IFRS17 Measurement of Property & Casualty Insurance Contracts

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Abstract: IFRS 17 introduces the concept of a risk adjustment that compensates insurers for the uncertainty about the amount and timing of the cash flows that arise from non-financial risks. The method for its calculation is not prescribed and several options are emerging, including value at risk and cost of capital. This paper recalls (Myers & Cohn, 1981) to provide a cost of capital approach that has desirable characteristics including relative ease of implementation, risk adjustment margins that are fully diversified and additive from granular levels, alignment with pricing bases and recognition of a uniform return on allocated capital.

1. INTRODUCTION

1.1. New accounting standard

IFRS17 Insurance Contracts will replace *IFRS4* for annual reporting periods from 1 January 2023 in setting out principles for the recognition, measurement, presentation and disclosure of insurance contracts. A further objective is to achieve greater consistency in financial reporting for life, health and property & casualty insurers, as well as greater consistency with other industries.

IFRS17 Paragraph 32 requires that measurement using the General Measurement Model (**GMM**) of insurance contracts on initial recognition be the total of:

(a) the fulfilment cash flows, which comprise:
  (i) estimates of future cash flows;
  (ii) an adjustment to reflect the time value of money and the financial risks related to the future cash flows; and
  (iii) a risk adjustment for non-financial risk.
(b) the contractual service margin.

Remeasurement at reporting periods after contract inception follows similar principles. IFRS17 also includes a simplified Premium Allocation Approach (**PAA**) for the measurement of insurance contracts where the coverage period is one year or less. It is expected that many insurers will adopt the PAA for their property & casualty insurance contracts.

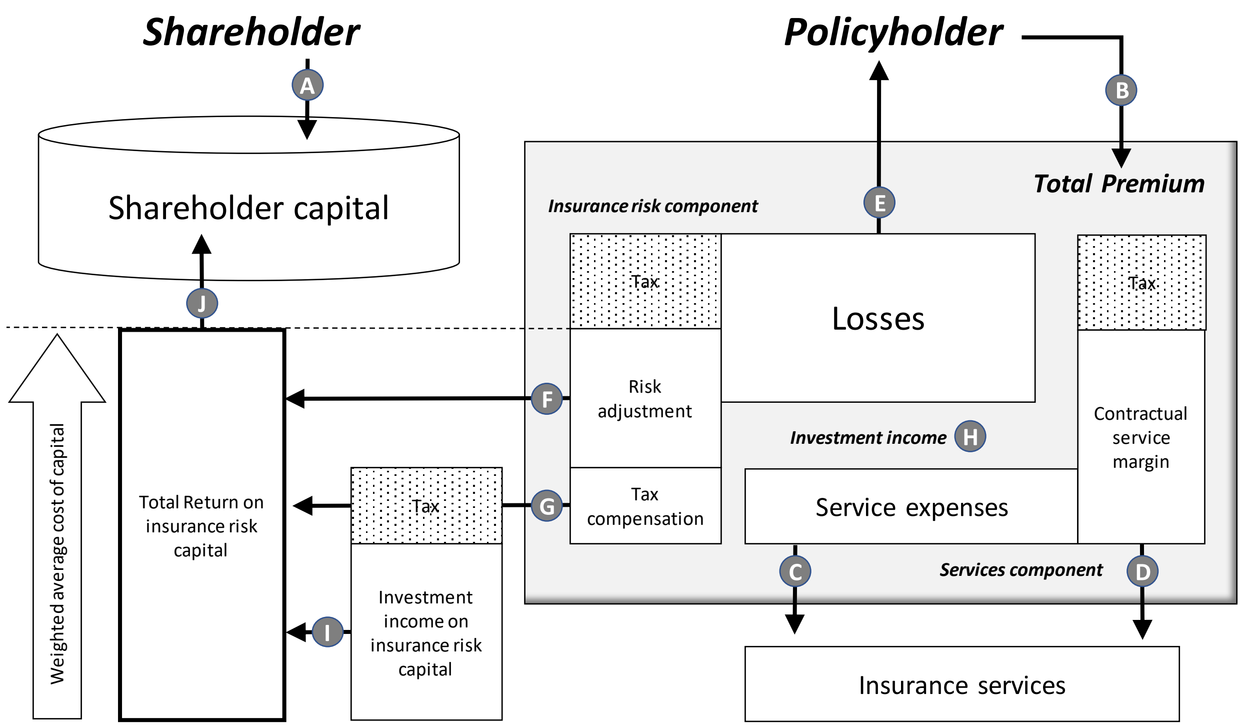
A key change that the IFRS17 measurement approach represents to property & casualty insurers is the use of the risk adjustment (**RA**) and the contractual service margin (**CSM**) to determine the recognition of profit.

This paper describes an approach to measurement of a property & casualty insurance contract that satisfies the requirements of IFRS17.

1.2. Insurance contract cashflows

Before exploring measurement of insurance contracts under IFRS17, it is useful to define the key cashflows that arise and understand their nature and purpose. The following diagram explores the cashflows associated with a typical property & casualty insurance contract between an insurer and policyholder. Also included are the cashflows involving the shareholder who supports the insurance contract with capital and receives a return. Each cashflow, marked with a letter, is discussed in some detail below.

Diagram 1: Property & Casualty Insurance Contract Cashflows



A. As cashflows are uncertain in their timing and ultimate amount, capital is needed to act as a buffer against adverse cashflow movements and enable the insurer to continue to fulfil its insurance contract liabilities and provide services. Cashflow **A** represents an injection into the insurer of capital by shareholders that will be allocated to support each insurance contract. For the purpose of this paper, there are two elements of capital allocated, that for insurance risk and that for the operational risk of the services the insurer provides.

B. An insurer and a policyholder enter into an insurance contract where the policyholder will be paid losses they may incur from insured events. Policyholders also receive a range of services associated with their contract that include distribution, product design & underwriting, claim handling, supply chain access and corporate services that support the operation of the insurer. The policyholder will pay a total premium, cashflow **B**, to the insurer in exchange for the insurance contract.

C. Services within the contract may be provided by the insurer or a range of external suppliers. The expense of services may be incurred prior to inception of the contract (such as product design), during the process of inception (such as distribution and underwriting) or after inception (such as claim handling and supply chain access). The service providers are compensated for their expenses by cashflow **C**.

D. Services may also receive a contractual service or profit margin, cashflow **D**, should they have provided value or utility to the policyholder in excess of the service expense that the policyholder was prepared to pay for. This profit ought to be released to the service proportional to service delivery. Before the profit is released though, a portion is paid as tax. This profit also includes the return on operational risk capital allocated to the insurance contract.

The value at inception of service expenses and contractual service margin, cashflows C and D, are referred to in this paper as the *Services* component of the total premium.

E. Policyholders experiencing a loss receive a payment, cashflow **E.** Although insured events will typically need to arise during the coverage time boundaries of the insurance contract, losses may be paid some time afterwards.

F. Policyholders need to reward, being cashflow **F**, the shareholder for the risk associated with the capital allocated to the contract for insurance risk. This is referred to as a risk adjustment. A portion of the risk adjustment is paid as tax.

G. Policyholders also need to compensate, cashflow **G**, the shareholder for tax that the insurer incurs on the investment income earned by the insurance risk capital. Shareholders would otherwise experience an extra layer of tax compared to investing directly in those same market assets. To make it at least a neutral proposition (before considering risk) to inject capital into an insurer compared to investing directly in the market, policyholders compensate the shareholder for this extra layer of tax through additional premium. As this additional premium is also taxed, the policyholder needs to provide a grossed-up compensation such that when tax is applied, the residual exactly compensates the tax on investment income on the insurance risk capital.

To illustrate the tax compensation component further, assume that a shareholder could invest $1,000 directly in an asset that provides an investment income of $70. Instead, this shareholder has decided to provide their funds to an insurer who now acquires the same asset in addition to writing insurance contracts. The investment income of $70 will be taxed in the hands of the insurer. Assuming the corporate tax rate is 30%, then this means the insurer pays $21 in tax leaving $49 to pass on to the shareholder. This is not acceptable to the shareholder who expects that the investment income on their $1,000 would be at least $70 plus a reward for risk from the insurance contracts. The policyholder is therefore required to compensate the shareholder for the $21 paid as tax through paying an additional premium. As premium is taxed, then the policyholder pays an additional premium amount equal to a grossed-up amount of $21 ÷ (1−30%) = $30.

Hence the $30 of additional premium is taxed at 30%, leaving $21 to add to the after-tax investment income of $49 thus providing a total of $70 for the shareholder – the same return as investing directly in the asset.

The value at inception of losses, the risk adjustment and tax compensation, cashflows E, F and G, are referred to in this paper as the *Insurance risk* component of the total premium.

H. The insurance contract cashflows C, D, E, F & G are not all paid at the point of inception. The total premium less any cashflows that occur at inception will be invested and produce investment income as cashflow **H** over time. This investment income has been allowed for in the present value of the insurance contract cashflows and is hence absorbed in the fulfilment of those cashflows.

I. Insurance risk capital is invested to produce an investment income as cashflow **I**. This investment income will be subject to tax, which is compensated for by the policyholder through cashflow G.

J. The final cashflow **J** represents the total return on insurance risk capital and is the sum of cashflows F, G and I – less the tax that is payable on all three of these cashflows. This total return has an expectation at inception of the contract of being equal to the weighted average cost of capital for the shareholder. If it were a lower return, then shareholders would look for other opportunities that did meet their cost of capital expectations. A higher return may be unfair on the policyholder who would be paying a higher premium than would be required to attract enough capital to support the risk in the contract.

1.3. The impact of tax on insurance contracts and insurance risk capital

The impact of tax on an insurance contract and capital allocated is significant. Tax scales down all cashflows in the same way a reinsurance quota share contract in the proportion of the corporate tax rate would take a share of all cashflows. Tax hence scales down the capital required to support an insurance contract compared to a tax-free environment.

To illustrate this further, assume an insurer underwrites two identical insurance contracts where one is in a tax-free environment, but the other is in an environment with a corporate tax rate of 30%. Suppose the insurance risk capital needed to support the contract in the tax-free environment is $1,000, for one year, and the risk adjustment component of the premium is $50. The shareholder receiving this risk adjustment therefore earns a 5% return on capital for assuming the risk under the insurance contract. The shareholder will also earn investment income through investment of the capital, but this is omitted in this simplified example. In the environment with the 30% corporate tax rate, all the insurance contract cashflows are scaled down 30%. It is as though the insurance contract is (1-30%) = 70% of the size of the contract in the tax-free environment. The shareholder is therefore required to inject only 70% of the capital in the taxed environment compared to the tax-free environment, or 70% × $1,000 = $700. The risk adjustment component of $50 is also taxed at 30% and hence the shareholder receives $35 that remains a 5% return on the $700 of capital injected. The return for the risk assumed is the same in the tax free and taxed environments, but the capital required is lower in the taxed environment to the extent of the corporate tax rate. The policyholder pays the same risk adjustment of $50 regardless of the level of the corporate tax rate.

1.4. Recognition of profit

A role of measurement under a financial reporting accounting standard is to recognise profit in proportion to the provision of insurance risk capital and delivery of services. Three elements to this profit have been identified:

- *Risk adjustment*: a cashflow from the policyholder to the shareholder to compensate for the risk within the insurance contract that has been conferred upon the supporting insurance risk capital.
- *Tax compensation*: a cashflow from policyholder to shareholder to compensate for an additional layer of tax on investment income on insurance risk capital that arises within the insurer.
- *Contractual service margin*: a cashflow from the policyholder to service providers to reward utility received from the services provided under the insurance contract and includes a return on operational risk capital allocated to the contract.

Along with other fulfilment cashflows, these three elements of profit also need to be measured for appropriate recognition against insurance risk capital and services.

Under IFRS17, the total premium (cashflow B in the diagram above) and the present value of all cashflows specific to the insurance contract (cashflows C, D, E, F & G) are essentially deemed to be equivalent at inception. The CSM is the balancing item that makes the cashflows sum to the total premium, so long as it is positive. If it would otherwise be negative, then the contract is considered onerous and a loss is recognised.

2. SUGGESTED APPROACH TO MEASUREMENT OF INSURANCE CONTRACTS

An insurance contract is considered in this paper to have two components that may be measured separately:

- *Insurance risk*: being the exchange of loss cashflows for a premium between policyholder and insurer; and
- *Services*: being services that are delivered to the policyholder for a price. These services could include such categories as distribution, product & underwriting, claim handling, supply chain and corporate.

These two measurement components collectively fulfil the requirements of IFRS17 paragraph 32.

A proposed approach to measurement of an insurance contract is demonstrated in the main body of this paper with a practical example. Cashflows are generated that are then shown in an IFRS17 GMM format. There remain some aspects of the profit and loss, balance sheet and accounting disclosures that are open to interpretation, hence the final approach may differ from what is proposed here.

Insurance contracts may also be measured using the PAA if their coverage period is one year or less. A simplification of the GMM formula proposed above is also provided that complies with the requirements of the PAA. The proposed simplification may be demonstrated to be materially similar to that of the GMM.

Included in Appendix A is the derivation and justification of all formulae used in the practical example.

3. FULFILMENT OF CASHFLOWS FOR THE INSURANCE RISK COMPONENT

3.1. Proposed General Measurement Model for the insurance risk component

The proposed GMM approach that complies with IFRS17 Paragraph 32(a) in respect of the cashflows from the insurance risk component of a contract, from the time of inception until extinguishment, is equivalent to:

- **Present value of uncertain future loss cashflows, discounted at a risk adjusted rate; plus**
- **Present value of the tax on investment income on insurance risk capital, grossed-up for tax and discounted at a 'risk free' rate.**

The 'risk free' rate for the purpose of this paper is defined as that consistent with IFRS17 paragraph 36.

This is the approach for the determination of a fair premium for an insurance risk component of a contract described by (Myers & Cohn, 1981). When certain conditions are met, the Myers & Cohn (**MC**) approach simplifies to the above. This is demonstrated in the Appendix.

3.2. Risk adjusted discount rate

The Capital Assets Pricing Model (**CAPM**) provides a useful and widely understood approach for deriving an appropriate risk adjusted rate to discount cashflows as follows:

$$r_L = r_f + \beta_L(r_m - r_f)$$

Where:

- r_L is the risk adjusted discount rate to apply to uncertain loss cashflows;
- r_f is the risk-free rate, which in the present context allows for the term structure and illiquid nature of the cashflows (IFRS17 paragraph 36);
- r_m is the expected market return; and
- β_L is the CAPM 'Beta' for the uncertain losses.

3.3. Compensation for tax on insurance risk capital

To be at least indifferent about injecting capital into an insurer, shareholders need to be compensated for tax on investment income on insurance risk capital that an insurer will incur. A compensation for tax is therefore included as the second part to the proposed measurement approach.

3.4. Insurance contract assumptions

Assumptions for the insurance risk component of an insurance contract are given in the following table and discussed further below. These assumptions are made to illustrate the measurement of insurance liabilities approach and their derivation is beyond the scope of this paper.

Table A: Insurance assumptions

			Time	*Losses*
Risk free rate	3.0%	p.a.		
Market risk premium	6.0%	p.a.	1	150.00
Loss cashlow β	(0.20)		2	300.00
Tax rate	30.0%		3	200.00
Capital (pre tax effect)	50.0%	of discounted loss reserves	4	100.00
Capital investment β	0.50		5	50.00
Coverage period	1 year			
Derived values				
Risk adjusted rate	1.8%	p.a.		
Capital return rate	6.0%	p.a.		
Capital (post tax effect)	35.0%	of discounted loss reserves		

- A risk-free rate of 3.0% p.a. has been assumed. This is the assumed earning rate for the invested loss reserves and other balances and the risk-free rate for the CAPM calculations of expected returns. The risk-free rate is that inherent in an asset portfolio that replicates the expected cashflows with reference to the term structure and its illiquid nature, but with no risk. This risk-free rate itself requires comprehensive consideration under IFRS17 paragraph 36 which is beyond the scope of this paper. It may be thought of, for example, as a curve of forward discount rates based on sovereign cash and bonds plus an illiquidity premium. However, for the purpose of this paper, this rate will be referred to simply as the 'risk free' rate.
- A market risk premium of 6.0% p.a. has been assumed, which is equal to $(r_m - r_f)$. This will be utilised to assess required discount rates and earning rates under the CAPM framework.
- Loss cashflows are assumed to have a CAPM Beta of -0.2.
- Capital (pre-tax effect) in respect of insurance risk at any point in time is assumed to be 50% of loss reserves in a tax-free environment.
- A single corporate tax rate of 30% is assumed.
- Capital is assumed to be invested in a portfolio that has a CAPM Beta of 0.5.
- A coverage period of 1 year has been assumed for the insurance contract, which is common for a property & casualty contract. The PAA will hence also be illustrated.

- Risk adjusted rate to apply when discounting losses is 3.0% -0.2×6.0% = 1.8%. This hence includes a risk adjustment of -1.2% against the risk-free rate.
- Capital return rate is the annual rate of investment income earned by capital. This is also assessed using the CAPM formula and is equal to 3.0% +0.5×6.0% = 6.0%
- Capital (post tax effect) is the insurance risk capital requirement in a tax-free environment reduced for the corporate tax rate and is hence equal to 35% = 50% × (1 - 30%).
- A total of $800 of losses are expected to arise under the insurance contract, payable at the end of the year in the pattern shown.

3.5. Insurance profit before tax

Using the assumptions above, the measurement of the insurance contract before tax is illustrated in the following table. An explanation for each column is provided. This includes only the loss cashflows and investment income on loss reserves with tax and earnings on insurance risk capital considered in a later table. All cashflows occur at the time indicated which is measured in years from inception of the insurance contract.

Table B: Insurance profit before tax

Time	*Insurance premium (losses only)* (1)	*Loss payments* (2)	*Discounted loss reserves* (3)	*Movement in discounted loss reserves* (4)	*Underwriting profit/(loss)* (5)	*Investment income on loss reserves* (6)	*Insurance profit* (7)	*'Risk free' discount factors* (8)	*Risk adjusted discount factors* (9)
0	765.26		(765.26)	(765.26)	0.00		0.00		
1		(150.00)	(629.03)	136.23	(13.77)	22.96	9.18	0.9709	0.9823
2		(300.00)	(340.35)	288.68	(11.32)	18.87	7.55	0.9426	0.9649
3		(200.00)	(146.48)	193.87	(6.13)	10.21	4.08	0.9151	0.9479
4		(100.00)	(49.12)	97.36	(2.64)	4.39	1.76	0.8885	0.9311
5		(50.00)		49.12	(0.88)	1.47	0.59	0.8626	0.9147

1. The insurance premium for the losses component only is $765.26 and is equal to the discounted value of loss payments at the risk adjusted rate of 1.8%. It is assumed that the premium charged for the insurance risk component of the contract is exactly this figure. Column (9) contains the set of risk adjusted discount factors such that the premium is equal to columns (2)×(9).
2. Loss payments that are made at the end of each year per the assumptions.
3. Discounted loss reserves are equal to the present value of future loss payments discounted at the risk adjusted rate. This is also equal to columns (2)×(9), but just for the loss payments expected in future years.
4. Movement in discounted loss reserves is the annual movement of column (3).
5. Underwriting profit/(loss) is equal to (1)+(2)+(4). This is a traditional measure of insurance contract performance.

6. Investment income on loss reserves is equal to 3% multiplied by the opening balance for the year of discounted loss reserves from column (3).
7. Insurance profit is equal to (5) + (6).
8. Risk free discount factors, calculated here for use throughout the worked example and equal to $(1+3.0\%)^{-Time}$.
9. Risk adjusted discount factors, calculated here for use throughout the worked example and equal to $(1+1.8\%)^{-Time}$.

The insurance profit that emerges each year is equivalent to the risk adjustment, being the negative of the Beta of liabilities times the market risk premium, (-1)×(-0.2)×6% = 1.2%, multiplied by the opening loss reserves.

3.6. Capital, Tax and Tax investment income compensation

Thus far, the operation of the risk adjustment has been demonstrated for losses. In this section, tax is considered and the compensation for tax that is incurred on expected investment returns on insurance risk capital.

Table C: Capital, Tax and Tax on investment income compensation

Time	*Insurance risk capital (reduced for tax effect)* (10)	*Investment income on capital* (11)	*Tax balance capital investment income* (12)	*Movement in tax balance* (13)	*Investment income on tax balance* (14)	*Total profit before tax* (15)	*Tax* (16)	*Total profit after tax* (17)	*Return on capital* (18)
0	267.84		(16.38)	(16.38)		0.00	0.00	0.00	
1	220.16	16.07	(9.98)	6.40	0.49	32.14	(9.64)	22.50	8.40%
2	119.12	13.21	(4.62)	5.36	0.30	26.42	(7.93)	18.49	8.40%
3	51.27	7.15	(1.70)	2.92	0.14	14.29	(4.29)	10.01	8.40%
4	17.19	3.08	(0.43)	1.27	0.05	6.15	(1.85)	4.31	8.40%
5		1.03		0.43	0.01	2.06	(0.62)	1.44	8.40%

10. Insurance risk capital (reduced for tax effect) is 35% multiplied by the loss reserves discounted at the risk adjusted rate from column (3).
11. Investment income on capital is equal to the capital at the beginning of the year in column (10) multiplied by the expected earning rate for capital investments of 6%.
12. Tax balance for capital investment income is the compensation that is charged to the policyholder as an additional premium component and released to compensate for tax on the investment income. This is equal to the present value using the risk-free discount rates of the expected future tax payable on the investment income on insurance risk capital, grossed up for tax. Hence it is equal to columns (11) × 30%÷(1-30%) × (8).
13. Movement in tax balance equals the annual movement of column (12).

14. Investment income on tax balance equals the risk-free rate of 3% multiplied by the opening tax balance for the year from column (12).
15. Total profit before tax equals the insurance profit plus investment income on insurance risk capital plus the movement in the tax balance plus investment income on the tax balance; hence columns (7)+(11)+(13)+(14).
16. Tax is 30% of column (15).
17. Total profit after tax equals columns (15) + (16).
18. Return on capital equals column (17) divided by the opening balance of capital from column (10).

The policyholder pays both the premium for losses as well as the tax balance in respect of the insurance risk component of the contract, a total of $781.63 = $765.26 + $16.38 (rounding).

The tax compensation, including its investment income and tax of itself, exactly equals the tax on insurance risk capital investment income each year. That is 30% × (11) = (1-30%) × [(13) + (14)].

The return on insurance risk capital after tax each year is equal to 6.0% from capital investment income, with the tax on this income compensated for, plus the risk adjustment. Capital being 50% of loss reserves before the tax effect means that the annual 1.2% risk adjustment in loss reserves becomes 1.2% ÷ 50% = 2.4%. Hence the total return on capital is 8.4% and this emerges each year provided that, as per this worked example, capital is a constant proportion of loss reserves discounted at the risk adjusted rate for the duration of loss cashflows.

3.7. Internal Rate of Return

The reconciliation of the internal rate of return (**IRR**) for the insurance risk capital supporting the insurance risk component of the contract is shown in the following table.

Table D: Shareholder IRR

Time	*Movement in capital* (19)	*Total profit after tax* (20)	*Shareholder cashflow* (21)
0	(267.84)	0.00	(267.84)
1	47.68	22.50	70.18
2	101.04	18.49	119.53
3	67.86	10.01	77.86
4	34.08	4.31	38.38
5	17.19	1.44	18.63
Internal rate of return			8.40%

19. Movement in capital is the annual change in the insurance risk capital requirement shown in column (10). It reveals the initial injection of capital to support the contract and its subsequent release.
20. Total profit after tax is a repeat of column (17).

21. Shareholder cashflow equals columns (19) + (20), which shows the injection the shareholder makes at inception and the return of that capital plus after-tax profit in subsequent years.

The internal rate of return of column (21) is 8.4%. This is an unsurprising result given the uniform annual return on capital of 8.4% from column (18).

3.8. Reconciliation to the weighted average cost of capital of the insurer

As a small but important aside, it can be shown that the return on insurance risk capital and IRR for this insurance contract of 8.4% p.a. is equivalent to the weighted average cost of capital (**WACC**) of the insurer.

In order to do this, it is assumed that the insurer is in a steady state, continuously writing the one identical insurance contract each year. The balance sheet for this steady state insurer is shown in the following table.

Table E: Steady state balance sheet

Assets			*Beta*
Capital	(22)	675.58	0.50
Loss reserves	(23)	1,930.23	0.00
Tax balance	(24)	33.11	0.00
Liabilities			
Loss reserves	(25)	(1,930.23)	(0.14)
Tax balance	(26)	(33.11)	0.00
Net assets	**(27)**	**675.58**	**0.90**
Weighted average cost of capital	**(28)**		**8.40%**

22. The insurance risk capital of the insurer is equal to the sum of the capital required to support one contract at inception, one at year 1, one at year 2 and so on. Hence the capital required in a steady state of five active contracts is equal to the sum of column (10). This capital is invested in a portfolio with an assumed CAPM Beta of 0.5.
23. Loss reserves in a steady state equal the sum of column (3). As the assets backing the loss reserves are assumed to be invested in risk free assets, the CAPM Beta is zero.
24. The tax balance in a steady state is equal to the sum of column (12). As the assets backing the tax balance are assumed to be invested in risk free assets, the CAPM Beta is zero.
25. Loss reserves in a steady state equal the sum of column (3). Loss reserves have a CAPM Beta of -0.2. As loss payments are tax deductible, the Beta is multiplied by the tax effect of (1-30%) such that the liability Beta on the balance sheet is -0.14.
26. The tax balance in a steady state is equal to the sum of column (12). The tax balance has a CAPM Beta of zero.
27. The net assets have a weighted average Beta of 0.9. This is found by multiplying the Betas by the balance sheet amount, taking the sum and dividing by the net assets.

28. The WACC is then found by applying the CAPM formula to arrive at 8.4% = 3.0% + 0.9×6.0%.

As is revealed in this table, the WACC of the insurer equates to the IRR of the contract within a CAPM framework. Under this framework, an insurer may potentially work backwards from its observed market Beta to determine an overall loss cashflow CAPM Beta for its insurance contracts for use in the risk adjusted rate formula. However, if the insurer undertakes other activities such as insurance services, then this needs to be considered if decomposing an observed CAPM Beta for the insurer to source components.

It was not necessary to assume a steady state; choosing an individual year of a single contract also produces the same result.

4. FULFILMENT OF CASHFLOWS FOR SERVICES AND THE CONTRACTUAL SERVICE MARGIN

4.1. Proposed General Measurement Model approach for services for property & casualty insurers

The proposed measurement that complies with IFRS17 Paragraph 32 in respect of the services provided within an insurance contract, from the time of inception until extinguishment, is equivalent to:

- **Present value of expense cashflows for future services to be provided under the contract, discounted at a risk adjusted rate; plus**
- **A contractual service margin, which equals the restated CSM as of inception plus risk free investment income multiplied by the proportion that the risk (of losses) in any remaining coverage period bears to the total coverage period risk.**

Expense services cashflows may be risk free in the sense that they are contracted to be provided at a certain time for a certain cost. Other services may be subject to risk. For example, claim handling services are relative to the claim frequency and complexity and duration of claim which is often indicated by the average claim size. It is not unusual for property & casualty insurers to assume that claim handling expenses are proportional to losses in quantum and risk.

Five services are defined for the worked example that include distribution, product & underwriting, claim handling, supply chain and corporate. These services have no particular meaning under IFRS17, but they illustrate a range of timing in incurring these expenses either before contract inception, at inception, during the coverage period or beyond the coverage period. The general model invites detailed cashflow projection of service expenses and a release of profit margins that can be attributable to those services proportional to their delivery.

This does not appear to be the case for property & casualty insurers. Under IFRS17, insurers are essentially deemed to provide just the one service under their contracts – coverage of insured events during the coverage period. Profit, being any amount in excess of what is put aside for contract fulfilment, risk adjustment and tax compensation is considered collectively to be CSM relative to the one service of risk coverage. The CSM is therefore released through the coverage period proportional to the risk of insured events, being completely recognised by the end of the coverage period. Perhaps in due course the standards will reflect a release of CSM proportional to the true nature of the services the insurer provides. This may result in profit relating to acquisition expenses being released at inception, a portion of profit during the coverage period and a final portion of profit released in proportion to claim handling and related services.

The CSM cannot be negative. Should it be, then the contract is onerous, and a loss recorded to the extent that the measurement with a zero CSM exceeds the total premium.

If, prior to the end of the contract period, projected fulfilment cashflows change, then the CSM as of inception is reassessed to again be the difference between total premium and the present value of all fulfilment cashflows. The measurement of CSM continues relative to this reassessed figure.

These service modules are typically all necessary for an insurance contract but are not necessarily all provided by the insurer who provides the insurance risk component. A broker or retailing partner may distribute the product for example. The service modules also require operational risk capital to support them. In this worked example, it is assumed that the insurer provides all five service modules to the insurance contract and accounts for them appropriately under IFRS17. Admittedly, the worked example of a 1-year coverage period does not strongly illustrate the CSM concept that would require wholesome consideration for insurance products such as lenders' mortgage insurance.

4.2. Expense assumptions

The expense assumptions for the five services for the worked example are shown in the following table.

Table F: Services expense and profit assumptions

Services	*Expense* (29)	*Profit margin of total premium* (30)
Distribution	100.00	2.50%
Product & UW	40.00	1.00%
Claim handling	5.00% of losses	1.20%
Supply chain	1.00% of losses	1.00%
Corporate	22.50	0.50%
Operational risk capital	45.0% of expenses	

29. The expenses for distribution, product & underwriting and corporate are assumed to be fixed amounts and the service is provided at inception. The two services of claim handling and supply chain are assumed to be provided as losses are paid, proportional to those losses.
30. This is the assumed profit margin percentage of total premium that is charged for the service.

The operational risk capital assumption of 45% of expenses is also expressed prior to the tax effect. Post tax effect the allocated operational risk capital is 31.5% = 45% × (1 - 30%).

4.3. Total premium

With the expense assumptions now defined, the total premium for the insurance contract is shown in the following table.

Table G: Total premium

			Premium	*Proportion*
Losses				
	PV of losses (risk free)	(31)	743.42	70.43%
Expenses				
	Distribution	(32)	100.00	
	Product & UW	(33)	40.00	
	Claim handling (risk free)	(34)	37.17	
	Supply chain (risk free)	(35)	7.43	
	Corporate	(36)	22.50	
	Total expenses	(37)	*207.11*	19.62%
Profit items				
	Risk adjustment on losses	(38)	21.84	
	PV of tax on income on capital	(39)	16.38	
	Total insurance risk margin	(40)	*38.22*	3.62%
	Risk adjustment on CH & SC	(41)	1.31	0.12%
	Distribution	(42)	26.39	2.50%
	Product & UW	(43)	10.55	1.00%
	Claim handling	(44)	12.67	1.20%
	Supply chain	(45)	10.55	1.00%
	Corporate	(46)	5.28	0.50%
	Contract service margin	(47)	*65.44*	6.20%
	Total profit	(48)	*104.97*	9.94%
Total premium		(49)	**1,055.49**	

31. The present value of losses at the risk-free rate is equal to the losses from column (3) multiplied by the risk-free discount rates in column (8). This is done to show the extent of risk adjustment from discounting at the risk adjusted rate which is shown as a profit item at row (38).
32. Distribution expenses per assumption above, incurred at inception.
33. Product & underwriting expenses per assumption above, incurred at inception.

34. Claim handling is assumed to be 5% of losses and carries the same risk. Shown here is 5% of the risk-free discounted value of losses with the risk adjustment included in row (39).
35. Supply chain is assumed to be 1% of losses and carries the same risk. Shown here is 1% of the risk-free discounted value of losses with the risk adjustment included in row (39).
36. Corporate expenses per assumption above, incurred at inception.
37. Total expenses equal the sum of rows (32) through (36).
38. Risk adjustment on losses. This is the difference in the present value of losses between using the risk adjusted rate and the risk-free rate.
39. Present value of tax on insurance risk capital investment income as calculated earlier in column (12) at time zero.
40. Total insurance risk margin on insurance risk capital equals rows (38) + (39).
41. Risk adjustment on claim handling and supply chain. This is the difference in the present value of claim handling and supply chain expenses between using the risk adjusted rate and the risk-free rate.
42. Distribution profit margin, percentage of total premium.
43. Product & underwriting profit margin, percentage of total premium.
44. Claim handling profit margin, percentage of total premium.
45. Supply chain profit margin, percentage of total premium.
46. Corporate profit margin, percentage of total premium.
47. Contract service margin equals the sum of rows (42) through (46).
48. Total profit equals rows (40) + (41) + (47).
49. Total premium for the insurance contract, which equals rows (31) + (37) + (48).

4.4. Expense reserves and contract service margin

The recognition of expenses and profit on expenses for the service modules are show in the following table.

Table H: Service expenses

Time	*Services premium component*	*Distribution; Product & UW; Corporate*	*Claim handling*	*Claim handling reserve*	*Supply chain*	*Supply chain reserve*	*Contract service margin*
	(50)	(51)	(52)	(53)	(54)	(55)	(56)
0	273.86	(162.50)		(38.26)		(7.65)	(65.44)
1			(7.50)	(31.45)	(1.50)	(6.29)	
2			(15.00)	(17.02)	(3.00)	(3.40)	
3			(10.00)	(7.32)	(2.00)	(1.46)	
4			(5.00)	(2.46)	(1.00)	(0.49)	
5			(2.50)		(0.50)		

Time	*Investment income on services balances*	*Services profit*	*Operational risk capital*	*Investment income on operational risk capital*	*Total services profit*	*Tax on total services profit*	*Total services profit after tax*
	(57)	(58)	(59)	(60)	(61)	(62)	(63)
0		0.00	51.19		0.00	0.00	0.00
1	2.36	66.97	2.84	3.07	70.04	(21.01)	49.03
2	1.13	0.45	5.67	0.17	0.62	(0.19)	0.44
3	0.61	0.25	3.78	0.34	0.59	(0.18)	0.41
4	0.26	0.11	1.89	0.23	0.33	(0.10)	0.23
5	0.09	0.04		0.11	0.15	(0.04)	0.10

50. Services premium component is the total charge included in the total premium for the contract services and equal to rows (37) + (41) + (47). In practice, it would typically be calculated backwards from the total premium at row (49) less the insurance risk component that equals the losses (31), the risk adjustment on losses (38) and the tax compensation (39).
51. Distribution, Product & Underwriting and Corporate expenses are assumed to arise at contract inception and are equal to rows (41) + (42) + (45).
52. Claim handling expenses are equal to 5% of loss payments from column (2).
53. Claim handling reserve is 5% of loss reserves from column (3).
54. Supply chain expenses are equal to 1% of loss payments from column (2).
55. Supply chain reserve is 1% of loss reserves from column (3).

56. Contract service margin at inception equals the service premium component from column (50) less the expenses at inception from column (51) less the present value of future service expenses from columns (53) and (55). This balance plus accrued investment income is released over the coverage period proportional to the risk of insured events. In this worked example, the CSM is assumed to be released uniformly over the coverage period of 1 year such that it is zero at time 1.
57. Investment income on services balances equals the risk free rate of 3.0% multiplied by the opening balances from columns (53) and (55) plus one half of the contract service margin in column (56) year 1 only given the assumption of being uniformly released during that year.
58. Services profit equals the sum of columns (50) through (57) plus the opening balances from columns (53) and (55).
59. Operational risk capital equals the capital to expense ratio of 45% multiplied by the tax effect of (1-30%) multiplied by expenses incurred in the coming year from columns (51), (52) and (54).
60. Investment income on operational risk capital is equal to the investment return on capital of 6.0% multiplied by the opening balance for operational risk capital from column (59).
61. Total services profit equals columns (58) + (60).
62. Tax on total services profit equals 30% of column (61).
63. Total services profit after tax equals columns (61) + (62).

5. IFRS 17 GENERAL MEASUREMENT MODEL PRESENTATION

5.1. Introduction

This section presents the cashflows of the worked example from Tables A through H in an IFRS 17 format for:

- The Insurance Contracts Liability (**ICL**) which is a balance sheet item that includes the reserves and balances associated with the claim fulfilment cashflows of the insurance contract; and
- The Profit & Loss including the items associated with the insurance contract.

Following this section, the PAA will be explored.

Included as Appendix B to this paper are the Profit & Loss statements from the insurance contract cashflows from Tables A through H, but presented under two alternative accounting bases:

- AASB1023 which is applicable in Australia where a key difference to the IFRS17 GMM is the use of a risk margin that provides a chosen probability of ultimate sufficiency of the reserves; and
- USGAAP which is applicable in the US where the loss reserves are undiscounted.

It may be of use to reference a familiar presentation of the Profit & Loss to appreciate the differences with IFRS17. The difference in profit recognition between the bases will then be summarised in the last section of this paper.

5.2. Summary of Insurance Contract Liabilities, General Measurement Model

The following table brings together the various reserves and balances over the cashflow duration of the insurance contract. In total it forms the 'Insurance Contract Liabilities' item on the balance sheet.

Table I: Summary of Insurance Contract Liabilities, General Measurement Model

			Time		
Loss reserves	*0*	*1*	*2*	*3*	*4*
Undiscounted loss reserve	(800.00)	(650.00)	(350.00)	(150.00)	(50.00)
Risk free discount	56.58	34.28	15.81	5.78	1.46
Risk adjustment	(21.84)	(13.31)	(6.16)	(2.26)	(0.57)
Discounted loss reserve	(765.26)	(629.03)	(340.35)	(146.48)	(49.12)
Tax compensation balance					
Undiscounted tax compensation balance	(17.37)	(10.48)	(4.82)	(1.76)	(0.44)
Risk free discount	0.99	0.50	0.20	0.06	0.01
Risk adjustment	0.00	0.00	0.00	0.00	0.00
Discounted tax compensation balance	(16.38)	(9.98)	(4.62)	(1.70)	(0.43)
Claim handling reserves					
Undiscounted claim handling reserve	(40.00)	(32.50)	(17.50)	(7.50)	(2.50)
Risk free discount	2.83	1.71	0.79	0.29	0.07
Risk adjustment	(1.09)	(0.67)	(0.31)	(0.11)	(0.03)
Discounted claim handing reserve	(38.26)	(31.45)	(17.02)	(7.32)	(2.46)
Supply chain reserves					
Undiscounted supply chain reserve	(8.00)	(6.50)	(3.50)	(1.50)	(0.50)
Risk free discount	0.57	0.34	0.16	0.06	0.01
Risk adjustment	(0.22)	(0.13)	(0.06)	(0.02)	(0.01)
Discounted supply chain reserve	(7.65)	(6.29)	(3.40)	(1.46)	(0.49)
Insurance Contract Liabilities					
Undiscounted ICL	(865.37)	(699.48)	(375.82)	(160.76)	(53.44)
Risk free discount	60.97	36.84	16.96	6.19	1.56
Risk adjustment	(23.15)	(14.11)	(6.53)	(2.40)	(0.61)
Discounted ICL	(827.55)	(676.76)	(365.40)	(156.96)	(52.49)
Contract service margin	(65.44)				
Total ICL	**(892.99)**	**(676.76)**	**(365.40)**	**(156.96)**	**(52.49)**
Summary of risk adjustment discount					
Undiscounted risk adjustment	(24.55)	(14.82)	(6.82)	(2.49)	(0.62)
Risk free discount	1.40	0.71	0.29	0.09	0.02
Discounted risk adjustment	(23.15)	(14.11)	(6.53)	(2.40)	(0.61)

There is quite an amount of necessary detail here to capture all items of loss reserve, tax balance, risk adjustments, service expenses and contract service margin. However, many of the blocks of information above are all based on simple multiples of the loss reserve cashflows given the nature of the assumptions made. For example:

- The discounted tax compensation balance is proportional to the loss reserve risk adjustment; and
- All cashflows for expenses and the contract services margins are percentages of the loss reserve cashflows.

Expressing the risk adjustment as the difference between using a risk adjusted discount rate and the risk-free rate reveals a risk adjustment that technically has no cashflow. Shown at the bottom of Table I above is a constructed risk-free discount unwind for the risk adjustment for use in IFRS17 reporting. This is found by working backwards from the projected last risk adjustment calculation and adding in the unwind each year.

5.3. Profit & Loss, General Measurement Model

Utilising the cashflows developed previously, the IFRS17 profit and loss that brings together the insurance risk and services components is assembled below:

Table J: IFRS 17 Profit & Loss, General Measurement Model

	Time					
	0	*1*	*2*	*3*	*4*	*5*
Insurance Revenue	**1,055.49**					
Insurance service expense	**(1,055.49)**	**82.06**	**13.66**	**7.39**	**3.18**	**1.07**
Losses paid		(150.00)	(300.00)	(200.00)	(100.00)	(50.00)
Undiscounted loss reserve mvt	(800.00)	150.00	300.00	200.00	100.00	50.00
Discount mvt on loss reserves	56.58	(22.30)	(18.47)	(10.03)	(4.33)	(1.46)
Discount unwind		22.30	18.47	10.03	4.33	1.46
Risk adjustment mvt	(21.84)	8.53	7.15	3.90	1.69	0.57
Undiscounted tax compensation mvt	(17.37)	6.89	5.66	3.06	1.32	0.44
Discount mvt on tax compensation	0.99	(0.49)	(0.30)	(0.14)	(0.05)	(0.01)
Discount unwind		0.49	0.30	0.14	0.05	0.01
Distribution	(100.00)					
Product & UW	(40.00)					
Corporate	(22.50)					
Contract service margin mvt	(65.44)	65.44				
Claim handling		(7.50)	(15.00)	(10.00)	(5.00)	(2.50)
Undiscounted claim handling mvt	(40.00)	7.50	15.00	10.00	5.00	2.50
Discount mvt on claim handling	2.83	(1.12)	(0.92)	(0.50)	(0.22)	(0.07)
Discount unwind		1.12	0.92	0.50	0.22	0.07
Risk adjustment mvt	(1.09)	0.43	0.36	0.19	0.08	0.03
Supply chain		(1.50)	(3.00)	(2.00)	(1.00)	(0.50)
Undiscounted supply chain mvt	(8.00)	1.50	3.00	2.00	1.00	0.50
Discount mvt on supply chain	0.57	(0.22)	(0.18)	(0.10)	(0.04)	(0.01)
Discount unwind		0.22	0.18	0.10	0.04	0.01
Risk adjustment movement	(0.22)	0.09	0.07	0.04	0.02	0.01
Total risk adjustment unwind		0.69	0.42	0.20	0.07	0.02
Insurance service result	**0.00**	**82.06**	**13.66**	**7.39**	**3.18**	**1.07**
Insurance finance income/ (expense)		**(24.83)**	**(20.30)**	**(10.96)**	**(4.71)**	**(1.57)**
Investment income		**44.95**	**33.68**	**18.45**	**8.01**	**2.72**
Loss reserves + balances		25.81	20.30	10.96	4.71	1.57
Shareholder capital		19.14	13.38	7.49	3.30	1.14
Investment result		**20.12**	**13.38**	**7.49**	**3.30**	**1.14**
Profit before tax	**0.00**	**102.18**	**27.04**	**14.88**	**6.48**	**2.21**
Income tax	**0.00**	**(30.66)**	**(8.11)**	**(4.46)**	**(1.95)**	**(0.66)**
Profit for the period	**0.00**	**71.53**	**18.93**	**10.42**	**4.54**	**1.55**

As required under IFRS17, no profit is recognised at the inception of the insurance contract. The mechanism of the risk adjustment, tax compensation and contractual service margin recognises profit proportional to the provision of insurance risk capital by the shareholder and the provision of services.

One of the key aspects in which the IFRS17 Profit & Loss differs from other standards that report an 'underwriting result' is that the discount unwind is credited to the 'Insurance service result' with an exact offset revealed as an 'Insurance finance expense'. A similar outcome would be achieved within current accounting standards by moving investment income on technical provisions into the underwriting result. This change means that the investment result is therefore the sum of:

- Investment income on capital; plus
- Investment income on the CSM; plus
- Market risk included in the investment strategy for assets supporting the 'Insurance Contract Liabilities' (which is zero under the assumptions of the worked example in this paper).

6. IFRS 17 PREMIUM ALLOCATION APPROACH

6.1. Proposed simplification of measurement for the PAA

The PAA may be applied to insurance contracts that have a coverage period of one year or less. At a reporting date, it enables insurance contracts that are currently within their coverage period to measure liabilities associated with the remaining coverage as a proportion of the premium less acquisition costs. The proportion represents the risk (of losses) in the remaining coverage period relative to the total coverage period risk. The PAA essentially replaces the concept of CSM.

Even if the PAA is adopted, incurred claims are measured in the same manner as they are under the GMM. Despite this, the opportunity is taken here to propose a simpler measurement approach for incurred claims that complements the PAA and reduces the extent of detailed cashflows that the GMM invites.

The proposed simplified measurement of *incurred claims only* that complies with IFRS17 Paragraph 32 for an insurance contract, including both insurance risk and services components, is:

- **Present value of uncertain future loss cashflows, discounted at a 'risk free' rate; plus**
- **Present value of claim handling and other service expenses, discounted at a 'risk free' rate; plus**
- **An adjustment for risk.**

The 'risk free' rate is defined as that consistent with IFRS17 paragraph 36.

6.2. Adjustment for risk

A proposed adjustment for risk combines the concepts of a risk adjustment on all cashflows and tax compensation on investment income on insurance risk capital into the one calculation as follows:

- Present value of future loss cashflows discounted at the risk adjusted rate less the present value of loss cashflows discounted at the risk-free rate; *multiplied by*
- An *RA modifier* that is equal to:

$$1 + \frac{\tau \kappa r_K}{(1-\tau)\left(r_f - r_L\right)} + \gamma$$

Where:

- τ is the tax rate, assumed to be 30% in the present worked example;
- κ is the insurance risk capital post tax effect expressed as a ratio of loss reserves discounted at the risk adjusted rate, assumed to be 35%;
- r_K is the expected return on capital, assumed to be 6.0%;
- r_f is the risk-free rate, assumed to be 3.0% and in the present context allows for the term structure and illiquid nature of the cashflows (IFRS17 paragraph 36);
- r_L is the risk adjusted discount rate to apply to uncertain loss cashflows, assumed to be 1.80%;
- γ is the claim handling and supply chain service expense allowance, expressed as a proportion of loss payments and is assumed to be 6.0%; and

In the present example, the RA modifier is equal to:

$$1 + \frac{0.30 \times 0.35 \times 0.06}{(1-0.30) \times (0.030 - 0.018)} + 0.06 = 1.810$$

It is a condition of the RA modifier that the insurance risk capital allocated to the insurance contract is maintained as a constant proportion of the loss reserves discounted at the risk adjusted rate from inception of the insurance contract until the loss cashflows cease.

6.3. Insurance contract liabilities, Premium Allocation Approach

Using the proposed measurement approach under the PAA, the insurance contract liabilities are given in the following table.

Table K: Summary of Insurance Contract Liabilities, Premium Allocation Approach

	Time				
Loss reserves	*0*	*1*	*2*	*3*	*4*
Undiscounted loss reserve	(800.00)	(650.00)	(350.00)	(150.00)	(50.00)
Risk free discount	56.58	34.28	15.81	5.78	1.46
Discounted loss reserves	(743.42)	(615.72)	(334.19)	(144.22)	(48.54)
Claim handling reserves					
Undiscounted projected claim handling	(48.00)	(39.00)	(21.00)	(9.00)	(3.00)
Risk free discount	3.39	2.06	0.95	0.35	0.09
Discounted claim handing	(44.61)	(36.94)	(20.05)	(8.65)	(2.91)
Risk adjustment					
Undscounted risk adjustment	(41.92)	(25.30)	(11.64)	(4.25)	(1.07)
Risk free discount	2.40	1.21	0.49	0.15	0.03
Discounted risk adjustment	(39.53)	(24.09)	(11.15)	(4.09)	(1.04)
Insurance Contract Liabilities					
Undscounted	(889.92)	(714.30)	(382.64)	(163.25)	(54.07)
Risk free discount	62.37	37.55	17.25	6.28	1.57
Discounted loss reserves	(827.55)	(676.76)	(365.40)	(156.96)	(52.49)

The risk adjustment calculation does not readily produce a cashflow pattern and it is not proportional to another cashflow such as loss payments. Hence the risk-free discount and undiscounted risk adjustment need to be determined working backwards from the last risk adjustment to impute a risk-free discount as with the GMM.

6.4. Profit & Loss, Premium Allocation Approach

The IFRS17 Profit & Loss utilising the PAA is as follows.

Table L: IFRS 17 Profit & Loss, Premium Allocation Approach

	Time					
	0	*1*	*2*	*3*	*4*	*5*
Insurance Revenue	**1,055.49**					
Insurance service expense	**(1,055.49)**	**82.06**	**13.66**	**7.39**	**3.18**	**1.07**
Premium less acquisition costs	(892.99)	892.99				
Discount unwind		24.83				
Losses paid		(150.00)	(300.00)	(200.00)	(100.00)	(50.00)
Undiscounted loss reserve movement		(650.00)	300.00	200.00	100.00	50.00
Discount movement on loss reserves		34.28	(18.47)	(10.03)	(4.33)	(1.46)
Discount unwind			18.47	10.03	4.33	1.46
Distribution	(100.00)					
Product & UW	(40.00)					
Corporate	(22.50)					
Claim handling		(9.00)	(18.00)	(12.00)	(6.00)	(3.00)
Undiscounted claim handling movement		(39.00)	18.00	12.00	6.00	3.00
Discount movement on claim handling		2.06	(1.11)	(0.60)	(0.26)	(0.09)
Discount unwind			1.11	0.60	0.26	0.09
Undiscounted risk adjustment movement		(25.30)	13.66	7.39	3.18	1.07
Discount movement on risk adjustment		1.21	(0.72)	(0.33)	(0.12)	(0.03)
Discount unwind			0.72	0.33	0.12	0.03
Insurance service result	**0.00**	**82.06**	**13.66**	**7.39**	**3.18**	**1.07**
Insurance finance income/ (expense)		**(24.83)**	**(20.30)**	**(10.96)**	**(4.71)**	**(1.57)**
Investment income		**44.95**	**33.68**	**18.45**	**8.01**	**2.72**
Loss reserves + balances		25.81	20.30	10.96	4.71	1.57
Shareholder capital		19.14	13.38	7.49	3.30	1.14
Investment result		**20.12**	**13.38**	**7.49**	**3.30**	**1.14**
Profit before tax	**0.00**	**102.18**	**27.04**	**14.88**	**6.48**	**2.21**
Income tax	**0.00**	**(30.66)**	**(8.11)**	**(4.46)**	**(1.95)**	**(0.66)**
Profit for the period	**0.00**	**71.53**	**18.93**	**10.42**	**4.54**	**1.55**

A somewhat simpler Profit & Loss with reduced cashflows yet remaining identical in profit recognition to the GMM under the conditions and assumptions of the proposed measurement approach.

7. PROFIT RECOGNITION PATTERN

7.1. Profit under different accounting standards

A key difference between accounting standards is the pattern in which profit is recognized.

In the table and chart below, the after-tax profit pattern for the insurance contract from the IFRS17 worked example (Tables A through L) is compared with the profit pattern produced under two alternative accounting standards: AASB1023 and USGAAP. The Profit & Loss statements under accounting standards AASB1023 and USGAAP are presented in Appendix B as Tables B1 and B2 respectively.

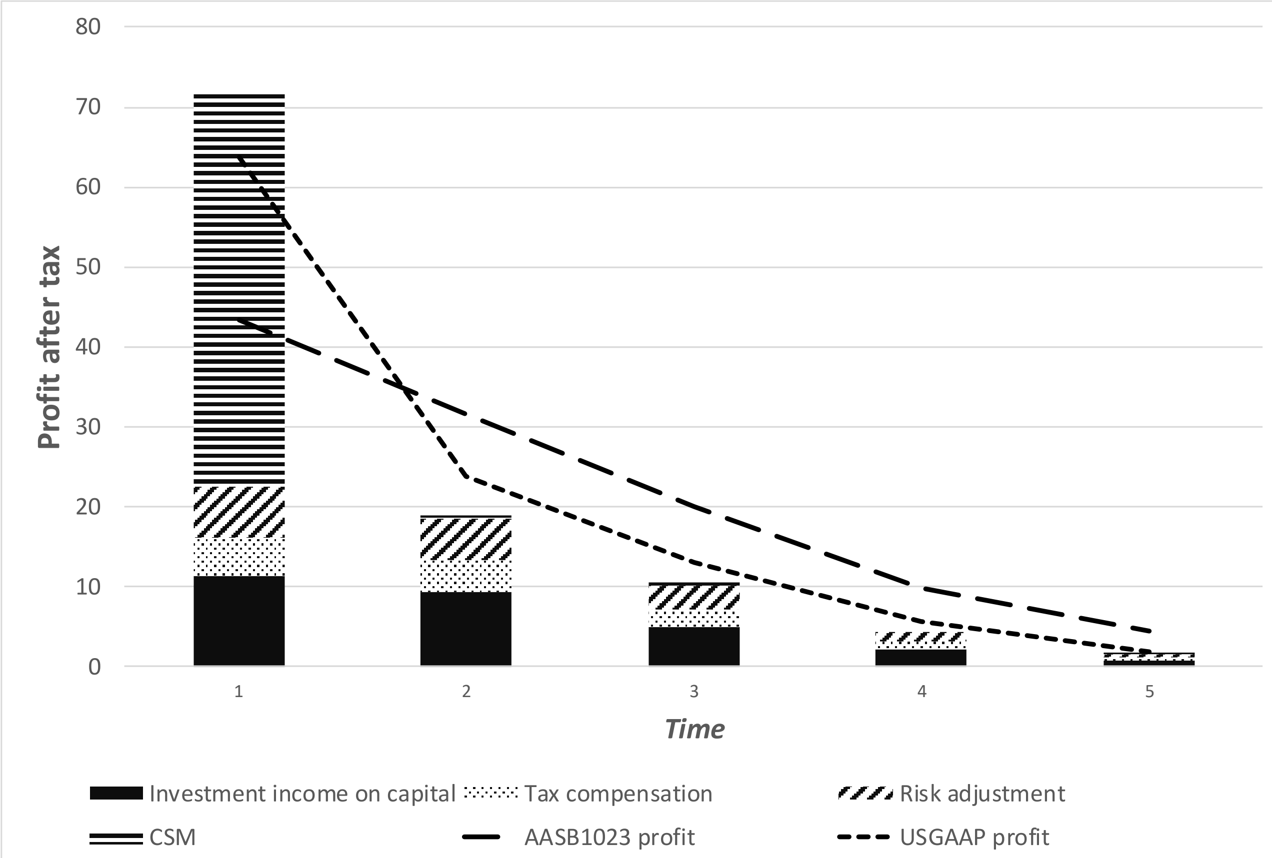
Table M: Recognition of profit after tax

	Profit after tax arising from						
Time	*Investment income on capital*	*Tax compensation*	*Risk adjustment*	*CSM*	*Total profit after tax (IFRS17)*	*Total profit after tax (AASB1023)*	*Total profit after tax (USGAAP)*
	(64)	(65)	(66)	(67)	(68)	(69)	(70)
1	11.25	4.82	6.43	49.03	71.53	43.39	63.65
2	9.25	3.96	5.28	0.44	18.93	31.63	23.83
3	5.00	2.14	2.86	0.41	10.42	20.08	13.03
4	2.15	0.92	1.23	0.23	4.54	9.73	5.65
5	0.72	0.31	0.41	0.10	1.55	4.51	1.91

64. Investment income on capital after tax, equals column (11) × (1-30%).
65. Tax compensation equals column (11) × 30%.
66. Risk adjustment after tax, equals column (7) × (1-30%).
67. CSM after tax, equal to column (63).
68. Total profit after tax (IFRS17), equals columns (64) + (65) + (66) + (67).
69. Total profit after tax (AASB1023), taken from Appendix B, Table B1.
70. Total profit after tax (USGAAP), taken from Appendix B, Table B2. Note that a 30% tax rate has been used for comparative purposes.

The same information is presented in the following chart.

Chart 1: Comparison of profit recognition between IFRS17, AASB1023 & USGAAP



7.2. Comparison to AASB1023

Industry practice under AASB1023 is to adopt a risk margin as part of total outstanding claim liabilities that provides a chosen probability of sufficiency (**PoS**). The PoS is the proportion of all possible scenario outcomes for future loss payments and associated expenses for which the total outstanding claim liabilities ultimately proves adequate to have met.

The PoS in practice for large listed property & casualty insurers in Australia is typically about 90%. Risk margins of this PoS will generally exceed the cost of capital and service profit margins included in the total premium that delays the recognition of profit relative to the proposed IFRS17 measurement approach.

7.3. Comparison to USGAAP

USGAAP measures loss and loss adjustment expense reserves on an undiscounted basis. This means the profit that is deferred beyond the coverage period is the investment income on the reserves with the underwriting result expected to be zero through the runoff of loss and loss adjustment expense cashflows. Given the prevailing low levels of risk-free investment return, the USGAAP approach currently releases profit somewhat similarly to IFRS17. The risk adjustment and tax compensation under IFRS17 defers profit to a marginally lesser extent than the 3% assumed risk free rate.

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Biography of the Author

Brett Ward is the Chief Actuary for Insurance Australia Group. He is responsible for advising the Board on loss reserves, capital and profit margins. Brett has an economics degree from Macquarie University and is a Fellow of the Institute of Actuaries of Australia.

Appendix A: IFRS17 application of the Myers & Cohn formula

9. CONTEXT

(Myers & Cohn, 1981) develops a formula for determining a fair premium, which is an initial measurement of the cashflows associated with an insurance contract. This formula aligns to the key principles of IFRS17 paragraph 32(a), namely it:

- considers estimates of future cash flows related to the contract;
- adjusts these cashflows to reflect the time value of money and the financial risks related to the future cash flows; and
- includes a risk adjustment for non-financial risk.

This Appendix shows that the proposed approach to the measurement of insurance contracts included in this paper is a special case of the Myers & Cohn (**MC**) formula. There are two conditions needed in order to support a simplified MC formula to measure insurance contracts:

- that there is a single corporate tax rate applied to cashflows of the insurer; and
- the proposed formula and approach to measurement of the insurance contract is applied separately to losses and tax balances until all cashflows associated with the contract cease.

If a third condition is met, it will be also demonstrated that this special case of the MC formula is equivalent to the internal rate of return (**IRR**) approach where the IRR is equivalent to the weighted average cost of capital (**WACC**) within a capital assets pricing model (**CAPM**) framework. This third condition is:

- that insurance risk capital allocated to the contract is a constant proportion of loss reserves discounted at a risk adjusted rate from inception until loss cashflows cease.

In environments where the conditions are not met, then the formulae will not be applicable without adjustment and there may not be equivalence of the IRR to WACC.

10. NOTATION

First, notation is defined for a simplified model of an *insurance risk* contract, meaning the exchange of uncertain losses for a fixed premium.

$t = 0, \ldots, T$	Time periods from the date of contract inception with cashflows generally occurring at integer time t.
P	The insurance risk component premium of the insurance contract.
L_t	Expected losses paid to the policyholder under the insurance contract at time t. Losses are assumed to be payable from time $t = 1, \ldots, T$.
r_f	Risk free rate of return per period.
r_m	Expected rate of return of the market per period.

β_L	The CAPM Beta of losses.
r_L	Risk adjusted discount rate per period applicable to the losses.
K_t	Insurance risk capital requirement, post tax effect, for the insurance contract at time t. Note that K_t may be any reasonable amount relative to the risk of the contract at time t that is consistent with the risk appetite of the insurer. This excludes operational risk capital that supports insurance services.
β_K	The weighted average CAPM Beta of the investments that make up the capital K_t.
r_K	The expected return per period on invested capital.
τ	The corporate tax rate.
λ	The constant proportion of insurance risk capital to loss reserves discounted at the risk adjusted rate – should this approach to capital allocation be adopted.
β_i	The CAPM Beta for the insurer's insurance risk capital, equivalent to the Beta for a share in the insurer that provides contracts with insurance risk only.

Second, notation is added in respect of the *Services* component of the insurance contract.

ρ	Coverage period for the insurance contract that runs from $t = 0 \rightarrow \rho$, where $1 \leq \rho \leq T$.
$\varphi(t)$	Probability distribution function reflecting insured risk within the coverage period, where $\int_{t=0}^{\rho} \varphi(t).dt = 1$.
α	Acquisition service expense amount incurred at inception of the insurance contract.
ξ	Profit margin on acquisition services as a proportion of acquisition service expenses.
γ	Claim handling and other services related to claim fulfilment as a proportion of loss payments.
η	Claim handling and other services profit margin as a proportion of the claim handling and other service expenses.
S_t	The contract service margin at time t.

The generic present value function for cashflows X_t at discount rate r_x is defined as follows:

$$\sum_{y=t+1}^{T} \frac{X_y}{(1+r_x)^{y-t}} = v_t(X; r_x) = v_t^X \tag{1}$$

With the discount rate made clear if the final abbreviated form above is used.

11. FULFILMENT OF CASHFLOWS FOR THE INSURANCE RISK COMPONENT

11.1. Myers & Cohn formula for a fair premium; the initial measurement of an insurance contract

(Myers & Cohn, 1981) proposes the following formula to determine a fair premium that adds two components to the present value of losses to allow for compensation of tax.

$$P = PV(L) + PV(UWPT) + PV(IBT) \tag{2}$$

That is, a fair premium and hence initial measurement of an insurance risk contract at inception equals the sum of:

- Present value of losses (L);
- Tax on the present value of underwriting profit components ($UWPT$); and
- Present value of tax on the investment income of the investible balance of reserves, other balances plus capital (IBT).

The difference in definition between $UWPT$ being the tax applied to present values and the IBT being a present value of tax is significant and implications are explored later.

The notation for the MC formula is abbreviated as follows such that the three premium components can be used more conveniently:

$$P = P^L + P^U + P^B \tag{3}$$

The discount rates used to determine the present value are related to the risk associated with each cashflow. Loss related cashflows are discounted at the risk adjusted rate r_L whereas premium and tax cashflows are discounted at the risk-free rate r_f.

11.2. Present value of losses with risk adjustment for non-financial (insurance) risk

In the absence of tax, the MC approach defines a fair premium as the present value of losses using a risk adjusted discount rate. Using the notation and function defined above, the formula is as follows.

$$PV(L) = P^L = \sum_{t=1}^{T} \frac{L_t}{(1 + r_L)^t} = v_0(L; r_L) \tag{4}$$

The CAPM framework has applicability in providing a suitable discount rate r_L for IFRS17 compliance purposes as follows:

$$r_L = r_f + \beta_L(r_m - r_f) \tag{5}$$

If β_L is negative, meaning that losses have an inverse covariance to market returns, then the discount rate is less than the risk-free rate thus creating a profit for shareholders for the risk they are assuming.

11.3. Compensation adjustments for tax on underwriting and investment income

The underwriting and investment income tax associated with the premium and losses will be dealt with first before considering the tax on investment income on insurance risk capital.

An insurer is (presently) taxed on its underwriting profit, that is, premium less losses for an insurance contract (P-L). Losses are paid over multiple periods and insurers are required to hold reserves for future loss payments. Consequently, premium is recognised as revenue not necessarily at the time of underwriting the contract but in a pattern that is determined by the movement in loss reserves. If we define P^* as the pattern of recognition of premium over multiple periods, then the MC adjustment for underwriting tax may be expressed as follows:

$$PV(UWPT) = P^U = \tau\left[v_0\left(P^*; r_f\right) - v_0(L; r_L)\right] \tag{6}$$

Note that the star superscript (*) will be used to indicate the recognition pattern for any premium item that appears in the tax adjustments.

An insurer is also taxed on its investment income. Leaving aside insurance risk capital for the moment, investment income is earned on loss reserves, which, for period t, is equal to $r_f v_{t-1}(L; r_L)$. If the sum of the underwriting and investment income tax balances is nonzero then this will itself earn investment income and attract tax. It is assumed that the loss reserves are invested in risk free assets replicating the expected loss cashflows, hence the present value of the tax on investment income on loss reserves is:

$$\begin{aligned} PV(IBT) = P^B &= \tau I_0^L + \tau I_0^{UB} \\ &= \tau\left[\sum_{t=1}^{T} \frac{r_f v_{t-1}(L; r_L)}{\left(1 + r_f\right)^t}\right] + \tau\left[\sum_{t=1}^{T} \frac{r_f v_{t-1}\left(P^{U*} + P^{B*}; r_f\right)}{\left(1 + r_f\right)^t}\right] \end{aligned} \tag{7}$$

Where the notation $\tau I_0^{\bullet}$ refers to the present value at contract inception, discounted at the risk-free rate, of the future expected tax on risk free investment returns for the reserves or balances indicated.

The partially complete MC formula, still excluding consideration of tax of investment income on insurance risk capital, is as follows:

$$P = v_0(L; r_L) + \tau\left[v_0\left(P^*; r_f\right) - v_0(L; r_L)\right] + \tau I_0^L + \tau I_0^{UB} \tag{8}$$

The MC formula can become somewhat iterative, particularly if the underwriting tax rate differs from the tax rate on investment income. The underwriting tax compensation has the property of being equal to the tax of the present value of all amounts recognised in the underwriting result *including* itself. The underwriting and investment income tax balances also generate further investment income and tax. The original MC formula is quite simply stated at equation (2) and, in that form, lends itself to mathematical solving similar to the IRR method. Nevertheless, under the present conditions including a single corporate rate of tax, the formula simplifies.

Separating P^* into its component parts, the MC formula becomes:

$$P = v_0(L;r_L) + \tau\left[v_0\left(P^{L*};r_f\right) - v_0(L;r_L) + v_0\left(P^{U*};r_f\right) + \tau I_0^{L*} + \tau I_0^{U*}\right] + \tau I_0^L + \tau I_0^{BU} \quad (9)$$

Extract the following three terms from equation (9):

$$\tau v_0\left(P^{L*};r_f\right) + \tau I_0^L - \tau v_0(L;r_L) \quad (10)$$

For simplicity, $v_t\left(L;r_f\right)$ will also be expressed as v_t^L, noting the discount rate is r_L. Expanding the terms, equation (10) becomes:

$$\tau \sum_{t=1}^{T} \frac{(v_{t-1}^L - v_t^L)}{\left(1+r_f\right)^t} \; + \; \tau \sum_{t=1}^{T} \frac{r_f v_{t-1}^L}{\left(1+r_f\right)^t} \; - \; \tau v_0^L \quad (11)$$

In combining the summations, successive terms for $v_1^L \dots v_{T-1}^L$ eliminate leaving the v_0 terms to also eliminate as follows:

$$\tau \sum_{t=1}^{T} \frac{\left(v_{t-1}^L + r_f v_{t-1}^L - v_t^L\right)}{\left(1+r_f\right)^t} \; - \; \tau v_0^L \quad (12)$$

$$\tau \sum_{t=1}^{T} \left[\frac{v_{t-1}^L}{\left(1+r_f\right)^{t-1}} - \frac{v_t^L}{\left(1+r_f\right)^t}\right] \; - \; \tau v_0^L \quad (13)$$

$$\tau v_0^L \; - \; \tau v_0^L \; = \; 0 \quad (14)$$

Hence:

$$v_0\left(P^{L*};r_f\right) - v_0(L;r_L) = -I_0^L \quad (15)$$

This indicates that the investment income at the risk-free rate appears as a negative item in the underwriting tax compensation. This is a tax deduction in the form of the risk-free discount 'unwind' on the loss reserves that appears in the underwriting result.

Extracting the underwriting tax term from equation (9):

$$P^U = \tau\left[\nu_0\left(P^{L*}; r_f\right) - \nu_0(L; r_L) + \nu_0\left(P^{U*}; r_f\right) + \tau I_0^{L*} + \tau I_0^{BU*}\right] \tag{16}$$

Substituting in equation (15):

$$P^U = \tau\left[-I_0^L + \nu_0\left(P^{U*}; r_f\right) + \tau I_0^{L*} + \tau I_0^{BU*}\right] \tag{17}$$

Equation (17) is solved with $P^U = -\tau I_0^L$ such that $P^B = \tau I_0^L$ and the tax balances sum to zero, thus:

$$P^U = \tau[-I_0^L - \tau I_0^{L*} + \tau I_0^{L*}] = -\tau I_0^L \tag{18}$$

The MC formula then simplifies to:

$$P = \nu_0(L; r_L) - \tau I_0^L + \tau I_0^L \tag{19}$$

$$P = \nu_0(L; r_L) \tag{20}$$

Simply the present value of losses discounted at the risk adjusted rate.

While it seems considerable effort to demonstrate that the MC formula tax compensations include an underwriting tax discount unwind deduction that offsets the tax payable on the investment income for loss reserves; what is not compensated for is also of importance.

At first glance, it appears as though the MC formula would compensate for <u>all</u> tax payable by the insurer; that the total profit from an insurance contract is the same as if no tax applied. It is common to read comments about the MC approach, including from Myers & Cohn themselves, that the fair premium includes the *present value of the tax burden on the insurer's underwriting and investment income*. However, this is not quite the case. The MC formula does not compensate shareholders in respect of all tax compared to a tax-free environment. There are two aspects of profit for which shareholders are not compensated for:

- *Insurance risk adjustment*. As losses are discounted at the risk adjusted rate in the underwriting tax compensation calculation, the risk adjustment emerges in the underwriting result without compensation and is therefore taxed. This is appropriate. As losses are tax deductible, the taxing authority is in effect a quota share partner and hence receives the appropriate share of the risk adjustment. As the net risk for the shareholder has been reduced, the risk adjustment net of tax is an appropriate return and no compensation from the policyholder is required.
- *Investment risk on loss reserves and tax balances*. Insurers often leverage investment risk on the loss reserves and other balances, particularly credit risk and duration mismatch risk. The risk, profit and tax are all borne by the shareholder and no compensation from the policyholder is required.

11.4. Compensation for tax on investment income on insurance risk capital

The taxing of investment income earned on capital represents an extra layer of taxation. Shareholders could otherwise invest the capital directly into the investments made by the insurer. By investing in an insurer, the shareholder experiences another layer of tax on investment income received by the insurer before it is ultimately distributed to the shareholder. In order to be at least indifferent about investing in an insurer to enable insurance contracts to be underwritten, shareholders need to be compensated for this extra layer of taxation.

Using the present notation and the assumption that cashflows occur at the end of each period t, the insurance risk capital that is required during period t that is required to support the uncertain loss reserves is equal to K_{t-1} which is the capital at the start of and for the duration of period t. This is assumed to have an expected return in each period of $r_K = r_f + \beta_K(r_m - r_f)$.

The tax compensation required in each period t is equal to $\tau r_K K_{t-1}$. The balance that delivers this compensation will also be subject to underwriting tax as well as income tax on investment earnings and needs to be 'grossed up' to allow for this. Although given the single corporate tax rate, this could be done intuitively by taking the present value of $\tau r_K K_{t-1}$ and using a $1/(1-\tau)$ gross up factor. A more detailed approach is taken here, including showing the MC formula components.

Insurers will have a strategic asset allocation to apply to its capital that will have a market Beta, β_K. The MC formula is agnostic to the Beta of capital and compensates the actual extent of the extra layer of taxation despite this being expectedly higher the higher the Beta. There is hence no strategic asset allocation considered other than fair by the MC formula.

Commencing with the last period of cashflows that occur at time T, the tax balance at the start of the period plus investment income needs to exactly deliver:

- underwriting tax on the part of the balance recognised in the period, which is all of the remaining balance for the last period T;
- tax on investment income earned by the balance; and
- the actual compensation on the tax on insurance risk capital investment income.

This is shown in equation (21). To simplify notation, the present value (risk free rate) at time t of the future tax balance cashflows in respect of the tax on the investment income on investment risk capital is denoted as v_t^θ.

$$v_{T-1}^\theta(1+r_f) - \tau v_{T-1}^\theta - \tau r_f v_{T-1}^\theta - \tau r_K K_{T-1} = 0 \qquad (21)$$

Which can be arranged as follows:

$$v_{T-1}^\theta(1+r_f)(1-\tau) = \tau r_K K_{T-1} \qquad (22)$$

$$\nu_{T-1}^{\theta} = \frac{\tau r_K K_{T-1}}{(1-\tau)(1+r_f)} \tag{23}$$

The preceding period is then added, which is in the same form as equation (21), except that:

- The underwriting tax is on the movement in the balance that occurs during period *T-1*; and
- The outcome of the opening tax balance together with the period *T-1* cashflows needs to deliver the required tax balance at the end of the period.

Hence the tax balance activity for period *T-1* may be expressed as:

$$\nu_{T-2}^{\theta}(1+r_f) - \tau(\nu_{T-2}^{\theta} - \nu_{T-1}^{\theta}) - \tau r_f \nu_{T-2}^{\theta} - \tau r_K K_{T-2} = \nu_{T-1}^{\theta} \tag{24}$$

Then, rearranging to determine ν_{T-2}^{θ}:

$$\nu_{T-2}^{\theta}(1+r_f)(1-\tau) = \tau r_K K_{T-2} + \nu_{T-1}^{\theta}(1-\tau) \tag{25}$$

$$\nu_{T-2}^{\theta}(1+r_f)(1-\tau) = \tau r_K K_{T-2} + \frac{\tau r_K K_{T-1}}{(1+r_f)} \tag{26}$$

$$\nu_{T-2}^{\theta} = \frac{\tau r_K K_{T-2}}{(1-\tau)(1+r_f)} + \frac{\tau r_K K_{T-1}}{(1-\tau)(1+r_f)^2} \tag{27}$$

$$\nu_{T-2}^{\theta} = \frac{\tau r_K}{1-\tau} \sum_{y=T-1}^{T} \frac{K_{y-1}}{(1+r_f)^{y-(T-2)}} \tag{28}$$

Adding back all preceding periods of t, the tax balance required to include in the premium to compensate for the tax on investment income on insurance risk capital is:

$$\nu_0^{\theta} = \frac{\tau r_K}{1-\tau} \sum_{t=1}^{T} \frac{K_{t-1}}{(1+r_f)^t} \tag{29}$$

The tax compensation for investment income on insurance risk capital can also be expressed as the present value of the tax payments for inclusion in the MC formula as follows:

$$\nu_0^{\theta} = \tau \sum_{t=1}^{T} \frac{(\nu_{t-1}^{\theta} - \nu_t^{\theta})}{(1+r_f)^t} + \tau \sum_{t=1}^{T} \frac{r_f \nu_t^{\theta}}{(1+r_f)^t} + \tau r_K \sum_{t=1}^{T} \frac{K_{t-1}}{(1+r_f)^t} \tag{30}$$

The first term is the underwriting tax that arises as the balance is recognised in the underwriting result. The second term represents the tax on the investment income on the balance itself. The last term is the compensation for the tax on insurance risk capital investment income. These three terms could be added to equation (19) to retain the original form of the MC formula with underwriting and investment income tax components.

The first two terms of equation (30), observing equations (11)-(14) equate to τv_0^{θ}. Thus equation (30) is shown to equate to the same tax balance as shown in equation (29) as follows:

$$v_0^{\theta} = \tau v_0^{\theta} + \tau r_K \sum_{t=1}^{T} \frac{K_{t-1}}{\left(1 + r_f\right)^t} \tag{31}$$

$$v_0^{\theta} = \frac{\tau r_K}{1-\tau} \sum_{t=1}^{T} \frac{K_{t-1}}{\left(1 + r_f\right)^t} \tag{32}$$

11.5. Simplified MC formula and measurement of insurance contracts

If we bring together equations (20) and (29) then we have the simplified MC formula for determining a fair premium:

$$P = \sum_{t=1}^{T} \frac{L_t}{(1 + r_L)^t} + \frac{\tau r_K}{1-\tau} \sum_{t=1}^{T} \frac{K_{t-1}}{\left(1 + r_f\right)^t} \tag{33}$$

The formula may also be applied to measure the insurance contract throughout the duration of the loss cashflows. If we define M_t as the measurement of the insurance contract at time t, the formula generalises to:

$$M_t = \sum_{y=t+1}^{T} \frac{L_y}{(1 + r_L)^{y-t}} + \frac{\tau r_K}{1-\tau} \sum_{y=t+1}^{T} \frac{K_{y-1}}{\left(1 + r_f\right)^{y-t}} \tag{34}$$

To this point, the simplified forms of the MC formula in equations (33) and (34) has been relaxed as to the basis for determining the insurance risk capital requirement K_t. Note that for the next sections dealing with an equivalence of IRR and WACC, the condition of allocated insurance capital being a constant proportion of loss reserves discounted at the risk adjusted rate is asserted.

11.6. WACC for the insurer within a CAPM framework

The balance sheet for an insurer, similar to most companies, may be simply represented as:

$$\text{Capital} = \text{Assets} - \text{Liabilities} \tag{35}$$

Under a CAPM framework, the market Betas weight across the balance sheet as follows:

$$\beta_{Capital}.\text{Capital} = \beta_{Assets}.\text{Assets} - \beta_{Liab}.\text{Liabilities} \quad (36)$$

Under the simplified model of an insurer presented in this Appendix, some of the assets and liabilities on the balance sheet are risk free with a zero Beta. The non-zero Beta asset and liability items on the balance sheet at time t are:

- *Insurance risk capital asset portfolio*. This has the value of K_t that is invested in an asset portfolio with a Beta of β_K.
- *Loss reserve liability*. The loss reserves have a Beta of β_L although the loss reserves are weighted by $(1-\tau)$ to allow for the impact of the tax deduction for losses.

Other items on the balance sheet are assumed to have a zero Beta and these include assets backing loss reserves and tax balance items.

At this point, the condition that the required amount of insurance risk capital is proportional to discounted loss reserves at the risk adjusted rate is asserted as follows:

$$K_t = \lambda(1-\tau)\, \nu_t(L; r_L) \quad (37)$$

The insurance risk capital factor λ refers to that applicable in a tax-free environment and hence needs to be adjusted for the impact of the corporate tax rate applicable in the environment under consideration. In utilising some of the formulae, it may be more convenient to utilise $\kappa = \lambda(1-\tau)$ where κ is the insurance risk capital post the tax effect and a more observable figure on the balance sheet of an insurer, subject to allowing for operational risk or other capital elements that may form part of capital for an insurer

The Beta of the insurer, β_i, is determined using equation (36) as follows, again making use of ν_t^L as being the present value of future loss cashflows discounted at the risk adjusted rate:

$$\beta_i\lambda(1-\tau)\nu_t^L = \beta_K\lambda(1-\tau)\nu_t^L - \beta_L(1-\tau)\nu_t^L \quad (38)$$

$$\beta_i = \beta_K - {}^{\beta_L}/_{\lambda} \quad (39)$$

This looks somewhat intuitive. The overall Beta for an insurer is equivalent to the Beta of the assets the capital is invested in, less the liability Beta grossed up for the ratio of loss reserves to capital. However, the ratio λ is not observed on the actual balance sheet owing to tax effects that need to be grossed-up for.

In the way the model has been defined, particularly insurance risk capital being a constant ratio of loss reserves, the Beta for the insurer remains constant through the duration of cashflows for the insurance contract.

The WACC for the insurer may then be found using the standard CAPM formula with β_i.

11.7. Return on capital and the IRR

We now evaluate the profit that is recognised by the proposed measurement of insurance contracts approach.

The first component is straightforward. In each period t, insurance risk capital earns r_K based on an investment allocation with a market Beta of β_K. Tax on insurance risk capital investment income is compensated for by the tax balance included with the premium and released appropriately through the measurement approach.

In addition, the risk adjustment emerges as profit and is subject to tax without compensation from the policyholder. As established earlier, there is no net tax on risk free investment income on loss reserves. In each period t, the risk adjustment hence emerges as follows:

- A change in the loss reserve balance; less
- Losses paid at the end of the period; plus
- Investment income at the risk-free rate on the opening balance of loss reserves.

The after-tax profit emergence of the risk adjustment in any given period t is therefore:

$$\left[(v_{t-1}^L - v_t^L) - L_t + r_f v_{t-1}^L\right](1-\tau) \tag{40}$$

The closing loss reserve balance can be expressed in terms of the opening balance adjusted for the discount rate and losses paid:

$$v_t^L = v_{t-1}^L(1+r_L) - L_t \tag{41}$$

Substituting equation (41) into (40):

$$\left[(v_{t-1}^L - v_{t-1}^L(1+r_L) + L_t) - L_t + r_f v_{t-1}^L\right](1-\tau) \tag{42}$$

Simplifies to:

$$v_{t-1}^L\left(r_f - r_L\right)(1-\tau) \tag{43}$$

Then the return on capital for period t, which is defined here as r_i, is as follows:

$$r_i = r_k + \frac{\nu_{t-1}^L (r_f - r_L)(1-\tau)}{K_{t-1}} \quad (44)$$

$$r_i = r_k + \frac{\nu_{t-1}^L (r_f - r_L)(1-\tau)}{\lambda(1-\tau)\nu_{t-1}^L} \quad (45)$$

$$r_i = r_k + \frac{r_f - r_L}{\lambda} \quad (46)$$

Then solving for β_i: that is implied in r_i using the CAPM formula:

$$r_f + \beta_i(r_m - r_f) = r_f + \beta_K(r_m - r_f) + \frac{r_f - r_f - \beta_L(r_m - r_f)}{\lambda} \quad (47)$$

Hence, we again arrive at:

$$\beta_i = \beta_K - {\beta_L}/{\lambda} \quad (48)$$

Thus, the return on capital equates to WACC and is the same for all periods of t. It follows that the IRR for the insurance contract is also WACC. This is a desirable outcome for a measurement approach and a useful property of allocating insurance risk capital proportional to loss reserves discounted at a risk adjusted rate.

12. SERVICES COMPONENT AND THE CONTRACTUAL SERVICE MARGIN (CSM)

Expenses associated with services provided with an insurance contract and their profit are now added to the measurement formula. Per the notation defined above, expenses for these services have been simply defined as having an acquisition component that arises at the inception of the insurance contract and a component that is proportional to loss payments related to the claim fulfilment services. Each service also has an explicit profit margin that is charged to the policyholder as part of the premium.

Building the service expenses into premium formula (33):

$$\begin{aligned} Total\ Premium &= \sum_{t=1}^{T} \frac{L_t}{(1+r_L)^t}[1+\gamma(1+\eta)] + \alpha(1+\xi) \\ &+ \frac{\tau r_K}{1-\tau} \sum_{t=1}^{T} \frac{K_{t-1}}{(1+r_f)^t} \end{aligned} \quad (49)$$

The expenses and profit associated with the claim fulfilment service are also subject to the risk adjustment under these assumptions.

The contract service margin component at inception is therefore equal to:

$$S_0 = \gamma\eta \sum_{t=1}^{T} \frac{L_t}{(1+r_L)^t} + \alpha\xi \tag{50}$$

IFRS17 requires that the contact service margin be recognized proportional to the risk of insured events during the coverage period; the pattern of risk during the coverage period defined here as $\varphi(t)$. Hence measurement during the coverage period will include a portion of the contract service margin given by:

$$S_t = \max\left\{0 \;\middle|\; S_0'\left(1+r_f\right)^t \int_t^\rho \varphi(t).dt \;\; ;\text{for } t < \rho\right\} \tag{51}$$

Where S_0' indicates any reassessment to time t of the initial contract service margin if loss or expense cashflows have been updated to reflect current information. The contract service profit parameters would be adjusted to equate total premium to the present value of cashflows, although cannot be less than zero.

If risk is assumed to be uniform through the coverage period, and the number of periods over which the coverage extends is a small number, then a useful simplification may be:

$$S_t = \max\left\{0 \;\middle|\; S_0'\left(1+tr_f\right)\frac{(\rho - t)}{\rho} \;\; ;\text{for } t < \rho\right\} \tag{52}$$

Hence the measurement of the insurance contract at time t after inception is:

$$M_t = \sum_{y=t+1}^{T} \frac{L_y}{(1+r_L)^{y-t}}[1+\gamma] + \frac{\tau r_K}{1-\tau} \sum_{y=t+1}^{T} \frac{K_{y-1}}{\left(1+r_f\right)^{y-t}} + S_t \tag{53}$$

Under IFRS17, several items within the Profit & Loss and disclosures may require calculation of items utilizing both risk-adjusted and risk-free rates to explicitly identify the risk adjustment.

13. A SIMPLIFICATION OF THE TAX COMPENSATION

A simplification of the tax compensation is possible if the condition that the required amount of insurance risk capital is proportional to discounted loss reserves at the risk adjusted rate is asserted.

Starting again with the base MC formula for premium using simplified notation:

$$\nu_0(L; r_L) + \nu_0^\theta \tag{54}$$

The risk adjustment may be separated against the risk-free discount rate as follows:

$$\nu_0(L;r_f)+\left(\nu_0(L;r_L)-\nu_0(L;r_f)\right)+\nu_0^\theta \tag{55}$$

Expanding the last term and expressing the insurance risk capital relative to the discounted loss reserves, noting that the $(1-\tau)$ term eliminates:

$$\nu_0(L;r_f)+\left(\nu_0(L;r_L)-\nu_0(L;r_f)\right)+\tau\lambda r_K\sum_{t=1}^{T}\frac{\nu_{t-1}(L;r_L)}{\left(1+r_f\right)^t} \tag{56}$$

If we take the last summation from equation (56):

$$\sum_{t=1}^{T}\frac{\nu_{t-1}(L;r_L)}{\left(1+r_f\right)^t} \tag{57}$$

Then this simplifies as follows:

$$\frac{1}{\left(1+r_f\right)-(1+r_L)}\left[\sum_{t=1}^{T}\frac{\left(1+r_f\right)\nu_{t-1}(L;r_L)}{\left(1+r_f\right)^t}-\sum_{t=1}^{T}\frac{(1+r_L)\nu_{t-1}(L;r_L)}{\left(1+r_f\right)^t}\right] \tag{58}$$

Expanding the summation terms:

$$\frac{1}{r_f-r_L}\left[\begin{array}{c}\frac{\left(1+r_f\right)\nu_0(L;r_L)}{\left(1+r_f\right)}-\frac{(1+r_L)\nu_0(L;r_L)}{\left(1+r_f\right)}\\ +\frac{\left(1+r_f\right)\nu_1(L;r_L)}{\left(1+r_f\right)^2}-\frac{(1+r_L)\nu_1(L;r_L)}{\left(1+r_f\right)^2}\\ +\frac{\left(1+r_f\right)\nu_2(L;r_L)}{\left(1+r_f\right)^3}-\frac{(1+r_L)\nu_2(L;r_L)}{\left(1+r_f\right)^3}\\ +\cdots\end{array}\right] \tag{59}$$

Then, nothing that $(1+r_L)\nu_t(L;r_L)=L_{t+1}+\nu_{t+1}(L;r_L)$:

$$\frac{1}{r_f-r_L}\left[\begin{array}{c}\nu_0(L;r_L)-\frac{L_1+\nu_1(L;r_L)}{\left(1+r_f\right)}\\ +\frac{\nu_1(L;r_L)}{\left(1+r_f\right)}-\frac{L_2+\nu_2(L;r_L)}{\left(1+r_f\right)^2}\\ +\frac{\nu_2(L;r_L)}{\left(1+r_f\right)^2}-\frac{L_3+\nu_3(L;r_L)}{\left(1+r_f\right)^3}\\ +\cdots\end{array}\right] \tag{60}$$

The successive negative and positive terms for $\nu_1(L;r_L) \dots \nu_{T-1}(L;r_L)$ eliminate leaving behind $\nu_0(L;r_L)$ and losses $L_1 \dots L_T$ discounted at the risk free rate:

$$\frac{\left(\nu_0(L;r_L) - \nu_0(L;r_f)\right)}{\left(r_f - r_L\right)} \tag{61}$$

Substituting equation (61) into equation (56), the MC formula simplifies to:

$$\nu_0(L;r_f) + \left(\nu_0(L;r_L) - \nu_0(L;r_f)\right)\left[1 + \frac{\tau\lambda r_K}{r_f - r_L}\right] \tag{62}$$

Adding in service expense and contract service margin, the measurement at time t after inception of the insurance contract is:

$$M_t = \nu_t(L;r_f)[1+\gamma] + \left(\nu_t(L;r_L) - \nu_t(L;r_f)\right)\left[1 + \frac{\tau\lambda r_K}{r_f - r_L} + \gamma\right] + S_t \tag{63}$$

Which appears more in the form of a central estimate including expenses discounted at the risk-free rate together with a risk adjustment and the contract service margin. This particular risk adjustment has three components expressed relative to the risk adjustment on discounted losses:

- The risk adjustment on losses itself; plus
- The tax compensation for investment income on insurance risk capital; plus
- The risk adjustment on claim handling and other expenses.

In the worked example included in the main body of the paper, formula (63) above is utilized with the substitution of $\lambda = {}^{\kappa}/_{(1-\tau)}$ introduced earlier.

Appendix B: Alternative accounting standard Profit & Loss statements

14. INTRODUCTION

This Appendix includes Profit & Loss statements that utilise the worked example cashflows developed in Table A through H in this paper and presents the Profit & Loss statements under alternative accounting standards.

14.1. AASB1023 (Australia)

There is one alternative assumption required in order present the AASB1023 Profit & Loss statement. Practice under AASB1023 is to adopt a risk margin as part of total outstanding claim liabilities that provides a chosen probability of sufficiency (**PoS**). The PoS is the proportion of all possible outcomes for future loss payments and associated expenses for which the total outstanding claim liabilities ultimately proves adequate to have met.

It is assumed that the adopted risk margin is 10% of losses and claim handling and supply chain expenses discounted at the risk-free rate. Capital and investment income on capital has been assumed to be the same as per the IFRS17 worked example for simplicity.

Table B1: Profit & Loss, AASB1023 Approach

	Time					
	0	1	2	3	4	5
Written premium	1,055.49					
Unearned premium mvt	(1,055.49)	1,055.49				
Earned premium	**0.00**	**1,055.49**				
Losses paid		(150.00)	(300.00)	(200.00)	(100.00)	(50.00)
Discounted loss reserve mvt		(615.72)	281.53	189.97	95.67	48.54
Claim handling		(9.00)	(18.00)	(12.00)	(6.00)	(3.00)
Discounted claim handling mvt		(36.94)	16.89	11.40	5.74	2.91
Discounted risk margin mvt		(65.27)	29.84	20.14	10.14	5.15
Claims expense		**(876.93)**	**10.26**	**9.51**	**5.56**	**3.60**
Distribution	(100.00)					
Product & UW	(40.00)					
Corporate	(22.50)					
Deferred acquisition costs	162.50	(162.50)				
Underwriting expense	**0.00**	**(162.50)**				
Underwriting result	**0.00**	**16.06**	**10.26**	**9.51**	**5.56**	**3.60**
Investment income on technical provisions		26.79	21.54	11.69	5.04	1.70
Insurance profit	**0.00**	**42.85**	**31.80**	**21.20**	**10.60**	**5.30**
Investment income on shareholder's funds		19.14	13.38	7.49	3.30	1.14
Profit before tax	**0.00**	**61.99**	**45.18**	**28.69**	**13.90**	**6.44**
Income tax	**0.00**	**(18.60)**	**(13.55)**	**(8.61)**	**(4.17)**	**(1.93)**
Profit after tax	**0.00**	**43.39**	**31.63**	**20.08**	**9.73**	**4.51**

The risk margin is typically selected to provide a PoS in the range of 75-90%. This results in a risk margin that will typically be in excess of the margins under IFRS17 that results in a slower recognition of profit.

14.2. US GAAP

Under US GAAP, loss and loss adjustment expense reserves are inflated but undiscounted. This creates an implicit margin equivalent to the amount of risk-free discount that would be applicable to cashflows. The lower the prevailing level of risk-free rates, the faster is the recognition of profit under US GAAP.

Capital and investment income on capital has been assumed to be the same as per the IFRS17 worked example for simplicity. The corporate tax rate assumption of 30% has also been maintained for comparative purposes.

Table B2: Profit & Loss, USGAAP Approach

	Time					
	0	*1*	*2*	*3*	*4*	*5*
Premiums written	1,055.49					
Unearned premium mvt	(1,055.49)	1,055.49				
Premiums earned	**0.00**	**1,055.49**				
Losses paid		(150.00)	(300.00)	(200.00)	(100.00)	(50.00)
Undiscounted loss reserve mvt		(650.00)	300.00	200.00	100.00	50.00
Loss adjustment expenses		(9.00)	(18.00)	(12.00)	(6.00)	(3.00)
Undiscounted loss adjustment mvt		(39.00)	18.00	12.00	6.00	3.00
Losses and loss adjustment expenses incurred		**(848.00)**	**0.00**	**0.00**	**0.00**	**0.00**
Distribution	(100.00)					
Product & UW	(40.00)					
Corporate	(22.50)					
Deferred acquisition costs	162.50	(162.50)				
Underwriting expenses	**0.00**	**(162.50)**				
Underwriting result	**0.00**	**44.99**	**0.00**	**0.00**	**0.00**	**0.00**
Investment income on reserves		26.79	20.67	11.13	4.77	1.59
Investment income on shareholder's funds		19.14	13.38	7.49	3.30	1.14
Profit before tax		**90.92**	**34.05**	**18.62**	**8.07**	**2.73**
Income tax		**(27.28)**	**(10.21)**	**(5.59)**	**(2.42)**	**(0.82)**
Profit after tax		**63.65**	**23.83**	**13.03**	**5.65**	**1.91**