THE INSTITUTE OF ACTUARIES OF AUSTRALIA
A.B.N. 69 000 423 656

GUIDANCE NOTE 353
EVALUATION OF GENERAL INSURANCE TECHNICAL LIABILITIES

INTRODUCTION

Application

This guidance note is issued to supplement Professional Standard 300 (PS 300) and is to be read in conjunction with that standard. It applies to actuaries preparing estimates of technical liabilities for general insurance entities. Its application is mandatory for valuations under Prudential Standard GPS 210, issued by the Australian Prudential Regulation Authority (APRA) for the purposes of the *Insurance Act 1973* as in force from time to time.

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[Note: The IAAust's Technical Guidance Note (Australian Actuarial Journal, 2002, Volume 8, Issue 2, pp365-396) continues to be a useful practical adjunct to PS 300 and GN 353 but without formal endorsement by the IAAust. In due course, it is expected that the Technical Guidance Note will be superseded by IAAust practice notes and educational material.]

DEFINITIONS

1. The definitions included in PS 300 (paragraphs 5 through 14) apply.

2. The following definitions also apply:

   a) A **valuation unit** is a line of business, a part of a line of business, a group of lines of business or a group of parts of lines of business which is treated as a single entity for the purposes of the actuarial valuation.

   b) **Standard** inflation is inflation measured by a published index, such as AWE for wages or CPI for prices, where an *a priori* link between such inflation and claim payments is believed to be present.

c) **Superimposed** inflation is the difference between total claim escalation and standard inflation.

PRODUCT KNOWLEDGE AND DATA CHECKING

3. The actuary is required to ensure that the data used for a valuation of technical provisions is appropriate and sufficient for the specified purpose of the valuation.

4. The actuary should be familiar with the characteristics of the insurance processes and claim processes that may materially affect the estimation of the insurance liabilities. This may include familiarity with:

   a) the nature of coverage, including any unusual terms and conditions of contracts;

   b) the underwriting strategy and the nature and mix of risks underwritten;

   c) the benefits payable under policy terms or by virtue of legislation, including deductibles and limits;

   d) the reinsurance arrangements, including any special or unusual features of reinsurance agreements that might affect reinsurance recoveries;

   e) the claim management philosophies, rules and guidelines, and the company's practices in setting case estimates;

   f) any monitoring reports that the insurer prepares of its claim and underwriting performance including any reports into compliance with claim and underwriting guidelines.

5. The actuary should also be familiar with economic, technological, medical, environmental, regulatory and social changes and trends within the broader community that may affect the value of the insurance liabilities. The actuary should also be aware that there may be changes in data quality or interpretation when staff turnover affects key positions, where personnel have a central role in the preparation of accounts or other relevant data.

6. It is the actuary's responsibility to ensure that the data gives an appropriate basis for estimating the insurance liabilities. This includes the insurer's own experience and claim experience data, but should extend to industry data, where the insurer's own data is

not sufficient to reduce the uncertainty to an acceptable level. Where even industry data is sparse, it may be necessary to rely, to a greater or a lesser extent, on subjective assessment. The appropriate compromise between the cost of better data and the benefit, in terms of more reliable estimation, is a matter for actuarial judgment, which should take into account the materiality of the reduction in uncertainty that might result.

7. The actuary should consider obtaining data at the most basic transactional level, rather than working from data that have already been summarised or aggregated. This should enable the actuary to better understand the data, and to identify data anomalies and seek appropriate rectification, or allow for errors or anomalies in the calculation of the liabilities.

8. The actuary should take reasonable steps to verify the consistency, completeness and reliability of the data collated, against the company's financial records. The actuary should discuss the completeness, accuracy and reliability of the data with the company's auditor (refer to GN 551 'Actuaries and Auditors'). The actuary should include in the written report on the valuation of the liabilities a description of the measures taken to investigate the validity of the data, and should outline the results of those data checks.

9. The degree to which the actuary relies upon the data provided by the company or upon earlier or later testing of the data by the company's auditors, and the resulting limitations that this places on the reliability of the actuary's conclusions, should be commented on in the report.

10. In order to meet reporting deadlines, the actuary may be asked to value insurance liabilities as at a valuation date prior to the reporting date. In such circumstances, the following approaches are considered to be acceptable:

    a) The valuation may be undertaken at an earlier date, and the resulting estimates subsequently updated to the valuation date.

    b) The valuation models may be derived from data at an earlier date, and subsequently applied to data at the valuation date.

    In either case, the actuary must consider experience between the earlier date and the valuation date, and make such adjustments as considered necessary. In particular, for calculations made in accordance with accounting standards AASB1023/AAS26 the rate

of discount adopted in the calculations must be appropriate to market values at the valuation date. The actuary should refer in the report on the extent of any additional uncertainty created by the approach adopted.

GLOBAL ASSUMPTIONS

Claim Inflation

Standard and superimposed inflation

11. For many classes of business, the amount of a claim will depend on money values at the time of payment. This occurs particularly in personal injury claims, where claim amounts are often defined by statute to reflect inflation between date of injury and date of payment. Amounts paid for medical, rehabilitation benefits, etc., will also reflect money values at the time of payment.

12. Even where there is no direct link between the amount of claim and money values at the time, claim inflation can still occur, as a result of legal decisions, for example.

13. Claim inflation may be incorporated into the estimates of outstanding liabilities either implicitly or explicitly. If this is done explicitly, then it is usual to convert past historical payments into values as at the date of calculation. Allowance must then be made for future claim inflation. In doing this, it may be useful to separate claim escalation into standard inflation and superimposed inflation.

14. Analysis of past claim escalation should form a basis for the assumptions regarding future claim escalation. Whatever the source of such escalation, the actuary should allow for all expected escalation in estimating the amount of outstanding claims.

Sources of estimates of standard inflation

15. Standard inflation is not specific to an insurer's portfolio. It is an external factor operating in the economy at large. As such, it is appropriate to refer to publicly available information. Histories of past wage and price inflation are available from the Australian Bureau of Statistics (ABS). However, there are a number of alternative indices and care should be taken to choose the one which is most appropriate to class of business being considered (for example, State-specific, gender-specific, ordinary wages or total earnings, wage cost index, CPI (overall or segment)).

16. In forming an assumption for future standard inflation, the actuary may consider:

    a) estimates made by economic forecasting groups. Economists would often be expected to have greater expertise in this area than actuaries, and most will have highly developed econometric models;

    b) an econometric model derived from past experience;

    c) The returns available on Government CPI-indexed bonds. These can be used to give an indication of the market's assessment of price inflation, which can then be used to determine a corresponding assessment of wage inflation. When using this method the actuary should ensure that they fully understand all of the factors that impact the yield on CPI-indexed bonds before deriving an inflation forecast.

17. Different approaches may be taken to short-term and medium to long-term standard inflation. For example, estimates from economic forecasting groups rarely extend beyond 3-5 years. The returns from CPI-indexed bonds may be a more appropriate basis for medium to long-term assumptions.

Sources of estimates of superimposed inflation

18. Unlike standard inflation, superimposed inflation is specific to an insurer's portfolio. Furthermore, it is specific to the claim statistics being analysed for modelling purposes. Superimposed inflation may be present in one statistic and not another.

19. It follows that an assessment of superimposed inflation should derive ideally from analyses of the insurers' own claim statistics.

20. However, it is often the case that, in smaller portfolios, it is difficult to be definitive as to the existence of superimposed inflation, let alone its absolute level. In such cases, it is reasonable to give some recognition to wider industry analyses, or to generally accepted views adopted by other actuaries.

21. Superimposed inflation may not operate in the same manner as standard inflation. In particular, it may not emerge as a uniform addition to standard inflation. Several years of experience without any superimposed inflation may be followed by a sudden and extreme burst of superimposed inflation, which may persist for some years, and then cease. This feature makes it very difficult to form a

view on future superimposed inflation, and there is always a high degree of uncertainty.

22. The sources of superimposed inflation are many and varied, but it tends to be present (at some point) in most classes which cover personal injury claims and which are influenced by judicial decisions.

23. If the sources of superimposed inflation can be identified and quantified, then they should be formally incorporated in the modelling process. For example, payments per claim incurred may be increasing due to an acceleration in the rate of finalisation of claims. This can be explicitly modelled by methods incorporating operational time, such as the payments per claim finalised model in operational time. In many instances, however, it is not possible to identify and quantify the precise causes of superimposed inflation. In such cases, a broad allowance may be made through an addition to the rate of future claims escalation.

Discount Rates

Discounting principles

24. There are a variety of approaches to the derivation of an investment return assumption for discounting insurance liabilities. These include:

    a) the rate of return expected to be earned on the assets supporting the liabilities;

    b) the rate of return on a hypothetical matched portfolio of sovereign fixed-interest securities;

    c) the time value of money;

    d) financial economic theory.

25. Specific assets or pools of assets are seldom identified as supporting general insurance liabilities. If the expected return approach is used, a distinction can be drawn between assets which earn an identifiable investment return (such as investments) and those which do not (for example, creditors, fixed assets). Under this approach, it is sometimes presumed that, as far as possible, the insurance liabilities are considered to be supported by fixed interest investments, and that equity investments are considered as supporting shareholders' funds or free reserves/capital. It is also

important to recognise that the apparent rate of return on assets includes an allowance for any default risk and, to that extent, is greater than the expected rate of return.

26. One way of allowing for the default risk is to assume that this is the only reason for market rates of return on commercial fixed interest securities in excess of the rate of return on sovereign fixed interest securities. In Australia, these are Commonwealth Government Bonds. This leads to the hypothetical matched portfolio approach.

27. The time value of money is usually assumed to be embodied in the yield curve on sovereign fixed interest securities. This is commonly referred to as 'the risk-free rate', even though it is neither totally free of risk nor a single rate.

28. The financial economics approach starts with the principle that the economic value of a sequence of cash flows is their discounted value, and that the appropriate discount rate is determined by the nature of those cash flows. Under this approach, the discount rate is dependent upon the rates of return available in the investment market, and the relationship of the insurance cash flows to that market. The discount rate is therefore independent of an insurer's own asset portfolio.

29. In Australia, there is as yet no consensus on the preferred approach. The actuary should consider the relative merits of the various approaches, and if in doubt consult with professional colleagues.

30. In practice the choice of discount rate is very often strongly influenced by, and sometimes determined by, the regulatory environment in which the actuary is reporting (see paragraph 37).

31. The actuary must consider the taxation environment in which the valuation results are to be reported. For most general insurance operations, the movement in the liability for outstanding claims is tax-deductible and it is appropriate to use a discount rate assumption which is gross of income tax. However, there may be instances where this is not the case (for example, at one stage such liabilities for self-insurers were not tax deductible).

32. As with all other assumptions underlying the valuation of outstanding claims, the actuary must consider the uncertainty in the discount rate assumption when advising on the overall level of uncertainty.

33. For a comprehensive discussion on the principles of discounting, the actuary should refer to 'A Coherent Framework for Discount Rates' by the IAAust Discount Rate Taskforce (Australian Actuarial Journal, 2001, Volume 7, Issue 3, pp435-572).

Liability betas

34. In the financial economics approach, it is necessary to consider the relationship between the insurance claim experience and the investment returns available in the market The Capital Asset Pricing Model (CAPM) formula underlying this theory introduces the notion of a *liability beta,* which quantifies this relationship. (While the theoretical derivation of CAPM is mathematically sound, there is by no means universal agreement as to the assumptions on which this structure is based. In particular, the *efficient market hypothesis*, which is central to the conclusion that the market does not charge for diversifiable risk, is widely questioned.)

35. So far, the work carried out on this aspect suggests that, for many insurance classes, there is little correlation between the two factors. This would imply a liability beta close to zero, and hence the use of a risk-free rate of discount.

36. However, in some classes, there is an *a priori* reason to believe that such a correlation does exist. For example, there are some classes, such as workers' compensation and professional indemnity, where it might be expected that claim experience deteriorates in times of poor market performance. This implies a negative liability beta and hence a discount rate which is less than risk-free. The effect of such a reduction from the risk-free rate would usually be considered as forming part of the risk margin on central estimates.

The regulatory environment

37. The two most important regulatory regimes for actuaries working in general insurance are those of Accounting Standards, particularly AASB1023/AAS26 (and subsequently supplemented in AAG13), and the *Insurance Act 1973*, particularly APRA Prudential Standard GPS 210. Other regulatory regimes, such as state based workers compensation and CTP, may also be relevant.

38. At present, Australian Accounting Standards provide a choice of discount rate between:

    a) a rate derived from the insurer's own assets, and which is 'sustainable' over the claim runoff period (as noted in paragraph

25 above, this rate should be adjusted for default risk, although this is not clear from AAGN13); or

b) the risk-free rate of return, derived from the market values of Commonwealth Government fixed-interest securities of duration similar to the claim runoff.

39. APRA Prudential Standard GPS 210 is more prescriptive. It requires actuaries to use the risk-free rate.

40. With respect to risk-free rates, it is acceptable to use either an average rate weighted by cash flows or a series of discount rates taken from the corresponding yield curve.

41. There are usually gaps in the maturity dates available and the longest dated security may not be long enough. It is appropriate to smooth, interpolate and extrapolate from the observed yields. When extrapolating, the reasonableness of the resulting rates for use in long-term discounting must be considered.

42. For liabilities in other currencies, the risk-free rate is derived from the corresponding yields on sovereign fixed interest securities in those currencies. Any foreign exchange risk should be considered in setting the risk margin for addition to central estimates.

Policy and Claim Administration Expenses

43. A separate allowance for policy and claim administration expenses will be necessary where such expenses are not included elsewhere in the data being analysed for outstanding claim and premium liabilities.

44. As with all assumptions, the actuary should attempt to analyse historical levels of expenses. However, it is often the case that internal insurer expense analyses do not properly allocate expenses between policy issue, ongoing policy administration, claim establishment and claim management. In such cases, it is acceptable to have regard to allowances made elsewhere in the market, with a comment to this effect included in the actuary's report. The actuary should always ensure that the allowances seem reasonable when considered in the context of the insurer's total administration expenses.

45. The accounting standards require expense allowances to be made on a going-concern basis. They should include appropriate proportions of general overheads, senior management costs, etc.

46. It is conventional to express the allowance for claim administration expenses as a percentage of gross payments. However, where there are unusually large gross outstanding claims, it may be appropriate to make an allowance based on a more usual mix of claims.

47. Claim administration expenses vary by portfolio and by the type and age of claims within a portfolio. For a stable, active portfolio it is usually reasonable to adopt an average rate for all claims. More detailed approaches are also possible, but are unlikely to result in a materially better estimate for a stable portfolio. However, in a closed portfolio, an increasing expense allowance may be needed.

48. While it is possible to develop complex approaches to the question of claim administration expenses, the actuary should be conscious of the materiality of the allowance within the context of the overall estimate of outstanding claims.

METHODOLOGY

APRA Valuation Process

49. The approved actuary undertaking a statutory valuation under APRA Prudential Standard GPS 210 is required to determine a central estimate of the liability and to recommend a valuation margin which, when added to the central estimate, gives a provision intended to secure a 75% probability of adequacy (but not less than half a standard deviation above the mean).

50. Initially, this must be done separately for outstanding claims and unexpired risks for each valuation unit, taken in isolation. In a separate step, the central estimates and valuation margins are added together and the sum of the valuation margins is reduced, by a 'diversification benefit', so that the overall margin, for the reporting entity, meets the 75% adequacy test, but is not less than half of the combined standard deviation.

51. Paragraph 17 of APRA GPS 210 specifies that the central estimate must be intended to be the mean of the underlying probability distribution. Paragraph 12 of IAAust PS 300 extends this requirement to all actuarial valuations of general insurance liabilities.

52. While many actuaries may find it helpful to do so, it is not necessary to form an explicit view as to the shape of an underlying probability distribution, either for a particular valuation unit or of the aggregate

liability. What is required is a view as to the mean and 75th percentile, separately for outstanding claims and unexpired risks for each valuation unit, and in aggregate and, in cases where the overall uncertainty is likely to be highly skew, the standard deviation. (The phrase 'intended to secure' covers the situation where these quantities cannot be reliably estimated from an explicit probability distribution.)

53. Where an explicit probability distribution is not used, it is important to recognise that many general insurance probability distributions are positively skewed. That is, there is often a wider spread of larger (absolute) values than of smaller values. As a result, the mean is usually greater (in absolute value) than either the mode or the median. There is a natural tendency, in informal estimation, to use the most probable value. This can lead to underestimation.

54. When an explicit probability distribution is used, it is important to ensure that it appropriately reflects any material skewness and that the central estimate incorporates any corrections for skewness, appropriate to the distribution. Again, failure to observe these steps can lead to underestimation.

55. The estimated uncertainty for each valuation unit should normally make appropriate allowance for reinsurance, including both the reduction in uncertainty inherent in the reinsurance terms and the diminution in this reduction, on account of the risk that these terms will not be observed.

56. Where a reinsurer is in default, or known to be at serious risk of default, however, such reinsurances should be reported on explicitly, rather than as a component of the net liability. Other asset risks should not be allowed for in determining the liability risk margin for APRA valuations, since they are reported on and allowed for elsewhere.

57. The purpose of the diversification allowance required under paragraph 14 of GPS 210 is to recognise that, when two or more classes of insurance are combined, the risk margin required to meet APRA's criterion may be less than the sum of the risk margins required to meet that criterion for each class taken in isolation. The uncertainties, which give rise to the need for a risk margin, can be crudely classified as either independent or systemic. Independent variation is, by definition, not correlated to anything and always gives rise to a diversification benefit. Systemic uncertainty can be correlated to varying degrees between classes. Some sources of

systemic uncertainty are only relevant to a single class, but most affect more than one class. Caution should be exercised in assuming a low degree of correlation, in the absence of experiential evidence.

58. It is also important to draw a distinction between correlations between the uncertainties in different classes, which should form the basis of the diversification calculation, and correlations arising because of trends in the experience. Trends should be recognised in the central estimate, rather than in the margin for uncertainty.

59. The calculation of the diversification benefit can proceed from the top down, starting from an estimate of uncertainty based on Dynamic Financial Analysis (DFA) or similar modelling techniques, or from the bottom up, by combining the uncertainties of the separate valuation units, with due allowance for correlations between them. In either case, once the global risk margin is determined, it (or, equivalently, the diversification benefit) must be apportioned between the APRA lines of business. The actuary performing such tasks is expected to be familiar with the appropriate techniques.

60. It should be noted that, under at least one theoretical approach, this process can result in negative risk margins for one or more lines of business. Such results are not acceptable to APRA. If such results are to be reported for other purposes, extreme care is needed to ensure that they are reported in such a way that users are not misled.

Changes in Valuation Model

61. The valuation model and assumptions need to reflect the actuary's interpretation of the data available at the current valuation date. The impact of any changes in assumptions should not be smoothed over future periods but should be reflected entirely in the central estimate.

62. Where the actuary has a prior valuation as a starting point, the actuary needs to comment on the new data that has emerged between the valuations in the context of the previous valuation model/assumptions. This could be by reference, for example, to an analysis of expected versus actual outcomes.

63. Where the new data available at the current valuation date suggests a change in approach and/or assumptions from the previous

valuation, the actuary needs to discuss the impact on the valuation model/assumptions adopted.

64. New data should be given weight appropriate to the credibility of that new data. The actuary should explain the basis of arriving at the level of credibility and the impact on valuation outcomes. The actuary should take into account the statistical significance of the new data compared to the existing data when determining the level of credibility to give to new data.

65. The actuary should also consider external issues that may change the credibility such as:

a) changes to the mix of business of the insurer;

b) changes in processing claims or premiums (for example, administrative delays, changes to case estimation procedures);

c) identified systems issues (new systems or changes to systems).

Gross and Net Liabilities

66. Both outstanding claims and premium liabilities are to be estimated on both gross and net bases, and separately for each line of business. Under AASB1023/AAS26, amounts recoverable must be split between GST, reinsurance and other recoveries.

67. The gross and net liabilities should be estimated on a consistent basis. The economic assumptions for the gross portfolio and the reinsured business should be the same, except in unusual circumstances (for example, there is convincing evidence that superimposed inflation has had a different impact on large claims than small claims). The actuarial models, for the gross portfolio and for reinsurance recoveries, should not contain unjustifiable inconsistencies. For example, where the reinsurance is on a simple quota share proportional reinsurance basis, the net liability should be the retained proportion of the gross liability.

68. In many circumstances, it may be appropriate to use the model for estimating the gross liabilities as the starting point for development of the model for estimating reinsurance recoveries.

69. Some reinsurance arrangements embrace risks from more than one class of reinsurance (for example, ‘whole account’ covers). In this case, there may be no obvious natural basis for the allocation of the

adjustment to either premium liabilities or outstanding claim liabilities between classes. Consideration of the basis of accounting for whole account covers or other multi-line covers should be given before the first actuarial valuation and the basis of accounting, once determined, should normally be observed consistently over future years.

70. For premium liabilities, the unearned premium approach may be applied to produce either a gross or a net value. Where a net value is to be calculated and the reinsurance is written on an events occurring basis, it would normally be appropriate to include an allowance for future reinsurance premiums in respect of that part of the unexpired period after current reinsurances expire. To get the corresponding gross value, it is necessary to add back the expected cost of claims under both current and future reinsurances and to add an allowance for other recoveries, including sharing, salvage, subrogation, third party recoveries and Input Tax Credits (ITC) and Decreasing Adjustment Method (DAM) recoveries.

71. For proportional reinsurance and recoveries under sharing agreements, the adjustment is simply a matter of inverting the average fraction retained. A similar approach should suffice for ITC and DAM recoveries and, unless the amounts are large, salvage and subrogation.

72. For non-proportional reinsurance, the simplest approach is to add back a fraction of the unearned non-proportional reinsurance premium. This requires an assessment of the expense and profit margins contained in those premiums, which in principle, would involve the same considerations as that assessment for direct premiums. In practice, unless these premiums are a substantial fraction of the direct premiums, it is acceptable to make a reasonable assumption.

Use of Case Estimates

73. Where case estimates are used as the basis for liabilities, they need careful interpretation. It is necessary to understand how they are set and how they relate to what is likely to be paid out.

74. Given sufficient historical data, standard actuarial techniques can be used to quantify this relationship, provided that the basis of estimation has not been changed.

75. In the absence of such data, it may be possible to form a view as to the relationship on the basis of discussions with those responsible

for the estimates. Care, however, is needed in interpreting such information.

76. Case estimates are often based on what the estimator thinks the claim is most likely to cost. If the potential range is small, this may be close to the mean. Where the potential range is large, however, the probability distribution is likely to be highly skew and the most probable value could be well below the expected value. Even greater bias may result, if the estimates are based on a best case or worst case scenario.

77. Case estimates seldom take account of how long it might take to settle a claim, and do not often incorporate a suitable allowance for either inflation or discounting, where these may be material.

78. For most short-tail lines of business, the estimate will be based on physical examination of the damage or on records of purchase, and can be a reliable estimate of the gross cost. The principal uncertainties may relate to salvage and subrogation, which are not always estimated. Other approaches to case estimation should be considered on their merits.

79. If estimation practices have changed, it may be necessary to make a subjective estimate of the impact of the change, until experience emerges. It should be noted that, even if estimation rules are unchanged, a change in personnel could have a material impact on the case estimates.

80. If the financial reporting deadlines allow, hindsight can be a very useful tool in assessing short-tail case estimates. Even two weeks can show a considerable turnover of estimates into paid claims and conversion of reports into considered estimates.

81. For long-tail lines of business, it is substantially more difficult to derive suitable valuation estimates from case estimates. If there is sufficient data for a proper actuarial analysis, this should be undertaken. If actuarial analysis of case estimates is undertaken, it is important for the actuary to have an understanding of the current and historical case estimation process, as changes in this process can have a material impact. It may sometimes be appropriate for the actuary to obtain independent expert advice on the insurer's case estimation procedures, particularly where large reported claims make up a significant proportion of the liabilities.

82. If the numbers of long-tail claims are too small for meaningful analysis of historical data, then it becomes even more important to

understand the nature of the case estimates. It may be possible to draw analogies with other lines of business or with other insurers, or to draw on industry data. Such comparisons need to take into account any discernible differences between the portfolio being valued and the base portfolio, with particular reference to the case estimation process.

83. It is also important to note that even a large portfolio can contain too few large claims to allow credible statistical analysis: for example, a major environmental disaster in the context of a liability portfolio where most claims are for minor personal injuries. In such cases, there is a danger of 'outlier' claims that cannot easily be dealt with using conventional statistical methods. In such cases, the actuary needs to exercise professional judgment and should take great care in so doing. Very large claims are a lesser concern for a direct insurer with suitable reinsurance, where the main interest is the net liability, which can be estimated from the retention.

84. Case estimates may be particularly useful for identifying the presence (or absence) of large claims or events and in the estimation of amounts recoverable under non-proportional reinsurances. However, the actuary needs to be aware if there are any classes or types of claim for which the company inserts a purely nominal case estimate when a claim is reported.

Reliance on Other Actuaries' Work

85. Larger insurers, underwriting numerous and sizeable classes of business, are likely to require the services of more than one actuary to assess the value of outstanding claim liabilities and premium liabilities, as well as the risk margins. In these circumstances, the Approved Actuary has the responsibility for coordinating the valuations and summarising the results into one opinion for delivery to the insurer's Board and senior management.

86. In such cases, the Approved Actuary should be satisfied that the actuary responsible for each valuation unit has the appropriate experience and competence to carry out a valuation of that particular part of the portfolio. In preparing the summary of the results for the insurer, the Approved Actuary should be satisfied as to the suitability of central estimates, risk margins and diversification benefits prepared by other actuaries for inclusion in the results.

87. In preparing the opinion summarising the insurance liabilities of the insurer, the Approved Actuary should be satisfied that the central

estimates, risk margins and diversification allowances are suitable, for each valuation unit. There is no need to repeat the calculations performed by the other actuary, but the Approved Actuary must review the results to ensure that the methods and results are fully understood.

88. The Approved Actuary should discuss the results with the other actuary to ensure the assignment was understood and to resolve any matters of interpretation of the other actuary's results.

89. Where the Approved Actuary is not satisfied as to the suitability of a particular item for inclusion in the overall valuation, then an alternative figure must be provided. The summary report must include the reasons for varying the original figure, and state the difference.

90. While the assessment of the central estimate, uncertainty and independent risk margin for the outstanding claim and premium liabilities for each valuation unit is a relatively independent exercise, capable of delegation to separate actuaries, the assessment of diversification benefits for the company is unlikely to be. The Approved Actuary must ensure that the diversification benefit is assessed on a holistic basis.

91. Some forms of reinsurance may be dependent upon the aggregate claim experience of a number of classes of business. Where an actuary is responsible for the valuation of a group of valuation units which completely encompass such a reinsurance arrangement, then the impact of the reinsurance on the central estimate and risk margins should be considered and included as part of the report. Where different actuaries are responsible for valuation units within such a reinsurance arrangement, the Approved Actuary must ensure that the impact of the reinsurance arrangement on the central estimates and risk margins is appropriately assessed and documented.

92. In order to meet reporting deadlines for published accounts, it may be necessary to invert the natural sequence and determine diversification adjustments before the individual valuation unit valuations are completed. It will normally be acceptable for individual valuation unit reports to show risk margins based on analysis of diversification benefits at the most recent previous valuation. If this is done, the continued appropriateness of those adjustments should be discussed.

Materiality

93. In accounting terms, an amount or difference is material if it is large enough to '… affect the decision making about the allocation of scarce resources by the users of general purpose financial reports…' (AASB SAC3).

94. This test requires a judgment as to how such users might react to a change in the reported amounts. Observation suggests that many users do not have a good grasp of the uncertainties of general insurance. As a result, they are likely to respond on the basis of what seems to be a substantial number, rather than on any concept of statistical significance. A further factor is that, for long tail lines of business, even small percentage changes in the liabilities can give rise to large percentage changes in profit. It is usually possible to assess the threshold of materiality in discussions with management and auditors.

95. It also should be noted that materiality depends on context. What is material in the context of an income or profit and loss statement may not be material in the context of a statement of assets or balance sheet, or in an assessment of solvency, particularly for long tail classes of business. The converse is also possible, particularly for short-tail classes. In considering materiality, the actuary should consider the purpose for which the provisions or estimates are required, but should also bear in mind the other uses to which they may be put.

96. While it is reasonable to omit individual items on the grounds of materiality, thought should be given to the cumulative impact. It is not acceptable to make such omissions if the overall result would be materially affected.

97. When, as is usual in general insurance, the threshold of materiality is below that of significance, it is vitally important for the actuary to communicate the uncertainty of the results. This can be particularly difficult, if not impossible, where those results are communicated at second hand.

Reasonableness of Major Results

98. Before signing off on the actuarial report, the actuary should ensure that the results obtained from the actuarial valuation are reasonable, both in aggregate and for each valuation unit within the insurer's total portfolio.

99. Reasonableness should be assessed in relation to:

a) comparable results for that valuation unit in the previous year;

b) development in the valuation unit over the inter-valuation period;

c) the experience of the valuation unit since the previous valuation;

d) changes in economic assumptions, particularly investment and inflation assumptions (including, where appropriate, superimposed inflation);

e) changes to the actuarial model; and

f) any industry results or benchmarks.

100. The movement in the actuarial valuation reserves since the previous valuation should be analysed into its components. The actuary should be satisfied that differences between the previous valuation result and the present result can be explained in terms of the experience in the intervening period and changes in the valuation assumptions.

101. If during the performance of this analysis, the valuation of any particular material class appears to be inconsistent with the value of the class at the previous valuation, or the differences cannot be satisfactorily explained, the actuary needs to further investigate the reasons why the unexpected differences arise in order to be satisfied that the cause is not an error in the valuation calculations.

TECHNICAL REQUIREMENTS

Relationship Between Outstanding Claims and Premium Liabilities

102. Different approaches may be taken to the assessment of premium liabilities. The choice depends on many factors, including the nature of the business, past experience, the maturity of the insurer or valuation unit, and changes to underwriting, pricing, claim management and marketing over the previous few years. Whatever approach is taken to the assessment of premium liabilities, the consistency of assumptions and methods between outstanding claims and premium liabilities needs to be considered.

Consistency Between Outstanding Claims and Premium Liabilities

103. In a stable environment there is an expectation that the assumptions and methods for outstanding claims and premium liabilities will be consistent, after adjusting for trends, claim inflation and investment earnings However the environment, whether internal or external to the insurer, is typically not static.

104. Some approaches to premium liabilities are based on the outstanding claim assumptions, adjusted for changes in matters considered in paragraphs 107 to 109.

105. If premium liability assumptions are arrived at independently of outstanding claim assumptions then the assumptions and valuation results for the outstanding claim and premium liabilities should be compared. Significant differences between the assumptions and methods should be explained on the basis of the available information and data.

106. Changes to the matters considered in paragraphs 107 to 109 may result in a significant difference, from past experience to future experience. The timing and extent of change is important, in assessing the consistency between outstanding claim and premium liability assumptions.

107. In forming a view of appropriate premium liability valuation methods and assumptions, an understanding of changes within an insurer's business needs to be considered. The following matters may affect the actuary's choice of assumptions for claim frequency, gross average claim size and gross loss ratios for premium liabilities and their consistency with the assumptions for outstanding claim liabilities. Many of the matters need to be investigated, so the actuary understands changes and trends in exposure and the related changes in premium adequacy. The timing of changes in these matters should be understood.

108. In forming a view of appropriate valuation methods and assumptions for premium liabilities and their consistency with outstanding claims, many other matters may need to be considered by the actuary. The timing of the changes in these matters should be understood.

109. In both outstanding claims and premium liabilities, explicit allowance for reinsurance and other recoveries, such as third party recoveries, salvage, subrogation, sharing and input tax credits, needs to be

made. Appropriate adjustment to this allowance for the risk of non-recovery of these assets is required.

Central Estimates - Reporting

110. The valuation report should contain a description of the following:

a) changes (if any) to the valuation model adopted, with an explanation for the changes.

b) changes to key valuation assumptions. The content of this will vary according to the valuation model adopted. However, the principle is to provide a commentary of whether an assumption has been strengthened (i.e. results in a higher valuation outcome) or weakened (i.e. results in a lower valuation outcome) as a result of observation of the updated claim experience.

c) key assumptions. For outstanding claims, these will depend on the method adopted but will usually include the number of claims incurred, finalisation and payment patterns, average claim size, future inflation (normal and superimposed), discount rate and, where applicable, case estimate development patterns. For premium liabilities, additional key assumptions may include loss ratios, seasonality and allowances for large claims.

d) the overall change to the net central estimate should be quantified and the key reasons for that change analysed. This should include:

i) previous central estimate plus interest to new valuation date, less

ii) payments from prior accident periods in the inter valuation period plus interest to new valuation date, compared with

iii) new central estimate for prior accident periods at valuation date, plus

iv) separate quantification of any material impact on the new central estimate of changes to the valuation model adopted and key assumptions, plus

v) the impact of new claims and exposure.

Detailed quantification is normally provided at the valuation unit level. There should, however, be an overall quantification of the

impact of changes to the valuation model and assumptions at the whole company level.

Risk Margins

Fundamentals

111. A technical provision may exceed the expected value of the present value of future payments in respect of the associated liability, which is its central estimate. This will result in a higher degree of confidence in the adequacy of the provision than would be the case if just the central estimate were chosen. The excess over the central estimate is often referred to as a risk margin.

112. A risk margin sometimes comprises an addition of a percentage of some quantity considered relevant to the risk associated with the liability concerned. For example, the risk margin contained in a provision for outstanding claims might consist of p% of the central estimate.

113. Alternatively, the risk margin may be determined by means of specified level of confidence, for example, such that the provision is adequate to meet the associated liability with q% confidence. In this case, the formulation of the risk margin is manifestly stochastic, and its determination will require a stochastic model of the claim experience to which the technical provision relates.

114. It will usually be necessary to formulate such stochastic models in two distinct parts:

    a) a model of the claim experience specific to the portfolio under consideration, with external influences factored out;

    b) a model of those external influences, which would usually include at least rate of inflation (possibly excluding superimposed inflation) and discount rates.

115. There may be circumstances in which a risk margin may be reasonably determined without reference to a stochastic model, though these would probably not be of the confidence level type mentioned above. The following sub-sections would not apply to such cases.

116. Even where a stochastic model is required, its derivation may be by means other than set out in those sub-sections. They should be regarded as advisory rather than mandatory.

117. Provisions may also be determined by adjusting the discount rate or the probability distributions involved in the valuation, in accordance with financial economic theories such as CAPM or option pricing. Following this approach, it is possible to characterise the risk margin, which is the difference between the adjusted and unadjusted values, as the value of the uncertainty of the liability.

Stochastic claim experience models

118. The actuarial literature contains a number of stochastic claim experience models. Those most likely to be useful in the quantification of risk margins include:

a) Stochastic forms of the chain ladder;

b) Generalised Linear Models (GLM);

c) Credibility models;

d) Other Bayesian models;

e) Adaptive filters, such as the Kalman filter.

This list, while reasonably comprehensive, is not intended to be exhaustive.

119. Some of these models (for example, Mack's stochastic chain ladder) explicitly produce estimates of no more than the first two moments of liability. Others (for example, GLM based models), are conceptually able to give the distribution in full detail, may require prohibitively extensive computation to produce this level of detail.

120. In cases where only the first two moments of liability are estimated, it will be necessary to supplement these with an assumption as to the form of the probability distribution of liability, if the estimates are to be converted into the confidence limit required to produce a risk margin.

Stochastic economic models

121. Models of external economic parameters can be found in the actuarial and economic literature. In the former case, they may be well known to actuaries (for example, the Wilkie model). Models from the economic literature (for example, Cox-Ingersoll-Ross, Heath-Jarrow-Morton) may be just as valid but are less well known to actuaries.

122. Some of these models have been implemented as the economic scenario generators in DFA systems.

123. It is usually desirable to apply a model which generates all of the economic time series required in the liability estimation, in order to recognise the stochastic dependencies between them. For example, it is usually unwise to adopt models which treat future inflation and interest rates as stochastically independent.

Full distribution of outstanding claim liability

124. Where it is desired to produce an explicit estimate of the entire distribution of the relevant liability, the following procedures may be helpful:

    a) Bootstrap;

    b) Markov Chain Monte Carlo (MCMC) sampling.

    The former is well embedded in the actuarial literature and well understood. The latter, which is perhaps ultimately just as useful, is newer and, at present, more experimental.

Practical Considerations

125. It is necessary to base estimates of uncertainty on an insurer's own data as much as possible. However, not all insurers, especially relatively new insurers or smaller insurers, have data that is adequate for this. Consequently, it may be necessary to rely, at least in part, and sometimes wholly, on industry research studies. Such studies should not be used blindly. Most insurers have features which suggest that industry parameters should be modified.

126. If a published industry study is used as a basis for estimates of uncertainty, it is important that the actuary should take note of the context of the study and modify the results of the study if special features of a specific insurer indicate this. Examples include:

    a) Risks concentrated in a particular geographical area or industry, relative to the data on which the study was based.

    b) The insurer's type of business being different from the industry average. Examples include a portfolio of small commercial business compared to industry data dominated by more volatile

large corporate business; and excess business compared to primary business.

c) Differences in reinsurance arrangements, such as lower or higher retention levels, or different types of reinsurance.

d) Variation in the reliance placed on intermediaries in underwriting.

e) Changes in underwriting conditions, such as a change in the legislation governing a line of business.

127. It is also essential to ensure that, if parameters drawn from different studies are combined, they are compatible.

128. Allowance for diversification benefits need to be carefully considered by the actuary as, in many situations, it may not be possible to support an allowance for diversification from empirical evidence. Some industry studies may not use empirical evidence to justify an allowance for diversification, but rather present their view of appropriate allowances. The actuary needs to justify the allowance for diversification. The extent of the diversification benefit depends on many factors. In particular, the way that the line of business margins are determined is important.

129. Uncertainty can be broadly divided into:

a) Independent variation, which operates at the individual claim level and is uncorrelated; and

b) Systemic (also called systematic) variation, which operates at the valuation unit level and affects all claims similarly. Typical sources of systemic variation are economic, social and climatic factors

130. There is always a diversification benefit when the independent variation from different valuation units is combined. The situation for systemic variation is more complex. The extent of any diversification benefit depends on the extent to which the same sources of systemic variation apply across different valuation units. If the dominant source of systemic variation is the same then, in the absence of empirical evidence to the contrary, no benefit from systemic variation should be assumed. Caution should be exercised in assuming low correlation (which implies higher diversification benefits) between even apparently unrelated sources of systemic variation.

Risk Margins – Reporting

131. Where the actuary calculates risk margins by reference to a particular notional distribution, this should be described in the report, along with the reasons why it is considered appropriate. Where this is not done, the actuary should discuss the reasoning behind the figure chosen. Material changes in the probability distribution of insurance liability outcomes by class of business since the previous valuation must be disclosed in the report.

132. The actuary's report should include discussion of the suitability of any industry study, as a basis for estimating uncertainty, for the particular insurer and present reasons for any adjustments that are made.

133. The actuary's report should include discussion of reasons why the adopted allowance for diversification is appropriate.

134. The approach adopted by the actuary who adjusts the risk margins for diversification and reinsurance should be clearly documented. While the apportionment of the diversification benefit between classes of business may be essentially arbitrary, the approach adopted should also be documented.

135. Changes to the model or models since the previous report should also be summarised.

END OF GUIDANCE NOTE.