, and other intangible elements of value. Accounting for goodwill is, of course, an entirely different matter!

I cannot agree with the suggestion in § 5.5.2 that, because we can predict the value of future renewal

business with reasonable certainty, it is in some way not goodwill. Even leaving aside doubts about the premise that the value of future renewals is predictable with some certainty—and I have considerable doubts on this score—the conclusion that a value placed on business not yet written is anything other than goodwill seems to me to be totally unacceptable. In the simplified approach, whatever accuracy we purport to achieve in arriving at the net profit margin per unit of gross premium, the choice of multiplier is a matter of very subjective judgement, as anyone who has undertaken practical work in this field will know. The modelling approach simply replaces one subjective judgement with a range of others. To seek to add spurious objectivity to this subjective process, by giving it a different name, will only strengthen the very barriers that the authors argue against constructing in § 5.3.2. The paper does not, however, suggest that we use the term 'existing structure value', which life company appraisals sometimes adopt in place of goodwill, and for this I am grateful.

I welcome the absence from the paper of any discussion of the concept of 'premium for control'. In my view, the value placed on future business should be considered by a buyer in the light of his expectations in exercising control, if that is his intention. If we include all such judgements in a wider review of the value of goodwill, rather than considering them separately, we may avoid the anomalous situation that we saw in the life insurance industry in 1989, when a substantial company was bought from an initially unwilling seller for a large negative control premium. This is clearly nonsense. If we are to seek acceptance of an actuarial approach to valuing insurance companies, then we must recognise its limitations. The value of a company is set by the market place. As such, it is influenced by a wide range of factors outside the scope of a mathematical calculation. As actuaries, we should seek to understand and explain the basic financial worth of the company, and this paper very ably sets out a method by which this can be achieved. However, we must always be wary of taking the process too far, and giving the impression, as sometimes happens, that where an appraised value differs from the market's perception, it is the market which is wrong! To assess fully the value of a general insurance company, we must consider, in the light of our experience, the environment in which it operates, and use mathematics only as a basis for an informed contribution to the overall consideration of value, to which practitioners from other disciplines have much to add. Actuaries are not the sole judges of fact in these matters!

Mr R. W. Whewell (a visitor): It is with some hesitation that I, an accountant, venture on to what is, essentially, an actuarial matter.

The paper advocates applying the appraisal value techniques already familiar in the life sector to non-life business. The distinctive feature of this approach, as I see it, is that it isolates the individual elements of profitability for each type of business and then applies a selected risk discount rate to each element. The possibility of adverse deviation is taken into account in the discount rate selected. Accordingly, the appraised value approach does have one advantage over other methods of valuation, such as price earnings ratios, in that it involves a detailed consideration of the future business to be written by the company and is based on explicit assumptions. However, given that the discount rates applied will inevitably be subjective, the appraised value will not, in practice, necessarily represent a significantly better measure of value than other methods.

I have two basic questions. The first is: is the valuation needlessly complicated by applying the discount rate to 'earnings', which I take to be those on a statutory basis, rather than simply being applied to cash flows? Is insufficient distinction made between the making of business decisions and the appraisal of the earnings which flow from those decisions? Cash flows have an intrinsic significance that earnings lack. In fact, earnings are essentially no more than cash flows, adjusted in accordance with certain accounting conventions, to enable users of accounts to infer the relationship between the cash flows. It seems to me that there may be some merit in using cash flows for the purpose of investment appraisal, in that it is the timing of cash flows that is significant rather than the inter-relationship. It is, perhaps, the cash flows which should be discounted rather than the earnings. The second question arises from the suggestion that it is necessary to allocate assets between shareholders' funds on the one hand, and policyholders' funds on the other, and to match particular investments with particular liabilities. Whilst this exercise may be necessary in determining investment strategy, and whilst a potential purchaser may wish to take account of investment strategy

in valuing the business, is it helpful to treat this exercise as though it were an integral part of the valuation process?

The paper suggests that a stochastic approach is 'potentially sounder' than the one being advocated, but that further research in the area is required. I ask a final question, therefore: is a stochastic approach based on cash flows a better way forward than the approach advocated in the paper?

Mr J. Plymen: The paper seems to have a strong American flavour. Much of the reference material is American. However, a great amount of work has been done on this and associated subjects in the U.K. At the CII conferences in 1969, 1974, 1977 and 1984, members discussed papers dealing with the subjects of the profitability, the earnings on capital employed, the discount between the price and the net asset value and the difficulty of maintaining a given reserve level with increasing premium income. The papers all had a similar theme: that the profitability of non-life insurance, as shown by the five major composites, representing a considerable portion of the market, is just too low for the business to be economic. Over the last year the premium income of the five composites has grown from £5,000 million to £5,800 million. With a solvency ratio of 40% that means that we need £320 million more reserves. The plough back for the industry after paying the dividends, is £75 million. Where is the rest of the reserve to come from?

Concerning the paper, the calculation of the value for the existing business is fine and is a textbook exposition of how to do it, but I have very considerable reservations about the authors' method of assessing the value of the future written business. The main point, which has been referred to by other speakers, is that the authors ignore the fact that the profits as shown, and as calculated, are before providing the reserves on the extra premium income. Mr Whewell asked whether it was the cash flows which should be discounted. I maintain that, in discounting future profits, we should only discount the surplus profits above what is needed to maintain the reserves. If we have, say, a 40% reserve ratio, and have 15% growth of business, that means we need 6 points net of profit just to maintain the reserve level. Surely any profit less than this is suspect, as it is obtained at the expense of reserves. My method would be to calculate, year by year, the balance of profit, if any, over what is needed to maintain the reserves at a definite level. This can be regarded as the distributable profit. Incidentally, in the various papers presented to the CII conferences, it is made perfectly clear that there is no question of any distributable profit being made from the actual operation of a non-life business. In fact, over the period concerned, 1969–84, the dividends paid by the composites were actually less, year by year, than the dividends on their equity reserves. This means that the shareholders have been subsidising the policyholders. A most extraordinary situation which surely cannot continue!

The calculation of the asset value of the existing business is a matter of investment analysis. In general, the asset value is the value of the shareholders' reserves held completely in equities, and that value and the income from it changes from year to year. At best, the income for the shareholders' assets grows from year to year, because of a certain amount of build-up of profit from the business. If there is not a build-up, then it runs down. A consideration of the change in this figure over the years enables the analyst to give an idea of the value of the shares, which will be largely made up from the existing asset value.

Mr W. M. Abbott: This is a timely paper on appraisal value theory and practice, which is a subject which forms part of the theory of corporate finance and extends far beyond the actuarial domain.

Professor Benjamin has said that the authors have narrowed their sights. However, by starting with the concept and need for appraised values, I do not think they have been negligent. Indeed, the next extension should be to the appraised values of other financial institutions so that these can reflect the risks from the level playing field. The appraised values, set out so clearly by the authors, can be very powerful and helpful. It is always interesting to see how decisions taken by management would be reflected in these appraised values. It would be desirable to demonstrate that changes in value would appear sensible on general so-called common sense grounds. If not, and without prejudice to the correct view, there is a communication gap which is difficult to bridge. I will illustrate this with two examples.

My first example is that of a parent company which is investing £10m into a general insurance

subsidiary. In §3.4.2 the authors say that the shareholders' funds are exposed to risk of loss if unprofitable business is written or unforeseen calamities occur, and that this risk must be compensated for by an additional return. I would agree with that. I struggled, however, with the logic that says that this means the investment return on shareholders' investments must be discounted at a higher rate than if they were held separately. Surely it could be argued that the shareholders' capital is there to provide working capital to enable the insurance process to happen, and that the additional return is the insurance profit. If this insurance profit is also heavily discounted in any valuation, surely this has introduced an element of double counting for the risk adjustment? The implications of risk discounting shareholder assets were then drawn out in the next paragraph. An additional £10m of capital injection with no extra profits from new business or otherwise would add less than £10m of value. Surely it is simpler to say that the £10m adds £10m of value plus an incremental return rather than £9m of value and an even greater incremental return; this assumes the two approaches could give the same net effect. In the extreme situation, where no extra operational profits are generated, why invest the £10m? If the answer is to protect solvency, then I would argue that the appraised value of a holding company with a general insurance company subsidiary should not be reduced if it decides, with nothing else being changed, to pass £10m down to the subsidiary. This assumes that the holding company is a going concern with its name to preserve, and is not prepared for its subsidiary to default on payments to policyholders. If value is lost, this might encourage a holding company to run subsidiary operations on minimal solvency margins.

My second example is on the effect of a decision to discount claims provisions or not. A basic rule of corporate finance theory is that only cash flow is relevant. This would imply, assuming zero tax effect, that the presentation of accounts and the provisions therein are not relevant to an assessment of value. In contrast, the authors indicate that management can increase value by introducing discounted reserves. This conclusion assumes that a company has scarce capital resources, and discounted provisions mean that an insurer can unlock some of these resources for more productive purposes. The less the capital tied up, the lower the risk discount rate, and the greater the value of the company to its shareholders. This formulation of the situation could be of great help when the zero tax effect assumption is discarded. The standard opposition to discounting has been that its introduction would bring forward tax payments, and that the acceleration of the cash flow leads to a diminished present value of the business. Indeed, it is difficult to argue against this in terms of current profit and loss reporting and its reflection of the benefit from an interest-free loan.

This perspective drives management to the view that discounting is not in the interest of shareholders. This is also supported by a policyholder perspective of added strength from the cushions built in from not discounting. The authors' description of value is important, in that it provides a conceptual framework for rationalising the views of those who argue that discounting is not necessarily against the interest of shareholders. It all depends on whether the acceleration of cash flow is more than offset by the effect of a change in the risk discount rate. I suspect, however, that the entrenched view against discounting will be difficult to shift, until management are primarily held accountable for value added rather than reported earnings.

Mr D. J. Keeler: As the authors have stated in Section 5, appraised value concepts have a wider application than to general insurance companies. Three years ago, Burrows and Whitehead presented a paper on life office appraisal values (*J.I.A.* 114, 411), which were commonly used in life assurance at that time. Since then their use has become more established, such that, in the recent hostile takeover of a quoted U.K. composite, the debate focused on the disclosure of assumptions rather than on whether the appraised value should be used.

An explicit modelling approach to earnings projections involves the selection of a number of economic and demographic assumptions—some of which are company or industry specific, but others relate more to the national and international economic outlook. The investment community has a role in advising on certain of the assumptions, such as investment returns and risk discount rates. However, the choice of the assumption set must be self consistent; this is a message which this paper emphasises.

It is important that the sensitivity of the appraised value to changes in assumptions is understood. During such sensitivity analysis work, the self consistency of the assumption set should be preserved.

The results of this analysis can be explained in an actuarial report. However, in a takeover situation, the communication of the illustrations of the impact of changes in assumptions is more difficult. One would wish to avoid creating an impression that the future experience of any particular assumption would necessarily fall within the limits used in the sensitivity analysis, and would also wish to avoid any impression that, by taking the lowest and highest values given in the sensitivity analysis, the value would necessarily fall within this range. The use of ranges can be misleading in these situations; accordingly, it is current practice to publish only the independent assessment of the appraised value.

In that same takeover, there was no published appraised value of the general insurance operations. This paper is to be welcomed as a step towards the use of appraisal techniques in general insurance. However, this is a small step—the biggest step is still to come, which is to communicate the technique and to publicise practical examples of the uses of these techniques to the investment community. Communication should make use of the simple message presented in the paper—that an appraised value discounts future earnings at appropriate risk discount rates using a different rate for existing business from that used for future written business. However, care must be taken with regard to future written business—there is no suggestion in the calculation that the company will grow at a certain rate; what is being said is that, underlying a willing buyer/willing seller price, there is a negotiated compromise between the likely rate of growth of the company and that part of the growth which the buyer is willing to pay for. The appraised value reflects this negotiated compromise. Accordingly, the company may well be expected to achieve higher growth in business than appears to be implicit in the strict calculation of future written business value.

The authors correctly refer to the likely divergence of a market price from an appraised valuation. There are always more than purely financial issues involved in a transaction. The appraised value is one of a number of factors involved. As one of a number of factors, it is interesting to consider the appraised value alongside the results of other methods of assessing the value of a company. In a perfect market, the alternative methods should all produce the same value. However, the real world is an imperfect market and the appraised value provides an additional dimension.

The appraised value would be considered alongside issues such as dividends, amount of working capital and the component of value relating to future business. If these are not consistent, then it may be an indication that the 'shape' of the appraised value—that is the relationship between the three components of value referred to in Section 2—is unusual. In such cases, there is either likely to be a particular reason for the inconsistency (such as the scope for high future dividend growth) or else there is likely to be greater divergence between the appraised value and a market price.

Mr D. I. Tomlinson: I would like to consider the risk discount rate, which has rather been taken for granted, and its background. Suppose that I am promised £100 in a year's time. To get the present value, I shall discount it. If I am then told there is some uncertainty about this £100, I might be tempted to discount it at some higher rate. However, what is meant by uncertainty? If there is a 50% chance I get £100, and a 50% chance that I get nothing, then what I should discount should be £50—the expected value in our technical statistical sense. It is quite possible to come up with a value, to compare it to £100 and say, "I have a discount rate here", but that is rather artificial. When I say, "There is a chance that I may get £100, or I may get nothing", the value I put on that is a matter of subjective judgement, depending on the particular circumstances.

I suggest that, having decided that value, we might well give thought to discounting it at a risk-free rate of interest. This runs contrary to the thinking behind a certain amount of the paper. We want to be quite clear whether we are discounting a true expected value, possibly adjusted because of the uncertainty, or whether we are increasing the rate of interest at which we discount to allow for the fact that we have not actually worked out what the expected value is.

Many bad business decisions are taken because people choose one scenario and treat that as the expected value. The authors mention the stochastic approach, but I do not particularly support that approach. It is all very well to say, "Here are a range of possibilities, let us give a probability to them". It is almost certain that you will miss out some of the possibilities. You can assign numbers to these, call them probabilities and make sure they all add up to one, but they do not have to be the true probabilities at all.

I am not certain that you can look at market values of various assets, and determine risk rates of

interest from these. You can certainly say, "Here is a scenario; here are the dividends I expect to receive" and divide that by the price, but, possibly, the market has come up with a standard risk-free rate of interest that is working on a different expected value.

Mr D. H. Craighead: Mr Plymen made the point that insurance has been unprofitable for a long period of time. Up to a point, yes; but one must not omit to divide the investment income between that due on the capital that is supplied to the business, and that which has arisen from the funds generated by the insurance itself—the premiums until they have to be paid out in claims. I consider that it is essential to separate these two in order to obtain a clear picture. Unfortunately that is not usually done, because of the universal failure to show the investment income arising from the insurance funds in the underwriting accounts, rather than in the profit and loss account. I suggest that, on the whole, the investment income from the insurance funds has been sufficient, and more than sufficient, to pay for the losses in the loss ratios involved, after allowing for expenses. If that were not the case, general insurance would not continue in the way it has been written in the past and is still being written.

I agree with the comments that have been made about cash flow, because there are snags when the actual amount that is invested is looked at. Not only are the investments made of different types, short-dated, long-dated or equities, but also the insurance funds can be affected to a considerable extent by other specific factors that arise. Among these are funds which are not available for investment, such as brokers' balances, which can often be a considerable proportion of the total; there are also such items as reinsurance recoveries. If the gross account is only 10% above the net account, then the recoveries do not affect the position very much, but if—and it does happen—the gross account is four or five times the net account, then the delay in obtaining reinsurance payments can affect the cash flow considerably. These factors must be brought into the picture.

Another point is the idea of goodwill. I suggest that goodwill properly fixes itself to the value of the business as an ongoing concern in relation to the name it enjoys in the market and the attractability it offers to policyholders, both in regard to renewal and in regard to new policyholders. It is derived from the abilities of the management and the past history of the office. It must, however, be a factor which is running off. If a buyer intends to replace the existing management with his own, which might be simply because he wants to do so or because he thinks a new management can do better, then the goodwill can relate only to the past performance and runs off fairly quickly—possibly over four or five years. If the buyer intends keeping the present management, then goodwill might continue for a long time, but people retire or die, and the management will change. So, of a necessity, when thinking of goodwill, the period cannot be extended too long into the future. Any other value of the company is simply the opportunity to obtain a business which has been an ongoing concern. I differentiate that from goodwill in the true sense of the word.

Mr J. A. Kamieniecki: As a life appraisal practitioner rather than as a non-life actuary I have found many of the ideas in the paper very useful.

Considering the difference between appraisal values in life assurance and in non-life assurance, they are of far more value on the life side, and are much more likely to remain so. Thinking of this in terms of information theory, there is much more information available on a life portfolio. Life contracts, as has been mentioned, are fairly stable in terms of risks associated with them. There are known maturity terms and profit-sharing systems, and so on. There is much information which is available to the appraisal value practitioner which is not available from published accounts. This information must be transformed into something which is of more value. On the non-life side, all that is available are guesses as to whether the reserves are adequate or not and as to future profitability margins which will be available on business not yet written.

Mr Keeler commented on the use of sensitivities. Surely the readers of appraised value reports, be they for private purposes or when published in a takeover, are intelligent. Most of them are directors of insurance companies. They are capable of understanding that sensitivity analysis does not claim to cover all the points available and that the range is not full. Sensitivity analyses should be shown, particularly when a value quoted is somewhat out of line with the market value of the company concerned. The more disclosure we can get in, the better. We are accused, as a profession, as being no better than astrologers; abstruse and irrelevant. We need to make clear what we are doing and how we

do it; how the results could vary based on different assumptions, preferably consistent ones. Otherwise we stand the risk of being marginalised and accused of being irrelevant.

Mr T. G. Clarke: The authors are well aware that we must not claim too much for these techniques, and there are a number of areas in which it has been suggested that they could be used which need further investigation and consideration.

The important point which Mr Hooker raised concerned consistency and understandability. Before we try to claim too much for this methodology, especially in the area of remuneration, we must be able to see that these techniques work over a period of time. I suspect, whilst the appraisal technique has been used in merger-takeover situations, it has not seen the test of time over a year or two to see whether the assumptions work out reasonably realistically. However, having said that, I firmly believe in the methodology. I think that having the formal framework helps us to understand the reasons why some of the mergers and takeovers which have occurred in Europe have multiples to earnings which seem ridiculously high. It is the investigation into the balance sheet and putting this framework to an appraised value which helps an understanding of some of the figures quoted and also paid for companies—certainly in Italy and Spain.

Mr D. I. W. Reynolds (closing the discussion): In the City we have marketmakers who are concerned only with price. Stockbrokers' analysts may also be more concerned with price than value; but they are concerned with the way in which price is moving, and more and more with the movement of price relative to the market. However, investors from insurance companies and pension funds, the long-term investors, should be most concerned with value and the rate at which it is increasing. As such investors are well represented in this Hall, it is appropriate that the authors should present their paper on the valuation of general insurance companies.

It is natural to actuaries that the value of a company, or of a contract, should be the present value of future expected net earnings—but, in view of the discussion, perhaps that should be cash flows. Actuaries, financial analysts, accountants (and even academics, now that they have introduced the concept of shareholder value added analysis), would agree on that. Whilst Mr Abbott would like appraisal values to be extended to other financial institutions, I think, at this stage, we should welcome this paper which extends them from life insurance to general insurance companies.

A number of speakers have talked about the total appraised value. Mr Craighead pointed out that it should have some relationship with market value, and that through this it gives a means of specifying the risk discount rate. Indeed, Mr Davies said it is only the agreed price that is anything of objective value in a takeover bid. Mr Coutts felt that the value for purchase reflects only the value to the purchaser, and, perhaps, it is therefore again subjective.

Numerous speakers have commented on the concept, introduced by the authors, of the cost of capital. At first sight it seems illogical that assets representing shareholders' funds should be valued below market valuation through the use of a risk discount rate which is higher than prevailing market rates. The opener suggested an alternative approach; but the fallacy, as Mr Hooker pointed out, is that the three components in an appraised value are not separate but are inter-connected. The separation is a useful aid to calculation, and as Mr Whewell pointed out, it has the benefit of making the assumptions explicit. Professor Benjamin went beyond those assumptions and asked for the profession to support a published fixed set of assumptions for setting provisions for policyholders, and, hence, for the backing capital needed by an insurance company. It was interesting in the discussion that backing capital was referred to in many cases as non-distributable. Mr H. Clarke went further and reduced its value to nil if premium growth was less than the risk discount rate.

The risk discount rate is the heart of the appraised value, and has been at the heart of our discussion. It is the choice of self-consistent risk discount rates that provides the professional contribution to the appraisal process. Unfortunately for the discussion and for the benefit of the profession, the examples in the second half of the paper used only a single discount rate, although the sensitivity of the valuation to the choice is shown very clearly in Table 9.6. Mr Craighead gave reasons for a high-risk discount rate and the current problems affecting general insurance companies. Mr Mehta indicated an approach via modern portfolio theory. Mr H. Clarke would use the same

discount rate for in-force business as he would for life insurance business, and gave an interesting justification of different approaches to new business for life insurance and general insurance.

The opener accepted that, in practice, adding £10 million of capital to a company would increase its net asset value by less than £10 million, though Mr Abbott preferred not to follow this approach, but to offset the reduction, if such were justified, by the value of the additional business being written. My own view is that it is unlikely that the increase in appraised value would be less than the capital injected in a practical case. If no additional business is written, the reduction in the risk discount rate that would be brought about by adding extra capital would, I believe, be at least sufficient to offset the discount on the extra net asset value. The authors, indeed, suggest that this can happen and go beyond that. Where a company is under-capitalised, the addition of capital can increase the value of the company by more than that capital.

Mr Hooker requested a glossary—and any paper which includes goodwill within it should have a glossary! Mr Davies accepted the use of that term for future written business. Perhaps to avoid the confusion the actuarial profession has had in the past in using the term ‘reserves’ in its discussions with the accountancy profession, we should consciously avoid the term ‘goodwill’. If ‘the value of future written business’ is too long, maybe I could suggest we use the term ‘the will-be value’, which seems both clear and concise and has the right tone of impermanence.

The authors asserted that a more conservative reserving policy reduces the value of the company. Clearly the reverse is not the case, as the recent example of London United Investments demonstrates. Nor, I believe, does the relative capitalisation of continental and U.K. general insurance companies add credence to the assertion. How is it that Allianz and Generali can declare profits broadly equal to the average of the five major U.K. composites, but each has a market capitalisation which is equal to the sum of the five U.K. composites? The implication goes further, and is made specific, in §4.3.7—and this was supported by Mr Abbott—that if you discount claims reserves, you will increase the value of the company. Now that is an interesting thought for the ABI and those in dispute with the Inland Revenue!

Clearly the assumptions used vary with the purpose of the appraised value. One purpose is in the remuneration of executives. For this, and other purposes, the authors say, and demonstrate with their numerical examples, that changes in appraised values are more important than absolute values. The opener thought, and maybe I am ascribing too much to him, that senior management are already well paid and that any remuneration based on appraised values should have some downside as well as upside. I do not know whether there are many senior executives who would wish to be rewarded on the basis of appraised values or on the difference between two subjective and maybe cyclical valuations, certainly if they did not have some control over the subjectivity involved.

At this early stage of discussing the concept, it was not surprising there were only a few references to a stochastic approach. While Mr Coutts would prefer a stochastic approach based on cash flows, he answered in the affirmative, in advance, the final question that Mr Whewell asked, as to whether this was a better approach.

One aspect that has not been covered in the discussion is the authors’ implication that they are seeking to advance the position of actuaries when general insurance companies are to be valued. As members of the Institute they can, and should, expect the support of the profession, but I do not think that that is the same as the profession putting itself forward as the sole, or principal, focus for the proper valuation of general insurance companies. It is probably too early, and it may always be too early, for the profession to make that claim, and Mr Davies confirmed the contribution of other professions to the valuation process. It is unfortunate that the constraints of confidentiality on consultants have restricted what the authors can say about specific cases. Maybe the paper would have benefited from a more concrete example, clearly not impossible, as stockbroker analysts are already quoting goodwill figures for the general insurance business of the major composites. The authors accept that valuations can be prepared from publicly available data, so this was something they could have done.

The paper is not perfect, but it is a step along the learning curve. Perhaps, as Mr Plymen pointed out, there is an American flavour, and, maybe, the editing has incorporated some of that caution that contact with the American legal system imposes on professional reporting. Nevertheless, I believe the authors have written a seminal paper which will father many offspring. It provides a consistent

methodology for the valuation of general insurance companies. It is practical but subjective, using professional judgement to control that subjectivity. I hope that we can welcome them back when their experience enables them to be more specific about the limits of professional judgement in valuing general insurance companies.

The President (Mr R. D. Corley): Our authors have written a paper to share their experience with us, and we are all grateful for the diligence and care with which they have made their methodology clear. The discussion which we have enjoyed shows that, although most of the work is accepted, there is still a wide variety of approaches to solving some of the problems. It is clear, then, that we can agree with two statements made early in the paper: that this type of valuation work provides an area rich in future research topics; and that the actuary experienced in this field can be expected to play an important role in the development of the general insurance industry.

However, it should, perhaps, be the statement at the beginning of Section 4 to which we should now turn our attention, for the authors assert that many of the ideas presented in the paper and in the discussion will also be applicable in areas other than general insurance. From my own experience, I have come to pay high regard to the value of reviewing the methodology of one sector of the actuary's fields of operation to assess its value in other sectors, and to believe that a part of the strength of the profession in this country is our insistence that our members gain a grounding in all our major sectors of interest. It is, perhaps, a pity that a wider cross-section of the profession has not been present this evening, for posterity may see the report on the paper and its discussion, not only as a text for those new to valuing general insurance companies, but also in a much wider context as a starting point for the development of methods of valuing many different types of financial institutions.

I would now ask you to join with me in showing our appreciation of the work of our two authors.

Mr J. P. Ryan (replying): One of the themes that came through is that appraised values are not necessarily estimates of market values on transactions. In the paper we say that you can solve a discount rate from a series of transactions at different market prices, and the opener referred to how you can use this methodology in reverse, which we consider to be quite an important aspect of it. However, very often, an appraised value, using reasoned choices of risk discount rates, is expected to be different from actual market values. This is not to suggest that the methodology is incorrect. Indeed, moving outside the field of insurance and into the broader investment world, one hears of company chairmen saying that the stock market does not understand them or does not know how to value them. That is not just company chairmen bleating about their share options, but is very often having genuine different perceptions between risk discount rates and values. Indeed, part of the shareholder value-added approach does suggest that some of these differences do come up and are an interesting part of our financial analysis and an important part of the Thatcherite economy. So, that we came up with differences in value does not, in our view, in any way invalidate this and actually encourages it as a means of financial analysis.

The other point that several speakers referred to was excess capital and whether the £10m put into a company is worth £10m or less than that. This, to some extent, does depend on whether the money can be taken out of the company easily or not, and it is one of the issues we have touched on in the paper. If it is difficult to take any excess capital out of the company, then it could well have a discount. I have been involved in a number of such situations.

Both the opener and Mr Craighead referred to catastrophes, difficulties in the Lloyd's market, and so on, perhaps in some way suggesting that these might invalidate the approach. I think it is worth taking that a stage further, and recognising that the existence of a sudden market catastrophe, or a series of hurricanes like we had at the beginning of the year, can increase the value of companies rather than decrease them. It is not unknown in the Lloyd's market, in times of soft markets, for reinsurers to say "We need a good big bang, so we will get the rates up". If you take a large company which may have lost £100m (for ease of arithmetic) in the recent storms and net that down for tax, that would knock £65m off the value of the company because that is what they would pay out net of reinsurance. The increase, as a result of the increase in rates that they can charge in the market, may well more than offset that. That can again justify stock markets pushing share prices up on catastrophes rather than down.

Perhaps it did not come clearly across in the paper that we recommend using different discount rates for different parts of the business. I know that, in the example, we have used only one. To use more than that makes the arithmetic unnecessarily complicated in what we felt was a complicated enough paper already.

There have been a few comments on remuneration based on appraised values. If you are going to set up a remuneration structure based on this, it needs to be done very carefully. You do not want the underwriter to have to understand the full ramifications of what the appraised value means to him, although we touch a little on how that can lead to different behaviour. It needs to be set up as part of an overall framework, rather than saying, "XYZ company's appraised value was 100; it is 120 this year, so we can increase remuneration by 20%". It needs to be thought through more carefully than that. The underwriter may want to be given separate targets and be rewarded on underwriting profit. That is not inconsistent with using appraised values as a whole.

On the question of excess capital, the opener made the point that he felt that discounts to net asset value can be difficult to explain. I found the reverse when I was a stockbroker; it was easier to explain it that way round. The investment community understands that investment trusts sell at a discount, and, therefore, why should not there be a discount to the net asset value of an insurance company? I would not underestimate the power of explaining the discount aspect outside the actuarial community.

The opener referred to the risk return on assets. You can diversify some of these away. Modern portfolio theory provides some explanation of these different rates of return and different discounts, bringing us back to an overall broad discount to the net asset value, assuming that we have efficient markets. He referred, as did Mr Coutts, to the lack of detail in some of the assets in some of the stochastic approaches. If you are going to do a full stochastic analysis, the asset modelling is an important part of it.

Mr H. Clarke's method was a good way of looking at the risk discount rates and returns on capital. One of the issues we were trying to cover in the paper was to relate that back and say, essentially, that you get the same answer. His method is a good way of explaining it to third parties.

Mr Craighead disagreed with us when he said that break-up can be less than appraised values because of the costs of running off business. The cost of running off a discontinued business can be high, as I am aware. There are many cases where it is better for companies to come out of the business. The classic example is if you have a tight motor tariff that forbids you to increase premium rates, as you had in Ireland in the early eighties; stopping writing the business there could well be better. The other case could be that a company has gone into a line of business, finds that it has inadequate market share and expense ratios are far too high. Then it will be better to cease writing the business than continue to lose money. You need to make full allowance for claims-handling expenses, remembering that, if you are running-off business, there is scope for selection against you.

Mr Mehta made an interesting point about modern portfolio theory, and the pricing of parameter uncertainty. This is an important area in which I would be interested to see further research and further papers. Professor Benjamin also made one about standardising capital requirements and the role of the actuary in non-life insurance. Mr Kamieniecki made the reverse point, saying that we could not always do it because we did not have a strong enough role in the insurance market. I agree with that. It is important that we should have more say in these broader areas. However, even if we could have a statutory role and we could impose capital requirements on companies, do we do it on the probability of ruin? If we do, the shareholder might be more concerned about the variance in return just in this year because he has different risk profiles. It is extremely difficult to say what a minimum capital requirement would be.

The important point about the need for a level playing field and comparing with that was made. I could not agree more. The Cook Report, produced under the influence of the E.C., has an impact on the relationship between banking and insurance generally. We shall be hearing more about that, and some of Professor Benjamin's ideas will be discussed further.

Mr Davies made the point that we should use the term goodwill, and he emphasised that some of the numbers are subjective. Certainly that is true. It is one of the reasons why we made the point that you should use the methodology and the changes in it rather than using it as an absolute number. One of the reasons for not using the term goodwill, is that it is not quite as easy to define as we would have liked. Mr Hooker referred to this.

Mr Whewell raised the question: should we discount cash flow rather than distributed profits? If the company is indifferent as to whether capital is left in the company or not, and it does not affect the risk profile, then you can just as easily discount cash flow as you can discount anything else. If the capital remains in the company and you cannot get it out, that represents a cost that has to be allowed for, which leads to an extra discount. The same applies to the point made by Mr Abbott: that discounting claims reserves can increase the value of the company. You need to take into account that extra capital in a company alters the risk profiles. That may go as an offset in the other direction. Discounted cash flow at least gives a first approximation to the answer.

Mr Tomlinson said that a stochastic approach should be used. The example he gave can only be solved in indeterministic terms and bearing the risk discount rate. This is an approach that we would advocate in a full stochastic model.

Mr T. Clarke made the interesting point that appraised values can be used to justify what, at first sight, seem to be unusual values in some of the Continental takeovers. This illustrates an important point of the paper: that the appraised value methodology gives considerable insight into the behaviour of insurance company managements. It also provides a framework with which insurance company managements can analyse the impact of some of their decisions.

WRITTEN CONTRIBUTION

The authors subsequently wrote: The prime purpose of the paper was to present the actuarial profession with a framework or methodology for estimating appraised values. We knew that many actuarial practitioners were involved in similar calculations, and at least part of our 'hidden agenda' for presenting the paper was to hope that the framework would be accepted and that discussion in the future would be centred more upon the parameter choice and uses of the framework. We feel the discussion very much reflected the acceptance of the framework and we are very pleased with this.

Nevertheless, there were dissenting voices. We regard this as healthy for the profession, since a framework used today, even if supported by the majority of the profession, may not be one valid for tomorrow. Indeed, in the paper we suggested that consideration be given to a stochastic framework and that certain of the more difficult valuation problems, including under-capitalisation, require this approach. We were pleased with the support for the stochastic viewpoint by several of the speakers.

Mr Hooker suggested that to value a company in three parts is artificial and does not give enough emphasis to inter-relationships. A framework based upon projection of a company as a whole and discounting aggregate earnings may, therefore, be more appropriate. In the authors' experience, whilst the inter-relationships between the elements of value cannot be over-emphasised, much is gained by a separate analysis and explicit consideration of the inter-relationships. Indeed, it is essential when considering the differing capital requirements of different strategies. The separation of value into separate components for each class of business also allows the framework to be applied to the assessment of on-going profitability for individual classes of business, as well as considering a valuation of a company at a particular point in time. It is also essential to a proper understanding of the inter-relationships, as simple projections tend to mask these.

In the discussion, two particular issues were extensively considered, namely, whether to discount cash flow or earnings and also the problem of allocation of capital.

Mr Plymen emphasised the importance of capital and the need to obtain an adequate return. There is, however, a fundamental difference in approach in that he assumes that insurance companies need to be self-financed, i.e. generate future capital requirements from future profits. This is incorrect. Economics only requires that adequate returns be made on additional capital. The methodology in the paper clearly handles both cases, whereas Mr Plymen's only covers the case where all companies are self-financing. This is manifestly not true, not only with general insurance companies, but also with a whole range of financial institutions. In this context 'reserves' essentially refers to the capital needed to support the insurance business. Mr H. Clarke suggested a specific approach to the two cases. This fits in with the framework suggested in the paper, where capital is allocated to the insurance business, perhaps as a percentage of premium. Such allocated capital is discounted at the risk discount rates appropriate for the insurance operations. The cost of capital is then the value of

the difference between the risk rate and the investment return. By allocating capital in proportion to premium, the cost of capital becomes very dependant on premium growth rate and the risk discount rates used. We believe this approach is most useful in considering on-going profitability for individual classes of business. We have used the technique ourselves. However, we believe more work is needed in understanding the role of capital in general insurance and in particular the role of risk diversification. To some extent this may underlie Mr Abbott's question and the second part of the contribution by Mr H. Clarke and also the points made by Mr Tomlinson. We believe that part of the issue is that, when looking at an individual class or segment of a company and valuing based upon expected values of future earnings, we are not emphasising that the downside risk is often much bigger than the upside risk. In effect, the risk profile is skewed. Risk diversification, through reinsurance, or writing a mix of business, or other methods, can reduce the skewness. The level of risk diversification currently undertaken by the company and also what may be possible in the future, therefore, becomes a critical issue in establishing relevant risk discount rates and the allocation of capital. The authors hope to revisit this issue in a further paper and encourage other authors also.

Given the above points, it was, perhaps, unfortunate that the examples given in the paper in Section 9 were not based upon an allocation of capital, and that no cost of capital was included in the calculations. As we mentioned in the paper, this was to keep the calculations simple.

Mr Whewell and others raised the question on whether we should be discounting earnings or cash flow. In looking at cash flow, we need to be clear whether we are looking at shareholder cash flow (i.e. dividends) or company cash flow. The former leads us to valuing the company as the discounted value of dividends, which is different from our suggestion in the paper of using accounted profit. Within the U.K. insurance market we very much favour the use of accounted profit, as we believe this reflects market valuations and their volatility more reasonably, but in certain countries and markets this may not be so. One particular circumstance where we have met this is where the shareholder is domiciled outside of a home country carrying severe restrictions on the transfer of profit outside of the country of the subsidiary. From the shareholder point of view, a present value of dividends carried at least equal weight to a present value of earnings. This is perhaps an extreme example of how values may change depending on perspective.

If a valuation is based upon cash flows of the company, then no allowance is being made for the deferral of accounted profit or loss. We believe the timing of the emergence of accounted profit is a critical factor in the determination of value and, therefore, we very much favour not using pure cash flows. Clearly, if the risk discount rate is equal to the investment rate, then the two values equate, but this presupposes no additional risk in the deferral of profit. This point was discussed in Section 3.7. In some work 'declarable profit' has more relevance than accounted profit when there are severe distortions, perhaps arising from the peculiarities of the taxation regimes in individual countries.

In summary, we strongly favour a valuation based on discounting accounted earnings, as described in the paper, and whilst allocation of capital in proportion to premium is often satisfactory for practical work, we believe further work is needed in this area.

Several contributors to the discussion mentioned doubt as to the use of appraised values in executive remuneration. These included the opener, Mr Hooker, Mr Reynolds and Mr T. Clarke. We agree that to use the change in appraised value directly has many practical difficulties, not least of which is establishing, on an objective basis, the parameters entering into the calculation. Nevertheless we believe that the framework does give a view as to how value is created within a company and when it might be recognised. We believe this is particularly important in, not only structuring remuneration packages in such a way that executives are rewarded for their contributions to increasing value, but also to the timing of such remuneration. In this context, the qualitative aspects of a remuneration package and, in particular, of deferred pay, can be linked to a value-creation framework. Clearly, much more work is required in this area, but we do believe that actuaries can play a useful role in advising and communicating with the professionals involved in remuneration work and senior executives of companies.

We were pleased with the discussion after the paper, both the kind words and the criticisms. We look forward in expectation of a development of some of the issues raised in further Institute and other papers.

Any extension of the bibliography is very welcome and the papers mentioned by Mr Hooker and Mr Plymen are certainly good references.