

*B.A.J.* 7, IV, 519-603 (2001)

## FINANCIAL CONDITION ASSESSMENT

BY J. P. RYAN, P. R. ARCHER-LOCK, A. J. CZERNUSZEWICZ,  
N. R. GILLOTT, P. H. HINTON, D. IBESON, S. A. MALDE,  
D. PAUL AND N. SHAH

[Presented to the Institute of Actuaries, 26 March 2001]

### ABSTRACT

This paper explores an approach to assessing the adequacy of capital resources for non-life insurance companies. It examines the range of risks faced by these companies and the factors that influence the analysis of their impact on an organisation's financial condition. The paper considers how the actuarial profession may contribute to this process, with particular reference to the regulatory regime envisaged in the United Kingdom.

### KEYWORDS

General Insurance; Non-Life; Financial Condition; Actuary; Capital; Solvency; Risk Assessment; Turnbull; Risk Management; Dynamic Financial Analysis (DFA); Financial Services Authority (FSA)

### CONTACT ADDRESS

J. P. Ryan, M.A., F.I.A., Tillinghast-Towers Perrin, Albion House, 55 New Oxford Street, London WC1A 1BS, U.K. Tel: +44(0)20-8895-2446; Fax: +44(0)20-7574-2222; E-mail: ryanjo@towers.com

## 1. INTRODUCTION

### 1.1 *Background*

1.1.1 The General Insurance Board set up a Working Party to explore the possible roles that general insurance actuaries might play in providing opinions on the financial condition of non-life insurance companies. The Working Party considered the new approaches to financial analysis incorporating risk. They put risk in the context of the developments of financial reporting for companies as a whole. This framework was then used to consider financial reporting within non-life insurance companies in a way consistent with that being introduced for other companies.

1.1.2 Share prospectuses have, for a number of years, required disclosure of major risk factors. Recently the Turnbull Committee provided guidance on how to implement the Cadbury Committee's recommendations

regarding internal controls. Companies have to report on the effectiveness of their internal controls. This is required to be included in the annual accounts, though no specific provision is required in the accounts unless there is a liability. Nor is there a requirement for formal internal reporting. However, the requirement means that the information should be available to assess the adequacy of capital resources to meet these risks and assess the impact on the value of the organisation. Turnbull applies to quoted United Kingdom insurance companies as well as to other U.K. quoted companies.

1.1.3 At an early stage, the Working Party discussed with the Financial Services Authority (FSA), the regulatory body for U.K. financial institutions, its proposed approach to prudential supervision. This is outlined in Section A.3. The Working Party is of the opinion that the indicated approach is sensible. As part of this paper, the Working Party has evaluated how the actuarial profession may participate in the regime envisaged by the FSA.

1.1.4 The risk metrics for the two regimes are also different. Turnbull is concerned with shareholder risk, and the FSA with policyholder risk. Turnbull applies to all companies, and not just insurance companies, as do the approaches outlined in this paper to the assessment of financial condition. The FSA approach only applies to insurance entities, and so some of the risks and part of this paper are insurance company specific. The FSA goes further than Turnbull in requiring companies to demonstrate (at least internally) that there is sufficient capital available to meet the risks. On the other hand, just to meet the FSA requirements would not require as detailed an evaluation or discussion of all risks as Turnbull, provided that the capital resources were clearly sufficient.

1.1.5 This paper discusses the various roles and tasks required to undertake a financial condition assessment (FCA). It also identifies the various skills and approaches that would be needed by actuaries and others to fulfil them adequately. Essentially, these are the same for both Turnbull and the FSA.

1.1.6 The Working Party also considered other approaches undertaken in other parts of the world, including that of the European Union Commission.

1.1.7 To supplement its analyses, the Working Party has analysed potential causes of failure of non-life insurance operations and the extent to which various professions might contribute to evaluating and ameliorating these problems.

1.1.8 Section 1 describes the current position on financial condition reporting and the roles that might develop. Section 2 provides an overview of the overall process. Section 3 considers the risks that a non-life company faces. Section 4 deals with the assessment of the individual risks. Section 5 covers the process for amalgamating all the different risks to form an assessment of the company as a whole. Section 6 deals with professional issues, and our conclusions are shown in Section 7. The example in Appendix E shows how

financial condition reporting might be carried out in practice. The other appendices contain much of the technical detail.

### 1.2 *Assessment of the Financial Condition of an Organisation*

1.2.1 Traditionally, assessing the financial condition of an organisation required a totalling up of all the assets and the liabilities that the organisation faced. Much of this work required point estimates for both the asset values and the required provisions for the liabilities.

1.2.2 Detailed work was not done on variability, and was essentially just a snapshot. Modern day best practice requires risk to be included in the formal reporting on the financial condition of an organisation. This is, therefore, a more forward looking and dynamic approach. The traditional approach of drawing up accounts and balance sheets and then auditing them is now regarded as insufficient. Variability of cash flows must also be considered.

1.2.3 The assessment of risk is an evolving field. Much work has been carried out in the field of commercial organisations. In general, this is only beginning to be applied comprehensively in the non-life insurance field. The approach to the assessment of risk is similar both in industrial organisations and in insurance organisations, though the detail is different.

### 1.3 *Two Distinct Roles; Three Types of Investigation*

1.3.1 To produce a financial condition report, three distinct types of investigation are required. The first involves the comprehensive identification of all relevant risks. The second covers the assessment of individual risk profiles for all the various risks that the organisation faces. The third combines all the individual risk profiles to produce one overall risk profile for the organisation as a whole. The first and third tasks interact closely. There is a clear need to identify comprehensively the risks that the organisation is facing, but (at least for assessment of financial condition) only to the extent that they affect the overall risk profile of the organisation. Thus, in considering the various roles, we have found it helpful to consider relating the first and third tasks. We define this combined role as the risk co-ordination role.

1.3.2 As well as covering the areas of premiums, claims and assets, the individual risks include many other risks which an organisation runs, such as fraud, inadequate IT systems and management failure. A number of different professions are likely to be involved in assessing these different individual risk profiles. For example, actuaries are likely to have a major input into the risks of claim reserving, premium rating and assets; however, they are, perhaps, less likely to be involved in such areas as fraud and inadequate IT systems. It is believed that a number of professionals will need to be involved if all the individual risk profiles are to be adequately considered.

1.3.3 It is necessary to ensure that a comprehensive risk identification process is carried out, including the consideration of low frequency/high severity risks. Once the individual risk profiles have been defined, it will be necessary to combine them into one risk profile for the organisation. This combination of individual risk profiles needs to allow for the various inter-relationships of the individual risk profiles. For example, risks that are uncorrelated will need less capital in total than the sum of the capital required for each individual risk.

1.3.4 It is suggested that actuaries have an important role to play in both the assessment of the individual risk profiles and in the risk co-ordination role. Actuaries have already established their credentials in the assessment of a number of the individual risk profiles, e.g. in claim reserving. They may also be able to play a significant role in other risk profiles. For example, in the case of fraud a specialist accountant may have more knowledge in assessing, in general terms, the extent of the risk, but an actuary may be the best person to translate a qualitative assessment into a quantitative one. Actuaries are used to evaluating variable cash flows, whereas accountants are much more used to dealing with point estimates. When combining the individual risk profiles, many actuaries are likely to be able to play a pivotal role. The actuary's training in such techniques as asset liability management (ALM) or dynamic financial analysis (DFA), statistical analysis (including correlations and dependencies) and more general financial understanding of the insurance process equip the actuary well for this role.

1.3.5 The Working Party believes that, while actuaries are well placed to play a major role in the financial condition reporting process, other professional skills are required to evaluate certain risks, e.g. fraud, and thus there is no suggestion that the whole process is purely an actuarial one. There is a requirement for input from many different professionals.

## 2. THE RISK ASSESSMENT PROCESS

### 2.1 *The Overall Process*

2.1.1 There needs to be a comprehensive approach to risk within the organisation to ensure that there are adequate resources to meet its obligations. It has a direct input into the financial condition of an insurance company, but the work also has value beyond that. In particular, a well managed financial institution would wish to co-ordinate this process, not only to ensure that sufficient capital is available, but that capital is being used efficiently and that the organisation is creating value for shareholders and/or other stakeholders. Another important aspect is that it should also reduce the cost of risk, i.e. the cost to the entity of all costs incurred to deal with risk, including expected loss costs, disruption to business, insurance

premiums, risk managers' salaries and other items. Thus, the approach should be a comprehensive one if the maximum value of the exercise is to be obtained for the organisation.

2.1.2 Simply to meet FSA requirements, a less comprehensive approach would be acceptable, provided that it could be demonstrated that there was more than enough capital to meet all reasonably foreseeable risks. In this case, it might be appropriate to take some short cuts with the process outlined below, provided that it can be demonstrated that the resources available to meet the relevant risks are at least sufficient. The remainder of this section will deal with the more detailed approach to assessing financial condition, but this is not meant to imply that short cuts are not appropriate in some circumstances.

2.1.3 The methodology is essentially the traditional risk management approach of identification, control, financing and administration. This is illustrated in Figure 2.1.

2.1.4 The 'control' process can be subdivided further into an analytical and evaluation stage and a treatment or mitigation stage. The analysis and evaluation process may require detailed investigations and subsequent quantification. The mitigation process will have an impact on the overall risk profile. Provided that the mitigation process is in place, it is the modified risk profile that is relevant to an assessment of financial condition.

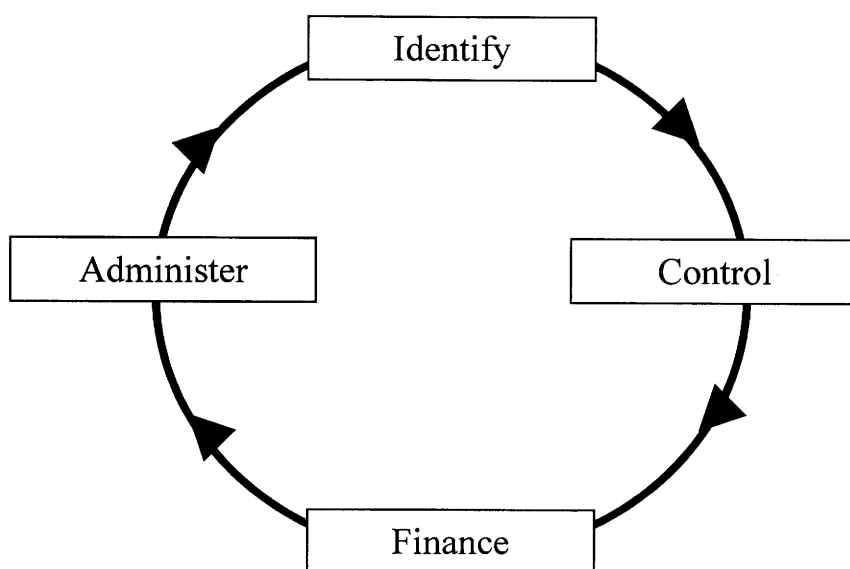


Figure 2.1. The traditional risk management approach

2.1.5 The basic process of assessment will include the following steps, although the order will depend on the individual circumstances of each company:

*Identification*

- decide what risks the company faces;
- decide on the risk measures to be used to assess financial condition;
- decide which risks are important; and
- decide on reasonable adverse scenarios/distributions of variables to be considered.

*Control*

- model the effect of risks on the financial condition;
- analyse key risks further; and
- investigate how risks can be mitigated and implement as appropriate.

*Finance*

- investigate dependencies between risks;
- combine the results to produce an overall risk profile of the company; and
- compare with the resources available to the company.

*Administration*

- risk appetite;
- board approval; and
- record methodology and report results.

2.1.6 Example of FCA methodology

2.1.6.1 Figures 2.2 and 2.3 illustrate very simply how a FCA might work. It is based on a DFA approach, and uses the probability of going insolvent as its risk measure.

2.1.6.2 The insurance company evaluates the various risks as in Figure 2.2.

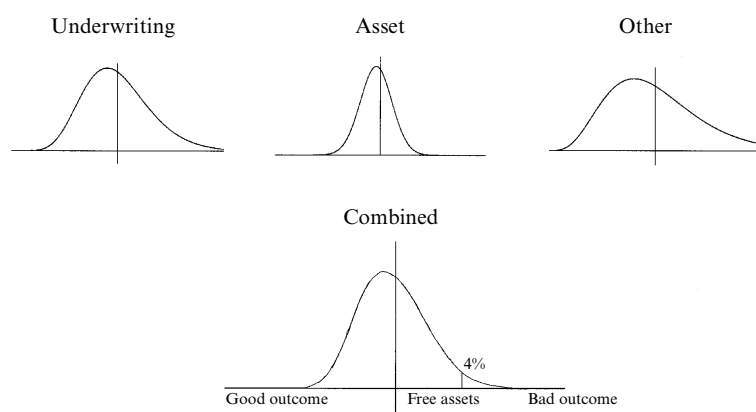


Figure 2.2. The various risks evaluated by the insurance company

2.1.6.3 The company believes that the 4% risk of becoming insolvent is too high, and decides to buy reinsurance to reduce its underwriting risk and to take a number of measures to reduce its operational risks. This action reduces the various risks to an acceptable level as in Figure 2.3.

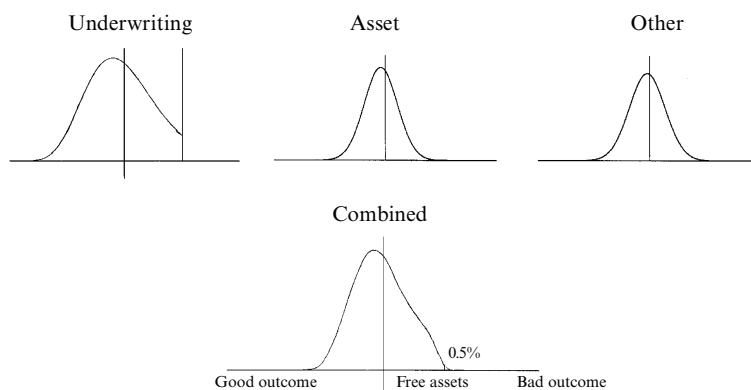


Figure 2.3. The action taken by the insurance company to reduce the various risks to an acceptable level

## 2.2 *Identification*

2.2.1 The basic structure of the figure shown in Appendix B ('Tree of Risks') sets out the risks that an insurer faces irrespective of the classes of business written (life, non-life, short tail, long tail). The exact description and importance of each risk and the inter-relationship between risks depends heavily on the individual circumstances of each insurer.

2.2.2 The directors of the company will need to decide on the risk measure(s) that they wish to use to assess the financial condition. Appendix D describes some possible risk measures that might be used, and discusses the pros and cons of each. The risk measures selected may influence the form of analysis that is required. They can also significantly alter the ranking of risk and change decisions. This is an area where actuaries are becoming increasingly involved, and is fundamentally changing risk analysis.

2.2.3 In addition to the choice of risk measure, a company will have to decide on its risk appetite and on any constraints that it wishes to apply, in addition, to the risk measure.

2.2.4 A clear understanding of the business undertaken by an insurer and the organisational structure is a key prerequisite to assessing the significance of each risk and how the outcome of that risk translates into a financial impact on the balance sheet (capital position at any one point in time) and cash flow (liquidity) requirements. The main effort in the analysis can then be directed to those key risks.

## 2.3 *Control*

2.3.1 This is an important and rapidly evolving area in the risk management field. Mitigation techniques are becoming increasingly sophisticated and wide ranging. Successfully applied, they can reduce the expected costs and/or reduce the likelihood of loss. They can, therefore, materially impact the profile of any given risk. This must, therefore, be considered in the assessment of an individual risk. Furthermore, a risk giving rise to serious exposures to the organisation is a priority candidate for applying control techniques.

2.3.2 Some mitigation techniques may simply be a means of putting a plan in place in case the adverse event happens, rather than changing the original risk. This is the approach behind much disaster recovery planning. However, it can also apply to financial risk, e.g. a stock market fall of 25% may require selling the entire equity portfolio. If the risk profile is to be adjusted for financial condition assessment purposes, it must be understood that this is contingent on the policy being carried out should the adverse scenario arise.

## 2.4 *Financing*

Financing techniques are becoming more sophisticated. A simple approach, such as insuring, is easy to evaluate, provided that the cover is



adequate. Otherwise, it will be necessary to verify that there are enough financial resources available to meet the financial consequences of risk. The aggregation of risk analysis (e.g. using some of the techniques outlined in Appendix D) can materially reduce risk financing costs. In general, provided that it is adequate, the form of financing only impacts on FCA to the extent that it affects the cost-of-risk.

### 2.5 Administration of the Process

It is important that the administration be carried out effectively, as ineffective administration will increase risk. Managing the group's appetite for risk is also important. It is also important to manage the relationship of the corporate centre and the operating units. Failure to choose the correct risk measure can also materially complicate this process. This is an area where actuaries are becoming much more involved and are devoting much research effort. Sections 4.4 and 5.4 describe some of the reporting issues and effective documentation of decisions.

## 3. INDIVIDUAL RISKS FACED BY AN INSURANCE COMPANY

### 3.1 Description of Risks faced by Companies

3.1.1 There are many risks that a company faces that need to be considered when making an assessment of the company's financial condition. These risks, and their relative importance, will depend on the particular circumstances of the company. For example, they will depend on the type of company, business and the territories of operation.

3.1.2 The risks are not restricted to those that directly relate to the financial elements of the company. They include operational and other non-financial risks. The schematic in Appendix B gives a framework that is useful when deciding upon the list of risks that a company faces. The upper levels of the schematic are generic to most businesses, and are likely to be familiar to all members of the company's board, including non-executive members who may not have an insurance company background. An alternative framework, which groups the risks by insurance company operation, is also presented in Appendix B.

3.1.3 There is much literature in the risk management field dealing with risk frameworks. It is an evolving field, and it is important that the practitioner keeps up to date.

3.1.4 This same generic framework can be applied to insurance companies and, in particular, non-life insurance companies. Traditionally, this formal type of risk assessment has not been undertaken by the insurance industry for itself, as opposed to analysing the risks of others. Nevertheless, it is possible to use an identical framework to look at insurance operations. However, most insurance practitioners are more familiar with insurance

terms. Therefore, we have set up a separate tree outlining the detailed risks that a non-life insurance operation might experience. We believe that this will be helpful for most practitioners in the insurance industry. However, multi-industry groups incorporating an insurance company will be able to apply the appropriate mappings to the industrial risk.

### 3.2 *Risks Susceptible to Actuarial Techniques*

3.2.1 Appendix B gives a non-exhaustive list of risks.

3.2.2 For each risk shown in the table in Appendix B, 'Risks faced by insurance companies', we have given an indication of the degree to which we think that the risk is susceptible to actuarial analysis. We have classified the risks as:

- ✓✓ where actuarial techniques can be used to assess the risk;
- ✓ where actuarial techniques may be of assistance in assessing part of the risk; and
- X where actuarial techniques are not likely to contribute to the assessment of risk.

3.2.3 We have based this classification on the skills and techniques that are taught as part of the current actuarial training for the Institute and the Faculty of Actuaries. Individual actuaries would need to judge whether they have the particular skills and experience required to make the assessment of any specific risk. There are likely to be cases where individual actuaries have skills and experience that are relevant to assessing some of the risks that we have classified as not being generally susceptible to actuarial techniques.

3.2.4 From the table in Appendix B, it can be seen that there are many areas that can be addressed using actuarial skills. However, there are also many risks where the Working Party thinks that the current training does not prepare actuaries to make an assessment. This highlights the expectation that multi-disciplinary teams are likely to be required to assess the financial condition of insurance companies. One issue that this raises for the actuarial profession is whether to expand our training or to carry out research into some of the areas where, currently, we are not in a position to make a full assessment.

### 3.3 *Relative Importance of each Risk Type*

3.3.1 Financial condition reporting will enable organisations to understand better the risks that they are undertaking, thus enabling them to take appropriate action to reduce such risks. This will reduce the risk of the company becoming insolvent. In order to understand better the principal risks which an organisation faces, it is instructive to consider why companies have failed in the past. A. M. Best (1999) analysed 683 insolvencies in the United States of America between 1969 and 1998. The reasons for the company failures are summarised in Table 3.1.

Table 3.1. Reasons for company failures in the U.S.A. between 1969 and 1998

Underwriting risks	Insufficient reserves/premiums	22%	42%
	Too rapid growth	14%	
	Catastrophe losses	<u>6%</u>	
Asset risks	Overvalued assets	6%	9%
	Failure of ceded reinsurance	<u>3%</u>	
Other risks	Subsidiaries	4%	49%
	Significant change of core business	4%	
	Fraud	7%	
	Miscellaneous	7%	
	Non-identifiable	<u>27%</u>	
Total			100%

3.3.2 It is important to recognise that Table 3.1 does not fully capture the interaction of the causes of loss. For example, if there are catastrophe losses, failure of ceded reinsurance is likely to be an issue. Consequently, any one source of risk may have a greater impact on the number of failures.

3.3.3 This work, which is based on historical failures in the U.S.A., may not be fully appropriate to future failures in the U.K. In particular, the insurance markets are different in the two countries, and the reasons for failure may change over time. Nevertheless, the analysis is likely to provide, at least, some insight into possible future U.K. failures. Similarly, an analysis for non-insurance companies would be helpful.

### 3.4 Contribution of Different Professionals

3.4.1 Our evaluation of the extent to which different professionals could contribute to the risk assessment of the various causes of insolvency in Table 3.1 is:

Profession	Contribution
Actuary	40%
Accountant	20%
Other	20%
Nobody	20%

3.4.2 Further details of the derivation of the percentages is shown in Appendix C. It appears that actuaries can make a significant contribution to the assessment of the individual risks of non-life insurers. Indeed, actuaries may have the biggest part to play in what will undoubtedly be a multi-disciplinary process. Actuaries are less likely to have such a significant role in industrial companies, though many of the techniques used in insurance company analysis would be helpful.

3.4.3 While this analysis is clearly very approximate, and based on data

which may not be directly applicable, it is, nevertheless, helpful in focusing attention on what are likely to be the key risks facing an insurance operation and on which professionals are best likely to be able to contribute to that risk assessment.

3.4.4 In addition to the assessment of individual risk, actuaries are well qualified to ascertain the overall risk profile of the company. This would be true especially of companies with many potentially severe risks.

#### 4. ASSESSMENT OF INDIVIDUAL RISK

##### 4.1 *The Process*

4.1.1 For each type of risk, the first step in assessing the risk is to consider its significance and the extent to which an assessment can be made. There will be a large number of risks, and it is important to be able to determine which ones are likely to have the greatest impact on the business.

4.1.2 Many of the risks that an organisation faces may require a specific provision in the accounts. These will often be based on estimates. However, a more detailed assessment of the risks may reduce the likelihood of those estimates proving inadequate, and thus act, not only as an assessment of the risk, but also as a mitigation of it. An example of this is the role that actuaries have been playing in non-life insurance claims reserving, and thus reducing the risk of claims reserves inadequacy and the corresponding financial consequences.

##### 4.2 *Factors to be taken into Account*

4.2.1 Some of the risks will translate directly into a financial effect (e.g. the impact of yield change on asset values), whereas other risks (e.g. the impact of price inflation on yields and claims inflation) may need other models in order to estimate the financial effect. For any organisation that is even moderately complex, it is essential that the interpretation of the various risks is consistent and that the risks are expressed in terms of external indices and measurable quantities relating to the business plan (for example price inflation, and impact on surplus position) to which the directors can relate.

4.2.2 A key part of the process is to understand the work (including the models in use) that is currently undertaken in the various areas of the organisation and the extent to which the more detailed analysis can be used to provide summary inputs into the process of analysing the capital and liquidity requirements of the whole entity.

4.2.3 In many countries actuaries have been involved in various activities that relate directly to the assessment of underwriting risk and, in particular, reserving analysis, rating analysis and reinsurance planning. In some instances these activities include an analysis of the impact on the financial position if

alternative scenarios materialise, instead of the selected scenario in respect of certain key aspects of the business. Some examples are:

- the impact on premium income and expenses, given a certain rate change and market position;
- the impact of catastrophes on the net position, given output from an exposure-based catastrophe model and current reinsurance programme;
- the impact of certain legislative changes; and
- the use of a reserving approach that incorporates a measure of variability (from the historical data).

4.2.4 In these particular areas, it may be relatively straightforward to derive plausible adverse scenarios or distribution assumptions and parameters for the individual items that are justified by detailed underlying models. In other instances, there will be a need to use market benchmarks, particularly because each company has limited historical information. It is interesting to note that some of the methodology and analysis conducted on U.S. market data, that was used to support the risk loading factors to be used for the National Association of Insurance Commissioners (NAIC) risk-based capital calculation (Feldblum, 1996), could be used in the absence of any other information for the selection of plausible adverse scenarios. It would then be a matter of assessing whether these outcomes can be explained by any particular risks.

4.2.5 Processes within many companies assess some or all of the individual risks, as noted above. These have, however, largely been set up to control and manage risk rather than for the explicit purpose of assessing overall capital requirements. Consequently, it is likely that the output will need to be adjusted in order to ensure consistency and avoid double counting, when scenarios involving adverse deviations of more than one item are to be considered. For example, if reserve ranges have been calculated using a statistical approach for business units in isolation (for the purpose of setting reserves), but not combined into a range for the company as a whole, then an adjustment may be needed to allow for any correlation. Also, the scenarios will need to be related to the economic scenarios with which particular outcomes are consistent, to check for any correlation with asset outcomes. Often it is not sufficient to consider correlations, tail dependency is often crucial in these types of analysis. This is also an area where actuaries are putting in much research effort.

4.2.6 In many instances, the definition of a plausible adverse scenario will be very soft, in that, even if there is a stated probability (for example, the Canadian Institute of Actuaries (1999) educational note mentions a 1% probability level for some of the risks) that the parameter risk and model risk associated with the underlying models is very high. In some circumstances, it may be more feasible to test for the level at which an individual risk causes a problem, and then assess the likelihood of such an event. An example here

would be that of a company that writes long-tail liability business; what rate of claims inflation on held reserves would cause a problem?

4.2.7 In some ways it is easier to assess asset risks than liability risks. Investments are generally liquid, and price histories are available at frequent time intervals, and so correlations between asset types, and the distribution of the asset risk, can be evaluated directly from the data, and used in the selection process of adverse scenarios. In addition, there are various economic series and asset models that have been proposed; these can be used as a basis for assessing risk arising from the investments and also the impact of economic series on the liabilities.

4.2.8 Methods used to assess the credit risk relating to reinsurance collectibles, akin to the rating agencies' default percentage rates for corporate bonds, may be applied (this type of methodology is included in the Australian proposals for assessing the risk loading (APRA, 2000)). Some additional work would be required in order to test the impact of significant catastrophe losses on the reinsurance companies, as occurred in the early nineties.

4.2.9 Some of the risks identified in the 'tree of risks' (in Appendix B) are clearly prospective in nature (e.g. the legal reform changes, the impact of tobacco related claims), and these types of risk would be incorporated into the process as events emerge. If the risks are judged to be material, it is likely that considerable effort may be required in setting up detailed models, in order to assess the financial impact of these prospective changes and events. This is an area where general insurance actuaries have expertise.

4.2.10 For other risks, for example some of the operational risks described in the 'tree of risks', it may be less clear how they would impact on the financial condition. Therefore, it may be necessary to decide how these risks translate into scenarios for the variables being modelled. It would be useful to keep a record of the risks considered and how each has been allowed for within the analysis. This is also an area where the actuary's experience in utilising information and data, in order to make financial assessments, is valuable. Consequently, existing modelling and quantification techniques can be used for these risks, even though the associated parameter and model error is likely to be high.

4.2.11 Individual risks can generally be assessed by using detailed models that may already exist within companies. However, an important aspect is the construction of plausible adverse scenarios that incorporate more than one risk, and also the impact of 'ripple effects', where one risk is heavily correlated with another (for example heavy catastrophe losses and reinsurance bad debt arising from a market failure). In order to accomplish this, modelling tools, such as business plans that allow for scenario modelling, and also more detailed dynamic financial models that incorporate explicit models for the various risks, would be required. This aspect is considered further in Section D.2.

#### 4.3 *The Actuary's Contribution to Individual Risk Assessment*

4.3.1 The actuary's contribution to the evaluation will depend on the type of risk. In assessing claims risks, reserve reviews conducted by the actuary would be a key input to the assessment. Appendix B provides a list of risks, and shows those for which the Working Party thinks that the assessment could be predominantly of an actuarial nature.

4.3.2 For some risks, for example in assessing the impact of rapid growth on the business, the actuary would require input from other experts, such as the marketing and underwriting functions. At the other extreme, say the assessment of risks posed by changing Government policy, there may be very limited actuarial input.

4.3.3 When assessing a particular risk, the actuary should consider the key factors influencing the risk, the likely trends in the factors and the range of plausible future outcomes. He, or she, should then apply appropriate methodology, and conduct high level reasonableness checks on detailed results.

#### 4.4 *Reporting of the Assessment of Individual Risks*

4.4.1 It is important that this process be documented. Areas outside the actuarial field are not covered in this report, but, where a professional is involved, the work would be subject to any relevant professional guidance. The company would have an obligation (under the FSA requirements) to document its own internal work.

4.4.2 Actuaries are likely to be heavily involved in assessing the reserving risk. This is widely documented in the actuarial literature. If a formal actuarial report is required, GN12 would apply. Other areas involving actuarial assessment of individual risks would also be covered by GN12, to the extent that a formal actuarial report is required. Such a report would need to make clear to the reader what investigations were carried out, and the reasons for the actuary drawing his or her conclusions. The report and/or the files would need to have the necessary documentation to supplement the conclusions. Writing everything up in immense detail may not be necessary for the purposes of fulfilling the FSA requirements, but we expect that the FSA would want to be able to verify from the report that the approach taken by the company was reasonable, and to be able to form its own view as to the appropriateness of the main parameters and model choices.

4.4.3 Where a company requires an actuarial assessment of risks that are significant to its overall financial position, documentation of the process is likely to require a formal actuarial report. GN12 would apply to such a report. It is not envisaged by the Working Party that any amendment would be required to GN12 arising out of these activities. For specific risks, there may be a need for working parties or advisory notes to promote relevant techniques and knowledge within the profession.

#### 4.5 *Skills Required to carry out the Assessment of Individual Risks*

4.5.1 Essentially, the skills required for this depend on the risk. It would be important that the actuary concerned is comfortable that he or she has the capabilities to undertake that role. Consultants are likely to have clearly specified assigned tasks as part of the overall process, and might reasonably be expected to have appropriate procedures in place to verify that they can meet professional obligations. An in-house actuary or actuarial department might be given a more roving assignment. This would require further understanding as to what was being covered and what was not. The department and/or the individual actuaries would also need to assess whether it (they) had sufficient skills and experience to carry out the work in the detail required to assess the overall capitalisation requirements of the company. For example, precise quantification of asbestos and pollution claims may not be required for a very strongly capitalised company. Therefore, it may, in many cases, be appropriate for the actuary concerned (whether consultant or in-house) to take a broad brush approach. If, however, the potential variations in the reserves were likely to be material, then the actuary would need to be comfortable that he or she had the relevant experience.

4.5.2 The actuary must have the necessary technical skills, whether they are knowledge of actuarial techniques, statistical methodology or DFA modelling. He, or she, should also have a high level knowledge of the workings of the non-life market, an understanding of the way in which the particular company operates, and how it is structured. He or she should have more detailed knowledge of the areas that are likely to be significant and capable of actuarial assessment. The actuary is also expected to be aware of the economic environment, IT systems, and the availability and appropriateness of management information, as the latter will determine what investigations can be carried out. The actuary should be able to ascertain who to ask for information.

## 5. RISK CO-ORDINATION

### 5.1 *Overview of the Risk Co-ordination Role*

5.1.1 The Working Party identified two separate roles: the individual risk assessment role and the risk co-ordination role. The latter role ensures that the risk identification process is complete, and also aggregates the results of the individual risk assessment process. Finally, it determines whether the company has enough resources to meet the risks that it faces. The individual risk assessment role covers the quantification and control of risks at the individual level. Combining the risks to determine the overall capital requirement is a complex task if it is carried out in a sophisticated way, rather than simply adding up the individual risks. In general, adding up



will overstate the capital required. To optimise the company's position requires more detailed approaches. These are outlined in Appendix D. This pulling together process interacts with the identification role, as risks that are not material or have been diversified can be effectively ignored.

5.1.2 The earlier part of this paper outlined the risks that an insurance company faces. It is important that this approach be systematic and exhaustive. Appendix B is a guide only, and is not designed to be a complete check list. Therefore, the process will need to ensure that all issues are covered. There are a number of papers and publications on the topic of identification of risk. These would be particularly applicable to unusual companies.

5.1.3 Many risks are better handled by control techniques rather than endeavouring to quantify and then holding capital against them. Examples would be succession and other 'people' issues. Reinsurance would be another example of transferring or controlling a risk. Other approaches would be to change a contract to transfer liability to other parties. While the scope for this in an insurer, whose purpose is to assume risk on behalf of others, is limited, the insurer can word (or at least try to word) contracts to restrict its liabilities to those it intends to assume. Effective control techniques can have a substantial impact on defining the capital required.

5.1.4 The board (and the FSA) is interested in whether risks should be mitigated, capitalised or financed in some other way, or transferred. Capital will need to be held, or, alternatively, the risk will need to be financed in some other way. To the extent that mitigation or control techniques or strategies are assumed to reduce or eliminate risk, in the financial condition report it is essential that this be documented, and that relevant parties understand the importance of these being implemented. For example, if the control technique to ameliorate the risk of a fall in the stock market is to sell equities, the board and the investment department must understand that they have no discretion but to sell, whatever the subsequent investment prospects, unless additional capital is found. The FSA would also need to be convinced on this point. It would be the responsibility of whoever was in charge of the risk co-ordination role to communicate this to the board.

## 5.2 *Aggregating the Results*

5.2.1 Very few risks are totally dependent on each other or totally independent. If they were all dependent, aggregation would be a simple matter of adding up all the separate capital requirements. If they were all independent, a commonly used approximation is: square the capital amounts for each risk; sum; and then take the square root (square root rule). In many circumstances, these two approaches provide upper and lower bounds to the aggregation process. For many organisations this may be sufficient; certainly if precision is not required. However, there are often correlations and dependencies between the risks. Consequently, more sophistication may be

required. Aggregation is discussed further in Appendix D. Appendix E provides an example of how this might be carried out in practice.

5.2.2 If all the risks facing the company can be turned into statistical distributions, it is appropriate to use a model to convolute and combine them all. This will then provide a measurement of the risk profile facing the company. Resource adequacy can then be dealt with by using the appropriate risk measures.

5.2.3 In practice, it is not possible to obtain precise statistical distributions for all the various risks. Even if it is possible to assign statistical distributions to each of the risks, there will usually be model or parameter risk. This arises from the difficulty in specifying precisely the various parameters and distributions. This is a feature that is well known to actuaries. It means that, inevitably, any model will tend to understate the overall variability of the risks facing the company, unless some adjustment is made for this. This topic is well treated in the actuarial literature.

5.2.4 In a number of cases, it is likely that precise statistical distributions will not be fitted to the risk. In Section 4.2 we discussed the use of adverse scenarios and realistic disaster scenarios as being an approach to quantifying the risk. If this is done and statistical distributions are used to assess some of the other risks, it is necessary to combine the two in order to form a judgement as to the overall capital assessment. On the assumption that it is decided not to fit a statistical distribution, as in ¶5.2.2, then the capital required to cover the risks analysed, using adverse scenarios, will need to be totalled and added to the capital required for the risks analysed using statistical modelling techniques. If the risks analysed using the two different approaches are independent of each other, it is possible simply to add the capital requirements from each of the two baskets of risk. However, it is quite likely that there will be some inter-relationships, and that, therefore, these have to be factored into the assessment. In particular, it is quite likely that there is some tail dependency between the two types of risk. For example, the risk of fraud has some degree of tail dependency with poor stock market conditions. Consequently, adverse outcomes analysed using statistical methods would need to be assessed against the adverse scenarios when trying to combine the overall results. For example, if the capital derived from a computer model indicates that £100m is required to meet the risk of a stock market fall, and £50m is required to meet the fraud risk in normal circumstances, it may be necessary for the company to provide more than £150m (£100m plus £50m), because the assessment of the fraud risk might need to be increased from the £50m level if there were to be an adverse stock market movement.

### 5.3 *Extent of Investigations Required*

5.3.1 The investigations must be sufficiently extensive to satisfy the board and the FSA that the company has sufficient financial resources to

protect against the significant risk that liabilities cannot be met when they fall due. These would include the impact of assumed risk mitigation techniques.

5.3.2 It is understood that the regulator regards the work required as being no more than necessary to manage the business properly and with due regard to the interest of policyholders. The shareholders would also be concerned about excessive or under-utilised resources.

5.3.3 The assessment of the financial condition will include a realistic (conservative) assessment of the current financial position of the company; that is a realistic (conservative) balance sheet, an assessment of the risks run by the company, and how the financial position might be affected by those risks.

5.3.4 Consideration should also be given to realistic adverse scenarios and combinations of scenarios.

5.3.5 For some risks, the assessment will be aimed at showing that there are financial resources to cover reasonable adverse scenarios. For other risks (such as operational risks), it may be that the aim is to show that there are appropriate procedures or plans in place to respond to adverse scenarios, should they arise, and that there are financial resources available to cover any resulting expenses, which would be incurred if the plans needed to be actioned.

5.3.6 The extent of the investigations, both at the individual risk level and at the aggregate level required, will depend on a number of factors, including those described below.

#### 5.3.7 *Solvency position of the company*

There is a trade off between the solvency margin of a company and the degree of investigation required to assess its financial condition. For example, a company with poor information on the risks that it faces would require more capital to satisfy itself and the regulator that it was sufficiently sound than a company which had made a detailed investigation of its risks, in order to be able to justify that it had adequate capital to meet reasonable adverse scenarios. Similarly, a company with a large solvency margin, in comparison to its peer companies, might need to do relatively little analysis in order to satisfy itself and the regulator that its financial condition was satisfactory for regulatory purposes.

#### 5.3.8 *Types of business written/type of company*

The risks faced by a company and their relative importance will depend on the type of company and classes of business written. Appendix E gives an example of how this might apply.

#### 5.3.9 *Company's market position*

The level of financial strength of a company expected by the FSA may

depend on the market position of that company. If the company has such a significant market share in classes of business, or plays such a major role in the underwriting process, that its failure would be of systemic importance, then the FSA may require it to demonstrate greater financial strength than for other companies.

#### 5.3.10 *Group structure*

If a company has financial guarantees from a parent, then the work required to assess its financial condition may be reduced. However, it may be necessary to assess whether the parent has adequate financial resources to support the subsidiary, and that the support is not discretionary. Where services are provided by the group companies, the viability of these companies needs to be assessed or alternative arrangements need to be available. Similar considerations are necessary where there are other dependencies, such as inter-group debts, or where business is obtained through group connections.

#### 5.3.11 *Ongoing management process*

The way in which a company runs its business will affect the extent to which separate independent investigations are needed to assess its financial condition. For example, the controls placed on pricing and underwriting of policies may already mirror the sorts of investigations that would be required to assess the impact of the associated risks on the company's financial condition. Therefore, it may only be necessary to show that the pricing and underwriting procedures are appropriate and have been properly followed. However, the people who make this assessment need some functional independence from the line managers or operators. Thus, external staff may not be required for this, provided that there are sufficient appropriately skilled internal staff, who are independent of those underwriting the risks. The appropriate degree of operational independence will be a matter for the directors, and this will be one item that the FSA will wish to discuss with them.

#### 5.3.12 *Frequency of investigations*

There is a continuous obligation on directors to maintain their company in a sound financial condition. Thus, the frequency of investigations will depend on the nature of the risks faced by the company and how these may change from time to time. Therefore, there is no formal reporting cycle that must be adhered to by every company. Rather, it is likely that different risks will be assessed at different frequencies, according to how the nature of those risks may change. If there are specific events that alter the risks or the financial condition of the company, these may trigger the need for specific investigations. At other times, the directors would commission whatever investigations they felt necessary, in order to be aware of the current condition of the company.

### 5.3.13 *Extent to which allowance is made for future business*

The time horizon for the investigations or planning needs to be sufficient, so that the company can recognise risks early enough to be able to mitigate or to overcome them. This would probably mean that the period covered should be at least 18 months. However, if the management plan covered a longer time horizon, then it would be helpful to consider that period. The analysis should also consider the management's attitude to riding the insurance cycle, taking account of the degree to which it would follow market rates or allow volumes of business to vary. The company's analysis must also cover the exposure of risks that have been contracted. Thus, if the company writes multi-year or long-tail policies, it will need to do sufficient analysis to demonstrate that it will be in a financially sound position during the exposure of those policies, and that, should it cease writing business, it would be able to meet its contractual obligations (which, in some cases, might include the option to commute the remaining exposures). The possible adverse scenarios taken into account during the time until all claims under such policies are settled may have regard to the interim management action which it is reasonable to assume would be taken to control the financial condition of the short-tail business.

### 5.3.14 *Changes in procedures*

If the analysis assumes any such change, then clear warnings of the effect of not making the change (or delaying the change) should be given.

## 5.4 *Reporting*

5.4.1 The results from the assessment will need to be communicated to the board, both orally and in writing. The following topics would need to be covered:

- what are the risks;
- how are these being handled;
- what are the resources to meet risk; and
- how is the group satisfied that it can meet these resources?

5.4.2 It is necessary that the documentation provides sufficient information and provides an audit trail for a third party to satisfy itself as to the validity of the results, whether that be the audit committee, the auditors or the FSA. Cross reference should be made to the key areas of individual risk assessment.

## 5.5 *Reduction of Risk*

The objective of such work is, not only to satisfy the regulatory authorities, but should also be to improve the management of the business. The actuary and/or risk co-ordinator should see that this important aspect is

adequately addressed. Items that it might be appropriate to draw to the attention of the company would be:

- areas of high concentration of risk;
- what mitigation actions could/would be taken; and
- disaster recovery programmes.

### *5.6 Skills Required to carry out the Co-ordination Role*

5.6.1 In this role, the aim is to produce an overall assessment of all financial risks facing the organisation, allowing for the inter-relationship between the various types of risks. This will have been preceded by a detailed assessment of individual risks by a multi-disciplinary team. There is also a need to document and communicate the outcome of the analysis.

5.6.2 Although technical knowledge is important, the key skill is to be able to extract, understand and co-ordinate the inputs of the various specialist functions. It is likely that different people may have considered the same risk, because, for example, it has been evaluated by function and also by category, or the same risk may apply to more than one function. In these cases the actuary can help by providing a consistent framework to assist comparability of the different views. Often, the reporting of the risk assessment needs to be done at different levels, and consistency between these is essential. For example, in a company with world-wide operations, the reporting in a given territory may be at a very detailed level, summarised to a slightly higher level for an operating region, and further summarised to produce the aggregated figures for the main board of the company.

5.6.3 The risk co-ordinator should understand how the different risks interact, and be able to apply appropriate statistical theory to allow for correlations between the risks and, more importantly, tail dependency. For many risks the assessment will rely heavily on qualitative information, which needs to be merged with quantitative information. It may be necessary to explain statistical concepts to some of the specialist functions. Input is likely to be required from some or all of the following professionals: underwriters, reinsurance specialists including catastrophe modellers, claims handlers, risk managers, planning specialists, actuaries, auditors, accountants, treasurers, legal and tax experts, and asset managers. It is important to obtain input from relevant experts, and to evaluate the significance of that input.

5.6.4 The input must be co-ordinated effectively, and there needs to be good and open sharing of this information. This requires strong project management skills and collaborative team working.

5.6.5 The results from the assessment will need to be communicated to the board, both orally and in writing. The reporting would need to cover, not only the sum of the individual risk assessments, but the impact of independent risks and those with tail dependency.

## 6. PROFESSIONAL ISSUES

6.1 *Professional Obligations*

6.1.1 The board has the legal obligation to manage the capital resources of an insurance company. It will use the services of executives and professionals, some of whom will be external advisers. It is important to understand where the various obligations lie and to whom various duties of care are required.

6.1.2 Essentially, the board of directors and some senior management, particularly those who have been given a specific executive responsibility for risk management and/or managing the financial condition of the company, would have duties of care to a number of third parties. These would include the shareholders and the policyholders. The impact of different decisions would affect each party differently. As regards policyholders, the board has the obligation to run the company in a prudential fashion, so it should satisfy itself that it has sufficient financial resources to make it believe that it is reasonably likely to meet obligations to policyholders. It would also have a duty to notify the FSA of any issues that might have a material impact on its financial condition in respect of the company's capabilities of meeting policyholder expectations.

6.1.3 In this context, it is, therefore, worthy of note that, should a piece of work (whether by an actuary or anybody else) indicate that the financial resources are quite likely to be inadequate, there would be an obligation on the board and relevant senior management to notify the FSA and take appropriate action. For general insurance, the FSA proposal has no 'whistle blowing' responsibility or obligation on the part of a reporting professional, whether an actuary or not, to notify any third party or take any other action. It would, of course, be incumbent on such a party to make clear to a board the import of any advice, especially if it might indicate significant financial problems.

6.1.4 The board would be at liberty to reject such advice. Clearly, it would have the right to obtain second opinions and/or decide what corrective action could be made. A board that ignored reports from such a professional, without sound reason (e.g. a formal second opinion from a reliable source that the previous report was excessively pessimistic, or a formal plan to deal with the issues raised), would have some very real problems, both from its legal obligations to policyholders and to the FSA, as well as the obligation to manage the insurance operation prudentially.

6.1.5 It is the right of a board to obtain a second opinion. If the second opinion were from an actuary and the first one was also from an actuary, it would often be normal for the second actuary to have a discussion with the first actuary as to any issues raised. However, it would not be incumbent on the actuary to do so, especially if, as would be likely, the board might request that the opinion be done totally independently. There would be no obligation on the actuary to reconcile his or her views with those of any other



professional (except as a member of the board or a responsible member of the management). It would, of course, be incumbent on the board and relevant management to ascertain that any relevant differences were reconciled if these had a material adverse impact on the financial condition of the company.

6.1.6 If there were to be a change of reporting actuary or advisor for reasons other than obtaining an independent opinion, it would be good practice to review previous reports, and possibly have any relevant discussions with other actuaries. As this is not a statutory appointment, there would be no professional obligation to do so, as there would be in the case of an Appointed Actuary in respect of a life company.

6.1.7 It is likely that the FSA would wish to have discussions with actuaries involved in the various stages of the process. One would not anticipate this normally creating any professional issues for the actuary, though he or she would be expected to get permission from his or her employer or client (which would normally be the insurance company) prior to agreeing to any such discussions. The insurance company may be within its rights to restrict such discussions, but this is likely to cause some major political issues with the FSA.

## 6.2 *Actuarial Manpower Resources*

6.2.1 No statutory role has been given to the actuarial profession as a result of the FSA proposals. Consequently, actuaries will only be involved where they are perceived to add value to the process. This means that both companies and the actuarial profession and the market will make the decisions as to the appropriate involvement of actuaries in this process. There is no need for the actuarial profession to develop resources to make the FSA proposal work, as others will develop this skill if actuaries do not. On the other hand, the Working Party is strongly of the view that actuarial involvement in the risk co-ordination process would be a valuable one, and that a significant number of actuaries would not only be capable, but would wish, to carry out such roles. The Working Party believes that the market will determine the requirement for the actuarial resource. Provided that the profession can demonstrate that it adds value in this area, the Working Party believes that many insurance companies will wish to utilise actuaries in these positions. Provided that the roles are attractive enough, sufficient actuaries will wish to develop the skills and experience to fulfil the roles identified. This may require some extra training needs for individual actuaries.

6.2.2 Elsewhere in this paper the Working Party has advocated the development of extra skills. These may also provide a guide to others. Obviously, the FSA will be concerned that the roles are carried out competently, and that specific actuarial input is obtained where it is necessary. A clear demonstration of its skills will be a major impetus in promoting the actuarial profession's activities in this area.



## 7. CONCLUSIONS

7.1 The Working Party believes that the risk co-ordination work is something that a well managed company should be doing anyway, although many are probably not co-ordinating it all in a formal way. A formal process for evaluating risks and satisfying itself that there are adequate financial resources in place is clearly good governance for any company. There is, currently, an obligation on a company to ensure that it has sufficient financial resources, but there is, as yet, no requirement to have a formalised process of reviewing and documenting it. The Working Party believes that the formalisation will encourage good practice in this area, and will facilitate the management process. Given that it is good practice for the company, we believe that the FSA approach is an excellent way to enhance its regulatory activities.

7.2 The Working Party believes that there are two roles that actuaries can play as part of this process. The first of these is the evaluation of the various risks which benefit from actuarial input. Many actuaries are already often substantially involved in their assessment, e.g. claims reserving and premium rating. The second role is in the risk co-ordination area, where we believe that actuarial input would be extremely valuable. In many cases, actuaries have the appropriate skills to carry out this work, though they need to rely on other professionals for certain activities.

7.3 We believe that the profession should make an effort to encourage the development of the additional skills for actuaries to undertake the risk co-ordination role. We believe that this would be valuable, not only for the profession in enhancing its capabilities and understanding of the general insurance business, but also that it would be helpful to the general insurance industry for the skills to be available in one profession. Actuarial advice should also be helpful to the industry in understanding what is required in this role, and ensuring that individual insurance companies have handled the process competently. Tail dependency is also an area where actuaries may be anticipated to play a significant role.

7.4 Finally, the Working Party believes that companies, particularly clearly solvent companies, can gain much additional value for their owners by utilising the approaches enumerated in this paper as part of their overall financial management.

The following lists, under the headings REFERENCES and WEBSITES, include, not only works referred to in the paper, but also details of other publications that may be of interest.

## REFERENCES

- BEST, A.M. (1999). *Insolvency: will historic trends return?* Special report.
- CANADIAN INSTITUTE OF ACTUARIES (1998). *Standard of practice*. Committee on Solvency Standards for Financial Institutions.
- CANADIAN INSTITUTE OF ACTUARIES (1999). *Dynamic capital adequacy testing, life and property casualty*. Committee on Solvency Standards for Financial Institutions.
- COUTTS, S.M. & THOMAS, T.R.H. (1997). Modelling the impact of reinsurance on financial strength. *B.A.J.* **3**, 583-653.
- FELDBLUM, S. (1996). NAIC property/casualty insurance company risk-based capital requirements. *P.C.A.S.* **LXXXIII**.
- GENERAL INSURANCE BOARD (1998). *Actuarial opinions for companies transacting general business*. Institute of Actuaries and Faculty of Actuaries.
- HINDLEY, D.J., ALLEN, M., CZERNUSZEWICZ, A.J., IBESON, D.C.B., MCCONNELL, W.D. & ROSS, J.R. (2000). The Lloyd's reinsurance to close process. *B.A.J.* **6**, 651-698.
- HOOKER, N.D., BULMER, J.R., COOPER, S.M., GREEN, P.A.G. & HINTON, P.H. (1996). Risk-based capital in general insurance. *B.A.J.* **2**, 265-323.
- RYAN, J.P. & LARNER, K.P.W. (1990). The valuation of general insurance companies. *J.I.A.* **117**, 597-669.
- SWISS RE (1995). *Development of insolvencies and the importance of security in the insurance industry*. Sigma No 7.
- SWISS RE (2000). *Solvency of non-life insurers: balancing security and profitability expectations*. Sigma No 1.

## WEBSITES

- Draft prudential standard on risk management for general insurers (00.32) — APRA 13/9/2000 [Internet site: [www.apra.gov.au/mediareleases](http://www.apra.gov.au/mediareleases)]
- Guidelines on actuarial advice on insurance liabilities(00.25) — APRA 15/8/2000 [Internet site: [www.apra.gov.au/mediareleases](http://www.apra.gov.au/mediareleases)]
- Prudential standard on capital adequacy for general insurers (00.24) — APRA 28/7/2000 [Internet site: [www.apra.gov.au/mediareleases](http://www.apra.gov.au/mediareleases)]
- Proposed reforms to the prudential supervision of general insurance companies in Australia — APRA April 2000 [Internet site: [www.apra.gov.au/mediareleases](http://www.apra.gov.au/mediareleases)]
- Dynamic capital adequacy testing — property and casualty*, Educational note, Committee on Solvency Standards for Financial Institutions, Canadian Institute of Actuaries, August 1997 [Internet site: [www.actuaries.ca](http://www.actuaries.ca)]

## APPENDIX A

## LEGAL FRAMEWORKS

A.1 *Current Legal Requirement for Risks to be considered*

A.1.1 Although corporate governance in the U.S.A. was first highlighted by the publication of the Treadway Report in 1987, action in the U.K. was first taken after the collapse of Polly Peck. 1991 saw the establishment of the Cadbury Committee on the 'Financial Aspects of Corporate Governance', but the BCCI and Maxwell scandals had occurred before Cadbury's report was published in late 1992. Cadbury recommended the 'Code of Best Practice', which was based upon the principles of openness, integrity and accountability, but placed emphasis upon internal control, as did the subsequent Rutteman Report.

A.1.2 In 1995 the Greenbury Committee published its report on good practice in determining directors' pay, but it was the Hampel Committee, established in November of that year, which was to bring together the previous reports as the 'Combined Code'. This had sponsorship from the Stock Exchange, the CBI and the Consultative Committee of Accountancy Bodies. Hampel was tasked:

- to review the Cadbury code to ensure that the original purpose was being achieved;
- to keep under review the role of directors;
- to review the Greenbury recommendations; and
- to address the roles of shareholders and auditors in corporate governance.

A.1.3 The 'Combined Code' was published in 1998, emphasising the structure and responsibilities of the board, relations with shareholders, directors' remuneration, and accountability and audit. *Inter alia*, the 'Combined Code' states that: "the board should maintain a sound system of internal control to safeguard shareholders' investments and the company's assets".

A.1.4 To assist the implementation of the 'Combined Code', the Institute of Chartered Accountants in England and Wales agreed with the London Stock Exchange that guidance in implementation would be provided, and the Turnbull Committee was established to undertake this work. Turnbull reported in September 1999. The effect of Turnbull was to emphasise that governance should go beyond financial internal control, and include operational and compliance controls and risk management; the focus was upon internal control processes that the directors should ensure are in place. Further, the reports and accounts of listed companies should now include statements in regard to the effectiveness of internal controls.

A.1.5 The effect upon the board collectively, and upon individual directors, is that responsibilities are clear and defence against non-compliance

is not easy. Consultation with government now continues, and it seems likely that the 'code of practice' approach will become the core of corporate governance, possibly enshrined in legislation.

A.1.6 There are currently no additional obligations on non-life insurance companies formally to evaluate risk, other than requirements to ensure that general insurance companies are run in a prudential fashion. The FSA consultation document will, therefore, take this process a stage further.

## A.2 *Evolving Insurance Regulation*

A.2.1 Quoted insurance companies in the U.K. currently comply under two distinct regimes. The first is the longer-standing insurance company supervision, previously administered by the DTI, and from 1999 by the FSA. It is prescribed by the Insurance Companies Act 1982, by regulations under the Act and by the gamut of associated prudential guidance notes, etc. The FSA will take full responsibility for supervision from N2 (expected to be July 2001 at the time of writing, but actually deferred until 30 November 2001). At N2, the Insurance Companies Act, regulations and guidance will be replaced by the Financial Services and Markets Act 2000, regulations under the Act and the FSA handbook. More significant changes to the prudential requirements for insurers are anticipated to come into force later (see Sections A.3 and A.4). The second is the requirement for good corporate governance, most recently set out in the 'Combined Code' and the Turnbull report.

A.2.2 Insurance company supervision is primarily concerned with protecting insurers' customers from their insurer not meeting its obligations to them. This is familiar to actuaries, and is mainly concerned with the adequacy of capital to meet future contingencies. Risk mitigation has tended to have a minor role.

A.2.3 Corporate governance is primarily concerned with protecting shareholders from a collapse in their holdings' value and to prevent other avoidable losses. This clearly cannot, by its nature, be addressed by additional capital, and is a generic issue for all types of company — not just insurance companies. In the case of insurance companies, the risks identified under 'corporate governance' include, as a subset, the same risks identified within insurance company supervision. In fact, in a consolidated group of companies, some of which are insurers, it will simply be that 'non-compliance with insurance supervision' is identified as one of several 'headline' risks.

A.2.4 Current insurance company supervision of general insurers does not impose massive additional requirements (insurers are, of course, fully exposed to all the normal rigours of accounting and audit). General insurers are required to submit FSA returns, and these demonstrate such matters as asset admissibility and solvency. Also, the directors have to certify compliance with various prudential guidance notes issued by the FSA (or previously by the DTI). For example, Prudential Guidance Note 1996/1 stipulates "Controls over general business claims provisions".

A.2.5 The current FSA requirements do not, however, require an overall assessment which might, for example, embrace methods of premium setting or an exploration of the suitability of assets to back liabilities. Taking again the example of PGN 1996/1, there is no requirement for an actuary or competent practitioner to certificate claims provision. Current FSA requirements require an insurer essentially to be able to pass a set of tests (at all times), and to demonstrate this once a year. They do not require the insurer to demonstrate that its management is taking all the necessary steps to pass tests one year hence. Informally, the FSA requires companies to meet higher standards than the minima laid down by law.

A.2.6 However, it is interesting to note that, with Turnbull fully in force from 20 December 2000, quoted insurers have to be fully compliant at the December 2000 or March 2001 year end. Therefore, they must have already addressed all major risks — of which FSA compliance must evidently be one, however it be categorised or classified. Presumably companies will have identified the ongoing risk of FSA non-compliance; as the historical ‘snapshot’ is not their main preoccupation. The logical extension of this is that they should already be embarking on a demonstration, for purposes of corporate governance, that proper controls exist for asset selection and premium setting (as two examples of many). Only then can the directors of the insurer be satisfied that FSA compliance will continue into the future — and hence they, the directors, can be satisfied that they are fully ‘Turnbull’ compliant.

### A.3 *FSA Proposals*

A.3.1 The first new requirement within the FSA proposals is that insurers should have adequate financial resources to protect policyholders against the risk that the insurer may not be able to meet claims. This is a positive obligation, rather than the current passive one not to trade while insolvent, and is clearly more rigorous than the existing ‘snapshot’ test of solvency (if the implications of Turnbull from ¶A.2.6 were to be disregarded). For example, the FSA proposals make it clear that an insurer’s directors must be satisfied that adequate controls are in place for such matters as premium setting and asset management. This FSA requirement differs from Turnbull, because it is directed at protecting policyholders rather than shareholders, and because different standards of prudence might apply. Theoretically, the FSA could be satisfied that an insurer could, after getting into trouble, meet its claims in ‘run-off’, whereas its shareholders would be very unhappy at such a prospect.

A.3.2 The second new requirement within the FSA proposals is that an insurer must have documented the process that it has used to ensure its financial adequacy. These plans must be regularly audited by operationally independent staff ‘with appropriate skills’. This is not a requirement for external audit — nor indeed to use an actuary in matters ‘actuarial’ — but,

clearly, it requires greater rigour than is required presently. It is to be hoped that this will make little practical difference to well-run companies, but it does seem that the FSA believes that some insurers' management does warrant these stipulations. The FSA's stated intent is to intervene increasingly where it becomes dissatisfied with the quality of the plans.

#### A.4 *FSA Consultative Document*

A.4.1 The FSA is currently preparing a consultation paper on proposed rules relating to the future prudential management of U.K. regulated insurance companies. The consultation paper may be published as early as April 2001, with a view to implementation by the end of 2002. We have seen an early pre-publication draft of the relevant part of the proposed rules, which represented thinking within the Insurance and Friendly Societies Division, but (at the date this paper was written) had not been approved by the FSA as a whole. The consultation will cover a range of issues relating to the insurance industry, but this summary only deals with the insurance risk module as it affects non-life insurance customers. The purpose of this module is to protect policyholders against the risk that the insurer may not have adequate financial resources to meet valid claims as they fall due. For life assurance companies, there are additional issues, such as the risk of not meeting policyholders' reasonable expectations, but these are outside the scope of this paper.

A.4.2 The basic requirement proposed is for companies to ensure that they have adequate resources to meet valid claims, not only if the outcome is as expected, but also if there are adverse developments. Companies will also need to document the process, so that they can demonstrate to the FSA, if asked, not only that their resources are adequate, but also that they did enough to satisfy themselves that this was the case.

A.4.3 The obligation will be on the company to identify the risks that it faces, and to ensure that there is an appropriate response. The response may be to hold adequate financial resources to cover the risk, or it may be to have procedures in place to mitigate the risk (together with the lower level of funding required to cover any costs of mitigation). For some risks the appropriate response may be to do nothing (e.g. destruction of London by asteroid impact).

A.4.4 Financial resources, in this context, include, not just capital, but also resources such as reinsurance and guarantees or contingent capital. However, no reliance should be put on non-contractual promises and vague assurances from a shareholder that it will make good any losses. In addition, counterparty risk needs to be assessed when considering the reliance that can be placed on reinsurance or guarantees, in the circumstances that give rise to the need for them.

A.4.5 Companies will need to be able to meet reasonable adverse scenarios and combinations thereof. The FSA has not expressed these in

terms of ruin probability, partly because this would lend an air of spurious precision to the exercise. While the cost of avoiding all chance of failure would be prohibitive, every insurance company failure reduces market confidence, so the frequency of failure needs to be low.

A.4.6 It should not be assumed that a company will be able to trade on profitably following a loss. It will need to be able to go into run-off with a reasonable prospect of paying claims in full.

A.4.7 Companies will not need to estimate the required amounts precisely. Very well capitalised companies can absorb most risks, and the corresponding amount of effort required to evaluate those risks would be less. Conversely, a less well capitalised company would need to demonstrate very much greater control over the risks that it takes, and evaluate them more precisely, in order to meet the FSA's requirements. There is, thus, a trade off between doing large amounts of work to identify and control risk and having the resources in place to cover more adverse consequences than might otherwise be necessary. This paper endorses that philosophy.

A.4.8 The FSA does not require a formal role for any professional, whether an actuary or otherwise, nor oblige any professional to produce a formal report on the company. Nevertheless, companies must demonstrate that they are in a position to meet the risks to which they are subject, and document this process. This is likely to oblige companies to commission formal reports from professionals in many circumstances.

A.4.9 The Working Party believes that the proposed FSA approach is eminently sensible, and is a step forward in the regulation of insurance within the U.K. It requires companies to understand and be aware of the risks that they face. The process must be formal and documented. We regard this understanding and awareness as crucial. There will be no systematic check of this aspect. However, the FSA has discretionary ability to check up on the process, principally by requiring to see the company's documentation. Failure to analyse and document in an effective way is likely to lead to further investigation by the FSA. Much of the success of this approach, therefore, will depend on how successfully the FSA can monitor and follow up.

A.4.10 It should be noted that similar proposals are not being applied to other E.U. insurers. This means that costs will be imposed on U.K. insurers which their European competitors will not have to meet. On the other hand, the Working Party feels strongly that this should not be just regarded as a regulatory burden. It is a process that will benefit all insurance companies. Well run insurance companies are likely to want to undergo a similar formal process as part of their corporate governance.

#### *A.5 International Position*

A.5.1 There are a number of countries (e.g. U.S.A., Italy, Canada, Norway, Finland) that require opinions on reserves by actuaries. However,



at the date of writing only Canada requires an actuary to conduct an investigation into the financial position and condition of property and casualty insurers.

A.5.2 Notwithstanding this requirement, Canadian property and casualty insurers are currently subject to a non-consolidated solvency test, referred to as the minimum asset test (MAT). The minimum asset test works by comparing assets available to assets required, where the assets required are broadly 110% of liabilities plus a margin. (In Canada the assets are shown at book value; assets available = market value of assets – non-admitted assets – investment valuation reserve). The margin is the higher of 15% of unpaid claims, 15% of written premiums and 22% of incurred claims, plus reserve for reinsurance ceded to unregistered insurers. This test is very similar in nature to that applied in the E.U. Canadian regulators have proposed to change the current requirements to a risk-based approach, that relates the capital requirements more closely to the degree of risk that a company assumes. The required minimum capital is derived by applying various factors to assets, policy liabilities and off-balance sheet exposures.

A.5.3 The U.S.A. and Japan have already introduced a risk-based framework for determining the minimum capital requirement, and the Australian Prudential Regulation Authority (APRA) is currently in the consultative stage of its proposals for introducing a risk-based system. We now consider the systems in place and the proposals in more detail.

#### A.6 *Canada*

A.6.1 The Canadian Institute of Actuaries (CIA) has produced a standard of practice, 'Dynamic Capital Adequacy Testing', that applies to the Appointed Actuary of an insurer (life and property & casualty), when preparing a report on the insurer's financial condition pursuant to law. The Superintendent of Financial Institutions has informed all federally registered property and casualty companies that he now requires the Appointed Actuary to file a dynamic capital adequacy testing (DCAT) report, in accordance with the CIA standards of practice. This clearly gives the Appointed Actuary a stronger role in the prudential supervision framework than that envisaged for actuaries by the FSA for supervision in the U.K.

A.6.2 The standard of practice (SOP) states that the actuary should make an annual investigation of the insurer's recent and current financial position and financial condition, as revealed by dynamic capital adequacy testing for various scenarios, and that the findings should be reported to the insurer's board of directors. The report should identify possible actions for dealing with any threats to a satisfactory financial condition revealed by the investigation. This requirement goes some way towards giving DCAT a central part in the risk management of the insurer, rather than being a purely regulatory burden. This aspect is totally aligned with the spirit of the FSA's proposals for the U.K.



A.6.3 The methodology set out in the SOP is that of forecasting the capital adequacy of the insurer over a forecast period, to demonstrate that:

- (a) on a realistic set of assumptions (the base scenario), the insurer passes the MAT; under normal circumstances this would be consistent with the insurer's business plan; and
- (b) under a plausible adverse scenario (at least three), the insurer has sufficient assets to meet its liabilities.

A.6.4 The SOP also provides guidance on the selection of adverse scenarios resulting from a non-exhaustive list of risk categories, and the need to allow for integrated scenarios (where more than one risk factor is varied) and the possible ripple effects of one assumption on another. It is interesting to note that an educational note produced by the CIA (1999) suggests a 1% probability level for selecting a plausible adverse scenario.

A.6.5 The actuary is required to provide a formal opinion on the satisfactory nature (or otherwise) of the financial condition of the insurer.

#### A.7 *Australia*

A.7.1 APRA has published proposals that describe a new supervisory regime. One of its objectives is to be more responsive to the risk profile of individual insurance companies and their business size, mix and complexity. The Draft Prudential Standard for Capital Adequacy describes a regime where there is a prescribed method for determining the minimum capital requirement (MCR) as the sum of capital charges for insurance risk, investment risk and concentration risk. However, insurers with sufficient resources are encouraged to develop in-house risk measurement models to calculate the MCR. Insurer's MCR may be determined using either:

- (a) an internal model developed by the company;
- (b) the prescribed method; or
- (c) a combination of (a) and (b), as appropriate to the mix of business of the company.

A.7.2 APRA's prior approval is required before method (a) can be used, and, as well as qualitative standards, APRA will specify a set of quantitative parameters, including a required probability of default and a modelling time horizon, over which the probability is to be measured. The current FSA proposals for the U.K. have identified that methodologies will differ between companies and evolve over time, and therefore the FSA will not be as prescriptive.

A.7.3 The draft also states that it is the responsibility of the board and management to ensure that the insurer's capital resources are appropriate to the scale, complexity and mix of its business. Accordingly, the insurer should have suitable systems in place to identify, measure and manage the risks

associated with its business activities, and to hold capital commensurate with its overall risk profile. This is very much in line with the stance that the FSA appears to be taking in the U.K.

A.7.4 The prescribed method applies factors to the various subdivisions of assets, outstanding claims and premium liability, in a similar fashion to the U.S. NAIC risk-based system, and a separate calculation for risk associated with an accumulation of exposure to a single event. The factor applied to reinsurance assets does attempt to take into account the reinsurers' security rating. This is in contrast to the NAIC, who felt that this would result in the NAIC becoming a rating agency for reinsurers. Also, there appears to be no explicit covariance adjustment for the three risk types.

A.7.5 APRA has also proposed that an approved valuation actuary would have the responsibility for ensuring compliance with the prudential standards for liability valuation and capital adequacy.

#### A.8 *U.S.A.*

U.S. actuaries have been involved in establishing the parameters that underlie the risk-based capital requirements, as set out by the NAIC. Although the system was established to derive a minimum capital requirement, the historical analysis of industry data provides useful benchmarks for establishing plausible scenarios. In addition, U.S. actuaries have also developed the *Dynamic Financial Analysis Handbook*, that sets out suggestions and guidance to actuaries performing dynamic financial analysis.

#### A.9 *E.U.*

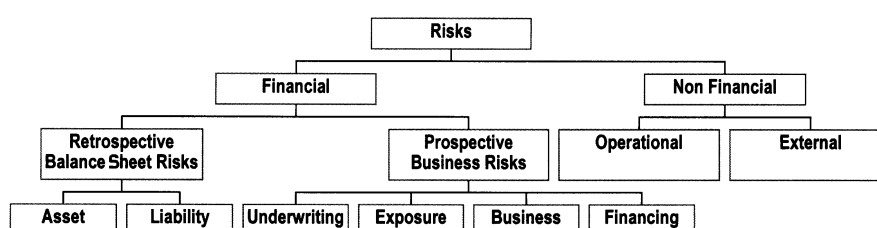
The E.U. Commission is currently initiating a review of the methods of determining solvency requirement for E.U. based companies.

## APPENDIX B

## RISKS FACED BY INSURANCE COMPANIES

B.1 *Analysis of Risk*

B.1.1 The structure for analysing risks of a commercial organisation is:



B.1.2 The banking industry has historically been ahead of the insurance industry in modelling risk, although its use of risk measures is less sophisticated than those that actuaries are developing for use in the insurance field. Less effort has also been put into analysing tail dependency. Risk in the banking field has traditionally been subdivided into four types:

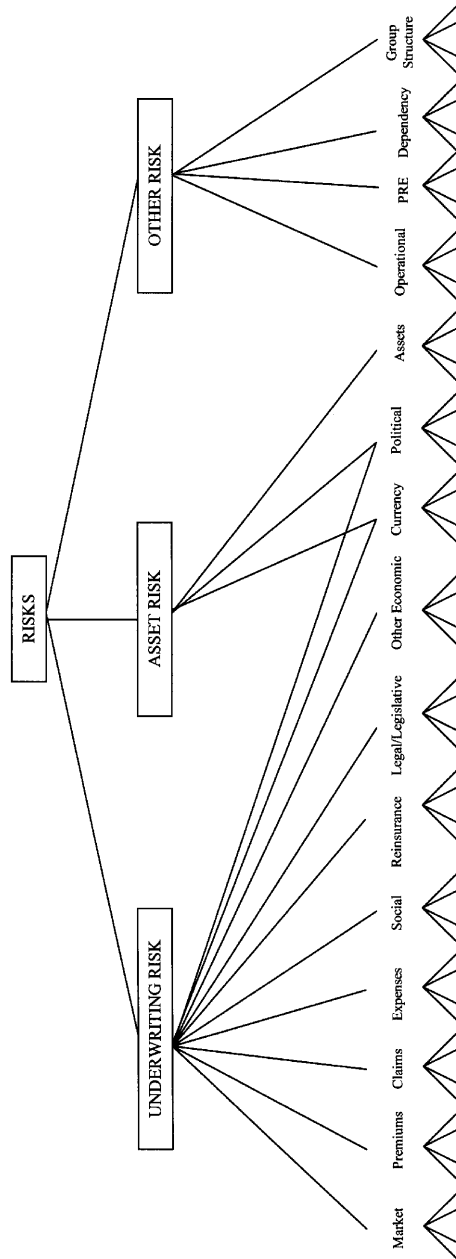
- market risk;
- credit risk;
- business risk; and
- event risk.

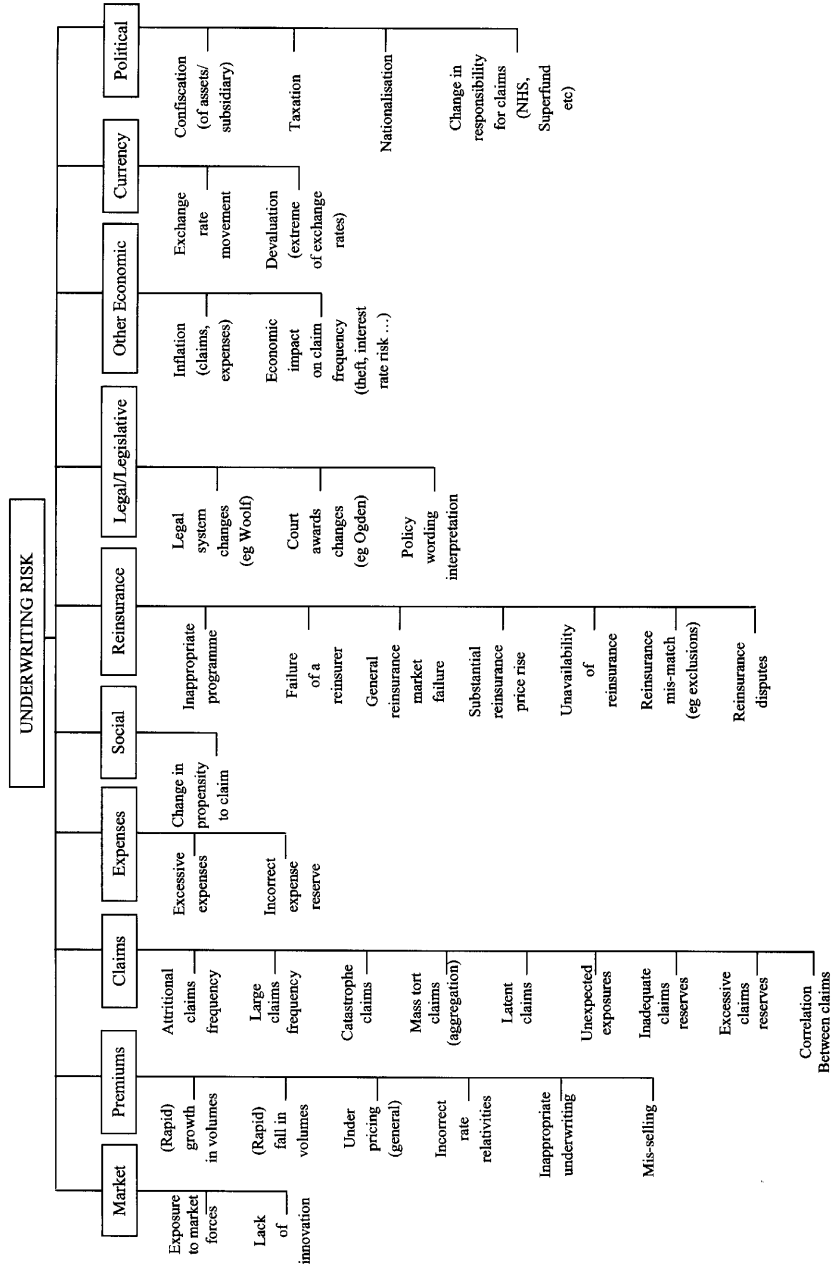
B.1.3 Each of the risks that an industrial and an insurance company face can be grouped into these areas. This then becomes a common framework towards analysing risk.

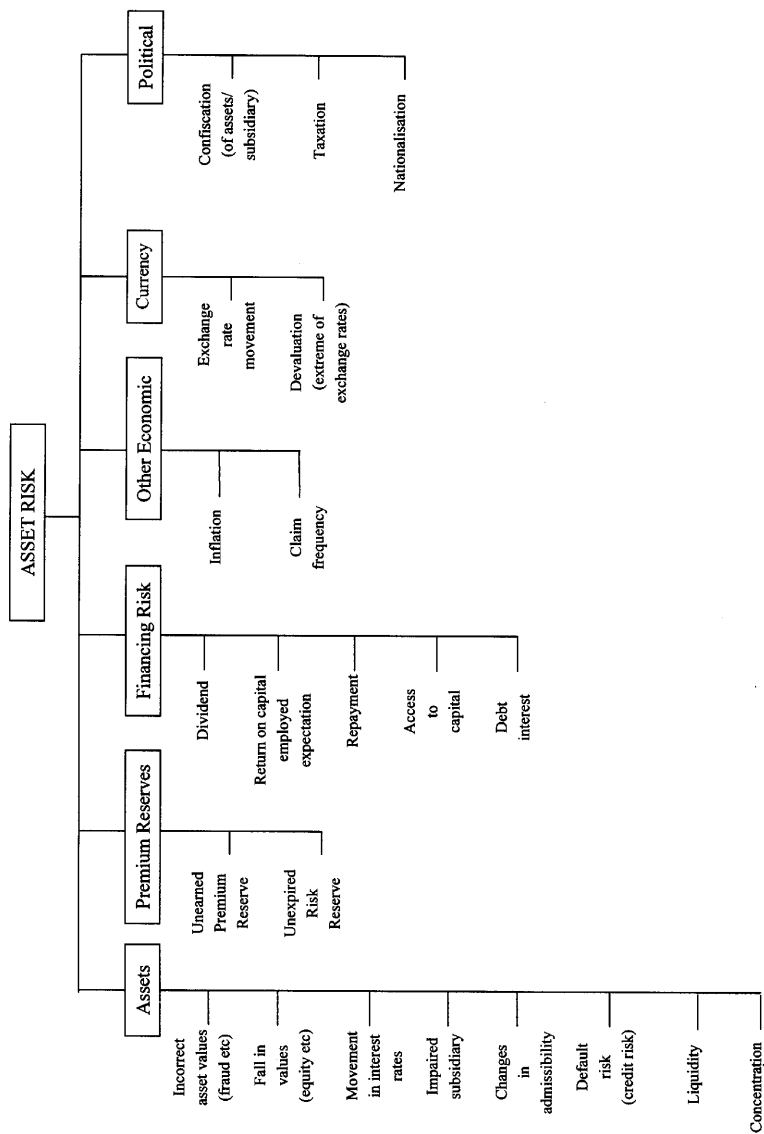
B.2 *Insurance Operations*

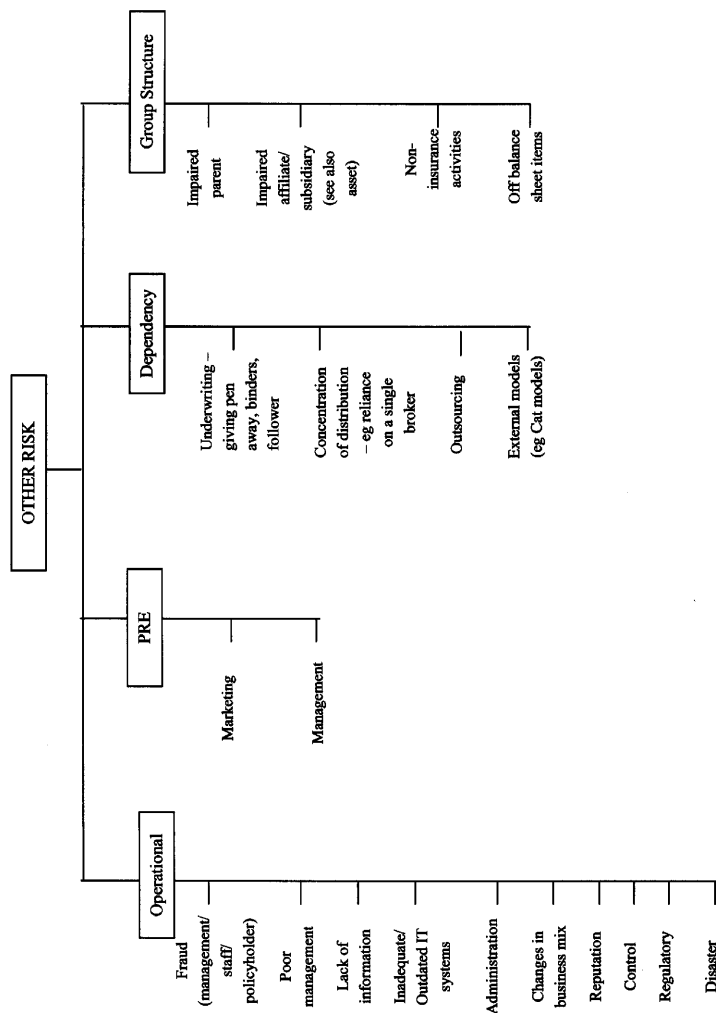
B.2.1 Analysing the risks faced by an insurance operation is very different. There is a much greater exposure to financial risk than companies in general. Historically, insurance operations have concentrated on financial risk. While this may cover the majority of risks, others can be of equal or greater importance if things go wrong.

B.2.2 The following figures indicate a structure that is more understandable to those involved in the insurance industry.









### B.3 *Commentary on the Tables*

B.3.1 There are many risks where actuaries have traditionally played a significant part in their assessment. This is both in analysing historical data to assess such items as reserve adequacy, and also reviewing trends to predict future premium rate adequacy and other future business assumptions. However, even in areas that are amenable to actuarial assessment, there may also be a need for other professional input into the analysis; for example, legal input into the impact of revised policy wordings.

B.3.2 For some risks, we have suggested that actuarial techniques may be relevant in assessing part of the risk. For a number of these, the assessment of the risks may affect the actuarial assumptions for other areas. Examples of these are reputation risk and policyholders' reasonable expectations (PRE).

B.3.3 Reputation risk is the risk that the company may suffer if its brand is damaged. This is relevant to the analyses that an actuary might carry out in a number of ways. In some circumstances, the management may choose to go beyond their strict legal obligations when settling claims, in order to protect or develop their desired brand. This may affect the assumptions that the actuary would use when analysing claim frequency and severity. Similarly, if much of the premium volume written by the company was thought to be dependent on the company's brand, and there was a perceived risk that the brand could be damaged, it would affect the volatility assumptions used for future premium volumes.

B.3.4 Policyholders' reasonable expectations are usually thought of as an issue facing life insurance companies, relevant to such things as bonus declarations. However, they are also relevant to general insurance companies in that treatment of policyholders should be consistent with the marketing, or other forms of representation, of the policies that they have purchased. Thus, if a company had historically applied the terms of its policies very strictly, but had started to advertise itself as being a company that was generous when assessing claims, this might have an impact on the assumptions that should be made about future claims frequency and severity.

B.3.5 Some of the other risks that we have identified may be partially assessable by actuarial techniques; the extent to which this is possible may depend on the individual company's circumstances. For example, the group structure risks of dependency on a parent or subsidiary would be more assessable by an actuary if the parent or subsidiary were themselves insurance companies.

B.3.6 While traditional actuarial techniques are not thought to be applicable in the assessment of certain risks, there may still be ways in which actuaries can be of assistance. For example, actuaries will need to gather significant amounts of data to carry out their assessment of the areas that they are asked to analyse. Therefore, it may become clear whether the company is able to produce data in similar forms and detail to the level the



actuary would normally expect, and how readily such data can be produced. There may also be evidence on the quality of the data available, although this is an area where auditors would usually make specific investigations. This sort of information on the data may be relevant to the assessment of risks such as management quality, adequacy of IT systems, and failures in administration procedures.

B.3.7 More generally, when making his or her assessments, it is possible that the actuary will come across evidence relevant to the assessment of other risks, including some of the asset and operational risks that the actuary has not specifically been requested to analyse. If this does occur, it would be good practice for the actuary to alert the person responsible for assessing these areas, or the risk co-ordinator, to the evidence that has been found.

B.4 *Generic Risks*

The table below shows the role that actuaries can play in the assessment of individual risk. It is broadly based on the risks shown in Section B.3, but there are differences of detail:

- √√ where actuarial techniques can be used to assess the risk;
- √ where actuarial techniques should be of assistance in assessing part of the risk, depending on the circumstances; and
- X where actuarial techniques are not likely to contribute to the assessment of risk.

Risk	Actuarial assessment
<b>UNDERWRITING RISK</b>	
<i>Market issues</i>	
Lack of innovation (or excessive) relative to others	X
Exposure to market forces (underpricing,...)	√
<i>Underwriting Controls</i>	
Inappropriate underwriting strategy	√
Failure to apply underwriting guidelines (acceptance criteria)	X
Mis-classification of business	X
Mis-selling	X
<i>Premiums</i>	
(Rapid) growth in volumes [under pricing]	√
(Rapid) fall in volumes [excessive pricing]	√
<i>Pricing</i>	
Incorrect pricing (general):	√√
— claims (amount/timing)	
— expenses	
— reinsurance price	
— earnings (returns/discounts)	
— actuarial/accounting systems	
Incorrect rate relativities:	√√
— methodology	
— data	
<i>Portfolio Management</i>	
Changes in business mix	√
Lack of diversification (or excessive)	√
Increase in line size	√
<i>Claims</i>	
Frequency of attritional claims	√√
Frequency of large claims	√√
Catastrophe claims	√√

Risk	Actuarial Assessment
Mass tort claims (aggregation)	√√
Latent claims	√√
Unexpected exposures	√√
Inadequate claims reserves	√√
Discounting risk:	√√
— interest rate assumptions	
— cash flow patterns	
Excessive claims reserves	√√
Correlation between claims	√√
<i>Expenses</i>	
Excessive expenses	√
Incorrect expense reserve	√√
<i>Social</i>	
Change in propensity to claim	√
<i>Currency</i>	
Movement in exchange rates	√√
Devaluation (extreme of exchange rates)	√
<i>Reinsurance</i>	
Inappropriate reinsurance programme:	√√
— net retentions	
— gaps/coverage	
— nature/basis of cover (not matched to inwards business)	
Assessment of exposures (PML)	
Failure of a reinsurer	√√
General reinsurance market failure	√√
Substantial reinsurance price rise	√√
Unavailability of reinsurance	√√
Reinsurance mis-match (e.g. exclusions, basis of cover)	√√
Reinsurance disputes	√
Financial reinsurance/ART (e.g. basis risk)	√√
<i>Legal/Legislative</i>	
Changes in legal systems (e.g. Woolf)	√
Changes in court awards (e.g. Ogden)	√
Policy wording interpretation	√
<i>Political</i>	
Confiscation (of assets subsidiary)	X
Taxation	√
Nationalisation	X
Change in responsibility for claims (NHS costs, superfund, ...)	√

Risk	Actuarial Assessment
<b>ASSET RISK</b>	
<i>Assets</i>	
Valuation risk — incorrect asset values (methods/uncertainty/fraud/systems)	√
Fall in values (equity, property, etc.):	√√
— general market (FTSE)	
— specific market	
Movement in interest rates (yield curve)	√√
Impaired subsidiary	√√
Default risk (credit risk)	√√
Liquidity	√
Concentration:	
— counterparty/credit risk	
— diversification/volatility risk	
— diversification (return) risk	
— portfolio management risk	
<i>Premium Reserves</i>	
Incorrect premium recognition	√√
Incorrect unexpired risk assessment	√√
<i>Financing Risk</i>	
Dividend commitments/expectations	√√
Return on capital expectations	√√
Repayment	√√
Access to capital debt (type and form)	√√
Debt interest/repayment commitments (and cash flow issues)	√√
<i>Other Economic</i>	
Inflation (claims, expenses)	√√
Economic impact on claim frequency (theft, interest rate risk, ...)	√√
<b>OTHER RISK</b>	
<i>Operational Risks</i>	
Fraud (management/staff/policyholder):	X
— inadequate controls	
— inadequate procedures for dealing with fraud	
— inadequate prevention/detection mechanisms	
Management risk:	X
— sound and prudent	
— fit and proper	
— insufficient development of staff	
— unsuitable/insufficient resources/staff	
— over-reliance on key persons	

Risk	Actuarial Assessment
Lack of information	√
Technology risk:	X
— inadequate/outdated IT Systems	
— technology failure	
— inadequate backups/disaster recovery	
— inadequate security	
— failure of processes	
Administration risk:	√
— failure of procedures/processes	
— failure of outsourcing (service/reputation/monitoring)	
— inappropriate organisational structure	
— inappropriate reporting structure	
— roles and responsibilities linked to firm's mission/objectives	
— inappropriate segregation of duties (duty statements)	
Planning risk:	√√
— inadequate strategic/business/marketing plan	
— business structure/direction	
— market share/competition management	
— investment/underwriting strategy	
— mission statement/business principles and philosophy	
— identify, measure, manage (control/mitigate) risk to mission	
— resilience testing	
— budgeting and forecasting (actual and reviews)	
Business risk:	√
— expense/cash flow/credit controls	
— market knowledge (U.K., E.U., international)	
— business knowledge (classes)	
— change in market conditions and business environment	
— mergers and acquisitions	
Reputation risk:	√
— moral obligation risk	
— reputation protection risk	
Control risk:	X
— inadequate corporate governance	
— inadequate internal systems and controls	
Regulatory risk:	X
— cost of non-compliance (fines, imposition of conditions, removal of licence, public censure — reputation risk)	
— cost of compliance U.K./E.U./international	
Audit risk:	X
— inadequate internal audit	
— inadequate external audit	
— audit committee (lack of)/compliance audits (lack of)	

Risk	Actuarial Assessment
Reporting risk:	√
— reliability and timeliness	
— usefulness/relevance	
— data integrity	
Exposure risk:	√
— product & liability insurance	
— inadequate directors and officers (D&O) insurance	
— inadequate security procedures	
— inadequate/incorrect legal advice	
— inadequate risk management	
Risk management risk:	√
— inadequate risk identification and controls (board)	
— risk exposure limits (identification, detection, control) — risk appetite	
— inappropriate risk/exposure levels	
Disaster risk:	X
— fire/power cut/strike action/terrorist attack	
— natural disaster (flood/earthquake/wind storm)	
— unsuitable/insufficient continuity plan	
Initiative risk:	√
— new products/processes	
— financing risk	
— poor understanding of business	
— inadequate systems and controls/processes and procedures for new initiative	
— acquisition risk	
— growth risk (market share)	
— implementation risk	
<i>Policyholders' Reasonable Expectations (PRE)</i>	
Marketing should give fair representation	√
Management of policies should be consistent with PRE	√
<i>Dependency on Others</i>	
Underwriting — giving pen away, binders, follower	√
Concentration of distribution — e.g. reliance on a single broker	√
Outsourcing	√
External models (e.g. Cat models)	√
<i>Group Structure</i>	
Impaired parent	√
Impaired affiliate/subsidiary (see also asset)	√
Non-insurance activities	√
Off balance sheet items	√

## APPENDIX C

### CONTRIBUTION OF DIFFERENT PROFESSIONALS TO ASSESSMENT OF RISK

Risk	Cause of insolvency (a)	Professional contribution to risk assessment				Contribution to overall opinion			
		Actuary	Accountant	Other	Nobody	Actuary	Accountant	Other	Nobody
<b>Underwriting risks</b>									
Insufficient reserves/premiums	22%	80%	–	20%	–	17.6%	–	4.4%	–
Too rapid growth	14%	40%	40%	20%	–	5.6%	5.6%	2.8%	–
Catastrophe losses	6%	40%	–	40%	20%	2.4%	–	1.2%	2.4%
Total	42%	60.9%	13.3%	22.9%	2.9%	25.6%	5.6%	9.6%	1.2%
<b>Asset risks</b>									
Overvalued assets	6%	20%	40%	20%	20%	1.2%	2.4%	1.2%	1.2%
Failure of ceded reinsurance	3%	40%	40%	–	20%	1.2%	1.2%	–	0.6%
Total	9%	26.6%	40.0%	13.3%	20.0%	2.4%	3.6%	1.2%	1.8%
<b>Other risks</b>									
Subsidiaries	4%	20%	20%	20%	40%	0.8%	0.8%	0.8%	1.6%
Significant change of core business	4%	40%	40%	20%	–	1.6%	1.6%	0.8%	–
Fraud	7%	20%	40%	–	40%	1.4%	2.8%	–	2.8%
Miscellaneous	7%	20%	20%	20%	40%	1.4%	1.4%	1.4%	2.8%
Non-identifiable	27%	20%	20%	20%	40%	5.4%	5.4%	5.4%	10.8%
Total	49%	21.6%	24.5%	17.1%	36.7%	10.6%	12.0%	8.4%	18.0%
Grand Total	100%					38.6%	21.2%	19.2%	21.0%

Source, (a): A. M. Best, Special Report, February 1999 — Insolvency: will historic trends return?

## APPENDIX D

## TECHNIQUES OF DETERMINING AGGREGATE CAPITAL REQUIREMENTS

D.1 *Overview*

D.1.1 This section gives an overview of the approaches that might be used to assess the aggregate financial condition. This involves the aggregating of the risk profiles of each of the individual risks faced by the company, and assumes that the work required to assess those risks has already been undertaken.

D.1.2 Since most risk events are not perfectly correlated and many are independent of each other, there is usually a reduction in the amount of capital required in the aggregate than when considering each risk separately and adding up the total separately. It is possible for certain risks to be more likely to occur together or to have more serious consequences when they occur together; fraud is often associated with adverse market conditions, e.g. Nick Leeson and the Japanese Stock Market. In this case, the capital required in the aggregate would be greater than if the risks were considered separately. Care is needed in this area, as much can also depend on the risk measure. This is an area where the actuary can provide input.

D.1.3 Various approaches are available for analysing the risks faced by companies. Some of these approaches involve assessing individual risks in isolation, others consider correlations of liabilities, and others consider the combination of both asset and liability risks. Some methods, like DFA modelling, are particularly suitable for assessing the overall financial risks faced by the company and the various inter-relationships of the risk. It is difficult to incorporate certain risks into a DFA model, and these may need to be augmented by other approaches. For example, if a company is insuring a specific event that has a very low probability, but a high severity, then the company will need to demonstrate that it has the financial resources to meet the liability should the specific event occur. In this case, the individual risk investigations may be necessary to assess the exposure to the event in relation to the other risks faced by the company. The capital required would then need to be covered, as well as that determined by a DFA model or other approach.

D.1.4 Generally speaking, the more sophisticated the methodology the more precise the answer. If plenty of capital is available or precision is not necessary, then more simplistic methods are appropriate.

D.1.5 The FSA has indicated that it will expect directors only to take credit for independence of risks where this can be justified. Thus, a high degree of correlation will need to be assumed between risks, unless an assessment has been made to justify a lower correlation. Therefore, if risks were only to be assessed in isolation, this could lead to a higher level of



financial resources being required. Therefore, it is likely that methods, such as DFA, which consider the possible impact of the correlations of risks, will be used if capital is a scarce resource.

D.1.6 It will be necessary to assess both realistic adverse scenarios and combinations of scenarios. When considering combinations of scenarios, it is worth noting that operational risks may cause simultaneous problems in apparently unrelated areas.

## D.2 *Specific Methods for looking at Aggregate Results*

D.2.1 The various approaches can be divided as follows:

- *Simplistic*. These are largely formulaic, and the main purpose is to determine the aggregate capital needs by comparison to a peer group.
- *More elaborate*. These fall short of a full analysis of the likelihoods of each of the various outcomes, but where a significant amount of analysis is required.
- *Actuarial or DFA*. This is the most precise approach to determine the overall aggregate risk profile.

D.2.2 It is likely that a combination of methods might be used. Simple techniques might be used to assess less critical risks or small parts of the business, with DFA or other models being used to assess other risks. Also, there may be a need to make further analyses of key risks identified from DFA or other approaches.

D.2.3 Methods for assessing financial condition include the following:

- (a) *Review of simple ratios*. This might include consideration of ratios such as solvency margin, operating ratio, debt equity ratio. This approach might be applied to small parts of the business, where a detailed analysis is not considered necessary. It might also be relevant for larger parts of the business, if the figures indicate a very strong financial position.
- (b) *Formulaic approach*. This might include applying risk-based capital formulae. Consideration would need to be given to the applicability of the formulae to the individual company.
- (c) *Deterministic assessment of reserve/premium rate adequacy*. This is likely to form part of the review of financial condition.
- (d) *Deterministic individual scenario testing based on a standard list of scenarios*. This might include specified tests, like a 20% fall in equity values, a 100-year return period hurricane. The company's business plan might be used for the base scenario, with each assumption being varied independently. This method relies on the tests being specified externally to the company. It would, therefore, only apply if the regulator, or market/professional bodies, set out guidance on the tests to be applied.
- (e) *As (d), but identifying realistic scenarios relevant to the individual company*. Realistic scenarios might be interpreted as events that are intended to have a defined probability of occurrence.

- (f) *As (d) or (e), but also considering multiple risks.* This might include, for example, a fall in equity values at the same time as a catastrophe.
- (g) *As (f), but considering 'ripple effects' on other assumptions.* For example, if a major catastrophe is assumed to occur, this might be assumed to cause an increase in reinsurance prices. This might also take account of management responses to an adverse experience.
- (h) *Stress testing scenarios.* Rather than assess the effect of a reasonable scenario, test at what point an assumption causes the company to have problems, and then assess the likelihood of this extreme an assumption (or set of assumptions).
- (i) *Actuarial assessment of the variation in reserve adequacy.* This may be part of the analysis, and might also be carried out as part of the parameterisation of a DFA modelling approach. This might involve stochastic reserving approaches or deterministic reserving under varying assumptions.
- (j) *Stochastic scenario testing.* This is as (e), (f) or (g), but allows a distribution for the scenarios.
- (k) *DFA modelling.* This is building a model to assess the distribution of outcomes for various company financial items. This may take the form of a stochastic business plan, where each assumption is given a distribution.
- (l) *Overview of operational risk.* This might involve assessing the key operational dependencies for the company, for example reliance on IT systems, key personnel and distribution channels. Consideration would then be given to realistic scenarios for disruption in these operations, and what effect these would have on the company. Plans could then be drawn up to mitigate these risks, and the associated costs allowed for within the financial modelling.
- (m) *Assessment of control procedures.* This will identify what the controls procedures are, whether they are suitable, and the extent to which they are being followed. This might include items such as: the management information produced; the underwriting guidelines; the functional independence of internal audit teams from operational teams.

D.2.4 Where more than one method is used to assess different risks, it will usually be the case that it is necessary to add the capital from each method and not to take any credit for independence. There are, however, techniques available to take some credit for independence. It is of fundamental importance that the techniques used are adequate in the aggregate, and that any tail dependency is effectively incorporated. This can be difficult if only simplistic methods are used.

### D.3 Risk Measures — Overview

D.3.1 The describing of risk by a single number involves a significant

loss of information. This may be reasonable in cases where a decision is to be made as to whether to participate in a contract or not, where the decision is essentially binary. It becomes more problematic when the financial condition of a company is considered. Therefore, it may be more appropriate for the actuary to consider more than one risk measure, so that the risk inherent in the business venture can be more readily understood.

D.3.2 The risk profile that we are looking at is essentially the distribution of capital positions of the entity in question. Not only will we have to consider the likelihood of capital being insufficient, but also the degree of insufficiency. This is, as it is, the management's obligation to ensure that as much of a valid claim is paid as is possible.

D.3.3 There are essentially two types of risk measure that will be used in practice: those based on scenarios (model-free risk measures); and those based on probabilities (model dependent). Different types of measure will be appropriate in different circumstances.

D.3.4 Model-free measures of risk can be used where only risks of position are considered, and are essentially a 'stress test' of the company to a number of pre-defined scenarios. The actuary will have to judge whether the scenarios used are reasonable, given the book of business. It is likely that model-free approaches may be used as an initial guide, and also where it is perceived that the company is already extremely well capitalised.

D.3.5 Model-dependent risk measures include: probability of ruin, value-at-risk, expected policyholder deficit, tail value-at-risk. The calculation of these risk measures will normally depend on the construction of a model.

D.3.6 Current thinking leads one to the conclusion that the type of risk measure to be used is a coherent risk measure. It is not the place of this paper to give the details of what constitutes a coherent risk measure and the rationale behind the choice of axioms. For that the reader should refer to the appropriate literature. Nevertheless, this is an area of which the risk coordinator should be aware.

D.3.7 Whichever risk measure is taken, the actuary may have to make a judgement as to whether the level of risk is reasonable. This may be by benchmarking the level of risk against that which the actuary has seen in other companies, and by taking into account the rating of the company. Also, the actuary will have to determine whether the level of risk is commensurate with the level that the management would think of as reasonable.

D.3.8 The actuary should consider how the risk level has altered from previous years, and the reasons for the change. In particular, if the perceived riskiness of the entity has increased, the actuary should try to ascertain whether this was a conscious decision on behalf of the management and whether it looks as if the trend looks likely to continue.

D.3.9 If the level of risks is too high, the actuary may wish to suggest approaches on how to manage the position.

#### D.4 *Value-at-Risk (VaR)*

This is a well-known concept widely used in the banking world. It is not without problems, as it only looks at one point on the probability curve. The implication of this is that the combination of two portfolios may increase the overall level of perceived risk, even though there should be a decrease due to the benefits of diversification. Under certain assumptions as to the dependency structure between different business areas, this problem does not arise. However, such assumptions may not be true in practice. VaR works much better with symmetrical risks rather than with the skew risks typical of many insurance operations.

#### D.5 *Expected Policyholder Deficit (EPD) and Risk-Based Capital (RBC)*

This is an improvement on VaR, as it considers the whole tail of the distribution rather than a particular point. However, EPD in isolation is not ideal. One of the desired properties of a risk measure is that it calculates directly the amount of 'risk free' asset needed to make the portfolio acceptable from a risk point of view. The addition of a 'risk free' asset to the portfolio does not alter the EPD by as much as expected, and hence does not, in itself, prove to be a suitable measure of risk on this basis. However, if one fixes the EPD per unit of premium and calculates a RBC amount to achieve this level of EPD, as per the Lloyd's RBC approach, then this measure of risk gets around that particular problem with EPD. It is important to recognise that with skew risks, such as many insurance risks, VaR and EPD will rank risks differently.

#### D.6 *Tail Value-at-Risk (TVaR)*

This is the natural generalisation of VaR into a coherent risk measure. It is essentially a combination of VaR and EPD. TVaR calculates the expected loss, conditional on the loss being at least TVaR. A benefit of this measure is that it directly expands the VaR measure to one without the drawbacks, and it never gives an answer less than VaR. Under certain regularity conditions, any other coherent risk measure that is greater than VaR is also greater than TVaR.

#### D.7 *Measures based on Standard Deviation*

Risk measures based on standard deviation also have properties that are undesirable. If one has two portfolios X and Y, and the outcome of X is always going to be worse than Y, then it is reasonable to assume that X needs more capital. If, however, the risk measure is based on standard deviation, then it may indicate the converse.

#### D.8 *Dealing with Dependencies*

D.8.1 In practice, companies do not normally fail because of just one event occurring, but due to a combination. The risk co-ordinator needs to

look at what combinations of events are reasonably foreseeable, and what the financial consequences may be. To be able to do this, the co-ordinator has to consider what dependencies exist in the business and in the analyses that are before him or her. As such, it is a highly important issue when looking at the overall position of a company.

D.8.2 A full analysis as to the different types of dependence that may occur falls into the realms of DFA. It is not intended to give the details of how to perform such an analysis. The reader is advised to look into the appropriate literature to learn more about such approaches. The following represents an overview of the issues.

D.8.3 It is quite likely that the various risk areas will, initially at least, be investigated separately, to see what, on their own, they contribute to the overall risk profile of the insurance entity in question. As indicated above, it is not sufficient to consider only items in isolation, as it is the overall financial condition that concerns us. Hence, these separate investigations need to be brought together in a way that reflects the dependencies between the different areas. Initially, there are two things that the risk co-ordinator should consider. Is there an element of double count in the analysis? What is the dependency structure between the different areas, assuming that there is no double count?

D.8.4 Let us consider the issue of the double count and how it may arise. If different people have analysed different contributions to the risk profile separately, then the same risk may be covered twice without the respective parties being aware of it. As an example, if an analysis of prospective underwriting volatility has been performed, and separately an analysis of the underwriting cycle, care must be taken to ensure that the volatility inherent in the underwriting cycle has not been double counted. Similarly, if a loss from a catastrophic event can affect more than one area, care must be taken that the same element of loss is not being counted twice. After performing this analysis of the double count potential, the risk co-ordinator is in a better position to consider the true dependencies.

D.8.5 If the dependency analysis only went this far, it would imply that it is believed that all of the various risks are, in fact, independent of each other, and further calculations would be made on this basis. If the co-ordinator is satisfied that this is the case, then broader questions of dependence need not concern us. Even in this case, the co-ordinator would need to satisfy the FSA that independence is a valid assumption. However, it is more likely to be the case that there is a degree of dependency between the outcomes of different areas, and, even within an area, care has to be taken that issues of dependence are properly addressed. The structure of the group, the lines of business written and the type of insurance entity all have an impact on the dependency analyses.

D.8.6 For example, dependence between areas could come about due to a common cause, such as a physical catastrophe affecting more than one line

of business. Other possibilities are relying on the same broker for income and the same reinsurers for risk transfer. It is also likely that there is a degree of dependence in the underwriting cycle for the different areas and in other economic factors.

D.8.7 It should also be realised that such common causes may not yet be known, and so judgement and a degree of prudence may be required when performing any analysis. It should not necessarily be assumed that, as a common cause has not historically been observed, it would not do so in the future. Also, if a dependency in the past has been seen to work in the insurance entity's favour, consideration must be taken before it is assumed that this will continue.

D.8.8 Note that dependence may arise over time, as well as at the same point in time, with, say, a catastrophic event altering the market for insurance, and hence increasing the policyholders' propensity to claim in other areas. The co-ordinator may wish to differentiate between different types of dependency, e.g. physical events, economic, legal.

D.8.9 The issue of determining the dependencies is highly complex, and judgement will be required as to what type of dependency structure is appropriate. In particular, the risk co-ordinator will have to look at those events that, when occurring together, cause the entity problems, and ask whether there is a degree of dependence driving those scenarios which would increase their likelihood. The historic information available to determine the dependence may be scant, and the co-ordinator will need to take into account the opinions of the underwriters of the business to try to determine what the potential drivers may be.

D.8.10 As well as looking at the tail of a distribution, a degree of dependency may indicate that combinations of less extreme events may cause significant problems. Hence, the co-ordinator should not always be looking at just the extreme tails of the individual distributions, but also consider combinations of events that may be more likely.

D.8.11 The co-ordinator may need to err on the side of caution, in order to satisfy the FSA as to the soundness of the enterprise. This need not necessarily mean greater dependencies, as, for example, parts of the reinsurance programme may only operate if there are two or more catastrophes in a given time period.

D.8.12 The treatment of dependencies will also depend on the risk measure chosen. For example, if VaR is the chosen measure of risk, then, by increasing the dependency between two lines of business, we may be reducing the VaR. This may not be what the co-ordinator actually wishes to do when trying to test the financial soundness.

D.8.13 Note that the question of dependence does not actually limit itself to considerations between different parts of the business. Within a risk area there may also be forms of dependence which have to be considered. For example, there may be heavy dependence on one reinsurer. Hence, if the

bad debt provision is on an expected value basis, care must be made when simulating the volatility. Similarly, there may be strong dependencies on a particular channel of distribution or even one broker.

D.8.14 The most explicit form of dependency modelling will occur when a DFA approach is used. In these cases, a requirement must be that, either it reflects the dependencies thought to exist, or, if not, some adjustment to the results must be made. The dependency analysis may centre on the actual causes of potential dependence and an analysis of actual loss experience.

D.8.15 When performing an individual scenario test, judgements need to be made. In some circumstances there may be more judgement than if a DFA model were to be utilised, as it is difficult to look at dependencies when considering one particular incident. In the case where only a handful of scenario tests are to be used, the co-ordinator may wish to consider an 'extreme' scenario, which consists of a combination of events which the co-ordinator believes are extremely unlikely to occur together. By using this 'ultimate' stress test, the co-ordinator may be able to draw some comfort in ensuring that there is enough capital to cover other more likely combinations.

D.8.16 In some cases dependence will result in an increase in (say) volatility within a risk area; in others a greater degree of modelled dependence between areas. On the whole, the analysis of dependencies reflects the move away from the traditional approach of concentrating on a single 'best estimate' to a consideration of the distributions of outcomes on a multivariate context.

## APPENDIX E

EXAMPLE OF THE FINANCIAL CONDITION  
ASSESSMENT PROCESS

E.1 This Appendix provides an illustration of the process outlined in the paper. It illustrates what is current industry practice (not necessarily best practice), including the types of individual risk assessment carried out, as well as the overall determination of capital adequacy. The examples then show the extra work that the Working Party believes would be appropriate in terms of additional individual risk assessments. It also deals with the formal 'bringing together' process.

E.2 *Example Personal Lines Company*

E.2.1 The company is wholly U.K. based, writing personal lines, motor and household, through insurance brokers. It has recently appointed a chief executive (CEO) and a recently qualified in-house actuary. The company has a branch network throughout the U.K. to support brokers and policyholders. It also makes extensive use of external claims adjusters for case estimates and settling more complex claims. The company is in the process of a major computer system upgrade, with the aim of allowing significant increases in capacity as well as potential reductions in cost. The account is protected by means of excess of loss reinsurance, which is placed through a reinsurance broker.

E.2.2 *Balance Sheet*

S/H funds	100	Deferred acquisition costs	20
Current liabilities	50	Current assets	50
Claims reserves	500	Equities	100
Unearned premium	<u>100</u>	Bonds	<u>580</u>
	750		750

Premium income is £250 million, of which £200 million is motor insurance.

E.2.3 *Current individual risk assessments*

The in-house actuary undertakes a quarterly claims reserve review. There is also a more detailed review at the year end. This latter analysis revealed a small deficiency of 10 on an undiscounted basis. Allowing for future investment income would reduce the reserve requirement by 15, meaning that there would be a small surplus on a discounted basis. Therefore, the company concluded that there is no need to make additional provisions.



E.2.4 Premium rate decisions are made by a committee chaired by the CEO. It is largely done by taking historical rates charged, and adjusting in the light of movements in the market place. The in-house actuary has an overall look at aggregate rate levels, but does not undertake detailed analyses.

E.2.5 The company reviews its claims handling procedures, and the case estimates are regularly updated. The company recognises its dependence on external claims adjusters, but relies on the regular reviews and monitoring of surpluses and deficiencies on individual case estimates to be sufficient to protect against the potential problems of the use of external adjusters. This work is carried out by the claims manager, and he declares himself satisfied with the process.

E.2.6 The company's reinsurance brokers advise the company on the level of reinsurance retentions required. The brokers do this on the basis of their understanding of the company's business, and their knowledge of the market place and of what other companies buy. No formal studies are carried out, other than a letter from the reinsured's brokers advising the company of the proposed arrangements.

E.2.7 The computer upgrade is being managed by external consultants. They report regularly to the CEO, who, in turn, keeps the board fully informed of what is going on.

E.2.8 The company plans on an annual basis. It projects business forward for the next three years. It is currently projecting a substantial increase in the volumes of business of 25% p.a. in real terms for each of the next three years. This growth is required to justify the investment in the computer system. The company believes that it will be able to achieve this by pricing more keenly on the back of the expected reduction in expense ratio. The recent underwriting loss of £10 million before investment earnings is projected to break even, as the cycle turns and the expense savings come through.

E.2.9 The board looks at the capital formally once a year, by comparing the company solvency margin with its peer competitors.

### E.3 *Suggested further Individual Risk Assessments*

E.3.1 Given the rapid expansion plans, it is suggested that an actuarial study of rating relativities and areas of relative profitability and unprofitability is conducted. Given the experience of the in-house staff, it is likely that this would be carried out by a consultant.

E.3.2 The company, presumably the actuary, should undertake a formal check as to the adequacy of the unearned premium and any unexpired risk reserves. This is important, given both the rapid expansion plans and the current lack of profitability of the account as whole.

E.3.3 The company should formally consider its vulnerability to delays in the computerisation programme. This should consider operational aspects, to see whether the company can continue in business if there are serious issues. It should also consider the financial impact of any delays. This would

cover cost over-runs, both of the computerisation and the need to employ other resources. Possible errors in the implementation of the programme need to be considered, including those that develop after the consultants have delivered it to the company. It will also be necessary to see that the appropriate back-up and other procedures are in place. While the consultant should be required to provide estimates of the development programme costs, the company should be aware that there could be additional costs that it could incur, in the event of delays that would not be covered by the consultant, e.g. employing additional claims staff.

E.3.4 The business plan appears very optimistic, and needs substantial stress testing and an understanding and commitment by the board to action, if adverse deviations occur.

E.3.5 The reinsurance brokers should be asked to document their recommendations on the limits purchased and on the choice and spread of reinsurers. This should also cover the financial strength of the reinsurers. Further studies should be commissioned on the exposure of the company to catastrophes, if necessary. This could involve actuarial modelling and exposure analysis.

E.3.6 Although the company does look at the claims reserve adequacy, and we have also suggested that it looks at unearned premium reserve adequacy, it would appear that nothing has been done about the potential variability in these items. This is something that should be investigated by either the in-house actuary or external advisers. While the in-house actuary reviews the reserves quarterly, the reserve variability study would not need to be undertaken nearly so regularly, unless there was a substantial change in the company's financial position or business mix.

#### E.4 *Risk Co-ordination Work*

E.4.1 Given the experience of the internal staff, the company has commissioned an external actuarial firm to prepare a report for the board on the adequacy of its capital resources. The firm was requested to utilise all existing reports, where possible, rather than to provide independent claims reserve reviews or other independent advice.

E.4.2 The firm worked with the company to produce a comprehensive list of all the risks that the company was facing. It obtained the various reports quoted above, including the additional investigations required.

E.4.3 A stochastic computer model office was put together for the next three to five years. This led to a distribution of possible outcomes for the results. A number of these scenarios indicated that the company would run into financial problems. These arose under situations of: a fall in the stock market; a deterioration in underwriting results (and/or existing provisions); or expansion at a greater rate than anticipated. Reference should be made to exposure to legal change (e.g. Ogden, and, more particularly, Woolf). Many

stochastic models will not cope with this type of problem. Consequently, it needs specific attention.

E.4.4 The stochastic computer model did not deal with the operational risk of the computerisation programme going astray. The consultants tackled this by reviewing the computer specialists' report together with discussions with the management of the company, and decided that it was appropriate to earmark an additional £10 million capital to allow for the programme going astray. This would include possible cost over-runs and other additional expenditure required to maintain existing operations.

E.4.5 The consultant reviewed the capital position in the light of the company's stated policy to each of the adverse scenarios, including the circumstances in which it would cease writing new business and go into run-off. The conclusion was that it was adequate in isolation. It would not be sufficient if more than one adverse scenario occurred at the same time. Since this was quite possible (at least a 10% chance on the assumptions made), the report concluded that the capital resources were inadequate for the next three years, unless some changes were made to the operations.

E.4.6 The board would need to decide whether, to raise more capital or to make changes to the operations. The consultants report outlined some possible changes:

- Eliminate the equity portfolio to reduce investment risk.
- Adjust the bond portfolio to be closer to the term of the liabilities (with prudent allowance for the possibility that claims are paid sooner than expected).
- Buy some more reinsurance; either a stop loss or quota share reinsurance to transfer more risk.
- Cut back on the expansion plans, though this might have expense overrun consequences.
- Outsource the computer operations, so that cost overruns were the responsibility of the outsourcer. This gives rise to additional risks. Outsourcing means that the provider controls the quality of the service provided; and there is the risk that it cannot, or will not, absorb the costs.

## E.5 *Standards of Solvency*

E.5.1 The board questioned the consultants as to what was the minimum amount of capital required in order to maintain the plans unchanged.

E.5.2 The FSA has not laid down any specific percentages or standards, and so the amount would be judgemental. Following discussions with the board, it was felt that a 10% chance of failing to pay all legitimate policyholder claims is clearly inadequate. A 0.5% chance might be acceptable, in theory, provided that the shortfall in assets in the event of failure was expected to be small (including all run-off costs), and all risks

were clearly identified and adequately costed, and that it was felt that the model error was limited. This would have to include possible computer failures and model and parameter error, plus all the other items that had not been thought of. Another consideration was the possibility that computer problems might give rise to additional losses from administrative delays and errors; these could impact on all areas of the company, including claim payments, credit control and premium quotations. In practice, residual uncertainties are likely to mean that a higher standard would need to be used. The company should inform the FSA at the earliest opportunity if there was any doubt about whether the FSA would regard its plans as sufficiently prudent, or if it intended to make changes to its operations so material as to change its character.

E.5.3 The consultants' report would have laid out the various adverse scenarios to ascertain these and the various interrelationships to calculate the various probabilities of ruin, and to indicate the distribution of possible outcomes. Most of this work would have arisen from the stochastic computer model. However, in this example the stochastic computer model did not include the computer risk. It is possible to adjust the model for such risks and to adjust for the various scenarios. However, in this case the consultant decided that it was easier to consider the two separately, and recommended that the company hold capital against the operational risk and the financial risk, given the size and the importance of the computer system. It is possible that utilising some form of computer model would allow for some degree of independence of these types of risks, but it was felt that this was being over precise, given the size of the company and the scope of the consultants' work.

E.5.4 The board then considered how to formulate its view as to its required solvency standard. A possible approach would be the minimum acceptable to the regulatory authorities, though this would involve considerable extra costs in refining the analysis and in demonstrating that the minimum standard is met (particularly for operational risk), and the FSA may not be easy to convince. The FSA is likely to exercise closer supervision of companies near the minimum, and this is likely to increase costs. Furthermore, if there were adverse developments, it might be necessary to raise more capital at short notice in order to avoid severe constraints on, for example, how much business was written. Another approach is to consider the capital needed to be able to sell the required volume of business at the desired premium rate. For personal lines companies, high solvency ratings may not be necessary for commercial reasons, though this is very important for reinsurance and commercial lines companies. One way to back into appropriate standards is the probability of ruin indicated by the rating agencies for a given rating. The consultant took the board through all these various options.

E.5.5 Although not strictly necessary to meet the FSA requirements, the

board was concerned that it was not using its capital efficiently. Thus, the board raised the issue of allocation of capital to each of the various parts of the group. The consultant pointed out that the risk measures that were appropriate for allocation to lines of business were not the same as those used by the FSA as solvency criteria. The recommendation was, therefore, not to use a probability of ruin as a means of allocating capital, even if that was used as a constraint to determine the minimum capital required. The board discovered that the use of different risk measures had a significant impact on the relationship of the amount of capital allocated to the motor lines as opposed to the household lines. The probability of ruin approach allocated more capital to the household lines. Since the board regarded reinsurance as an alternative to capital, this, in turn, had an impact on the amount of reinsurance that the board considered it appropriate to buy. It found that less reinsurance was actually required than when the reinsurance brokers were considering the amount on a stand alone basis.

#### E.6 *The Report*

E.6.1 The company is required by the FSA to document the process formally. Clearly, the company has undertaken much work and produced many detailed internal and external reports as part of the evaluation process. It is not necessary that these be bound in one mega volume. However, the report should be sufficiently comprehensive to provide an audit trail for the FSA and other interested parties, to evaluate the process and conclusions in more detail.

E.6.2 The report should include the following:

- a list of all the material risks the company faces; smaller risks are best dealt with as budgetary items;
- provision of a clear statement that there is no material chance of the company being unable to meet policyholder claims and to go into successful run-off at the end of the stated period of the projections;
- an indication of the probabilities of ruin, and/or the expected policyholder deficit or other risk measures; and
- a clear description of all the assumptions made (including those buried in any models used), and the dependence of the conclusions (especially the statistical measures) on those assumptions. If the results are sensitive to the detailed assumptions, this should be made clear.

E.6.3 Also to be included are a summary of the company's stated policy for dealing with adverse scenarios and a clear statement that failure to adhere to the stated policy would invalidate the conclusions; in particular, how the board would deal with the expansion plans in the event that the market did not improve as expected.

## APPENDIX F

EXTENT OF WORK REQUIRED FOR A FINANCIAL  
CONDITION REPORT

Company	Characteristics	Scenarios
A	Obviously well capitalised, but a very complex book of business and a decentralised management system	An FCR would not have a material impact on the regulator's action. Not much work would be required to sign a capital adequacy statement, but it would be expensive to provide opinions on the constituent parts or to calculate required capital.
B	As A, but capital appears to be just adequate	This would require substantial amounts of work, but all of this would be required if a meaningful assessment of its financial position is required.
C	Capital just adequate, but writes a well documented book of personal lines business	This would not be expensive, and an FCR would add significantly to the FSA's knowledge and reduce the risk of insolvency. Opinions on the constituent parts would not allow a proper indication as to how safe the company is.
D	Well documented business, where actuarial reviews of claims reserves, reinsurance programme, unexpired risk reserves and premium rates show that the balance sheet and premium rates are at a best estimate level. The available capital is very close to the statutory minimum	As C, but it would be 'expensive'. It also provides the only way to assess properly the financial condition of the company. A reserve review would provide some comfort, but a clean reserve opinion and a premium rate opinion could conceivably both be given, even if the capital was inadequate, as 'normal' variances could cause the company to fail the statutory tests.
E	Complex London Market company, with a heavy reinsurance programme	This would be expensive, but would add significantly to the regulators' understanding of the real financial position of the company.

## APPENDIX G

## ORGANISATION OF STRUCTURE

G.1 *Background*

G.1.1 In the paper, particularly in Section 2, we have identified the process to manage risk. We have also outlined what we see as the key roles and functions. In addition, there needs to be a clear structure in an organisation in order to manage risk properly. In order to facilitate the understanding of the roles and functions, we have prepared diagrams of possible structures, suggesting how this process might be managed in a group with an insurance subsidiary, and also for a stand alone insurance company or other financial institution. The Working Party is aware of much work having been done in both the banking industry and in non-financial organisations. This has influenced our thinking, but it is important to recognise that financial risk has a much greater impact in an insurance operation than in an industrial company.

G.1.2 It should be noted that the role of the risk co-ordinator, as defined in this paper, is different from that of a compliance officer. The two different roles could, of course, be carried out by the same person, but there is no need for this to be the case. Indeed, in large and complex organisations it would be preferable for the two to be separated. In this context, it is also important to realise that regulatory risk (the company falling foul of its regulators) will be much more in the compliance officer's function than in the risk co-ordinator's. The risk co-ordinator would regard regulatory risk as one of many. The risk co-ordinator's responsibility is essentially that of assessing total risk for the organisation, both for its own purposes and for reporting to regulators. There is no need for the compliance officer to have a direct line of report to the risk co-ordinator.

G.1.3 The risk co-ordination role needs to be high up in the organisation, if it is to be handled effectively. In the diagrams, we have placed it as low as we believe that it can be carried out effectively. We would have no objection, indeed we would think it to be preferable, if the responsibility were taken higher up the chain. In particular, finance directors and CEOs would be effective in this role, provided that they have the necessary skills.

G.1.4 The risk co-ordinator will obviously need to delegate much of the detailed work. Indeed, a CEO or finance director may wish the actuary to do much of the co-ordination analysis, but take overall responsibility for the results themselves. Also, much work would need to be done by individual operating units and individual risk assessments. These structures have not been included in this figure.

G.2 *Stand Alone Insurance Company*

G.2.1 Essentially, the structure for an insurance company is similar to

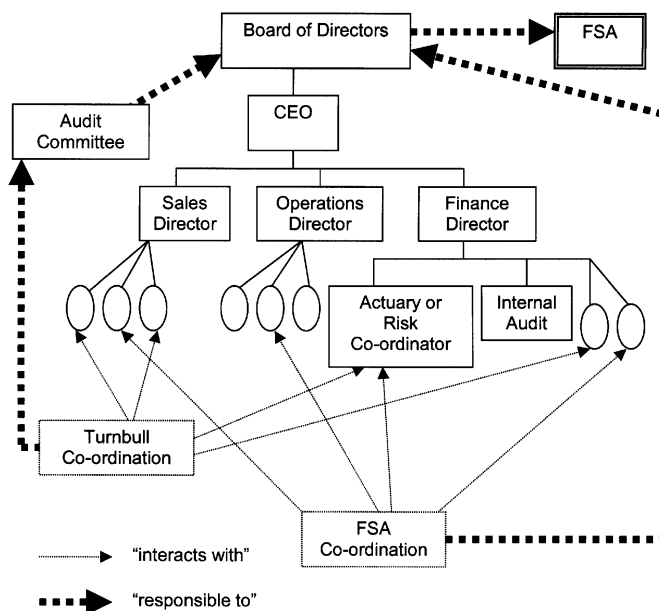
*Financial Condition Assessment*

Figure G.1

that for any other pure financial institution. In non-insurance operations, the actuarial role might well have a different title.

G.2.2 The board clearly has overall responsibility for risk. This is illustrated in Figure G.1.

G.2.3 In Figure G.1 we have placed the risk co-ordination role with that of the actuary reporting up through the finance director. It is possible that the risk co-ordination role could be placed higher up in the organisation, but not further down the organisation for it to act effectively. In particular, the finance director or CEO could equally fulfil these roles. Where the CEO takes a direct interest or responsibility, the board should scrutinise the process particularly closely, to ensure that all the relevant factors have been taken into account and that the assessment has not been biased by the CEO's involvement. The board retains overall responsibility, and should preserve its independence.

G.2.4 It is important to recognise that the board will have a direct relationship with the FSA, and that the risk co-ordinator is reporting through the board and is putting together all the information required for this part of compliance with the FSA. The FSA issue is a sub set of Turnbull, and this is also illustrated in the diagram.

G.2.5 While many non-financial organisations place the risk



management role in areas other than reporting up through the finance side, we believe that it is important, in a financial institution, for the two to be coordinated. However, we would see no problem if the CEO wants to take a direct interest or responsibility. The board would still have overall responsibility, and should preserve its independence.

G.3 The Insurance Subsidiary

G.3.1 We also considered how an organisation should function with an insurance subsidiary. Such an organisation would need to deal with risk from its Turnbull aspects and managerial aspects. The insurance subsidiary, in addition to forming part of overall group policy, would also need to meet the FSA requirements.

G.3.2 Our suggested structure is laid out in Figure G.2.

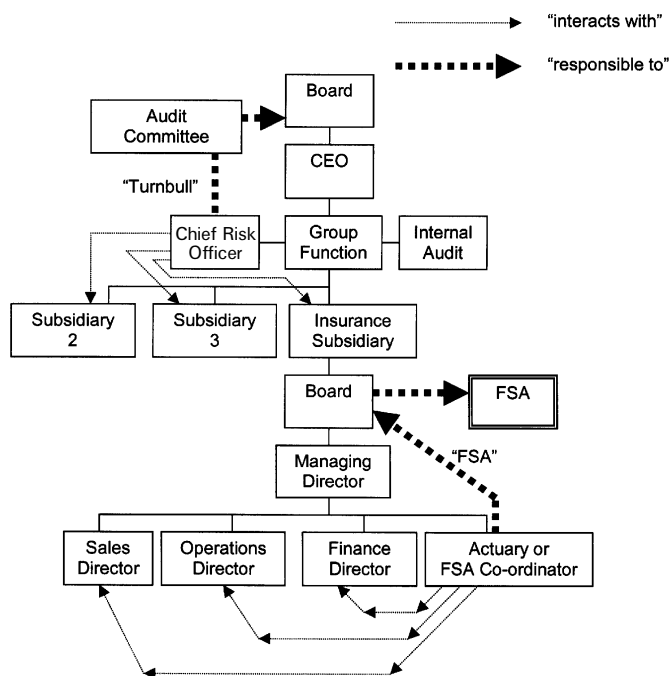


Figure G.2

G.3.3 It will be seen that, in these circumstances, we believe that there should be a direct report from the actual risk co-ordinator direct to the board. We believe that this is important, as risks that may be immaterial to

the group as a whole, but material to the insurance operations, could be ignored by more conventional structures. In order to meet the FSA requirements, it will be necessary to consider all risks that are material to the insurance operation in isolation.

G.3.4 The need to assess risk for the insurance operation, purely for FSA purposes, and not for the group, may mean that less detailed analyses are carried out at the group level if the insurance operation is not material in relation to the overall group.

G.3.5 We have not shown any direct reporting from the risk co-ordinator to the chief risk officer of the group, as it will be the insurance company board's responsibility to ascertain the degree of risk, and not that of the chief risk officer. It is possible that the two roles could be fulfilled by the same person, but their priorities would need to be very different.

G.3.6 Figure G.2 suggests that the risk co-ordinator may well be the actuary in that case, but this is not essential. The separation between the 'chief risk officer' at group level and the subsidiary's actuary would not be as clean cut as Figure G.2 suggests.

G.3.7 Both examples also suggest a clear separation between the 'chief risk officer', the 'Turnbull coordinator', the 'FSA co-ordinator' and 'internal audit'. In fact, at the other extreme, there is no reason why an internal audit function, with the necessary skills, could not embrace all these roles.