Institute of Actuaries of Australia

Risk Business Capital Taskforce

Part 2 Risk Margins Actuarial Standards: 2.04 Solvency Standard & 3.04 Capital Adequacy Standard

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1 Purpose

1.1 The Risk Business Capital Taskforce was established by the Life Insurance & Wealth Management Practice Committee (LIWMPC) to review the basis of the capital requirements for protection business (including lump sum and disability income) and to review the annuitant mortality assumptions.

1.2 The Taskforce has split its review into two parts:

- Part 1: To assess the appropriateness of the minimum termination value (MTV) and current termination value (CTV) minimums that apply in the two standards and recommend changes where appropriate. A paper was released to IAAust members for this purpose, and discussed in Sydney and Melbourne at the Insights meetings in October 2007, Attachment 5 provides a summary of the Taskforce's subsequent recommendations.
- Part 2: To assess the mortality and morbidity margins outlined in Appendix 1 of Actuarial Standard 2.04 Solvency Standard (LPS2.04) and Actuarial Standard 3.04 Capital Adequacy Standard (LPS3.04) and to recommend changes where appropriate.

1.3 This paper covers the second of these two parts. It is currently a working draft with Taskforce members still working on deriving some of the risk margins.

1.4 This paper will be presented to members at the FS Forum in Melbourne (May 2008). Feedback is requested either in writing by 15 June 2008 or in person at the FS Forum.

1.5 The Taskforce plans to make its recommendations to APRA in the second half of 2008.

2 Executive Summary

2.1 The Solvency and Capital Adequacy standards require a company to assess assets and liabilities under scenarios of adverse experience. For Capital Adequacy, the principles in LPS3.04 Section 2.4 (Solvency: LPS2.04 Section 2.6) state that current standards when applied to a typical life company, are designed to provide a level of reserves that would cover a combination of adverse circumstances that would be expected to arise 1 in every 400 years (Solvency 1 in every 200 years). The standards anticipate a time frame of twelve months in which the circumstances would arise and any actions to mitigate risks are applied.

2.2 The Taskforce has used these high level probabilities as a base for determining the risk margins. In order to maintain a similar probability of capital sufficiency across all companies, the resulting risk margins will vary by company, based on the size and risk profile of each company.

2.3 This paper outlines a framework for calculating risk margins. The resulting risk margins are expressed as "x%+" of best estimate assumptions, where x is the margin for a large, well diversified and well run company. The principles of the framework enable a company to determine the additional margin that should be held in excess of x%, based on the company's business profile and risks.

2.4 The approach encourages companies to use their internal models to set risk margins and to compare their results against industry assumptions.

2.5 Companies with small books of business can use the framework to set their assumptions without the use of internal models. Their risk margins are expected to be at the high end of possible risk margins.

2.6 The solvency margins are no longer on a prescribed basis. Instead, the margins vary but are based on a consistent probability of sufficiency. The Taskforce recommend setting the Solvency margins as a fixed percentage (85% recommended) of the Capital Adequacy assumptions.

2.7 The paper includes an external pandemic shock as an explicit step in the determination of Solvency and Capital Adequacy requirements.

2.8 The Taskforce has reviewed the approach and the resulting margins against those used internationally, with most focus on Canada and proposed standards for Europe (Solvency II). Attachments 8 and 9 provide a summary of the approach used in Canada and Europe.

In summary, Solvency II has some consistency with the Australian framework, particularly the margins used in the capital adequacy liability. It is possible that the Australian framework will converge with Solvency II by 2012.

The Canadian approach has some similarity with both Solvency II and Australia for Disability Income business (new claims risk and continuing claims risk) and for lapse risk. The approach used for mortality is more complicated and is difficult to compare.

3 Framework

3.1 The framework followed by the committee in recommending revised margins consisted of five steps as shown below:

Step 1 Identify material mortality & morbidity risks
Step 2 Set individual confidence levels (1 in x) allowing for diversification
Step 3 Quantify the individual risks and risk margins
Step 4 Consider the selection of base assumptions
Step 5 Consider the impact of a pandemic or shock event

3.2 The Taskforce used a normal distribution in Step 2 and in parts of Step 3 of the framework. Where companies feel a normal distribution understates the risk, other distributions should be used and additional reserves held.

3.3 The margins have been calculated to cover a 1 in 400 year event in any one year for the whole statutory fund. The margins apply for as long as the risk remains. In the case of Yearly Renewable Term (YRT) or Group Risk business, this is until the next opportunity to reprice, which is assumed to be in three years time. This is intended to provide sufficient time to identify issues and reprice.

3.4 Section 2.4 (c) of LPS 3.04 requires the reserve at the end of the year to be "determined in accordance with the Capital Adequacy Requirement of this Standard, but allowing for the implementation of plausible risk reduction actions". Notwithstanding the comments made in 3.3, the Taskforce has assumed that suitable reinsurance or repricing can be put in place, at the end of the year, to remove the need to hold additional capital reserves at the end of the year.

4 Step 1: Identify Material Mortality & Morbidity Risks

4.1 A company should identify the risks impacting its mortality and morbidity experience.

4.2 The specific risks will vary with product type, for instance, risk concentration caused by exposure to specific locations or industries is more likely to be an issue for group risk than other product types.

4.3 Risks can be classified into the following categories:

- Risks impacting the estimation of claims distributions such as those related to the quality and credibility of experience investigations;
- Risks impacting trends in claims experience such as product design and economic and environmental factors;
- Risk of unexpected changes in underlying claims distributions such as might be caused by new illnesses or new diagnostic techniques in the case of trauma cover; and
- Risk of statistical fluctuations in claims experience.

4.4 There are also risks associated with sudden short term changes in claims rates such as might occur during a pandemic.

4.5 Quantification of these risks is dealt with in Step 3, other than the impact of a pandemic which is dealt with in Step 6.

5 Step 2: Consider the impact of diversification.

5.1 In order to set individual risk margins, the Taskforce determined the required level of capital sufficiency ("1 in x" or "sufficiency level") for each individual risk, which, after allowing for diversification, gave a combined level of capital sufficiency of 1 in 200 (Solvency) and 1 in 400 (Capital Adequacy).

5.2 To do this, the Taskforce tested the combined impact of separate but correlated risks (mortality, morbidity, market (incl. credit), operational & business).

5.3 Attachment 1 summarises the approach used, including the diversification assumptions.

5.4 The results supported the use of a sufficiency level of 5% (1 in 20) for Solvency and 3% (1 in 33.3) for Capital Adequacy for each individual risk type (mortality, morbidity etc.). Assuming a normal distribution, these equate to 1.64 standard deviations (Solvency) and 1.88 standard deviations (Capital Adequacy). These probabilities and standard deviations were used to set the minimum risk margins in Step 3.

5.5 Companies should use higher risk margins where less diversification exists than that used in Attachment 1.

6 Step 3: Quantify the individual risks identified

6.1 Step 1 of the Framework identified the major risks and classified them as either "sudden impact" or "experience risks". Sudden impact risks are considered in Step 5 (Pandemic Risks). Experience risks are considered in this section.

6.2 The four primary experience risks are: mis-estimation of the mean; deterioration of the mean; unexpected changes in the mean; and statistical variation around the mean. This step discusses how to quantify each of these risks, based on the sufficiency levels derived in Step 2. In some cases, a calculation is possible while in others cases a subjective assessment is required.

6.3 Attachment 2 outlines the factors to consider and the valuation techniques that can be used to quantify these primary risks.

6.4 The Taskforce expects some companies to use internal models to quantify their risks and derive their risk margins.

6.5 The resulting risk margins for a large, well diversified insurer are included in Attachment 2. If the methodology is accepted, margins will be derived for other combinations of risks, to assist companies without internal models to set their risk margins.

7 Step 4: Consider the selection of base assumptions

7.1 To be consistent with the methodology outlined in Steps 2&3, the Taskforce concluded that risk margins should be applied to best estimate assumptions. To use an alternative base assumption would introduce an additional margin (positive or negative) without any justification.

7.2 This approach is different to the current Solvency basis that uses, for some risks, both a prescribed table and prescribed assumption. The Taskforce was comfortable with using different Solvency assumptions, for different companies, if these differences reflect the inherent risks.

7.3 Attachment 3 provides more detail around this thinking.

8 Step 5: Consider the impact of a pandemic or shock event

8.1 The Taskforce recommends that Solvency and Capital Adequacy reserves should include an allowance for an industry wide mortality shock, such as a pandemic.

8.2 The Taskforce proposes the following prescribed factors for the pandemic scenario:

Prescribed factor for Pandemic	Solvency	Capital Adequacy
Excess mortality (1 year only of excess claims)	1.0 per mille sum insured	1.7 per mille sum insured
Excess morbidity	Claim termination rates reduced by 6% (x 0.94)	Claim termination rates reduced by 7.5% (x 0.925)

8.3 The prescribed factor for excess mortality is based on separate published research by the Committee of European Insurance and Occupations Pension Scheme Supervisors (CEIOPS) and by Swiss Re. The factor for excess morbidity was derived to produce an equivalent shock for disability business, as a proportion of annual premium. The mortality and morbidity shocks will be calculated separately and the greater of the two will be included in the determination of the capital requirements.

8.4 Please refer to Attachment 4 for more details.

8.5 The taskforce recommends that this test is applied at a category level (participating/non participating) within a statutory fund and in a similar manner to the MTV or CTV minimums, with a capital requirement, post shock, equal to the best estimate liability. See Attachment 4 for more details of how this test applies.

Attachment 1: Allowing for Diversification

1 Diversification

1.1 The Taskforce sought to test the combined impact of separate but correlated risks by modelling the combined impact of the different risks within a statutory fund. The risks were assumed to be normally distributed and correlated according to the assumptions summarised below.

1.2 The purpose of this model was to determine the required probability of loss (sufficiency level) at an individual risk level that, when combined with the other risks in the statutory fund, gave a combined probability of loss of 1 in 200 (Solvency) or 1 in 400 (Capital Adequacy).

1.3 This approach allows for the diversification benefits arising both from the individual risks not being perfectly correlated and a company writing a mix of different risk products from a single statutory fund.

1.4 The Taskforce considered a variety of product mixes within a statutory fund. As the number of uncorrelated products increases, the level of required sufficiency decreases.

1.5 Four different statutory funds were considered, each with different product combinations (1) term life only, (2) risk only (term and disability), (3) risk and traditional participating, (4) risk traditional participating and annuities.

1.6 The main assumptions and results are outlined below:

Relative standard deviations by type of risk

	Product Mix within the Statutory Fund			
	Term Only	Risk Only	Risk & Trad	Risk, Trad & Annuities
A. Mortality	100	100	100	100
B. Market	25	25	50	75
C Morbidity	0	100	100	100
D Business	50	60	70	80
Total	175	285	320	355

1.7 Assumptions:

- The mortality and morbidity standard deviations are similar. Although morbidity was assumed to be more volatile, this was offset by a higher volume of mortality business.
- Market and credit risk are assumed to grow as Trad & Annuity products are added to the fund due to the higher asset holdings backing these liabilities and the impact of implicit guarantees in the products.
- Business risk includes expense risk, lapse risk and pricing risk.
- LPS 2.04 and LPS 3.04 do not require an explicit reserve for operational risk. To be consistent, operational risk is implicitly included in the other risk types and no diversification benefit is included.

2 Risk correlations

Correlation Table by Risk Type				
Risk Type	A. Mortality	B. Market	C Morbidity	D Business
A. Mortality	1.0	0.0	0.3	0.2
B. Market	0.0	1.0	0.3	0.2
C Morbidity	0.3	0.3	1.0	0.2
D Business	0.2	0.2	0.2	1.0

2.1 The risk correlations assume that:

- Mortality and morbidity risks are correlated due to the impact of influenza and other illnesses but the correlation is low (0.3). Although Solvency II currently assumes a higher correlation of 0.5, the view of Taskforce members based on their experience indicated a lower correlation particularly given the potential inverse relationship for some risks.
- The Taskforce believes that business risk is higher during periods of adverse mortality and morbidity due to the difficulty in determining long term profitability and hence business planning, however this is not the exclusive driver of the level of business risk. A low correlation factor of 0.2 was therefore adopted.
- Lapse experience is also expected to demonstrate some weak correlation to market conditions. This is reflected in the 0.2 assumed correlation between business risk (that includes lapse risk) and market risk.
- Morbidity experience demonstrates some correlation to economic conditions and therefore to market risk with claims incidence rates expected to rise during an economic downturn and disability income termination rates expected to decline. A correlation factor of 0.3 was set to reflect this risk.

2.2 The Taskforce recognised that the degree of correlation may also be dependant on the characteristics of each individual company (eg. operating structure, control framework, distribution channel). However, a single set of parameters was adopted representing a high level view of relative correlations at "industry" level rather than statistical analysis. This approach recognises that the choice of correlations is subjective and that based on testing performed, the results are relatively insensitive to small changes (e.g. 0.2) to assumptions.

2.3 The assumptions are similar to those used in Solvency II (Attachment 6)

3 Resulting probabilities after diversification

3.1 The resulting levels of sufficiency at an individual risk level are shown in the following table.

Required level of sufficiency at an individual risk level

	Death Only	Risk Only	Risk & Trad	Risk, Trad & Annuities	Current Standards	**Recommendation**
Solvency	3.3%	4.1%	4.7%	5.0%	5%	**5%**
Cap Ad	2.2%	2.9%	3.4%	3.7%	1%	**3%**

3.2 The table shows that a 4% to 5% level of sufficiency is broadly needed for each risk type for solvency purposes; this is consistent with LPS 2.04. The requirement for capital adequacy purposes is 3%. This is higher than the current standard's 1% requirement.

3.3 In setting the risk margins we have used an assumption of 5% (1 in 20) for solvency and 3% (1 in 33.3) for capital adequacy. Based on a normal distribution, this is

equivalent to 1.64 standard deviations for solvency and 1.88 standard deviations for capital adequacy.

Attachment 2: Quantify the individual risks identified

1 Determining Risk Margins Overview

1.1 Step 1 of the Framework involved assessing risks in four risk categories: mis-estimation of the mean; deterioration of the mean; unexpected changes in the mean; and statistical variation around the mean.

1.2 This step discusses how to estimate risk margins for each of these risk categories. Where risks can be quantified, we demonstrate below an approach to calculation. We note however that subjective assessment will ultimately be required in considering the impact of each risk. Such assessment will take into account, amongst other things

- the size, nature and circumstances of the business
- the effectiveness of the company's risk control framework, in particular the timely and effective monitoring of risk and the steps in place to mitigate risks
- the estimated time frame for corrective action, which will include the scope within contracts for variation of terms or premiums

1.3 The margins required depend on the type of risk; the coverage period and how the risk varies over the coverage period. For a non-guaranteed contract, the effective coverage period under consideration is the time before a rate increase can be effected.

1.4 The risk margin is based on the probabilities (after diversification) calculated in Step 2 (5% Solvency and 3% Capital Adequacy)

1.5 A standard actuarial technique for estimating future claim amounts is as follows:

- Select a suitable standard claim rate table that is based on a population or industry table;
- Observe the past experience of the insured population relative to that standard table;
- Derive adjustment factors based on the standard table that reflect this past experience, including the level of credibility of the past experience;
- Allow for claim rate improvements; and
- Project future claim amounts based on the above data and the known characteristics of the insured population.

1.6 However, actual future claim amounts may differ from the projected claim amounts for reasons including:

- The standard table is not fully credible;
- The adjustments factors are not fully credible;
- The future insured population does not have the same characteristics as the observed population;
- The experience of the population does not change at a known fixed rate over time;
- Statistical fluctuations in the claim amounts; and
- Experience changes for unexpected reasons.

1.7 The impact of these factors is considered below for the four risk categories.

2 Mis-estimation of the mean

2.1 Standard published tables generally provide details of the standard error of the table. A risk margin may be derived based on this standard error.

2.2 Generally, where the standard table is current and has utilised a wide experience base, the standard error of the adjustment factors will be more significant than the standard error of the standard table. On this basis, the standard error of the standard table may be ignored on materiality grounds and the standard errors of the adjustment factors used to determine the appropriate risk margin.

2.3 Where the standard table is no longer based on recent data, and is used in the best estimate assumptions, it may provide a misleading shape, which results in greater volatility of experience when compared to best estimate assumptions. In such situations, companies should increase their risk margins.

2.4 Consideration should be given as to why a future insured population would differ from the observed population and the likely magnitude of any differences. Examples include:

- Adjustment factors not being based on company specific experience, for example factors provided by a reinsurer, based on Australian industry or overseas experience. The experience on which such factors are based may differ from company specific experience due to differences in product design, underwriting and claims management;
- Even where adjustment factors are based on company experience, future experience may be impacted by changes to underwriting, claims management, changing mix of clients insuring under a product or changes to a product's benefit definitions.
- Where a product is completely new and no relevant experience studies are considered to be available, higher risk margin would be required.

2.5 Calculation Basis

2.5.1 Traditionally companies have used margins in the range of 5-15% for this type of risk, but we are not aware of any objective methodology for establishing such margins.

2.5.2 We believe that the level of mis-estimation risk is likely to be constant, or reduce, as experience develops, over the time horizon of a product.

2.5.3 The starting point for quantification is the standard error of the underlying experience. Assuming a normal distribution, the standard deviation of the mean uncertainty from an experience investigation is 1/(√(number of claims in the investigation). Assuming a large company has 500 mortality claims p.a., and experience investigation covering 4 years, the resulting standard deviation would be calculated as 2.2% (1/√(4*500)). Based on an individual sufficiency level of 3% (Capital Adequacy - Step 3), the required risk margin for mean uncertainty would be 1.88 standard deviations or 4.2%.

# Claims in Experience Investigation	Implied Standard Deviation	Base Risk Margin - Capital Adequacy	Likely Basis for
2000	2.2%	4.2%	Mortality
1000	3.2%	5.9%	
400	5.0%	9.4%	Trauma/TPD
100	10.0%	18.8%	
50	14.1%	26.6%	

2.6 Interaction of Calculation Basis and Subjective Considerations

2.6.1 The calculation basis specified above represents a starting point or minimum. Subjective factors should then be taken into consideration, resulting in adjustments over this minimum.

2.6.2 Allowance should be made for any systemic risk in the underlying insured portfolio and any operational risk, including accuracy of the data handling processes.

2.6.3 For a large diversified book of mortality business where the company conducts its own experience investigation (2000 claims = 4.2% base margin) and there has been little change the product or client mix the additional margin for subjective factors is likely to be low, so a 5% margin overall may be appropriate (see table at the end of this Attachment 2).

2.6.4 A small company which uses a basis recommended by a reinsurer may have a low basis for the reinsurer's experience investigation (2000 claims = 4.2%), but then would need to add in a larger margin for differences between the reinsurer's book and the company's book of business. Thus a margin in the range of 5% to 10% overall may be appropriate.

2.6.5 Trauma and TPD portfolios tend to be smaller than mortality portfolios, with lower claims rates so that even a large, well-diversified book of Trauma or TPD risks, where the company conducts its own experience investigation, is likely to start with a larger margin (based on fewer claims, say 400 claims giving a 9.4% base). Once again if there has been little change to the product or client mix then a low additional margin for subjective factors would be appropriate, which may produce an overall margin of 10%.

2.6.6 For group risk, the base margin would be similar to retail risk (4.2%). However the subjective factors for group risk are significant: the accuracy of the occupational loading is crucial, and where little information is available to map a group of lives to the standard tables the risk of mis-estimating the mean could be high. In addition, for occupational loadings, due to competitive pressure it would be rare for a scheme to be under-rated rather than over-rated. Where past experience is taken into account, if a scheme is fully credible the risk of mis-estimating the mean should be small. Where partially credible past experience is significantly different to the expected standard table, the risk of mis-estimation is higher, and margins should reflect this. For these reasons, the Taskforce concluded that overall margin associated with mean uncertainty for group life (Term and TPD) should be in the order of 15% for a large diversified company.

2.6.7 For disability income, the claim volumes in an investigation are more likely to be around 400 so a base margin of 9.2% might be present of a large, well diversified insurer. The subjective factors for disability income are likely to be significant due to the complexity of benefit features, rating factors and premium rates, reducing the credibility of experience data at an individual premium rate level. The Taskforce considered that an overall margin of 15% would be appropriate for a large, well diversified insurer.

2.6.8 For Group Salary Continuance (GSC) a large well diversified insurer might have 400 claims in an investigation (base margin of 9.2%). The subjective factors play a highly significant role here as both the factors impacting disability income business and those impacting group life business come into play. The Taskforce considered that a 20% overall margin would be appropriate for a large, well diversified insurer.

2.6.9 This establishes that low risk equates to a margin of around 5%, medium risk equates to a margin of around 10%, high risk translates to a margin of 15% and very high risk to a margin of 20%.

3 Deterioration of the mean

3.1 The risk of deterioration of the mean is the risk that the mean trends away from the initial estimate or that any initial estimate of mean change is incorrect. It is important to consider the risks to which a product is exposed, and the extent to which future experience may deteriorate due to those risks. For example, trauma experience is more dependent on medical advances than term life cover, so would be expected to have a higher margin.

3.2 If a trend analysis exists:

3.2.1 Good practice in setting assumptions should include a review of whether a trend applies to the data and whether a mean change assumption should be incorporated. If such an adjustment is made then the standard error of the trend estimate should be determined and used to set a risk margin in a similar manner as outlined above for mis-estimation of the mean. Note that the margin for deterioration of the mean will increase over time as the margin applies to a trend factor which compounds over time.

3.2.2 The results of a trend analysis may indicate that no clear trend exists but that the claim rate varies from year to year by more than can be reasonably explained by statistical fluctuation. In such a case, the claim rate may be responding to other factors (e.g. the economic cycle). If these factors can be reasonably identified then the data could be regressed based on these factors to identify the nature of this dependency. However, such an analysis is only useful if the underlying factors themselves can be identified and predicted with greater certainty then the claim rate itself.

3.3 If no trend analysis exists:

3.3.1 If no trend analysis is conducted than a subjective margin should be set for this risk and appropriate trend analysis should be conducted when there is sufficient data to analyse. Note that the level of margin would increase as the time elapsed from the previous completed study increases.

3.3.2 One general solution is to note the increased variance of actual claim outcomes over that expected by statistical fluctuation and to allow for this additional variance by way of an additional risk margin. Another approach would be to consider such changes in the same way as unexpected changes.

3.4 Impact for Margins

3.4.1 The Taskforce does not have an underlying calculation basis for the trend risk margin. Instead the risks were classified into low, medium and high and the margin associated with those risks for the mean mis-estimation was used.

3.4.2 For a large, well diversified insurer the Taskforce considers that the following margins are appropriate:

Risk Margins - Deterioration of the Mean

Product	Risk Category	Reasoning for Risk Category	Implied Margin
Term – mortality	Low		5%
Term – TPD	High	Impacted by the economic cycle	15%
Term – Trauma	Very High	Possibility of medical advances	20%`
Disability Income	Very High	Impacted by: unemployment changes, behavioural changes. Long claim durations means the claim cost is very sensitive to trend factors.	20%
Group Business		Additional risk to individual plans due to: workplace safety, moral hazard associated with TPD and GSC.	Individual Margin + 5%

4 Unexpected Changes in the mean

4.1 Unexpected changes are difficult to predict by their nature but often represent a significant risk for an insurer. Although hindsight often suggests that these risks should be anticipated (e.g. the sub-prime crisis in the US), in practice they rarely are. In the Australian context, an example would be the significant deterioration in disability income experience from the mid 1990s.

4.2 We recommend that such risks are allowed for by considering a range of shock scenarios (at the 95% or 99% probability level) and then taking the greatest loss from each of these scenarios as the appropriate additional capital margin. We recommend that the solvency and capital adequacy standards should include a pandemic flu scenario and the policy termination scenario (as discussed in Attachment 4 & 5).

5 Adverse Statistical Fluctuation – Lump Sum

5.1 Statistical fluctuations can arise for the following reasons:

- variance in claim rate estimate (already considered above);
- variance in claim numbers for a given claim rate estimate;
- variance in benefit amounts for given claim numbers; and
- variance in claim duration for given benefit amounts.

5.2 The level of risk margin will depend on the expected claim numbers for the portfolio, the range of sums insured covered and the level of reinsurance purchased, among other things.

5.3 Group life products would be expected to show less statistical deviation than individual life products, due to them having reasonably uniform levels of cover and a large number of lives. However, statistical fluctuations do depend on the benefit

scale. Fluctuations would be expected to be higher with the standard $1 per week style benefit (as the young lives have the largest sums insured, the lowest probability of claiming and the largest standard deviation of claiming), or where there are a few individuals / executives with very large benefits compared to the rest of the plan.

5.4 Calculation Basis

5.4.1 Stochastic variation is an important reason to hold additional margins, and is the least subjective of all the reasons for margins. Accordingly the Taskforce has modelled this source of variation based on general assumptions.

5.4.2 A simple model was used, with the probability of death being modelled as a binomial distribution (ie a life either survives or dies during the period) using a random number generator. Key assumptions were for the number of lives at risk, their age and sex distribution, the mortality table, and the sum insured distribution

- Sum Insured Distributions (set so average sum insured is $100,000):
  a. Flat 100,000
  b. Linear distribution
  c. Normal distribution
  d. Lognormal distribution
  e. Industry $1 per week scale
  f. Exponential distribution
- For each result, 1000 random results were used, and the variation shown in this paper is the 97% worst result divided by the mean result. This allows for diversification, as explained in step 2.

5.4.3 Number of Lives and Sum Insured Scale Impact on Stochastic Variation

- As the number of lives increases the variation reduces, for example if sums insured follow a log-normal distribution the variation for 200,000 claims is only 10% (110% shown in the table less 100%) of the mean compared to 174% for 1,000 claims.
- In the context of capital adequacy and solvency, the number of lives is the number of lives currently insured, as the resulting stochastic margin is based on 97% sufficiency over a one year period. The resulting margin is applied for only one year.
- As the range of sums insured increases the variation increases. In particular the industry $1 per week scale is more variable than many other scales as the highest sums insured are at the young ages, which have the lowest probabilities of death, so are the most variable.
- It is recognised that some companies will have a higher exposure than has been modelled or a different pattern of sums insured. If a mortality margin (which necessarily includes other margins such as mis-estimation and deterioration of the mean) is set at the bottom of the indicated capital adequacy range, it is expected that the company will perform some sort of stochastic modelling based on their own portfolio of lives to derive an appropriate stochastic variation margin.

Mortality Claims at 97 percentile divided by mean

	a	b	c	d	e	f
1,000	208%	255%	257%	274%	290%	330%
5,000	157%	169%	165%	167%	176%	190%
10,000	138%	149%	146%	154%	157%	159%
20,000	129%	133%	131%	130%	140%	141%
50,000	118%	121%	121%	123%	123%	126%
100,000	112%	114%	114%	115%	116%	117%
200,000	109%	110%	111%	110%	111%	112%

5.4.4 Age Profiles Impact on Stochastic Variation:

- Older portfolios of lives are less variable than younger portfolios as the expected number of claims is higher, and hence the claims experience is less variable.

	a	b	c	d	e	f
Age 20	132%	135%	134%	136%	130%	144%
Age 30	132%	138%	139%	143%	133%	148%
Age 40	129%	135%	136%	137%	129%	142%
Age 50	120%	123%	125%	122%	120%	130%
Age 60	111%	112%	112%	113%	111%	115%

5.4.5 Reinsurance Impact on Stochastic Variation

- Due to the importance of the sum insured scales, it was also recognised that the company's reinsurance arrangements would have an impact. In particular, the stochastic variability for reinsurers could vary to the direct insurer.
- For the insurer, the lower the level of surplus cover, the more the variation converges to that of the fixed sum insured.
- For the reinsurer, the higher the level of reinsurance, the fewer lives were actually included in the cover, which increased the variability. That impact has been adjusted for here to give a constant 50,000 reinsured lives. The scale which had the most variation for the reinsurer was the flat industry $1 per week, as the higher the retention, the younger the ages will be. The exponential distribution leads to the most variation at higher levels of reinsurance.
- The modeling was done using 50,000 life years.

	a	b	c	d	e	f
Insurer, surplus 25% of mean	117%	117%	120%	116%	118%	118%
Insurer, surplus 100% of mean	118%	120%	119%	117%	121%	118%
Insurer, surplus 150% of mean	116%	120%	120%	117%	121%	122%
Insurer, surplus 300% of mean	117%	120%	122%	124%	123%	123%
Insurer, no reinsurance	118%	121%	121%	123%	123%	126%
Reinsurer, surplus 25% of mean	118%	119%	122%	122%	124%	121%
Reinsurer, surplus 100% of mean	n/a	120%	122%	125%	134%	122%
Reinsurer, surplus 150% of mean	n/a	121%	127%	128%	143%	126%
Reinsurer, surplus 300% of mean	n/a	n/a	123%	126%	n/a	158%

5.5 Impact for Margins: Stochastic variation in particular is heavily dependent on the individual company's size of book and characteristics of that book

5.5.1 Individual Term Mortality Risk: For a large (100,000 insured lives), well diversified portfolio, and assuming a log normal sum insured distribution, the Taskforce considers that a minimum stochastic risk margin of 15% be adopted.

6 Adverse Statistical Fluctuation – Income Stream (Morbidity)

6.1 The Lump Sum statistical fluctuation listed three reasons for statistical fluctuations of claims costs (variance in claim rates, claims numbers and benefit amounts). Income stream benefits have a further source of statistical fluctuation:

- Variance in claim duration for given benefit amounts.

6.2 The analysis of lump sum statistical fluctuations looked at the impact on variance due to number of lives, sums insured scale, age profiles and reinsurance. The Taskforce considers that the conclusions reached for lump sum are equally valid for income stream therefore no further modelling has been done in these areas. As always companies should consider their individual circumstances when setting margins.

6.3 Calculation Basis

6.3.1 As with the lump sum calculation basis, a simple model was used, with:

- The probability of a claim incurred being modelled as a binomial distribution (ie a life either survives or dies during the period) using a random number generator;

- The probability of a claim terminating being modeled as a binomial distribution (ie a life either terminates or continues during any period) using a random number generator.

6.3.2 Key assumptions were for the number of lives at risk, their age, sex and occupation distribution, the claim incidence and claim termination tables and the sum insured distribution.

- Sum Insured Distributions (set so average monthly benefit payment is $6,000 and $3,000 for white collar and blue collar workers respectively):
  a. Flat $6,000 or $3,000
  b. Linear distribution
  c. Normal distribution
  d. Lognormal distribution
- For each result, 1,000 random results were used, and the variation shown in this paper is the 97% worst result divided by the mean result. This allows for diversification, as explained in step 2.

6.4 Wait Period and Benefit Period and Gender Impact on Stochastic Variation

- As the benefit period increases, the variability of the claims cost increases;
- As the wait period increases, the variability of claims increases (this is as expected as the number of claims reduces). The cost of claims is more sensitive to wait period than it is to benefit period;
- The variability of female claims is slightly lower than male claims, this is as expected as the number of claims is higher for females.

	a	b	c	d	
Male, Wait Period of 30 days, Benefit period to age 65,	118%	120%	121%	122%	
Male, Wait Period of 90 days, Benefit period to age 65,	138%	149%	149%	152%	
Male, Wait Period of 30 days, Benefit period of 5 years,	110%	112%	111%	112%	
Male, Wait Period of 90 days, Benefit period of 5 years,	125%	130%	127%	129%	
Female, Wait Period of 30 days, Benefit period to age 65,	115%	118%	118%	120%	
Female, Wait Period of 90 days, Benefit period to age 65,	140%	145%	146%	150%	
Female, Wait Period of 30 days, Benefit period of 5 years,	109%	111%	110%	111%	
Female, Wait Period of 90 days, Benefit period of 5 years,	124%	128%	129%	129%	

6.5 Occupation Impact on Stochastic Variation

- There is some variability between occupation classes. The variability is greatest for white collar occupations and least for blue collar occupations, though the differences are not great.

Male, Wait Period of 30 days, Benefit period to age 65,	a	b	c	d	
Occupation Class 1	119%	123%	124%	126%	
Occupation Class 2	118%	122%	122%	124%	
Occupation Class 3	114%	116%	117%	119%	
Occupation Class 4	114%	115%	115%	117%	

6.6 Impact for Margins: Stochastic variation in particular is heavily dependent on the individual company's size of book and characteristics of that book

6.6.1 Individual Term Morbidity Risk: For a large (100,000 insured lives), well diversified portfolio, and assuming a log normal sum insured distribution and that the portfolio is mostly composed of white collar males with a 30 day wait period and a benefit period to age 65, the Taskforce considers that a minimum stochastic risk margin of 30% be adopted.

7 Duration of Margins

7.1 Although the capital requirements are based on one year probabilities, allowance needs to be made for ongoing errors that result in inadequate reserves at the end of the

year. In this regard, the mean and trend uncertainty margins should be applied for the period it would normally take the actuary to identify the mis-estimation errors and take corrective actions (e.g. reprice). This would typically be 3 to 5 years.

7.2 Adverse statistical experience is not expected to repeat each year (i.e. ongoing best estimate assumptions are not understated). Consequently, the risk margins from statistical fluctuations need only be applied for one year.

7.3 Companies may find it impractical to apply the statistical margin for one year and the mis-estimation and trend margin for three years. An alternative is to spread the statistical margin over three years in the projection, provided this gives a similar result.

8 Risk Margin Summary (Capital Adequacy)

	Trend Uncertainty (ongoing)	Mean Uncertainty (ongoing)	Adverse Statistical Fluctuation (1 year)	Implications for Minimum Risk Margin (ongoing)
Mortality – Term	Low (5%)	Low (5%)	15%+	15%+
Mortality – Group	Medium (10%)	Medium (15%)	15%+	25%+
TPD – Term	Medium (15%)	Medium (10%)	30%+	30%+
TPD – Group	High (20%)	Medium (15%)	30%+	40%+
Trauma – Term	High (20%)	Medium (10%)	25%+	35%+
DI	High (20%)	Medium (15%)	30%+	40%+
GSC	High (25%)	High (20%)	25%+	45%+

Notes:

1. Adverse statistical fluctuation is a one year margin which has been spread over three years in the "Minimum Risk Margin" column
2. Assumes 50% correlation between the three risks
3. Pandemic risk is modelled separately
4. Based on a 3% individual risk probability for Cap Ad.

8.1 Companies should consider their individual circumstances when setting margins and the guidance offered in the current Capital Adequacy Standard (4.3.2 and 4.3.3) should be considered:

8.1.1 The qualitative factors relevant to the Actuary's considerations will vary depending on the assumption being assessed, but should at least include the following matters:

a. the availability of relevant and reliable data on which to base the assessment;
b. the currency and reliability of relevant company experience investigations;
c. the stability of, or emerging trends in, the company's experience over time; and
d. the extent to which relevant company policy (investment policy, underwriting policy etc) is clearly defined and adhered to.

8.1.2 Where all of the qualitative factors indicate that the risk exposure is low, then a margin closer to the Minimum Margin may be adopted. Where the qualitative factors indicate that the risk exposure is high, then a margin closer to the High Margin should be used. The result should be that if two statutory funds with differing risk profiles both hold assets equal to the Capital Adequacy Requirement then the probability of ruin should be comparable for each fund.

9 Risk Margin Summary (Solvency)

9.1 The Taskforce recommend setting the Solvency risk margins as 85% of the Cap Ad margins. This is consistent with the 5% sufficiency assumption for Solvency and the 3% assumption for Capital Adequacy, assuming a normal distribution. The 85% assumption is consistent with the methodology outlined in this paper and is simple to apply.

Attachment 3: Selection of base mortality and morbidity tables

1 Solvency Assumption Basis

1.1 A number of approaches to the setting of base claims assumptions for Solvency were considered.

- Standard Table – currently used for Australian lives mortality and Annuitants
- Standard Table Underpin to Best Estimate – currently used for DII
- Best Estimate – currently used for all other assumptions
- Best Estimate with Credibility Margin – a method not applied in the current standards

1.2 Recommended Approach: Best Estimate Assumptions with a Credibility Factor

1.3 The Taskforce recommends use of best estimate assumptions with a margin which should be varied depending upon the credibility of the underlying experience, but with standard tables, where available, mandated for companies without a credible best estimate basis. This is similar to the approach adopted under the current standards for many types of risks but with more flexibility regarding the use of best estimate assumptions. The reasoning of the committee is as follows:

- Individual company experience can vary widely. Therefore use of standard tables and standard assumptions, while appearing to facilitate uniformity and comparability, would lead to different capital requirements (level of sufficiency) for each company.
- Standard tables are based on the combined experience of survey participants and may therefore be a poor fit to any particular company.
- Standard tables could not be used for all risk types as many (eg TPD, trauma) do not have current, standard Australian tables.

1.4 A summary of the approach used within the current Standards is as follows:

Risk type	**Current Solvency Basis**
Mortality – Australia	Standard Table
Mortality – Overseas	Best Estimate
Mortality – Group	Best Estimate
Annuitants	Standard Table
TPD – Individual and Group	Best Estimate
DII – Individual and Group – Active Lives	Standard Table Underpin Greater of Best Estimate and Standard Table
DII – Individual and Group – CICP	Standard Table Underpin Greater of Best Estimate and Standard Table
DII – Overseas	Best Estimate
Trauma	Best Estimate
Other	Best Estimate

Attachment 4: Consider the impact of a pandemic or shock event

1 Step 5 of Framework - Impact of Pandemic or Shock Event

1.1 The Taskforce concluded that the Solvency and Capital Adequacy reserves should include an allowance for a "sudden impact" risk, i.e. a shock event. These risks are industry wide in nature and include external shocks such as pandemics, terrorist attacks, concentrations of risk (e.g group life cover of employees located in a single CBD building) and natural catastrophes. These risks would increase mortality and disability claims over a short time period. A sudden impact risk for immediate annuity business would be a cure for cancer, which would worsen experience on the annuity portfolio but improve experience on the term insurance portfolio.

1.2 The Taskforce recommends that a sudden impact shock scenario be applied for mortality and disability income business. The appropriate shock event for mortality and disability income business is a pandemic.

1.3 A shock scenario is not required for immediate annuity business because there would be a partial offset on the mortality portfolio and annuity business is generally smaller than term and disability portfolios.

2 6.1 Application of pandemic scenario

2.1 The pandemic scenario should be applied by calculating the additional claims cost over 12 months, for Solvency and Capital Adequacy, using the prescribed factors for the pandemic mortality. A separate calculation will be made of the additional claims cost for Solvency and Capital Adequacy, using the prescribed factors for the pandemic morbidity. The Pandemic Liability will be the sum of the best estimate liability plus the additional claims from the pandemic factors. The greater of the mortality and morbidity shocks will be included in the determination of the capital requirements.

2.2 Additional steps should be inserted into the Solvency and Capital Adequacy determination processes:

- For Solvency, in LPS 2.04 6.1, insert a new step after (b) to calculate the Pandemic Liability using the pandemic scenario and aggregate across all policies in the category. Change the title of the old step (c) "Minimum of MTV" to "Maximum of MTV, Solvency Liability and Pandemic Liability". The calculation will take the highest of the MTV, the Solvency Liability and the Pandemic Liability for each category and aggregate across the statutory fund.
- For Capital Adequacy, in LPS 3.04 7.1, insert a new step after (b) to calculate the Pandemic Liability using the pandemic scenario and aggregate across all policies in the category. Change the title of the old step (c) "Minimum of CTV" to "Maximum of CTV, Capital Adequacy Liability and Pandemic Liability". The calculation will take the highest of the CTV, the Capital Adequacy Liability and the Pandemic Liability for each category and aggregate across the statutory fund.
- The Pandemic Liability for both Solvency and Capital Adequacy is based on the greater of the mortality and morbidity shocks.

3 6.2 Prescribed factors for pandemic scenario

3.1 There is no source of definitive scenario assumptions that should be considered, although industry stress tests have been conducted in several countries including Australia. These tests use a range of assumptions for scenarios of varying severity.

3.2 In the development of Solvency II, the Committee of European Insurance and Occupations Pension Scheme Supervisors (CEIOPS) proposed capital of 1.5 per mille sum insured for mortality catastrophe risk, based on a 1 in 200 year probability.

3.3 Swiss Re developed a comprehensive pandemic influenza model in 2007 and has published research on the impact of past pandemics. The Swiss Re model allows for a range of factors present in the 3 pandemics of the past century. The model also allows for interventions that may slow or mitigate the effects of a pandemic (e.g. antibiotics, antivirals, vaccines, travel restrictions, improved healthcare). Swiss Re has estimated that if the 1918 pandemic occurred today, the excess mortality would be reduced from the original level of 5 per mille in 1918 to 1.7 per mille today, as a result of the various interventions.

3.4 The Swiss Re model shows "insured age excess mortality due to pandemic influenza", by country, for different levels of annual probability. The excess mortality for Australia and New Zealand was 0.9 per mille sum insured for Solvency (1 in 200 years, i.e. 99.5% sufficiency) and 1.7 per mille sum insured for Capital Adequacy (1 in 400 years, i.e. 99.75% sufficiency).

3.5 In selecting factors for the pandemic scenario, the Taskforce noted that at a 1:200 year level:

- CEIOPS, a European body, proposed a rate of 1.5 per mille
- Swiss Re's model showed rates of 0.9 per mille for Australia and New Zealand and 1.1 per mille for Europe.

3.6 For a 1:200 year event, the CEIOPS rate of 1.5 pm is broadly consistent with Swiss Re's rate for Europe of 1.1 pm. As the Swiss Re rate for Australia and new Zealand was lower than the European rate, the Taskforce selected a rate of 1.0 per mille for Solvency.

3.7 The Taskforce selected a rate of 1.7 per mille for Capital Adequacy. It is noted that this rate is consistent with the CEIOPS rate, although at a different level of sufficiency and the CEIOPS rate is also not a one-off test as it includes other adverse scenarios. The rate of 1.7 per mille is similar to Swiss Re's modelling of the impact of a 1918 style pandemic occurring today.

3.8 The factor for excess morbidity was derived to produce an equivalent shock for disability business, as a proportion of annual premium, compared with the mortality shock.

3.9 The Taskforce's proposed prescribed factors for the pandemic scenario are:

Prescribed factor for Pandemic	Solvency	Capital Adequacy
Excess mortality (1 year only of excess claims)	1.0 per mille sum insured	1.7 per mille sum insured
Excess morbidity	Claim termination rates reduced by 6% (x 0.94)	Claim termination rates reduced by 7.5% (x 0.925)

3.10 The Taskforce considered which assumptions should be included in the pandemic scenario and concluded that:

- excess mortality and morbidity were included;
- although there may be a resilience impact from a pandemic, the capital required would be approximated by the normal resilience reserve;

- the additional expenses incurred in administering extra claims would not be material;
- full value could be taken for any reinsurance recoveries. This is based on: (i) the positive results from APRA's pandemic stress tests in 2006 for reinsurers, for the moderate scenario; and (ii) all Australian reinsurers currently meet capital adequacy.

4 6.3 Impact of pandemic scenario

4.1 In late 2006, APRA conducted an industry wide pandemic stress test using moderate and severe scenarios. The moderate scenario had excess mortality of 1.0 per mille sum insured. It appears that the additional claims incurred were readily absorbed by existing capital within the affected statutory funds of life insurers. APRA's stress test results suggest that Australian life insurers are well-positioned to withstand a pandemic on a scale consistent with the prescribed factors in the table in 6.2.

4.2 As a result of the inclusion of a pandemic stress test for Solvency and Capital Adequacy:

- it is likely that little or no additional capital will be required by life insurers for individual term insurance products, mainly due to the large amount of capital already required to cover the deferred acquisition cost (DAC). It is assumed that the mortality shock will exceed the morbidity shock so that the former will apply;
- it is likely that additional capital will be required by life insurers for group life business. The current level of capital for group life is relatively low because: (i) there is no DAC to offset; (ii) group life premium rates are lower than those for individual term business because group life business has lower margins; and (iii) premium rates are only guaranteed for 3 years and group schemes with poor experience can be rerated. Again, it is assumed that the mortality shock will exceed the morbidity shock for group business so that the former will apply.

4.3 The impact of the pandemic stress test on life insurers will vary, depending on their mix of individual and group business and their mix of death and income protection business. It is expected the impact on reinsurers will be greater than on direct writers.

SECTION 7 Determination of the Solvency Requirement

7.1 The Solvency Requirement for a statutory fund is to be calculated as follows:

(a) CALCULATE SOLVENCY LIABILITY
Subject to paragraph 6.2, for each policy in force, determine the Solvency Liability and aggregate this across all policies in the category (participating/non participating).

(b) CALCULATE MINIMUM TERMINATION VALUE
Subject to paragraph 6.3, for each policy in force, determine the Minimum Termination Value and aggregate this across all policies in the category.

(c) CALCULATE PANDEMIC SHOCK
Subject to paragraph xx, for each policy in force, calculate the Solvency Liability based on the pandemic scenario and aggregate across all policies in the category.

(d) MAXIMUM OF MINIMUM TERMINATION VALUE, SOLVENCY LIABILITY AND PANDEMIC
Determine the highest of the amount in (a), (b) and (c) for each category and aggregate across the statutory fund.

(e) ADD EXPENSE RESERVE
Increase the amount determined in (d) by the Expense Reserve for the statutory fund.

(f) ADD OTHER LIABILITIES
Increase the amount determined in (e) by the Other Liabilities of the statutory fund.

(g) ADD RESERVE FOR INADMISSIBLE ASSETS
Increase the amount determined in (f) by the reserve for Inadmissible Assets for the statutory fund.

(h) ADD RESILIENCE RESERVE
Based on the Admissible Assets of the statutory fund, increase the amount determined in (g) by the Resilience Reserve for the statutory fund.

SECTION 7 Determination of the Capital Adequacy Requirement

7.1 The Capital Adequacy Requirement for a statutory fund is to be calculated as follows:

(a) CALCULATE CAPITAL ADEQUACY LIABILITY
Subject to paragraph 7.2, for each policy in force, determine the Capital Adequacy Liability and aggregate this across all policies in the category (participating/non participating).

(b) CALCULATE CURRENT TERMINATION VALUE
Subject to paragraph 7.3, for each policy in force, determine the Current Termination Value and aggregate this across all policies in the category**.**

(c) CALCULATE PANDEMIC SHOCK
Subject to paragraph xx, for each policy in force, calculate the Capital Adequacy Liability based on the pandemic scenario and aggregate across all policies in the category.

(d) MAXIMUM OF CURRENT TERMINATION VALUE, CAPITAL ADEQUACY LIABILITY AND PANDEMIC
Determine the highest of the amount in (a), (b) and (c) for each category and aggregate across the statutory fund.

(e) ADD OTHER LIABILITIES
Increase the amount determined in (d) by the Other Liabilities of the statutory fund.

(f) ADD RESERVE FOR INADMISSIBLE ASSETS
Increase the amount determined in (e) by the reserve for Inadmissible Assets for the statutory fund.

(g) ADD RESILIENCE RESERVE
Based on the Admissible Assets of the statutory fund, increase the amount determined in (f) by the Resilience Reserve for the statutory fund.

(h) MINIMUM OF SOLVENCY REQUIREMENT
For the statutory fund determine the greater of the amount determined in (g) and the Solvency Requirement for the statutory fund.

(i) ADD NEW BUSINESS RESERVE
Increase the amount determined in (h) by the additional capital requirements for new

Attachment 5: Termination value minimums

1 Recommendations

1.1 In the "Termination Value Minimums on Risk Products" discussion paper, dated August 2007, the Risk Business Capital Taskforce presented its review of the appropriateness of MTV and CTV minimums in the current Solvency / Capital Adequacy Standards.

1.2 In that paper the Taskforce concluded that the Capital Adequacy and Solvency reserves for risk business should be based on a prospective risk based methodology with suitable risk tolerance levels.

1.3 The Taskforce also concluded that the resulting prospective reserve should be stress tested against a mass lapse scenario, particularly for Solvency purposes, to cover the risk of mass lapses from a single event or related events over a short period of time. The current standards include such a stress test by applying the MTV / CTV minimums. However, this test effectively assumes that 100% of active policies lapse. The Taskforce's view was that the likelihood of all policyholders voluntarily lapsing was remote, and that some value would remain in respect of remaining policies. Such value could be realised in a "distressed sale" of the business, however, the Taskforce recognised the difficulties in setting a robust basis for determining a "distressed sale" value, and recognised the uncertainty over which party, buyer or seller, acquired this value. For this reason, although a number of options for incorporating a mass lapse scenario into the Solvency and Capital Adequacy requirements were presented in the paper, the Taskforce recommended Option 2 in the discussion paper, which is given as follows:

The Solvency / Capital Adequacy requirement is to be based on the greater of the prospective Solvency/Capital Liability (calculated using margins for adverse experience for all components) and the CTV/MTV (calculated using best estimate experience for all components*)
*Including:
unexpired risks;
• claims that have been incurred but not reported;
• claims that have been reported but not admitted;
• claims that have been admitted and are still outstanding.
Under the current standards, the CTV and MTV for risk business generally include best estimate reserves plus margins for adverse experience on some of these items Under the Taskforce's proposal, margins would not be required on the above items.

1.4 The taskforce has also recommended applying the test at the Statutory fund Level rather than the RPG level, except where a Statutory fund contains both participating and non - participating business, in which case each of the two categories should be grouped and the test applied separately to each category.

1.5 In making these recommendations, the task force has not been able to model the impact of the changes on current capital positions in the industry. We note that the changes may lead to a significant reduction in Solvency / Capital Adequacy requirements, especially where a company has significant retail and Group Risk business within the same Statutory Fund. We therefore recommend that APRA conducts sample modelling or surveying to determine the impact of these changes.

2 Reasoning for Recommendations

2.1 Margins based on the greater of the prospective liability and CTV/MTV (with no additional margins).

- This basis is transparent and is easy to apply. One of the stated objectives of LPS 2.04 is to provide comparability across the industry. The application of termination value minimums to determine the solvency liability for a statutory fund ensures a minimum capital benchmark is applied consistently across all life insurance companies. The termination value minimum is appealing from an external communication perspective as it is easy to explain and provides a clear sense of security to policyholders.
- The prospective liability contains margins on all components which are calculated to take into account the risk tolerance levels under the standards.
- The CTV/MTV minimums provide additional margins to cover a mass lapse scenario.
- Margins are not required on the CTV/MTV minimums as the likelihood of all active lives leaving and only existing claimants remaining is remote. In reality, a mass lapse scenario would not result in a loss of 100% of the business. A mass lapse scenario may result in a distressed sale, with most of the value passed to the acquirer. However, a distressed sale is likely to include the transfer of both active lives and existing claimants at a consideration of no more than the CTV without margins.

2.2 Applying the test at the Statutory fund Level

- Applying the test at a statutory fund level recognises the benefits of diversification across product lines. It also avoids the situation where capital requirements differ between two companies simply due to differing approaches to categorisation of products into RPGs.
- Applying the CTV/MTV test at a statutory level could weaken the security of participating policyholders. The Taskforce recommends applying the test at a category level.

Attachment 6: Solvency II

1 Introduction

1.1 Solvency II is intended to modernise and standardise insurance legislation in Europe. The European Commission is responsible for the overall framework principles and the detailed implementation measures. CEIOPS (Committee of European Insurance & Occupational Pension Supervisors) is responsible for the supervisory standards. Solvency II is expected to be implemented in 2011 by the European Commission.

1.2 The draft framework directive was published by the European Commission in July 2007. The framework has a high-level approach but contains many detailed implementation measures. The evolving framework of Solvency II has undergone three quantitative impact studies (QIS) by insurers and is moving towards the final framework. A fourth QIS has been scheduled with results due in November 2008.

1.3 This summary gives a brief outline of the Solvency II framework and then focuses on the methodology required to calculate the capital charges for the key Life Risks (refer 3.4).

2 Capital Requirements

2.1 Solvency II uses two levels of capital requirement, representing two levels of intervention:

- A solvency capital requirement (SCR) sets the required level of capital for a licensed entity, calibrated to cover at least a one in 200 year event (99.5% Value at Risk) over a one year period. Refer to section (3).
- A lower minimum capital requirement (MCR) serves as the threshold for ultimate supervisory intervention, including winding-up, thus making the ease, robustness and reliability of calculation of the MCR important features. Refer to section (4).

2.2 These capital requirements are required to be held above Technical Provisions, calculated as a "market-consistent" value of liabilities.

2.3 For non-hedgeable liability cashflows, Technical Provisions are calculated as the sum of a best estimate provision, plus a risk margin element.

Technical provisions (best estimate element)

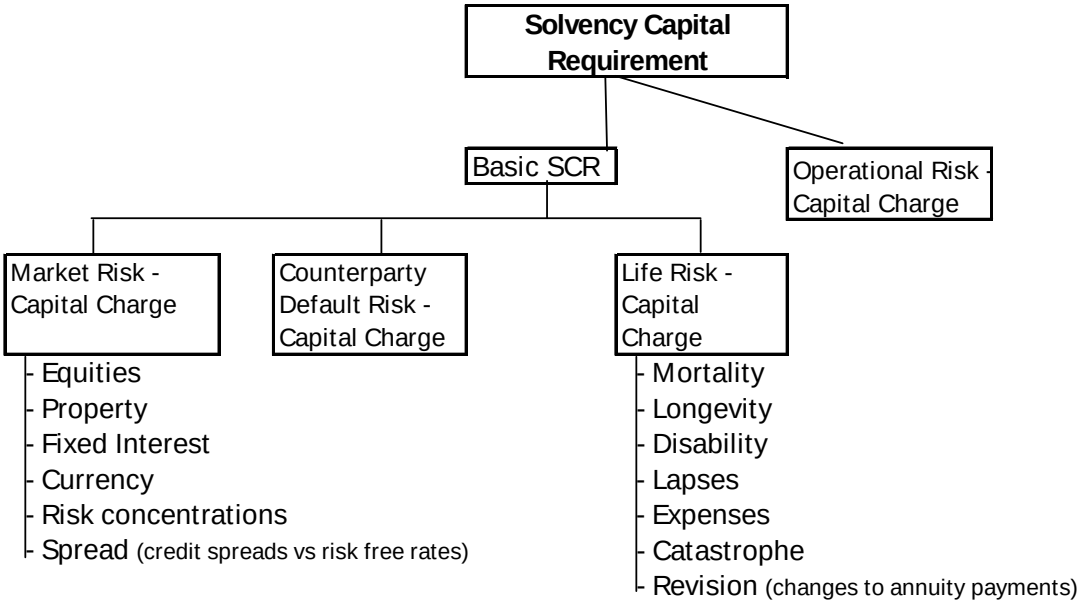
The best estimate liability is calculated using the life insurer's best estimate of future cash flows until all insurance commitments are fulfilled, discounted using a risk free yield curve. This is akin to the "exit value" method, currently being considered in IFRS II.

Technical provisions (risk margin element)

The risk margins are the compensation a purchasing entity would require for taking on the best estimate liability. The risk margin element combined with the best estimate element represents the "exit value" or transfer value of the liabilities.

3 Solvency Capital Requirement (SCR)

3.1 The SCR is built up as follows:



3.2 The Basic SCR comprises capital charges for Market Risk, Counterparty Default Risk and Life Risk. A correlation matrix is used to combine and reduce the capital charges for the three risks, after allowing for the diversification of risks.

- The Basic SCR includes only those risks that have a probability of occurrence of more than 0.5% in the next 12 months.
- Note that Life Insurers have the option of using an Internal Model to derive the various capital charges, instead of following the prescribed parameters outlined below.

3.3 The Operational Risk capital charge is calculated as the lower of (a) 30% SCR and (b) a formula of (3% Premium plus 0.3% Reserves).

3.4 The Life Risk capital charge, a component of the Basic SCR, is determined using the following steps:

(i) Calculate the Capital charges for individual risks.

Capital charges (and risk margins) are calculated for the Life sub-risks using the following shock scenarios:

- Mortality Shock: permanent 10% increase in mortality rates for each age.
- Longevity Shock: permanent 25% decrease in mortality rates at each age.
- Disability Shock: increase of 35% in disability rates for the next year, together with a (permanent) 25% increase (over best estimate) in disability rates at each age thereafter.
- Lapse Shock: the greater each year of (i) a 50% increase in the lapse rates, or (ii) 30% of the sum of (SV – technical provisions), for policies where the surrender value currently exceeds the technical provisions; together with a 50% reduction in the assumed lapse rates for policies where SV is less than reserves.
- Expense Shock: future expenses are best estimate plus 10%, the rate of expense inflation is expected plus 1% p.a.; for policies with adjustable loadings, 75% of these additional expenses can be recovered from year 2 by increasing fees and charges.
- Revision Shock: Increase of 3% in the amount payable under annuities exposed to revision risk.

- Catastrophe Risk: 0.15% of capital at risk for any products with benefits dependent on mortality or disability. Capital at risk is defined as Lump Sum Assured + (Annualised Benefit Payments x annuity factor for expected duration of benefits) - Technical Provisions.

Risk mitigating effects can be included in the calculations e.g. rate increases, fee increases.

(ii) Adjustment for diversification

- The total capital charge for Life Risks is derived by combining the capital charges for the various life sub-risks using a correlation matrix as follows:

$$SCR_{life} = \sqrt{\sum_{rxc} CorrLife^{rxc} \bullet Life_r \bullet Life_c}$$

where

SCR_{life} = the capital charge for life underwriting risk

$CorrLife^{rxc}$ = the cells of the correlation matrix *CorrLife*

$Life_r$, $Life_c$ = capital charges for individual life underwriting sub-risks according to the rows and columns of correlation matrix *CorrLife*

and where the correlation matrix *CorrLife* is defined as:

$CorrLife=$	$Life_{mort}$	$Life_{long}$	$Life_{dis}$	$Life_{lapse}$	$Life_{exp}$	$Life_{rev}$	$Life_{CAT}$
$Life_{mort}$	1						
$Life_{long}$	0	1					
$Life_{dis}$	0.5	0	1				
$Life_{lapse}$	0	0.25	0	1			
$Life_{exp}$	0.25	0.25	0.5	0.5	1		
$Life_{rev}$	0	0.25	0	0	0.25	1	
$Life_{CAT}$	0	0	0	0	0	0	1

3.5 It should be noted that all of the above parameters are based on the CEIOPS QIS4 technical specifications. These are all subject to change following further consultation.

4 Minimum Capital Requirement (MCR)

4.1 It is intended that the MCR will be calculated quarterly using approximate methods. Life Insurers may use a modular factor-based approach, such as percentages of premium and reserves. These factors could be recalibrated each year against the SCR.

4.2 Under the QIS4 specification, the formula for a Life MCR is:

$$MCR_{Life} = \sum_i \alpha_i TP_i + \sum_j \beta_j CAR_j$$

4.3 Where the Technical Provisions have following factors α separated into the following categories i:

1st level segment		*Risk driver*	
		Death or Savings	Survivorship or Morbidity
With-profits	provisions for guaranteed benefits	0.025	0.035
	provisions for discretionary benefits	0.00	0.00
Unit-linked		0.005	0.0175
Non-profit		0.01	0.035

4.4 With the following special classes of unit-linked business:

Class VII business (Management of group pension funds)	0.0005
Unit-linked with guarantee on survival	0.0175

4.5 Capital-at-risk is defined as the sum of amounts currently payable on death or disability, less technical provisions, where these are positive. The capital-at-risk factors are set for the following categories j:

J	*Outstanding term of contract*	β_j
1	5 years or more	0.00125
2	3 to 5 years	0.0009
3	3 years or less	0.0005

4.6 The Life MCR is subject to an absolute (monetary) floor of €2m

Attachment 7: Canadian Minimum Capital Requirements

1 Canadian Minimum Capital Requirements

1.1 The minimum capital requirements for Canadian life insurers are specified in a Guideline document dated November 2006 and issued by the Canadian regulator (Office of the Superintendent of Financial Institutions Canada).

1.2 A life insurer's minimum capital requirement is the sum of capital required for each of five risk components. The components are determined using factor-based or other methods applied to specific assets or liabilities. The five risk components are:

- Asset default risk
- Mortality/morbidity/lapse risks
- Interest margin pricing risk
- Changes in interest rate environment risk
- Segregated funds risk

1.3 This note focuses on the second component listed above, i.e. insurance risks, particularly the risk margins used to determine the amount of capital for insurance risks.

2 1.0 Mortality Risks - including Accidental Death and Dismemberment

2.1 The gross mortality component for life insurance (both individual and group) is the sum of the components for volatility risk and catastrophe risk.

2.2 Companies need to allocate their mortality business into sets of like products, i.e. having similar attributes for premium adjustability and guarantee duration. Death and accidental death & disablement (AD&D) products must be separated, as must individual and group products.

2.3 All cashflow projections, benefit amounts and reserve amounts used to determine the mortality component are calculated net of all reinsurance. Cashflow projections should take into account all current valuation decrements and assumptions including margins for adverse deviation.

3 1.1 Volatility Component

3.1 The capital required for volatility risk is:

$$\sqrt{\sum_{\text{Basic Death}} S^2} + \sqrt{\sum_{\text{AD\&D}} S^2}$$

where the sums are taken over all sets of basic death and AD&D products respectively, and S is the volatility component for the set of products. The formula for S is given by:

$$S = 2.5 \times A \times B \times E / F$$

where:

A is standard deviation of next year's projected net death claims for the set, defined by:

$$A = \sqrt{\sum q(1-q)b^2}$$

In the above equation, the sum is taken over all policies in the set, q is equal to the valuation mortality (including the margin for adverse deviations) for a particular policy, and b is the net death benefit for the policy.

B is defined by:

$$B = \begin{cases} \max\left(\frac{1}{2}\ln(D), 1\right) & \text{for sets of adjustable and participating policies that meet the criteria for reduced factors} \\ \max(\ln(D), 1) & \text{for all other sets of policies} \end{cases}$$

where D is equal to the Macaulay duration of all projected net death claims for the policies in the set, calculated assuming a discount rate of 5% per year, and ln is the natural logarithm function.

E is the total net amount at risk for the policies in the set,

F is the total net face amount for the policies in the set.

4 1.2 Catastrophe Component

4.1 The capital required for catastrophe risk is:

$$\sum_{\text{All Products}} K$$

where the book of business is split into the same sets as in the volatility component, and K is the capital requirement for catastrophe risk for the set. The formula for K is given by:

$$K = \alpha \times C \times E / F$$

where:

α = 0.05 for most risk policies,

C is projected value of the next year's total net death claims for all policies in the set,

E is the total net amount at risk for the policies in the set,

F is the total net face amount for the policies in the set.

5 2.0 Morbidity Risk

5.1 Morbidity risk for accident and sickness insurance relates to risks arising from volatility in claims experience, and from events that would lead to increased claims. To compute the morbidity component, a factor is applied to the measure of exposure to risk. The resulting values are added to arrive at the morbidity risk component requirement.

6 2.1 New Claims Risk

6.1 The new claims risk component relates to claims arising from the current year's coverage, and includes the risks of incidence and claims continuance. The factor applied to the measure of exposure is as follows:

Length of Prem G'tee	Percentage of Annual Premium	
	Individually U/written	Other
≤ 1 year	12%	12%
< 1 year ≤ 5 years	20%	25%
> 5 years	30%	40%

For benefits attached to group life insurance policies, the factors for individual coverages should be used. These factors should be multiplied by 75% for benefit periods that do not exceed two years.

7 2.2 Continuing Claim Risk

7.1 The continuing claims component covers the risk of claims continuance arising from coverage provided in prior years. The factor applies to disability income or waiver of premium claim reserves related to claims incurred in prior years, including the portion of the provision for incurred but unreported claims.

The factor applied to the measure of exposure is as follows:

Ben Period remaining	Duration of Disability		
	≤ 2 years	2 - 5 years	> 5 years
≤ 1 year	4.0%	3.0%	2.0%
< 1 year ≤ 2 years	6.0%	4.5%	3.0%
> 2 years	8.0%	6.0%	4.0%

7.2 The total capital and surplus requirements for morbidity risk is multiplied by a factor determined by interpolation from the following table:

Calculated Component Requirement	Factor
≤ $10 million	1.00
$20 million	0.95
$50 million	0.85
≥ $100 million	0.75

8 3.0 Lapse Risk

8.1 The lapse risk component of required capital recognizes the risk that lapse experience may vary year to year from what has been assumed.

8.2 It is calculated by either increasing or decreasing the lapse assumption for each policy at each duration, depending on which adjustment gives a higher reserve. For policies with crossover points, the assumed lapse rate will be increased at some durations and decreased at others.

8.3 The lapse component is determined by:

1) Calculating total policy liabilities net of reinsurance.

2) Recalculating total net policy liabilities using higher lapse margins for adverse deviation. The magnitude of the lapse margin at each policy duration should be increased by 7.5% for qualifying participating policies and adjustable premium policies, and 15% for all other policies.

For example, if a lower lapse assumption at a particular duration for a non-participating, non-adjustable premium policy produces a higher reserve, and the valuation assumption uses a best-estimate lapse rate of 6% reduced by a 10% margin to 5.4%, then the revised assumption should use a lapse rate of 6% reduced by a 25% margin to 4.5%. On the other hand, if a higher lapse assumption at a particular duration produces a higher reserve, and the valuation assumption uses a best-estimate lapse rate of 6% increased by a 10% margin to 6.6%, then the revised assumption should use a lapse rate of 6% increased by a 25% margin to 7.5%.

3) Subtracting the reserve calculated in Step 1 from the reserve calculated in Step 2.

Guideline Document issued by Canadian regulator:

http://www.osfi-bsif.gc.ca/app/DocRepository/1/eng/guidelines/capital/guidelines/MCCSR_07_e.pdf