FINANCIAL CONDITION ASSESSMENT

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

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 UK.

KEYWORDS

General Insurance; Non-Life; Financial Condition; Actuary; Capital; Risk Assessment; Risk Management

1. INTRODUCTION

1.1 *Background*

1.1.1 This paper is based on one presented by a Working Party to the Institute of Actuaries on 26th March 2001. We felt that the paper would benefit from a wider international exposure. This would help identify the techniques that are used elsewhere in the world as well as sharing some of the experience in the UK. Although much of what we say applies to all financial institutions, this paper concentrates on general insurance.

1.1.2 Share prospectuses in the UK have for a number of years required disclosure of major risk factors. Recently the Turnbull Committee (set up to consider the disclosure that it is appropriate for UK quoted companies to make) provided guidance on how to implement the Cadbury Committee's (this Committee considered corporate governance in the UK) recommendations regarding internal controls. Companies have to report on the effectiveness of their internal controls. This report must be part of 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 UK insurance companies as well as to other UK quoted companies.

1.1.3 The Financial Services Authority (FSA), the regulatory body for UK financial institutions, proposes that each UK financial institution should analyse the risks that it faces. This analysis should include all risks and demonstrate that there are sufficient resources to meet those risks with a reasonable degree of certainty.. This proposal, which applies to

general insurance companies along with other financial institutions, is outlined in Appendix A.3. We believe that this approach is sensible. As part of this paper we have evaluated how the actuarial profession may participate in the regime envisaged by the FSA.

1.1.4 The two regimes differ in a number of ways. Turnbull is concerned with shareholder risk and the FSA with policyholder risk. Turnbull applies to all quoted companies and not just financial institutions. The proposed FSA approach only applies to insurance, banking and investment entities and so some of the risks and part of this paper are financial institution 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 if the capital resources were clearly sufficient.

1.1.5 This paper discusses the various roles and tasks required to undertake a Financial Condition Assessment in the context particularly of general insurance companies. 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 We also considered other approaches undertaken in other parts of the world including the proposals for revising the Basle agreement.

1.1.7 To supplement its analyses, we have 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. 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 show 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 faces. 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 the result 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 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 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 task interact closely. There is a clear need to identify comprehensively the risks the organisation is facing but (at least for assessment of financial condition) only to the extent that it affects 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. We believe 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, but, on the other hand, risks that are tail dependent might require more capital when combined than the sum of the separate parts.

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, eg 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 appear to equip the actuary well for this role.

1.3.5 We believe 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, such as fraud. Thus there is no suggestion that the whole process is purely an actuarial one, nor need the actuarial role always be central. There is a requirement for input from many different professionals.

2. THE RISK ASSESSMENT PROCESS

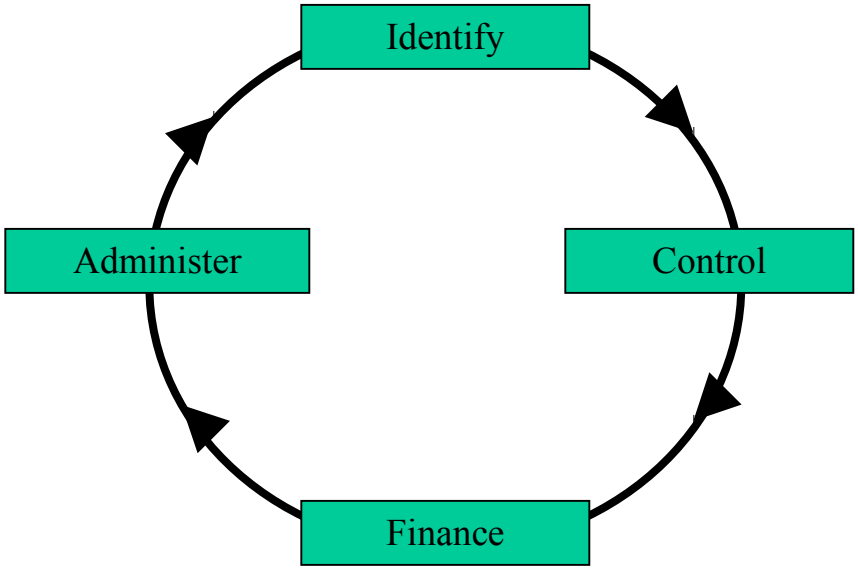
2.1 *The overall process*

2.1.1 There needs to be a comprehensive approach to risk within the organisation to ensure 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, that is the cost of 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 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 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 the diagram below:-



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 the mitigation process is in place, it is the modified risk profile that is relevant to an assessment of financial condition.

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;
- 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;

- 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;
- compare with the resources available to the company.

Administration

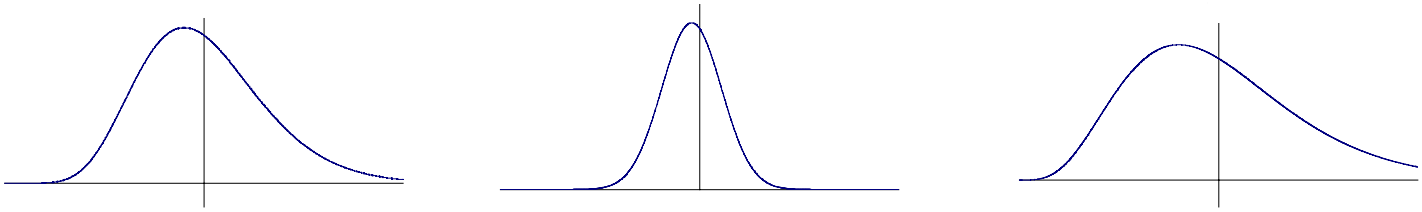
- Risk appetite;
- Board approval;
- record methodology and report results.

2.1.6 *Example of FCA Methodology*

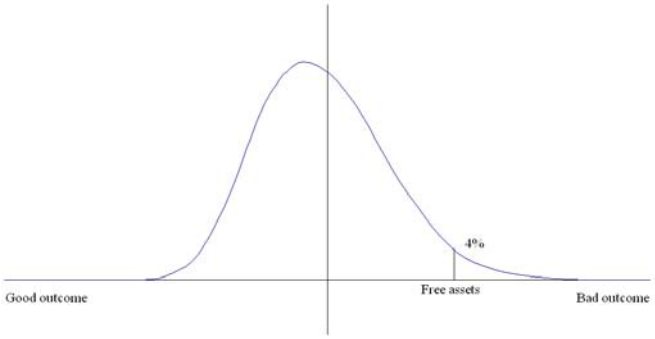
The example below illustrates very simply how a Financial Condition Assessment might work. It is based on a DFA approach and uses the probability of going insolvent as its risk measure.

The insurance company evaluates the various risks as follows:

Underwriting **Asset** **Other**

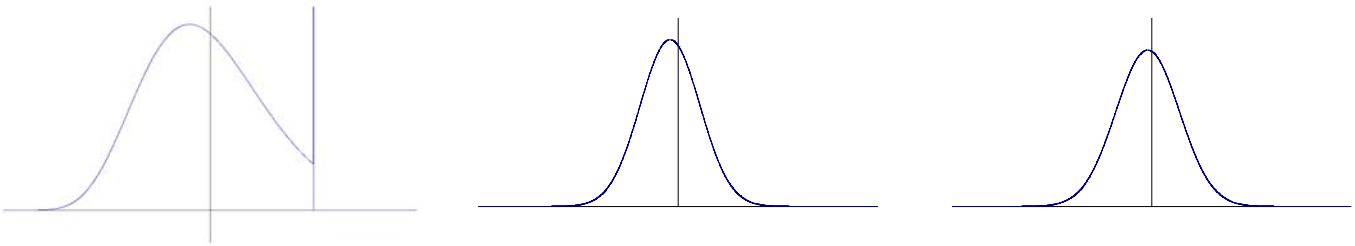


Combined

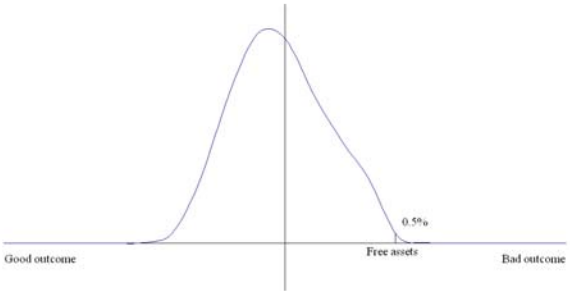


The company believes the 4% risk of becoming insolvent is too high and decides to buy reinsurance to reduce its underwriting risk and to take a number of measures to reduce its operational risks. This action reduces the various risks to a more acceptable level as follows:

Underwriting **Asset** **Other**



Combined



2.2 I*dentification*

2.2.1 The basic structure of the chart 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.

2.2.3 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 C*ontrol*

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.

2.4 F*inancing*

Financing techniques are becoming more sophisticated. A simple approach such as insuring is easy to evaluate provided the cover is adequate and the conditions of cover are met. 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 it is adequate, the form of financing only impacts on Financial Condition Assessment to the extent that it affects the cost of risk.

2.5 A*dministration of the process*

It is important that administration be carried out effectively as ineffective administration will increase risk. Managing the company's appetite for risk is also important. It is also important to manage the relationship of the centre with those making delegated decisions. 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 its 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 themselves 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. We have, therefore, set up a separate tree outlining the detailed risk 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 under each of the categories shown above.

3.2.2 For each risk shown in the table in Appendix B Insurance Companies, we have given an indication of the degree to which we think 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
X	Where actuarial techniques are not likely to contribute to the assessment of risk, but may be of use in quantifying the risks assessed by other professionals

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 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 we think 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 this raises for the actuarial profession is whether to expand our training, or carry out research, into some of the areas where we currently 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 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 analysed 683 insolvencies in the United States between 1969 and 1998. The reasons for the company failures were summarised as follows:

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

3.3.2 It is important to recognise that the above table 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 US, may not be fully appropriate to future failures in the UK. 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 UK 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 the above table is shown below:

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 the 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 likely to be best 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 especially true 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. This will often be based on estimates. However a more detailed assessment of the risks will provide a sounder basis for the estimates and so 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. The assessment may also uncover particular dangers and lead to action to mitigate them. 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 (eg impact of yield change on asset values) whereas other risks (eg 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 assessment of underwriting risk and in particular reserving analysis, rating analysis and reinsurance planning. In some instances these activities often 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:

- impact on premium income and expenses given a certain rate change and market position;
- impact of catastrophes on the net position given output from an exposure based catastrophe model and current reinsurance programme;
- impact of certain legislative changes;
- 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 US market data that was used to support the risk loading factors to be used for the NAIC risk based capital calculation 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 is 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 (or indeed absence of 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.

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 educational note mentions a 1% probability level for some of the risks), 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). Some additional work would be required in order to test the impact of significant catastrophe losses on the reinsurance companies.

4.2.9 Some of the risks identified in the Tree of Risks (in Appendix B) are clearly prospective in nature (eg the legal reform changes, 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. It may therefore 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 Appendix 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 for which we think the assessment could be predominantly of an actuarial nature.

4.3.2 For example in assessing the impact of rapid growth on the business, the actuary would require input from other experts, for example, from 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. In the UK, if a formal actuarial report is required, professional guidance (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 to fulfil 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. We do not envisage that any amendment would be required to GN12 (for UK reports) to cover 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 it 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. It may therefore 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 it is 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 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.

4.5.3 Some of the work that is being developed to model operational risk in banks will likely be of use to model similar risks in other financial institutions.

5. RISK CO-ORDINATION

5.1 *Overview of the risk co-ordination role*

5.1.1 We 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 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 outlines 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 and 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 FSA (and the Board) 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 in the financial condition report, to reduce or eliminate risk, it is essential that this be documented and that relevant parties understand the importance of these being implemented and are comfortable with the strategy. For example, if the control technique to ameliorate the risk of a fall in the stock market is to sell equities, the Board and Investment department must understand 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. This 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 precisely specifying 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 4.2, we discuss the use of adverse scenarios and realistic disaster scenarios as being an approach to quantifying the risk. If this is done and statistical distributions 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 this has 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 significant risk that liabilities cannot be met when they fall due. This 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 resource.

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 and 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 there are appropriate procedures or plans in place to respond to the 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 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 illustrates this in the context on an example.

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 determine 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 investigation that would be required to assess the impact of the associated risks on the company's financial condition. It may therefore 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 there are sufficient appropriately skilled internal staff who are independent of those underwriting the risks being considered. 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 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 they would follow market rates or allow volumes of business to vary. The company's analysis must also cover the exposure on risks that the company has accepted. 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, Further should it cease writing business it must still be able to meet its contractual obligations (including any 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 – detail
- How are these being handled
- What are the resources to meet risk
- How is the company satisfied it can meet these resources

5.4.2 It is necessary that the documentation provides sufficient information and provides an audit trail to allow a third party, 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*

5.5.1 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
- Disaster recovery programmes.

5.6 *Skills required to carry out the coordination 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 coordinator should understand how the different risks interact and be able to apply appropriate statistical theory to allow for correlations between the risks. 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, other 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 effectively co-ordinated 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.

6. PROFESSIONAL ISSUES6.1 *Professional Status*6.1.1 It is important for any actuary involved in a financial condition assessment to understand his role. He may be a mere technician responsible for overseeing calculations but with no responsibility for the underlying assumptions. Alternatively there may be a requirement to exercise professional judgement. In that case, the professional code of the actuarial body to which he belongs may apply.

6.2 *Professional Obligations*

6.2.1 The Board has the legal obligation to manage the capital resources of an insurance company. An actuary with professional responsibility for a financial condition assessment will therefore wish to ensure that his opinions and concerns are properly communicated to the Board. Actuarial bodies may issue guidance on this and on when and how actuaries should approach the Board or audit committee directly ("whistle-blowing").

6.2.2 The Board and some senior management have duties of care to a number of third parties, including shareholders and policyholders. If they ignored a financial condition report without good reason, they might be in breach of these duties. For a financial institution in the UK, they would be in breach of FSA requirements and potentially subject to discipline by the FSA.

6.2.3 For non-life insurance, the FSA proposes to introduce no "whistle-blowing" requirement for a reporting professional, whether or not an actuary, whereby the professional is required to report concerns to the FSA. This contrasts with the situation in life assurance, where the appointed actuary will be required to report major concerns to the FSA, if the Board do not. [CHECK]

7. CONCLUSIONS

7.1 We consider 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.

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.

APPENDIX A

LEGAL FRAMEWORKS

A.1 *Current UK Legal Requirement For Risks To Be Considered*

A.1.1 Although corporate governance in the United States was first highlighted by the publication of the Treadway Report in 1987, action in the UK 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, 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;
- 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. Among other things, 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 on 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 In The UK*

A.2.1 Quoted insurance companies in the UK quoted insurers 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 Financial Services Authority (FSA). Until December 2001 it was prescribed by the Insurance Companies Act 1982, by Regulations under the Act and by the gamut of associated Prudential Guidance Notes etc. FSA took full responsibility for supervision from 1 December 2001. At that date, the Insurance Companies Act, regulations and guidance were 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 A3 and A4). 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 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 certificate compliance with various Prudential Guidance Notes issued by the FSA (or previously by the DTI). For example Prudential G.N. 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 the tests one year hence. Informally 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. They therefore 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 "snap-shot" 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 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 some insurers' management do 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 Paper*

A.4.1 The FSA has consulted on proposed rules relating to the future prudential management of UK regulated financial institutions. The consultation paper (CP 97) was published in June 2001 and FSA is considering the responses and what modifications to its supervisory regime are appropriate.

A.4.2 The basic requirement proposed is for companies to ensure that they have adequate resources to meet valid liabilities to customers, 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 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 (eg 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 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 this in terms of a 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 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 We believe that the proposed FSA approach is eminently sensible and is a step forward in the regulation of insurance within the UK. 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. The FSA has not yet determined how it will check 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 will therefore 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 EU insurers. This means that costs will be imposed on UK insurers which their European competitors will not have to meet. On the other hand, we feel 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. USA, 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 EU. Canadian regulators have proposed to change the current requirements to a risk based approach that relates more closely the capital requirements 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 USA and Japan have already introduced a risk-based framework for determining the minimum capital requirement and the Australian Prudential Regulation Authority 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 Canadian Institute of Actuaries (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 UK.

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 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 UK.

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 the base scenario 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-exclusive 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 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 The Australian Prudential Regulation Authority (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 the insurers with sufficient resources are encouraged to develop an 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;

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 UK 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 the FSA appears to be taking in the UK.

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 US 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 *USA*

A.8.1 US 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, US actuaries have also developed the Dynamic Financial Analysis Handbook that sets out suggestions and guidance to actuaries performing dynamic financial analysis.

A.9 *EU*

A.9.1 The EU Commission is currently initiating a review of the methods of determining minimum solvency requirements for EU based companies. No proposals have yet emerged, but we hope that the eventual proposals will include a requirement for companies to assess whether their capital is sufficient to meet the risks to which they are subject and to be able to persuade their regulator that this is the case.

A.10 *Basle*

A.10.1 For market risk and credit risk models have been developed by the banking industry to allow the Basle Committee to produce precise capital requirements. The banks can use these to monitor and manage their risks. The Basle Committee will allow an individual bank to use its own models provided it can justify them. Event risk usually follows the techniques used in the insurance industry. Thus for these risks the banks are essentially already producing financial condition reports, thought they are not dealing with the dependencies between risks but simply add the capital requirements. In practice for these risks the results would not be materially different if a full scale actuarial study were carried out.

A.10.2 The Basle Committee has recognised that its capital requirements are deficient if provision is not made for operational risk (i.e. all the risks not covered in A10.1). Unfortunately as yet they have not come up with any proposals that actuaries would consider to be reasonable though further work is being carried out. This is complicated by the fact that operational risks are very skew and so the approximations used for market risk do not really

work. There is also likely to be some tail dependency with operational risk and market risk e.g. fraud is more likely when markets fall.

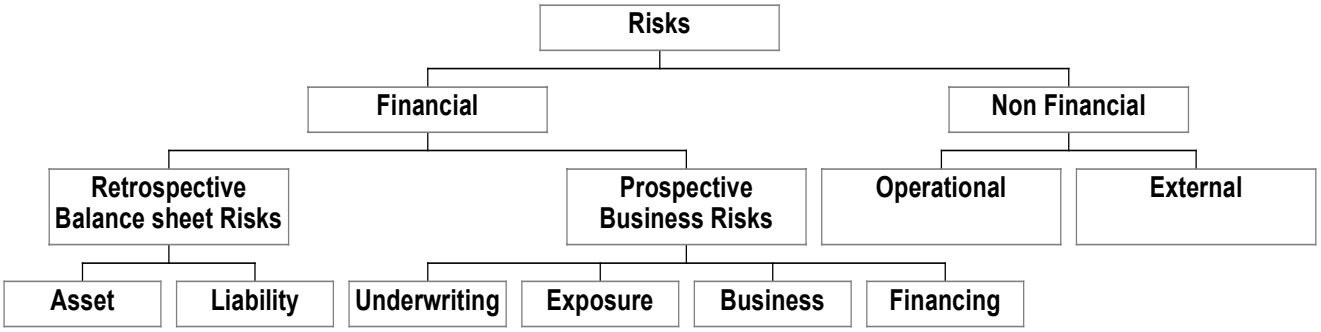
A10.3 The Basle Committee as well as some working groups are looking at ways insurance can be used to provide capital to finance this risk. One of the stumbling blocks is how to deal with policy disputes which could provide a capital shortfall precisely when it was needed.

A.10.4 We believe that there are some opportunities for actuaries in developing techniques to handle operational risk ……

APPENDIX B

B.1 *Analysis of risk*

The structure for analysing risks of a commercial organisation is shown in the table below:-



The banking industry has historically been ahead of the insurance industry in modelling risk. Risk in the banking field has traditionally been subdivided into four types:-

Market Risk
Credit Risk
Business Risk
Event Risk.

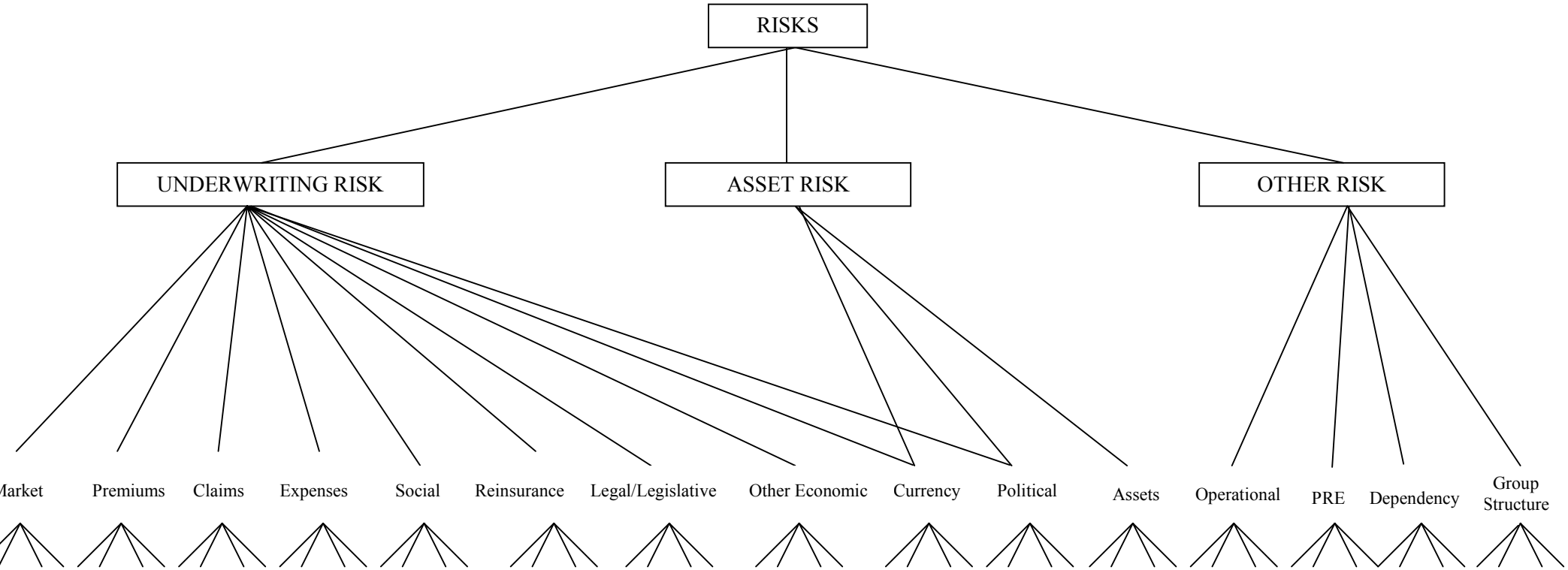
Each of the risks an industrial and an insurance company faces can be grouped into these areas. This then becomes a common framework towards analysing risk.

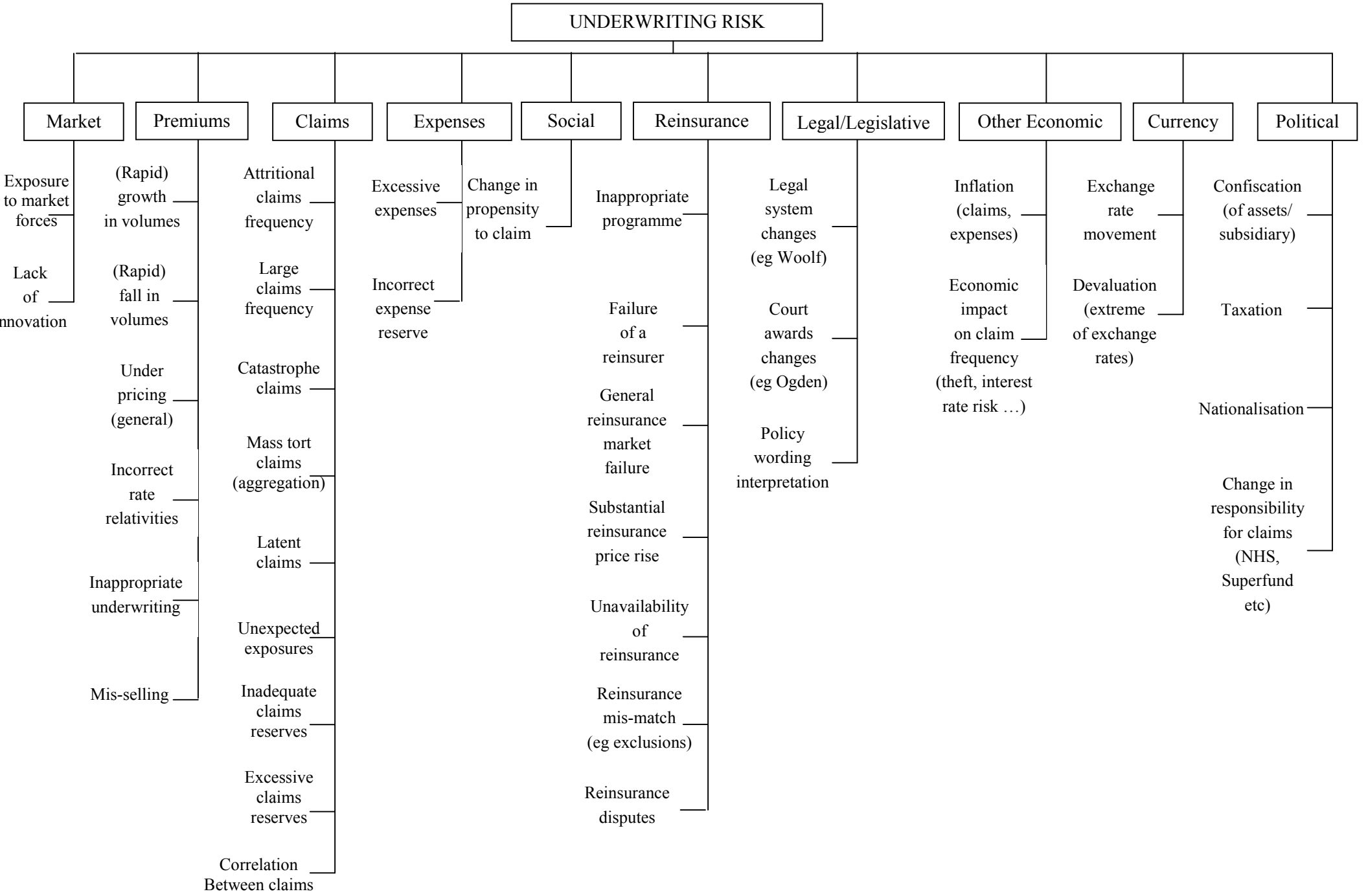
B.2 *Insurance operations*

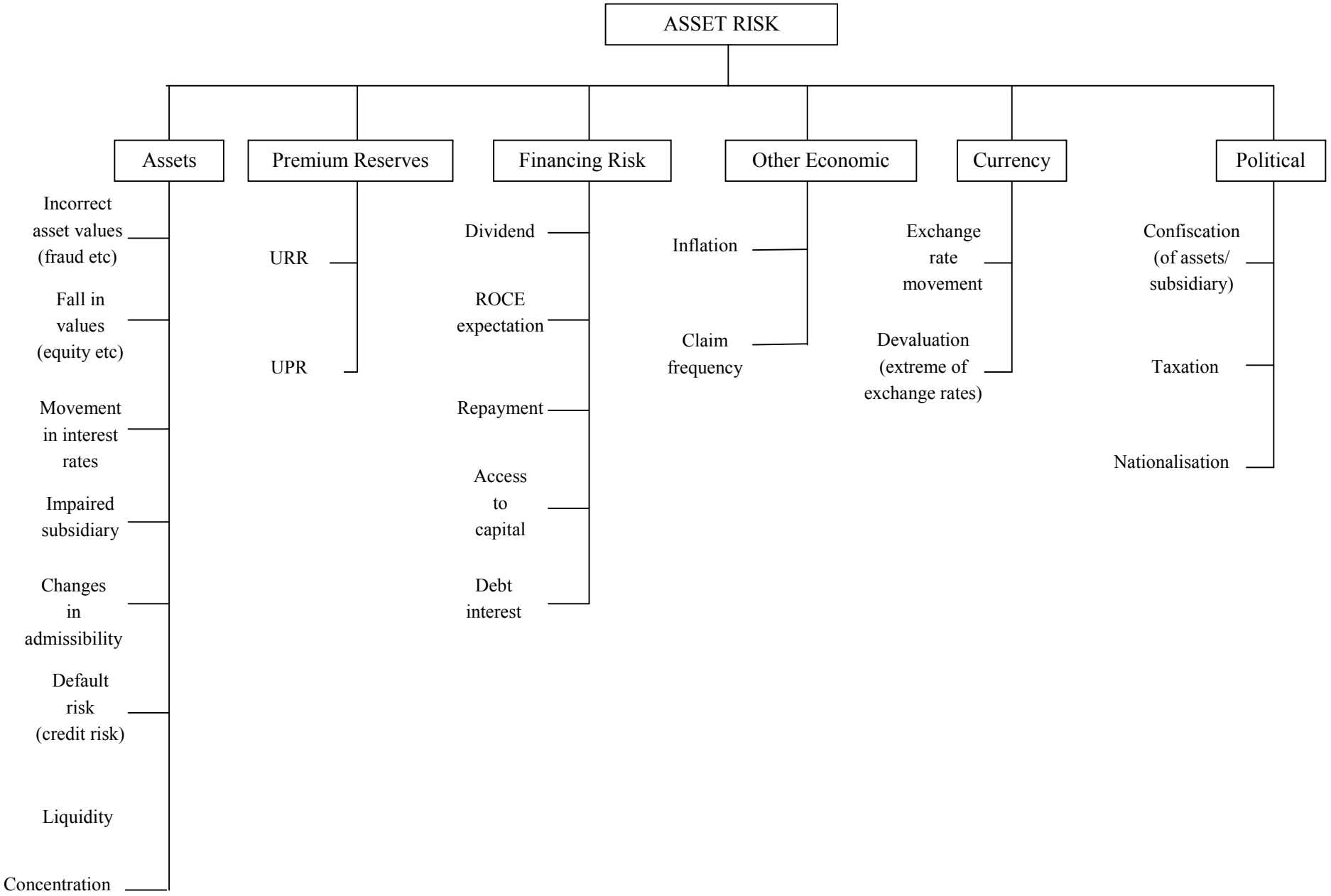
Analysing the risks faced by an insurance operation is very different. There is a much greater exposure to financial risk than companies in general. Historically insurance operations have concentrated on financial risk. While this may cover the majority of risks others can be of equal or greater importance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

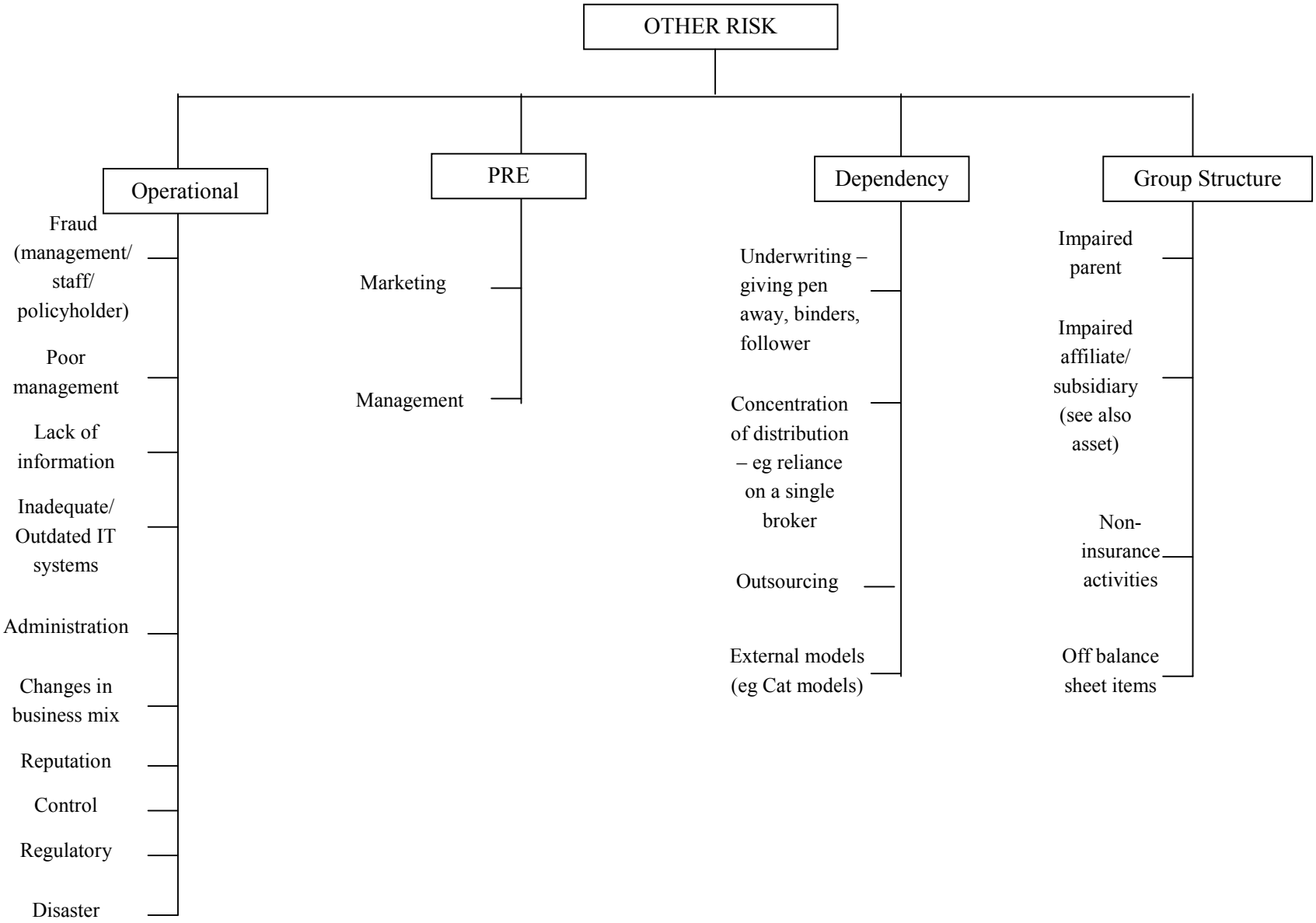
The following table indicates a structure that is more understandable to those involved in the insurance industry.

APPENDIX B - RISKS FACED BY INSURANCE COMPANIES




UNDERWRITING RISK
Market
Premiums
Claims
Expenses
Social
Reinsurance
Legal/Legislative
Other Economic
Currency
Political
Exposure to market forces
Lack of innovation
(Rapid) growth in volumes
(Rapid) fall in volumes
Under pricing (general)
Incorrect rate relativities
Inappropriate underwriting
Mis-selling
Attritional claims frequency
Large claims frequency
Catastrophe claims
Mass tort claims (aggregation)
Latent claims
Unexpected exposures
Inadequate claims reserves
Excessive claims reserves
Correlation Between claims
Excessive expenses
Incorrect expense reserve
Change in propensity to claim
Inappropriate programme
Failure of a reinsurer
General reinsurance market failure
Substantial reinsurance price rise
Unavailability of reinsurance
Reinsurance mis-match (eg exclusions)
Reinsurance disputes
Legal system changes (eg Woolf)
Court awards changes (eg Ogden)
Policy wording interpretation
Inflation (claims, expenses)
Economic impact on claim frequency (theft, interest rate risk …)
Exchange rate movement
Devaluation (extreme of exchange rates)
Confiscation (of assets/ subsidiary)
Taxation
Nationalisation
Change in responsibility for claims (NHS, Superfund etc)


ASSET RISK
Assets
Premium Reserves
Financing Risk
Other Economic
Currency
Political
Incorrect asset values (fraud etc)
Fall in values (equity etc)
Movement in interest rates
Impaired subsidiary
Changes in admissibility
Default risk (credit risk)
Liquidity
Concentration
URR
UPR
Dividend
ROCE expectation
Repayment
Access to capital
Debt interest
Inflation
Claim frequency
Exchange rate movement
Devaluation (extreme of exchange rates)
Confiscation (of assets/ subsidiary)
Taxation
Nationalisation


OTHER RISK
Operational
Fraud (management/ staff/ policyholder)
Poor management
Lack of information
Inadequate/ Outdated IT systems
Administration
Changes in business mix
Reputation
Control
Regulatory
Disaster
PRE
Marketing
Management
Dependency
Underwriting – giving pen away, binders, follower
Concentration of distribution – eg reliance on a single broker
Outsourcing
External models (eg Cat models)
Group Structure
Impaired parent
Impaired affiliate/ subsidiary (see also asset)
Non-insurance activities
Off balance sheet items

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 this 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 volumes written by the company were 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 is usually thought of as an issue facing life insurance companies relevant to such things as bonus declarations. However, it is 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 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 For some of the other risks that we have suggested 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 they are asked to analyse. It may therefore become clear whether the company is able to produce data in similar forms and detail to that which 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 coodinator, to the evidence that has been found.

B.4 *Generic Risks*

√ Where actuarial techniques can be used to assess the risk
? Where actuarial techniques may be of assistance in assessing part of the risk
X Where actuarial techniques are not thought likely to contribute to the assessment of risk, but may be of use in quantifying the risks assessed by other professionals

Risk	Actuarial Assessment
Underwriting Risk	
Market Issues	
Lack of innovation (or excessive) relative to others	X
Exposure to market forces (underpricing...)	?
Underwriting controls	
Inappropriate underwriting strategy	?
Failure to apply underwriting guidelines (acceptance criteria)	X
Mis-classification of business	X
Mis-selling	
Premiums	
(Rapid) Growth in volumes [under pricing]	?
(Rapid) Fall in volumes [excessive pricing]	?
Pricing	
Incorrect pricing (general)	√
• Claims (amount/timing)	
• Expenses	
• Reinsurance price	
• Earnings (returns/discounts)	
• Actuarial/accounting systems	
Incorrect rate relativities	√
• Methodology	
• Data	
Claims	
Frequency of attritional claims	√
Frequency of large claims	√
Catastrophe claims	√
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	√
Expenses	
Excessive expenses	?
Incorrect expense reserve	√

Social
Change in propensity to claim ?

Currency
Movement in exchange rates √
Devaluation (extreme of exchange rates) ?

Reinsurance
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 (eg exclusions, basis of cover) √
Reinsurance disputes ?
Financial reinsurance /ART (accounting for actual impact) √

Legal / Legislative
Changes in legal systems (eg Woolf) ?
Changes in court awards (eg Ogden) ?
Policy wording interpretation ?

Political
Confiscation (of assets / subsidiary) X
Taxation √
Nationalisation X
Change in responsibility for claims (NHS costs, superfund, ...) ?

Asset Risk

Assets
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 ?
Changes in admissibility X
Default risk (credit risk) ?
Liquidity ?
Concentration
- Counterparty / Credit risk
- Diversification / Volatility risk
- Diversification (return) risk
- Portfolio management risk

Premium Reserves

Incorrect premium recognition	√
Incorrect unexpired risk assessment	√

Financing Risk

Dividend commitments / expectations	√
Return on capital expectations	√
Repayment	√
Access to capital /debt (type & form)	?
Debt interest / repayment commitments (& cash flow issues)	√

Other Economic

Inflation (claims, expenses)	√
Economic impact on claim frequency (theft, interest rate risk...)	√

Other Risk

Operational Risks

Fraud (management/staff/policyholder) X
- Inadequate controls
- Inadequate procedures for dealing with fraud
- Inadequate prevention / detection mechanisms

Management Risk X
- Sound & prudent
- Fit & proper
- Insufficient development of staff
- Unsuitable/insufficient resources / staff
- Over-reliance on key persons

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 (UK, EU, 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 UK /EU / International	
Audit Risk	X
• Inadequate internal audit	
• Inadequate external audit	
• Audit Committee (lack of) / Compliance audits (lack of)	
Reporting Risk	X
• Reliability and timeliness	
• Usefulness / Relevance	
• Data integrity	
Exposure Risk	?
• Product & liability insurance	
• Inadequate 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	
Changes in business mix	√
Lack of diversification (or excessive)	√
Increase in line size	√

Policyholders Reasonable Expectations (PRE*)*
Marketing should give fair representation
Management of policies should be consistent with PRE

Dependency on Others	
Underwriting - giving pen away, binders, follower	
Concentration of distribution -	
eg reliance on a single broker	
Outsourcing	
External models	
(eg Cat models)	
Group Structure	
Impaired parent	?
Impaired affiliate / subsidiary (see also asset)	?
Non-insurance activities	
Off balance sheet items	?

APPENDIX C

CONTRIBUTION OF DIFFERENT PROFESIONALS TO ASSESSMENT OF RISK

Risk	Cause of insolvency	Professional Contribution to Risk Assessment				Contribution to Overall Opinion			
		Actuary	Accountant	Other	Noone	Actuary	Accountant	Other	Noone
Underwriting risks									
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%	-	20%	40%	2.4%	-	1.2%	2.4%
Total	*42%*	*60.9%*	*13.3%*	*20.0%*	*5.7%*	*25.6%*	*5.6%*	*8.4%*	*2.4%*
Asset risks									
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%*
Other risks									
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%***	***18.0%***	***22.2%***

(a) Source: 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 aggregate financial condition. This involves the aggregating of the risk profiles of each of the individual risks faced by the company. This section 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, compared to considering each risk separately and just summing the totals. 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, for instance 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.

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 Dynamic Financial Analysis (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 for these the model may need to be augmented by other approaches. For example, if a company is insuring a specific event that has very low probability but high severity, the company will need to demonstrate that it has the financial resources to meet the liability should the specific event occur. In this case, individual risk investigation 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, but undue reliance should not be placed on a model whose appropriateness or parameters are uncertain. 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 lower correlation. By effectively assessing risks in isolation this could lead to a higher level of financial resources being required. It is therefore 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 We have categorised the various approaches into categories to facilitate the analysis of when to use which method. The various categories are:-

- *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. More elaborate.

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, 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*

For example, a fall in equity values at 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 adverse experience.

h. *Stress testing scenarios*

Rather than assessing 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*

As **e.**, **f.** or **g.** but allowing a distribution for the scenarios.

k. *DFA modelling*

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*

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, 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 take any credit for independence. There are, however, techniques available to take some credit for independence.

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 as the decision is essentially binary. It becomes more problematic when the financial condition of a company is considered. It may therefore 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 we are concerned with 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 because 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 "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.

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

D.4.1 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. A consequence 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 the skew risks typical of many insurance operations.

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

D.5.1 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 against the risk standard adopted. 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 Risk Based Capital amount to achieve this level of EPD, as per the Lloyd's Risk Based Capital approach, then this measure of risk gets around that particular problem with EPD.

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

D.6.1 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*

D.7.1 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 *Further comments on risk measures*

D.8.1 Whatever 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 what 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.8.2 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.8.3 If the level of risk is too high the actuary may wish to suggest approaches on how to manage the position.

D.9 *Dealing with dependencies*

D.9.1 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 they have before them. As such it is a highly important issue when looking at the overall position of a company.

D.9.2 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.9.3 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 only consider 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 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.9.4 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. For instance 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.9.5 If the dependency analysis only went this far it would imply that it is believed that all of the various risk 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.9.6 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.9.7 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 that 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, continuance of this must be justified before it is assumed to continue.

D.9.8 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.9.9 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 joint 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.9.10 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.9.11 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.9.12 The treatment of dependencies will also depend on the risk measure chosen. For example if Value-at-Risk (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.9.13 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 of the experience. Similarly there may be strong dependencies on a particular channel of distribution or even one broker.

D.9.14 The most explicit form of dependency modelling will occur when a DFA approach is used. In those cases a requirement must be that either it reflects the dependencies that is thought 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 analyses of actual loss experience

D.9.15 When performing an individual scenario test judgements need to be made. In some circumstances 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.9.16 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 REPORTING PROCESS

E.1 This Appendix provides an example to illustrate 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 example then shows 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 UK based, writing personal lines, motor and household, through insurance brokers. It has recently appointed a chief executive and a newly qualified in-house actuary. The company has a branch network throughout the UK 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	100	Bonds	580
	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. The company concluded that there is no need therefore 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 rates charged previously 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 regular reviews and monitoring of surpluses and deficiencies on individual case estimates and considers them 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 and what other companies buy. No formal studies are carried out other than a letter from the company's brokers advising it of the proposed arrangements.

E.2.7 The computer upgrade is being managed by external specialists. 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 3 years. It is currently projecting a substantial increase in the volumes of business of 25% per annum in real terms for each of the next 3 years. This growth is required to justify the investment in the computer system. The company believes 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 formally looks at the capital once a year by comparing the company solvency margin with its peer competitors.

E.3 *Suggested Further Individual Risk Assessments*.

E3.1 Given the rapid expansion plans it is suggested that an actuarial study of rating relativities and areas of relative profitability and unprofitability should be conducted. Given the lack of 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 specialists 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 specialist 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 specialist, such as 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 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 reviewed 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, business mix or the external environment (for instance as the result of legal or economic changes).

E.4 *Risk Co-ordination Work*

E.4.1 In view of the lack of experience of the internal staff, the company has commissioned an external actuarial consultant 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 providing 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 3-5 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 expected to alter claims amounts or the timing of settlements (eg "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. The capital 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 3 years unless some changes were made to the operations.

E.4.6 The Board would need to decide whether to raise more capital or make changes to the operations. The consultant's 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 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 he cannot or will not absorb the costs.

E.5 *Standards Of Solvency*

E.5.1 The Board asked the consultants 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 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 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 shown the various adverse scenarios and their effects and the various interrelationships when calculating the various probabilities of ruin and indicating the distribution of possible outcomes. Most of this would have been derived from the stochastic computer model. However in this example the model excluded the computer risk. It is possible to adjust the model for this risk and and show how it affects the various scenarios. However in this case the firm decided that it was easier to consider the two separately and, bearing in mind the size and the importance of the computer system, recommended the company hold capital against each of this operational risk and the remaining financial risk. A more sophisticated model could allow for some degree of independence of these types of risks but it was felt that this was being over elaborate given the size of the company and the scope of the consultant's work.

E.5.4 The Board then considered how to formulate its view on its required solvency standard. A possible approach would be the minimum acceptable to the regulatory authorities, though this will 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 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 options.

E.5.5 Although not relevant for FSA requirements, the Board was concerned that it was not using its capital efficiently. Thus the Board raised the issue of how capital should be allocated to each of the various parts of the company. The consultant pointed out that the risk measures that were appropriate for allocation to lines of business were not the same as those that would be acceptable to 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 between the capital allocated to the motor lines and that allocated 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 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 formally document the process. 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:

- List of all the material risks the company faces. Smaller risks are best dealt with as budgetary items.
- Provide 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.
- 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 Include a summary of the company's 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 modify the expansion plans if 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. An important aspect would be to demonstrate that systems and controls (especially checks and balances on managers) were adequate.
B	As "A" but capital appears to be just adequate.	This would require substantial amounts of work, but all of which 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 a financial condition report would add significantly to knowledge of the management and the regulator so reducing the risk of insolvency. Opinions on the constituent parts would not allow any 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" but also provides the only way to properly assess 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 or even become insolvent.
E	Complex London market company (writing a heterogeneous book of international insurance and reinsurance business) with a heavy reinsurance programme.	This would be expensive but would add significantly to the understanding of the real financial position of the company.

APPENDIX G

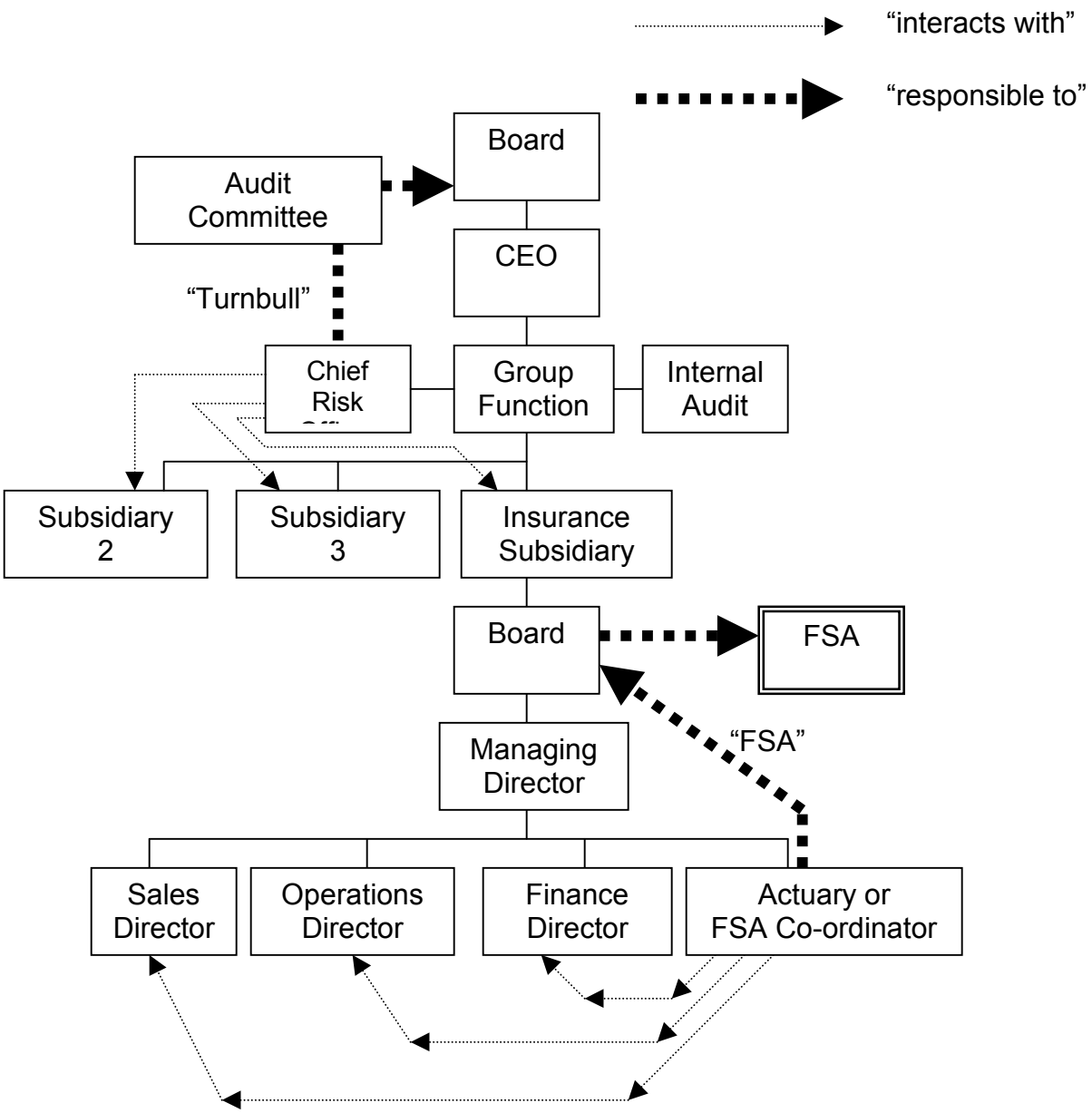
BIBLIOGRAPHY

1. Dynamic Capital Adequacy Testing – Committee on Solvency standards for financial institutions – Canadian Institute of Actuaries – December 1998
2. Educational Note : Dynamic Capital Adequacy Testing – Life and Property Casualty - Committee on Solvency standards for financial institutions – Canadian Institute of Actuaries – June 1999
3. "NAIC Property/Casualty Insurance Company Risk-Based Capital Requirements" - SHOLOM FELDBLUM - PCAS LXXXIII, 1996
4. GENERAL INSURANCE BOARD (1998). *Actuarial opinions for companies transacting general business*, Institute of Actuaries and Faculty of Actuaries, October 1998.
5. HINDLEY, D.J. (2000), *The Lloyd's Reinsurance to Close Process*, Presented to the Institute of Actuaries 27 March 2000.
6. *Dynamic Capital Adequacy Testing*, Standard of Practice, Committee on Solvency Standards for Financial Institutions, Canadian Institute of Actuaries December 1998.
7. *Insolvency: Will Historic Trends Return*? A.M. BEST Special Report, February 1999.
8. Sigma No 7 (1995), *Development of insolvencies and the importance of security in the insurance industry*, Swiss Re.
9. HOOKER, N.D. (1996), *Risk Based Capital in General Insurance*, BAJ Volume 2 Part II 1996.
10. COUTTS S.M. (1997), *Modelling the Impact of Reinsurance on Financial Strength*, BAJ Volume 3 Part III 1997.
11. Sigma No 1 (2000), *Solvency of non-life insurers*: *Balancing security and profitability expectations*, Swiss Re **[Effectively supersedes 7/1995]**
12. The Valuation Of General Insurance Companies By JP Ryan, MA, FIA, ASA, ACAS, MAAA, FIRM, AMSIA and KPW Larner, MSc, FIA, ASA. Presented to the Institute of Actuaries, 4 June 1990.

WEBSITES

1. Draft Prudential Standard on Risk Management for General Insurers (00.32) – APRA 13/9/2000 [Internet site: www.apra.gov.au/mediareleases]
2. Guidelines on actuarial advice on insurance liabilities(00.25) – APRA 15/8/2000 [Internet site: www.apra.gov.au/mediareleases]
1. Prudential Standard on Capital Adequacy for General Insurers (00.24) – APRA 28/7/2000 [Internet site: www.apra.gov.au/mediareleases]
2. Proposed Reforms to the Prudential Supervision of General Insurance Companies in Australia – APRA April 2000 [Internet site: www.apra.gov.au/mediareleases]
5. *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]

Coherent Risk Measure references.


"interacts with"
"responsible to"
Board
Audit Committee
CEO
"Turnbull"
Chief Risk
Group Function
Internal Audit
Subsidiary 2
Subsidiary 3
Insurance Subsidiary
Board
FSA
"FSA"
Managing Director
Sales Director
Operations Director
Finance Director
Actuary or FSA Co-ordinator