Actuaries Institute

The Practice of Life Insurance in Australia – Part B

Important Administration Information

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The Practice of Life Insurance in Australia – Part B

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Chapter 21 – Valuation of Policy Liabilities

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21.1. Introduction

The valuation of policy liabilities for the purpose of determining profits is one of the key responsibilities of the appointed actuary. This chapter discusses the methods used for valuing policy liabilities in Australia for the purposes of preparing both the general purpose financial statements under the accounting standards and the financial statements that have to be submitted to APRA. The two sets of financial statements are similar but may not necessarily always be exactly the same.

Key reference documents are:

- Accounting Standard AASB 1038 Life Insurance Contracts (www.aasb.gov.au)
- Prudential Standard LPS 340 Valuation of Policy Liabilities (www.apra.gov.au)

The preparation of general purpose financial statements is required under the Corporations Act. General purpose financial statements must be lodged with the Australian Securities and Investments Commission. These are the statements that life companies make publicly available. The financial statements provided to APRA are used for APRA's prudential supervision processes and are also published in APRA's statistical publications. Certain items referred to in the Life Insurance Act must be calculated according to LPS 340. These include shareholders' and policy owners' retained profits.

21.2. Relevant Parties and Legal Requirements

The responsibility for placing a value on the company's policy liabilities rests with the board of a life company. The board must consider the advice of the appointed actuary. The appointed actuary must calculate the policy liabilities on an annual basis. The appointed actuary must provide advice on an appropriate methodology if he/she does not perform the calculations for interim financial reports. If the board decides not to adopt the values or methodology advised by the appointed actuary it must explain why to APRA.

AASB 1038 requires the notes to the general purpose financial statements to disclose whether the policy liabilities have been calculated in accordance with the requirements of the Life Insurance Act (i.e. LPS 340) and whether the actuary is satisfied as to the accuracy of the data from which the amount of policy liabilities has been determined. If the outcomes under AASB 1038 and LPS 340 differed this would need to be mentioned in the notes to the general purpose financial statements.

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The auditor of a life company has a responsibility under both the Corporations Act and APRA reporting standards for providing assurance that the company's annual general purpose financial statements and annual reporting forms (with some exceptions) submitted to APRA are reliable. Interim statements and reporting forms do not need to be audited.

21.3. Valuation Principles

The features of life policies that create difficulties in measuring profits are:

- life policies are long term contracts;
- the timing and amount of the contractual cash flows can be very uncertain;
- there can be a significant mismatch between the timing of cash inflows and outflows; and
- for participating business, there must be an allocation of profits between policy owners and shareholders.

Profit from a block of life insurance business can only be known with certainty once all the policies have terminated. However, the profit emerging each year can be estimated by making a valuation of the policy liabilities and treating the increase in policy liabilities as a deduction from net cash flows. The profit of a life insurance company for a particular period is:

- net cash flows (premiums and investment income less claim payments, expenses and tax); less
- increase in policy liabilities.

Life policies must be valued according to the following broad principles under both the accounting and APRA standards:

- the liability for future cash flows associated with policies must be calculated on a best estimate basis;
- revenue and expenses must be recognised as services are provided to policy owners, not at the time that revenue is received or expenses paid. Revenue and expenses must not be recognised prematurely or be deferred until after services are provided. An exception to this rule is that if a policy is expected to make future losses, these losses must be recognised immediately.

The first principle means that policy liabilities must be realistic. They must not be deliberately over or under estimated. It might appear more prudent to use a conservative basis for calculating policy liabilities. However, this will result in a deferral of profit emergence. There is indeed a need for prudence in the management of life companies, but this issue is dealt with separately under the topic of capital management.

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The second principle affects the timing of profit emergence. It would not, for example, be appropriate, to recognise the expected profit from all future cash flows immediately when a policy is sold as the revenue has not yet been received.

The pattern of profit emergence for a policy depends on the valuation basis that is used for determining the policy liability. The following table shows projected cash flows for a 10 year level premium term insurance policy.

Table 21.1: Cash flows – 10-Year Level Term Policy

Year	Premiums	Claims	Expenses	Net Cash Flow
1	1,000.00	415.00	1,200.00	-615.00
2	900.00	509.00	90.00	301.00
3	810.00	488.64	81.00	240.36
4	729.00	469.09	72.90	187.01
5	656.10	450.33	65.61	140.16
6	590.49	432.32	59.05	99.12
7	531.44	415.02	53.14	63.27
8	478.30	398.42	47.83	32.04
9	430.47	382.49	43.05	4.93
10	387.42	367.19	38.74	-18.51

If profit was defined to be the net cash flow (i.e. policy liabilities were zero), the expected profit would be negative in year 1 because of the policy acquisition costs. This would not be appropriate because acquisition costs would be recognised before services were provided to the policy owner. The expected profit would be negative in year 10. This is not appropriate either because revenue would be recognised prematurely in profit before the service (payment of claims) in year 10 had been provided.

A comparison of profit emergence under different valuation bases is shown in the table below (the discount rate has been set to zero in order to simplify the calculations). The liabilities shown in the table are the values calculated at the end of each year.

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Table 21.2: Profit emergence – 10-Year Level Term Policy

Year	Best Estimate Basis		Conservative Basis		LPS 340 Basis	
	Liability	Profit	Liability	Profit	Liability	Profit
1	-1,049.39	434.39	289.76	-904.76	-656.66	41.66
2	-748.39	0.00	411.06	179.70	-406.75	51.09
3	-508.03	0.00	480.53	170.89	-215.44	49.05
4	-321.02	0.00	504.93	162.60	-75.52	47.09
5	-180.86	0.00	490.31	154.78	19.44	45.20
6	-81.74	0.00	442.02	147.41	75.16	43.40
7	-18.47	0.00	364.85	140.45	96.78	41.66
8	13.58	0.00	263.01	133.88	88.83	39.99
9	18.51	0.00	140.29	127.66	55.37	38.39
10	0.00	0.00	0.00	121.78	0.00	36.86

For the best estimate basis, the policy liability equals the value of future net cash flows. This basis allows all expected profits to emerge in year 1. This is inappropriate because revenue is recognised before it has been received and before services to the policy owner have been provided. This also assumes that the assumptions used to determine the best estimate liability is same as that used to price the contract.

In the conservative basis, the liability equals the value of future net cash flows, assuming claims and expenses are 30% higher than best estimate. A loss is reported in year 1 because of the conservative basis (as the PV of premiums would be less than the claims and expenses) and because acquisition costs have not been deferred. This basis is not appropriate because it is unrealistic and because acquisition costs are recognised before services are provided.

The LPS 340 basis provides for a much smoother pattern of profit emergence. A service provided to the owner of a 10 year term policy is insurance against the risk that the life insured might die. If claims are chosen as the profit carrier, profit emerges as a constant proportion of claim payments.

It is a useful exercise for readers to:

- confirm profit is equal to net cash flow less change in policy liability (note there is insufficient detail to reproduce the net cash flow and liability figures themselves);
- verify that the total profit is the same under each method over the life of the policy; and
- rationalise the different pattern of recognition of profit under each method

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21.4. Contract Types

AASB 1038 and LPS 340 both classify life policies as being either insurance contracts or investment contracts. The methods for valuing the two types of contracts differ, although both methods aim to satisfy the principles described previously.

An insurance contract is a contract under which one party (the insurer) accepts significant insurance risk from another party (the policy owner) by agreeing to compensate the policy owner if a specified uncertain future event (the insured event) affects the policy owner.

Insurance contracts include:

- participating business (traditional and investment account);
- non-participating investment account business with a discretionary participation feature;
- lifetime annuities;
- term insurance;
- disability income insurance;
- group life insurance;
- group salary continuance.

Discretionary participation features are defined in LPS 001 Definitions. The most common form of this type of feature occurs where the life company has discretion to vary crediting or bonus rates from time to time depending on the performance of a specified pool of assets.

Participating business and discretionary non-participating investment account business are always treated as insurance contracts, even though they may not have significant insurance risk.

Investment contracts include:

- investment account business without a discretionary participation feature (i.e. the life company has no discretion is setting the crediting rates);
- investment-linked business; and
- term annuities.

The reason for treating investment contracts separately is that similar types of contracts are issued by companies other than life companies. The accounting treatment for investment contracts is the same, regardless of what type of company issues them.

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21.5. Valuation of Insurance Contract Liabilities

The method for valuing insurance contract liabilities is set out in AASB 1038 and LPS 340. The liabilities calculated under the two standards are usually the same. LPS 340 is the more detailed of the two standards and this chapter focuses mainly on this standard. It is however useful to read the relevant sections of AASB 1038 as well (sections 8 and 9). The method for valuing insurance contract liabilities was known as the "Margin on Services" or MoS method when it was first introduced in the 1990s, although this term is not used in either of the current standards.

The policy liability has the following components:

- the best estimate liability; plus
- the present value of future best estimate shareholder profits; plus
- the present value of future best estimate bonuses (for participating business only).

The best estimate liability is the present value of the future net cash flows (claims or benefits plus expenses less premiums), but excluding future bonuses. Future bonuses represent participating policy owners' entitlements to their share of future profits. Future bonuses and shareholder profits are included in the policy liability so that profit is not recognised prematurely, before services have been provided.

For an in-force portfolio the best estimate liability may also include the termination values i.e. IBNR and DLR for risk business.

The best estimate liability can be positive or negative but the present values of future shareholder profits and future bonuses cannot be less than zero. Under the projection method the initial expenses/commissions are included implicitly in the best estimate liability compared to the accumulation method which is explicit. This will be discussed further in the sections below.

Important features of the Margin on Services method are discussed in the following paragraphs.

21.5.1. Asymmetric Risks

The best estimate liabilities are the present values of future cash flows projected using best estimate assumptions. If the distribution of potential liability outcomes is symmetrical, then it will normally be sufficient to set each best estimate assumption to be the mean of the distributions of future experience for that assumption.

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The distribution of potential liability outcomes is not always symmetrical. Examples of asymmetries found in life insurance contracts include:

- guaranteed minimum surrender and maturity values in participating business and discretionary non-participating business – future bonuses or interest credits can be added to policy values, but cannot subsequently be taken away if investment losses occur. If a mean investment return is assumed, the possibility of negative investment returns at some point in the future will be ignored; and
- profit sharing formulae for group risk business – a profit share rebate will be paid to the policy owner if experience is good but the rebate cannot fall below zero if experience is bad. It would be inappropriate to set the best estimate mortality assumption to be the expected mean of future mortality rates as this would ignore those potential outcomes where the profit share rebate is zero.

More sophisticated techniques are required to properly value business which include asymmetric liability outcomes. Some of these techniques are described in the information note on asymmetric risks that can be found on the Actuaries Institute website. These techniques include stochastic modelling. In a stochastic model, there is no single deterministic best estimate assumption for investment returns, mortality, etc. Instead the best estimate assumptions are expressed as probability distributions of random variables.

21.5.2. Expense Allocation

In order to calculate the policy liabilities, actual expenses for the reporting period must be allocated between acquisition and maintenance activities. Acquisition expenses must be further allocated to product line. The acquisition expenses are one of the inputs used to determine the profit margins for new business.

The expenses (acquisition and maintenance) allocated to participating business will affect the amount of profit allocated to participating policy owners.

There also needs to be an allocation of budget expenses for the following year. The best estimate of maintenance expenses must be sufficient to cover the budget maintenance costs for the following year. The allocation of budget expenses will affect the profit margins determined for each product line.

Note that "one-off" expenses are deducted from profits, but unlike other types of expenses they do not have to be considered when calculating the policy liabilities.

Under Section 80 of the Life Insurance Act 1995, the appointed actuary must advise the life company whether the apportionment of expenses is appropriate.

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21.5.3. Profit Emergence

Shareholder profits are expressed as a uniform percentage of an appropriate profit carrier. A profit carrier is selected with reference to the services provided under the policy. For example:

- for term insurance, the service provided is death cover so the selected profit carrier is normally expected death claims (premiums can be used if they have the same run-off pattern as claims);
- for disability or trauma insurance the profit carrier is normally either the expected cost of claims or premiums. Considerations must also be made on whether the premiums are on a stepped or level basis as for level business normally the projected premiums in the earlier years are higher than the claims (and lower in the latter years) where using premiums as a carrier may prematurely release profit;
- for lifetime annuities, the profit carrier is normally expected annuity payments;
- for participating business, the main service is payment of bonuses, so the selected profit carrier is usually future bonuses.

The present value of the profit carrier reduces over time as services are provided and the policy approaches maturity or expiry. This results in a gradual release of shareholder profits from the policy liabilities.

It is possible to have more than one profit carrier for a policy, but this complicates the calculations.

21.5.4. Loss Recognition

A policy will be loss-making if the best estimate liability at commencement (before any cash flows occur) is greater than zero. In other words, the present value of claims and expenses will exceed the present value of premiums. In this circumstance the policy liability at commencement will be set to equal the best estimate liability as the value of future profits is zero. In practice, this adjustment is done for a Related Product Group rather than an individual policy.

LPS 340 applies this requirement through an "adequacy threshold" for the value of future profits. For policies where the discount rate is a risk-free rate, the value of future profits cannot be less than zero, or in other words the policy liability cannot be less than the best estimate liability. For other policies, including participating business, the value of future profits cannot be less than the difference between the best estimate liability calculated using a risk-free discount rate and the actual best estimate liability. In other words, the policy liability cannot be less than the best estimate liability calculated using a risk-free discount rate.

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21.5.5. No Profit at Commencement

Profit must not be released at policy commencement, unless acquisition is considered to be a service and there is an explicit establishment fee.

If a policy is profitable, the best estimate liability at commencement must be negative. For profit to be zero at commencement, the policy liability at commencement (before any cash flows occur) must be zero. This means that the value of future shareholder profits and bonuses must equal the absolute value of the best estimate liability. The profit margin is the value of best estimate shareholder profits divided by the value of the profit carrier. After the policy commences, the value of future shareholder profits will be the profit margin multiplied by the value of the profit carrier.

In the example in Tables 21.1 and 21.2, the best estimate liability at commencement is -434.39. The value of the profit carrier (expected claims) is 4,327.50. The profit margin is therefore 10% (note this has not been rounded in the calculations).

If a policy is profitable and the acquisition expenses exceed the first premium, the policy liability immediately after commencement will be negative. This is a typical feature of individual risk business.

The following table shows the breakdown of the policy liability at the end of each year for the policy in table 21.1. The present value of the carrier is the present value of future death claims. The present value of shareholder profits is the profit margin of 10% multiplied by the present value of the carrier. The policy liability is the best estimate liability plus the present value of shareholder profits. The right hand column confirms that profit emerging in each year equals the profit margin multiplied by the profit carrier.

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Table 21.3: Projected policy liabilities – 10-Year Level Term Policy

Year	Claims	Net Cash Flow	PV Carrier	BEL	PV S/h profits	Policy liability	Profit	Profit / Claims
1	415.00	-615.00	3,912.50	-1,049.39	392.73	-656.66	41.66	10.0%
2	509.00	301.00	3,403.50	-748.39	341.64	-406.75	51.09	10.0%
3	488.64	240.36	2,914.86	-508.03	292.59	-215.44	49.05	10.0%
4	469.09	187.01	2,445.77	-321.02	245.50	-75.52	47.09	10.0%
5	450.33	140.16	1,995.44	-180.86	200.30	19.44	45.20	10.0%
6	432.32	99.12	1,563.12	-81.74	156.90	75.16	43.40	10.0%
7	415.02	63.27	1,148.10	-18.47	115.24	96.78	41.66	10.0%
8	398.42	32.04	749.67	13.58	75.25	88.83	39.99	10.0%
9	382.49	4.93	367.19	18.51	36.86	55.37	38.39	10.0%
10	367.19	-18.51	0.00	0.00	0.00	0.00	36.86	10.0%

21.5.6. Assumption Changes

The assumptions used to determine the best estimate liabilities are reviewed and changed regularly as experience unfolds. However, future expected profits must not be released into current year profit as a result of these assumption changes because an assumption change is not a service provided to policy owners. In order for the policy liability to be kept constant when assumptions are changed, the value of future profits and bonuses must be adjusted. This is achieved by recalculating the profit margins.

An exception is made for market-related changes to the discount rate and other economic assumptions such as inflation rates. The discount rate reflects prevailing interest rates. The value of the fixed interest assets on the balance sheet also reflects prevailing interest rates. To avoid profit being released through a mismatch between the asset valuation basis and the liability valuation basis, the policy liabilities must change to reflect changes to discount rates.

There is also an exception for policies that are already in loss-recognition. If a policy has recognised losses, the value of future shareholder profits included in the policy liability is zero. Favourable changes in assumptions will result in a reduction to previously capitalised losses and a reduction in policy liabilities. Once recognised capitalised losses are extinguished, further favourable changes in assumptions result in a value of future shareholder profits being re-established (through positive profit margins) and added to the policy liabilities.

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It is acceptable for changes to assumptions affecting incurred but not reported claims (IBNR reserves) and disability claims in course of payment (CICP or DLR reserves) to result in an immediate change to the policy liabilities. The rationale for allowing these assumption changes to affect policy liabilities is that the profit margins for these policies were released at the time that claims were incurred (or if premiums are the profit carrier, when premiums were paid). A change of assumptions for IBNR or CICP reserves does not therefore affect the emergence of future expected profits because there are no future expected profits for these policies.

The following table shows the impact of an assumption change made at the end of year 5 for the level term policy. In this example, the best estimate of expenses for years 6 to 10 has been increased by 10%. The policy liability at the end of year 5 is 19.44 (from table 21.3). Under the new assumptions the best estimate liability is -156.68. The present value of shareholder profits must therefore be 176.12 (= 19.44 + 156.68). The present value of the profit carrier is 1995.44 and the profit margin becomes 8.8% (= 176.12 / 1995.44).

Table 21.4: Impact of an assumption change – 10-Year Level Term Policy

Year	Expenses	Net Cash Flow	PV Carrier	BEL	PV S/h profits	Policy liability	Profit	Profit / Claims
5			1,995.44	-156.68	176.12	19.44		
6	64.95	93.22	1,563.12	-63.46	137.96	74.50	38.16	8.8%
7	58.46	57.96	1,148.10	-5.51	101.33	95.83	36.63	8.8%
8	52.61	27.26	749.67	21.75	66.17	87.92	35.17	8.8%
9	47.35	0.63	367.19	22.38	32.41	54.79	33.76	8.8%
10	42.62	-22.38	0.00	0.00	0.00	0.00	32.41	8.8%

21.6. Discount Rates

If the policy benefits depend on the performance of the assets (e.g. participating business and discretionary non-participating business), the discount rate must reflect the expected investment returns. This allows profit to emerge in line with investment returns. However, the policy liability must be increased, if necessary, so that the "adequacy threshold" (described previously) is met. The policy liability cannot be less than if it was calculated using a risk-free discount rate.

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For policies, whose benefits do not depend on investment performance, the discount rate must be a risk-free rate. The risk-free discount rate measures the time value of money. Use of a risk-free rate, rather than an expected investment return, ensures that the value of the liabilities is independent of the assets held. A company can invest in risky assets in the expectation that these will provide it with higher profits in future, but it cannot capitalise these profits by using a higher discount rate to reduce its present liabilities. This can sometimes lead to policies being reported as being in loss-recognition, even though the company expects them to ultimately be profitable.

The Actuaries Institute information note on risk free discount rates under AASB 1038 discusses methods for determining risk-free discount rates.

21.6.1. Related Product Groups

It would add to the complexity of valuation calculations if a profit margin had to be calculated separately for each policy. LPS 340 allows profit margins to be calculated at "related product group" level. A related product group is a group of products with similar benefit characteristics and pricing structures.

For new policies that commence in a reporting period, the value of future shareholder profits can be combined with those of existing policies for the purpose of determining the profit margins for the related product group at the end of the period.

Records of cumulative capitalised losses must be kept for each related product group. Sales of profitable new business can reduce existing cumulative capitalised losses. Profits from the new business are capitalised at commencement in this circumstance.

21.6.2. Accumulation Methods

LPS 340 allows life companies to use a simpler method for calculating policy liabilities if the results will not be materially different from those obtained under the "projection method" described above. An "accumulation method" does not require projections of all future policy cash flows.

The accumulation method is commonly used for valuing the policy liabilities for group risk business (however may also be applied to individual risk business). This business is typically short-term with low acquisition costs, in contrast to individual risk business, which is typically long-term with high acquisition costs.

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LPS 340 does not specify in detail how an accumulation method should work. However, for group risk business the policy liabilities determined under an accumulation method must have the following components in order to give similar results to the projection method:

- an unearned premium reserve or UPR (this is the portion of the last premium payment that represents payment for insurance risks after the calculation date); plus
- claim reserves (incurred but not reported claims, reported but not admitted claims and disability claims in course of payment); less
- deferred acquisition recovery cost component .

There will also be a reserve for accrued profit share payments for policies with profit-sharing arrangements.

Deferred acquisition costs are deducted from the policy liability so that a loss is not reported at policy commencement. LPS 340 requires that deferred acquisition costs be run-off in line with the acquisition cost recovery carrier. The carrier must reflect the method the company uses to recover acquisition costs. For group risk business, the acquisition cost recovery carrier will most likely be premiums as part of each premium will, in effect, include an allowance for the recovery of the acquisition costs.

It is important to note that under the accumulation method a 'test' may be required to ensure whether the DAC is recoverable (applicable for individual risk business). This ensures that any expected future losses are recognised in the current period. The test subjects the policy liability to a minimum of the best estimate liability. The DAC recoverability 'test' may be performed by comparing the projected BEL to the UPR less DAC. The UPR less DAC is used as a proxy for policy liability in this test. Certain other reserves (such as the DLR and IBNR) are excluded from both the BEL and policy liability for this purpose, however this has no impact on the assessment of the amount of DAC expected to be recoverable.

The following example shows a comparison of the projection and accumulation methods for a group policy with a term of 3 years and premiums paid yearly in advance. The policy liability and profit emergence have been calculated at the end of each 6 months in order to show the impact of yearly premiums. Discounting of cash flows has been ignored in order to simplify the calculations. There is assumed to be no profit sharing.

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Table 21.5: Group risk policy – projection method

Months	Premiums	Claims	Expenses	Net Cash Flow	PV Carrier	BEL	PV S/h profits	Policy liability	Profit
1 to 6	1,000.00	400.00	175.00	425.00	2,120.00	102.50	271.31	373.81	51.19
7 to 12	0.00	400.00	25.00	-425.00	1,720.00	-322.50	220.12	-102.38	51.19
13 to 18	1,050.00	420.00	26.25	603.75	1,300.00	281.25	166.37	447.62	53.75
19 to 24	0.00	420.00	26.25	-446.25	880.00	-165.00	112.62	-52.38	53.75
25 to 30	1,100.00	440.00	27.50	632.50	440.00	467.50	56.31	523.81	56.31
31 to 36	0.00	440.00	27.50	-467.50	0.00	0.00	0.00	0.00	56.31

The best estimate liability at commencement is -322.50. The value of the profit carrier (expected claims) is 2,520.00 and the profit margin is 12.8%. The acquisition costs are 150 (the other 25 of expenses in months 1 to 6 are maintenance expenses).

Table 21.6: Group risk policy – accumulation method

Months	Premiums	Claims	Expenses	Net Cash Flow	UPR	PV AER Carrier	DAC	Policy liability	Profit
1 to 6	1,000.00	400.00	175.00	425.00	500.00	2,650.00	126.19	373.81	51.19
7 to 12	0.00	400.00	25.00	-425.00	0.00	2,150.00	102.38	-102.38	51.19
13 to 18	1,050.00	420.00	26.25	603.75	525.00	1,625.00	77.38	447.62	53.75
19 to 24	0.00	420.00	26.25	-446.25	0.00	1,100.00	52.38	-52.38	53.75
25 to 30	1,100.00	440.00	27.50	632.50	550.00	550.00	26.19	523.81	56.31
31 to 36	0.00	440.00	27.50	-467.50	0.00	0.00	0.00	0.00	56.31

The value of the acquisition expense recovery carrier (premiums) is 3,150. The acquisition expense recovery component is 4.8%. Note that the value of the acquisition expense carrier at any point in time includes the unearned premium reserve.

In this example, the accumulation method gives exactly the same results as the projection method as the acquisition cost recovery carrier has the same run-off pattern as the profit carrier. Expected claims are likely to be a fairly constant proportion of earned premiums for a group risk policy due to the relatively short term of the contract, the absence of any significant selection effects, and because new lives insured are continuously replacing those who cease to be covered by the policy.

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21.6.3. Claims Reserves

Reserves for claims that have already been incurred, but where the final claim amount is not yet known, must be included in the policy liabilities under both the projection and accumulation methods. If the projection method is used, these claims reserves will form part of the best estimate liability. Note that provisions for claims that have been admitted and finalised, but not yet paid are recorded separately from policy liabilities on the balance sheet.

Claims reserves include reserves for:

- incurred but not reported claims (IBNR);
- reported but not admitted claims (RBNA or pending); and
- disability income claims in course of payment (CICP or DLR).

RBNA claims are claims that have been reported, but the company has not yet decided whether to admit liability. This can occur if medical or other evidence is required to confirm the claim but it has not yet been submitted, or if the claim is subject to dispute. Reserves for RBNA claims may be calculated separately for each claim, based on the claims manager's assessment of the probability that the claim will eventually be admitted or may be determined using statistical or actuarial techniques.

It is important that the claims reserves are consistent with the accounting treatment pf claims. For example, the may already be a provision for some or all of the RBNA reserves in the accounting entries.

For disability income business, best estimate liabilities for open claims are usually valued separately from the liabilities for active lives.

IBNR claims can arise for a variety of reasons. For death claims, the beneficiaries may not become aware of the existence of a life policy until some time has elapsed after the death of the life insured. For disability income claims, there is usually a waiting period before claim payments can commence. For TPD claims there is usually a waiting period, and it also needs to be established that the disability is permanent rather than temporary. For TPD claims, delays of several years between the incidence and reporting of claims are common particularly for group business. Methods for calculating IBNR are discussed in example 5.

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21.6.4. Participating Business

The policy liabilities for participating business are determined in a similar manner to those for non-participating business but with some notable differences:

The policy liabilities for participating business include an additional component for the value of future best estimate bonuses. Future bonuses are the portion of future profits that will be allocated to participating policy owners. Future best estimate bonuses and future shareholder profits are inter-related as a life company must specify what proportions of profit it will allocate to its policy owners and shareholders. The Life Insurance Act limits shareholder profits to a maximum of 20% of profit for participating business.

For participating business, actual investment experience is retained within the policy liability, rather than being allowed to emerge as an experience profit. The policy liability at the end of the year is calculated as the value of supporting assets (VSA) less the cost of the current year best estimate bonus (for the policies still in force) less the shareholder profit margin on that bonus. These deductions ensure that the cost of the current year best estimate bonus and associated shareholder profit margin emerge and are recognised in the current year.

The VSA at a reporting date is calculated as:

- the policy liability at the end of the previous reporting period; plus
- the cost of declared bonuses at the end of the previous period; plus
- the actual policy related cash flows and investment experience; less
- the expected shareholder profits emerging over the period (on interim and terminal bonuses for policies terminating during the year); less
- the non-investment experience profit.

The VSA incorporates actual investment returns. Differences between actual and expected investment returns affect the current year best estimate bonus and the value of the future best estimate bonuses within the policy liabilities. Investment experience does not emerge as an experience profit in the current year.

The non-investment experience profit includes differences between actual and expected experience for expenses, mortality and withdrawals. The non-investment experience profit is deducted from the VSA and therefore emerges as an experience profit in the reporting year whereas investment experience is retained within the VSA. Non-investment experience does not directly affect best estimate bonuses and shareholder profits; whereas investment experience does. However, all experience (investment and non-investment) will flow through the bonus declaration mechanism and impact future declared bonuses and distributions of shareholder profits.

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The assets backing participating business usually include a significant proportion of risky assets such as shares and properties. The actual investment returns on these assets will vary from the best estimate, often significantly, from year to year. If differences between actual and expected investment returns were allowed to emerge as an experience profit, profit could be very volatile. This would not be appropriate. The emergence of profit must be consistent with a company's bonus philosophy, which will include the smoothing of changes in bonus rates in response to fluctuating investment returns. Methods of bonus distribution are discussed in Chapter 26.

For participating business, the current year best estimate bonuses and shareholder profit can be determined using either the best estimates of future experience as at the current reporting date or the best estimates at the previous reporting date. This differs from non-participating business, where assumptions changes (other than the discount rate and related economic assumptions) have no impact on profit emerging from existing business in the current year, other than through loss recognition or reversal. The current year best estimate bonuses can also be determined using the actual investment return for the current year, rather than the expected return.

It is usually necessary to use a projection method to determine current year best estimate bonus for traditional business because of the complex nature of the future cash flows and bonus distributions for this business. An accumulation method can be used for investment account business because of the simpler nature of these products, but the best estimate crediting rate will need to allow for actual investment returns in the past and might also allow for expected future investment returns. A formula that averages actual investment returns over recent years and expected investment returns in coming years might typically be used.

LPS 340 requires that best estimate bonuses must be consistent with policy conditions and the company's practice or stated philosophy. For traditional business with both terminal and reversionary bonuses it is necessary to determine best estimate bonus rates for both types of bonus. A practical method of determining best estimate bonuses is to assume the latest declared terminal bonus rates remain unchanged and solve for the best estimate reversionary bonus rates that equate the present values of future cash flows (including future reversionary and terminal bonuses) to the policy liability.

Allocation of Profits

The Life Insurance Act distinguishes between the allocation of profit and the distribution of profit to participating policy owners. This distinction is necessary in order to allow the retained profits allocated to policy owners to be identified separately from retained profits and capital that have been allocated to shareholders.

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The total profit emerging during a reporting period comprises:

- cost of best estimate bonus;
- best estimate shareholder profit;
- experience profits; and
- investment return on assets in excess of policy liabilities (capital and retained profits).

The total profit must be allocated to participating policy owners' retained profits and shareholders' retained profits. The maximum allocation to shareholders is 20% of total profit or 25% of the profit allocated to policy owners. The declaration of a bonus is treated as a distribution from policy owners' retained profits.

The cost of a bonus is the surrender value of a reversionary bonus, or the actual amount paid to terminating policy owners for interim and terminal bonuses. This will differ from the present value of the bonus (i.e. the value of the increase in future benefit payments on a best estimate basis).

If a company allocates 25% of the cost of bonuses to shareholders retained profits, the value of future shareholder profits may be more or less than 25% of the value of future bonuses. This effect occurs because the surrender basis (mortality and interest) for reversionary bonuses may be different from the best estimate assumptions used to value policy liabilities.

The cost of declared bonus for any reporting period will almost certainly be more or less than the cost of the best estimate bonus. Policy owners' retained profits will therefore fluctuate over time, and can become negative for the purpose of the Life Insurance Act and reporting to APRA. There is one notable difference between the Life Insurance Act and reporting under AASB 1038: under AASB 1038 policy owners' retained profits are included in the total "unvested policy benefits", which cannot become negative. If unvested policy benefits fall to zero, all bonuses vested in the reporting period must be recognised as an expense (loss) in the reporting period. 'Vested' refers to that portion of policy benefits that relate to guaranteed benefits (sums assured and already declared reversionary bonuses) as opposed to 'unvested' policy benefits, which relate to future reversionary bonuses not yet declared, and terminal bonuses.

21.6.5. Non-participating Business Entitled to Discretionary Additions

The most common example of this type of business is investment account policies where the assets backing the policies are very short-term fixed interest assets. These policies are classified as non-participating according to APRA prudential standard LPS 600 because the account balances will never be less than 95% or more than 103% of the value of the assets backing the policies.

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These types of policies are valued in the same way as participating business. However, because they are non-participating there is no allocation of profit to policy owners and no distribution of profit to policies.

The policy liabilities for this type of business are usually determined using an accumulation approach as:

- total investment account balances; plus
- investment fluctuation reserve; less
- deferred acquisition costs

The difference between the actual investment return (net of fees and tax) and the crediting rate for a period is added to the investment fluctuation reserve. The difference can be positive or negative. A change to the crediting rate does not affect profit, unless the business is in loss recognition.

21.6.6. Reinsurance

Policy liabilities are measured gross of reinsurance. If a company reinsures some of its business, the reinsurance is measured as if it were a negative policy liability, consisting of a reinsured best estimate liability and value of reinsured best estimate shareholder profits. The negative reinsured policy liability is shown as a positive reinsurance asset in the company's financial statements.

The reinsured policy liability is usually determined by calculating the policy liabilities gross and net of reinsurance and then taking the difference. The reinsured policy liability must be reduced to allow for impairment if it is likely that the life company will not receive the amounts due to it from the reinsurer.

21.6.7. Sources of Profit

Profit under Margin on Services emerges from three sources:

- release of profit margins included in the policy liabilities;
- investment earnings on assets in excess of policy liabilities (policy owners' retained profits, shareholders' capital and shareholders' retained profits); and
- experience gains and losses arising from experience differing from the valuation assumptions.

A number of simple worked examples have been included later in this chapter to assist students understanding of the principles and mechanics of Margin on Services calculations.

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21.7. Valuation of Investment Contract Liabilities

LPS 340 defines the policy liability for a life investment contract to be the sum of:

- the life investment contract liability; and
- the management services element.

The methods for valuing these items are set out in the accounting standards. The life investment contract liability is valued according to the fair value method set out in *AASB 139 Financial Instruments*. The same valuation method is used for the assets backing policy liabilities (see Chapter 23). The management services element is valued according to the requirements of *AASB 118 Revenue*. These standards are quite detailed and lengthy as they apply to all types of companies, not just life insurance companies. Students are not expected to be familiar with the details of these standards.

Life investment contract liabilities must be determined at "fair value". This is defined in the accounting standards to mean the amount for which a liability could be settled, between knowledgeable, willing parties in an arm's length transaction. Fair value cannot be less than the current surrender value before any exit fees have been deducted. Term annuities are the only commonly encountered type of life investment contract liability where fair value would normally be greater than the surrender value before exit fees.

For life insurance contracts, the profit carrier is the mechanism for deferring profit emergence but there is no equivalent concept under the accounting standards for life investment contracts. Nor is there any equivalent to the best estimate liability or the value of future shareholder profits. These two items are implicit within the policy liability.

If a policy is expected to be loss-making, the future losses must be recognised at commencement. A loss-making contract is known as "onerous contract" in *AASB 137 Provisions, Contingent Liabilities and Contingent Assets*.

The amount of acquisition expenses that can be deferred is restricted to incremental expenses. This refers to expenses that would be avoided if the policy had not been sold. Typically, only commissions and some related costs will be incremental. This is a much more restrictive treatment than for life insurance contracts, where all acquisition costs are deferred. As a consequence, a loss can be reported for life investment contracts at commencement, even though the contract may be expected to be profitable in subsequent periods.

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21.7.1. Investment-linked and Investment Account Business

The life investment contract liability is the value of units for investment-linked policies or the account balance for investment account policies. The management services element is the value of deferred entry fee revenue less deferred acquisition costs. Deferral of entry fees and acquisition costs may be necessary so that revenue and costs are not recognised prematurely before services have been provided. If a life company deems entry fees and initial commission to be related to the service of providing advice on the purchase of the product, deferral will not be necessary.

For repeat single premium contracts, the fees and commissions on initial and subsequent premiums are identical, so it is usual for all premium-related fees and commissions to be related to the services provided at the time of premium payment. In this circumstance, no deferral of fees or commissions is necessary.

For investment-linked contracts, the unit prices used must be consistent with the values placed on the assets backing the policy liabilities. Both assets and liabilities are determined at fair value.

Projections of all future policy cash flows are not required unless the contracts are onerous. A limited form of projection may be required in order to amortise any deferred entry fee revenue or deferred acquisition costs. This projection may not need to be done at individual policy level. A grouped approach may suffice. The deduction for deferred acquisition costs (or addition for deferred entry fee revenue) would be calculated in a similar way to the acquisition cost recovery component for life insurance contracts.

If assumptions are changed, the amount of deferred acquisition costs or deferred fee revenue stays the same (unless the contract becomes onerous) but the rate of future amortisation will change. This is analogous to the way assumption changes are treated for life insurance contracts.

21.7.2. Term Annuities

For term annuities, the life investment contract liability is the present value of the annuity payments. The management services element includes the value of future maintenance expenses and a profit margin in respect of services not yet provided.

Individual policy projections are needed to calculate policy liabilities for term annuities.

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21.7.3. Discount Rates for Life Investment Contracts

Discount rates are needed for the purpose of valuing term annuities and onerous contracts. Discount rates for life investment contracts are not required to be risk-free. Instead, they must be consistent with the determination of liabilities at fair value. This means the discount rate could be higher or lower than the risk-free rate.

Term annuity liabilities are only rarely transferred between life companies in an arm's length transaction. It is therefore unlikely that a life company will be able to refer to recent transactions in term annuity liabilities when determining fair value. Instead, a valuation technique will have to be used. Term annuities have similar cash flows to corporate bonds. A company that issues a corporate bond to investors has a liability with cash flows that are very similar to those of a term annuity. A potential method for setting the discount rate for term annuities would be to use the market yields for highly rated corporate bonds of similar maturity.

21.8. Definition of New Business

The accounting standards and APRA prudential standards mention new business but do not define it. A definition of new business is needed for:

- expense allocations;
- finding the profit margins and acquisition expense recovery components for new business under LPS 340;
- analysis of profit (chapter 25);
- appraisal values (chapter 27).

It is not always obvious whether new contracts or changes to existing contracts should be considered as new business. Examples of situations which could be treated either way include:

- contractual inflationary increases to sums insured and/or regular premiums;
- other increases to sums insured and/or regular contractual premiums;
- conversions from a group policy to an individual policy when a member leaves the group policy (for example leaving a group superannuation policy due to cessation of employment);
- premiums paid in addition to those specified in the contract;
- new lives insured under group policies;
- renewal of group policies at the end of a fixed term;
- new policies automatically reinsured under the terms of reinsurance treaties.

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A test of whether business could be considered to be "new" is the extent to which effort and/or action from the sales force was required to produce the increased business volumes. Automatic increases would not be regarded as new business according to this test.

If the company reports new business volumes (either internally or externally) it would normally be desirable to use these volumes for actuarial calculations so that there is consistency of reporting. However, this may not always be appropriate. For example, sometimes companies report contractual inflation increases as new business – but this would not normally be appropriate for actuarial reporting because of the contractual nature of the increases.

Ideally there should be consistency in the definition of new business for various purposes. But this may not always be possible. For example, automatic conversions from group to individual contracts may not be considered to be new business for the purpose of an embedded value calculation, but because the conversion is across Related Product Groups it may need to be treated as new business for LPS 340.

Clear disclosure of what comprises new business should be included in actuarial reports.

21.9. Worked Examples

The information used in the following section is included for students as an excel file accompanying this text.

21.9.1. Example 1: Simple MoS Example

This example shows Margin on Services calculations for a 10 year non-participating endowment policy. The sheet "Ex1-Cashflows" shows the calculation of the projected cash flows.

The sheet "Ex1-Profit Carriers" shows the projected policy liabilities and profits using a range of different profit carriers, namely premiums, investment returns on BEL and maintenance expenses. It should be noted that changing the profit carrier only affects the incidence of profit in a contract and not the present value of profits expected at commencement of that contract.

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There is a considerable difference in the pattern of emergence of profit depending upon the profit carrier chosen. Using investment return as the profit carrier results in a relatively late emergence of profit. It is unlikely that a life company would choose to use this carrier for this type of product. Using premiums or maintenance expenses as the profit carrier results in an earlier emergence of profit.

The impact of a change to the best estimate assumptions at the end of year 5 is shown in the "Ex1-MoS Exp Ch" sheet. Note that in this example there is a loss in year 5. This is because the reduction to the discount rate results in an increase to the policy liability. It has been assumed in the example that the investment return in year 5 is the original expected return. In practice a life company would aim to hold assets that provide a closer match to the liabilities. If interest rates fell in year 5, the value of the assets should increase to at least partially offset the increase in the policy liabilities.

21.9.2. Example 2: MoS with Loss Recognition

This example is based on Example 1, but uses worse mortality assumptions so that a loss must be recognised at the policy commencement. The sheet called "Ex2-Loss Recognition" shows the policy liabilities under this scenario. A loss is reported in the first year of the projection.

21.9.3. Example 3: Participating Business

This example shows the calculation of the policy liabilities at a particular date (duration 11) for an existing portfolio of identical participating policies (sheet "Ex3-Par Liability").

The policy liability and cost of declared bonus at duration 10 are already known and are used as inputs to calculate the VSA and policy liability at duration 11. A projection is used for the purpose of determining the best estimate bonuses for year 11. The best estimate bonus rates are assumed to be the same for year 11 and subsequent years. The present value of future cash flows at duration 11 is equated to the VSA by solving for the best estimate bonus rates.

The calculation of the VSA at duration 11 uses as inputs the actual investment return and cash flows, together with the non-investment experience profit and shareholder profit on interim bonuses. The example has been simplified by not showing how the non-investment experience profit has been derived. This topic is covered in Chapter 25.

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In the excel sheet "Par Accounts", there are two examples of how information comes from the valuation makes its way into the financial statements of the company. For financial statements prepared under the accounting standards, policy owners' retained profits are treated as an unvested policy liability. The allocation of profits to policy owners and the declaration of bonuses are treated as movements in unvested policy liabilities.

This example follows the method set out in LPS 340. However, the standard does allow other methods to be used as long as the principles of the standard are observed.

There are alternative calculation methods that do not require the non-investment experience profit to be calculated separately as an input. The paper by Edwards and Swinhoe included in the readings for Unit 3 describes an alternative method for calculating the VSA.

21.9.4. Example 4: Valuation of Disability Income Business

The valuation of policy liabilities for disability income business has additional complications compared with lump sum insurance for death, TPD and trauma. The value of a disability income claim is not fixed – it depends on the amount of benefit (usually paid monthly), the waiting period between claim incidence and the commencement of benefit payments, the duration of disability and the maximum benefit period.

A common method of calculating the best estimate liability is through use of an "incidence and annuity" model. The active lives in force are projected, with allowance for lapses and claim incidence. The cost of claim incidence at each point in time is calculated as an annuity value in a separate part of the model. The annuity value depends on claim termination rates, the claim inflation rate, claim processing expenses and the discount rate. Example 4 is a simple example of this type of model. In an "incidence and annuity" model, the liabilities for existing claims on lives who are currently disabled are projected separately from the liabilities for active lives. Note that termination rates depend on the age of the live insured when the claim incepts. Older lives tend to take longer to recover from a disability.

The valuation of existing claims in course of payment uses a similar method based on the claim continuance table. The liability for an existing claim will be the monthly benefit multiplied by an annuity factor, plus an allowance for claim processing expenses. The annuity factor will depend on claim duration as well as the attained age of the life insured and the remaining benefit term.

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An incidence and annuity model implicitly assumes that each life can only make a single claim. When the claim terminates the policy ceases. In reality, the terms of disability policies often allow them to continue after the life insured recovers from disability. Further periods of disability may occur, and indeed are more likely to occur than for policies that have never been on-claim. A model that allows for multiple claims on each policy is known as a "multi-state" model as each policy can switch between being on-claim and off-claim throughout the term of the projection.

More complex modelling may be necessary for policies with additional benefits. For example, if a death benefit is provided a projection of future mortality rates will be required.

Note that example 4 does not include any allowance for IBNR or RBNA reserves. In practice these would need to be added to the best estimate liabilities.

21.9.5. Example 5: Valuation of IBNR Reserves

Common methods for calculating IBNR reserves include:

- average delay between date of incidence and date reported; and
- the chain ladder method.

Other more complex methods can also be used.

The first method is simple and should give reasonable results if delays between incidence and reporting are relatively short. If the average delay was 3 months, the IBNR reserve would typically be set to equal the best estimate cost of claims incurred for the 3 months prior to the reporting date.

The chain ladder method is a more appropriate method of estimating IBNR if reporting delays are long. It allows for the possibility that the actual cost of claims incurred in past periods differed from the best estimate. The chain ladder method analyses the delays between incidence and reporting that have occurred for claims in the past. It projects future reporting of claims by starting with the claims that have been reported to date and assuming that the pattern of claim development that will occur in the future will similar to the pattern that has occurred in the past.

Each claim that has been admitted in the past must be categorised by both year of incidence and year of reporting. This is presented as a claims triangle. The diagonal of the triangle represents claims reported in the last 12 months. The run-off patterns in the claims triangle are used to estimate the claims that have been incurred in the past but have not yet been reported.

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In example 5, the aim is to calculate the IBNR reserve for TPD claims at the end of 2013. The data for reported claims that were incurred from 2006 to 2013 is shown in the top table. This shows the cumulative amount of claims reported for each incidence year at 0, 12, 24, etc. months from the end of the incidence year. Note that relatively few claims are reported during the year of incidence.

This data is used to calculate development factors. These factors are the ratio of cumulative claims reported over successive claim development years. The development factor for month 12 is an average of the factors for 7 different incidence years. The development factor for month 84 only has one observation but the factor is 1, meaning that no extra claims were reported between months 72 and 84.

The development factors are used to complete the shaded part of the lower table. The figures in the right hand column represent the ultimate amount of claims that are expected to be reported for each incidence year. The difference between these ultimate amounts and the claims actually reported to date is the IBNR. Also shown is the expected loss ratio of claims incurred to earned premiums for each incidence year.

Because only a small proportion of claims are reported within each incidence year, the development factors for month 12 are extremely variable. In other words, the claims reported during the incidence year don't tell you much about the claims that have not yet been reported. If we used the development factors to estimate the IBNR for incidence year 2013, the results would be very unreliable, since they would depend on the amount of claims reported during 2013. A more reliable method of estimating the IBNR for this incidence year is to estimate the ultimate amount of claims incurred using a best estimate of the loss ratio, and deduct the actual amount of claims reported during 2013. The projected development of the IBNR claims for the incidence year 2013 has been calculated using the development factors, working backward from the ultimate amount. The best estimate loss ratio has been calculated from the ultimate claims and earned premiums from earlier incidence years. This method of calculating IBNR for incidence year 2013 highlights that judgement and a mix of methods may be required in estimated IBNR reserves.

The final step in the calculation is to project the payment of the IBNR claims and calculate their present value.

Other adjustments might be necessary in performing this calculation. If premium rates had changed at some point, the earned premiums would need to be adjusted so that the loss ratios were all measured on a consistent basis.

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21.9.6. Example 6: Investment-linked Business

This example shows the projected policy liabilities for a single premium investment-linked policy. In this example, the initial commission is higher than the entry fee. The excess commission is considered by the life company to be payment in advance for advice that will be provided to the policy owner throughout the term of the contract. The excess commission must therefore be treated as a deferred acquisition cost. There is no deferred revenue, so the management services element is the negative of the deferred acquisition costs.

In this example, the deferred acquisition costs are amortised in line with the present value of future ongoing fees. The ongoing fees implicitly incorporate an allowance for recovery of acquisition costs.

Note that a loss is reported in the first year, as it has been assumed that the initial expenses are not incremental and cannot therefore be deferred. Initial expenses include marketing and sales expenses and the cost of processing the policy application. These costs are most likely to consist of salaries for staff and associated overheads. These types of costs are not incremental as they would need to have to be paid even if the policy had not been sold.

The profit has been calculated using both a "cash flow" basis and a "fees less expenses" basis. Note that for the fees less expenses basis, allowance has to be made for interest on the management services element (MSE) as well as the fees and expenses incurred at the beginning of the year.

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Chapter 22 – Liability Valuation Methods

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22.1. Introduction

This chapter discusses some of the practical issues that arise in the calculation of policy liabilities. It also looks at alternative valuation methods that have been used in the past in Australia and are still used in many countries which are yet to adopt International Financial Reporting Standards (IFRS).

22.2. Mechanics of Valuation

A valuation system must be capable of producing results that are:

- accurate;
- available quickly;
- on alternative bases (for sensitivity testing, analysis of profit, embedded value and capital adequacy calculations); and
- in the format required for general purpose financial statements and APRA reporting forms.

The valuation system should be economical to maintain and run.

These objectives need to be balanced against each other. The approach adopted will vary considerably between life companies, depending on such factors as the size and nature of the business in force and legacy systems. Foreign-owned companies may have to satisfy both local and overseas reporting requirements.

The purpose of the valuation being undertaken must be borne in mind (whether for external or internal users of the information). This will have a bearing on the format required for the final results, the degree of precision required and the data required in the valuation records.

22.2.1. Preparation and Assembly of Data

A company's policy administration system contains the policy details necessary to perform a valuation. Some life companies have several administration systems to record data for different types of policies. This is often a result of merger and acquisition activity or the introduction of new products over time. It can be difficult and expensive to move policies from older systems to more modern systems. A data extract from the system will be created at each valuation date to provide the data required for valuation purposes.

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The information recorded for valuation purposes in respect of each contract in force at the valuation date will vary according to the type of policy and valuation method. For example, the data for yearly renewable term business will normally include:

- policy number
- sex
- smoking status
- date of entry
- date of birth
- sum insured
- base premium (i.e. before any extra premium)
- extra premiums (if any)
- mode/frequency of premium payment
- benefit indexation
- rider benefits

Claims are typically managed on a separate computer system. Information from this system is required to calculate reserves for outstanding claims and for the analysis of profit.

For traditional business, a similar set of data is required with adjustments being made for information specific to these contracts, e.g. bonus information, surrender values and maturity dates.

For investment-linked business the number of units of various types will be recorded. A data file of unit prices at the valuation date is required but unit prices do not need to be included in the policy data as the same set of prices applies to all policies. For investment account business, the account balance will be recorded. For both investment-linked and investment account policies the amount of any surrender penalty at the valuation date, or data to calculate or estimate this, will be needed.

Profit margins and cumulative losses (if any) for related product groups need to be brought forward from the previous end of year valuation. These items would be recorded within actuarial systems, not within the policy administration systems.

Consistency checks will normally be carried out. Examples of checks include:

- in force at last valuation plus aggregate "ons and offs" should equal in force at this valuation for number of policies, premiums and sums insured. Increases and decreases to premiums and sums insured must be accounted for;
- reconciliation of valuation data with “snapshots” obtained directly from policy administration systems; and
- comparison of the average of premiums in force at the start and end of the year with actual premium income for the year.

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Further checks will be placed on the valuation results through the analysis of profits. This is discussed in Chapter 25.

The Appointed Actuary must discuss the quality and accuracy of the data in the Financial Condition Report (refer to Professional Standard 200 of the Actuaries Institute).

22.3. Grouping

When a projection method is used to calculate policy liabilities, policies are usually valued individually and the results are then summarised into groups for checking and presentation. However, older valuation systems may group policies with similar risk characteristics into model points prior to performing the projection in order to reduce the processing time required.

In the past, computer run times were much longer than they are now. It was often necessary to group policies with similar characteristics in order to keep run times within reasonable bounds.

Grouping is best avoided, if possible, as it introduces approximations into the calculations. There is also potential for errors arising through the grouping process.

If grouped data is used, "model points" must be constructed. A model point is a single "average" policy designed to represent a number of individual policies with similar characteristics. An example of a model point would be all yearly renewable term policies for male non-smokers currently aged 45. The model point would be a single policy with an average sum insured, premium, duration, etc. The liability for the policies represented by the model point would be obtained by multiplying the liability for the model point by the number of policies it represents.

This process could lead to inaccuracies in the projections. For example, the projection may not separate policies by duration. If lapse rates vary by policy duration, the allowance for lapses in the projection may be inaccurate. A change to actual short duration lapse rates will have no impact on the best estimate liability per policy. Similarly, select mortality rates may not be applied accurately depending on the average duration assumption used.

The process can be made more accurate by increasing the number of model points. If lapses vary by policy duration, it might be necessary to create separate model points for a range of different durations, rather than having a single model point with the average duration. A balance needs to be struck between greater accuracy (which requires more model points) and a shorter processing time (which requires fewer model points).

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For simple products or products with small volumes of business in force it may be reasonable to represent the whole product line by one model point. For other products, the volume or complexity of the business may necessitate the use of a large number of model points. Typically, unbundled investment products require fewer model points than risk products as risk products can have more rating factors, e.g. age, sex, smoking status and occupational class. For investment account or investment-linked business, the design of any early termination charges will have an impact on the number of model points required. Superannuation business generally requires model points to be grouped according to attained age (or alternatively by entry age and duration), because termination rates peak when superannuation fund members reach retirement age.

If grouped model points are used, the process for determining the model points must be validated by comparing the valuation results based on the model point projection with the results based on individual policy projections. The validation can be carried out in between reporting dates when there is less time pressure on the valuation department. Further, the model points opening position (i.e. the total sums insured, annual premiums and policy counts for the model points after applying any scaling factors) must be reconciled to the actual opening position at the reporting date.

If stochastic modelling is to be performed, it is usually necessary to use a small number of model points rather than individual projections for each policy. A stochastic model may require thousands of simulations to be run, especially if it is being used to analyse the tail of the probability distribution for capital management purposes. Stochastic models also need a random number generator and additional assumptions regarding the probability distributions of the random variables.

22.4. Consistency between Models

Models are often developed for a range of different purposes. A life company can potentially have different models for the purposes of pricing, valuation of policy liabilities, appraisal values, capital management, monthly reporting and business planning. This is more likely to occur if these activities are carried out in different parts of the company. Simplified models can sometimes be used for monthly reporting and business planning so that results can be obtained very quickly and/or on a range of alternative bases.

If different models are used, regular consistency checks need to be carried out. For example, it can cause considerable embarrassment if the pricing model says that a new product will be profitable, but after the product has been launched the valuation system reports it as unprofitable.

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Differences between the results produced by models can arise due to differences in modelling techniques, the selection of model points and/or the assumptions used. It is important that all assumptions are explicitly described in model documentation. Hard-coding of assumptions within models should be avoided as this can lead to difficulties in identifying what assumptions have been made. For example, stepped premium risk business often has an expiry age of 100, but assumptions for mortality and lapse rates are very unreliable at high ages due to the lack of relevant experience data. A model might avoid the area of uncertainty at high ages by terminating the projection at an earlier age (for example, 65 or 80), rather than continuing all the way through to age 100. If the model is designed in this way, the end point for the projection should be coded as an input to the model, rather than hard-coded within the model. This assumption should also be well-documented, so that all users of the model are aware of it.

22.4.1. Types of Models

The two types of models that are most commonly used for valuation purposes are spreadsheets and proprietary projection models.

Spreadsheets are readily accessible and can be used on any personal computer. They have the advantages of being very flexible, easy to write and easy to modify. The disadvantages are:

- difficulty in auditing and detecting errors – the formulae usually rely on cell references. Dependent cells can be in different parts of the spreadsheet. This makes the formulae difficult to understand and check. Studies have shown that most spreadsheets used for business purposes contain undetected errors. The risk of undetected errors increases with the size and complexity of the spreadsheet;
- slow processing times – this can be a problem if individual policy projections or stochastic modelling are necessary;
- poor documentation – textboxes and comments can be used to document spreadsheets, but these are normally not well structured and may be difficult to maintain;
- poor version control – it may not be clear what revisions have been made since the last version and unintended changes may be introduced. This problem can be overcome to some extent using protection and passwords;
- poor programming practices – untrained users can often be allowed to modify spreadsheets using adhoc programming methods;
- inputs and outputs may not be clearly indicated – assumptions can be hard-coded within formulae and can therefore be difficult to find and change; and
- difficulty of making modifications – the three dimensional spacial layout of a spreadsheet makes revisions more difficult as blocks of code have to be moved around.

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The use of linked suites of spreadsheets exacerbates these problems. Despite these drawbacks, spreadsheets can be very useful for valuing simple products where detailed individual policy projections are not required. They are also useful for providing quick answers (e.g. what-if scenarios), for doing audit checks on other models, for summarising results and for presenting results in the form of tables and graphs.

Proprietary projection models are designed specifically for actuarial valuations and overcome the problems of spreadsheets by imposing a much more structured design on the model. Assumption files, data input files and output files are clearly separated. Formulae refer to variable names, rather than cell addresses. A description of each formula and variable is included within the model. Version control is much stronger, allowing changes since the previous version to be readily identified. Unauthorised model changes can more easily be avoided. Proprietary models also have much faster processing speeds than spreadsheets. The main drawbacks of these models are the extra costs of purchasing and maintaining the software and the need to train staff in the use of the model.

22.4.2. Asset Share Models

Asset share models are sometimes used in the management of participating business. An asset share model calculates liabilities on a retrospective (rather than prospective) basis by accumulating past cash flows up until the reporting date for the policies that are currently in force.

The methodology used for calculating the Value of Supporting Assets under APRA Prudential Standard LPS 340 is an example of a retrospective method, although the calculation is performed on a group basis rather than for individual policies. The calculation is rolled-forward every year so that at any particular reporting date it only has to look back over the previous 12 months' experience.

Asset share calculations for individual policies can be useful as a guide for determining bonus rates. Bonus rates can vary between policies with different starting dates in order to reflect differences in historical experience. They can also vary between policies with different scales of premium rates. Asset shares are also useful in assessing whether the current surrender value basis remains appropriate.

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Asset shares allow for the actual amounts of premiums, expenses (expressed as unit costs), rates of investment return and tax rates. There will also be an allowance for the cost of death claims (and other rider benefits) and shareholder profits. Sometimes a "cost of capital" will be deducted instead of shareholder profits. There may be an allowance for profits or losses on terminated policies, depending on whether the company's bonus philosophy is to distribute these profits to continuing participating policies.

The asset share for a policy is, in effect, equal to the value of an investment-linked policy with the same premiums, rider benefits and backing assets, but with expenses and shareholder profits being deducted from the policy value instead of fees.

An asset share model needs historical data going back as far as the commencement date of the oldest policies still in force. Obtaining this data can be a challenging exercise if asset shares have not previously been calculated.

The liability calculated using an asset share approach can be compared with the best estimate liability and value of future bonuses calculated using a projection approach. Supportable future bonus rates can then be found by equating the projected liabilities to the asset shares.

22.5. Historic Valuation Methods

Under the Life Insurance Act of 1945 (which was superceded in 1995), liabilities were published on a solvency basis, which used conservative assumptions to ensure that there was a sufficient buffer to absorb adverse changes in experience or circumstances. The main purpose of a valuation of policy liabilities was to assess the solvency of the life company. The policy liabilities were not on a realistic basis and did not provide useful information about the profitability of life companies. An allocation of surplus assets between participating policy owners and shareholders was not required. This meant that the ownership of the surplus assets (also known as the "estate") was often unclear.

In order to address these problems, the Life Insurance Act 1995 established distinct and separate methods for valuing policies for the purpose of determining profit and for establishing whether a statutory fund had sufficient capital to ensure solvency. The ownership of surplus assets was also made clear by establishing separate pools for shareholders' capital, shareholders' retained profits and policy owners' retained profits within each statutory fund.

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22.6. Net Premium Method

The most common historical method for valuing policy liabilities for traditional business was the net premium method. This method is still used in some overseas countries.

The net premium method was developed long before computers were invented and is simpler and cruder than modern valuation methods. Policy liabilities calculated using this method err on the side of conservatism (i.e. they tend to have a bias towards being too high) since the alternative would be to risk having the policy liabilities being inadequate. A conservative bias is appropriate if the policy liabilities are used as a measure of solvency. However, it also means that the net premium method is not all that useful as a means of calculating policy liabilities for the purpose of profit reporting.

The net premium method uses commutation functions combined with conservative assumptions. Commutation functions avoid the need for a projection of future cash flows. A low future interest rate is assumed and there is no explicit allowance for future bonuses, maintenance expenses, surrenders or shareholders' profits.

An artificial net premium is calculated using the valuation assumptions for interest and mortality and an approximate allowance for acquisition expenses. The net premium is used to calculate the policy liability instead of the actual premium so that the policy liability at commencement of a new policy (before any cash flows occur) is zero. Note that the Margin on Services method achieves the same outcome by including a reserve for future best estimate shareholder profits and bonuses in the policy liability. Under the net premium method there is no explicit reserve for these items.

The net premium method can be used for immediate term and lifetime annuities and for level premium risk business. It cannot be applied to stepped premium risk business because the net premium method assumes that premiums are level.

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22.6.1. Strict Net Premium Method

There are several variants of the net premium valuation method – the simplest being the strict net premium method. Using this method, the liability under a whole of life policy is:

$$(SI + RB)\, A_{x+t} - PNP \times \ddot{a}_{x+t}$$

where

SI is sum insured

RB is attached reversionary bonuses

A_{x+t} is a reversion, at the valuation rate of interest, for age x+t where x is entry age and t is duration in force

PNP is the pure net premium which is calculated as SI * $A_x/\ddot{a}_x$

$\ddot{a}_{x+t}$ is an annuity at the valuation rate of interest for age x+t

22.6.2. Modified Net Premium Method

Although simple to use, the strict net premium valuation method can be criticised on the grounds that it is entirely artificial, as it makes no explicit allowance for expenses or for future bonuses.

Various modifications can be made to the strict net premium valuation method. The main modifications are discussed below.

Sprague adjustment

A Sprague adjustment allows the net premium to be calculated at a higher entry age and for a shorter term than the actual age/term status at issue. The intention is to offset the first premiums against the acquisition expenses for the policy. For example if the acquisition expenses equal the first year premium, the Sprague adjustment could be set at one year. The valuation liability with a d-year Sprague adjustment is:

$$(SI + RB)\, A_{x+t} - SNP \times \ddot{a}_{x+t}$$

where the Sprague net premium, SNP, is calculated as:

$$SNP = \frac{A_{x+d}}{\ddot{a}_{x+d}} \times SI$$

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The Sprague adjustment to the strict net premium method, while more realistic in relation to actual circumstances than the strict net premium method, can still be criticised. The main problem is that although acquisition expenses are now allowed for as a percentage of sum insured, the Sprague adjustment is only a rough approximation to the actual acquisition expenses. Initial commission can vary significantly between whole of life policies and endowments of different terms. Other acquisition costs can also vary from policy to policy as a proportion of premium.

Sprague's method can lead to negative liabilities, which may not be appropriate for solvency valuations. These negative values can be difficult to eliminate when grouped data are used.

Zillmer adjustment

The Zillmer Adjustment adds to the pure net premium an amount which has a fixed capitalised value per unit sum insured regardless of the age/term status at the inception of a policy. The formula is:

$$(SI + RB)\, A_{x+t} - \left(PNP + \frac{I}{\ddot{a}_x} \right) \ddot{a}_{x+t}$$

where I is the Zillmer adjustment and PNP is the pure net premium

This again moves in the direction of realism but like the Sprague adjustment it will produce negative liabilities, which can persist for several years at young ages. In fact the valuation liability at the outset of the contract is -I per unit of sum insured.

Other adjustments

Another modification that has been used is to specify that the premium to be valued by net premium methods shall not exceed K% of the office premium that is actually being paid. This modification is aimed at making at least a minimum allowance for renewal expenses.

22.7. Example

The example in the spreadsheet is the same as Example 1 from Chapter 21 but includes a projection of net premium liabilities on three different bases: strict, Sprague and Zillmer. The Sprague adjustment is 6 months and the Zillmer adjustment is the actual acquisition costs. In practice the Sprague and Zillmer adjustments would not provide such a close match to actual acquisition expenses as they have to be averaged across a range of policies issued at different times.

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22.7.1. Bonus Reserve Valuation Method

The bonus reserve valuation method is also sometimes called the gross premium valuation method. It too uses commutation factors. However, unlike the net premium method it makes explicit allowance for the actual premium and future expenses and bonuses.

When a compound reversionary bonus is being declared and the only expenses are premium-related expenses and per policy expenses, the valuation formula is:

$$(SI + RB)\ A^{i-b}_{x+t} - (1-E)P\ \ddot{a}^{i}_{x+t} + R\ddot{a}^{i-r}_{x+t}$$

where:

A^{i-b}_{x+t} is the reversion at the valuation date, at a rate of interest i-b, where i is the valuation rate of interest and b is the reserved rate of bonus

SI is the sum insured

RB is the attached reversionary bonuses

P is the actual annual premium being received

E is the proportion of premium reserved for future expenses

$\ddot{a}^{i}_{x+t}$ is an annuity at rate i

R is the per policy expense

$\ddot{a}^{i-r}_{x+t}$ is an annuity at rate i-r, where r is the assumed rate of inflation of per policy renewal expenses

22.8. Other Valuation Methods

A number of different profit reporting methods have been used at various times in different countries around the world. The differences between methods generally revolve around the following key issues:

- timing of profit recognition;
- degree of conservatism;
- deferral of acquisition costs;
- treatment of assumption changes; and
- treatment of participating business

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As noted in Chapter 21, under Margin on Services future profits are not recognised at point of sale but future losses must be provided for. This means that, while sales of new business are one of the main activities of a life company, providing the business is expected to be profitable, new business commencing during the reporting period has little impact on the reported profit.

A Margin on Services policy liability comprises a best estimate liability together with reserves for future bonuses and profits. Other reporting methods sometimes use a more conservative estimate of the liabilities. For example, Australian general insurers are required to hold a liability that is higher than the best estimate. An additional risk margin allows for the possibility that claims will be higher than expected and results in a deferral of profit emergence. Another type of margin that can be required to be included in the liabilities is a margin for the cost to shareholders of providing capital support to the liabilities. The aim of this type of margin is to increase the liabilities to their fair value. The fair value is the amount of compensation another insurer would require if it was to take over the liabilities. The fair value must exceed the best estimate of the liabilities as the acquiring insurer will want some reward for providing capital and taking on the risk that future experience will be worse than expected.

In Chapter 21 it was noted that different rules currently apply in Australia to the deferral of acquisition costs for life insurance contracts and life investment contracts. The amount of acquisition costs that can be deferred varies under different reporting methods. If some of the acquisition costs are recognised immediately a loss might have to be reported for new business, even though the business is expected to produce profits in future reporting periods.

Under Margin on Services, all valuation assumptions are regularly reviewed, but changes in assumptions do not result in changes to the policy liabilities unless future losses are expected. Some reporting methods used in other countries (e.g. US GAAP) lock in some or all of the assumptions at point of sale with specific levels of conservatism (provisions for adverse deviations or PADS). This results in larger and more persistent experience profits than would typically be observed under Margin on Services. It also makes the valuation process much more complicated as policies must be grouped by year of commencement, with different assumptions being used to value each group.

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The Life Insurance Act 1995 distinguishes between the allocation and the distribution of profits to participating policy owners. Retained profits are identified as belonging to either shareholders or participating policy owners. These features did not exist under the previous Act and do not exist in many overseas countries. One method of determining shareholder profits for participating business in overseas countries is as a fixed proportion (e.g. 10%) of the cost of declared bonuses. An undesirable outcome of this approach is that it gives management an incentive to inflate profits by declaring higher bonuses than can actually be supported. In theory, a company could report higher and higher profits whilst heading towards insolvency. Under the Australian system, shareholder profits are a fixed proportion of the cost of the best estimate bonus. The best estimate bonus must be supportable by the Value of Supporting Assets. If the declared bonus exceeds the best estimate bonus, policy owners' retained profits will reduce. Under the accounting standards, unvested policy benefits (which includes retained profits) cannot become negative. If they fall to zero any further distributions to policy owners must be expensed in the reporting period. Under APRA standards, policy owners' retained profits can become negative, but a write-off may become necessary if they are not expected to eventually return to zero.

Appraisal values are an example of an alternative reporting method that is often used to provide supplementary information in the financial statements for publicly-listed life companies (or their parents). Appraisal value methods can also be used for internal management reporting. These methods are widely used in both Australia and overseas. This topic is covered in detail in Chapter 27.

22.9. Future Changes to Valuation Methods

The method used to value life investment contracts in Australia changed in 2005 as a result of Australia's adoption of International Accounting Standards. Prior to 2005, life investment contracts had been valued using the Margin on Services method.

Methods for valuing life insurance contracts currently vary around the world as there is no international standard for valuing these types of contracts. The Margin on Services method is not an international standard. It will be replaced by a method that conforms to International Accounting Standards once agreement on an international standard is reached. At the time of writing, a method for valuing life insurance contracts has been under development and discussion by the International Accounting Standards Board (IFRS 17) for a number of years.

It is expected that the mandatory effective date for IFRS 17 for insurance contracts will be no earlier than 2021. While there will be many similarities between measurement of insurance contract liabilities under the revised IFRS and under current Australian standards there will be a number of differences that will affect the timing of profit.

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Chapter 23 – Valuation and Investment of Assets

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23.1. Introduction

This chapter is concerned with the valuation and investment of the assets of a life company.

The assets of a life company can include a broad range of investments from the more traditional asset classes such as equity, property and fixed interest securities to other assets such as derivatives, commercial loans, hedge funds, private equity and controlled subsidiaries.

The valuation of assets must be carried out in accordance with the accounting standards and APRA standards. These are not identical – there can be some differences between asset values reported to APRA for capital adequacy purposes and those reported under the accounting standards in a company's general purpose financial statements.

23.2. Legal Requirements and Responsibilities

The responsibility for placing a value on the company's assets rests with the Board of a life company.

A life company's policies regarding asset valuation issues are typically documented in the form of an Asset Valuation Policy approved by the Board. The Policy may address issues including:

- where valuations are sourced for each asset class
- how frequently assets are revalued for each asset class
- how assets which not traded in deep, liquid and well-maintained markets are to be valued
- methods to estimate the value of an asset if the normal sources for asset values are not available or reliable at a particular time, e.g. system failure or market disruption
- roles and responsibilities of management and staff

While the Board is ultimately responsible for the valuation of assets, it is typical that the actual valuations are performed by independent professionals. These may include market data vendors providing valuations for actively traded assets, and external valuers providing valuation for thinly traded assets such as unlisted property and private equity.

The accounting standards require the notes to the general purpose financial statements to include a description of how the values of assets are arrived at.

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The auditor of a life company has a responsibility under the Corporations Act and APRA reporting standards to provide assurance that the company's annual general purpose financial statements and annual reporting forms submitted to APRA (with some exceptions) are reliable. The assessment of reliability includes the valuations placed on assets. Interim statements and reporting forms do not need to be audited.

The actuary needs to understand how the value of assets may vary over time. This is essential for assessing the capital requirements of the life company and for providing advice on investment policy. In particular, APRA Prudential Standard LPS 114 Capital Adequacy: Asset Risk Charge requires that asset values be recalculated in a series of stressed scenarios. The actuary must understand how to apply these scenarios. This is not always straightforward, particularly in the case of unlisted fixed interest assets and derivatives.

For the purpose of the actuary's financial condition investigation, Professional Standard 200 requires the actuary to consider and comment on the methods by which the asset values have been obtained and their appropriateness.

23.3. Valuing Assets in Statutory Funds

Accounting Standard AASB 1038 requires that assets backing insurance liabilities generally be valued at fair value. The meaning of "assets backing insurance liabilities" is not clearly defined. However, life companies typically treat all of the assets of statutory funds as backing insurance liabilities. This is consistent with APRA's requirement that all assets of statutory funds be valued at fair value for the APRA prudential standards and reporting forms.

For most assets that back insurance liabilities, the accounting standards require changes in fair value to be included in profit or loss. There are some exceptions, such as owner-occupied property, where increases in value must be reported as "other comprehensive income" which does not form part of the reported profit. This can cause a distortion in reported profit if there are policy liabilities whose value depends on the value of these assets. Companies will normally disclose the impact of any profit distortions in the notes to their financial statements.

For APRA reporting purposes, all changes in fair values must be reported through profit and loss. This can result in discrepancies between the profit reported to APRA and profit reported under the accounting standards.

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23.3.1. Fair value

The fair value of an asset is the amount for which an asset could be exchanged between knowledgeable, willing parties in an arm's length transaction.

The best evidence of fair value is quoted prices in an active market. For example, the fair value of listed equities can readily be determined from the latest market prices.

The requirement that fair value be based on prices agreed between knowledgeable, willing parties means that actual transaction prices may sometimes be ignored. For example, in a mortgagee sale the seller may be unwilling and the selling price may be at less than fair value. Alternatively, an eager but unknowledgeable buyer may pay a price for an asset that exceeds its fair value.

If the market for an asset is not active, fair value must be determined by using a valuation technique. The objective of using a valuation technique is to establish what the transaction price would have been on the measurement date in an arm's length exchange motivated by normal business considerations.

Valuation techniques include consideration of:

- recent arm's length market transactions between knowledgeable, willing parties for identical assets;
- fair values at the reporting date of other assets that are substantially the same;
- discounted cash flow analysis; and
- option pricing models.

If there is a valuation technique commonly used by market participants to price an asset and that technique has been demonstrated to provide reliable estimates of prices obtained in actual market transactions, the company should use that technique.

Valuation techniques should make maximum use of market inputs and rely as little as possible on company specific inputs. They should incorporate all factors that market participants would consider in setting a price and be consistent with accepted economic methodologies for pricing financial instruments. For example, unlisted property assets may be valued by reference to recent transactions for similar properties.

Another example of a valuation technique is the valuation of unlisted fixed interest securities by means of a discounted cash flow analysis, with the discount rate set by reference to recent market transactions for instruments with similar duration, credit risk and liquidity.

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It is important for the actuary to have an understanding of how valuation techniques have been used by the life company. Some assets may be difficult to value and there may be uncertainty as to what the underlying fair value is at any point in time. Fair value can become particularly difficult to determine at times of extreme market volatility, or if there have been no recent transactions for similar assets. If there is uncertainty about fair values, a life company should consider holding additional capital.

Fair value is determined after allowing for any transaction costs incurred in purchasing the assets, but before any transaction costs that would be incurred on sale. This means that any buying costs are recognised in the profit and loss statement during the reporting period in which an asset is purchased and any selling costs are recognised during the reporting period in which an asset is sold. A drawback of this method is that fair value overstates the amount a life company would receive if it sold all of its assets.

For listed assets, fair value is normally determined as the bid price for an asset held and the asking price for an asset to be acquired. The bid price is the highest price at which buyers are offering to purchase the asset. The asking price is the lowest price at which existing owners are willing to sell the asset. The asking price will always be greater than or equal to the bid price. Again, fair value could overstate the amount a life company would receive if it sold all of its assets – the amount of assets that buyers are willing to purchase at the prevailing bid price could be smaller than the life company's holdings of the asset.

23.3.2. Relationship to Unit Pricing

The valuations placed on assets for the purpose of unit pricing may differ from the values used for accounting purposes. Unit pricing was discussed in Chapter 3 of the textbook. Any inconsistencies will distort the emergence of profit.

In particular, there will be an inconsistency between assets and liabilities if the unit prices incorporate an allowance for the discounting of deferred tax, which is not allowed for financial reporting purposes.

23.4. Valuing assets in the Shareholders' Fund

The assets of the shareholders' fund must be valued using the same methods that apply to the valuation of assets of non-insurance companies. Fair value is the most common method of valuing assets in the shareholders' fund, but some exceptions are allowed under the accounting standards for the general purpose financial statements and for the financial statements prepared for APRA.

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The following types of assets can be valued either at fair value or at cost:

- investment property;
- property, plant and equipment (including owner-occupied property); and
- investments in subsidiaries, associates and joint ventures.

Fixed interest assets which the company intends to hold (rather than trade) must be normally be valued at amortised cost. However, companies are allowed to use fair value instead of amortised cost if doing so would reduce the potential for accounting mismatches to occur between their assets and liabilities.

Assets whose fair value cannot be reasonably measured must be valued at cost.

23.4.1. Cost Method

For assets valued at cost, the asset value is the purchase price (net of transaction costs) less any subsequent depreciation and impairment charges. An impairment charge must be made if fair value subsequently falls below purchase price.

The cost method of valuing assets has the benefit of being simple, but is unrealistic and can result in a misleading balance sheet if assets have significantly appreciated in value since they were purchased.

23.4.2. Amortised Cost Method

For the amortised cost method, the discount rate that equates future cash flows (interest payments and maturity value) to the purchase price is determined at the date of purchase. The same discount rate is then used to measure the value of the asset at all times subsequent to the date of purchase. A deduction must be made to the asset value if the asset becomes impaired (i.e. the counterparty is expected to default).

The amortised cost may be greater or less than fair value, depending on whether market interest rates, credit spreads or other factors have risen or fallen since the date of purchase.

Amortised cost is a useful method for companies whose liabilities are not interest sensitive. By using amortised cost instead of fair value, reported profit is much less sensitive to variation in market interest rates. However, the balance sheet is less useful as a measure of solvency as the values placed on assets may not reflect their current realisable values.

It would not be appropriate for the amortised cost method to be used for assets backing insurance liabilities as the value of insurance liabilities depends on prevailing interest rates. Use of the amortised cost method would create an accounting mismatch and distort profit emergence.

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23.5. Deferred Tax Assets

Each asset has a deferred tax asset or deferred tax liability associated with it, depending on whether the reported value of the asset is lower or higher than its tax base (the difference between the reported value of an asset and its tax base is referred to as a "temporary difference" in the accounting standards). Deferred tax assets and deferred tax liabilities must be calculated assuming the asset is sold immediately. AASB 112 *Income Taxes* does not allow discounting to reflect the length of time the company expects to hold the asset. The rationale given for not allowing discounting is that it would be impracticable and highly complex. This may seem odd in the context of life companies as policy liabilities must be calculated using discounting. However, AASB 112 applies to all companies, not just life companies.

Deferred tax assets may also exist in respect of unused tax losses and tax credits carried forward from previous periods.

Deferred tax assets can only be recognised to the extent that it is probable that they will be able to be utilised to reduce future tax liabilities.

23.6. The Relationship between Assets and Liabilities

23.6.1. Allocation of Assets to Liabilities

Assets must be identified as backing specific liabilities in the following circumstances:

- assets in the Complying Superannuation Pool (i.e. those backing complying superannuation products) and Segregated Exempt Assets (e.g. those backing immediate annuities and other retirement income products) must be identified for taxation purposes;
- assets backing investment-linked business must be identified for unit pricing purposes;
- assets backing participating business must be identified so that the investment income can be added to the VSA (Value of Supporting Assets) and profit apportioned between shareholders and policy owners; and
- assets backing other discretionary investment business must be identified so that the investment income can be allocated to policy owner accounts (by means of a crediting rate) and to/from the investment fluctuation reserve.

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Life companies may choose to go beyond these requirements. For example, it may be useful to identify separate pools of assets for term and lifetime annuities. This will allow investment income to be allocated appropriately and allow profit to be analysed separately for each product.

23.6.2. Investment Policy

The assets of a statutory fund or shareholders' fund must be chosen with deliberate regard to the risk profile of the liabilities of the fund. The first step must therefore be a high level analysis of the characteristics of the liabilities. The second step is to identify the assets that most closely match the liabilities. The third step is to consider whether mismatching will help to achieve the company's financial objectives. The range of financial objectives might include:

- minimising regulatory capital requirements;
- maximising appraisal value;
- maximising expected return on capital (i.e. profit divided by capital); and
- minimising profit volatility.

The assets backing investment-linked business, participating business and other discretionary investment business must be chosen with regard to policy owner reasonable expectations. The promotional material for these types of products will give a broad indication of the types of assets the company intends to use to back the liabilities.

23.6.3. Matching Assets and Liabilities

The simplest type of liability to match is a term annuity. The timing and amount of the annuity payments are fixed. The only uncertainties in the liability cash flows are the servicing expenses and the possibility that the annuity might be surrendered. However servicing expenses are small in proportion to the annuity payments and the prudential minimum surrender value standard varies with interest rates.

The assets that most closely match a term annuity are a portfolio of high quality fixed interest assets with cash flows that match the annuity cash flows. In Australia, Commonwealth Government bonds are usually the closest one can get to a risk-free asset. Other assets that are very low risk include state government bonds, high quality corporate bonds and bank term deposits. An exact cash flow match may not be possible as fixed interest assets are only available with a limited range of maturity dates. Finding assets to match long-term annuities (beyond 15 years) can be particularly difficult.

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Lower quality fixed interest assets will provide higher investment returns, but will not provide such a good match to the liabilities as there is a greater risk of default and a higher volatility in fair value. Other assets such as properties or shares, while also likely to provide higher investment returns, are a poor match as rents, dividends and the fair values of these assets vary and they have no maturity date or maturity value.

More complex types of liabilities are more difficult to match. For lifetime annuities and disability claims in the course of payment, the current instalments of claims payments will be known but there will be uncertainty about how long these payments will continue. In addition, disability claim payments. Annuities can also be inflation linked and therefore assets with inflation linked cash flows will need to be found to provide a good match to these liabilities.

For participating business with future best estimate bonuses and shareholder profits at the adequacy threshold (i.e. the policy liability equals the best estimate liability calculated using a risk-free discount rate), the matching assets would be high quality fixed interest assets with cash flows that match the expected payments of the sums insured and reversionary bonuses. Other assets could be chosen to match the additional liability if the adequacy threshold is exceeded. The additional liability can rise or fall to reflect actual investment returns.

Finding matching assets for regular premium business is more difficult than for single premium business as there are future cash inflows as well as outflows to be considered. If a fund's cash inflow will exceed its outflow in the short to medium term, matching may only be possible through the use of derivatives. For example, interest rate futures could be used to lock in current interest rates until future cash inflows can be invested. A similar but more difficult problem arises with matching liability options which may not be exercised until many years into the future. For example, a superannuation product might include an option to convert to an annuity at age 65 using guaranteed annuity rates.

23.6.4. Other Assets

After the matched asset portfolio has been determined, a company can consider the impact of mismatching.

Traditional asset classes include Australian shares, international shares, direct property, listed property trusts, government bonds and corporate bonds. Other investments might include residential and commercial mortgages, infrastructure, private equity, hedge funds and joint ventures/subsidiary companies.

Mismatching should increase the expected amount of future investment experience profits. However it will also increase the company's capital requirements and the volatility of future profits.

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Diversification of mismatched asset exposures should be used to optimise the risk/return trade-off to shareholders (and any participating policy owners). For example, if a company decides to invest in shares, the share portfolio should be well diversified rather than being concentrated in a small number of holdings.

The liquidity of assets should be considered if large unexpected payments to policy owners may have to be made in a short period of time. A liquid asset is an asset that can be sold quickly for its fair value. Some types of assets such as direct property and operating subsidiaries are normally very illiquid.

Trading costs can also be an issue. For example, investments should not be made in direct property unless it is reasonably certain that these assets will not need to be sold in the near future. The transaction costs for buying and selling direct property include stamp duties, legal fees and agents' commissions. The property must be held for a substantial period of time in order if rental income and capital appreciation are to recover these costs.

23.6.5. Replicating Portfolios

Replicating portfolios of assets are increasingly being used by actuaries as a tool in managing and understanding asset/liability risks. It is important that students understand the meaning and use of replicating portfolios.

A replicating portfolio is a portfolio of market instruments (i.e. assets) whose cash flows match as closely as possible the cash flows of the liabilities. The replicating portfolio will have the same value as the liabilities due to the principle of non-arbitrage – if two sets of identical cash flows have different values it would be possible to make a profit by buying one and selling the other. The value of the replicating portfolio will move in harmony with the value of the liabilities as financial markets change – this includes factors such as interest rates and the value of equity and property assets. The replicating portfolio will not move in harmony with the liabilities if non-market variables affecting the liabilities change. These non-market variables could include mortality and morbidity experience, lapse rates and servicing expenses.

For pure risk products the replicating portfolio will typically be comprised of risk-free fixed interest assets whose cash flows match the expected cash flows of the liabilities.

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For products with exposure to financial market risk the replicating portfolio will be more complex. For participating business in Australia the policy owners are usually allocated 80% of investment returns. However, there is a minimum investment return implied by the guarantees of sums insured and reversionary bonuses, or investment account balances. The replicating portfolio could be made up of the actual asset mix but with the addition of put options (to provide the guarantee) and perhaps a higher proportion of fixed interest assets (to give volatility which is 80% of the volatility of the actual asset mix). Alternatively, the replicating portfolio could be made up of fixed interest with call options. There will be a considerable amount of work involved in deriving the replicating portfolio for business with complex financial guarantees.

The replicating portfolio may not exist in practice. For example, very long term fixed interest assets may not be available to back long term products such as annuities. And options are not normally available to match the guarantees of investment products invested in property assets.

The replicating portfolio is particularly useful for valuing liabilities with embedded financial guarantees (e.g. participating business and investment-linked business with guarantees) and for understanding the dynamics of change in the value of liabilities as market variables change.

The replicating portfolio (even if only theoretical) creates a liability-driven benchmark for setting the actual investment policy. The benchmark can be used to split profit between the investment management operations and the insurance operations of a company. If used for this purpose the investment return allocated to the insurance operation will be the return from the benchmark. The investment management operation may attempt to add value to the company by actively managing the assets. Any differences between returns on the actual portfolio and the benchmark will be allocated to the investment management operation.

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Chapter 24 – Capital Management

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24.1. Introduction

One of the most important parts of the actuary's work within a life company relates to capital management.

APRA's capital standards play a central role in a life company's management of its capital. This chapter summarises the requirements of these standards. For greater detail, students should access the standards through APRA's website (www.apra.gov.au) in the section covering the life insurance prudential framework. The list of capital standards is:

- LPS 001 Definitions
- LPS 110 Capital Adequacy
- LPS 112 Capital Adequacy: Measurement of Capital
- LPS 114 Capital Adequacy: Asset Risk Charge
- LPS 115 Capital Adequacy: Insurance Risk Charge
- LPS 117 Capital Adequacy: Asset Concentration Risk Charge
- LPS 118 Capital Adequacy: Operational Risk Charge

LPS 110 summarises APRA's capital adequacy requirements and is the first standard that students should refer to.

There is an additional prudential standard, LPS 100, in relation to solvency. This standard deals with a number of legacy issues in the Life Insurance Act and is outside the scope of the course.

24.2. What is capital for?

APRA describes capital as the cornerstone of a life company's financial strength. It supports a life company's operations by providing a buffer to absorb unanticipated losses from its activities and, in the event of such losses, enables the life company to continue to meet its obligations to policy owners and other creditors.

Life companies, like other companies, are only able to continue operating if they are solvent. A definition of solvency is given in Section 95A of the Corporations Act 2001. This definition applies to all companies including life companies. According to the Corporations Act, a company is solvent if it is able to pay all of its debts when they become due.

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The Corporations Act definition of solvency is normally interpreted as being on a "best-estimate" basis. A company is solvent if, on the balance of probabilities, it is likely to be able to pay all of its debts when they become due. This is not necessarily the same as the accounting definition of solvency, whereby assets must exceed liabilities. For example a company could have assets in excess of its liabilities, however it may not be solvent in the sense of the Corporations Act if some of its assets (for example intangible assets such as deferred tax and capitalised expenses) cannot be realised before the existing liabilities become payable.

For a life company, there is often significant uncertainty with regard to the amount of liabilities and the timing of their payment. The value of the assets of a life company might currently exceed the best estimate of its liabilities, but the liabilities could turn out to have been underestimated, and by the time the liabilities become payable, the assets may have fallen in value. Policy owners could be at significant risk of not receiving the amount due to them if a life company only just satisfied the Corporations Act definition of solvency. A significant amount of capital may be necessary if a life company is to have a strong likelihood of being able to meet its liabilities.

It is important for life companies to be well capitalised. For life insurance to be a sensible purchase, policy owners need to be reasonably certain that the life company will be able to honour claims which might not occur until many years into the future. Life companies are also an important part of the financial system – the failure of a major life company would cause instability throughout the Australian financial system.

Section 3 of the Life Insurance Act says that the principal object of the Act is to protect the interests of the owners and prospective owners of life insurance policies in a manner consistent with the continued development of a viable, competitive and innovative life insurance industry. One of the means for achieving this objective is the imposition of prudential requirements and the supervision of life companies by APRA. Section 230A of the Act allows APRA to make prudential standards for life companies, including standards for capital adequacy.

APRA must strike a balance between protecting the interests of policy owners, protecting financial system stability in Australia and allowing the continued development of a viable, competitive and innovative life insurance industry. APRA aims to achieve this balance by targeting a very low (but not zero) failure rate for the life companies it supervises. It is not possible to guarantee a zero-failure regime, and trying to achieve such a regime would be likely to stifle the life insurance industry with excessive capital requirements.

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24.3. Minimum Capital Requirements

24.3.1. Introduction

APRA's minimum capital requirement for life companies is called the Prudential Capital Requirement (PCR). Each statutory fund and the shareholders' fund must have a capital base that exceeds the PCR of the fund at all times (note that APRA uses the term "general fund" to refer to the shareholders' fund). The capital base is the amount of capital that APRA recognises as eligible for capital adequacy purposes, and is described in the next section. The PCR is intended to provide a 99.5 per cent probability that a fund will have sufficient capital to absorb unexpected shocks or losses that may arise over a one-year period and continue to be able to meet its obligations to policy owners (in the form of the "adjusted policy liabilities") and other creditors at the end of that period. The one-year period represents a "breathing space" during which remedial action to restore capital adequacy can be taken if there is a breach of PCR. A life company will normally have a capital base in that is well in excess of the PCR, so that the probability that the fund will be unable to meet its obligations to policy owners in one year's time is in almost all cases considerably less than 0.5%.

The PCR consists of a prescribed capital amount (PCA) calculated by the life company in accordance with prudential standards plus the supervisory adjustment (if any) that is determined by APRA. The PCA consists of risk charges for each of the major risk types faced by a life company, a combined stress scenario adjustment, less an aggregation benefit to allow for diversification between different risk types.

Minimum capital requirements apply to a life company as a whole, as well as to each of its funds.

The following diagrams summarise APRA's capital requirements in the context of a life company's balance sheet.

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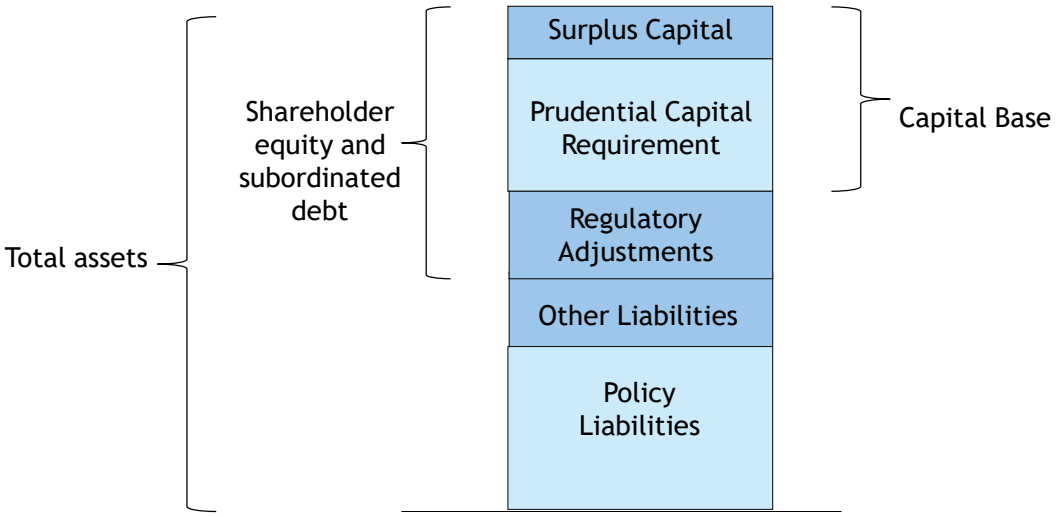
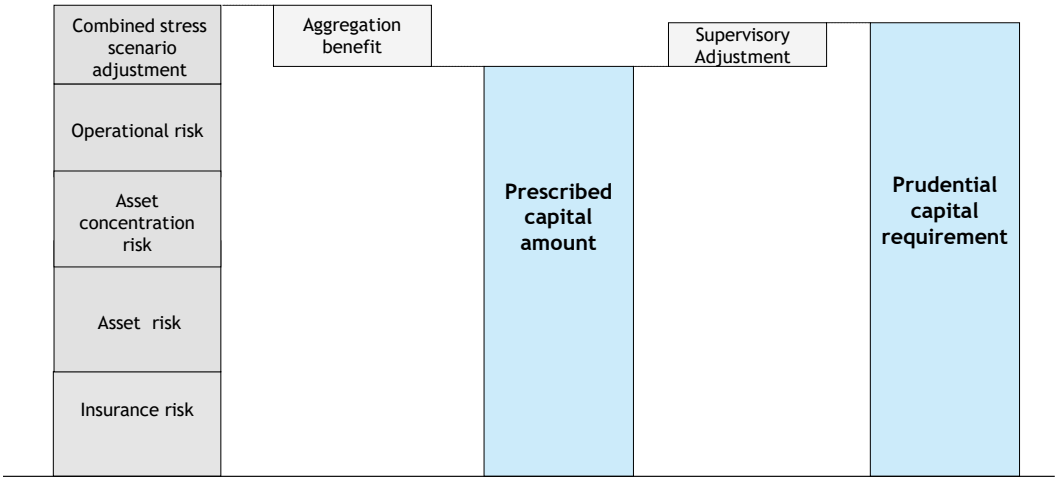
Components of balance sheet



Components of PCR



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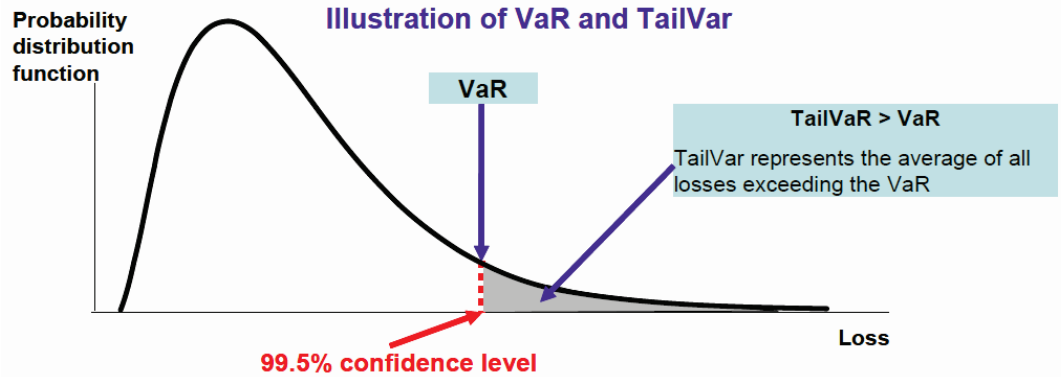
24.3.2. VaR and TailVaR

The PCR is intended by APRA to be set at a level such that there is only a 0.5% probability that a fund will incur a loss greater than the PCR over a 12 month period. This is an example of a "Value at Risk" (VaR) method of setting capital requirements. A weakness in this method is that it ignores the size of the losses in the tail of the loss distribution beyond the 99.5% confidence level. The tail of the loss distribution can be very skewed if the life company has exposure to rare, but potentially large, asymmetric risks. For example, non-proportional catastrophe reinsurance might protect a life company from smaller, foreseeable catastrophes, but if the treaty caps the reinsurer's liability to the life company, it will not provide protection against additional losses if a very severe but extremely rare catastrophe occurs.

An alternative risk measure to VaR is "Tail Value at Risk" (TailVaR). The TailVaR is the average value of losses in the tail of the loss distribution beyond the specified confidence level. If losses have a normal distribution, VaR at 99.5% is the same as TailVaR at 98.7%. In a sample of 10,000 scenarios, VaR would be determined using the 50th worst scenario, whereas TailVaR would be determined using an average of the 130 worst scenarios. The point of equivalence between VaR and TailVaR will change if the loss distribution is not normal. In practice, the tail of the loss distribution for life companies is unlikely to be normal.

TailVaR is used by some overseas regulators for setting minimum capital requirements. It can also be used by life companies in setting their own internal capital targets. An accurate calculation of both VaR and TailVaR requires the use of a stochastic model. However, VaR can be approximated by using a single scenario with appropriately chosen parameters (this is the approach used by APRA for calculating the prescribed capital amount according to the standard method). A weakness of TailVaR is that it depends on assumptions made about the likelihood of extremely rare events and the size of the resulting losses. These assumptions must, by their nature, be very subjective. The following graph illustrates the difference between Var and TailVaR measured at the same confidence level.



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24.3.3. What could happen to a life company with insufficient capital?

APRA expects to be informed by a life company if a breach of PCR is imminent and will keep a close watch on life companies which are close to a breach of PCR.

The options available to a life company with a statutory fund or shareholders' fund that breaches its PCR include raising additional capital from outside the company, transfer of surplus assets from another fund, closure of the fund to new business and de-risking the fund. Closure to new business might help restore capital over time because any capital strains from new business would be eliminated, whilst any profits from existing business would be added to the existing capital. However, closure to new business would create some additional one-off costs that would reduce the capital base, for example staff involved in marketing, sales and processing of new business may need to be made redundant. De-risking strategies could involve changing the investment policy to a less risky mix of assets, purchasing derivatives to limit the size of potential future asset losses, or purchasing additional reinsurance in order to limit potential losses due to increases in claim costs.

If a fund breaches its PCR, or is coming close to a breach, and the life company cannot remedy the situation within a short time, APRA may issue directions under Section 230B of the Life Insurance Act. The Act allows APRA to direct life companies to take actions in a broad range of circumstances, including failure to comply with a prudential standard. The range of potential actions listed in Section 230B is quite broad.

Section 157 of the Life Insurance Act allows APRA or a life company to apply to the court for an order to appoint a judicial manager. The effect of appointing a judicial manager has a broader impact that the issuing of directions by APRA. A judicial manager effectively takes over the day to day management of the company from the board and senior managers. In order to appoint a judicial manager, the court must be satisfied that there are reasonable grounds for the appointment. These are listed in Sections 158 and 159 of the Act and include a failure to comply with capital standards or the court deciding that the financial position or management of the company is unsatisfactory.

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A judicial manager is required to recommend a course of action as soon as possible. Section 175 of the Life Insurance Act lists the courses of action that the judicial manager can recommend to the court. These can include recapitalisation, transfer of liabilities to another insurer or the wind-up of the life company. A recapitalisation or transfer of liabilities to another life company would be the preferred courses of action as the contractual entitlements of policy owners would be preserved. Wind-up would normally be the least desirable outcome and would only be recommended if none of the other courses of action were feasible.

Section 187 of the Life Insurance Act describes the application of statutory fund assets in a wind-up. The priority payment listed in Section 556(1) of the Corporations Act must be paid first. These include some specific wind-up costs such as employees' retrenchment payments. After the priority payments have been made, the remaining assets of the fund can be used to pay out the liabilities to policy owners. The liability on wind-up is likely to differ from the policy liability calculated for normal financial reporting purposes. For example, a policy liability on wind-up could not be less than zero even though negative policy liabilities are allowed under LPS 340. If any assets remain after policy owners have been paid, these assets can be used to pay other debtors of the statutory fund, followed by policy owners and debtors of other funds and the life company's shareholders.

There are no statutory arrangements for providing compensation to policy owners for their losses if a life company fails. A Financial Claims Scheme does protect the depositors of banks and the policyholders of general insurers from potential loss due to the failure of these institutions, but the scheme does not apply to the policy owners of life companies.

24.3.4. APRA's Three Pillars of Supervision

APRA's approach to supervision of life companies has three pillars. These go beyond merely setting minimum capital requirements.

Pillar 1

The first pillar is the detailed quantitative requirements in relation to the capital base, the prescribed capital amount and liability valuations, which must be calculated by life companies in accordance with prudential standards.

Pillar 2

The second pillar is the supervisory review process. This includes APRA's supervision of the risk management and capital management practices of life companies.

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As part of the second pillar, APRA requires life companies to have an Internal Capital Adequacy Assessment Process (ICAAP) and to provide an annual report on the ICAAP to APRA. Further detail on the ICAAP is given later in this chapter.

Also as part of Pillar 2, APRA has the ability to include a supervisory adjustment in the PCR. APRA may apply a supervisory adjustment to the prescribed capital amount in a range of circumstances including:

- the prescribed capital amount calculation does not adequately address the risks specific to the life company (e.g. strategic risk, reputation risk);
- the life company is newly licensed or has recently materially changed, or plans to materially change, its business mix;
- APRA has identified material issues with the competence or probity of responsible persons associated with the life company;
- APRA has identified material weaknesses in the life company's governance, risk management strategy or realised risk management outcomes;
- the life company has failed to comply with, or is consistently minimally compliant with, applicable prudential standards;
- the life company is using a business model, has an organisational structure or is following a business strategy that APRA regards as highly risky, or overly difficult to assess, in a way that is not captured under the calculation of the prescribed capital amount;
- the life company's ICAAP is not well-defined or documented, or its target capital policy is assessed as being inadequate, e.g. due to a lack of sufficiently rigorous stress and scenario testing;
- the life company has been unable to restore its capital position to target capital levels in accordance with its ICAAP in a timely manner.

Pillar 3

The third pillar is disclosure requirements. These are intended to encourage market discipline. Disclosure of the financial strength of life companies assists potential policy owners, financial advisors, share market analysts and other interested parties in deciding which life companies they should recommend or maintain relationships with. Mandatory disclosure of their capital resources gives life companies an added incentive to maintain a strong financial position.

APRA requires that the capital base and prescribed capital amount be published at least annually for each fund and for the life company as a whole. The capital base must be broken down by the different types of capital together with regulatory adjustments. The prescribed capital amount must be broken down into the various risk charges.

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APRA does not allow life companies to disclose supervisory adjustments. The PCR must always remain confidential. APRA's view is that disclosure of the supervisory adjustment could have unintended or adverse consequences. For one thing, external observers may over-react to such an adjustment. For another, disclosing the supervisory adjustment could inhibit APRA's role as a prudential supervisor, in that it would have to consider the market reaction or over-reaction to its actions.

There are also disclosure requirements for capital in the Australian accounting standards. AASB 1038 requires life companies to disclose the regulatory capital position of each statutory fund (before supervisory adjustments). AASB 101 (Presentation of Financial Statements) requires companies to disclose information that enables users of financial statements to evaluate the company's objectives, policies and processes for managing capital.

24.4. Capital Base

The basis for measurement of the capital base is specified by APRA in LPS 112. Due to the need to ensure that the capital base of a life company provides adequate support for its activities, APRA imposes some restrictions on the composition of the capital base. It will normally differ, sometimes significantly, from the shareholders' net assets that are shown on a company's balance sheet.

Life companies can include various types of capital instruments within their capital base. Eligible capital provided by shareholders is referred to as Tier 1 Capital. Subordinated debt is referred to as Tier 2 capital. The capital base of a life company is the sum of the Tier 1 capital and the Tier 2 capital. The Tier 1 capital is subdivided into Common Equity Tier 1 (CET1) capital and Additional Tier 1 (AT1) capital.

CET1 and AT1 are only identified at life company level. Within statutory funds and the shareholders' fund, these different types of shareholder capital are not separately identified and the term "net assets" is used instead to refer to all shareholder capital.

24.4.1. Common Equity Tier 1 Capital

CET1 is the highest quality component of capital. It includes paid-up ordinary shares and retained earnings, and must be net of the regulatory adjustments specified by APRA. CET1 must be subordinated to all other forms of funding (meaning that it has lowest priority in the winding-up of the company). CET1 absorbs losses as and when they occur (through deduction of losses from retained earnings), has full flexibility of dividend payments and has no maturity date (i.e. never has to be repaid to shareholders).

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APRA requires that CET1 be at least 60% of a life company's prescribed capital amount at all times.

APRA requires that several regulatory adjustments be made to CET1. Any assets that could have little or no value in the event of wind-up must be deducted from CET1. The deductions include intangible assets such as goodwill and capitalised expenses, and deferred tax assets. These types of assets can be recognised on a life company's balance sheet because the accounting standards use a "going concern" approach – assets can be recognised to the extent that their value would be realised if the life company continues to operate in a profitable manner. In contrast, APRA takes a "gone concern" approach to determining the capital base by considering the value of assets if the life company ceased to operate and had to be wound up.

An adjustment must also be made to bring all assets to their fair values if they are not reported at fair value on the balance sheet.

Adjusted policy liabilities

A regulatory adjustment to CET1 must be made by adjusting the policy liabilities. Adjusted policy liabilities are defined in Attachment H of LPS 112. These adjustments allow expected reserves for future shareholder profits to be removed from policy liabilities and included in CET1, and also apply a minimum liability equal to the "termination value" of policies. Termination values are an approximation to the liabilities to policy owners in the event of the company being wound-up (in an actual wind-up these liabilities would be determined by a liquidator according to Section 186 of the Life Insurance Act 1995). The termination value of a policy is not necessarily the same as its surrender value. Termination values are defined in Prudential Standard LPS 360 Termination Values, Minimum Surrender Values and Paid-up Values.

Further adjustments must be made to the liabilities for participating business and non-participating business with entitlement to discretionary additions. The aim of these adjustments is to ensure that policy owner entitlements to future bonuses and interest credits are not treated as part of the capital base.

Non participating policies without discretionary additions

The adjusted policy liabilities for the non-participating policies of a statutory fund (other than policies such as investment account policies that are entitled to discretionary additions) are defined to be the greater of the risk-free best estimate liabilities (RFBEL) and the termination values. The "greater of" is determined after summing the RFBEL and termination values for all non-participating policies that are not entitled to discretionary additions.

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LPS 360 defines termination values to be the present value of annuity and disability claims in course of payment, the best estimate value of incurred but not reported (IBNR) claims and reported but not admitted (RBNA) claims, the unearned premium or contractual premium refund for other risk policies, and the surrender value for other policies. The RFBEL is calculated in the same way as the best estimate liability is calculated in a policy liability valuation, but using a risk-free discount rate. The RFBEL is calculated for both life insurance contracts and life investment contracts, even though under LPS 340 the BEL only forms part of the policy liabilities for life insurance contracts. The adjusted policy liabilities do not include any reserves for future shareholder profits.

To calculate the RFBEL, APRA specifies that the risk-free discount rate for Australian policy liabilities must be derived from the yields on Australian Commonwealth Government Securities (CGS). This definition of the risk-free discount rate is contained in LPS 001. This is a tighter definition of the risk-free discount rate than that given in LPS 340 and is also more conservative. In LPS 340 the risk-free discount rate must be based on the current observable, objective rates that relate to the nature, structure and term of the future liability cash flows. The tighter definition specified in LPS 001 and used in LPS 112 ensures much greater uniformity of discount rates between different life companies. A more conservative definition of "risk-free" is also appropriate for the purpose of determining regulatory capital.

Another difference between the RFBEL and the best estimate liability calculated according to LPS 340 is that RFBEL is always calculated using a risk-free discount rate. For the best estimate liability in LPS 340, the discount rate for benefits that are contractually linked to the performance of the assets held must reflect the expected investment earnings applicable to the assets backing the benefit being valued (i.e. it is not risk free).

For annuities and some other types of policies, APRA allows an illiquidity premium to be added to the risk-free discount rate. The rationale for allowing the illiquidity premium is that the yields obtainable on illiquid assets (i.e. assets that are traded less frequently and in smaller volumes) are usually higher than the yields on liquid assets with the same term and credit rating. Liabilities such as annuities that have very predictable cash flows can be matched to illiquid assets as there is little risk that the assets will have to be sold before they mature. If an annuity can be surrendered, the RFBEL cannot be less than the minimum termination value calculated according to LPS 360. The illiquidity premium must be calculated using a formula that depends on the credit spreads for corporate bonds. This formula is specified in a letter from APRA under LPS 112, which is available on the APRA web site. Corporate bonds are less liquid than Commonwealth Government Securities and therefore the yields on corporate bonds normally include an illiquidity premium. The illiquidity premium reached levels in excess of 100 basis points during the global financial crisis in late 2008 and early 2009, but is usually much smaller than this.

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The adjusted policy liabilities can be greater or less than the unadjusted policy liabilities reported on the balance sheet, depending on the types of policies referable to a statutory fund. For stepped premium risk business, termination value is usually greater than the LPS 340 policy liability. For level premium risk business, termination value is usually greater than the LPS 340 policy liability at early durations, but at longer durations the position reverses. For annuities, the termination value and RFBEL are usually the same and may be less than the LPS 340 policy liabilities as the former do not include any allowance for future profit margins. However, the outcome for each type of business also depends on any differences between the discount rates used for LPS 112 and LPS 340.

Non participating policies with entitlement to discretionary additions

For non-participating business with entitlement to discretionary additions (e.g. non-participating investment account policies), the adjusted policy liabilities are determined by taking the greater of the RFBEL and the sum of the investment fluctuation reserve (if it is greater than zero) and the termination values. This adjustment prevents the investment fluctuation reserve from being included in the capital base. Note that the investment fluctuation reserve is included in the RFBEL, but it is not part of the termination value.

The 'greater of' test must be determined at sub-group level if there are any policy benefits for a sub-group of policies that are determined with reference to the performance of particular assets that the life company has allocated to the liabilities for that sub-group.

Participating policies

For participating business, the RFBEL is replaced by the participating policy liability (PPL). The PPL is similar to the RFBEL but includes the value of future bonuses, including distributions from policy owners' retained profits. Termination values must be increased if necessary so that the value of policy owners' retained profits that would remain after the payment of termination values is not greater than zero. These adjustments mean that future bonuses and policy owners' retained profits cannot be treated as capital. APRA believes it is appropriate to assume that all Australian policy owners' retained profits are held for the benefit of Australian policyholders and must eventually be distributed to them. If APRA did not impose this requirement, there would be an incentive for life companies to withhold distributions of policy owners' retained profits and use these retained profits as a replacement for shareholders' capital. Section 62 of Life Insurance Act says that Australian policy owners' retained profits may only be distributed to owners of Australian policies that provide for participating benefits. However, there is nothing in the Life Insurance Act that requires distributions to be made.

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As for non-participating policies that are entitled to discretionary additions, the adjusted policy liabilities for participating policies must be calculated at sub-group level if each sub-group has a different asset allocation for the purpose of determining its bonus rates.

24.4.2. Additional Tier 1 Capital (AT1)

Additional Tier 1 Capital consists of shareholder capital that has less ability to absorb losses than CET1. AT1 capital instruments must be subordinated to other forms of funding with the exception of CET1. They must have fully discretionary non-cumulative dividends, meaning that the company can decide not to pay a dividend, and missed dividends will not accumulate and be liable for payment in a subsequent period. In addition, AT1 instruments must have neither a maturity date nor an incentive for the life company to redeem them. An example of an incentive to redeem would be a dividend that was guaranteed to increase at a specified date in the future.

The most common type of AT1 instrument is perpetual preference shares. These shares typically pay shareholders a fixed rate of dividend and have priority over ordinary shareholders in the wind-up of the company. A life company normally has the right to cancel dividend payments to preference shareholders, but only if it also cancels payment of dividends to ordinary shareholders.

Perpetual preference shares can absorb losses because the life company has no obligation to pay dividends or to repay the amount invested by shareholders. Some forms of preference shares also include non-viability options where the regulator can trigger a write down of the nominal value or conversion to equity.

APRA requires that Tier 1 capital (CET1 plus AT1) be at least 80% of a life company's prescribed capital amount at all times.

24.4.3. Tier 2 Capital

Tier 2 Capital is the lowest quality form of capital that can be included in the capital base. It must be in the form of a debt that is referable to a particular statutory fund and it must be subordinated to the policy and other liabilities of that fund. The subordinated debt will appear as a liability on the fund's balance sheet. However, in assessing the capital base of the fund it is not treated as a liability.

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Tier 2 Capital can be perpetual but it is far more common for it to have a maturity date. The amount of Tier 2 Capital that can be included in the capital base is scaled down over the 4 years preceding its maturity date. This means that when it comes time for the debt to be repaid, the repayment has a limited effect on the capital base. The interest payments on Tier 2 Capital instruments are normally fixed or pegged to a reference rate such as the 90 day bank bill rate.

Tier 2 Capital only absorbs losses if the statutory fund to which it is referable, or the life company, becomes non-viable or is wound-up. Losses incurred by a life company are normally borne by the Tier 1 capital. But if Tier 1 Capital becomes small or negative, further capital raisings may become impossible. Shareholders may be unwilling to commit new Tier 1 capital because the risk that the company will fail and the capital will be lost may be too high relative to potential returns on the capital. In this situation, a life company would be unable to continue operating and the Tier 2 Capital could bear part or all of any further losses after the Tier 1 Capital is exhausted. The investors in Tier 2 Capital would suffer a partial or full write-off of their investment.

Because of its limited loss-absorbing qualities, APRA only allows a relatively small proportion of the prudential capital requirement to be met by Tier 2 Capital.

24.4.4. Statutory funds and shareholders' funds

The previous section described the capital base and prudential capital requirement for a life company as a whole. Similar requirements apply to each statutory fund and the shareholders' fund. The key differences at fund level are that the CET1 and AT1 definitions do not apply. Instead they are replaced by "net assets". This is because share capital is raised at company level. At fund level, there is no need to identify which net assets belong to particular groups of shareholders.

The net assets of a statutory fund (before the regulatory adjustments) include shareholders' capital and shareholders' retained profits. The net assets may also include foreign currency translation reserves and any other reserves attributable to shareholders.

APRA requires the net assets of a statutory fund (after applying the same regulatory adjustments as apply to CET1) to exceed 80% of the prescribed capital amount at all times. The capital base (including any Tier 2 Capital of the fund) must exceed the prudential capital requirement of the fund at all times.

The shareholder's fund is not allowed to have Tier 2 Capital. The net assets (after regulatory adjustments) must exceed the prudential capital requirement of the shareholders' fund at all times.

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The capital base of a life company will normally be equal to the sum of the capital bases for each of its funds. One situation where this will not be true is if the life company has issued share capital that does not qualify as either CET1 or AT1. Such capital would be included in the capital bases of the company's funds, but it would not be included in the capital base of the company as a whole.

One might ask why APRA specifies capital requirements at both company and fund level? The main reason is so that the CET1 and AT1 limits can be applied. The company level information is also useful for external observers in analysing the financial strength of a life company.

24.5. Prescribed Capital Amount

The standard method for calculating the prescribed capital amount (PCA) is summarised in LPS 110. The PCA must be calculated using prescribed, risk-based methods. Under the standard method, the PCA is determined separately for each statutory fund and the shareholders' fund of a life company as the sum of:

- the Insurance Risk Charge (LPS 115); plus
- the Asset Risk Charge (LPS 114); plus
- the Asset Concentration Charge (LPS 117); plus
- the Operational Risk Charge (LPS 118); less
- an aggregation benefit (specified in LPS 110); plus
- a combined stress scenario adjustment (specified in Attachment B of LPS 110).

The PCA for a life company as a whole is the sum of the PCAs for the individual funds. The PCA for a life company has a minimum of $10 million. The minimum capital requirement prevents life companies from starting up and continuing in business without a minimum level of capital resources.

LPS 110 also mentions an alternative Internal-Model Based Method for determining the PCA. At the time of writing, this method was not used by any life companies. An internal model would use parameters set by the life company, instead of the standard parameters specified for each of the risk charges. It would most likely be a stochastic model. The model and its parameters would need to be approved by APRA. Internal models are used by some Australian banks and general insurers to calculate their PCA (or its banking equivalent). Internal models are also commonly used for determining regulatory capital for life companies in some foreign countries.

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24.5.1. Insurance Risk Charge

The method for calculating the insurance risk charge is specified in LPS 115. This charge is the minimum amount of capital a statutory fund needs to hold against insurance risks. Insurance risks include mortality, morbidity, longevity, lapses, servicing expenses and other insurance contingencies such as take-up rates for guaranteed conversion options. Note that APRA distinguishes between mortality risks, where the company makes a loss if mortality rates increase, and longevity risks, where the company makes a loss if mortality rates decrease. Longevity risks would generally only be an issue for statutory funds with lifetime annuity liabilities.

The insurance risk charge is defined to be the reduction in the capital base that would occur if the adjusted policy liabilities were replaced with stressed policy liabilities. The stresses to the policy liabilities must be determined so that there is a probability of 99.5% that the stressed policy liabilities will be sufficient to provide for claims and expenses over the following 12 months together with the adjusted policy liabilities at the end of 12 months. The stressed liability should be significantly higher than the best estimate liability, which has only a 50% probability of sufficiency.

The stressed liabilities are calculated in the same way as the risk-free best estimate liability (for non-participating business) or the participating policy liability, but using stressed assumptions instead of best estimate assumptions in respect of insurance risks. There is an additional requirement that stressed liabilities must be sufficient to fund adjusted policy liabilities calculated using stressed assumptions 12 months after the reporting date. This is similar to the calculation of adjusted policy liability (greater of RFBEL and termination values) except that the "greater of" is calculated in 12 months' time. This amount must then be discounted back to the reporting date, and added to the discounted value of the stressed cash flows that are projected to occur over the first 12 months.

The insurance stresses increase the RFBEL. They also increase the termination values for lifetime annuities, disability claims in course of payment, IBNR and RBNA.

The appointed actuary must determine the stressed assumptions for mortality and morbidity risks. APRA specifies 3 different types of stresses that must be applied to the best estimate assumptions – random, event and future stresses. The margins for each of these stresses must be determined at a 99.5% probability of sufficiency over a 12 month period. This means that, in the assessment of the appointed actuary, there is no more than a 0.5% probability that the actual cost of claims will exceed the stressed estimate. The stress margins must then be adjusted to allow for diversification between these risks.

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Random stress

Random stresses are adverse fluctuations in experience from the best estimate, excluding the impact of single events that could cause large numbers of claims, such as pandemics, terrorist attacks and natural catastrophes. The size of the random stress will depend on factors such as the number of expected claims, the distribution of sums insured and the impact of existing reinsurance arrangements. The random stresses are applied for 12 months from the reporting date.

If sums insured and ages attained are the same for all policies and claim incidence rates are assumed to have a binomial distribution, the extra claims at the 99.5% confidence level can be estimated using the formula 2.576 / √(n x p), where n is the number of policies, and p is the claim incidence rate.

For example, assume the best estimate mortality rate is 0.5% and there are 100,000 lives insured. The random mortality stress margin will be 12% (= 2.576 / √(100,000 x .5%)). The best estimate number of claims will be 500 and the number of extra claims at the 99.5% confidence level will be approximately 60 (i.e. 500 claims multiplied by the stress margin).

If there were 10,000 lives insured the stress margin would be 36%. For 1,000,000 lives insured the random stress margin would only be 4%. This example highlights the importance of the number of lives insured in determining the amount of capital needed for random insurance stresses. A larger number of lives will result in smaller random claim fluctuations and therefore a lower amount of capital will be required. This is an example of the outcome of the "law of large numbers".

In practice, a life company's policies are likely to have a skewed distribution of sums insured. A small proportion of policies will have very large sums insured. In addition, best estimate mortality rates will vary by age, sex, smoking status and other rating variables. The claims costs will not have a binomial distribution and stochastic modelling may be necessary to determine the random stress margins. The random stress will decrease as the number of policies in a statutory fund increases. It will increase as the skewness of the distribution of sums insured increases. Surplus reinsurance can be used as a means of reducing the random stresses as this type of reinsurance reduces the skewness of the distribution of sums insured (i.e. the sum insured retained by the life company will be limited to the retention limit specified in the reinsurance treaty).

Separate random stresses must be determined for mortality and morbidity risks.

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Event stress

The event stress allows for the impact of a single event causing multiple claims that could commence in the 12 months following the reporting date. The event stress must reflect the worst single event that could occur with a probability of 0.5% and affecting both mortality and morbidity experience. APRA specifies a minimum event stress of a pandemic scenario where mortality rates increase by 0.5 per thousand lives insured for the 2 years following the reporting date. APRA also specifies an increase in morbidity in this scenario, with 10% of lives insured becoming temporarily disabled for up to 60 days in each of the 2 years.

For most companies the event stress is the pandemic scenario. However, the actuary needs to consider whether worse events than the pandemic scenario could happen. For example, the actuary may need to consider risks such as terrorist attacks, natural catastrophes or industrial accidents if the life company has a high proportion of lives insured who work at a single site (this might occur if the life company specialises in issuing large group risk policies).

The pandemic scenario has been set by APRA with reference to the Spanish flu pandemic that occurred over roughly a 12 month period during 1918 and 1919. This pandemic spread around the world during a fairly short period. In Australia, it resulted in excess mortality of about 6 deaths per thousand people. If a similar pandemic occurred now its impact is expected to be much smaller, mainly due to advances in health care and the advent of antiviral drugs. The impact on claim amounts for insured lives is expected to be lower than in the general population due to selection effects. These effects include the impact of underwriting and the fact that people insured for larger amounts tend to have better access to medical care than the general population. Flu pandemics are expected to recur roughly once every 30 or 40 years. Smaller flu pandemics occurred in 1957 and 1969. Another pandemic could occur at any time.

One particular feature to note is that the increases in mortality and morbidity in the pandemic scenario are the same at all ages. This means that the proportionate impact of the pandemic scenario, relative to normal mortality and morbidity rates, is much greater for younger lives. Another notable feature of the pandemic scenario is that it is the same regardless of the number of lives insured. If a pandemic with a claim rate of 0.5 per thousand over 2 years did actually occur, the claims experience of different life companies would vary due to random chance. However the specified claim rate of 0.5 per thousand is already at the 99.5% confidence level, so life companies are not required to hold capital against the risk that they may by chance experience even higher rates of claims than the industry average during a pandemic event.

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The pandemic scenario is spread over 2 years. This may look inconsistent with the 12 month horizon for capital requirements, but it is as an approximation to the effect of a 12 month pandemic that commences at some point during the next 12 months.

The pandemic scenario also applies to lifetime annuities. If a statutory fund includes lifetime annuities as well as policies providing death cover, the overall impact of the pandemic scenario will be reduced.

Future Stress

The future stress margin allows for other possible causes of variations in experience and assumptions for mortality and morbidity. These include the possibility that the best estimate assumptions are incorrect or that changes to allowances for future trends in mortality and morbidity experience will have to be made.

The future stress margins must be applied from the reporting date for the remaining term of the liabilities. They must allow for the possibility that the best estimate assumptions may need to be changed in 12 month time, either because they were misestimated at the reporting date or because adverse trends have been identified during this period.

The size of the future stress margins will depend on the adequacy of the investigations used to determine the best-estimate assumptions and the range of adverse factors that could affect trends in claims experience.

The best estimate mortality or morbidity assumptions will usually be in the format of a factor multiplied by a standard table. The factor is usually set by comparing actual experience for the company to that expected by applying the standard table.

Statistical techniques can be used to estimate the uncertainty arising from the numbers, sizes and attained ages of the policies included in a company's experience investigations and the industry experience underlying the standard table. There is a risk that the company's adjustment factor, or the standard table, will underestimate future claims experience because, due to pure random chance, there were fewer than expected claims during the periods of investigation. The margin required for this type of error can be estimated in a similar way to the random stress margin.

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There will be additional uncertainty about the best estimate assumptions because mortality and morbidity experience may have changed since the experience investigations were carried out. An unavoidable problem with experience analyses is that they are out of date to some extent. Standard tables based on industry-wide experience may no longer be relevant and/or not representative of the life company's data. The experience of the life company will generally be more up to date, but will be based on a smaller number of lives than the standard tables. To get meaningful volumes of experience data and reduce the impact of random fluctuations, several years of experience data is normally required. This reduces the impact of random fluctuations on the mean, but increases the risk that recent trends in experience are missed. For example, the company may have changed its underwriting standards, claims management practices, benefit definitions or target markets since the period of the most recent experience investigation.

Other examples of trends which might cause a deterioration in experience include: diet and lifestyle factors; medical advances leading to improvements in diagnostic techniques that affect trauma claim rates; economic and social factors that affect income protection claims incidence and termination assumptions. Some allowance for adverse trends should be incorporated in the future stress margin. This size of this allowance will be fairly subjective.

Longevity stress

The longevity stress is a 20% reduction in mortality rates. This stress applies to lifetime annuities and is effectively a combination of random and future stresses.

APRA specifies the longevity stress, rather than leaving it to the appointed actuary to determine, because there is little relevant experience for annuitant mortality in Australia. Determining the longevity stress would otherwise be a very subjective exercise and the stress margin could vary significantly between life companies.

Management actions

The insurance risk stresses are intended to be extreme, but realistic. In practice, a life company would take mitigating actions in response to extreme stresses. These actions can include, but are not limited to:

- reducing bonus or crediting rates for participating business; or
- increasing premium rates for non-participating business.

APRA allows life companies to take credit for the actions it would expect to take in order to reduce their capital requirements. Any allowances for management actions which reduce capital requirements must be appropriate, justifiable and equitable. They must also be consistent with policy owners' reasonable expectations based on product disclosure documents.

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Premium rate increases cannot be assumed to occur in response to the future stress within 12 months of the reporting date. This restriction recognises that it takes time for a life company to identify changes in its mortality and morbidity experience. The 12 month period must be extended to allow for the time it would take for the life company to increase premium rates in response to stresses occurring over the 12 month period.

The value of any assumed premium increases must not exceed the value of the increases in claims and expenses. This restriction means that it is not possible to assume that business currently in loss-recognition could be repriced to bring it back to profitability. Life companies must also consider the extent to which competitive pressures and policy owners' reasonable expectations might limit their ability to fully reprice their products in line with worsening experience assumptions. If a life company believes it can fully reprice its policies, a simple way of modelling the impact of repricing is to assume that premium rates remain unchanged and the future mortality and morbidity stresses cease to apply from the date that repricing will occur. This will give the same result as maintaining the future mortality and morbidity stresses and increasing the premium rates.

Premium rate increases cannot be assumed as a response to the random or event stresses. This is because these stresses only affect claims that are expected to be incurred over the next 12 months. It would not be appropriate to assume that losses from these stresses could be recovered via subsequent long-term increases in premiums. Random and event stresses are effectively one-off occurrences, so an increase in premium rates in response to these stresses would be difficult to maintain in a competitive market.

Diversification

The stressed policy liabilities must be determined using stress margins that have been adjusted to allow for diversification between the random, event, future and longevity stresses. Each of the unadjusted stress margins was determined at 99.5% probability of sufficiency over 12 months. However, the different types of stresses are not perfectly correlated. It would be overly conservative to assume that all of the unadjusted stresses would occur over the same 12 month period.

The combined impact of the stresses must be determined allowing for correlations between the stresses using a formula and correlation matrix specified by APRA in LPS 115. Most of the correlation factors in the matrix are zero (i.e. the risks are assumed to be uncorrelated). There is a low positive correlation of 0.25 between future mortality and future morbidity. This recognises that some types of trend risk, such as increases in obesity rates, can affect both mortality and morbidity experience. There is a low negative correlation of -0.25 between longevity and future mortality.

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The method APRA uses to allow for correlations is an approximate method for finding the tail of a multi-variate loss distribution. The method is theoretically correct only if the individual variables are normally distributed and the dependence between the variables is linear. These conditions are not always true. For example, in life insurance the probability distribution of losses arising from single events is very skewed – the maximum loss arising from a single event will be small in most years, but very large losses may occur very occasionally from events such as pandemics. If a life company has non-proportional reinsurance arrangements, these will also affect the shape of its retained loss distributions.

One might expect the correlation between longevity and future mortality to be minus 1 because an increase in mortality rates would always improve longevity. The reason why the correlation is not minus 1 is that annuitants and insured lives are separate groups with different age profiles and different best estimate assumptions. Misestimation of the mean can adversely affect the best estimate assumptions for both groups at the same time. In addition, adverse trends that would increase mortality rates for younger lives insured may have little or no impact on the longevity of annuitants and vice versa.

Expense stress

The stress margin for servicing expenses is a 10% increase to the best estimate of future unit costs. If the best estimate assumption depends on a service agreement with a company that provides the services to the life company and the agreement doesn't adequately reflect the long term sustainable costs of operating the business, then a higher margin must be used to reflect the difference between the best estimate assumption and long term sustainable costs.

The expense stress margin is specified by APRA, instead of being determined by the actuary, because APRA believes it is a relatively subjective margin and there are no strong reasons why it should not be the same for all life companies and statutory funds.

Management actions, such as reductions in bonus rates or increases in fees or premium rates, can be assumed in response to the expense stress. Increases in fees or premium rates are subject to a minimum 12 month delay. There is no adjustment for diversification for the expense stress margin.

Lapse stress

The stress margin for lapses must be determined by the actuary. Lapses included all types of voluntary terminations. The lapse margin must be determined so that the insurance risk charge is at the required 99.5% probability of sufficiency over 12 months. The lapse margin cannot be set in isolation from other risks. Diversification of lapse risk with other risks can be allowed for.

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The lapse margin must be set considering the potential behaviour of policy owners if other risks occur. This is likely to require considerable judgement. In particular, the actuary will need to consider what might happen to lapse experience if premium rates or fees are increased substantially in response to the mortality, morbidity and expense stresses.

The stress margin for lapses can be either an increase or decrease in lapse rates, depending on which gives the higher insurance risk charge. If the expected claims incurred and expenses exceed earned premiums after applying the other stresses, the lapse stress will be a reduction in lapse rates. Otherwise, the lapse stress will be an increase in lapse rates. In some circumstances, the lapse stress could be a reduction in lapse rates for the first 12 to 24 months and an increase in lapse rates thereafter. This can occur because the random stresses only apply for the first 12 months, the event stress only applies for the first 24 months and repricing can be assumed to occur at some point after 12 months. It is fairly common for stressed claims incurred and expenses to exceed earned premiums during the first 12 months, but for the position to reverse at some point during the second 12 months.

Summary of insurance risk charge calculation

The calculation of the insurance risk charge can be summarised in the following steps:

1. Determine the random and future stress margins to be applied to the best estimate mortality and morbidity assumptions
2. Determine the management actions that would be applied in response to the future mortality and morbidity stresses
3. Determine the greatest loss from a single event commencing in a 12 month period at 99.5% probability of sufficiency. The minimum event stress is the pandemic scenario specified by APRA
4. Determine the increase in RFBEL or PPL, after allowing for management actions, for the random, future, event and longevity stresses
5. Combine the dollar impacts from step 4 using an APRA specified correlation matrix. The diversification factor is equal to the combined impact divided by the sum of the dollar impacts.
6. Adjust the margins for all of the stresses in step 4 using the diversification factor from step 5 (or a modified diversification factor) to give adjusted margins that can be applied simultaneously in determining the stressed liabilities
7. Determine the management actions that would be considered appropriate after allowing for diversification
8. Determine appropriate lapse margins so that the stressed liability in step 9 will have a probability of sufficiency of 99.5% over 12 months

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9. Determine the stressed liability by applying the adjusted margins and adjusted management actions simultaneously. The stressed liability must be sufficient to fund termination values calculated using stressed assumptions 12 months after the reporting date.
10. The insurance risk charge is the excess (if any) of the stressed liabilities over the adjusted liabilities.

Exercise 1

Two statutory funds both have policy liabilities consisting entirely of risk business. One statutory fund has a significant insurance risk charge, whilst the other fund has an insurance risk charge of zero. Discuss possible reasons for the difference in charges.

24.5.2. Asset Risk Charge

The method for calculating the asset risk charge is set out in LPS 114. The asset risk charge is the amount of capital a fund must hold against asset risks. The asset risk charge reflects the potential losses arising from such risks, including asset/liability mismatch.

Asset risks include market and credit risks. They include movements in interest rates, expected inflation rates and foreign currency exchange rates. They also include the risk that counterparties, such as reinsurers, will default on their obligations. Asset risks can affect the value of liabilities, as well as the value of assets.

As for the insurance risk charge, the asset risk charge is calibrated to provide a probability of sufficiency of 99.5% over a 12 month period. However, unlike the insurance risk charge, all of the asset risk stresses are specified by APRA.

The asset risk charge is calculated by determining the fall in the capital base of the fund in seven stress tests:

- real interest rates
- expected inflation
- currency
- equity
- property
- credit spreads
- default

The first three stress tests are bi-directional. Rises and falls in real interest rates, expected inflation and foreign currency exchange rates must both be considered.

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Each of the stresses is calibrated to a probability of sufficiency of 99.5% over a 12 month period. In other words, there is only a 0.5% probability that a more severe stress could occur. The capital required for each of the stresses is combined using a correlation matrix, which allows for the likelihood of the seven stresses occurring simultaneously. The correlations are intended to reflect the dependencies between the different stresses in extreme circumstances. The actual correlations observed in normal day to day circumstances would typically be lower.

The correlation between stresses depends on the sign (or direction) of the stresses. For example, a fall in the Australian dollar is assumed to be positively correlated with falls in real interest rates, expected inflation, equities and properties, and increases in credit spreads. Negative correlations have not been recognised, in order to limit the degree to which diversification benefits can be recognised.

Management actions can be allowed for in each of the stress tests. The range of potential management actions is different from those in the insurance risk charge due to the different nature of the stresses. For the asset risk charge, potential management actions include reductions to future bonus or interest credits and immediate reductions to termination values (e.g. by reducing the surrender value of terminal bonuses or unvested interest credits). The ability of a company to vary its bonus rates and termination values in response to asset stresses is very important in reducing the capital requirements for participating and discretionary investment business.

An increase in premium rates for risk business may not be a feasible or appropriate response to asset stresses. Premium rates might become uncompetitive if other life companies matched their assets to their liabilities and were immunised from asset stresses. The reasonable expectations of policy owners would also be a constraint if promotional material indicated that premium rates would only be increased in response to a worsening of claims experience.

Another type of management action that can be allowed for is altering the asset exposures of the fund after the stresses have occurred. This may reduce the value of any embedded options such as investment guarantees that are included in the post-stress liabilities.

Real interest rates are the portion of nominal risk-free interest rates that remain after deducting expected CPI inflation. Nominal risk-free rates for Australian assets and liabilities are defined by APRA to be the yields on Commonwealth government securities.

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The real interest rates stress affects assets and liabilities whose value depends on a discount rate. On the assets side, it affects bonds but not property or equity assets. Liabilities whose value depends on a discount rate will be affected. Liabilities for participating business and other discretionary investment business will also be affected if there is a change in the value of supporting assets.

The expected inflation stress does not affect assets or liabilities where the cash flows are indexed to CPI inflation. A non-indexed bond or liability will be affected by both the real interest rates and expected inflation stresses, but a CPI-indexed bond or liability will only be affected by the real interest rate stress.

The currency stress measures the impact of an appreciation or depreciation of the Australian dollar against all other currencies. For funds where all liabilities are Australian and some assets are invested overseas, the appreciation of the Australian dollar will create a capital charge because the overseas assets will fall in value.

The equity and property stresses measure the impact of falls in equity and property markets. The equity stress also allows for an increase in equity volatility which will affect the value of derivatives. The equity stress differs for listed and unlisted equities. Unlisted equities have a higher capital charge as APRA considers these assets to have higher risk and less liquidity than listed equities.

The equity and property stresses are defined by reference to increases in dividend and rental yields rather than falls in asset values. Dividend and rental yields increase when asset values fall. Higher yields result in a lower stress and therefore a lower capital requirement. One of these reasons for applying the stresses in this way is to make it less likely that life companies will seek to reduce their capital requirements by selling assets into a falling market. There have been instances in the past in overseas countries, where falls in asset markets have been exacerbated when life companies and other institutional investors were forced to sell assets so that they could reduce their regulatory capital requirements.

Example

- If the current dividend yield for the ASX 200 is 4%, the stressed yield for listed equities would be 6.5%, which is equivalent to a fall of 38.5% in equity values (= 1 – 4%/6.5%).
- If the current dividend yield is 7% (a level reached in early 2009 during the global financial crisis following severe fall in equity markets), the stressed yield would be 9.5%. This is equivalent to a fall of 26.3% in equity values.

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The credit spreads stress affects interest bearing assets. A credit spread is the difference in yield between an asset that is subject to credit risk (such as a corporate bond) and a similar risk-free asset (such as an Australian government bond). Credit spreads can vary significantly over time, both for individual securities and for securities markets as a whole. The credit spreads stress increases the prevailing yields on these assets. In addition to the risk of an increase in credit spreads for the particular counterparty grade, the stresses also allow for the risk of migration of individual assets to lower credit ratings, which will result in the assets having a higher credit spread. There is a separate factor that allows for losses through default over the following 12 months. The default factors allow for both the probability of default and the loss given default (i.e. the proportion of the value of the defaulted asset that will not be recovered).

The credit spreads stresses vary depending on the counterparty grade of the asset. The mapping of rating agency ratings to counterparty grades is set out in LPS 001. Higher stresses apply to securitised and re-securitised assets, reflecting the complexity and the difficulties associated with rating and assessing the inherent risk of these types of assets. An example of a securitised asset is a residential mortgage backed security.

Part of the credit spread stress is assumed to be due to an increase in the illiquidity premium. This means that annuities and other illiquid liabilities will reduce in value when the credit spreads stress is applied.

The default stress applies to reinsurance assets, over-the-counter (OTC) derivatives, unpaid premiums and any other credit exposures that are not considered in the credit spreads stress.

One feature of the asset risk charge that should be noted is that the stress tests are applied to all of the assets of a fund, including those that back surplus capital. This has the result that if a distribution of surplus capital is made from a fund, the asset risk charge and the PCR will reduce (unless the distribution was funded by selling or transferring assets that do not have an asset risk charge). The fall in the amount of surplus capital will be less than the amount of surplus capital that was distributed.

24.5.3. Asset Concentration Risk Charge

The method for calculating the asset concentration risk charge is specified in LPS 117.

The asset risk charge specified in LPS 114 is calibrated to be appropriate for funds whose investments in each asset class are well diversified. Additional capital is therefore required, in the form of the asset concentration risk charge, if there are excessive concentrations of investments in individual assets or in exposures to single counterparties.

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The concentration limits in LPS 117 vary depending on the type of asset. Note the higher limits for reinsurance arrangements with life companies registered in Australia. There are also special limits for specialist reinsurers that allow them to retrocede a significant portion of their business to their overseas parent. Global sharing of risk is a key part of the business model of reinsurers. Policies issued by specialist reinsurers must all be owned by other life companies, rather than directly by individual policy owners. This limits the risks to individual policy owners from any concentrated exposures of specialist reinsurers to their overseas parents.

The asset concentration risk charge is normally zero in practice because one of the consideration of life companies when setting their investment policy and reinsurance arrangements is to minimise the capital requirements that could result from excessive asset concentrations.

Although APRA nominally uses a VaR method for setting minimum capital requirements, the asset concentration risk charge shows the influence of TailVaR methodology. For example, historical records show that the probability of default over 12 months for a AAA-rated (counterparty grade 1) corporate bond is extremely low – much less than 0.5%. A life company could theoretically hold all of its assets in a single corporate bond maturing in 12 months' time and have a probability of insolvency of less than 0.5%. The problem with this strategy is that if the bond did default, there might be a total loss of all assets. A catastrophic loss of this type would be picked up in a TailVaR measure of losses, but not in a VaR measure. This helps explain why the asset concentration limit for high quality corporate bonds is relatively low, being the greater of 5% of total assets or 25% of capital base.

24.5.4. Operational Risk Charge

The method for calculating the operational risk charge is specified in LPS 118. It relates to the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. Examples of operational risk include losses due to:

- fraud, either by staff or from external sources;
- failures in computer systems and administrative processes, whether from in-house or outsourced delivery;
- legal risk (excluding strategic risk and reputation risk);
- misselling of products;
- lack of effective management of distributors and other third parties, where they are integral to the insurer;
- manipulation or concealment of financial information;

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- poor performance by the management team;
- unit pricing and other administrative errors;
- failure to provide customers with sufficient product information; and
- external events causing damage to the life company's premises, equipment or people – e.g. terrorism, vandalism, earthquakes, fires, floods and pandemics. These types of events can cause major disruption to an insurer's operations.

Recent international and Australian experience has shown the potential for operational risk exposures to result in severe and unexpected losses. There is also evidence that operational risk is continuing to increase in its size and complexity due to factors such as the increasing reliance on advanced technology, legacy and IT system issues, outsourcing and agency distribution channels and mergers and acquisitions activity.

The formulae for the operational risk charge includes a base component to reflect the scale of a life company's operations plus a change component to recognise significant increases or decreases in that scale. A significant increase in the scale of operations (either by organic growth or the acquisition of another life company) is an indicator of increased operational risk. If the scale of operations decreases, the formulae have the effect of delaying the decrease in the operational risk charge for 12 months. Losses arising from operational risks can take some time to become apparent – for example, misselling and unit-pricing errors may not become apparent until well after they have occurred.

For risk business, the base component depends on premiums or liabilities and the change component measures the change in premium income over the last 12 months. For non-risk business, the base component depends on liabilities and the change component compares premium income and claims for the last 12 months with the liabilities at the start of that period. The operational risk charge would typically be 3% of premiums (gross of reinsurance) for risk business and 0.25% of adjusted policy liabilities (net of reinsurance) for non-risk business, but it can vary depending on the particular circumstances of each statutory fund.

In theory, the amount of capital required for operational risks should depend on the complexity of an insurer's operations and the strength of its management and control processes. These things are inherently difficult to measure in an objective way. The operational risk charge formulae are intended to be broadly appropriate for a well-managed insurer. To the extent that APRA assesses a life company to have a higher operational risk profile or an inadequate approach to operational risk management, APRA can increase the company's PCR by applying a supervisory adjustment.

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24.5.5. Aggregation Benefit

The aggregation benefit is an explicit allowance for diversification between asset and insurance risks. The formula for the aggregation benefit is specified in LPS 110.

A correlation factor of 0.2 is assumed between asset and insurance risks. In normal circumstances, asset and insurance risks are largely independent. However, the correlation factor is not zero because extreme insurance risks, such as natural catastrophes and pandemics, can have adverse impacts on both claims experience and asset values. There is also some evidence to suggest that disability claims experience tends to worsen during times of economic stress.

APRA does not include the operational risk capital charge in the calculation of the aggregation benefit because operational risk is linked to both asset risk and insurance risk and these correlations become stronger in times of extreme stress. Operational risk can be a significant factor in company failures because of these linkages. Operational risks can manifest in the form of poor management of investment policy, underwriting and claims administration.

The asset concentration risk charge is designed to address excessive concentrations of assets and APRA does not consider it appropriate to include this charge in the aggregation benefit.

24.5.6. Combined Stress Scenario Adjustment

The combined stress scenario is a single scenario where all of the insurance and asset risk stresses are applied simultaneously after modifying the stresses by multiplying them by diversification factors. The specifications for this scenario are set out in Attachment B of LPS 110.

The stressed scenarios used for the Insurance Risk Charge and the Asset Risk Charge will give rise to tax benefits (i.e. a reduction in future tax liabilities). These tax benefits are recognised in full in each charge and will reduce both capital charges. The combined stress scenario tests the extent to which these tax benefits are recoverable. The limit to the recoverability of tax benefits is the point at which future tax liabilities reduce to zero.

The combined stress scenario also tests the extent to which management actions can reduce capital charges. For example, reductions to bonus rates can be assumed in determining the Insurance Risk Charge and in each of the stress tests for the Asset Risk Charge. However, it is possible that the combination of all these bonus rate reductions would produce negative bonus rates. The bonus rates assumed in the combined stress scenario must be consistent with policy documents, promotional material and policy owners' reasonable expectations.

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Exercise 2

Explain why a merger of two statutory funds could reduce the PCR for a life company.

24.5.7. Worked example

You have been asked to calculate the prescribed capital amount for a statutory fund containing only term insurance policies that expire in 10 years' time.

The information required for this example is in the spreadsheet provided with this chapter. Input cells for assumptions are shaded.

To keep the example simple, it has been assumed that there is no taxation, no reinsurance, premiums are paid at the beginning of the year and expenses and claims are paid at the end of the year. The claim, expense and lapse assumptions are set as a percentage of premiums

24.6. Internal Capital Adequacy Assessment

The previous sections of this chapter focused on the capital base, the prescribed capital amount and the prudential capital requirement. As part of its prudential standards for capital management, APRA requires life companies to have an Internal Capital Adequacy Assessment Process (ICAAP). An ICAAP involves an integrated approach to capital and risk management, aimed at ensuring that the capital held is adequate in the context of the risk profile and risk appetite of the life company.

Risk appetite refers to the types and amounts of risk that the life company is willing to accept. APRA expects life companies to clearly define their risk appetite in the form of a risk appetite statement. This statement must be approved by the Board of the company. It provides a foundation for risk management throughout the company. In particular, it sets boundaries for risks that the company is unwilling to accept.

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APRA's requirements for the ICAAP are set out in LPS 110. Further advice on the ICAAP is included in APRA's Prudential Practice Guide CPG 110. At a minimum, the ICAAP must include:

- adequate policies, procedures, systems, controls and personnel to identify, measure, monitor and manage the risks arising from the life company's activities on a continuous basis, and the capital held against such risks;
- a strategy for ensuring adequate capital is maintained over time, including specific capital targets set in the context of the life company's risk profile, the Board's risk appetite and regulatory capital requirements. This includes plans for how target levels of capital are to be met and the means available for sourcing additional capital where required;
- actions and procedures for monitoring the life company's compliance with its regulatory capital requirements and capital targets. This includes the setting of triggers to alert management to, and specified actions to avert and rectify, potential breaches of the regulatory capital requirements;
- stress testing and scenario analysis relating to potential risk exposures and available capital resources;
- processes for reporting on the ICAAP and its outcomes to the Board and senior management of the life company, and for ensuring that the ICAAP is taken into account in making business decisions;
- policies to address the capital impact of material risks not covered by explicit regulatory capital requirements; and
- an ICAAP summary statement that describes and summarises the capital assessment and management processes of the life company.

A life company must, on an annual basis, provide a report on the implementation of its ICAAP to APRA. The ICAAP report must include:

- detailed information on current and three-year projected capital levels relative to minimum regulatory capital requirements and target levels for each fund and the life company as a whole;
- detailed information on the actual outcomes of applying the ICAAP over the period, relative to the planned outcomes in the previous ICAAP report (including analysis of the life company's actual capital position relative to minimum capital requirements and capital targets and actual-versus-planned capital management actions);
- description of material changes to the ICAAP since the previous ICAAP report; and
- detail and outcomes of stress testing and scenario analysis used in undertaking the ICAAP;

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- a breakdown of capital usage over the planning horizon, as relevant, by material:
    - business activity;
    - geographic spread of exposures; and
    - risk types;
- an assessment of anticipated changes in the life company's risk profile or capital management processes over the planning horizon;
- details of any review of the ICAAP since the previous ICAAP report, including any recommendations for change and how those recommendations have been, or are being, addressed; and
- references to supporting documentation and analysis as relevant

Preparing the three-year projection can be a very complex task and sophisticated models may be required. In addition to the best estimate assumptions used for calculating policy liabilities, assumptions will also be required for future levels of new business and future capital distributions and raisings. It may be necessary to make allowance for changes to best estimate assumptions during the projection – for example best estimate maintenance expenses must be sufficient to cover forecast costs for the following year. Best estimate maintenance costs are therefore likely to change each year throughout the three-year projection, necessitating a recalculation of profit margins each year. Any planned changes to product pricing, reinsurance arrangements or investment policy would add more complexity to the task of making the projection. The projection model also needs to be capable of performing stress testing and scenario analysis, where actual experience in any or all of the three years differs from the best estimates.

The analysis of actual to planned outcomes over the previous year can also be a complex task. This analysis will need to explain the reasons for movements in the capital base and the prescribed capital amount.

24.6.1. Target Capital

Target capital is the amount of capital that a life insurance company aims to hold over the medium to long term. The actual amount of capital will vary from the target, depending on whether recent experience of the company has been better or worse than expected. Actual capital will also be affected by capital raisings and distributions.

Due to the serious nature of breaching the PCR, life companies must have target capital that exceeds the PCR by a significant margin. The excess of target capital over the PCR is referred to as target surplus.

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APRA does not set detailed requirements for target capital. It must be determined by a life company having regard to its risk profile, the Board's risk appetite and the regulatory capital requirements. In setting its target capital policy, a life company may also consider:

- the amount of risk-based (or economic) capital that is required to meet the company's objectives;
- the amount of capital required to support a specific financial strength rating by external rating agencies;
- the likelihood of breaching the PCR and the consequences of such a breach; and
- the cost of capital.

A life company may take the view that the amount of risk-based (or economic) capital that it requires is greater than its PCR. For example, it may consider that a higher probability of sufficiency than 99.5% or a longer time horizon than 12 months is appropriate. It may also take a different view from APRA on the amount of capital required for particular risks.

A life company might target a specific financial strength rating from ratings agencies such as Standard and Poor's, Moody's and Fitch. The financial strength rating can be important to a company as it may be one of the factors used by financial advisers in making recommendations to potential policy owners. It will also be important if the company intends to borrow funds. The ratings agencies each have their own method for assessing the amount of capital a company needs to hold in order to achieve specific ratings.

Target capital is often set by companies at a level that provides a desired level of sufficiency with regard to a breach of PCR over the following 12 months. The probability of breaching PCR might range from as much as a 10% to as little as 0.5%. The lower the probability of breaching PCR, the higher the target capital needs to be. A company might be satisfied with a lower level of target capital if its cost of capital is high, it is confident that it could rapidly rectify any breach of PCR and the consequences of a temporary breach would not be too severe.

A model is typically used to determine that amount of capital required to meet these targets. A target capital model would normally consider:

- all the material risks that are currently faced by the entity, including for example strategic and political risks, some of which may not be covered under APRA's capital standards;
- how to quantify the probability and impact of these risks, taking into account the underlying probability distributions, correlations between different risk types and how these could interact or break down in extreme scenarios;

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- management actions that are available and able to be taken in case of a deterioration in capital position;
- how risks could emerge (e.g. a sudden shock or a gradual deterioration), which could affect the timing of the impact of these risks on the capital position and management actions.

An alternative to assessing target capital through a modelling approach would be to set target capital as a multiple of the PCR, for example 150% of PCR. However, a target of this nature is less useful as it does not indicate the likelihood of a breach of PCR. Target capital may also be defined as a range rather than a single number. A target range is a useful concept for managing capital as it recognises that actual capital is volatile, but management action only needs to be taken if it moves outside the target range.

The cost of capital is the return shareholders seek to earn on their invested capital less the investment return (net of tax) on the assets that the capital is invested in. The return shareholders seek to earn will depend on the risks that the capital is exposed to. The cost of capital will limit the amount of capital that shareholders will be willing to commit to a life company. On the other hand, if surplus capital is too low and a breach of PCR occurs, the adverse publicity is likely to be damaging to the value of the company. There is also the possibility that APRA will take actions which damage the value of the shareholders' interests in the business – for example, by closing the company to new business. A balance must be struck between having too much or too little surplus capital.

Life companies may consider the position of other companies when setting their own target capital policy. A life company will probably not want to be the weakest in the industry. Weak companies may have difficulties attracting new business and retaining existing business and will be the first to breach PCR in a crisis that affects the entire industry. On the other hand, a life company may not see any need to be the strongest company in the industry. A life company that is excessively well capitalised may struggle to remain price competitive in the market.

Example A: Target Surplus Policy

TXX is a wholly owned subsidiary of a listed holding company. Target surplus is TXX's principal tool for determining the appropriate amount of capital to hold within its statutory funds. Its aim is to ensure that under a range of adverse scenarios, TXX can continue to meet the PCRs of all funds in the short to medium term.

The target surplus level is the amount of capital "sufficient to reduce the risk of breaching the PCR of TXX over the next 12 months to 2.5%". This equates to a probability of once in forty years.

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The key components of the target surplus calculations are:

- Insurance, Asset and Operational Risk stresses: Stress margins and correlations between risks are estimated at a 97.5% probability of sufficiency over 12 months. Target surplus is calculated so that the PCRs of all funds can still be met in 12 months' time after stresses at the 97.5% level of sufficiency have been applied. For the purpose of calculating target surplus, the company decides it is appropriate to assume there is a zero correlation between insurance, asset and operational risks.
- Diversification between funds: The PCR is calculated separately for each statutory fund. Surplus capital can be moved between funds, so it is appropriate to allow for diversification between funds. The target surplus is calculated at company level and then allocated to funds in proportion to their prescribed capital amounts.
- Capital projections: The PCR does not allow for the capital requirements of new business, or the release of capital from existing business. Capital projections are necessary to determine whether an addition or reduction to target surplus should be made to allow for these effects.

Example B: Target Capital Policy

SWW is an Australian subsidiary of a foreign mutual life company. It has a single statutory fund consisting mostly of participating business. The parent expects to receive a regular dividend from its subsidiary, but has no intention of ever injecting additional capital. Target capital is SWW's principal tool for determining the appropriate amount of dividends and retained capital.

The target capital level is the amount of capital sufficient to reduce the risk of failing to meet policy owners' reasonable expectations to 0.5% if the company ceases to sell new business and goes into run-off in 12 months' time.

The company calculates target capital using a stochastic model that uses probability distributions for each of the insurance, asset and operational risks. The model also allows for correlations between risks and for appropriate management actions to be taken in response to each risk. Target capital is calculated so that default occurs in no more than 1 in every 200 scenarios. Default is defined as the inability to pay claims as and when they fall due. A scenario is deemed to end in default if the company's assets fall to zero.

The target capital is subject to a minimum of 150% of PCR in order to provide a reasonable buffer against breaches of PCR.

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Exercise 3

You are the Appointed Actuary for a medium sized listed Australian life company. APRA has just announced a significant strengthening of its capital standards following a period of severe turmoil in financial markets. The impact of this will be that your company still meets its PCR, but falls short of target capital by a significant margin. What actions could the company take in response to this situation and what factors would you consider in making a recommendation to senior management?

Exercise 4

In exercise 3, why might the cost of additional reinsurance be lower than the cost of holding additional capital for insurance risks.

24.6.2. Capital response

A life company's ICAAP would typically adopt a graduated approach of response actions to protect the company's capital position should it fall below target capital. These actions might include:

- adjust dividend policy;
- reprice existing business;
- manage the rate at which new business is acquired;
- change the company's reinsurance arrangements;
- adjust the investment asset mix to achieve a change in the company's risk profile;
- transfer assets between statutory funds and into (and potentially back from) shareholders' funds, if available;
- capital injections from the company's parent.

Not all of these alternatives can be arranged quickly, or necessarily as required, and may become impaired or even unavailable in an environment where capital is scarce.

24.6.3. Stress testing

APRA expects stress and scenario testing to be used as an integral part of decision-making in a life company, in setting a life company's risk appetite and target capital levels, as well as playing a key role in determining a life company's reinsurance strategy and investment policy. It should form part of the life company's ICAAP. In addition, APRA often conducts stress tests on an industry-wide basis as part of its supervisory responsibilities.

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Scenario testing is used to assess the vulnerability and resilience of a life company under a severe but plausible scenario. A scenario would typically describe an event, which would then translate into several different types of risk outcomes, such as an increase in claims, a fall in equity and property markets, adverse movements in interest rates and foreign currency exchange rates and a reduction in new business volumes. Actual scenarios that have happened in the past can be a useful guide. The impact of the scenario on financial metrics, such as cash flows, profits and capital, are then modelled.

It can also be a useful exercise to conduct "reverse stress testing", i.e. devising scenarios that would lead to a breach of PCR or the insolvency of a life company. These scenarios can help management and boards to gain an understanding of the severity of events that would lead to these outcomes and plan their response should such scenarios actually occur.

24.6.4. Allocation of capital to business lines

Larger life companies are usually subdivided by business lines for management purposes. In order to improve management's understanding of the usage of capital resources across business lines and drive better decision-making on the use of capital, a life company's ICAAP may include a process by which the company's capital resources are allocated to individual business line.

Under this approach, each business line will be given an allocation of target capital and be expected to achieve a target return on new investments of capital. If the target return cannot be achieved, the business line would be expected to return capital to a central unallocated pool.

It may not always be obvious how capital should be allocated to business lines. In particular, where multiple business lines give rise to diversification benefits, the allocation of these benefits can be fairly subjective.

24.6.5. Distributions of capital and capital raising

A life company's ICAAP will typically include a dividend policy, which specifies how much dividend it expects to pay to shareholders each year. An example of a dividend policy would be an aim of paying a dividend of between 70% and 80% of profits over the medium to long term. A rapidly growing company might aim to pay a lower dividend and retain a higher proportion of its profits in order to fund its future capital requirements. However, if dividends are too low relative to earnings, a life company may not be able to distribute all of its franking credits. Franking credits are valuable to Australian shareholders, but they can only be distributed via franked dividends.

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A dividend policy would normally have regard to the position of the life company's capital base relative to its PCR and target capital. If the capital base is less than target capital, but still well above PCR, dividends might be reduced. If the shortfall relative to target capital becomes serious, there would be a point at which payment of dividends should be suspended.

LPS 110 requires a life company to obtain APRA approval for any reduction in its capital base. This includes the payment of a dividend that exceeds after-tax earnings. This requirement applies even if a life company is in a very strong financial position, although in this situation APRA is unlikely to withhold its approval.

If a life company is growing rapidly, it may need to raise additional capital. As part of its ICAAP, a life company should estimate its future capital needs and plan for future capital raisings if there is a possibility they will be necessary.

A life company will also need to regularly review the capital positions of each of its funds. Transfers would be made from funds with excess capital to funds that have less than their target capital.

Sections 62 and 63 of the Life Insurance Act prevent a distribution of shareholders' retained profits or capital from being made if a statutory fund would fail to meet its PCR following the distribution. It is because of this restriction that APRA requires PCRs to be calculated separately for each statutory fund as if they were stand-alone entities. Diversification benefits between funds cannot be recognised as it would not be possible to transfer assets between two funds if both funds had capital bases equal to their PCRs.

There is a further regulatory restriction on distributions which does not relate to capital requirements. LPS 600 prevents a distribution of shareholders' retained profits (Australian participating) if there is not at the same time a distribution of Australian policy owners' retained profits and the remaining shareholders' retained profits (Australian participating) is less than 25% of the remaining Australian policy owners' retained profits. The aim of this requirement is to maintain the ratio of shareholders' to policy owners' retained profits at the appropriate level, which cannot be less than 20:80. If the ratio was less than this, shareholders' could be allocated an excessive proportion of the investment earnings on the assets backing retained profits.

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24.7. Regulation of financial conglomerates

Most life companies operating in Australia today are wholly-owned by holding companies as part of a financial conglomerate. The financial strength of the conglomerate can affect the financial strength of the life company, as the holding company of the conglomerate is often the only readily available source of new share capital.

Section 28A of the Life Insurance Act gives APRA the power to register non-operating holding companies (NOHCs). Section 21 of the Act allows APRA to refuse to register a life company if it has a NOHC that is not also registered under the Act. These provisions give APRA the ability to regulate the NOHCs of life companies. The prudential standards for life insurance NOHCs currently extend to governance and fit and proper, but not to capital requirements.

APRA's conglomerate supervision framework operates on a hierarchy, with three "levels". Level 1 refers to individual operating entities authorised by APRA, such as life companies, general insurers and banks. Level 2 refers to groups of companies that operate primarily within a single industry, including life companies and their NOHCs. Level 3 refers to conglomerate groups that have material operations in more than one APRA-regulated industry and/or have one or more material unregulated entities, such as groups headed by the major Australian banks.

The contagion effects of a possible weakness of a member of a group may threaten the position of APRA-regulated entities within the group, even if these entities are prudentially sound. As group structures become larger, more complex and sometimes opaque, the risk of contagion within a group increases, as does the systemic impact of a failure of the group. The lessons of the global financial crisis, particularly the difficulties of the American International Group (AIG) and a number of European bancassurance groups, demonstrate that a failure to adequately regulate conglomerate groups can have serious consequences.

APRA is currently developing its Level 3 supervision framework, including capital standards, in consultation with industry. Details of APRA's proposed Level 3 capital standards are beyond the scope of this course, however students need to be aware of the existence of these proposals.

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24.8. Implications of the capital adequacy standards on the actions of a life company

The capital adequacy requirements imposed on life companies has implications on the way they operate, including in the commercial context. The following examples illustrate this (though is not an exhaustive list):

New business

Selling new business requires capital, and careful consideration is needed prior to launching new business offerings to ensure the capital requirements are understood and can be sourced (e.g. from available capital in the company or through a capital injection from shareholders/parent company). This includes:

- The way the product is sold (e.g. the commission structure), which contributes to new business capital strain.
- The benefits offered in the product (i.e. product design), which can influence the profile of the capital requirement over the life of the policy.
- The expected volume of new sales, which will influence the amount of capital required in the short term (and/or the ability of the life company to pay dividends). Capital may be required for some years to fund new business growth before the business is self-supporting (and/or may be supplemented by ceasing distributions of capital). This demonstrates how capital implications can differ depending on the time horizon being considered.

Reinsurance

One primary reason for entering into a reinsurance treaty is often to release capital. The structure of the reinsurance arrangement will determine how much capital is released, and the timing of the release. For example:

- Large initial reinsurance commissions can have the effect of releasing capital immediately. When considering and structuring reinsurance arrangements, a life company will likely perform analysis to understand the effects on the available capital and capital requirements of the arrangements (as well as understanding this from a profitability perspective).
- Consideration needs to be given to the level of exposure a statutory fund has to a single reinsurer, both currently and as anticipated in the future (as this can result in an Asset Concentration Risk Charge, which reduces the effectiveness of the reinsurance from a capital perspective).

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Investment strategies and asset allocations

A life company's asset and liability management strategy has an impact on the capital that needs to be held (through the asset risk charge). One example of this is deferred or lifetime annuities:

- Due to their expected long term nature, investing (at least in part) in riskier asset classes (such as equities) is expected on the long term to bring higher returns compared to defensive assets (such as bonds).
- However, doing so would result in a significant amount of capital that needs to be held compared to a portfolio of high quality bonds which are duration-matched to the expected annuity payments.

A life company may not approach investment strategies with solely a view of minimising capital requirements – for example an asset/liability mismatch may result in extra investment returns achieved which could increase distributable profit in total over a longer time horizon. Other companies may want to reduce profit volatility (which may increase capital volatility).

Assumption setting

Many life companies go through an annual assumption review process, where experience is analysed and changes to the previous best estimate assumptions and capital stress margins (if any) are considered. Changing capital stress margins has a direct implication on the capital requirement. Changing best estimate assumptions can have capital implications, for example:

- An increase in policy liabilities caused by product groups entering loss recognition (which can reduce the capital base in certain scenarios).
- An increase in the Insurance Risk Charge component of the Prescribed Capital Amount (due to product groups becoming less profitable).

Prior to changing best estimate assumptions, life companies will typically analyse the impact of such changes ahead of time to ensure:

- The implications on both profit and capital are understood.
- There is sufficient capital available so that each statutory fund will maintain capital levels which are within the capital triggers described in the ICAAP (e.g. as related to target surplus) even when the assumptions change (which may require capital injections or transfers between statutory funds ahead of the assumptions being changed).

This is not to say best estimate assumptions won't be changed if there is an adverse capital impact, but rather highlights the operational impact in terms of steps that need to be taken prior to changing assumptions to ensure capital adequacy at all times.

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24.9. Example of a life company failure

On 28 September 1990, a fraudulent transaction was completed whereby $65 million was removed from the statutory funds of the Occidental and Regal life companies. The fraudulent transaction was in relation to an attempted sale of both life companies by their parent. Both life companies were already in a weak position. The parent company was also in some financial difficulty and could not continue to support the life companies with sufficient capital.

Both life companies had grown rapidly during the late 1980's and were subject to financial pressures on a number of fronts. These included:

- large exposures to unlisted assets such as properties and loans;
- expense overruns, low profitability and high growth of new business; and
- excessive distributions to participating policy owners in order to grow market share.

These problems were inter-related. Adequate profits could only be achieved if unit costs were kept down. Low unit costs could only be achieved through high new business growth. High new business growth could only be achieved if crediting and bonus rates were kept competitive. High crediting rates could only be afforded if high investment returns were achieved by investing in risky assets.

The reasons for the expense overruns included:

- too many products for efficient management. New products had been developed at frequent intervals and in multiple versions. While there were substantial volumes of business written for some products, there were many other products with non-viable volumes. The products were generally not designed in a manner which permitted later merger and upgrades of old products;
- continuing difficulties in maintaining and upgrading computer systems;
- products were sold via independent agents who received generous remuneration, including attendance at high cost conventions and other non-commission benefits;
- the head office accommodation of both companies was particularly lavish.

The acquisition of both companies by the same parent in the late 1980s had achieved little in the way of expense savings because the two companies had very different computer systems, products, commission bases and market segments.

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On 25 October 1990, the Deputy Commissioner of Life Insurance in the Insurance and Superannuation Commission (ISC—the predecessor of APRA) was appointed as an Inspector to both companies. Immediately the ISC issued the following directives to the companies using its powers under the Life Insurance Act 1945:

- cease issue of new business;
- no board meetings without ISC presence;
- bank account signatories to be ISC authorised;
- persons investing funds to be ISC authorised;
- all new business premiums received to be refunded; and
- payment of surrender values to be suspended

On 31 October, the ISC applied for the appointment of a Judicial Manager under the Life Act, and on 7 November a Judicial Manager was appointed by the Federal Court.

The Judicial Manager arranged the sale and transfer of the risk business of both companies to another life company in February 1991. Prior to this transfer occurring, there was a significant amount of "twisting" of risk business to other life insurers. This made the situation of the two life companies worse.

The payment of surrender values for investment policies continued to be suspended until after these policies were eventually sold and transferred to another life company in October 1992. A major effort was required during the period of the judicial management to correct the basic policy data records to the point where they could be transferred to another company.

Ultimately, most policyholders received the full value of their policies, and many reforms were included in the Life Insurance Act 1995 in response to the Occidental and Regal failures.

The Australian government enacted legislation in early 1992 which gave it the power to raise a levy from the life insurance industry to compensate Occidental and Regal policy owners for their losses. A levy was not ultimately needed and the act allowing it was repealed in 1994.

24.10. Historical background

Capital requirements for Australian life companies have evolved over many years in response to financial crises, the introduction of new types of products, developments in the regulation of overseas life insurance markets and a trend towards increasing sophistication in financial reporting and capital management.

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Each financial crisis tends to have different features. For example, one of the most notable features of the global financial crisis which commenced in 2007 was the extreme increase in credit spreads for fixed interest assets. Increases of this magnitude had not been seen previously. If earlier versions of capital standards had included credit spread stresses of this size, the standards would have been criticised as being unrealistically severe. It is difficult to anticipate what might happen during future crises, so capital standards tend to evolve in response to actual events.

APRA's current capital standards became effective on 1 January 2013. The previous capital standards that applied from 1995 to 2012 were known as the solvency and capital adequacy requirements. The capital adequacy requirement was the higher of the two. Life companies were expected to comply with both requirements at all times. The consequences of a breach of the solvency requirement were more severe than for a breach of the capital adequacy requirements. The dual requirements created significant additional reporting work for actuaries and life companies. This was one of the reasons why APRA replaced the solvency and capital adequacy requirements with a single requirement in the form of the PCR.

The solvency and capital adequacy requirements were also less risk-sensitive than the current capital standards. For example, APRA did not have the ability to apply a supervisory adjustment, and there were no explicit capital charges for operational risks (except for investment-linked business), inflation risk or pandemic risk. Prior to 1995, the capital standards for life companies were far less sophisticated, relying on the use of a conservative net premium valuation basis for traditional participating business and simple margins added to the liabilities for other types of business. The problem with simple but conservative methods for measuring capital adequacy is that they may not adequately recognise all material risks and they do not give an accurate measure of the overall financial strength of a life company.

24.10.1. Solutions to the Exercises

Exercise 1

The size of the insurance risk charge will depend on a number of factors. The random stress will depend on the number of lives insured and the distribution of sums insured (net of reinsurance). The future stress will depend on the adequacy of experience investigations and the potential for changes in trends. The relative impact of the event stress will depend on the age distribution of the lives insured.

A fund with exposure to both mortality and morbidity risks will gain diversification benefits that are not available to a fund with exposure to a single type of risk.

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If products can be repriced at short notice, the insurance risk charge may be reduced. Some products might only allow for premium rates to be changed on a policy anniversary, and a notice period may have to be given to policy owners. Some products may have a guarantee that premiums will never be increased.

If there is a substantial margin between premium rates and best estimate claims and servicing expenses, it is possible that premiums will exceed the stressed claims and expenses for the first 12 months as well as in following periods. A net cash inflow to the company from active lives during the first 12 months can be offset against the stresses to termination values for IBNR, RBNA and disability claims in course of payment. This may lead to the insurance risk charge being zero. This outcome is more likely for individual risk business than for group risk business. Individual business typically has greater margins built into the premium rates due to the need to recover the higher acquisition costs. A zero insurance risk charge is also more likely for mortality risks than for morbidity risks as termination values tend to be less significant for policies with mortality risks – there are no claims in course of payment, and death claims are reported and settled much faster than disability claims.

Students should experiment with the example in the spreadsheet to see how varying the assumptions can result in a zero insurance risk charge.

Exercise 2

A larger pool of insured lives would reduce the random and future stresses for the insurance risk charge, and also possibly the lapse stress. If the insurance risk charge was negative for one fund (before applying the minimum of zero), it could be offset against a positive insurance risk charge for the other fund.

Combining statutory funds might produce a greater diversification of asset risks. In particular, if the two funds are at risk from movements in opposing directions for real interest rates, expected inflation or currency, combining the two funds will allow risks to be offset.

Combining statutory funds might increase the overall aggregation benefit.

The asset concentration risk charge is likely to be smaller (if it is not already zero) as the limits will be based on the assets of the combined statutory funds.

The "change component" of the operational risk charge will increase for the first 12 months following the merger due to the increase in premiums and/or policy liabilities in the merged fund (although APRA might give relief to the life company from this requirement if there was no real increase in operational risks as a result of the merger). Subsequently, the volatility of the "change component" of the operational risk charge should be reduced by combining statutory funds. If one of the original funds was growing rapidly, whilst the other was declining, the combined fund would be more stable and the "change component" would be more likely to be zero.

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Exercise 3

You will use models to project the future capital position of the company under different scenarios. You will also need to investigate the impact on profits and appraisal value of different courses of action.

Possible actions include:

- do nothing, but recognise that there will be an increased risk of breaching PCR in the short to medium term. There may also be consequences for sales of new business and persistency of existing business if the company is recognised as being weakly capitalised by market participants. The risk and consequences of a downgrade by ratings agencies would need to be considered.
- raise additional capital. Further investigation would be required as to the best way of raising capital – there are different types of Tier 1 and Tier 2 capital instruments that could be issued and they have differing costs.
- dividends could be reduced over the short to medium term. However, this may disappoint investors and lead to weakness in the company's share price.
- new business targets could be scaled back, or the company could reduce its capital utilisation by selling less capital intensive products.
- profitability could be enhanced by increasing premium rates and fees. The feasibility of this option will depend on the company's competitive position. It is more likely to be feasible if other companies also raise their premium rates and fees in response to APRA's changes.
- increase the company's use of reinsurance. The company will need to balance the cost of holding additional capital with the cost of reinsurance. It might be possible to design a reinsurance program so that the cost of reinsurance is lower than the cost of holding additional capital.
- change investment policy with the aim of reducing the asset risk charge. This is likely to reduce expected profits, but is also likely to reduce the volatility of profits. Policy owners' reasonable expectations would need to be considered if any changes to investment policy affected participating or discretionary investment business.
- if the company would have an asset concentration risk charge, changes to asset exposures should be made so that this charge is eliminated.

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Exercise 4

A reinsurer might have lower stress margins than a direct insurer in respect of the random and future stresses because these stress margins are partly dependent on the number of lives insured. Australian reinsurers retrocede a significant portion of their business to their overseas parents. These global reinsurance groups could have proportionately lower capital requirements than Australian direct insurers simply because of their greater size. It is also possible that foreign regulatory capital requirements could be lower than those applying in Australia. If reinsurers have a lower cost of capital than Australian direct insurers, they might choose to pass these savings on through lower reinsurance premiums. This is more likely to occur at times when the reinsurance market is competitive and price sensitive.

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Chapter 25 – Analysis of Profit

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25.1. Introduction

Chapter 21 covered the valuation of policy liabilities for the purposes of determining the profits of a life insurance company. Analysis of the actual profit reported during the period, compared to the profit that was expected to emerge under the valuation methodology and assumptions, is a critical step in understanding the financial performance of the company.

For insurance contracts, shareholder profits are expected to emerge smoothly over the duration of the policy as services are provided, i.e. in line with the profit carrier. Actual profits will differ from expected profits due to the underlying experience of the portfolio being different to the valuation assumptions. Interest on retained profits will also form a component of the actual profit. Analysis of profit analyses the actual profit into its components: interest on retained profits, expected profit release and experience variations.

For investment contracts, the main source of profit variance will arise from experience affecting the management services element, i.e. the value of deferred entry fee revenue less deferred acquisition costs. The main experience item affecting the recovery of deferred acquisition costs will be lapses, but renewal expenses and investment performance can also be significant factors. Investment experience is particularly important for term annuity profits.

This chapter illustrates the concept of analysis of profit, explains why it may be undertaken and provides a number of worked examples for different products.

25.2. The Approach

Profit is the movement in asset values less the movement in liabilities. This can be expressed as

$(A_1-A_0) – (V_1'-V_0)$ where:

A_1 is the value of assets at the end of the year. This should be the amount of assets that have been included in the profit being analysed and therefore have been recorded in the profit and loss statement. In particular, A_1 will include transfer into and out of the fund as well as accruals and provisions. The treatment of these items needs to be consistent with the definition of profit.

A_0 is the value of assets at the start of the year.

V_1' is the actual valuation liability at the end of the year

V_0 is the valuation liability at the start of the year.

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There is a symmetry between the movement in the value of assets and the value of liabilities. As premiums are paid, liabilities increase, as claims are paid liabilities decrease. As interest is earned on assets, interest is earned on liabilities. As expenses are paid assets decrease. If there is an expense allowance in the valuation, then there will be a corresponding offset in the movement in liabilities. If there is no valuation expense allowance then expenses can be offset by the difference between the gross premium paid and the valuation net premium received. If a claim is paid assets reduce but the liability is also reduced.

However, actual valuation premiums, interest, claims and expenses may not be identical to the expected valuation premiums, interest, claims and expenses as the valuation assumptions may be different from actual experience. Analysing this difference is an essential part of the Actuarial Control Cycle and provides guidance for managing the business going forward.

As the analysis is based on $(A_1-A_0) – (V_1'-V_0)$ it is vital that the information exists to move from A_0 to A_1 and V_0 to V_1'. The movement in A comes directly from the profit and loss statement. A number of calculations are usually needed to explain the movement in liabilities from V_0 to V_1'.

There are two approaches that can be used to analyse the movement in liabilities and hence the sources of profit:

1. Use a model to analyse the total profit movement. This is called the Step Through method.
2. Use algebra and a movement valuation to derived the individual components.

These two approaches are described below.

Regardless of the approach it should be remembered that the analysis is not only a test of the valuation assumptions but also a test of the correctness of the calculations. A large unexplained item may indicate a problem with the valuation process. For example, a new product line may have been introduced but not coded correctly into the valuation program. Alternatively, what was previously a minor unmodelled line may now be a more significant line of business which needs to be modelled.

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25.2.1. Step Through Approach

The Step Through Approach involves using a profit projection model. This could be either an individual policy model or a grouped model. This approach was used by Edwards and Swinhoe[1].

The business planning process will normally involve a profit projection model. The base projection of this model is the expected profit. Note it will include expected new business. Before using this model is necessary to check the validation against actual experience as shown in the profit and loss account. The model should also be accurate for policy liabilities, numbers of policies, sums insured and premiums.

The model is then run changing (or stepping though) each assumption at a time. Because variations in new business are often significant, new business is often added as the last run.

The order of the runs will influence the allocation of profit. A possible order is:

1. **Expected** results for the modelled in force
2. **Lapses and Surrenders.** The assumption should be reconciled against the movement statistics as well as the actual surrenders paid. It may be necessary to adjust some assumptions by policy class to get an acceptable reconciliation. The difference between Run 2 and Run 1 is the Lapse and Surrender experience.
3. **Claims.** Again, claim amounts should be reconciled with the accounting entry and run statistics (count, premium and sum insured) should be reconciled with the actual movement statistics. It is important to understand the accounting and valuation treatment for IBNR and RBNA. The difference between Run 3 and Run 2 is the claims experience. Separate runs are usually made for mortality and morbidity.
4. **Expenses**. Here the model unit assumptions need to be changed to produce actual expenses. The difference between Run 4 and Run 3 is the expense experience.
5. **Investment Income.** The model is run using the actual rate of return on the modelled assets. Adjustment will be needed for unmodelled assets. The difference between Run 5 and Run 4 is the investment experience.
6. **New business.** Often the major variation is volume and it is easier to understand the results if this is left to last. The difference between Run 6 and Run 5 is the new business experience.

An example of this approach is given below.

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Example

The Actuarial Department has produced the following summary output for a level premium term insurance product line. Assets in excess of the policy liability are kept outside the product line. Analyse the sources of profit and give your recommendations for the management of the business or further investigations over the next twelve months.

Sensitivity Runs	**In Force at 31/12/16**					**NB**	**IF+NB**	
Term Insurance Product Line	Best	Lapse	Mortality	Interest	Expense	Actual	ReRun	Actual
$m or #policies	Estimate	ReRun	ReRun	ReRun	ReRun	Result	+NB	Result
Results for Year Ending 31 December 2016								
Income								
Premium Income	63.000	61.501	61.517	61.517	61.517	7.240	68.756	68.760
Interest, Dividends, Rents etc	0.504	0.488	0.597	0.597	0.585	0.001	0.587	0.590
Realised and Unrealised Gains	0.000	0.000	0.000	-0.300	-0.300	0.000	-0.300	-0.300
Outgo								
Death Claims - Insurance	37.800	37.800	30.515	30.515	30.515	1.898	32.412	32.410
Commissions	0.000	0.000	0.000	0.000	0.000	1.380	1.380	1.450
Acquistion Expenses	0.000	0.000	0.000	0.000	0.000	2.200	2.200	2.130
Maintenance Expenses	16.380	15.990	15.994	15.994	16.793	1.664	18.457	18.460
Cash Flow	9.324	8.198	15.604	15.304	14.494	0.100	14.594	14.600
Change in MoS Liability	-0.398	-0.997	-0.991	-0.991	-0.991	-0.477	-1.468	-1.470
Earnings	9.722	9.195	16.595	16.295	15.485	0.576	16.061	16.070
Mos Liability 31/12/15	12.400	12.400	12.400	12.400	12.400			12.400
MoS Liability 31/12/16	12.002	11.403	11.409	11.409	11.409	-0.477	10.932	10.930
Number of Policies 31/12/15	110,000	110,000	110,000	110,000	110,000	0		110,000
Number of Deaths	-275	-275	-222	-222	-222	-6		-228
Number of Lapses	-9,725	-14,723	-14,723	-14,723	-14,723	-572		-15,295
No of New Policies 2016	0	0	0	0	0	16,667		16,667
Number of Policies 31/12/16	100,000	95,002	95,055	95,055	95,055	16,089		111,144
In Force Premium at 31/12/15	66.000	66.000	66.000	66.000	66.000	0.000		66.000
Annual Premium for Deaths	-0.110	-0.110	-0.089	-0.089	-0.089	-0.009		-0.098
Ann Prem Lapse	-5.890	-8.917	-8.917	-8.917	-8.917	-1.191		-10.108
Annual Premium for Sales	0.000	0.000	0.000	0.000	0.000	15.000		15.000
AP In Force At End 31/12/16	60.000	56.973	56.994	56.994	56.994	13.800		70.794

The profit can be analysed by differencing the results for each run:

Analysis of Profit	Best	Lapse	Mortality	Interest	Expense		ReRun	Total
	Estimate	ReRun	ReRun	ReRun	ReRun	NB	+NB	Actual
Cash Flow	9.324	8.198	15.604	15.304	14.494	0.100	14.594	14.600
Liability	-0.398	-0.997	-0.991	-0.991	-0.991	-0.477	-1.468	-1.470
Profit	9.722	9.195	16.595	16.295	15.485	0.576	16.061	16.070
Change in Cash Flow	9.324	-1.126	7.406	-0.300	-0.810		0.100	0.006
Change in Liability	-0.398	-0.600	0.006	0.000	0.000		-0.477	-0.002
Change in Profit	9.722	-0.526	7.400	-0.300	-0.810		0.576	0.009
Accumulated Change	9.722	9.195	16.595	16.295	15.485		16.061	16.070

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The most significant sources of experience earnings are mortality ($7.4m) followed by expenses ($(0.8)m), lapses ($(0.5)m) and investment ($(0.3)m). Overall the explained movement in profit is $16.061m compared with $16.070m leaving $0.009m unexplained or 0.1% of profit.

Lapses

Lapsed annual premium of $8.9m compared with expected of $5.9m indicates that assumptions need to be examined and probably changed. No commissions are paid on renewal but introducing a renewal commission would cost more than the current cost of lapses. Strategies to improve business retention rates after business is written are rarely successful. It is far better to concentrate on the quality for future business but an examination of actual to expected by age (5 year bands) and duration would be useful.

Mortality

The actual death claim outgo, number of deaths and annual premium for deaths are 81 per cent of the expected values. This suggests that the favourable mortality experience was due to actual claim numbers being lower than expected, not a smaller average claim size. Examination of actual to expected claim numbers and amounts by age would be helpful. This analysis should be done before and after reinsurance.

However, the overall number of claims is low so age grouping would be needed. Confidence intervals should be calculated to see if assumptions are within the expected range.

Interest

Investment income from interest dividends and rents was as expected but there was a loss of $(0.3)m on realised and unrealised gains. If this change had been due to changes in market interest rates, then there would have been some change in the liability as well. This did not occur so the source of change should be investigated. If the change was due to changes in the value of shares, then this would be expected but the investment policy may not be appropriate to this class of policy. If the losses are from bad loans, then further investigation of the loan policy is needed.

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Expenses

Maintenance expenses have increased by 3% with unit costs increasing by 5 per cent due to higher than expected lapses. A strategy needs to be developed to reduce future expenses or the assumption will need to be changed. However, it is important to look at expenses at the company level as product line results could be affected by other lines of business being reduced. As a result, increased expenses are allocated to the remaining lines where premium or policy count is used as the expense driver. It should also be noted that in a MoS valuation, actual acquisition costs (i.e. acquisition commission and expense) are used for new business and hence they do not contribute to expense experience.

In this example, total actual acquisition costs are equal to expected but the split between acquisition commission and acquisition expenses is slightly different to expected. This could be because of differences in the definition of acquisition costs between the accounts and the valuation. This difference needs to be investigated.

The new business expense experience could be separated into a pricing experience and an actual experience by running first on pricing assumptions and then on valuation assumptions.

25.2.2. Calculation Approach

The calculation of profit comes from $(A_1-A_0) – (V_1'-V_0)$· For the algebraic analysis, this is reallocated to be:

Interest on Surplus at the start of the year
+ Expected Profit
+ Experience Profit

Policy values at the start of the year plus premiums less claims and expenses all accumulated at the valuation rate of interest will equal the liability at the end of the year. This can also be expressed as the difference between the end of year liability and the start of year liability will be equal to the accumulation of premiums less claims and expenses all accumulated at the valuation rate of interest. These items are released over the valuation year. This is sometimes call “unwinding”.

For Margin on Services liabilities, expenses include the profit margin expressed as a margin on a service e.g. premiums, claims, expenses. Over the valuation period, when a premium is received assets increase. However, the liability also increases when the valuation premium is received. In a gross premium valuation, such as MoS, there will therefore be no impact on profit.

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Similarly, over the valuation period, when an expense is paid there should be an offsetting reduction in liability if the actual amount of expenses equals the liability. Similar logic applies to lapses, claims and interest.

As the same time as a service (expense or claim) Is reflected in the valuation liability, the valuation liability is reduced by the profit margin on that service. As there is no corresponding movement in asset values this margin is released into profit. This is the expected profit.

This whole process is called unwinding.

Appendix 1 shows how the basic equation of value is used to derive the equations to analyse the experience profit. The equations can be adjusted to include a profit margin on the chosen service. In practice the Step Through Approach is used to analyse profit for a Margin on Service valuation.

Conceptually, the Algebraic Approach assumes successively that there is no interest experience, expense experience or decrement experience. By subtracting this equation from equation 1 the individual experience item can be determined. Looking first at investment experience we have:

$X_i = (X_i + X_e + X_d) - (X_e + X_d)$

And by a similar process

$X_e = (X_i + X_e + X_d) - (X_i + X_d)$, and

$X_d = (X_i + X_e + X_d) - (X_i + X_e)$

The equations derived by this process are:

Item	Formula
Interest Profit	$(i' - i) \cdot \left(l_x V_0 + l'_{x+\frac{1}{2}} \frac{(P - E')}{2} - d'_x \frac{B}{2} \right) = X_i$
Expense Profit	$l'_{x+\frac{1}{2}} \ (E - E')\left(1 + \frac{i}{2}\right) = X_e$
Decrement Profit	$(d_x - d'_x) \cdot \left(B - \left[\frac{V_1}{(1+\frac{i}{2})} - \frac{(P-E)}{2} \right] \right)(1+\frac{i}{2}) = X_q$

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25.3. Analysis of Profit for an Insurance Contract

For life insurance contracts with policy liabilities valued consistently with Australian accounting and APRA standards, the expected profit margin is determined at the point of sale of the contract and is recalculated at the end of each year. The expected profit margin is expressed as a percentage of the profit carrier (e.g. premiums or claims).

The expected profit in a period is the expected net cash flow including interest and the change in policy liability, or equivalently the profit margin percentage multiplied by the expected profit carrier cash flow emerging during the period.

If experience is as expected, the profit that emerges is the expected profit release plus interest on retained profits.

In practice, experience will not be as anticipated by the valuation process. The main items of experience variance will be:

- Investment – the investment experience profit is the difference between the discount rate and the actual rate of investment return on the policy liability at the beginning of the period and the policy cash flows over the period, and any change in policy liability due to changes in the discount rate;
- Decrements (claims and lapses) – the claims or lapse experience profit is the difference between the expected and actual benefit payments (e.g. death benefit or surrender benefit) less the difference between expected and actual policy liabilities released, accumulated with interest to the end of the year;
- Expenses – the expense experience profit is the difference between the expected and actual expenses, accumulated with interest to the end of the year;
- Tax – generally each experience item would be adjusted for tax at the expected tax rate. There would be an additional item for the difference between expected tax payable on the actual profit (net cash flow and change in policy liability) and the actual tax payable. This may also include an item for changes to tax legislation that were not anticipated in the best estimate assumptions.

There may also be an experience variance due to loss recognition or loss reversal. These items could arise from new business being sold at a loss or from assumption changes on existing business that is in loss recognition either at the start or end of the year.

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APRA reporting form LRF 430 is a useful reference as it shows the format of the analysis of profit that is required for the purpose of reporting to APRA. Different formats with more or less detail might be used for other purposes such as internal management reporting and reporting in the general purpose accounts. More detail might be provided for larger items. For example, if claims experience was poor, management would expect to see greater detail and explanation with regard to this item.

25.3.1. Simple Example

The table below shows a 3 year cash flow projection for a group of term life insurance policies which have been in-force for a number of years. Premiums and expenses are paid at the start of the year, and benefits and profit margins are paid/released at the end of the year. The amount of assets in excess of policy liabilities at the start of year 1 is 100. Tax is ignored, and the discount rate is 5% p.a.

Year	Premium (start of year)	Expense (start of year)	Benefit (end of year)	Profit Margin (end of year)
1	500.00	50.00	1,100.00	110.00
2	550.00	55.00	1,210.00	121.00
3	605.00	60.50	1,331.00	133.10

The policy liability at the start of year 1 is 2,209 and the policy liability at the end of year 1 is 1,582 as calculated in the following table:

	Policy Liability at the start of year 1	Policy Liability at the end of year 1
PV benefits	3,295	2,360
+ PV expenses	+ 157	+ 112
- PV premiums	- 1,573	- 1,126
+ PV profit margins	+ 330	+ 236
= Policy Liability	= 2,209	= 1,582

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If experience is as expected, the year 1 profit of 115 is derived as follows:

	Year 1 Profit
Premiums	500
Investment income = (100 + 2,209 + 500 – 50) x 5%	138
Claims	(1,100)
Expenses	(50)
Increase in policy liability = - (1,582 – 2,209)	627
Profit	115

The components of the year 1 profit would be as follows:

Investment income on assets in excess of policy liabilities = 100 x 5%	5
Expected profit margins emerging	110
Total	**115**

Now consider the situation where experience in year 1 varies from the original projection assumptions as follows:

- investment income is 110 rather than 138;
- benefit payments are 1,000 rather than 1,100; and
- expenses are 80 rather than 50.

The analysis of profit is completed in a step by step process where each of the expected components of profit is replaced by the actual outcome.

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Step 1

Benefit payments are 1,000 in year 1 instead of 1,100 assumed in the original projection. This increases the profit to 215. Note this example is simplified as it assumes no change in the policy liability at the end of the year even though there are fewer than expected claims. For a term insurance policy, the impact of a variation in claims experience on the end of year policy liability is small relative to the impact on claim payments. The movement in the liability would be greater for traditional policies. In practice, there will also be a movement in the policy liability due to lapses being different from expected.

	Year 1 Profit
Premiums	500
Investment income	138
Claims	(1,000)
Expenses	(50)
Increase in policy liability	627
Profit	215

The components of year 1 profit are now:

Investment income on assets in excess of policy liabilities = 100 x 5%	5
Expected profit margins emerging	110
Claims experience profit = 1,100 – 1,000	100
Total	**215**

Step 2

Expenses are 80 instead of 50 in the original projection. This causes expected investment income to reduce as the expenses are assumed to be paid at the beginning of the year. The overall impact is to reduce the profit to 183.5:

	Year 1 Profit
Premiums	500
Investment income (= 138 – 30 x 5%)	136.5
Claims	(1,000)
Expenses	(80)
Increase in policy liability	627
Profit	183.5

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The components of the year 1 profit are now:

Investment income on assets in excess of policy liabilities = 100 x 5%	5
Expected profit margins emerging	110
Claims experience profit = 1,100 – 1,000	100
Expense experience profit = (50 – 80) x (1 + 5%)	(31.5)
Total	**183.5**

The expense experience loss reflects the difference between the actual and expected expenses at the start of the year accumulated at the expected rate of investment return to the end of the year.

Step 3

Investment income is 110 as compared with 138 in the original case. The overall impact of all experience items is to reduce the profit to 157:

	Year 1 Profit
Premiums	500
Investment income	110
Claims	(1,000)
Expenses	(80)
Increase in policy liability	627
Profit	157

The actual rate of investment income earned is determined by solving for i in the equation: (100 +2,209 + 500 – 80) * i = 110. The solution to this equation is i = 4.03%. The calculation of this rate allows the actual investment income to be split between excess assets and the assets backing policy liabilities. Note that this equation uses the actual rather than the expected cash flows for the year.

The components of the year 1 profit are now as follows:

Investment income on assets in excess of policy liabilities = 100 x 4.03%	4
Expected profit margins emerging	110
Claims experience profit = 1,100 – 1,000	100
Expense experience profit = (50 – 80) x (1 + 5%)	(31.5)
Investment experience profit = (2,209 + 500 – 80) x (4.03% - 5%)	(25.5)
Total	**157**

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The investment experience loss reflects the difference between the actual and expected investment return on the policy liability at the start of the year plus the actual net cash flows (premiums less expenses). Again, this example is simplified as it assumes no change to the policy liability at the end of the year due to changes in the discount rate. In practice an accurate analysis would track the movement in end of year policy liabilities from expected to actual due to lapses, deaths, changes in the discount rate and changes in other assumptions.

The analysis is based on one particular order of analysis – claims, expenses and investment experience. Different orders of analysis are equally valid, but may give slightly different results. For example, if we started with investment experience, we would have calculated this item using expected expenses and then calculated the expense experience loss using the actual rate of investment return.

The analysis of profit for participating business can be performed in a similar manner to non-participating business. The main difference is that there is no investment experience profit as actual investment returns are included in the value of supporting assets (VSA) and hence the end of year policy liability.

For policies valued using an accumulation method, the expected profit can be calculated using the best estimate assumptions that applied at the previous valuation date. Although best estimate assumptions may not be used in calculation of the policy liability, the actuary will still need to derive these assumptions in order to verify that these policies are not in loss recognition.

As well as performing a numerical analysis, the actuary also needs to be able to explain the underlying causes of each of the experience items. Investment experience can usually be explained by examining the performance of each of the main asset sectors that the life company invests in. Reports from investment managers can assist in this explanation. Changes to discount rates will reflect movements in risk-free interest rates. Claims experience could be attributable to random fluctuations, single events causing multiple claims, misestimation of the mean, adverse trends or changes in underwriting or claims management practices. If a life company has high retentions (i.e. low levels of reinsurance), claims experience can be quite volatile as it will be affected by the number of claims incurred for policies with high sums insured. The expense experience for a product will depend on the total expenses for the life company, how they are allocated to products and how they are split between acquisition and maintenance categories. If the allocations change during the year, there can be significant expense experience profits at product level.

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The investigation into the causes of experience items could also expose operational issues such as:

- previously undiscovered errors in the company's administrative, accounting or investment systems;
- previously undiscovered errors in the methodology or systems used to calculate the values of in-force and new business;
- identification of areas where actual transactions differ from stated company practice (possibilities include payment of policy owner benefits or refunding of policy premiums and commissions); and
- poor management of underwriting or claims.

25.3.2. Analysis of Profit

The previous sections described the analysis of profit where policy liabilities are valued on a "realistic" basis in accordance with Australian accounting and APRA standards.

Where policy liabilities are valued using a net premium valuation method (or another "non-realistic" method that does not utilise best estimate assumptions), the assets in excess of policy liabilities are termed the surplus, and the surplus emerging over a year must be analysed.

The methodology for an analysis of surplus is similar to the analysis of profit, with surplus arising during the year replacing profit, and some adjustments to analysis items consistent with the valuation method.

An analysis of surplus tends to be less useful than an analysis of profit. The assumptions used for the valuation are not best estimates, hence the experience profits are expected to be non-zero. The fact that a mortality or expense surplus is greater than zero does not necessarily indicate good performance by a life company since the surplus is being calculated relative to an unrealistic conservative assumption. If a net premium method is used one of the items of surplus will be the difference between the actual and net premiums.

25.4. Analysis of Profit for an Investment Contract

The policy liabilities for Investment-linked contracts, term annuity contracts and investment account contracts that are not entitled to discretionary additions consist of a life investment contract liability (LICL) and a management services element (MSE). The MSE is the net amount of deferred entry fee revenue and deferred acquisition expenses.

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There is no equivalent to "profit margins emerging" for investment contracts. Instead, APRA form LRF 430 requires profit to be split between:

- investment earnings on assets in excess of policy liabilities;
- the Financial Instrument Profit;
- the Management Services Profit;
- changes in valuation methods and assumptions affecting the MSE.

The Financial Instrument Profit is the sum of all cash flows relating to the financial instrument element of life investment contracts, including investment earnings on the underlying assets, less the change in the value of the Life Investment Contract Liability. The Financial Instrument Profit reflects any mismatch between the LICL and the assets that back it. For investment-linked business there should normally be an exact match, so this item of profit will be zero. An exception could occur for investment-linked policies that have performance guarantees. For term annuities and investment account business there would usually be some degree of mismatch between the assets and the LICL, so the Financial Instrument Profit will be non-zero.

The Management Services Profit is the difference between fees and expenses, including changes to the MSE. In other words, fees include reductions in deferred fee revenue and expenses include reductions to deferred acquisition costs.

For investment-linked contracts a projection would generally only be required to determine the run-off of the MSE. The expected change in the MSE can be calculated using this projection and compared with the actual change. In making this comparison, allowance needs to be made for the impact of new business, either by allowing for new business within the expected MSE, or by removing the impact of new business from the actual MSE.

It can be useful to analyse the Management Services Profit by subdividing it between new and existing business. If acquisition costs cannot be deferred, new investment contracts may produce a loss in the first year, even though the contract is expected to be profitable over its full term. In this case the profit in the first year will be reduced by the amount of acquisition costs that are not deferred.

Changes in valuation methods and non-economic assumptions should not normally affect the MSE. These changes would normally only affect the future run-off of the MSE. However, if a contract becomes onerous (i.e. it is expected to make losses in the future) there will be an immediate impact. Investment-linked contracts could become onerous if high rates of termination or poor investment performance make it unlikely that future fees will be sufficient to recover the existing deferred acquisition costs and future maintenance expenses. Changes to economic assumptions (e.g. the discount rate) would have an immediate impact on the MSE.

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For term annuities, a projection method needs to be used to calculate both the LICL and the MSE. The MSE includes an allowance for profit margins. It is possible to analyse the profit for term annuities in a similar way to the methods used for life insurance contracts. The main item of experience will most likely be investment experience arising from the mismatch of assets and liabilities. Mortality is usually ignored (deaths would be treated as withdrawals). Withdrawal and expense experience will normally be of relatively minor importance.

25.4.1. Example

Consider the 10 year investment-linked single premium policy example from Chapter 21.

For a fully in force policy in year 1:

Premium	10,000
Commission	500
Expenses	180
Account Balance: 10,000 * (1 – 3%) * (1 + 6% - 1%)	10,185
Surrender Value: 10,185 x (1 – 2%)	9,981
Fees: 10,000 * (1 – 3%) * 1%	97

Using the expected withdrawal rate of 20% the cash flows in the first year are:

Premium	10,000
Commission	500
Expenses	180
Surrender payments: 9,981 * 20%	1,996
Account Balance: 10,185 * (1 – 20%)	8,148
Fees: 97 + (10,185 – 9,981) * 20%	138

The present value of ongoing fees is 522. The deferrable acquisition cost in excess of the entry fee is 200, which is 38.3% of the value of the ongoing fees. At the end of year 1, the value of ongoing fees has reduced to 456 and the DAC to 175, giving an MSE of (175).

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The LICL at the end of year 1 is the account balance of 8,148. The policy liability is the LICL plus MSE and equals 7,973. The contract makes a loss in the first year (and profits in subsequent years) because part of the acquisition costs cannot be deferred.

If experience is as expected the Financial Instrument Profit will be zero and the Management Services Profit will be a loss of 90.

If the actual withdrawal rate in year 1 is 30%, the value of ongoing fees at the end of year 1 reduces to 399 and the DAC to 153 (applying the 38.3% to the value of ongoing fees), giving an MSE of (153). There will also be an extra 20 of exit fees charged.

The Management Services Profit will be a loss of 92, of which 2 is attributable to the higher than expected withdrawals.

25.5. Reasons for Analysing the Profit

The principal reason for an analysis of profit (or surplus) is to disclose the sources of the emerging profit. Such analysis is carried out:

- to enable the actuary to advise management on the factors affecting the profit;
- as a semi-independent check on the accuracy of the valuation and of the data in the company accounts;
- to compare the valuation assumptions to actual experience, thus signalling the need for a review of the best estimate assumptions or for management to take action to address areas where experience has deteriorated (this does not apply to an analysis of surplus as the assumptions used are not best estimates);
- to comply with requirements for a basic analysis of profit to be disclosed in the general purpose financial statements and in APRA reporting form LRF 430.

Note that the analysis is not a complete check. It may not be possible to explain all experience profits. However, any unexplained profit should be within acceptable limits.

The analysis will not provide a foolproof verification that the valuation data is correct. For example, consistently wrong policy data over time may not be identified.

Some items of experience profit may be estimated based on the valuation results themselves. This does not give an independent check.

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Examples of errors that might be picked up include:

- premiums that have been recorded correctly in the policy administration system and valuation of liabilities, but double counted in the accounting system;
- failure to reverse a manual provision for contributions tax liability after annual contributions tax processing has occurred.

The analysis of profit for a single period is not an ideal indicator of the financial performance of a life insurance company, and some experience variances may give misleading signals. For example, higher than expected lapse rates for a level premium term insurance will result in experience profits if the policy liability is greater than zero. However, if the best estimate liability is less than zero the loss of future profit margins will exceed the experience profit and the company will actually be worse off. An embedded value analysis gives a better measure of financial performance. This topic is discussed in the next chapter.

25.6. Analysis of Changes to Profit from Year to Year

The analysis of profit discussed above splits the current year profit into its various components. Another type of analysis which is very useful in explaining the performance of a life company is an analysis of the change in profit from the previous year to the current year. Management and shareholders will be particularly interested in understanding the drivers of trends in profit, and whether these trends are expected to continue in future.

This type of analysis builds on the analysis of profit performed for each year in isolation. For insurance contracts, the profit margins emerging in the current year will differ from those emerging in the previous year because of changes in the volume of business and the best estimate assumptions. They will also be affected by differences between the profit margins (as percent of profit carrier) for new business as compared with existing business. For participating business, the profit margins emerging will also be affected by investment experience. A comparison of profit between current and previous years should attempt to identify and explain all of these factors to the extent that they are material.

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Experience profits for the current and previous years will not be directly comparable if the best estimate assumptions for each year are different. A change in assumptions at the end of the previous year will typically have an opposite effect on profit margins emerging and experience profits for the current year. For example, a reduction in the best estimate claim rates at the end of the previous year will increase profit margins emerging for the current year and reduce the experience profits. However, the two effects will not cancel each other precisely as profit margins are spread over the terms of the policies.

For investment-linked contracts, profit is likely to be sensitive to investment returns. For these products, the majority of fee income is usually based on assets under management. Other key factors affecting profit will be new business, withdrawals and changes to the level of expenses.

It is particularly useful to identify large one-off items in a year by year analysis as they can distort trends in profit emergence. Examples of one-off items include loss recognition, loss reversals and losses that arise from operational risks (e.g. fraud or compensation to policy owners for mis-selling). Repricing of risk products and investment-linked products can cause a significant shift in profits emerging. For participating business, changes to the asset mix will affect the profit margins emerging if they result in changes to the discount rates used in determining the best estimate liabilities and the value of future bonuses and shareholder profits.

25.7. Analysis of Profit and the Control Cycle

The Control Cycle is the process whereby a life insurance company monitors the experience emerging for a product and the implications this has for valuing and pricing that product going forward.

The analysis of profit provides a feedback mechanism to indicate which of the best estimate assumptions might need reviewing. It can also highlight those products which need to have their premium rates and charging structures reviewed in order to maintain an adequate level of profitability. For example, if the analysis of profit showed significant lapse experience losses, this may indicate the need for a thorough investigation of lapse experience by various rating factors (distribution channel, benefit type, policy size, etc.) which in turn may feed into a revision of the premium rates, charges and commissions.

The analysis of profit may also suggest other management actions that could be taken to reduce profit volatility. For example, if claims experience is adversely affected by a few large claims the life company might consider reducing its retentions and making more use of reinsurance. Volatility in investment experience could be reduced through better matching of assets and liabilities or the use of derivatives.

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25.8. Worked Examples

The worked examples are included in an excel file accompanying this text.

25.8.1. Example 1 – Term Life Insurance Policy

This example shows an analysis of profit for a portfolio of term life insurance policies. The related calculations are in sheet "Ex1 Term Life AoP". Investment returns on assets in excess of policy liabilities (e.g. retained earnings) are ignored.

The following valuation assumptions are made:

- premium of $1000 payable yearly in advance
- sum insured payable on death
- no surrender value
- initial expenses of $1,200 per policy
- death claims of 35% of premiums in the first year, increasing by 8% p.a.
- renewal expenses of 10% of premiums in the first year, increasing by 6% p.a.
- the lapse rate is 15% p.a.
- the discount rate is 5% p.a.
- premiums and initial expenses are paid at the start of the year; claims are paid mid-year and renewal expenses are paid at the end of the year

From these assumptions, a projection of premiums, claims and expenses is calculated, as follows:

Year	Premium	Claims	Initial Expenses	Renewal expenses
1	1,000	350	1,200	100
2	850	321		90
3	723	295		81
4	614	271		73
5	522	249		66
6	444	228		59
7	377	209		53
8	321	192		48
9	272	177		43
10	232	162		39

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The above cash flows are discounted to determine the best estimate liability and the present value of expected profits. For this product, premiums are used as the profit carrier. The profit margin is 19.1% of premiums, being the present value of profits (882), divided by present values of premiums (4,615).

Cash Flow	Present Value
Premiums	4,615
Claims	(2,008)
Initial expenses	(1,200)
Renewal Expenses	(526)
Expected profit	882

At the beginning of the policy, before any premiums are received or expenses incurred, the policy liability (calculated as the present value of premiums less claims, expenses and profit margins) is zero. This can be checked from the calculations given above.

The expected profit in year 1 is calculated as the profit margin percentage applied to the premium cash flow, i.e., 1,000 x 19.1% = 191, plus interest on the profit margin of 10, totalling 200.

This can be verified from the cash flow (premiums less claims and expenses) accumulated with interest to the end of the year, less the increase in the policy liability over the year, i.e., (1,000 – 1,200) x 1.05 – 350 x √1.05 – 100 – (-869 – 0) = 200.

Let us assume that actual experience in year 1 differed from the projection assumptions as follows:

- claims are 400 instead of 350;
- lapses are 17% instead of 15%. As a result, the closing policy liability is (849) instead of (869);
- renewal expenses are 110 instead of 100;
- the investment return equals the assumed discount rate.

The claims experience loss is the difference between the expected and actual claims, accumulated with interest to the end of the year, i.e., (350 – 400) x √1.05 = (51). The claims experience will also have a minor impact on the policy liability as the policies remaining in force will differ from expected. However, this effect has been ignored on grounds of immateriality.

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The lapse experience loss arises because there are fewer policies remaining in force at the end of year 1 than expected. The lapse loss is (869) – (849) = (20). In effect, this loss arises because the acquisition costs for the extra lapsed policies must be recognised in full, rather than continuing to be deferred. This is not an assumption change, rather it is applying the original valuation assumptions to reduced in-force premium volumes due to higher lapse experience.

The expense experience loss is the difference between the expected and actual expenses, i.e. 100 – 110 = (10).

The actual profit in year 1 is now 119 compared to expected profit of 201.

This can be verified from the cash flow (premiums less claims and expenses) accumulated with interest to the end of the year, less the increase in the policy liability over the year, i.e. (1,000 – 1,200) x 1.05 – 400 x √1.05 – 110 – (-849 – 0) = 119.

The analysis of profit can be presented as:

Profit margins emerging	200
Claims experience profit	(51)
Lapse experience profit	(20)
Expense experience profit	(10)
Actual profit	119

In this example, the valuation assumptions were not revised. However in practice, consideration would need to be given as to whether claims, lapse or expense valuation assumptions were increased at the end of year 1. This may lead to loss recognition if the recalculation of the components of the policy liability means that the value of future profits falls to zero, and the policy liability increases. This in itself would be an item of experience loss in year 1.

25.8.2. Example 2 – Group Salary Continuance Insurance (Accumulation Method)

This example shows an analysis of profit for statutory fund consisting of group salary continuance insurance policies. The policies do not have any profit sharing entitlements, there is no reinsurance and tax has been ignored. The calculations are in sheet "Ex2 GSC AoP". This example includes the investment return on the retained earnings of the statutory fund in the analysis.

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An accumulation method is used in this example, hence the value of future shareholder profits is not explicitly calculated as a component of the policy liabilities. However, profit margins are implicitly released at the time that premiums are earned and expected claims are incurred.

The policy liabilities are calculated as:

- unearned premium reserve (UPR); plus
- incurred but not reported claims reserve (IBNR); plus
- reported but not admitted claims reserve (RBNA); plus
- disabled lives claims reserve (DLR, also known as Claims in Course of Payment, CICP); less
- deferred Acquisition Costs (DAC)

The profit margins emerging are calculated using expected loss ratios for claims and maintenance expenses determined at the beginning of the year. The loss ratio for claims is the expected value of claims incurred during the year, divided by the earned premium. The loss ratio for maintenance expenses is determined in a similar way. The profit margins emerging also include expected interest on the UPR and DAC, and are net of expected releases from the DAC.

The claims profit compares actual and expected claims. The actual claims include increases in the claim reserves net of expected interest on the claims reserves.

The lapse profit is the residual change in the DAC. In this example, there is a loss from lapses, presumably arising because actual lapse rates were higher than expected.

The claims loss ratio is the expected ratio of incurred claims to earned premiums. The expense loss ratio is the expected ratio of maintenance expenses to earned premiums.

The acquisition expenses are $21,680 (in this example all commissions are paid on commencement of new group policies and are therefore classified as an acquisition cost). This leaves $2,570 in maintenance expenses.

25.9. The Budgeting/Planning Process

Prior to the start of each financial year a company will set an expense budget for each area or department within the company, for the amount it can spend during the coming year.

The first step in this process is generally for each department to review the previous budget and identify changes to the business or particular plans that will result in lower or higher costs. The department then reworks the budget to provide the following year's estimate of expenses.

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The actuary and finance/accounts people will then get together and review these plans. The area of the company responsible for the payment of commission to advisors can be used as an example. This group may be part of a larger department in a real life scenario. Their budget would include the costs of calculating and paying commission, but not the commission amounts paid. The inputs to this part of the process are:

- The new budgets set by the department – this indicates how much the area wishes to spend and what on. The budget would have included the cost of additional staff anticipated, salary increases, computer upgrades.
- The expense experience analysis – this indicates how expenses of the company were spent or are generally spent. The analysis would have information that would identify the costs of calculating and paying commissions from the previous year.
- It would also have numbers of advisors and total amount of business written, which allows the expense to be expressed as an amount per advisor, per contract or per sum insured amount.
- With a bit of work, the expense analysis should be able to tell the finance and actuarial people how this department performed against the expected (based on loadings in the expense assumptions on the contract) experience in the previous year.
- The strategy or business plan for the company. This will provide information about the anticipated additional costs, areas in which these costs are likely to occur and the anticipated new business and lapse experience expected given changes to aspects of the company from this plan.
- The analysis of profit – the information about actual to expected profit and the reasons for its variance will give information about the spending of the company in the previous year and also the environment in which the company is operating. This is explored further below.

This information is analysed for each department budget submitted. The budgets will be approved, reduced, increased in some cases, if it is felt that anticipated changes have not been budgeted for sufficiently, or altered in some way. An example of the last item here could be advertising expenses. If the analyses reveal that a large amount was spent on advertising in the previous year, without any increase in sales volume or quality, the department responsible for advertising would be likely to be provided with a reduced budget and a restriction on the total amount to be spent on advertising and promotion for the coming year.

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25.9.1. Analysis of Profit and the Budgeting/Planning Process

The business plan includes budgets for expenses together with estimates of all other cash flows that will affect the company's profit for the coming year. At the end of the year the actual results will be compared with those forecast in the business plan. This creates further work for the actuary as the analysis against business plan will differ from the analysis of profit discussed previously.

Management are usually more interested in comparing the actual profit with budget forecasts than splitting actual profit into the profit margins emerging and experience profits. The budget profit may differ from the profit margins emerging for a number of reasons:

- The budget assumptions may allow for short term variances from the best estimate assumptions – for example lapse rates may be anticipated to be higher than normal because the company has just raised its premium rates.
- The expected investment return will most likely differ from the discount rates used in the policy liability valuations.
- The best estimate assumptions may change between preparation of the budget and the start of year liability valuation (e.g. discount rates will almost certainly change).

As new sales will differ from those assumed in the business plan, the first stage in the process would be to recalculate the plan using actual sales. It may also be necessary to restate the opening position due to different volumes of business being in force at the start of the year compared to the volumes forecast in the budget (remember that the budget is prepared some time before the start of the year).

The analysis is more useful if it is performed separately for each major operating division and for major products within each division. It can offer insights as to which products are profitable, which products need to be repriced or markets from which the company may wish to withdraw, enabling company management to take appropriate action.

Frequency of Analysis

A detailed analysis of profit by source will normally be carried out at year end. At other times during the year, the ability to carry out a detailed investigation will depend on the availability of data from the management information systems. Some of the necessary information may need to be estimated if an interim analysis is carried out. In order to avoid surprises, companies will generally want to complete the analysis at least quarterly, even if this must be on an approximate basis. Many companies perform a monthly analysis against budget. Most companies update their forecasts of full year profit as the year progresses.

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Communication

The key messages coming out of the analysis of results must be highlighted to senior management. Care needs to be taken not to obscure important information; for example, by presenting too many numbers, or by spending too much time on secondary details. It is important to write reports so that they are useful to the reader, rather than to regard them as documentation of the processes undertaken.

An understanding of the drivers of profit is essential if senior management are to make well-informed decisions regarding the future direction of the company.

25.9.2. Exercise

You have completed your analysis of profit calculations for the latest financial year, which show a considerable deterioration in results due to a maintenance expense overrun in a key product open to new business. Your appointed actuary is very concerned and has allocated one of the actuarial analysts to assist you in performing your investigation into the expense experience. The aim of this investigation is to determine the causes of the deterioration in results. Please provide the analyst with a list of things that need to be investigated together with reasons why.

25.10. Solutions to the Exercise

Investigation item	Reason
Expenses	
Check the payments process	To ensure no breakdowns in procedure that have led to expensive work-arounds or manual intervention
Check the expense apportionment from the current year and compare to previous years	To identify if any areas have changed their split up of expenses and this has resulted in more being attributed to this product than there should be.
Check for one-off expenses	To identify any unusual and non-recurring items that may affect the accounts.
Check the non-apportioned expense data	To make sure no large/repetitive entries have been put through to this product by mistake
Comparison of Actual to Budget	Highlight any areas of differences
Reconcile projected expense results	Are there any errors in the expense treatment within the valuation system?

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25.11. Appendix 1

This Appendix demonstrates an algebraic derivation of the items of experience profit or loss.

Irrespective of the type or method of valuation, the same basic equation of value structure underlies the valuation process. For a group of simple and identical policies, over a one-year period, the equation will be of a form similar to:

$$l_x V_0 (1+i) + l_{x+\frac{1}{2}} (P - E)(1+\frac{i}{2}) - d_x B (1+\frac{i}{2}) - l_{x+1} V_1 = 0$$

where:

l_x Number of policies at the start of the year

V_0 Liability of a policy at the start of the year

i Interest rate assumed

P Valuation Premium payable for each policy

E Expected expenses to be incurred for each policy

d_x Number of policy exits expected

B Benefit payable on policy exit

l_{x+1} Number of policies in force at end of year

V_1 End of year liability per policy in force

That is, the reserves at the start of the year plus expected premiums and interest will be just sufficient to meet expected expenses and benefit payments and set up the end of year reserves.

The precise formula will vary in different situations:

- for a valuation of an insurance contract consistent with Australian accounting and APRA standards, an extra term must be included for the expected profit margins emerging "M";
- the component "d_x B (1+i/2)" may be replaced by a series of components for each type of benefit, for example: death " d_x S (1+i/2)" where S is the death sum insured; surrender "w_x SV (1+i/2)" where SV is the surrender value and disability "i_x T (1+i/2)" where T is the TPD sum insured;
- more precision could be obtained by using a monthly projection, rather than simply assuming cash flows occur on average in the middle of the year.

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Other products and valuation approaches will require other adjustments. However, the overall equation structure is the same and most variations involve only minor modification to the basic equation above.

In practice, experience will not be as anticipated by the valuation assumptions. If the actual experience is designated with a dash, the result will be:

Equation 1

$$l_x V_0 (1+i') + l'_{x+\frac{1}{2}} (P - E')(1+\frac{i'}{2}) - d'_x B(1+\frac{i'}{2}) - l'_{x+1} V_1 = X$$

That is, an amount of experience profit "X" has arisen.

The objective of the analysis of profit is to split the experience profit "X" into components for investment experience (X_i), expense experience (X_e) and decrement experience (X_q), such that $X_i + X_e + X_q = X$.

One approach to the derivation of these items is as follows.

Equation 1 can be regarded as a function of interest, expenses and decrement experience (i, e, d), therefore:

Equation 1 can be regarded as $X=X_i+X_e + X_d$

Conceptually, the process then assumes successively that there is no interest experience, expense experience or decrement experience. By subtracting this equation form equation 1 the individual experience item can be determined. Looking first at investment experience we have:

$X_i = (X_i+X_e + X_d) – (X_e + X_d)$

And by a similar process

$X_e = (X_i+X_e + X_d) - (X_i + X_d)$, and

$X_d = (X_i+X_e + X_d) - (X_i+X_e)$

Now the algebra can be applied.

First the interest item is derived. Logically, if the investment experience had been as expected (i.e. equal to the discount rate), only the expense and decrement items would have emerged, thus:

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Equation 2

$$l_x V_0 (1+i) + l'_{x+\frac{1}{2}} (P - E')(1+\frac{i}{2}) - d'_x B(1+\frac{i}{2}) - l'_{x+1} V_1 = X_e + X_q$$

Equation 1 less equation 2 above therefore gives X_i as follows:

$$(i' - i) \cdot (l_x V_0 + l'_{x+\frac{1}{2}} \frac{(P - E')}{2} - d'_x \frac{B}{2}) = X_i$$

Thus, the interest experience profit is given by the extra rate of interest earned on the initial liability and the actual policy cash flows over the year. There will be an additional item for any change in the end of year liability resulting from changes to the discount rate.

Next the expense item is derived. If expenses, as well as interest, had been as anticipated, then only the decrement experience profit would have emerged, thus:

Equation 3

$$l_x V_0 (1+i) + l'_{x+\frac{1}{2}} (P - E)(1+\frac{i}{2}) - d'_x B(1+\frac{i}{2}) - l'_{x+1} V_1 = X_q$$

Equation 2 less the above equation 3 therefore gives X_e:

$$l'_{x+\frac{1}{2}} (E - E')(1 + \frac{i}{2}) = X_e$$

The expense experience profit is given by the difference between the expected and actual expense rate for the actual number of policies, accumulated with expected interest to the end of the year.

Finally, the decrement experience profit is derived. If decrements, as well as expenses and interest had been as anticipated, then we are back to the basic equation of value of:

$$l_x V_0 (1+i) + l_{x+\frac{1}{2}} (P - E)(1+\frac{i}{2}) - d_x B(1+\frac{i}{2}) - l_{x+1} V_1 = 0$$

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Equation 3 less the equation above therefore gives X_q. Noting that $l_{x+1} = l_x - d_x$ and $l_{x+1/2} = l_x - d_x/2$:

$$(d_x - d'_x) \cdot \left(B\left(1+\frac{i}{2}\right) + \frac{(P-E)}{2}\left(1+\frac{i}{2}\right) - V_1 \right) = X_q$$

or, with some rearrangement:

$$(d_x - d'_x) \cdot \left(B - \left[\frac{V_1}{(1+\frac{i}{2})} - \frac{(P-E)}{2} \right] \right)\left(1+\frac{i}{2}\right) = X_q$$

Thus, the decrement experience profit is the saving on the expected strain on exit (say, death) accumulated with expected interest to the end of the year. The expected exit strain is given as the benefit payable less the "mid-year reserve", where "mid-year reserve" is given as the end year reserve discounted to the middle of the year less half the premium less expenses due (i.e. assuming half the benefit payments occur before the premium is due and half after).

The equations above assumed no change in the liability valuation basis between the start and end of the year. If the valuation basis changes, there may also be an experience variation equal to the impact of the basis change on the end of year policy liability.

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Chapter 26 – Distribution of Profits to Policy Owners

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26.1. Introduction

This chapter focuses on the distribution of profits to participating policies.

26.2. Distribution of Profits

The traditional participating policy is one of several solutions to the problem of how to share risk between the shareholders of life companies and the owners of life insurance policies. At one extreme is the traditional non-participating policy. This type of policy has premiums and benefits that do not change in response to actual experience after the policy is issued. All of the risks arising from the issue of the policy are borne by the life company's shareholders.

At the other extreme, an investment-linked policy offers very little in the way of guarantees and the investment risks are entirely borne by policy owners. An investment-linked policy offers policy owners the likelihood of higher benefits than a traditional non-participating policy, but with considerable volatility and downside risk.

Participating policies are an intermediate solution where risks are shared between policy owners and shareholders. A traditional participating policy has higher premiums than a non-participating policy with the same guaranteed benefits, but in return the policy owner is entitled to increases in benefits financed by distributions of profits. On the other hand, the expected benefits are lower than for an investment-linked policy with the same premiums as shareholders must be compensated for the cost of capital provided to support the policy guarantees. As well as providing minimum guaranteed benefits, distributions of profits are smoothed so that the value of a participating policy does not fluctuate from day to day in the same way as an investment-linked policy.

Traditional participating policies originated in the 18th century in the United Kingdom. Reversionary bonuses were a simple method for sharing mortality and investment risks between a life company and its policy owners. The amount of bonus added to a policy each year could be calculated and recorded by hand on a life company's policy records and on the bonus notices sent to policy owners. The bonuses could be valued relatively easily by multiplying their face value by a commutation function. By comparison, investment-linked policies would have been extremely difficult and expensive, if not impossible, to administer prior to the advent of computers.

Investment returns are the main factor affecting profit emergence for modern participating business, although mortality, expenses and surrender experience can also have a significant impact.

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The Life Insurance Act requires participating policies to have a significant exposure to investment risk. Section 15 of the Life Act says that a participating benefit is a benefit that is not a non-participating benefit. It then goes on to define non-participating benefits to be those that do not have an entitlement to share in distributions of surplus or profits and the benefits are not able to be altered by a decision of the life company. Additional types of non-participating benefits are defined in APRA's Prudential Standard LPS 600. The description of non-participating benefits given in LPS 600 effectively requires a participating benefit to have a substantial exposure to investment risk. For example, group risk business with profit-sharing features via premium refunds is not regarded as participating business. Nor is investment account business if the account balances will always be between 95% and 103% of the value of the assets.

For traditional policies in Australia, profits are distributed by means of reversionary and terminal bonuses. The most common methods of profit distribution are examined in some detail in this chapter.

In the 1980s, alternative types of participating policies – investment account policies – became popular in Australia. These policies have their own particular issues and these are also discussed in this chapter.

Section 62 of the Life Insurance Act 1995 requires the actuary to provide advice to the directors on the consequences of any proposed distribution of profits. This includes distributions to participating policy owners. The Actuaries Institute Professional Standard 200 gives some guidance on the issues the actuary should consider when providing this advice.

The actuary must provide advice on the amount of profit that is to be distributed as well as the method of distributing the profits. The issues the actuary must consider as part of this advice include:

- policy owners' reasonable expectations;
- equity between policy owners and shareholders;
- equity between different groups of policy owners;
- the timing of profit emergence;
- the impact on the company's capital requirements;
- the capabilities of the policy administration system;
- potential impacts on future surrender experience; and
- potential impacts on future sales of new business.

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26.3. Reasonable Expectations

The concept of policy owners' reasonable expectations is not well defined. However, it has been commonly used in relation to participating business, both in Australia and overseas, for many years. Reasonable expectations are based on a combination of policy documentation, promotional material, annual statements, and the past practice of the company. Reasonable expectations are not the same as actual expectations. Life companies do not normally carry out surveys of their policy owners when establishing what their reasonable expectations are.

One of the challenges in managing participating business is avoiding the creation of unreasonable expectations. This can be achieved by regularly reminding policy owners how bonus rates might vary in future and by applying this bonus philosophy in a consistent manner when declaring bonus rates.

The following extract comes from an annual report to policy owners published in 2010 by AMP. The extract summarises the way AMP determines bonus rates and helps to define the reasonable expectations of policy owners. Other documents published at various times in the past may provide additional information relevant to reasonable expectations.

> *"The distribution of profit (in the form of bonuses) is made in accordance with the Life Insurance Act (1995). Under the Life Insurance Act, AMP's Actuary regularly assesses the strength of the AMP Statutory No.1 Fund and advises how much policy owner profit it can prudently pay out, and how to share it fairly amongst different groups of policies.*
>
> *In determining bonus rates, the Actuary not only considers the recent investment performance, but also likely future investment returns, estimated future rates of mortality, assumed rates of taxes, fees and other expenses.*
>
> *Annual (reversionary) bonuses are allocated to plans each year as additions to the sum insured. As the rate of bonus is dependent on AMP's investment experience and our estimates of future experience including investment returns, annual bonuses may fluctuate from year to year. However, once declared they are guaranteed and payable in full when the sum insured becomes payable (i.e. usually on death or maturity).*

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Terminal bonuses are currently paid in addition to annual bonuses on maturity, death or disability claims (where appropriate) on plans which have been in force for 5 years or more. Terminal bonuses are currently allotted as a percentage of attaching annual bonuses. They are a means of passing on a greater level of capital appreciation, usually from growth oriented assets, such as equities and property. While there is still some smoothing there is a greater recognition of underlying market values, and terminal bonus rates are more volatile than annual bonuses. Terminal bonuses are not guaranteed and may be increased or decreased based on movements in underlying markets relative to policy values.

Changes to investments can be made according to the outlook for the various investment sectors and the nature of the plan. The long term strategic mix of assets that back your plan are usually in the following ranges: shares and alternative investments 25% - 55%; property 10% - 30%; fixed interest and cash 25% - 60%."

Points to note in this disclosure:

- the asset allocation has very broad bands and is not binding on the company. This gives scope for the company to reduce its capital requirements by moving to a less aggressive asset mix if necessary. Alternatively, it could adopt a quite aggressive investment strategy if capital is not a constraint;
- the bonus distribution policy explicitly refers to "strength" and "prudence". This implies that bonuses might be held back if the capital position of the fund is, or might become, unsatisfactory;
- fairness of distributions amongst different groups of policies is mentioned;
- some of the factors affecting bonus rates are mentioned. Presumably other factors such as recent mortality, surrender and expense experience are ignored as they are unlikely to have a material impact on bonus rates;
- for reversionary bonuses the reference to future investment returns is important. It means that reversionary bonus rates can be reduced if long term interest rates fall, even though recent investment returns may have been better than expected;
- terminal bonuses are more volatile than reversionary bonuses and can increase or decrease in response to movements in asset values. The use of the words "currently paid" indicates that terminal bonuses might stop being paid at any time;
- the Actuary is described as providing advice on bonus distributions (rather than being the final decision maker) – however it is strongly implied that the company will always follow this advice.

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Another important factor in determining policy owners' reasonable expectations (not mentioned in the extract above) is the way a company has managed bonus rates in the past. Policy owners should reasonably expect consistent management of bonuses from year to year.

Some overseas countries have more stringent regulatory requirements regarding disclosure to policy owners of how participating business is managed. The "With-Profits Guides" of major UK life insurers can be useful as additional background reading.

26.4. Reversionary Bonuses

The reversionary bonus system is used for the distribution of profits for traditional (conventional) participating life insurance business in Australia, New Zealand, the United Kingdom and a number of other countries.

Under the reversionary bonus system, policy owners' profits are converted into their reversionary equivalent (i.e. an amount payable on death and/or maturity) and allocated pro-rata to policy owners according to the size of their policies. The reversionary bonus becomes a contractual liability of the life company which cannot be revoked.

There are three main types of reversionary bonus:

- simple reversionary bonuses are calculated as a bonus rate multiplied by the sum insured;
- compound reversionary bonuses are calculated as a bonus rate multiplied by the sum insured plus existing reversionary bonuses; and
- super-compounding reversionary bonuses are calculated as a bonus rate multiplied by the sum insured plus a higher bonus rate multiplied by existing reversionary bonuses.

The most common bonus systems used in Australia today are the compounding and super-compounding systems.

The spreadsheet accompanying this chapter shows a simplified projection for a 10 year pure endowment. Expenses and shareholder profits have been ignored.

The first part of the spreadsheet shows the projected asset shares, together with reversionary bonuses calculated under the 3 different bonus systems. The bonus rates have been determined using "goal seeking" so that the maturity value matches the asset share. For the super-compounding method, a fixed differential between the two rates has been assumed.

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The calculation of asset shares was described in Chapter 22. The asset share of a policy is the accumulation of the premiums with actual rates of investment return less deductions for expenses, tax, the cost of death cover and a margin to provide for shareholder profits. Sometimes a "cost of capital" will be deducted instead of shareholder profits. The asset share is a measure of what the maturity value should be if bonuses are distributed in an equitable way.

The compound and super-compounding methods result in a later distribution of profits than the simple method. The differences between the three methods are relatively small when investment returns are low. The differences become much more significant when investment returns are high and, for the super-compounding method, the gap between the two bonus rates is increased.

The second part of the spreadsheet shows the impact if, from year 6, the rates of investment return increase substantially. The bonus rates for years 6 onwards have been re-equated so that the maturity values again match the asset shares. The simple bonus rate has to increase by more than the other rates.

The third part of the spreadsheet shows the results for a new policy that commences at the beginning of year 6. The bonus rates are the same as in the second part. If these bonus rates continue right through to maturity, the maturity values will be well in excess of the asset share. In theory, this outcome could be avoided by reducing the bonus rates from year 11 (after the policy in the second part of the spreadsheet matures). However, it would be hard to explain to policy owners why bonus rates have reduced from year 11 when investment returns are unchanged. Alternatively, a separate bonus series could be started for new policies, but this would add significant administrative complexity.

This example illustrates why reversionary bonuses do not cope well with fluctuating investment returns. The mathematical reason for this is that the bonus rate is applied to the sum insured (and existing reversionary bonuses for compound bonuses), whereas investment returns are earned on the asset share. In the early years of a policy, the sum insured greatly exceeds the asset share and the asset share may even be negative if there are high acquisition costs. The sum insured remains constant whereas the asset share grows continuously throughout the term of the policy. At times when interest rates are unusually high, the super-compounding method provides a more equitable outcome as it allows higher investment returns to be passed to policies with longer durations and substantial asset shares, whilst limiting the amount of bonuses added to newer policies with small asset shares.

Up until the late 1980s, one of the main sales tools of life companies was projections of future benefits made using current bonus rates. The examples show that such projections can significantly overstate the likely benefits when interest rates and investment returns are abnormally high.

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26.4.1. Interim bonuses

A life company that declares reversionary bonus rates at the end of each year will normally pay an interim bonus on policies that terminate during the year. Interim bonus rates are sometimes set conservatively to minimise the possibility of having to adjust policy values downward (for those policies that have not terminated) when the final bonus is declared. An interim reversionary bonus will be pro-rated to reflect the portion of the year that the policy remained in force.

26.5. Terminal Bonuses

Terminal bonuses were introduced around the 1960s in Australia as a response to changes in the investment strategies of life companies. In the 1950s, life companies began investing a significant proportion of their assets in more volatile asset classes such as equities and property. Previously, life company assets had predominantly been invested in loans and fixed interest investments.

Terminal bonuses were a useful mechanism for adjusting policy values in response to fluctuating investment returns. Unlike reversionary bonuses, existing terminal bonuses could be reduced or removed from a policy in response to poor investment returns.

The methods for distributing terminal bonuses include:

- terminal bonus equal to a percentage of existing reversionary bonuses;
- terminal bonus equal to a percentage of sum insured and existing reversionary bonuses multiplied by the number of years the policy has been in force;
- terminal bonus equal to a percentage of existing reversionary bonuses, the rate varying by year of policy commencement; and
- terminal bonus equal to a percentage of surrender value multiplied by the number of years in force.

The methods vary as different life companies have different views on how equity between different groups of policy owners can best be achieved. Administration systems may also be a constraint on the method adopted.

Terminal bonuses are payable on death and maturity benefits. Most life companies also pay them on surrenders, but using a more penal surrender basis than for reversionary bonuses. Using a penal basis results in a smoother progression of surrender values from year to year, even though terminal bonus rates might vary significantly. It also reduces the risk of anti-selective surrenders occurring after a major drop in asset values, but before a company has been able to implement a reduction in its terminal bonus rates.

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Life companies typically declare terminal bonus rates annually, but may vary the rates more frequently if they deem it necessary. A more frequent variation in bonus rates will improve equity between policy owners whose policies terminate at different times. It will also potentially reduce a life company's capital requirements as benefit payments can be reduced more rapidly in response to major falls in asset values.

The main advantages of using terminal bonuses are improved equity between policy owners and a reduction in shareholder capital requirements. A significant disadvantage for shareholders is the deferral of profit emergence.

26.6. Equity

Equity is an often-mentioned, but hard to define concept. For participating business, equity has two dimensions: between policy owners and shareholders, and between different groups of policy owners.

26.6.1. Equity between shareholders and policy owners

The Life Insurance Act 1995 clearly defines the interests of participating policy owners and shareholders in a statutory fund. Since 1996, life companies have had to maintain separate allocations of retained profits and capital for participating policy owners and shareholders. Under the 1945 Act this was not the case and ownership was not clearly demarcated. On transition to the 1995 Act, the "starting amounts" of policy liabilities and policy owners' retained profits had to be determined by the appointed actuary. The starting amounts were required to be consistent with the history and structure of the business of the statutory fund and needed to be sufficient to secure the reasonable benefit expectations of policy owners.

Conflicts of interest between participating policy owners and shareholders can still occur under the 1995 Act. Potential areas of conflict include the allocations of expenses, investment income and tax. For example, judgement is required in allocating overhead expenses amongst different categories of business. The majority of overhead expenses allocated to participating business will be borne by policy owners, whereas overhead expenses allocated to non-participating business will be borne entirely by shareholders.

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Capital requirements can also create potential conflicts of interest. Participating business always provides guaranteed minimum benefits in some form (e.g. for traditional business the sum insured and premiums are guaranteed). Guarantees must be supported with capital. A life company can potentially minimise the amount of shareholder capital required to support participating business by moving the asset allocation towards a more conservative asset mix, by placing greater reliance on non-guaranteed terminal bonuses instead of reversionary bonuses, or by suppressing bonus distributions so that policy owners' retained profits build up over time. However, all of these actions are likely to disadvantage policy owners.

APRA's prudential practice guide LPG 260 Conflicts of Interest under Section 48 is useful background reading on the management of conflicts of interest between the policy owners and shareholders of a life company.

One issue to note is that the method of allocating profits on participating business between policy owners and shareholders may not be particularly equitable in all circumstances. A participating policy effectively guarantees a minimum rate of investment return to policy owners. For traditional business, this is the rate using in the premium basis. For investment account business, the minimum guaranteed rate is usually zero, but can sometimes be greater. Investment returns greater than the guaranteed rate (together with profits from other sources) are split between policy owners and shareholders, usually in the ratio of 80:20.

When long-term interest rates are very low, there can be a significant risk that actual investment returns will be less than the minimum guaranteed rate. Shareholders" capital will be required to support this guarantee, but the expected return on capital will be unduly low (and if interest rates are extremely low losses might be expected). In contrast, when long-term interest rates are high, the risk of inadequate investment returns and the capital required will be much smaller and the expected return on shareholder capital will be unduly high. A theoretically correct pricing of risk would allocate a higher proportion of profits to shareholders when long-term interest rates are low and a lower proportion when long-term interest rates are high. In practice this is not possible because the allocation of profits to shareholders is limited to maximum of 20%. In addition, policy conditions or reasonable expectations may prevent a life company from varying the allocation of profits.

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Achieving equity between policy owners and shareholders is a more difficult issue in overseas countries where there is no legislative requirement for life companies to allocate capital and retained profits between shareholders and participating policy owners. In this situation, the ownership of the "orphan estate" (unallocated capital and retained profits in excess of amounts required to meet reasonable expectations) can become problematic. The question of ownership becomes important if shareholders need to inject additional capital or wish to withdraw excess capital from a life company. Shareholders will be reluctant to inject capital if it is not clearly identified as belonging to them and can be repaid when it is no longer needed. If the ownership interests of existing capital and retained profits are not clearly identified, it becomes difficult to decide whether any excess capital should be distributed to policy owners or shareholders.

26.6.2. Equity between policy owners

Bonus or crediting rates will usually vary between the following groups:

- policies with fundamentally different designs (e.g. traditional and investment account policies);
- ordinary, superannuation and exempt (retirement income) business. Bonus rates much reflect differences in rates of taxation;
- policies with significantly different benefits, guarantees or asset allocations. For example, whole of life policies have very long terms and may have a different asset allocation from shorter term endowments. Pure endowments may be distinguished from endowment policies that provide death cover;
- policies with premium rates based on different pricing assumptions (e.g. different bonus loadings);
- policies that commenced at different points in time. There will be differences in historical experience for different cohorts of policies and there may also be differences in pricing assumptions.

The level of subdivision used in setting bonus rates for different groups of policies is a matter for judgement. A balance must be struck between having an excessively complicated bonus structure and achieving a reasonable degree of equity between policy owners.

Equity between different groups of policies can be assessed by comparing endowment maturity values (or death benefits at advanced ages for whole of life policies) with asset shares. This comparison can be made for current maturities when setting terminal bonuses and, on a projected basis, when setting reversionary bonus rates for policies that will mature in the future.

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If the distribution of bonuses is equitable between different groups of policy owners, the ratio of maturity values to asset shares should be similar for all policies maturing at the same point in time.

There should also be a reasonable degree of equity between policies that mature at different points in time. However, one of the key features of participating business is the smoothing of investment returns, so some degree of inequity between policies maturing at different points in time is to be expected. The smoothing of investment returns is also one of the reasons why there will normally be differences between maturity values and asset shares at any point in time.

The distribution of non-investment experience profits between different types of policies can be a difficult issue to resolve. In particular, it is not always clear how surrender experience profits should be distributed. For groups of policies that are in rapid run-off, the distribution of surrender profits or losses to the remaining policies in that group can create tontine effects. On the other hand, distributing losses arising from one type of policy (e.g. investment account) to a different type of policy (e.g. traditional) could be considered unfair to the latter.

26.7. Profit Emergence

Under the Life Insurance Act 1995, the distribution of profit is nominally independent from the emergence of profit. However, the best estimate bonuses must be consistent with the actual method of bonus distribution. If terminal bonuses are used in practice to distribute part of the profits, the best estimate bonuses must also include a realistic allowance for terminal bonuses.

Terminal bonuses are only distributed when a policy terminates. The use of terminal bonuses therefore delays the emergence and distribution of profits to both policy owners and shareholders. This feature can cause distortions in profit emergence. For example, if an unusually large number of policies terminate in a single year there can be a temporary increase in reported profit, even though there has been no real improvement in the financial position of the life company. This is one of the reasons why embedded values are a useful form of supplementary financial reporting.

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26.8. Capital Requirements

Policy owners' retained profits (PRP) are included in the participating policy liability for the purpose of calculating a life company's capital base. A distribution of retained profits in the form of reversionary bonuses should normally have only a minor impact on the capital base (refer to the formula for adjusted policy liabilities in LPS 112). A minor impact is almost certain to occur because the cost of the declared bonus (deducted from PRP) reflects its surrender value, whereas the resulting increase in RFBEL depends on best estimates of future experience and the discount rate. The surrender basis for reversionary bonuses is unlikely to be the same as the valuation basis for RFBEL.

A distribution in the form of terminal bonus would normally not affect the capital base or Prudential Capital Requirement as terminal bonuses are, in effect, paid directly from policy owners' retained profits to the owners of the terminating policies.

In contrast, a reversionary bonus is guaranteed and the declaration of a reversionary bonus reduces the ability of the capital base to absorb the stresses applied in the calculation of the insurance risk charge and the asset risk charge. The capital base is more resilient to these stresses if the distribution of retained profits is deferred by declaring terminal bonuses instead of reversionary bonuses.

26.9. Administration Systems

Any change to the method of bonus distribution will affect administration systems. If the product is open to new business it will also potentially affect sales systems. The actuary will have to consider whether the cost of making system changes is justified by benefits in other areas.

An example of this issue would be a change in the frequency of declaration of terminal bonus rates from once each year to quarterly (or even more frequently). In periods when asset values are volatile, more frequent changes to terminal bonus rates would improve equity between policy owners for claims paid at different points in time. It would also reduce the amount of capital needed to support the business as claim payments could be reduced quickly in response to a fall in asset values. However, the system change could be costly if the administration system is old and inflexible. In this type of situation, it can be difficult to judge whether the benefits of the change outweigh the costs.

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26.10. Impact on Surrenders

Distributions of profit can have an impact on future experience and profit emergence. The most direct effect is on future rates of surrenders. If bonus rates are lower than policy owners expect, rates of surrender may increase. This can lead to experience profits or losses, depending on whether surrender values are lower or higher than policy liabilities. It will also affect a life company's appraisal value, usually adversely. On the other hand, if a company is struggling to meet its target capital requirements an increase in surrenders can be a good thing as capital will no longer be required to support the surrendered policies.

If a life company maintains bonus rates in the face of falling investment returns it can create an expectation that its bonus rates will not fall. This creates the likelihood of future capital strains and the potential for poor profitability if over-crediting cannot subsequently be recouped. The company could suffer a loss of reputation due to its failure to meet expectations when it does eventually reduce its bonus rates at some point in the future.

In Australia AASB 1038 acts as a deterrent to over-crediting of bonuses as unvested policy benefits liabilities (which include policy owners' retained profits) cannot become negative. Once unvested benefits liabilities reach zero, any further distributions of vested bonuses to policy owners must be reported as a loss to shareholders. For APRA and Life Act reporting purposes, policy owners' retained profits can become negative.

26.11. Impact on New Business

In some overseas countries where traditional business continues to be sold, the financial press regularly compares the current maturity values for endowment policies issued by different life companies. In some countries, it may still be permissible to illustrate future maturity values using the latest declared bonus rates. A life company that continues to sell participating business in either of these circumstances may be reluctant to cut bonus rates in response to low investment returns as there is likely to be an impact on future sales of new business unless other companies make similar cuts.

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26.12. Variations in Policy Owners' Retained Profits

As noted in earlier chapters, for participating business investment experience is included within the VSA and hence the policy liability. However, mortality, expense and surrender experience emerges as an experience profit. This leads to variations in policy owners' retained profits unless these experience items are immediately distributed to policy owners. The investment returns on the assets backing policy owners' retained profits will also result in variations.

Another source of variation is the differences between actual and best estimate bonus rates. One of the reasons for these differences is the need to run-off retained profits as the closed book of participating business runs off. Another reason is that changes to actual bonus rates are often smoothed.

Best estimate bonus rates are normally set using an algorithm. Typically, the algorithm assumes the best estimate bonus rates remain unchanged until the business has run off. The best estimate bonus rates will be heavily dependent on past actual investment experience and the estimates of future investment returns. Both of these items are volatile. Estimates of future investment returns are usually linked to a prevailing long-term interest rate, such as the 10 year government bond yield or a long-term swap rate which can vary significantly from year to year. Life companies typically aim to dampen the volatility of their declared reversionary bonus rates, so that they follow a relatively smooth trend. Policy owners' retained profits can therefore act as a form of smoothing reserve for bonuses.

26.13. Closed Books and the Tontine Problem

Participating business in Australia is effectively closed to new business and in run-off. The reasons for this state of affairs were briefly mentioned in Chapter 1. They include the inflexible and opaque product design for policy owners and the inadequate returns on capital these products provide for shareholders in a low interest rate environment. Run-off will, however, take many years to complete as much of the participating business is in the form of whole of life policies.

The Life Insurance Act only allows Australian policy owners' retained profits to be distributed to Australian participating policy owners. Hence life companies need to plan the distribution of these retained profits to their remaining policy owners. Otherwise an amount of policy owners' retained profits could in theory remain as a liability on the balance sheet forever after all of the participating policies have terminated.

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A tontine is a type of investment contract that was common in the 18th and 19th centuries. The members of a tontine each received a lifetime annuity. On the death of a member, their share of the tontine passed to the survivors. On the death of the last survivor the tontine expired. The annuity payable to the last survivor could potentially be very large indeed.

A closed book of participating business can behave like a tontine if policy owner retained profits are not carefully managed as the business runs off. In order to run policy owner retained profits down to zero, profit distributions need to closely match the profits emerging and also allow for the distribution of existing retained profits. As the business runs off it may become necessary to adopt strategies that reduce the volatility of emerging profits, so that bonus distributions do not become unduly volatile. These strategies might include a gradual move to a more conservative asset allocation, the reinsurance of mortality risks and the adoption of a surrender basis that closely matches the policy liabilities and retained profits.

26.14. Investment Account Policies

The previous sections of this chapter highlight the difficulty of achieving an equitable distribution of profits to traditional policies. One solution to the problem of equity is the investment account policy, where profits are distributed as interest additions to policy owners' account balances. The account balance for an investment account policy is similar to an asset share but with smoothed investment returns. These contracts were very popular during the 1980s but largely disappeared from sale during the 1990s. Some Australian life companies still have significant amounts of this type of business in force.

Crediting rates can be declared either in advance or in arrears. If rates are declared in advance, the latest declared rate will continue to apply until the life company announces a change to the rate. If rates are declared in arrears, the crediting rate for each year is announced after the end of that year and an interim crediting rate is applied to terminating policies for the period since the last year end.

26.14.1. Competition and Market Pressures

In theory, investment account policies are meant to smooth crediting rates by paying less than the actual investment return in years when investment returns are good and more than the actual investment return in years when investment returns are poor. However, this creates a strong potential for anti-selection by policy owners.

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Crediting rates for investment account policies, unlike bonus rates for traditional business, are easily compared with interest rates offered by banks and other financial institutions. In simple terms, if a life company experiences poor (potentially negative) investment returns it will smooth the impact on policy owners by declaring a crediting rate that is higher than the rate it earned on its investments. But it can only recoup the excess of past interest credits over past investment returns by crediting less than it earns on its investments in future periods. The impact of these reductions may make future crediting rates uncompetitive. In this situation, policy owners will be more likely to surrender and the company may find itself unable to recoup all of its past over-crediting.

As an example, consider a company that invests entirely in fixed interest assets. When market interest rates rise, fixed interest assets fall in value. Crediting rates would need to rise to maintain their competitive position with other market interest rates. However, a life company may not be able to increase its crediting rates as it will need to recoup its investment losses. In fact, if the expected duration of the liabilities is similar to the duration of the fixed interest assets, the crediting rates should stay broadly unchanged.

Similarly, if recent investment returns have been better than expected, crediting rates may become excessive compared to other market interest rates. This will encourage increased volumes of new business whilst the product remains open for sale. Crediting rates for new policies will be cross-subsidised from the excess investment returns already earned on assets backing existing policies.

The risk of anti-selection can be mitigated by applying penalties on the surrender of a policy. Surrender penalties can only be applied if they are allowed by the policy and have been clearly disclosed at the point of sale. The ability to reduce surrender values is a desirable feature for life companies, but makes these products less marketable. Some investment account policies have no maturity date. In these circumstances payment of the full amount of the account balance might be guaranteed on surrender at specific times, whilst at other times a penalty might be applied.

Common methods of applying surrender penalties include:

- market value adjustments – multiply the account balance by a factor that broadly reflects the ratio of asset shares to account balances;
- terminal bonuses – part of the investment return is credited as a terminal bonus which can be reduced or removed at any time;
- deferred payment of surrender values with a reduced crediting rate payable during the deferral period. This method was sometimes used for group investment contracts sold to superannuation funds. The deferral period could be several years. If the superannuation fund needed the money earlier, the surrender value would more closely reflect the asset share.

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For investment account policies without surrender penalties, the amount of capital required can be substantial if there are risky assets backing the policies. APRA's capital adequacy standards effectively require life companies to hold sufficient capital so that all surrender values can be paid immediately following a substantial drop in asset values.

A variation on the investment account policy that was popular in the UK for a time was the "unitised with-profits contract". This looked liked an investment-linked contract, but the unit price was smoothed by the life company and guaranteed not to reduce.

26.14.2. Non-participating investment account policies

As noted previously in this chapter, if the account balances will always be between 95% and 103% of the value of the assets, an investment account policy is classified as non-participating and all profits (other than investment experience) are allocated to shareholders. In order to avoid breaching the limits, these types of policy must have a conservative asset mix consisting mostly of short term fixed interest assets and the crediting rates must be actively managed. The crediting rate will tend to move in line with short term market interest rates, with some additional adjustment to reflect differences between actual and expected investment returns. Crediting rates are not affected by non-investment experience as profits from these sources are allocated entirely to shareholders.

26.15. The Contribution Method

The contribution method is an example of an alternative method of profit distribution. It is commonly used in the United States. Under this method of profit distribution, a policy's share of profit is paid immediately as a cash dividend. The share of profit is calculated by a "dividend formula" which expresses the contribution made by each policy to profits from the three sources of interest, mortality and expenses. The dividend formula can be written as:

$$D = (V_0 + P) \cdot (i'' - i) - (q'' - q) \cdot (1 - V_1) + (P' - P - e'') \cdot (1 + i'')$$

Symbols have the usual meanings, double accent denotes actual experience, single accent the premium basis and unaccented symbols the valuation basis.

In practice, actual experience is usually based on an average of recent trends.

The interest component is usually the largest part of the dividend and it increases with policy duration. The mortality contribution tends to decrease with duration.

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A simple cash dividend calculation is shown below:

Sample Cash Dividend Calculation as at 30/06/2004

Date of entry		30-Jun-02	30-Jun-84	30-Jun-99	30-Jun-94
Age at entry		30	30	30	30
Current age		32	50	35	40
Policy year (t)		2	20	5	10
Interest					
Policyholder share	A	50%	80%	70%	80%
Actual investment return	B	5%	5%	5%	5%
Pricing interest rate	C	3%	3%	3%	3%
Reserve @ t-1	D	5	940	120	360
Reserve @ t	E	40	1000	170	420
Interest contribution	O=A*(B-C)*0.5*(D+E)	0.23	15.52	2.03	6.24
Mortality					
Policyholder share	F	50%	0.8	0.7	0.8
Actual pricing mortality ratio	G	50%	0.68	0.54	0.71
Pricing mortality rate	H	0.00091	0.00322	0.00098	0.00141
Death benefit	I	1,000	1,000	1,000	1,000
Reserve @ t-1	J	5	940	120	360
Mortality contribution	P=F*(1-G)*H*(I-J)	0.23	0.05	0.28	0.21
Expense					
Policyholder share	K	50%	80%	70%	80%
Actual pricing maintenance expense ratio	L	85%	65%	65%	65%
Maintenance expense as % of premium	M	8%	8%	8%	8%
Annual premium	N	50	0	50	50
Expense contribution	Q=K*(1-L)*M*N	0.30	0.00	0.98	1.12
Total cash dividend	O + P + Q	0.76	15.57	3.29	7.57

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Chapter 27 – Appraisal Values

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27.1. Introduction

This chapter provides an introduction to appraisal values. An appraisal value is an economic valuation of the shareholders' interests in a life insurance or other financial services company. The calculation of appraisal values is an important task for actuaries in the life insurance and wealth management sectors of the financial services industry.

Many companies perform internal appraisal valuations of their businesses. These provide critical management information on the value of the business and how it is changing. Additionally, some life insurance companies publish appraisal values (or components thereof) as supplementary financial information for external market analysts.

Appraisal values also often form the basis for assessment of value in merger and acquisition, as well as business restructuring activities.

Practice Guideline 199.03 Economic Valuations published by The Institute of Actuaries of Australia applies to actuaries performing an economic valuation of an economic asset. An appraisal value is one particular type of economic valuation.

There are no prudential (APRA) or accounting standards governing the calculation and disclosure of appraisal values in Australia. The methodology for the calculation of appraisal values described in this chapter is commonly used in Australian-based life companies. However, some companies use alternative methods. In Europe, the CFO forum has published principles and guidance for Market Consistent Embedded Values (MCEV). These principles have been widely adopted by European life companies. The MCEV principles are described in the last part of this chapter.

27.2. Definition of Appraisal Value

The appraisal value of a life insurance company is an estimate of the value of the life insurance business to the shareholders of the company.

An *appraisal value* has three components:

- adjusted net worth;
- value of in force business; and
- value of future new business.

The sum of the adjusted net worth and the value of in force business is known as the *embedded value*.

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Where a life insurance company has participating business, the appraisal value is based on the shareholders' interest in the profits of the participating business. It does not include profits allocated to policy owners.

27.3. Adjusted Net Worth

Net worth refers to the 'excess assets' of the company. It is the amount of shareholder assets in excess of regulatory capital requirements and could in theory be paid to shareholders immediately. In most circumstances the net worth can be calculated as the capital base less the prudential capital requirement (PCR).

The prescribed capital amount would be used instead of the PCR if the embedded value was to be disclosed to persons outside the company. Any supervisory adjustments included in the PCR must remain confidential. If subordinated debt was included in the capital base, it would need to be excluded from adjusted net worth as it does not belong to shareholders.

Sometimes target capital is valued as part of the value of in force business, instead of being included in adjusted net worth. This recognises that life insurance companies must, in practice, hold surplus assets in excess of the PCR to provide a buffer against the risk of breach. This amount (or a component of it) may be deducted from net assets to reflect that surplus assets may not, in practice, be immediately distributable to shareholders. If surplus assets are included in the value of in force, the overall embedded value will be reduced due to the delay in the availability of such assets to shareholders and the risks associated with this delay.

27.4. Value of In Force Business

The value of in force business is the present value, at the hurdle rate (or risk discount rate), of future distributions to shareholders of profits and capital. It excludes capital that has already been included in the adjusted net worth. The amount that can be distributed at the end of each year is the profit for the year, plus the amount of capital that can be released. Capital releases are only possible if the projected capital base meets the projected PCR. These distributions are often known as "distributable profits".

The hurdle rate represents the investment return required by the providers of capital, i.e. the life insurance company's shareholders and debtholders, if applicable. The hurdle rate normally exceeds the expected after tax rate of investment return on the assets backing capital and this results in the present value of future distributions of capital being less than the current face value of capital. This difference between the current face value of capital and the present value of future distributions is sometimes referred to as a "cost of capital".

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The value of in force business is determined from a cash flow projection, not dissimilar to that used for the projection method for calculating the value of future profits for insurance contract policy liabilities. The key differences between the valuation of future profits and the valuation of in force business are:

- A valuation of in force business requires projections for all types of business, including insurance contracts whose policy liabilities are determined using an accumulation method and investment contracts.
- Discount Rates – the value of in force is determined using a hurdle rate (or risk discount rate) representing the required rate of shareholder return whereas insurance contract policy liabilities are calculated using the expected earned rate on the assets backing the business or a risk free discount rate.
- Prudential Capital Requirement – the value of in force business includes the release of the capital required to meet the PCR for the business as well as the best estimate shareholder profits emerging from the policy liabilities. The amount of capital needed to meet the future PCR needs to be projected as well as the policy cash flows.
- Investment returns – the value of in force business includes the investment earnings on the assets backing the policy liabilities and capital. The rate of investment earnings is the best estimate. The discount rate differs from the investment earnings rate. Therefore, investment earnings have to be projected as an explicit cash flow item.
- Tax – this must be modelled as an explicit cash flow item. Profits must be valued net of tax.

Best estimate assumptions are used to determine appraisal values. For insurance contracts, the mortality, morbidity and lapse assumptions are usually the same as the assumptions used in determining policy liabilities. Expense assumptions may differ as an embedded valuation may allow for anticipated future expense savings. There may also be an allowance for future changes to pricing. Future reductions to fees and/or premiums may be assumed to occur due to competitive pressures – this is known as "margin squeeze". For investment-linked contracts, assumptions for lapse/withdrawal rates and servicing expenses are necessary, even though these may not be required to value the policy liabilities.

Determining an appropriate risk discount rate is one of the most challenging and important tasks in an appraisal value calculation. This issue is discussed further in the readings for this course. The risk discount rate must be consistent with the risk free rate. The risk discount rate is usually set at a margin above the risk free rate. This margin is also referred to as the risk premium and a range of 3% to 5% is commonly used. Effectively, this means that shareholders expect to earn a return that is 3% to 5% above the risk free rate on the capital they invest in a life company.

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27.5. Value of Future New Business

To arrive at an appraisal value, the value of future new business is added to the embedded value.

The value of future new business is the value of the shareholder profits expected to emerge from future sales of new business, net of the cost of supporting capital.

Valuing new business may be done in a number of ways. These include:

- estimating sales into the future and building a projection model of the distributable profits from all such future sales; and/or
- calculating the value of one year's new business and multiplying by a "capitalisation" factor. The capitalisation factor depends on the number of years of new business that are to be included in the appraisal value and the discount rate (and margin squeeze/expansion) that is considered appropriate for this purpose.

The value of future new business is often the more subjective component of the appraisal valuation, as there can be a lot of uncertainty around future sales volumes and future pricing. Depending upon the size of the company, the stage of development of the company, the relative profit margin on its new business and the potential for future growth in sales, the value of future new business can be the most materially significant part of the appraisal valuation. In a merger or acquisition scenario, the potential synergies from market expansion and scale of operations may also be significant.

The first step in estimating future sales volumes is to estimate the likely growth in the life insurance market. This will vary by product – for example sales of superannuation and risk products might be expected to grow strongly for a number of years, then stabilise at a lower growth rate as a greater proportion of the population enters retirement. The next step is to estimate growth rates for the company by allowing for future changes in the company's share of the total market.

An Embedded Value projection often uses unit costs to project expenses. However, when the Value of Future New Business is added in the projected total expenses should be reviewed in order to test if the projected expense base looks reasonable. Allowance needs to be made for:

- Fixed costs that will not increase with volume
- Semi fixed costs which will increase in a stepped fashion. A good example of this is computer systems
- Variable costs, particularly business processing costs

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For the purpose of providing supplementary information to market analysts, some life companies disclose the embedded value and the value of the new business sold in the latest reporting period. This information allows analysts to calculate the appraisal value using their own estimate of an appropriate capitalisation factor for future new business.

27.6. Imputation Credits

The value of imputation credits is often included in embedded and appraisal values of life insurance and wealth management businesses.

Imputation credits (also known as franking credits) are tax benefits that are passed to shareholders with their dividend distributions. An imputation credit represents the amount of tax that the company has already paid on its shareholder profits.

Australian shareholders have to pay tax on their dividend income, but they can reduce their tax liability by the amount of imputation credits they have received with their dividends. If they did not receive imputation credits they would effectively be taxed twice – the life company paying tax on its profits and the shareholders paying tax again on their dividends. Imputation credits have value to some, but not all shareholders.

Foreign shareholders are generally only able to obtain partial value from imputation credits by using them as an offset to withholding tax that would otherwise be payable.

The value attributed to imputation credits will depend on the ownership of the company and the purpose of the valuation. For a foreign-owned company, the value might be zero if the company was assumed to continue in foreign ownership. But if the foreign parent was intending to sell the company to an Australian entity, the imputation credits would potentially have a value to the new owners.

The explicit valuation of imputation credits is usually disclosed as separate items for both in force and future new business in the appraisal value. This allows the users of the information to assess the impact of including imputation credits in the valuation.

Including imputation credits essentially means that an appraisal value represents the value of the business in the hands of the shareholders, before the shareholders are taxed on their dividend income. This is often referred to as a "gross-gross" valuation. This means that a before tax or "gross" risk discount rate is applied to net of tax profits plus imputation credits. The resulting appraisal value is effectively before tax or "gross" of tax for the shareholders.

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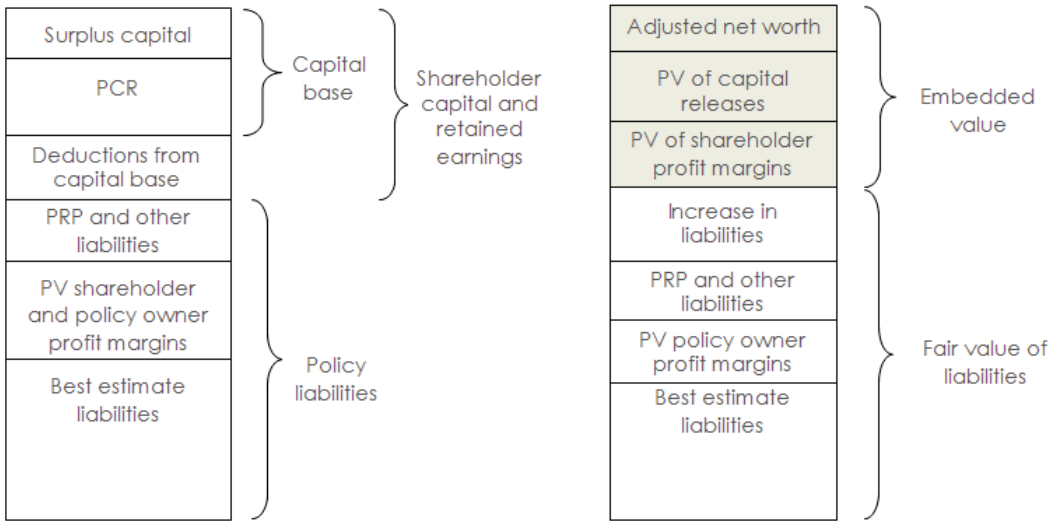
Sometimes a valuation may exclude imputation credits and use a discount rate that is "net" of tax. A net of tax discount rate applied to net of tax earnings (i.e. a "net-net" approach) should produce an equivalent result to the "gross-gross" method. However, it is less useful to the users of the information because they cannot adjust the results to reflect their own tax position (i.e. they cannot deduct the value of imputation credits if the credits are of no value to them).

27.7. Embedded Value Reporting

The breakdown of the total assets of a life company into its liability and capital components is represented graphically below. The column on the left shows the breakdown that corresponds to the balance sheet, with shareholder capital further broken down into surplus capital, the PCR and the deductions from the capital base. For life investment contracts, profit margins and best estimate liabilities are implicit in the policy liabilities, even though these concepts are not explicitly used in the valuation. The column on the right shows the breakdown according to economic values. The total height of both columns must be the same as the total assets are the same (fair value) under both reporting methods.



On the right hand side, the economic value of the liabilities and policy owners' retained profits (PRP) has been called the "fair value of liabilities". The fair value includes an item called "increase in liabilities" which arises because of the use of a hurdle rate to discount shareholder profits and because of the treatment of tax in the embedded value calculation.

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The fair value of liabilities is the amount for which a liability could be settled, between knowledgeable, willing parties in an arm's length transaction. If a liability is transferred between life companies, the company acquiring the liabilities will want to earn a hurdle rate (above expected investment returns) on the capital they must provide to support the liabilities. They can only earn the hurdle rate if the assets they receive exceed the best estimate of the liabilities. The excess of fair value over best estimate (including PRP and policy owner profit margins) is a margin for risk which reduces the PV of shareholder profits on the economic balance sheet compared to the normal balance sheet.

In the diagram on the left, PV shareholder profits are valued gross of tax (for products taxed on profits). In the diagram on the right, PV shareholder profits are valued net of tax and tax is treated as part of the best estimate liabilities.

Another point to note is that "deductions from the capital base" on the left hand side are included in "PV of capital releases" on the right hand side. For example, deferred tax assets in excess of deferred tax liabilities must be deducted from the capital base, but will form part of the embedded value. The capital base is measured using a "wind-up" basis, whereas the embedded value is measured assuming the company continues as a going concern. Deferred tax assets can have zero value in a "wind-up" but can be used to reduce future tax liabilities for a going concern.

The diagram does not include the value of future new business. If this was included, the liabilities would reduce (if future new business has a positive value to shareholders the best estimate liability for it must be negative) and embedded value would be replaced by a larger block representing appraisal value.

An alternative presentation of EV results is sometimes used, in which the adjusted net worth includes the full face value of locked in capital, and the value of in-force business is presented as the present value of shareholder profit margins less the difference between the face value and the present value of the ultimate release of that locked-in capital.

27.8. Other Considerations in Determining an Appraisal Value

When conducting an appraisal value you should be clear about who you are preparing it for, who will use it and the purpose of the appraisal value. You will also need to understand the business you are valuing. Based on these you should select appropriate methods, models and assumptions. If, for example the business you are valuing is a small, immaterial part of a bigger economic valuation, your valuation of the "smaller" entity may be approximate.

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If the appraisal value might be used for purposes other than those intended, you should disclose any qualifications or limitations on the usage of the appraisal value. For example, where the appraisal value could reasonably be construed to be a market value or fair value when this was not the intended purpose, you should include a statement to that effect in the your report.

An appraisal value is very sensitive to the assumptions that are used. It is very different in this respect from policy liabilities, where a change in assumptions often has no impact on the results. An appraisal value investigation should highlight the sensitivity of the results to changes in the key assumptions.

27.9. Analysis of Change in Appraisal Value

If appraisal values are used for regular financial reporting, it is important to analyse the movement in the appraisal value since the previous valuation. Internal management and external analysts need to understand the reasons for the change in appraisal value. It is of little value to report a large movement in appraisal value without giving an explanation of why the movement occurred.

The analysis of change also acts as a check on the accuracy of the calculations (unexplained items should be small). It highlights areas where there has been a significant deviation between actual experience and the best estimate assumptions and areas where there has been a significant change to best estimate assumptions.

Conceptually, the approach and items that appear in an analysis of change in appraisal value are similar to the analysis of profits. A sample representation for the analysis of change in appraisal value (for a savings portfolio) is shown below.

Analysis of Change in Appraisal Value

Analysis Item	Appraisal Value
	$m
Value at start of year	1,000
Expected change in value	110
Expected value at end year	1,110
Experience variations over period	
expenses	(20)
sales (volume)	8
sales (mix)	16
redemptions	(16)
investment earnings	(20)
	8
Assumption changes	
redemptions	(85)
	(77)
Actual value at end year	**1,033**

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The example illustrates the type of items which could appear in an analysis of change. In practice, the key variance items will depend upon the business being valued and what the variations are. For example, if the information above were based on a risk portfolio rather than a savings portfolio, then variance items relating to claims experience would be included. Changes due to movements in the risk free discount rate and risk discount rate are always likely to be significant, although they are not shown in this table. Other items which may appear include changes to the assumed growth rate of future new business, pricing changes, dividend payments to shareholders and capital injections.

In practice the analysis is likely to be further split so that it explains the movement in embedded value (often including a separate analysis of the movement in adjusted net worth) and the movement in the value of future new business. One of the most important items in the analysis of change for both of these items is the value of the new business sold during the reporting period. The value of new business sold will explain part of the increase in the embedded value. It will also directly affect the value of future new business if this is calculated using a capitalisation factor applied to the value of one year's new business.

Because the value of one year's new business is such an important item in determining the appraisal value, it is important to analyse the reasons why it changes from one year to the next. Changes in the value of one year's new business will be mainly driven by changes in volume and mix, best estimate assumptions, acquisition costs and product pricing.

27.9.1. Expected Change in Appraisal Value

The expected value is most commonly calculated by "rolling forward" the appraisal value from the previous reporting date. Simplistically, this involves growing the net worth at the assumed fund earning rate, growing the value of in force and value of future new business at the risk discount rate (referred to as "unwinding the discount rate") and adjusting the net assets for dividend payments to shareholders (including franking credits) and new capital raised during the period.

Additional complicating steps are to:

- allocate expected cash flow for the period from both in force and new business over the period into the net assets (and subsequently remove from the value of in force and new business) and
- adjust the value of in force and value of future new business by transferring the present value of future profits from the new business expected to be written over the period to the in force, as by the end of the period such new business would now be in force. This amount, now included as in force, should be removed from the value of future new business.

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27.9.2. Experience Variations and Assumption Changes

Experience variations occur when actual business volumes, cash flows and other items that were forecast in the previous appraisal valuation do not occur at the levels expected. For instance, sales inflows could be higher than forecast and this will impact the appraisal valuation as the number of contracts now being administered will be higher than forecast. This may generate higher past period and future period cash flows that will be reflected in a higher appraisal value compared to expected.

Some experience variations will be the same as for the analysis of profit. For example, there will be an item for death claims being different from the best estimate. Other experience variations will be very different.

Any assumption changes made at the reporting date will affect future expected cash flows and have a far greater impact on the appraisal value than on the reported profits. Assumption changes are identified separately from experience variances in the analysis of movement and the appraisal value will be affected by both changes in non-economic assumptions (e.g. claims, lapses) and economic assumptions (e.g. investment earnings rates, risk discount rates).

27.10. Comparison with Other Valuation Methods

Two other methods that can be used to value a life company are the shareholders' equity reported on the balance sheet (capital and retained profits) and a price/earnings ratio.

The equity on the balance sheet is not useful as a measure of shareholder value because:

- it ignores the value of future profits expected to emerge from the liabilities;
- it ignores the value of future new business; and
- it does not deduct a "cost of capital" from the capital held to meet the prudential capital requirement.

The method most commonly used to value non-life insurance companies is via a price/earnings (P/E) ratio. The latest year's profit (or next year's forecast profit) is multiplied by a P/E ratio. The P/E ratio is derived from a comparison of market values of similar listed companies to their reported profits. There is an obvious difficulty if there are no similar listed companies. In this circumstance a broader pool of reference companies could be used (e.g. companies in similar industries or foreign listed companies).

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Adjustments to the P/E multiple can be made to reflect company specific issues such as risk or growth rates. The reported profit may also be adjusted to remove any distortions such as one-off items. This method may be unsuitable for life companies because:

- profit margins can emerge unevenly (e.g. terminal bonuses for traditional business);
- the mix of business may change over time (e.g. new risk and investment-linked business may be less profitable than existing participating business);
- actual profit can be significantly distorted by experience profits (e.g. random variations in claims). Experience profits could be ignored, but the profit margins emerging for the current year will not reflect any changes to best estimate assumptions since the previous year end;
- there is no explicit allowance for risk. A lower P/E multiple could be used for business with higher perceived risk, however such an adjustment to the P/E multiple would be fairly subjective.

The P/E method can, however, be used for life companies that have a simple product range and a reasonably stable rate of growth. An example would be an established life company whose business consisted entirely of single premium investment-linked business.

An alternative to the P/E method is the price to book (P/B) ratio, which relies on net shareholder assets instead of potentially volatile company earnings.

27.11. Example 1

The following example is provided to assist in understanding the fundamental concepts and calculations of an appraisal value. A spreadsheet is provided for this chapter and this example is in sheet "Example 1". It is recommended students work through the example carefully.

The example is for a single YRT policy. In practice, this calculation would be done across a portfolio of policies. It is shown for illustration only under simplified assumptions. The best estimate rate of investment return is assumed to be the same as the risk free discount rate.

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You are given the following data, assumptions and information relating to the starting net worth:

Entry		56	next
Sex		Male	
Smoker		Non smoker	
Policy term		10	years
Premium term		10	years
Sum insured		250,000	increases with CPI annually
Premium payable		annually	
Risk free rate		7%	
Tax rate		30%	
Inflation		2%	
Expenses			
	Fixed initial	$350.00	point of sale
	Fixed renewal	$75.00	indexed and starts from beginning year 2
Commission			
	Variable initial	70%	of annual premium
	Variable renewal	5%	of annual premium, indexed and starts from beginning year 2
Mortality		100%	
Mortality table		IA90-92	
Lapse rate		15%	
Reserves as % IF	20%		Policy liabilities and capital requirements
Net worth (assets) at start	1,500.00		
Risk discount rate	10%		

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Term premium rates		Decrement Rates	
Male non-smoker			
Age next	Rate per $1,000 sum insured	Age next	qx
56	0.00553	56	0.0043
57	0.00622	57	0.0047
58	0.00703	58	0.00529
59	0.00797	59	0.00591
60	0.00900	60	0.00662
61	0.01027	61	0.00743
62	0.01168	62	0.00836
63	0.01324	63	0.00940
64	0.01507	64	0.01058
65	0.01704	65	0.01192

The resulting projection of cash flows (excluding interest earnings on net worth) is shown in the table below.

Embedded/Appraisal value											
Year	Premium	Investment Income	Death outgo	Mat outgo	Surr outgo	Expense	Commission	Increase in reserves	Distributable Profit (gross)	Tax	Distributable Profit (net)
1	1,383	5	1,065	0	0	350	968	277	-1,272	43	-1,315
2	1,342	104	1,023	0	0	65	68	-8	298	71	227
3	1,309	102	985	0	0	56	68	-7	308	69	240
4	1,280	100	949	0	0	48	68	-6	320	66	254
5	1,246	98	916	0	0	42	67	-7	325	63	262
6	1,224	96	886	0	0	36	68	-4	335	60	275
7	1,198	94	858	0	0	31	67	-5	342	57	285
8	1,168	92	829	0	0	26	67	-6	343	52	291
9	1,142	90	802	0	0	23	67	-5	346	48	298
10	1,107	88	775	0	0	19	66	-228	563	43	520
								Distributable Profit (lifetime)			1,336
								Distributable Profit (NPV 10%)			272.23

Note: Investment income for VIF/VNB calculations is that the earnings on those assets backing capital reserves. This is because the 'Excess Assets' component of the EV/AV implicitly includes the future earnings on these assets in the face/market value given to them.

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The initial excess assets held are assumed to be $1,500 in order to support the initial strain of the business. The ongoing policy liabilities plus capital requirements are assumed, for simplicity, as being 20% of annual premiums in force on business written. This results in the following reserves and excess assets, which are used in the derivation of the distributable profits.

Additionally, in order to determine the tax amount, it is necessary to determine the policy liabilities. To assist, the policy liabilities are shown below (you may also wish to confirm these in your calculations to refresh your understanding of policy liability calculations).

Reserves and excess assets

Year	Reserve (boy)	Excess assets (boy)	Policy liabilities (boy)
1	0	1,500	0
2	277	259	-1138
3	268	498	-1085
4	262	762	-1013
5	256	1,054	-920
6	249	1,367	-813
7	245	1,709	-682
8	240	2,078	-534
9	234	2,471	-372
10	228	2,889	-191

The appraisal value also needs to include a value for imputation credits. These are assumed to be worth 70% of the value of future tax payable. (Perform the calculation yourself based on the above tax cash flows!)

Using the results above and calculating imputation credits, the appraisal value can be expressed as:

Item	Value $	
Adjusted Net Worth	1,500	
Value of Inforce Business	-	As assumed only new business
Value of New Business	272	
Value of Imputation Credits	286	
Appraisal Value	2,058	

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27.12. Example 2

The following example is intended to show the fundamental concepts of an appraisal value as well as an analysis of change for an investment product. The workings can be found in the spreadsheet included with this chapter.

The example relates to 1,000 superannuation bonds that all mature in 10 years' time, when all of the clients turn 65.

Adjusted net worth	2,000,000	
Opening FUM	20,000,000	
All funds returned at end of 10 years as all members turn 65		
Premium p.a.	–	received at start of year
no of members	1,000	
Fees:		
Member fee p.a.	90	net of policyholder tax and paid at start of year
% fee	1.20%	net of policyholder tax and paid over the year
risk discount rate	12%	
Expenses:		
$ per member exp	75	paid at start of year
% per member exp	1.10%	paid over the year
Policyholder tax rate	15%	
Shareholder tax rate	30%	
Investment return	8%	
Lapse rate	12%	leaving midway through the year
PCR (% of FUM)	1%	
Assumes there are no deferred acquisition costs running off		
Distributable profits paid at end of year		

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Time	Number of members boy	P/H FUM at boy	Prem iums	P/H interest	P/H tax on interest	P/H fees gross of tax	P/H tax on fees	Lapses	Maturity	P/H FUM at eoy
1	1,000	20,000,000	0	1,504,000	-225,600	-380,318	57,048	-2,467,200	0	18,487,930
2	880	18,487,930	0	1,390,292	-208,544	-346,864	52,030	-2,280,671	0	17,094,173
3	774	17,094,173	0	1,285,482	-192,822	-316,558	47,484	-2,108,737	0	15,809,021
4	681	15,809,021	0	1,188,838	-178,326	-289,084	43,363	-1,950,201	0	14,623,611
5	600	14,623,611	0	1,099,696	-164,954	-264,159	39,624	-1,803,969	0	13,529,849
6	528	13,529,849	0	1,017,445	-152,617	-241,531	36,230	-1,669,042	0	12,520,333
7	464	12,520,333	0	941,529	-141,229	-220,974	33,146	-1,544,508	0	11,588,297
8	409	11,588,297	0	871,440	-130,716	-202,284	30,343	-1,429,532	0	10,727,547
9	360	10,727,547	0	806,712	-121,007	-185,280	27,792	-1,323,350	0	9,932,414
10	316	9,932,414	0	746,918	-112,038	-169,800	25,470	-1,225,263	-9,197,701	0

Time	PCR at boy	PCR at eoy	Int on PCR	S/H fees	S/H expenses	S/H tax on int on PCR	S/H tax on fees	S/H tax on expenses	Distributable profits	Imputation credits
1	200,000	184,879	16,000	380,318	-286,684	-4,800	-114,095	86,005	91,865	23,023
2	184,879	170,942	14,790	346,864	-261,702	-4,437	-104,059	78,510	83,904	20,990
3	170,942	158,090	13,675	316,558	-239,048	-4,103	-94,967	71,714	76,681	19,149
4	158,090	146,236	12,647	289,084	-218,490	-3,794	-86,725	65,547	70,123	17,481
5	146,236	135,298	11,699	264,159	-199,821	-3,510	-79,248	59,946	64,164	15,968
6	135,298	125,203	10,824	241,531	-182,856	-3,247	-72,459	54,857	58,745	14,595
7	125,203	115,883	10,016	220,974	-167,428	-3,005	-66,292	50,228	53,814	13,348
8	115,883	107,275	9,271	202,284	-153,388	-2,781	-60,685	46,016	49,324	12,215
9	107,275	99,324	8,582	185,280	-140,602	-2,575	-55,584	42,181	45,233	11,185
10	99,324	0	7,946	169,800	-78,364	-2,384	-50,940	23,509	168,891	20,870

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The following table shows the value represented by the example at time 0 as well as the expected value in one year's time (which equals the actual value if all goes as expected).

	Net Worth	Value of Inforce	Embedded Value	Value of New Business	Total
Value at time 0	$2,000,000	$529,387	$2,529,387	$0	$2,529,387
Expected change in value	$80,000	$63,526	$143,526	$0	$143,526
Move distributable profits to Net Worth	$114,888	-$114,888	$0		$0
Expected value at end of period	$2,194,888	$478,025	$2,672,913	$0	$2,672,913
Actual value at time 1	$2,194,888	$478,025	$2,672,913	$0	$2,672,913

Note: this assumes a cash return is expected (and earned) on net worth of 4% after allowing for tax and imputation credits

If expenses turned out to be different from expected with:

- $10,000 difference in profit for the period after allowing for tax and imputation credits
- the per member expense assumption for future years will be increased to $80 per member, then the following two tables represent the impact on cash flows and value.

Time	PCR at boy	PCR at eoy	Int on PCR	S/H fees	S/H expenses	S/H tax on int on margin	S/H tax on fees	S/H tax on expenses	Distributable profits	Imputation credits
1	184,879	170,942	14,790	346,864	-266,102	-4,437	-104,059	79,830	80,824	20,066
2	170,942	158,090	13,675	316,558	-242,920	-4,103	-94,967	72,876	73,971	18,336
3	158,090	146,236	12,647	289,084	-221,897	-3,794	-86,725	66,569	67,738	16,765
4	146,236	135,298	11,699	264,159	-202,820	-3,510	-79,248	60,846	62,065	15,338
5	135,298	125,203	10,824	241,531	-185,495	-3,247	-72,459	55,648	56,898	14,041
6	125,203	115,883	10,016	220,974	-169,750	-3,005	-66,292	50,925	52,188	12,860
7	115,883	107,275	9,271	202,284	-155,431	-2,781	-60,685	46,629	47,894	11,786
8	107,275	99,324	8,582	185,280	-142,401	-2,575	-55,584	42,720	43,974	10,807
9	99,324	0	7,946	169,800	-79,947	-2,384	-50,940	23,984	167,784	20,538

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27.12.1. Expenses different from expected

During the period expenses (after allowing for tax and imputation credits) were $10,000 worse than expected.

The future expense assumption per member is $5.00 higher.

	Net Worth	Value of Inforce	Embedded Value	Value of New Business	Total
Values at time 0	$2,000,000	$529,387	$2,529,387	$0	$2,529,387
Expected change in value	$80,000	$63,526	$143,526	$0	$143,526
Move distributable profits to Net Worth	$114,888	-$114,888	$0	$0	$0
Expected value at end of period	$2,194,888	$478,025	$2,672,913	$0	$2,672,913
Expenses higher than expected in period	-$10,000	$0	-$10,000	$0	-$10,000
Change in expense assumption	$0	-$14,779	-$14,779	$0	-$14,779
Unexplained	$0	$0	$0	$0	$0
Actual value at time 1	$2,184,888	$463,246	$2,648,134	$0	$2,648,134

27.13. Example 3

Your company reports to its parent on an annual basis. The method in use is to calculate an appraisal value at the end of each financial year.

The appraisal value report provided to your parent includes the following information:

- The actual appraisal value at the end of the current financial year;
- The expected change in that appraisal value over the following year.

The actual appraisal value at the end of the current financial year (Year 2) is considerably different to the expected appraisal value provided in last year's reporting.

The company is a niche marketer that sells a range of YRT products with TPD and trauma riders available. The company has been selling these products for 25 years.

The following information is provided in respect of this business.

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Appraisal information at the end of the prior financial year (Year 1), values are in $m:

VIF	88.91
VNB	72.05
ANW	8.54
Total AV	169.50

In the appraisal value report for Year 1, the expected change in the appraisal value in Year 2 is $19.31m.

The capital requirements above the policy liabilities are estimated to be 20% of the value of in force calculated on appraisal value assumptions.

Capital strain for appraisal value reporting purposes expected for the financial year, at the end of Year 2, is $8m.

Assume a risk discount rate of 10% is in use.

Identify and roughly quantify the impact of new business being 20% greater than expected for the current year on the experience on the parts (i.e. VIF, VNB and ANW) and the whole of the appraisal value as given.

Identify the impact of expenses (acquisition and maintenance combined) being $2m higher than expected. (Hint: assume the expense variation occurs in the same year as the increase in new business in a))

Identify the changes you would expect in the VIF, VNB and ANW and the appraisal value overall if actual lapses were 30% higher than expected at all durations in force.

Solution

- VIF on NB = VNB(@inception) * (1+RDR)^0.5 + NB strain(@ year end)
- As this company has been writing business for some time and is established in a niche market a multiple closer to the upper end of this range would be likely, let's say 8 times.
- Thus we can deduce the rough value of 1 year's new business as VNB/8 = 72.05/8 = 9.01m. Therefore VIF for 1 year of new business = 9.01 * 1.1^0.5 + 8 = 17.45.
- If new business is 20% higher than expected then VIF after this 1 year of new business is added would be expected to increase by 20% * 17.45 = 3.49m.
- If new business is 20% higher than expected the VNB would be expected to increase by somewhere between 1 and 1.2 times, depending on the expected sustainability of the increase. In the absence of information around this a, conservative approach would be to allow a 10% increase, leading to a new VNB of 79.30 (increase of 79.30 – 72.05 = 7.25).

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- Additional reserves for capital are 20% of VIF, currently 88.91*.2 = 17.78m.
- The VIF will increase as indicated above, presumably the capital will increase in line with this due to the additional liabilities and the additional assets backing them and these being invested in a manner similar to the current arrangement.
- Thus the capital will increase by 3.49 x 0.2 = 0.7m.
- VNW will also be reduced by the 1 year of strain now included in the VIF for this year's NB. Overall change to VNW = -0.7 - 8 * 0.2 = -2.30m
- This gives the following new end of year values:

Change in VIF from NB increase	3.49
Change in VNB from NB increase	7.25
Change in ANW from NB increase	-2.30
Plus beginning year AV	169.50
Plus change in AV	19.31
Total	197.25

Expenses $2m higher than expected:

- Generally initial expenses would be around 20% of premium.
- New business strain would be around 70% to 90% of premium, let's say 80%.
- Thus an increase in new business of 20% above expected would generally result in a corresponding increase in initial expenses of 20% * 20% * $8m / 80% =$400,000.
- Thus $400,000 has been allowed for in a). The remaining $1.6m is an expense overrun that will affect the VNW.

Lapses 30% higher:

- There will be a lower end of year in force than expected, which will result in a proportionate reduction in the PVFP and thus VIF will reduce.
- VNB will not be affected as the NB strain affects the net worth.
- There will be a lower capital requirement at the end of the year due to the reduced end of year in force.
- ANW is affected by the reduction in capital, which increases the net worth.
- The reduction in VIF would be expected to be greater than the increase in ANW due to the capitalised effect of loss of all future profits from a lower in force at year-end.
- Therefore overall AV will be lower.
- Any subsequent increase in the lapse assumption (given experience) will further decrease the VIF and also reduce the VNB due to the reduction in renewal premium volumes to recover the new business strain.

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27.14. Market Consistent Embedded Values

Embedded values and appraisal values are widely used by European life companies as a means of supplementary financial reporting. For many years, this supplementary information varied by country and, in some cases, by company within a country making it difficult for investors in life companies to compare their relative performance. In October 2009, the "CFO Forum" published a set of Market Consistent Embedded Value (MCEV) principles as a step to improve the consistency and transparency of embedded value reporting. The CFO Forum is a high-level discussion group formed and attended by the Chief Financial Officers of major European listed, and some non-listed, insurance companies. The MCEV principles can be accessed at the CFO Forum website (www.cfoforum.eu)

An MCEV consists of:

- free surplus;
- required capital; and
- value of in force business

The required capital consists of shareholder assets whose distribution is restricted (e.g. required to meet regulatory requirements, but may include target surplus). Free surplus consists of the remaining shareholder equity. The value of in force business is the risk-adjusted value of future distributable profits expected to emerge from the policy liabilities.

The value of in force business consists of:

- present value of future shareholder profits (after tax); less
- the time value of financial options and guarantees; less
- frictional costs of required capital; less
- the cost of residual non-hedgeable risks.

The VIF should be valued on a market consistent basis, i.e. valued using discount rates consistent with those that would be used to value such cash flows in the capital markets. Different discount rates might be used for different types of cash flows. For example, if shareholder assets were invested in equities, a higher discount rate would be used to value the best estimate investment returns than if the assets were invested in fixed interest. Alternatively, a simplifying method sometimes used for calculating the VIF on a market consistent basis is to assume that both future investment returns and the discount rate are at the risk free rate.

The present value of future shareholder profits is determined using best estimate assumptions, but excludes the time value of financial options and guarantees.

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The time value of financial options and guarantees must be calculated using stochastic techniques. This is a key difference between an MCEV and the "traditional" method discussed earlier in this chapter. The financial options and guarantees include guarantees provided to participating business (e.g. that death and maturity benefits will not be less than the sum insured and reversionary bonuses, and the surrender values will not be less than the LPS 360 minimum). Under the traditional method, the value of financial options and guarantees would be allowed for by adjusting the risk discount rate. If the guarantees were closer to being "in the money" a higher risk discount would be used. However this adjustment is fairly crude. Financial options and guarantees are asymmetric in nature (i.e. in most scenarios, including the best estimate scenario, the options and guarantees won't come "into the money" and will have zero cost, but in some adverse scenarios they will). A stochastic model is a far more accurate method of measuring the cost of financial options and guarantees.

Frictional costs are defined to be the tax and investment expenses relating to required capital. By investing capital in a life company, shareholders lock-in their capital and become liable for additional tax and investment expenses, compared to the alternative of investing directly in assets similar to those held by the life company. The life company is taxed on its investment income and shareholders are taxed again on their dividends from the life company. Note that if shareholders can use imputation credits to offset their tax liabilities double-taxation is avoided and frictional costs are limited to investment expenses.

Residual non-hedgeable risks are those risks not already allowed for in the value of future shareholder profits or in the time value of financial options and guarantees. Non-hedgeable means that the risks cannot readily transferred to another party such as a reinsurer or through matching the assets to the liabilities. These risks include operational risks, strategic risk and reputational risk. This tends to be the most subjective part of the valuation but is usually quite significant. The cost of residual non-hedgeable risks might, for example, be allowed for by adding a margin to the discount rate used to determine the present value of future shareholder profits.

An MCEV (in total) should not necessarily be materially different from a traditional embedded value. Both methods have the same objective of determining the economic value of the shareholders' interest in a life company. However the presentation of the components of the embedded value differs and an MCEV uses a more complex method of allowing for risk. It can be useful to use both methods in order to gain greater insights into the value of the business. For this reason, some companies publish both traditional and market consistent embedded values in their market disclosures. The MCEV methodology is particularly useful for valuing life companies with complex or asymmetric risks such as those found in participating business. It tends to be less useful for simpler types of business such as risk insurance business and investment-linked business that do not have financial options or guarantees.

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Chapter 28 – Financial Statements

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28.1. Introduction

In this chapter we explore financial statements prepared in accordance with the rules and standards applying in Australia at the current time.

AASB 1038 prescribes general purpose reporting requirements in accordance with accounting principles whilst Life Reporting Standards 110.0 to 430.0 issued by APRA prescribes special purpose reporting requirements in accordance with the prudential regulation framework. However, in the development of the respective regimes the AASB and APRA have endeavoured to achieve these objectives through a single set of financial reports.

Note that, at the current time, Australian accounting standards are awaiting the finalisation of international reporting standard IFRS 4 (currently expected to be released in late 2016 or early 2017, with implantation several years after that) This means that there is no definitive presentation prescribed for financial statements. The presentation shown below is typical of the current time, but is by no means the only allowable presentation.

Financial statements for funds management companies are less complex and are prepared on a "fees less expenses" basis.

28.2. Life Insurance Company Data

The spreadsheet that accompanies this chapter contain the calculation of the tables below, and the student should trace the formulae used in order to understand the derivation of the numbers contained in them.

We will use the data below to prepare elements of the financial statements for an Australian life insurance company with two statutory funds.

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Table 28.1: Summary of data used

Fund	1	1	1	1	2	2	Statutory	Sh'holder	
Class of Business	ORD	ORD	SUPER	SUPER	ORD	SUPER	Funds	Funds	Company
category	par	nonp	par	nonp	nonp	nonp	TOTAL		TOTAL
START OF YEAR BALANCES									
Policy liabilities	157,000	115,000	80,000	276,000	164,000	3,860,000	**4,652,000**		**4,652,000**
Reinsurance liabilities		(80,000)		(5,000)			**(85,000)**		**(85,000)**
Policy owner retained profit	36,000		16,000				**52,000**		**52,000**
Other liabilities							**0**		**0**
Shareholder retained profit	9,000	105,000	4,000	57,000	180,000	31,000	**386,000**	125,000	**511,000**
Shareholder capital							**0**	10,000	**10,000**
CASHFLOWS DURING THE YEAR									
Gross premiums	3,000	55,000	1,000	32,000	96,000	911,000	**1,098,000**		**1,098,000**
Investment portion of premiums	0	0	0	13,000	95,000	900,000	**1,008,000**		**1,008,000**
Reinsurance premiums	0	27,000	0	7,000	0	0	**34,000**		**34,000**
Investment income	14,000	11,000	9,000	27,000	20,000	139,000	**220,000**	9,000	**229,000**
Claims - death	2,000	25,000	1,000	7,000	0	0	**35,000**	0	**35,000**
Claims - surrender	10,000	0	2,000	65,000	86,000	800,000	**963,000**	0	**963,000**
Investment portion of claims	0	0	0	62,000	86,000	800,000	**948,000**		**948,000**
Reinsurance claims	0	18,000	0	9,000	0	0	**27,000**	0	**27,000**
Expenses	3,000	28,000	1,000	9,000	3,000	58,000	**102,000**	4,000	**106,000**
Tax	4,000	6,000	2,000	8,000	8,000	(7,000)	**21,000**	2,000	**23,000**

Fund	1	1	1	1	2	2	Statutory	Sh'holder	
Class of Business	ORD	ORD	SUPER	SUPER	ORD	SUPER	Funds	Funds	Company
category	par	nonp	par	nonp	nonp	nonp	TOTAL		TOTAL
END OF YEAR DISTRIBUTIONS / TRANSFERS									
Cost of policy owner bonuses	4,000		4,000				**8,000**		**8,000**
Inter fund transfers	1,000	25,000	1,000	25,000		30,000	**82,000**	(82,000)	**0**
END OF YEAR BALANCES									
Policy Liabilities (before bonus)	145,000	95,000	79,000	236,000	177,000	4,044,000	**4,776,000**		**4,776,000**
Reinsurance liabilities		(75,000)		(5,000)			**(80,000)**		**(80,000)**
Property holdings	16,000	9,000	10,000	27,000	57,000	179,000	**298,000**	0	**298,000**
Equity holdings	50,000	29,000	24,000	64,000	177,000	2,719,000	**3,063,000**	108,000	**3,171,000**
Interest bearing securities holdings	81,000	46,000	60,000	160,000	62,000	837,000	**1,246,000**	54,000	**1,300,000**
Other asset holdings at end of year	66,000	36,000	15,000	38,000	102,000	428,000	**685,000**	75,000	**760,000**
Other liabilities	14,000	7,000	6,000	14,000	35,000	103,000	**179,000**	17,000	**196,000**
Shareholder capital							**0**	10,000	**10,000**

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The actuary will normally have a trial balance which consists of the revenue account (showing cash flows for the period) and the balance sheet. The data in Table 28.1 above is a simplified version of this. The item that the actuary needs to determine is the policy liabilities. The increase in policy liabilities determines the profit for the period.

For participating business, the profit is apportioned between policy owners and shareholders. We will assume that policy owners are allocated 80% of profits on participating business. This is the minimum that can be allocated to policy owners under the Life Insurance Act 1995.

The next table shows the revenue account for the year and the balance sheet at the end of the year in the Life Insurance Act presentation, which is close to the way actuaries traditionally think of earnings: profit consists of net revenue less increase in reserves, and includes both shareholder and policy owner portions – it therefore needs to be split into these two components. The liability is the full provision for future claims and expenses less premiums, whether the business is investment or risk business. Care must be taken in distinguishing between amounts and balances at the end of the current year (which excludes cost of bonus and transfers pursuant to the year end valuation) and the amount carried forward to the beginning of the next year (which includes those items).

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Table 28.2: Life Act presentation of results

Fund	1	1	1	1	2	2	Statutory	Sh'holder	
Class of Business	ORD	ORD	SUPER	SUPER	ORD	SUPER	Funds	Funds	Company
category	par	nonp	par	nonp	nonp	nonp	TOTAL		TOTAL
REVENUE ACCOUNT FOR THE YEAR									
Net premiums	3,000	28,000	1,000	25,000	96,000	911,000	**1,064,000**	0	**1,064,000**
Investment income	14,000	11,000	9,000	27,000	20,000	139,000	**220,000**	9,000	**229,000**
Less: Net claims	(12,000)	(7,000)	(3,000)	(63,000)	(86,000)	(800,000)	**(971,000)**	0	**(971,000)**
Less: Expenses	(3,000)	(28,000)	(1,000)	(9,000)	(3,000)	(58,000)	**(102,000)**	(4,000)	**(106,000)**
Less: Increase in liabilities	12,000	15,000	1,000	40,000	(13,000)	(184,000)	**(129,000)**	0	**(129,000)**
Less: Tax	(4,000)	(6,000)	(2,000)	(8,000)	(8,000)	7,000	**(21,000)**	(2,000)	**(23,000)**
NET PROFIT	**10,000**	**13,000**	**5,000**	**12,000**	**6,000**	**15,000**	**61,000**	**3,000**	**64,000**
Apportioned to:									
Policy owners	8,000	0	4,000	0	0	0	**12,000**	0	**12,000**
Shareholders	2,000	13,000	1,000	12,000	6,000	15,000	**49,000**	3,000	**52,000**
NET ASSETS AT THE END OF THE YEAR									
Investment assets	147,000	84,000	94,000	251,000	296,000	3,735,000	**4,607,000**	162,000	**4,769,000**
Cash	1,000	25,000	1,000	25,000	0	30,000	**82,000**	(82,000)	**0**
Reinsurance asset	0	75,000	0	5,000	0	0	**80,000**	0	**80,000**
Other assets	66,000	36,000	15,000	38,000	102,000	428,000	**685,000**	75,000	**760,000**
Less: Policy liability	(145,000)	(95,000)	(79,000)	(236,000)	(177,000)	(4,044,000)	**(4,776,000)**	0	**(4,776,000)**
Less: Other liabilities	(14,000)	(7,000)	(6,000)	(14,000)	(35,000)	(103,000)	**(179,000)**	(17,000)	**(196,000)**
TOTAL NET ASSETS (BEFORE DISTRIBUTION)	*55,000*	*118,000*	*25,000*	*69,000*	*186,000*	*46,000*	*499,000*	*138,000*	*637,000*
Less: Cost of Bonus	(4,000)	0	(4,000)	0	0	0	**(8,000)**	0	**(8,000)**
Net transfers	(1,000)	(25,000)	(1,000)	(25,000)	0	(30,000)	**(82,000)**	82,000	**0**
TOTAL NET ASSETS (AFTER DISTRIBUTION)	**50,000**	**93,000**	**20,000**	**44,000**	**186,000**	**16,000**	**409,000**	**220,000**	**629,000**
Consisting of:									
SHAREHOLDER CAPITAL	0	0	0	0	0	0	**0**	10,000	**10,000**
POLICY OWNER RETAINED PROFIT									
Balance brought forward	36,000	0	16,000	0	0	0	**52,000**	0	**52,000**
Plus: profits allocated	8,000	0	4,000	0	0	0	**12,000**	0	**12,000**
BALANCE BEFORE DISTRIBUTION	*44,000*	*0*	*20,000*	*0*	*0*	*0*	*64,000*	*0*	*64,000*
Less: Cost of bonus	(4,000)	0	(4,000)	0	0	0	**(8,000)**	0	**(8,000)**
BALANCE CARRIED FORWARD	**40,000**	**0**	**16,000**	**0**	**0**	**0**	**56,000**	**0**	**56,000**
SHAREHOLDER RETAINED PROFIT									
Balance brought forward	9,000	105,000	4,000	57,000	180,000	31,000	**386,000**	125,000	**511,000**
Plus: profits allocated	2,000	13,000	1,000	12,000	6,000	15,000	**49,000**	3,000	**52,000**
BALANCE BEFORE DISTRIBUTION	*11,000*	*118,000*	*5,000*	*69,000*	*186,000*	*46,000*	*435,000*	*128,000*	*563,000*
Less: Net transfers	(1,000)	(25,000)	(1,000)	(25,000)	0	(30,000)	**(82,000)**	82,000	**0**
BALANCE CARRIED FORWARD	**10,000**	**93,000**	**4,000**	**44,000**	**186,000**	**16,000**	**353,000**	**210,000**	**563,000**

Life Act revenue account shows us the (policy owner plus shareholder)profit for each fund, calculated as net premiums plus investment income less net claims, expenses, increase in net policy liability and tax. For participating business, the increase in net policy liability is calculated as the net policy liability at the end of year excluding bonus less the net policy liability at the start of the year.

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The Life Act retained profits are split between the shareholder component and the policy owner component. The balance at the end of the year is calculated as the balance brought forward plus the share of net profit. The balance carried forward to the beginning of next year is this amount less the cost of bonus and transfers paid out pursuant to the valuation.

28.3. Profit and Loss Statement

Reporting under IFRS differs from Life Act reporting in two significant respects (from the actuarial perspective):

- The profit reported is the profit allocated to shareholders. It does not include profit allocated to policy owners; and
- The revenue and expenses shown on the income statement must exclude the deposit components of the premiums and claims if a deposit component can be measured separately.

The profit and loss statement derived in this manner is also known as the "income statement" or "statement of financial performance".

The exclusion of policy owner share of profits is achieved by:

1. Defining the increase in net policy liability to be the net policy liability at the end of year including bonus less the net policy liability at the start of the year and
2. Showing the increase in policy owner retained profits as an outgo item (i.e. as an increase in liabilities).

Excluding the deposit component of premiums and claims is sometimes referred to as "premium and claim splitting". Deposits are not regarded as revenue as they are effectively held on trust for policy owners. Splitting is not required if a deposit component cannot be separately identified e.g. for traditional contracts. For risk business all premiums are treated as revenue – there is no deposit component.

Premium and claim splitting has no effect on profit – it only affects the presentation of revenue and expenses. The reduction in revenue caused by exclusion of the deposit components is exactly offset by a reduction to the increase in policy liabilities.

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For investment-linked business, revenue consists of fees and investment income. If there is no deferral of entry fees or acquisition costs, the increase in policy liabilities shown on the income statement will be the investment income credited to policies net of policy owner tax. This effectively reverses out the revenue item for investment income on policy owner assets and the expense for policy owner tax. Profit therefore comprises fees plus investment income on shareholder assets, less expenses and shareholder tax. If this business was issued by a fund management company instead of a life company, the items for investment income on policy owner assets, policy owner tax and increase in policy liabilities would not appear. We would simply be left with fees and operating expenses, investment income on shareholder assets and shareholder tax.

Table 28.3: IFRS Profit and Loss Statement

Fund	1	1	1	1	2	2	Statutory	Sh'holder	
Class of Business	ORD	ORD	SUPER	SUPER	ORD	SUPER	Funds	Funds	Company
category	par	nonp	par	nonp	nonp	nonp	TOTAL		TOTAL
PROFIT AND LOSS STATEMENT									
Insurance contracts revenue	3,000	55,000	1,000	19,000	1,000	11,000	**90,000**	0	**90,000**
Less: Outwards reinsurance expense	0	(27,000)	0	(7,000)	0	0	**(34,000)**	0	**(34,000)**
NET INSURANCE CONTRACTS PREMIUMS	**3,000**	**28,000**	**1,000**	**12,000**	**1,000**	**11,000**	**56,000**	**0**	**56,000**
Fees for management services rendered	0	0	0	0	0	0	**0**	0	**0**
Investment revenue	14,000	11,000	9,000	27,000	20,000	139,000	**220,000**	9,000	**229,000**
Other revenue	0	0	0	0	0	0	**0**	0	**0**
TOTAL REVENUE	**17,000**	**39,000**	**10,000**	**39,000**	**21,000**	**150,000**	**276,000**	**9,000**	**285,000**
Claims expenses	12,000	25,000	3,000	10,000	0	0	**50,000**	0	**50,000**
Less: Reinsurance recoveries revenue	0	(18,000)	0	(9,000)	0	0	**(27,000)**	0	**(27,000)**
NET CLAIMS EXPENSES	**12,000**	**7,000**	**3,000**	**1,000**	**0**	**0**	**23,000**	**0**	**23,000**
Operating expenses	3,000	28,000	1,000	9,000	3,000	58,000	**102,000**	4,000	**106,000**
Increase in net policy liabilities	(8,000)	(15,000)	3,000	9,000	4,000	84,000	**77,000**	0	**77,000**
Increase in policy owner retained profits	4,000	0	0	0	0	0	**4,000**	0	**4,000**
TOTAL EXPENSES	**11,000**	**20,000**	**7,000**	**19,000**	**7,000**	**142,000**	**206,000**	**4,000**	**210,000**
OPERATING PROFIT BEFORE INCOME TAX	**6,000**	**19,000**	**3,000**	**20,000**	**14,000**	**8,000**	**70,000**	**5,000**	**75,000**
Income tax attributable to operating profit	4,000	6,000	2,000	8,000	8,000	(7,000)	**21,000**	2,000	**23,000**
OPERATING PROFIT AFTER INCOME TAX	**2,000**	**13,000**	**1,000**	**12,000**	**6,000**	**15,000**	**49,000**	**3,000**	**52,000**

In table 28.3, the revenue and expenses for SF1 superannuation non-participating business and for SF2 investment-linked business have been adjusted to exclude the deposit components. Please note that the increase in net policy liabilities has been adjusted to remove the deposit component of premiums and the withdrawal component of claims.

Note that only the fees related to premiums are shown. In practice life companies would report all fees as revenue, i.e. including policy fees and fees levied on assets under management. If these extra fees were reported as revenue there would need to be a corresponding increase to the item for increase in net policy liabilities, so that profit remained unchanged.

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If entry fees or acquisition costs are deferred this must also be reflected in the revenue and expenses. The increase in policy liabilities reported on the income statement is the increase in balance sheet policy liabilities, less the deposit component of premiums, plus the deposit component of withdrawals, plus the non-premium related fees, plus the increase in the liability for deferred entry fee revenue, less the increase in the liability for deferred acquisition costs. A reconciliation of the increase in policy liabilities shown on the income statement with the actual increase in policy liabilities reported on the balance sheet is given in the notes to the accounts (see later section of this chapter).

The last column of table 28.3 table shows how the profit and loss statement would be presented for this company. Note that the company would also have to show comparatives (i.e. figures for the prior year) and, if it has subsidiaries, a consolidated profit and loss statement for the current and prior year.

28.4. Balance Sheet

The balance sheet shows the shareholder retained profits and capital for the statutory funds and shareholder fund combined. The policy owner retained profits are excluded from net assets by treating them as a liability. The balance sheet is also known as the "statement of financial position".

The balance sheet for this company is shown below.

Table 28.4: IFRS Balance Sheet

Fund Class of Business category	**Company TOTAL**
BALANCE SHEET	
Cash (including other assets)	**760,000**
Equity securities	**3,171,000**
Debt securities	**1,300,000**
Investment property	**298,000**
TOTAL INVESTMENT ASSETS	**5,529,000**
Policy liabilities ceded (reinsurance)	**80,000**
TOTAL ASSETS	**5,609,000**
Provisions	**196,000**
Gross policy liabilities	**4,784,000**
Policy owner retained profits	**56,000**
TOTAL LIABILITIES	**5,036,000**
NET ASSETS	**573,000**
Shareholder capital	**10,000**
Shareholder retained profits	**563,000**
TOTAL SHAREHOLDERS' EQUITY	**573,000**

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28.5. Notes to the Financial Statements

There are a number of notes to the financial statements where actuarial input is or may be required. These include:

1. Summary of significant actuarial methods and assumptions
2. Summary of shareholders' interests
3. Reconciliation to Life Insurance Act 1995 profits
4. Capital base and prescribed capital amount
5. Insurance premium revenue
6. Claims expense
7. Policy liabilities
8. Statement of sources of operating profit
9. Statutory Fund and segment information
10. Risk Management Policies.

We will consider these notes, giving examples based on our life insurance company data where appropriate.

28.6. Summary of Significant Actuarial Methods and Assumptions

As the name suggests, the actuary must disclose what method (e.g. projection, accumulation) has been used to value the liabilities and, for the projection method, what profit carriers have been used. Disclosure is required of the process used to determine the assumptions that have the greatest effect on the recognised assets, liabilities, income and expense cash flows arising from life insurance contracts.

The assumptions that are disclosed include:

- Discount rates
- Bonus and interest crediting rates
- Future expenses and indexation
- Inflation
- Future participating benefits
- Voluntary discontinuances and premium dormancy
- Surrender values
- Unit prices
- Mortality and morbidity
- Taxation and commission.

There is also a requirement to show the effect of changes in assumptions on the value of future profit margins and policy liabilities.

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28.7. Summary of Shareholders' Interests

The balance sheet shows a single figure for shareholder net assets. This note provides more detail about that figure, splitting it between the statutory funds and the shareholder fund and between shareholder capital and the shareholder retained profit pools.

An example of this note, based on our earlier data is presented below.

Table 28.5: Summary of shareholders' interests

Fund Class of Business category	**Statutory Funds TOTAL**	**Sh'holder Funds**	**Company TOTAL**
Operating profit after tax	49,000	3,000	**52,000**
Shareholders' retained profits at the start of the year	386,000	125,000	**511,000**
Transfer of profits between funds	(82,000)	82,000	**0**
SHAREHOLDERS' RETAINED PROFITS AT THE END OF THE YEAR	*353,000*	*210,000*	*563,000*
Shareholder capital	0	10,000	**10,000**
TOTAL SHAREHOLDER EQUITY	**353,000**	**220,000**	**573,000**

Fund Class of Business category	**Components of shareholders' interest in the statutory funds**
Shareholder retained profits (Australian participating)	14,000
Shareholder retained profits (non participating)	339,000
TOTAL SHAREHOLDER EQUITY	**353,000**

28.8. Reconciliation to Life Insurance Act Profits

The profit and loss statement shown in the financial statements excludes the policy owner profit. Similarly, the balance sheet treats the policy owner retained profits as a liability not as a component of net assets. This note shows the alternative presentation where the interests of participating policy owners are treated as "equity interests", not liabilities. An example of this note, based on our earlier data is presented below.

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Table 28.6: Reconciliation to Life Act profits

	Policy owner interests	Shareholder interests	Statutory Funds TOTAL
RECONCILIATION TO LIFE INSURANCE ACT PROFITS			
Operating profit after tax	0	49,000	**49,000**
Bonuses provided for or paid	8,000	0	**8,000**
Increase in policy owner retained profits	4,000	0	**4,000**
LIFE INSURANCE ACT OPERATING PROFIT AFTER TAX	**12,000**	**49,000**	**61,000**
SOURCES OF LIFE INSURANCE ACT OPERATING PROFIT			
FROM NON INVESTMENT LINKED BUSINESS			
- Australian participating business	12,000	3,000	**15,000**
- Non participating business	0	25,000	**25,000**
FROM INVESTMENT LINKED BUSINESS			
- Non participating business	0	21,000	**21,000**
TOTAL	**12,000**	**49,000**	**61,000**
RETAINED PROFITS AT THE START OF THE YEAR			
Retained profits at the start of the year	0	386,000	**386,000**
Liability for policy owner retained profits	52,000	0	**52,000**
LIFE INSURANCE ACT RETAINED PROFITS AT THE START OF THE YEAR	*52,000*	*386,000*	*438,000*
LIFE INSURANCE ACT OPERATING PROFIT AFTER TAX	*12,000*	*49,000*	***61,000***
TRANSFERS TO SHAREHOLDER FUND			
- Australian participating business	0	(2,000)	**(2,000)**
- Non participating business	0	(80,000)	**(80,000)**
PROVISION FOR BONUSES TO PARTICIPATING POLICY OWNERS	*(8,000)*	*0*	***(8,000)***
LIFE INSURANCE ACT RETAINED PROFITS AT THE END OF THE YEAR	**56,000**	**353,000**	**409,000**
Policy owner retained profits at the end of the year	56,000	0	**56,000**
Shareholder retained profits at the end of the year	0	353,000	**353,000**
COMPONENTS OF LIFE INSURANCE ACT RETAINED PROFITS AT THE END OF THE YEAR			
- Australian policy owner	56,000	0	**56,000**
- Shareholder (Australian participating)	0	14,000	**14,000**
- Shareholder (non participating)	0	339,000	**339,000**
TOTAL	**56,000**	**353,000**	**409,000**

28.9. Capital Requirements

The disclosure requirements for the capital base and prescribed capital amount are discussed in the chapter on capital management.

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28.10. Insurance Premium Revenue

The profit and loss statement only shows the income component of premiums (e.g. a premium for risk insurance or the fee component of an investment premium). In this note we show the total premium, the deposit component and the income component. Based on our data the note would appear as follows:

Table 28.7: Insurance Premium Reserve

	Non investment linked business	Investment linked business	Statutory Funds TOTAL
INSURANCE PREMIUM RESERVE			
Direct consideration for annuities	0	0	**0**
Othert insurance direct premiums	91,000	1,007,000	**1,098,000**
Policy conversions	0	0	**0**
DIRECT INSURANCE PREMIUM REVENUE	*91,000*	*1,007,000*	*1,098,000*
Inwards reinsurance premium revenue	0	0	**0**
INSURANCE PREMIUM REVENUE	**91,000**	**1,007,000**	**1,098,000**
Insurance premiums recognised as a change in policy liability	(13,000)	(995,000)	**(1,008,000)**
TOTAL INSURANCE PREMIUM RECEIVED OR RECEIVABLE	**78,000**	**12,000**	**90,000**

28.11. Claims Expense

The profit and loss statement only shows the expense component of claims (e.g. the sum insured for risk insurance). In this note we show the total claims, the withdrawal component and the expense component. Based on our data the note would appear as follows:

Table 28.8: Claim Expense Reserve

	Non investment linked business	Investment linked business	Statutory Funds TOTAL
CLAIMS EXPENSE			
Death and disability	35,000	0	**35,000**
Maturities	0	0	**0**
Annuities	0	0	**0**
Surrenders and terminations	77,000	886,000	**963,000**
Policy conversions	0	0	**0**
DIRECT CLAIMS EXPENSE	*112,000*	*886,000*	*998,000*
Inwards reinsurance claims expense	0	0	**0**
TOTAL CLAIMS EXPENSE	**112,000**	**886,000**	**998,000**
Policy payments recognised as a change in policy liability	(62,000)	(886,000)	**(948,000)**
TOTAL CLAIMS PAID OR PAYABLE	**50,000**	**0**	**50,000**

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28.12. Policy Liabilities

There are three parts to the policy liabilities note:

1. Part 1 shows the movement in policy liabilities, adjusted for the deposit component of premiums and the withdrawal component of claims
2. Part 2 shows the movement in policy owner retained profits
3. Part 3 shows the components of insurance contract liabilities (present value of future benefits, present value of future expenses, present value of future premiums and present value of future profit margins) both on the current and prior year bases.

An example of the format of this note is shown below.

28.12.1. Part 1 – Movement in policy liabilities

Table 28.9: Movement in policy liabilities

	Insurance contracts	Investment contracts	Statutory Funds TOTAL
MOVEMENTS IN POLICY LIABILITIES			
Gross policy liabilities	563,000	4,221,000	**4,784,000**
Gross policy liabilities ceded	(80,000)	0	**(80,000)**
NET POLICY LIABILITIES	**483,000**	**4,221,000**	**4,704,000**
RECONCILIATION OF NET INCREASE / (DECREASE) IN NET POLICY LIABILITIES			
Net increase / (decrease) in net policy liabilities shown on the face of the P&L	(11,000)	88,000	**77,000**
Plus deposits recognised as an increase in policy liabilities	13,000	995,000	**1,008,000**
Less withdrawals recognised as a reduction in life insurance policy liabilities	(62,000)	(886,000)	**(948,000)**
NET INCREASE / (DECREASE) IN NET POLICY LIABILITIES	**(60,000)**	**197,000**	**137,000**
MOVEMENT IN NET POLICY LIABILITIES FOR THE YEAR			
Opening balance	543,000	4,024,000	**4,567,000**
Net increase (decrease) in net policy liabilities	(60,000)	197,000	**137,000**
CLOSING BALANCE	**483,000**	**4,221,000**	**4,704,000**

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28.12.2. Part 2 – Movement in policy owner retained profits

Table 28.10: Movement in policy owner retained profits

	Non investment linked business	Investment linked business	Statutory Funds TOTAL
MOVEMENT IN POLICY OWNER RETAINED PROFITS			
Unvested policy owner benefits at the end of the year	56,000	0	**56,000**
Unvested policy owner benefits at the start of the year	52,000	0	**52,000**
INCREASE / (DECREASE) IN UNVESTED POLICY OWNER BENEFITS	**4,000**	**0**	**4,000**

28.12.3. Part 3 – Components of insurance contract liabilities

Table 28.11: Components of insurance contract liabilities

	Value of net policy liabilities on prior year basis	Value of net policy liabilities on current year basis
BEST ESTIMATE LIABILITIES		
FOR NON INVESTMENT LINKED BUSINESS		
- value of future policy benefits	612,000	637,000
- value of future expenses	156,000	120,000
- value of future premiums	(352,000)	(367,000)
TOTAL BEST ESTIMATE LIABILITY	*416,000*	*390,000*
VALUE OF FUTURE PROFITS		
FOR NON INVESTMENT LINKED BUSINESS		
- value of future policy owner bonuses	16,000	17,000
- value of future shareholder profit margins	35,000	68,000
TOTAL VALUE OF FUTURE PROFITS	*51,000*	*85,000*
Total value of declared bonuses	8,000	8,000
NET POLICY LIABILITIES	**475,000**	**483,000**

Part 3 of the policy liabilities note provides users of financial statements with quantification of the impact of changes in the assumptions.

AASB 101 requires separate disclosure of current and non-current assets and liabilities. Life insurers therefore need to disclose estimates of policy liabilities that are expected to be settled within 12 months of the reporting date and those expected to be settled in more than 12 months after the reporting date. Industry practice is to include these disclosures in the policy liability note.

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28.13. Statement of Sources of Operating Profit

The statement of sources of operating profit note is essentially an analysis of profit showing the interest on retained profits, profit margins emerging, experience profit and loss recognition/reversal. An example of the format of this note appears below.

Table 28.12: Sources of operating profit

	Insurance contracts
The shareholder's operating profit after tax in the statutory funds is represented by:	
Investment earnings on shareholder retained profits and capital	12,000
Emergence of shareholder profit margins	26,000
Experience profit / (loss)	7,000
Loss reversal / (loss recognition)	4,000
SHAREHOLDER PROFIT AFTER TAX	*49,000*
Cumulative losses carried forward at the end of the year	1,000
The Life Insurance Act policy owner operating profit after tax is represented by:	
Investment earnings on policy owner retained profits	1,000
Emergence of policy owner profit margins	7,000
Experience profit/(loss)	4,000
LIFE INSURANCE ACT POLICY OWNER PROFIT AFTER TAX	*12,000*

Note that the cumulative losses carried forward at the end of the year are also shown. This indicates the scope for future loss reversal.

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28.14. Statutory Fund and Segment Information

The statutory fund and segment information includes:

1. A list of the statutory funds and the major products in each fund.
2. A profit and loss account by statutory fund
3. A profit and loss account by statutory fund, class (ordinary/ superannuation) and category (participating/ non participating)
4. A balance sheet by statutory fund
5. A balance sheet by statutory fund, class (ordinary/ superannuation) and category (participating/ non participating)
6. Life Insurance Act operating and retained profits by statutory fund.

28.15. Risk Management Policies

Under AASB 1038, life insurers are required to disclose information about the amount, timing and uncertainty of future cash flows. This includes:

- Details of the company's objectives in managing risks arising from life insurance contracts and its policies for mitigating these risks
- The terms and conditions of the products issued by the life insurance company that materially affect its cash flows
- The sensitivity of profit and loss and equity to changes in variables that have a major effect on them.
- Concentrations of insurance risk
- The development of claims that are not resolved within one year. This disclosure would not normally be required for most life insurance products and annuities are specifically exempt
- Information about credit and interest rate risk
- Information about exposures to interest rate risk or market risk under embedded derivatives not measured at fair value.

28.16. Funds Management Companies

As noted earlier, financial statements for funds management companies are less complex. The profit and loss statement shows fee income (including premium and asset fees) and expenses. The balance sheet shows the assets backing the shareholder net assets. Many of the notes included in financial statements for life insurance companies are not required for funds management companies.

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28.17. Interpreting Financial Statements

When interpreting the financial statements of a life insurance company, one of the most important notes is the statement of sources of operating profit. This note analyses the profit into "one-off" components (experience profit and loss reversal) and "ongoing" components (planned profit and interest on retained profit). It can be used to estimate the profit in the following year.

Other notes which are useful in estimating future profit include the summary of significant actuarial methods and assumptions, which indicates how the best estimate assumptions have moved, and part 3 of the policy liabilities note (components of policy liabilities), which quantifies the impact of the assumption changes on the present values of benefits, expenses, premiums and profit margins.

The financial statements can also be used to see:

1. trends in premium revenues and claims
2. the amount of capital base supporting the prescribed capital amount and
3. the assets backing the liabilities.

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