Chapter 21 – Valuation of Policy Liabilities

Additional Space for Notes

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.

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.

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.

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.

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.

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

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

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 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.

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

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

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.

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 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. The service provided to the owner of a 10 year term policy is insurance against the risk that the life insured might die. The 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.

Insurance Contracts and Investment Contracts

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) adversely 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.

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 normally 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.

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.

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

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.

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 includes 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.

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.

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;

- 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 future bonuses.

The 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.

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.

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.

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 table 21.1, 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. This amount by which policy liabilities fall below zero is often referred to as the "deferred acquisition costs". The reduction in policy liabilities offsets the excess of the acquisition costs over the first premium, ensuring that a loss is not reported.

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 shareholder profits. The right hand column confirms that profit emerging in each year equals the profit margin multiplied by the profit carrier.

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%

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

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. In order 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 cumulative losses, the value of future shareholder profits included in the policy liability is zero. Favourable changes in assumptions will result in a reduction to cumulative losses and a reduction in policy liabilities. Once cumulative losses are extinguished, any further favourable changes in assumptions will result in a value of future shareholder profits being added to the policy liabilities, so that the policy liabilities cease reducing.

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).

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%

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

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.

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.

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

If a related product group is running off, the cumulative losses should also be run off. This does not affect policy liabilities but is important for taxation purposes. Risk business is taxed on profits, but with the policy liabilities measured net of cumulative losses. Running off the cumulative losses therefore reduces a company's tax liabilities.

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. 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.

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 costs or DAC.

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.

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.

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

Table 21.5 - Group risk policy – projection method

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).

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

Table 21.6 Group risk policy – accumulation method

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.

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); 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 are usually calculated separately for each claim, based on the claims manager's assessment of the probability that the claim will eventually be admitted.

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. Methods for calculating IBNR are discussed in example 5.

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 as profit 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 affect best estimate bonuses and shareholder profits; whereas investment experience does.

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.

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. Note that the cost

of a reversionary bonus differs from the present value of the bonus (i.e. the value of the increase in future benefit payments). If a company allocates 25% of the cost of bonuses to shareholders, 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 will almost certainly be different from the best estimate assumptions used to value policy liabilities.

The cost of declared bonus for any reporting period can 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 referred to as "unvested policy benefits" and cannot become negative. If unvested policy benefits fall to zero, all further losses must be allocated to shareholders' retained profits.

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.

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.

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.

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.

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.

Investment-linked and Investment Account Business

The life investment contract liability is the value of units for investment-linked policies, 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.

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 calculated policy liabilities for term annuities.

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. So it is 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.

The fair value of liabilities must reflect a life company's own credit risk in respect to meeting its liabilities to policy owners. This risk will normally be very low - a life company has to meet APRA's minimum capital requirements and its liabilities to policy owners will rank ahead of shareholders and most other creditors in the event of wind-up. If a life company's credit risk increased, its term annuity liabilities would reduce. The fall in liabilities would be reported in "other comprehensive income" in the company's financial statements and would not be included in profit.

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.

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.

Worked Examples

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

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.

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 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.

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.

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.

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.

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.

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.

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.

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.

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 is 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 made for interest on the MSE as well as the fees and expenses incurred at the beginning of the year.