

# STRATEGIC FINANCIAL MANAGEMENT IN A GENERAL INSURANCE COMPANY

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## ABSTRACT

The paper considers the objectives of company modelling for management purposes by consideration of the criteria likely to be used by shareholders to judge company performance retrospectively. It then goes on to analyse current approaches to modelling and strategic management and suggests that current models do not make full use of current computer capability and, judged by the standards of strategic management theory, remain too internally orientated. A method is then proposed for developing a model for a large quoted company which would be capable of widespread use within the organisation. It is suggested the benefits of the model would include broadening the strategic management base and serving as a catalyst for more comprehensive and credible management information. In conclusion it is suggested the actuary should form only one part of an integrated strategic management team.

*“To make plans and project designs brings with it many good sensations; and whoever had the strength to be nothing but a forger of plans his whole life long would be a very happy man: but he would occasionally have to take a rest from this activity by carrying out a plan -and then comes the vexation and the sobering up”.*

F. Nietzsche

## 1. INTRODUCTION

The paper considers the objectives of company modelling for management purposes by consideration of the criteria likely to be used by shareholders to judge company performance retrospectively. It then goes on to analyse current approaches to modelling and strategic management and suggests that current models do not make full use of current computer capability and, judged by the standards of strategic management theory, remain too internally orientated. A method is then proposed for developing a model for a large quoted company which would be capable

of widespread use within the organisation. It is suggested the benefits of the model would include broadening the strategic management base and serving as a catalyst for more comprehensive and credible management information. In conclusion it is suggested the actuary should form only one part of an integrated strategic management team.

## 2. OBJECTIVES OF MODEL BUILDING

There are many potential reasons for modelling an insurance company as regulators, creditors, policyholders, employees, shareholders and others will all require knowledge of the prospects for a company.

While management will be aware of the needs of all the various parties, its main aim will be satisfying the shareholders of the company. To this end it may be helpful when considering management objectives to consider directly how shareholders are likely to gauge company performance retrospectively. Discussions with insurance analysts indicate that dividend growth and share price performance relative to competitors are the main criteria for assessing historic performance. Except in extreme circumstances risk adjustment is not made to historic returns due to the problems of defining an appropriate basis for adjusting returns. This is partly due to the difficulties in disentangling additional returns produced as a result of extra risk from those produced by superior management insight and similarly in disentangling the effect on risk of expected higher returns from the effects of superior insight or greater efficiency.

On this basis, performance relative to competitors is not only the main influence on the survival of a company in its market place but is also one of the main guidelines by which shareholders judge company performance, especially for large quoted companies. This has some common ground with policyholder's reasonable expectations in life assurance. If this is accepted then the setting of, for example, return on capital in absolute terms has limited use as a guide to satisfying shareholders, since views on acceptable returns are likely to change significantly as a result of market circumstances.

As a result, any model that attempts to address the major objectives of a company needs to take its competitive position into account. This will not only enable it to allow for the effect of competitor developments on the outlook for the company but will also address the objective of satisfying shareholders directly by allowing consideration of the particular criteria that the shareholder is likely to use. In addition,

profitability relative to competitors is likely to be a more realistic target for many managers, given the uncertainty of the future outlook. As indicated below, current modelling approaches do not fully address these points.

### 3. A REVIEW OF CURRENT APPROACHES

There have been a number of approaches to the overall assessment and modelling of companies and the main ones are analysed below:

#### 3.1. ADAPTED SOLVENCY APPROACHES

The main actuarial approaches to modelling of a General Insurance company are considered below with particular reference to the Daykin and Hey model (Daykin and Hey 1990) which covers many of the more advanced features of such models. The model is an extension of the results of the working party on solvency of the General Insurance Study Group. Various other approaches have been made by regulators and others (see for example Pentikainen et al 1989, Paulson 1988 and Ryan 1984).

Daykin and Hey's model provides a thorough consideration of the quantifiable factors that can affect a general insurance company. The model is based on cashflow modelling leading to the projection of future balance sheets and profit and loss accounts. It allows stochastic variation of parameters and makes some allowances for the relation between the company and the market. Illustrations of its use have tended to concentrate on the output of data in stochastic mode.

Daykin and Hey have designed the model as a tool for use by actuaries. As a result, it appears to require an actuary to gather all the relevant information from various experts, input the data and select the appropriate values for the large number of parameters required. In a deterministic mode the model relies largely on simple relationships to project the future position and hence the accuracy of the output relies almost exclusively on the reliability of the input parameters. The actuary can then check the sensitivity of the model to different parameter values by using (a large number of) simulations, varying the parameters and seeing the effect on the results.

The question arises as to what extent the Daykin and Hey model can itself bring about an improvement in the reliability of the input

data. This is important in a number of areas involved in determining strategy such as the outlook for premiums, the effect on market share of changing premium rates and the relationship between various insurance and investment variables through the action of economic growth and other factors. A management model might be expected to play an important part in addressing these questions. However, by allowing input of a wide range of parameters that determine the behaviour of the model, the Daykin and Hey approach has the tendency to define away these and other important questions that senior management have to answer.

If the model is being developed to obtain a better appreciation of the company's likely position in the future, then as this understanding increases some of the assumptions that go into the model may change. This suggests that an iterative approach to determining various parameter values is likely to be appropriate. However, if the area of expertise of the users of the model is narrow there is likely to be a loss of information as the data is interpreted by the model users into values for input parameters and a further loss as the output is interpreted back on each iteration. A model with a wider spread of users is likely to be more efficient (see section 4.4). An alternative is for the model not to answer these questions at all, but this raises the possible problem of having a number of less than comprehensive models each having different explicit or implicit assumptions.

The nature of the Daykin and Hey approach has also led to the use of a number of questionable assumptions particularly in the investment area. The yield curve used for calculating interest rates has a permanent and constant upward slope. The amount of capital gains tax crystallised in any one year is set according to simple rules with no account taken of possible sales of underperforming assets within a class or use of derivatives. Other assumptions may also be too simplistic as, for example, the feedback mechanism for regaining past losses within a class of insurance (see Pentikainen et al 1992). Whilst small adjustments to the model may allow more accurate representations, this would be at the expense of adding further complexity and might be taken as indicative of the problems of designing a realistic model for users with a narrow range of expertise.

Features connected with management of the assets are very limited. Investment returns are likely to have an equal or greater significance than the fluctuations in the claims process (Daykin et al 1984). On a theoretical level management of the overall asset and insurance portfolio

can be viewed in terms of the CAPM approach as taking advantage of inefficiencies between the asset and insurance markets caused by their segmentation and other factors. Techniques such as the use of derivatives may play a part in this process. Again, there is limited scope in the model for corporate executives to investigate alternative strategies for management of the assets given scenarios for the future.

There is a limited allowance for the effects of competition in the model via an effect between premium rates and market share in the 1990 model. A further refinement in this area is suggested in their 1992 paper, and an option has been introduced in the model which produces an analysis of company insolvencies restricted to situations where the market remains solvent. We would suggest this does not go far enough and that modelling like strategic management should have a major emphasis on the consideration of competitors (see section 3.5). Individual modelling of competitors has been suggested by others (see for example Pentikainen et al 1989).

The Daykin and Hey model illustrates a number of the problems associated with stochastic simulation. Some of the difficulties associated with future variation of the parameters have been reduced by way of premium and claim cycles input by the user. With suitable definitions for the premium and claim cycles the stochastic variables associated with the parameters can be made independent, simplifying the modelling. Nevertheless some commentators have criticised the use of the normal distribution for claims outgoings in the model.

Turning to the projection of asset values, here Daykin and Hey use the Wilkie model (1986). This is stated to be designed for long term simulations and contains a very limited number of parameters. As a result it is imprecise for short periods. Daykin and Hey, in using the Wilkie model, assume the long term to be periods in excess of 2 years. However, other variables are likely to have a predictable and meaningful impact on investment returns for much of the 10 year period that Daykin and Hey suggest forms the limits of use of their model. Though the Wilkie model is better for long periods, other aspects of the overall model will then be less reliable. In addition, the Wilkie model will not produce consistent investment and insurance scenarios. Although some allowance is made for the common effect of inflation, a fully consistent model is likely to require the common effect of economic growth and possibly other factors on the assets, premiums and claims to be taken into account.

An alternative for the assets may be to use some form of base

case or cycle (as is the case for the premiums and claims) and limit stochastic variation to a fluctuation around that base case. In this way the asset projections become a mixture of deterministic and stochastic effects. This may be preferable until such time that more coherent stochastic models become available. However it raises the problem of how to produce the coherent premium, claim and asset market base projections (see section 4.5).

Given even an acceptable treatment of the behaviour of assets and liabilities there remains other drawbacks to stochastic modelling. By giving the potential for all possible outcomes to occur through the use of Monte Carlo simulation there is a possible misinterpretation by laymen that everything has been fully allowed for. This may attach to models of this type a spurious proficiency. This is similar to the comment made by Geoghegan et al (1992). Clearly the model results are only as accurate as the assumptions underlying the model specifications and the accuracy of the parameter estimates. A further drawback is that it dramatically cuts down the number of people who can understand and use the model directly, with Daykin and Hey strongly recommending interpretation of the results of their model by an actuary. This gives rise to difficulties in fitting it in with a wider strategic management process.

Despite some drawbacks, the Daykin and Hey approach and other similar models, may be of use in smaller organisations. Here, such a model may represent a substantial improvement on less formal strategic planning processes or else as a useful reference point.

### 3.2. ASIR MODEL

The ASIR model, in its various stages of development, has been described by a number of authors (e.g. Galitz, 1982, Abbott 1982, Brown, 1984, Brown, 1990). It was originally built during the early 1980s under the sponsorship of the Geneva Association. It also included the ability to undertake stochastic simulations. It represented a considerable achievement in modelling for the insurance sector at the time it was developed. However, it was designed as a mainframe program and therefore suffered from all the inflexibilities associated with that, such as a lack of user friendliness and the inability of easy integration into existing management reporting systems.

There have been a couple of attempts during the late 1980s to transfer the model to a pc. However, these do not appear to have led to any widespread use of the model at all as far as we are aware. Thus

despite the potential that the ASIR model represented and the idea expressed that it would be easily adaptable to the needs of individual companies, this has not proved to be the case. Ratchiff (1986) argues in a similar manner when discussing the use of modelling for strategic planning and he says of the ASIR model's supposed adaptability: "This may be theoretically true but the many hours that have been expended in vain attempts to actually achieve such adaptation in practise bear out the points I am making". It has been suggested by those connected with the development of the original model that, given advances in computing it is likely to be easier to begin the modelling process from scratch than to adapt the existing programmes.

### 3.3. APPRAISAL VALUE APPROACH

Larner and Ryan (1990) give an example of a detailed analysis of the process of appraisal valuations for property-casualty insurance companies. The approach followed uses the accepted ideas and techniques of modern finance theory to determine the current value of a company as the net present value of the future earnings discounted at an appropriate risk discount rate.

It is possible, by making the increase in appraisal value the core objective of a company, to use this approach as a part of the overall strategic management of a company. In fact this has been suggested by writers on this subject such as Wenner and LeBer (1989) who have proposed that, despite some difficulties in implementation, executive's remuneration be linked to the increase in appraised value. The appraisal value approach also provides a consistent theoretical basis on which different lines of business and insurance operations can be assessed.

Appraised values of various types are being increasingly used by insurance analysts in conjunction with other methods as a basis for valuation of a company's shares and hence the appraised value approach is likely to become increasingly meaningful to shareholders in insurance companies. Nevertheless the values produced by this method are subject to substantial sensitivity to the value of the parameters used. It is often suggested that parameter estimation can be assisted by reference to market values of companies. However these themselves are subject to significant variation not always related to economic realities.

One aspect of the appraised value approach is that, if parameter estimation is correct, then the return produced by the company will be equal to the risk discount rate. Hence those companies that have

taken a lower risk should expect to produce lower returns. However the benefits of a lower risk may be lost on investors in the company. With little objective criteria for establishing risk discount rates, it may be difficult in practice to refute claims that the incremental returns were the result of superior management insight rather than increased risk. In fact it is likely that quality of management will be part of any investor's assessment of risk but will be difficult to include in any appraisal value approach. The existence of this problem is illustrated by those insurance analysts who adopt a dividend discount approach to valuing insurance company shares. General practice here is to discount expected future dividends at the same rate for all the major UK composites.

Furthermore shareholders' risks will depend on their own objectives. If, for example, the Beta of the company was considered the main determinant of the risk of an investment in the company, then this risk may have little direct connection with the risk discount rates developed in the appraisal value approach (see for example Fairley 1979). A similar argument is made by Salter and Weinhold (1979). We would not advocate ignoring risk when setting policy, but an alternative is for company management to focus directly on returns and consider risk in the context of desired returns not being achieved on an overall basis relative to competitors (see Section 2).

#### 3.4. INSURANCE ANALYSTS

To the extent that insurance analysts advise investors on the value of shares, in the short term at least their approach can be taken as the most objective method of assessing likely shareholder satisfaction.

Stockbrokers insurance analysts have been engaged in modelling of insurance companies for many years at increasing levels of sophistication. Their approach, as for other industries, has tended to focus more on profitability than balance sheet strength. Profitability has often paid limited reference to balance sheet projections and hence total return, although this has begun to change in recent years. Projections have tended to be for around two years and in part this reflects the difficulties in projecting for longer periods although a number of analysts do attempt this in some form. Most projections are based on extrapolations of recent trends adjusted as necessary for changes in the economic environment and other factors. The main discriminants between analysts' profit forecasts are the outlook for claims, the outlook for premium rates and premium volume growth.



The outlook for claims depends on a number of factors including economic growth, changing concepts of liability, legislation and trends in lawlessness. These effects can be unpredictable as, for example, the impact of the recession in the USA has tended to reduce claims whilst the opposite has been true in the UK. There can also be unforeseen factors that can have dramatic effects since, although for many years underlying growth in claims has remained closely linked to the rate of inflation, there was a dramatic growth in claims in 1991 due particularly to the recession, mortgage indemnities and subsidence. Underwriting results are often considered overall in a territory and by line, and exceptional changes to territorial underwriting margins are often modified. One factor put forward by analysts is that sharp changes to underwriting margins are often 'smoothed' by companies.

The analysts' estimates of future premium rates will, amongst other things, take account of capacity, claims experience and legislation, but again the effects are not always straightforward, depending on how companies view past experience, the structure of the market and the philosophy of market leaders.

Premium volume will in part reflect growth of the market, itself dependent on economic growth, among other things, and an extrapolation from recent company actions and statements allowing for possible capacity constraints and the actions of competitors.

Besides the underwriting results, the other main factor is the investment income from both shareholders funds and technical reserves. When projecting investment income the assumption is usually made that investment income on insurance premiums tends to move in line with premium income, and is invested in bonds with a 5 to 10 year maturity at most. One technique is to assume investment income grows at a constant percentage below premium growth, if interest rates and the mix of business do not change. Movements of capital between countries can however upset income forecasts.

A further source of profits for a composite insurer is the life business. This is much more predictable than non-life business and, as a result, life profits can normally be estimated to within 5% by assuming a linear extrapolation. No attempt is usually made to model tax and, as investors in general tend to focus on pre-tax figures, this is not too much of a problem. The model output is examined for reasonableness and inputs may be adjusted on the basis of the analyst's 'intuitive feel'. A feel for likely results is obtained from discussions with numerous companies. If, for example, most companies' results are bad in a territory

whilst one company is showing good results, this raises the possibility of under-reserving.

Two other techniques are often used by analysts. First, an adjusted net asset value equivalent to the current asset values plus the present value of the insurance cashflows. This is conceptually identical to the appraisal value discussed earlier. In this approach, various methods are used for calculating the value of future cashflows, for example using projected results, or using a 'standard' insurance cycle. Others ignore the value of future cashflows in this calculation, taking account of it elsewhere. Second, given the heavy focus of the stockmarket on dividends, the long term realisable dividend potential. This plus the equity yield enables a share price to be calculated.

Analysts advocate approximate methods but are usually too stretched to do much else. Whilst they suggest that they usually produce superior forecasts to those produced internally by insurance companies, they may be misunderstanding planning projections which are often targets rather than actual estimates. Given the large variations in estimates of future profitability of the UK insurance companies given by the leading city analysts, it is clear that the modelling process is not always robust.

### 3.5. STRATEGIC PLANNING IN GENERAL

Business strategy developed as a separate topic in the 1960's with the publication of a series of books on the subject mainly emanating from authors associated with the Harvard Business School. However by as late as the mid 1970's there had failed to be any widespread adoption of strategic planning by companies. This may be in part due to the difficulties of putting the theories into practice with some of the early works being subject to major theoretical amendments by the authors in later editions. But also there was a lack of any substantial empirical analysis of strategic approaches. The latter was addressed in part by the PIMS (Profit Impact of Market Strategy) programme started in 1972 which comprises detailed information from over 2,600 business units mainly in the United States, and the Federal Trade Commissions "Line of Business" programme in 1975 which allowed researchers to analyse the impact of market conditions on profitability. By the early 1980's the vast majority of the largest US corporations had separate units responsible for strategic planning.

Although analysis of the markets in which a company operates had always been a part of the strategic management process, this aspect

of strategic management gained a major impetus following the work of M.E. Porter, again of the Harvard Business School, in 1980. He proposed methods of analysing the industry in which a company operates and the company's position within it. In particular, competitive pressures were split into five sources (i) current competitors (ii) potential new entrants to the market (iii) product substitutes (iv) suppliers to the company including the supply of labour and (v) buyers. This method of analysis has formed a major part of subsequent strategic management approaches.

As the interest in strategic planning has increased so has the literature and number of consultants providing strategic management advice. Although there is little agreement among the specialists in this area, on the definition of strategy, for example, a number of tools have developed as a means of assisting or appraising the strategic management process. These include the strategy model, the product-market/portfolio model and the risk/return model. The strategy model typically consists of four parts. For example the identification of: (i) the limits of the business the company is in; (ii) the companies' strengths and weaknesses; (iii) the opportunities and threats in the marketplace; and (iv) synergies between the companies' current products and potential new products.

A number of variants exist of the product-market/portfolio model and these have been well publicised. The risk/return model is mainly applicable in considering acquisitions and sets criteria in terms of the benefits to a shareholders's return and overall risk level allowing for the potential for diversification of a shareholders' portfolio of investments.

Other topics in strategic management have included the appropriate organisational structure for different types of company and methods of implementing and monitoring strategy changes. Perhaps the most relevant to this paper is the development of the strategy function itself. McKinsey have suggested four stages of strategic management development. The stages being (i) company budgeting (ii) company forecasting (iii) analysis of the external market (iv) strategic management including a well defined strategic framework and widespread strategic thinking capability.

### 3.6. STRATEGIC MANAGEMENT IN GENERAL INSURANCE

A variety of strategic planning techniques have been used and various company approaches have been documented by the Geneva Association. Most of the documented approaches have been relatively unsophis-

ticated. There are some exceptions, for example AIG (Paul 1985) where the corporate planning approach largely followed conventional strategic management theory with particular focus on shareholder value. It was suggested that a corporate financial model would be an appropriate support system. Also Allstate insurance (Gagnola 1990), which set up a Strategic Planning Division. This division has developed a highly complex model with some similarities to the ASIR model. Other aspects of the process follow conventional strategic management theory with a detailed analysis of the situation and activities of competitors. The modelling approach taken by Allstate has been criticised (Harrington 1982), however, on the basis of potential inaccuracy. Finally, Eagle Star (Ratcliff 1985) indicated use of conventional strategic management methods together with the use of modelling techniques allowing for the interaction between underwriting results and economic conditions. Strategy was developed against a central forecast based on market expectations against which the planners own views are set. However a wide range of 'scientifically devised scenarios' was also considered.

Turning to survey data, Aylor and Cummins (1985) indicated that 'only a handful of US insurers were taking account of external influences'. While a survey in 1987 (Ennew et al 1988) by the Nottingham Institute for Financial Studies indicated only that a few UK insurance companies took account of conventional strategic management techniques for analysis of the external environment. However the more recent Grosjean and Honore survey (1991) and an earlier Australian survey (Sharp 1982) indicated a high proportion using at least some external data.

When it comes to modelling, most surveys show a majority of companies make some use of modelling techniques, although Grosjean and Honore indicate a significant drop in the use of such techniques over the period 1982-91. This, they speculate, may be due to the difficulty in adapting models to the needs of companies. The Nottingham study of UK companies showed a low level of modelling of the insurance sector, confirming an earlier survey (Martin 1982) which indicated a relatively low use of modelling of overall activities. Aylor and Cummins indicated that models were only moderately important to the strategic planning process.

The General Insurance Study Group working party looking at corporate planning (Akhurst et al 1988) suggested conventional strategic management techniques with major emphasis on analysing the external environment. The difficulty of setting appropriate profit objectives is addressed and appraised values are suggested as a possible objective (see

Section 3.3). It is stated that 'any model would be imperfect because it cannot possibly incorporate all the dynamic influences of the future business environment' and that it is 'vital' that all relevant parties are involved in the planning process and that 'to ensure realism everyone needs to understand the issues involved'. The working party refer to the use of stochastic modelling and to the Daykin and Hey Model (3.1 above). However they do not address the problem of integrating this into the overall strategic management process, or the implications of strategic management theory on setting suitable profitability and solvency objectives.

#### 4. A PRACTICAL APPROACH TO A COMPREHENSIVE PROCESS

##### 4.1. DEVELOPMENTS IN COMPUTING CAPABILITY

Recent developments in corporate model building have been driven as much by the developments in computer hardware and software as by the intellectual basis of the analysis. The ability to run corporate models on portable computers gives rise to a range of possibilities with regard to their usage. It enables, in effect, sensitivity analysis on selected variables and projections of future scenarios to be transferred from the planning and other support functions to the senior executives themselves, should they so wish. Decisions on corporate policy can then be examined on an interactive basis after consistent base projections have been put in. The model becomes then the equivalent of a what-if corporate calculator for senior management.

We have found that the increasing power of computer hardware has enabled ever larger models to be constructed and manipulated within a reasonable processing time. More sophisticated users have tended to use decision support software that was originally available only on mainframe computers often via timesharing mechanisms. During the 1980s, the rise in the power of the hardware enabled much of the software to be available on smaller and smaller computers. At the same time, spreadsheets themselves have become more sophisticated and powerful. As a result, the most powerful spreadsheets are serious rivals to the previous mainframe-only decision support software, whilst the widespread use of spreadsheet-based software reduces problems of accessibility for programs developed in this format.

One advantage of the advanced spreadsheet based software is that their ease of use means that models can be rapidly built up and amend-

ed, making feasible a rapid evaluation through prototyping of the benefits and drawbacks of the various approaches and enhancements. As a result, the programs can be tailored more closely to the needs of the current environment.

The main limitations of spreadsheets include the potential difficulty of maintenance, and the inability to handle very complex data structures. These can be alleviated by utilising the mainframe in the task that it is best suited for, namely to store all corporate data in a database in an easily accessible format. The complexities of data storage are addressed in this way in the mainframe environment, whilst the ease and flexibility of the microcomputers are brought to bear by downloading appropriate and possibly changing data sets from the 'corporate' database into the financial models developed in the advanced spreadsheet environment.

#### 4.2. DATA ORIGINATION AND ORGANISATION

Given the objectives of company strategic financial management, the information that is available is usually not in the form that is necessary for use in strategic decision making. Accounting departments responsible for existing management information systems are often geared more to statutory accounting than the particular needs of the decision makers. As a result, there can be a tendency to produce copious information in a form that is not easily assimilated. There are also other dangers, such as obscuring economic risks and introducing accounting risks where no economic risks exist by for example, changing the treatment of certain items such as the value of the shareholders interest in life funds, or the treatment of off-balance sheet transactions.

Reorganising mainframe computer systems designed to report historical accounting information to produce financial analyses of the future outlook is likely to be not only a very costly exercise, but also, given the inflexibilities of large scale computer systems, unlikely to ever offer a fully satisfactory solution. However using today's microcomputers in the way outlined, financial models can rapidly be developed that incorporate all the available existing information, both historic as well as planning and market data, etc. Through the mechanism of linked spreadsheets, data can be incorporated from different sources and analysed in further spreadsheets which allow user input of estimates of future prospects. This enables a range of analyses to be undertaken that management are likely to require to look at the company's prospects.

These models can, in effect, be bolted onto existing information

systems through downloading data and hence are capable of analyses based on the latest available management information. The model can then be regarded as an extension of existing information systems. As a result, the development of a generally accepted modelling procedure is intimately tied in with the development of the management information systems and the associated information gathering, processing and dissemination procedures.

Presenting all the information available within a company in such a processed and easily understood form offers one of the most immediately useful outcomes of a modelling exercise. As a result, it becomes much easier to detect inconsistencies in the data provided by disparate departments, and thereby acts as a catalyst in developing coherent and consistent management information. The use of advanced spreadsheet software allows this to be done without developing a monolithic model that is out of date by the time it is completed.

#### 4.3. DEVELOPMENT STEPS

The development process of introducing credible strategic financial modelling requires an acceptance of the benefits of such modelling. This may be achieved by a combination of developing powerful yet straightforward models, together with an equally important education process that seeks to develop an understanding of the capabilities and also the limitations of the approach amongst the widest possible spread of senior management who contribute to the strategic and planning processes. This requires an approach that seeks to gain acceptance of the data and the methodology. This will be facilitated by building up from existing information with a simple model that has immediate benefits, and from there introducing more sophistication. It is also likely to be advantageous to use existing data definitions and formats as far as possible to expedite understanding and acceptance. Specialist programmers can be used to add the finishing touches to produce very 'user friendly' models that then enable senior management to utilise the information and analyses in an interactive way. The widespread use of spreadsheet software assists the accessibility of such models.

Kischuk et al (1988) outline a similar approach and perhaps one of the most relevant points made is the statement that 'Technical skills are very important in corporate planning projections, but possibly the most important skills an actuary has or corporate actuaries have are interpersonal skills. You can live with less sophisticated projections if

the process harnesses the input of all of the people in the organisation. In fact, my view is that many companies would be better off with a simple electronic spreadsheet rather than a complex corporate model, combined with the process ... that really seeks input from all around the company'. Kischuk's point has even more validity today when current spreadsheet based software is powerful enough to enable an evolutionary development to be made from a simple spreadsheet to a complex corporate model within the same package.

Whilst many of the large UK insurance companies have complicated legal structures with a number of foreign subsidiaries, from the strategic point of view the first requirement is an understanding of the total risk exposures on both the investment and insurance sides. As a result, a model can initially neglect the legal distinctions between subsidiaries and examine the consolidated exposures by risk type.

The projection is likely to consist of the following elements: Firstly the latest published information. From this will be projected as far as possible movements and developments on both the investment and insurance side to give the best estimate of the current position. Some of the movements may be estimated by use of stock market indices for particular assets, for example. This will produce estimated current balance sheets by currency and other financial statements. From these, projections can then be made of future financial statements on the basis of consistent estimates (see Section 4.5). Investments and insurance activities will be separated by currency and type. Separate spreadsheets enable switches to be made between the assets and premium growth to be changed in different lines of business. Other spreadsheets allow adjustments to be made to the economic and insurance scenarios as desired by the user.

Thus the projected balance sheet at the end of any quarter starts from the balance sheet at the end of the preceding quarter. To this is added the retained earnings adjusted for changes in insurance provisions into a generalised asset category, with the changes in insurance provisions being derived from premium growth by use of input claims run-off patterns. Switches between asset classes and changes in borrowings and hedges are added to this. The balance sheet is then revalued according to market movements. This then provides a framework for other analyses such as, for example, adding in a spreadsheet containing details of different derivative hedges. This forms a natural extension since the profit profile will be driven by the same economic scenarios driving the asset price movements. The profit/loss from the hedge can



then be added to the retained earnings as before to produce estimates of the effects of hedging.

This first model is likely to be a projection of accounting figures representing a view of how the corporate accounts would look like rather than a projection of true economic worth. The model at this stage should gain general acceptance and be used as a means of consolidating expertise and views from disparate areas within an organisation and presenting them to senior management in a way which enables the total effect on the corporate balance sheets to be investigated. Widespread use is likely to throw up deficiencies in the approach much sooner than a model with limited users and hence the model is likely to become more reliable and robust. Other developments that should proceed from here include the development of projections of economic value and the inclusion of competitors as outlined below. The structures can also be put in place for more credible input data on a consistent basis to be provided.

#### 4.4. IMPLEMENTATION IN A MULTI-USER ENVIRONMENT

The basic philosophy behind the approach that we would advocate, is that it should represent a framework in which the activities of a number of departments can be guided towards a common objective and contribute towards gaining a consensus approach.

Given the complexities in any assessment of the future outlook, an 'analytical' model builders solution is unlikely to be appropriate. A model that is to be used for strategic management is best developed as a tool that can be used by management to determine the effects on the company of the future as they see it, rather than a model that sets out to reach an optimal solution to strategic decision-making on the basis of the knowledge and research of the model builders. The alternative approach of developing a completely self-contained model independent of the corporate environment will, in practice, merely give rise to an unverified and generally inconsistent analysis for which it would be difficult to gain credibility.

Widespread use of the model has a number of other benefits. It takes strategic management to some extent away from central staff to those more in touch with current practice and developments in the marketplace. As a result, it acts as a method of broadening the strategic management base, emphasising those most closely associated with the various markets.

The model also has the benefit of giving the providers of the data an appreciation of its use in analysis when it is incorporated in the model. It thereby stimulates development of more appropriate and accurate input data. In a similar way, it acts as a method of communicating between different areas the effects on their parameter inputs of the various underlying factors and thus aids in the development of consistent scenarios as described in the next section.

#### 4.5. SCENARIO CONSTRUCTION

The output of any analysis must be something that can add an essential or at least a useful insight into the decision making process. Given the complexities inherent in any assessment of the future outlook, it can be a daunting task to develop a real understanding of the crucial factors. Construction of scenario-based deterministic models and sensitivity analyses based on this type of model are likely to be essential because they provide a quantitative framework for the way the environment can change and the possible responses of the company.

A deterministic model requires development of self-consistent scenarios incorporating both business and economic projections so that users can see the nature of likely future corporate developments. In practise, the dispersion of expertise through a company can make the development of consistent scenarios difficult to achieve. One starting point is to use corporate planning projections as a base case for discussion by the relevant experts and business managers. Although these have a bias to optimism, they form a set of projections whose basis and purpose are widely understood and can be combined with economic scenarios as appropriate. Another source of expertise would be external analysts (e.g. stockbrokers) who in theory at least, produce consistent unbiased projections. Although external sources may be a useful starting point, it would be surprising if they could not be improved upon by the internal company expertise both for the user's own company but also competitors as well.

The production of consistent scenarios is likely to depend on discussions using the model. The impact of the various functions within a company on each other will be able to be illustrated using the model and the effect of common factors illustrated equally clearly. Reference to previous cycles is likely to form part of the derivation process and analyses of extreme and disaster scenarios are likely to be regarded as essential. In this way an understanding of the major factors affecting the

company will be greatly facilitated. It would be surprising if discussions of this type did not lead to some revision of the expected future developments of the company and a greater understanding of the freedoms and constraints of various contributors. This is particularly so when consideration of the user's company is set against the likely development of competitors which will also be required to be covered by the model.

Given possible scenarios, the model enables an assessment to be made of the most sensitive factors to the company's performance. Complex business strategies can be devised and analyzed which may, for example, include using derivatives to protect portfolios etc. Used interactively in this way the true nature of the outlook and the impact of the suggested corporate strategies can be quantified. Issues such as the optimum premium volume growth, the change to solvency levels if equity markets collapse or the sensitivity to changes in exchange rates can be clearly illustrated immediately to the individuals responsible for the strategy.

The alternative to producing internally generated consistent forecasts is to use a model that does this automatically. However, given the various idiosyncrasies of the markets and the wide range of factors that need to be incorporated, the development of an acceptable model is likely to be some time away if indeed, one can ever be produced.

#### 4.6. MAJOR ISSUES

##### *4.6.1 - Economic versus accounting balance sheets*

A major issue that quickly arises when modelling balance sheets of any company is on what basis they are produced. Management need to be aware of the accounting basis that is used for the statutory accounts, but this invariably has numerous and often major deviations from a representation of the current worth of the company. This gives rise to important issues particularly for multinational companies which need to define clearly the risks being carried by the company including currency exposures. A model of the type described should be consistent not only with the approach used by planning departments but also with the data and analysis used by the treasury area in determining and hedging the group's exposures. As a result, the balance sheet should ideally represent the economic worth of the group and have a reasonably faithful representation of the true risk exposures of the group. The economic based treatments of items such as shareholders interest in life funds,

discounted insurance provisions, market value of debt and off-balance sheet items will need to be determined under various scenarios. The question of what weight is to be attached to accounting representations of the company and the true economic value is likely to be decided at the highest level. Other representations of the output of the model are also likely to be of use (see section 4.8).

#### *4.6.2 - Modelling Competitors*

Relative performance against competitors is probably the most relevant consideration of performance for large quoted companies. Comparisons with market averages are unlikely to be sufficient as they do not show the spread of competitor positions. For a major company, forecasting for all major competitors is likely to form an essential part of any strategic plan. Such an approach has been suggested by Pentikainen et al (1992) and is an approach that would be indicated by strategic management theory (see Section 3.5). Modelling of competitors enables an assessment to be made of the major relative risks being taken by the company.

Undertaking a comprehensive analysis of all competitors internally would require an army of analysts and is unlikely to be cost effective. However, there are a large number of external analysts with probably greater information on competitors than any individual company would be able to obtain by itself. As a result, insurance analysts are likely to be a major source of information on competitors.

Modelling competitors is one of the most daunting areas for model builders and rapidly brings into focus the question of what it is worth modelling explicitly and what is best left to more qualitative assessment. Complex modelling of competitors seems inappropriate given the quality of information available (even to full time insurance analysts) and the use of qualitative information, such as the characteristics of company management and the implications drawn from company statements and actions. Simplified balance sheets and profit and loss projections for competitors can be included in the spreadsheet structure very easily and routines developed that allow the effect on all companies of different scenarios to be indicated in graphical form. The characteristics and outlook of individual companies can also be easily projected in the way previously described. While modelling competitors is likely to give rise to less accurate output from the model, it will increase substantially its role as a strategic tool.

#### 4.6.3 - Accuracy

The approach that we have adopted in this paper is to produce a model whose mechanism can be easily understood by a wide range of users. As such, we have eschewed complex modelling techniques for producing projections in favour of a range of scenarios produced on a consensus basis.

Simple models can usually be criticised on the basis of inaccuracy in that more detailed modelling, by for example incorporating modelled projections of the underwriting cycle, may give rise to more accurate output. Often however, complex modelling and the additional assumptions it requires can obscure the limitations of the approach and lead to a greater chance of misinterpretation and misapplication. In the longer term, this can lead to frustration with the modelling approach adopted and subsequent loss of credibility with the model. This is perhaps illustrated by the performance of economic forecasting models. Hence it is possible that greater complexity may lead to lower credibility rather than the higher credibility it attempts to achieve. In addition, it may reduce the quality of the input data as the providers may have less understanding of the use of the data within the model. Determination of the optimum level of complexity is likely to be an iterative process.

#### 4.7. ADDITIONAL BENEFITS OF APPROACH

In addition to the benefits of improving management information, creating a broader base for strategic management and a greater understanding of the company's objectives already mentioned, there are a number of other benefits likely to arise from this approach.

Development of the model allows various areas to see more clearly their effect on the company as a whole and by interactive use, the effects of different approaches. This is likely to have benefits in clarifying the objectives of different areas in a way that corporate policy statements are unlikely to achieve.

One of the most important uses of the model is the ability to adopt an integrated approach to risk assessment. This aids the development of more useful definitions of risk, the idea being to replace such notions as the risk asset ratios and crude solvency measures by more useful concepts. The management of the risk can also be examined on a more comprehensive basis and various strategies can be examined

incorporating, for example the use of derivative instruments such as put options on equity indices to protect equity portfolios against large falls.

The improvement of management information extends to the production of information in a dynamic form rather than a series of static analyses. Users will also be guided towards considering longer time horizons in their analyses. The results such as key ratios and sensitivities can be shown in both tabular and in graphical form enabling a rapid understanding of the implications for the company. This focuses attention on the key risks and objectives of the company rather than just those that can be easily quantified, especially towards the area of competitor developments.

Finally, another useful role that a model can play is in a comparison of planning forecasts with the results estimated by external analysts. This would shed a useful light on the reasonableness of both.

#### 4.8. LIMITATIONS

Modelling of the company and its competitors under the forces of the external environment will allow a greater understanding of the prospects of the company and the critical factors that will lead to its successful future development. It is important that such models cover the major factors that will have an effect on the company, but not so many factors such that the model becomes unwieldy and the assumptions underlying the model and hence the reliability of the model output is obscured.

In this way it is likely that models will always be a simplification of the external environment and hence will exclude factors, especially potential new factors that could have a material effect on the company's prospects. Limited access to, for example, competitors financial positions and limited understanding of the relationships between variables is also likely to limit the accuracy of a model, as will the range of qualitative data which will not easily fit into a quantitative framework. Hence any model is likely to form a method of bringing together all the available quantitative information in a coherent and consistent form rather than a true overall assessment of the future position of the company.

Analysis requiring the assessment of tax and maintenance of regulatory capital in appropriate locations would require the development of a much more complex set of calculations together with access to detailed corporate records enabling realised capital gains etc to be calculated.

It may be questionable whether such detailed models add any major insights to strategic financial decisions making. Nevertheless, it is possible that tax and regulatory requirements may in certain circumstances, constrain the actions of the company in ways not easily inferred from the main model.

#### 4.9. FURTHER DEVELOPMENTS

Areas for further development include the development of more coherent stochastic models. This could be done by using the approach of the Wilkie model but with the inclusion of more factors such as economic growth that affect the insurance and investment areas or alternatively methods derived from Arbitrage Pricing Theory (APT). APT envisages that asset price movements are a function of a number of independent factors. Historical analysis is used to determine the most appropriate set of factors to describe each asset type. A similar type of analysis could conceivably be used to attempt to describe the insurance environment. This would lead to multi-factor models describing both assets and liabilities. It would also be useful to develop methods of determining the error of such models due to misspecification and parameter misestimation so that their reliability can be gauged.

Other areas of development could include modelling the competitor environment using game theory concepts and developing better methods of describing the output from the models and its relationship with the input perhaps using risk-based capital concepts.

#### 5. CONCLUSIONS

Modern spreadsheet systems allow flexible modelling systems to be produced that can have a wide range of users. This allows the use of a comprehensive strategic management model by all the major areas that would provide input to the model. This is likely to lead to a more balanced, comprehensive and hence robust approach to strategic management. The model described by us, we suggest, should fulfil the task of both acting as a catalyst for improved management information, and a method of achieving the most advanced level of strategic management processing using the McKinsey criteria. With the approach proposed there is no requirement for the actuary to be the sole model user and a wider range of expertise using the model is likely to lead to better understanding of the process and hence better strategies.

We hope to provide some simple examples of the use of the approach at the conference.

We must emphasise that the approach set out in this paper is entirely that of the authors and does not necessarily represent the approach followed by their employing company.

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