How to Calculate Risk Margins Under IFRS

2010 Casualty Loss Reserving Seminar

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Insurance Contracts Project Timeline

- March 2004 – IASB issues IFRS 4 *Insurance Contracts*
- May 2007 – IASB issues *Preliminary View on Insurance Contracts*
- 2008 – FASB joins IASB's insurance contracts project
- July 2010 – IASB issues exposure draft for Phase II

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Measurement of Liabilities – Building Blocks

- Unbiased probability-weighted average of cash flows
- Time value of money
- Margin
  - Risk adjustment and residual margin – preferred by IASB
  - Composite margin – preferred by FASB

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Margin - Risk and Residual

- Residual margin eliminates gain at inception
- Residual = expected premium – (expected claims and expenses + risk adjustment)
- Recognition/release of margin components
  - Risk: recognized over claim-paying period
  - Residual: recognized over coverage

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Margin - Composite

- Does not split between uncertainty and profit
- Market-based risk adjustment is hypothetical
- Calibrated to premium at inception
- Questions exist on how to release margin

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Margin – Estimation Approaches

- Implicit
- Explicit
  - Add margin to parameters
  - **Quantile**
  - **Cost of capital**

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Margin – IASB Criteria

- Should be explicit
- Reflect observable market prices for market variables
- Reflect uncertainty about cash flow amount and timing
- Use all available current information
- Include only those cash flows arising from existing contracts

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Risk Margin Methods

1. Derivation from First Principles

2. Cost of Capital Method

3. Solvency II Method

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Market Value of Liabilities

- Fair value = market value
- Market value of liabilities?
- Market value of asset

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Selling you my GL book

Discounted reserves = $236 million

1st offer: $236 m

Selling you my GL book

Discounted reserves = $236 million

1st offer: $236 m → TOO LOW

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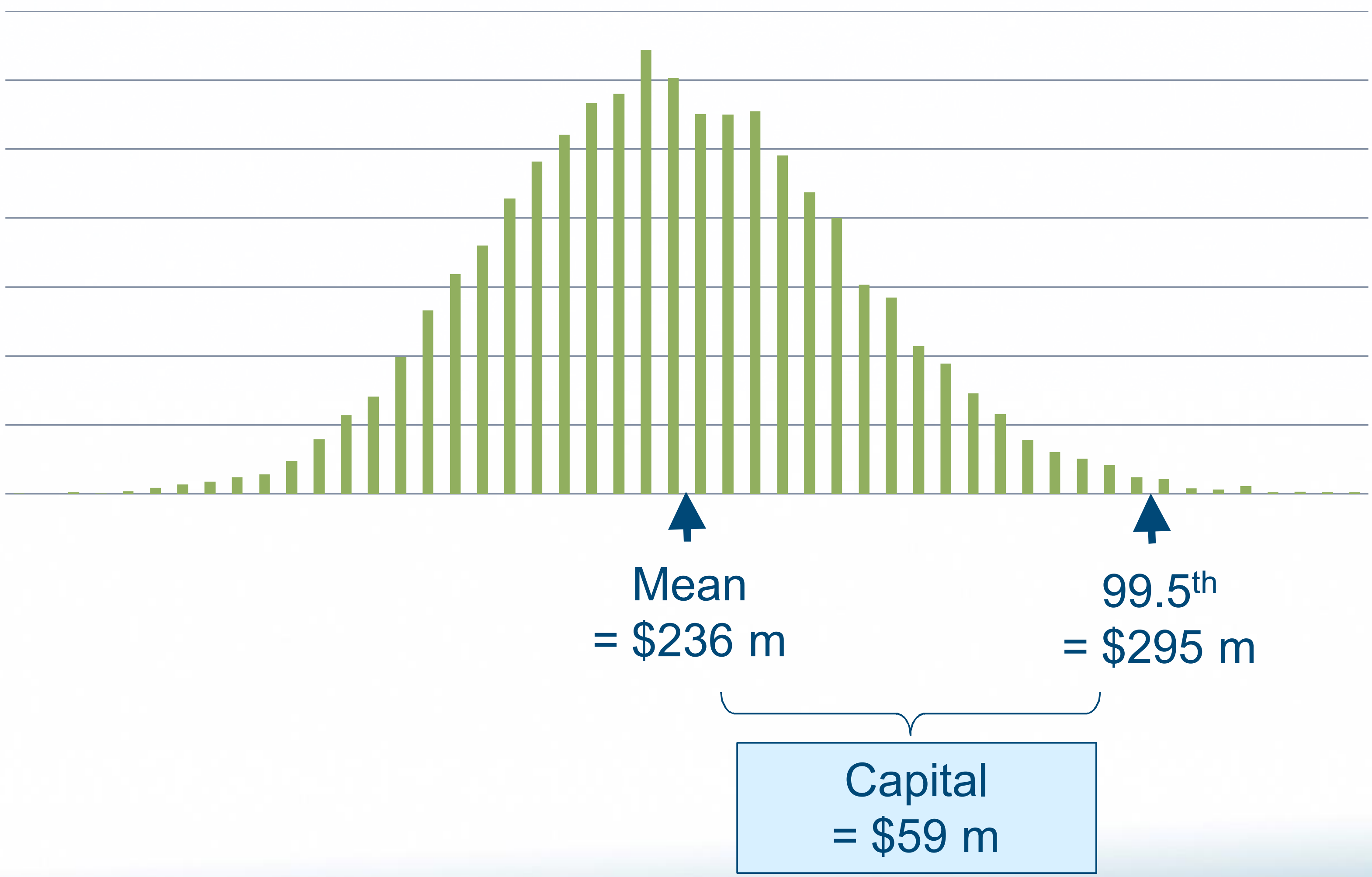
How much Capital?



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Selling you my GL book

Discounted reserves = $236 million

1st offer: $236 m → TOO LOW

2nd offer: $236 m + $59 m

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$236 m + ? = Market Value

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Selling you my GL book

Discounted reserves = $236 million

1st offer: $236 m → TOO LOW

2nd offer: $236 m + $59 m → TOO HIGH

$236 m + Risk Margin = Market Value

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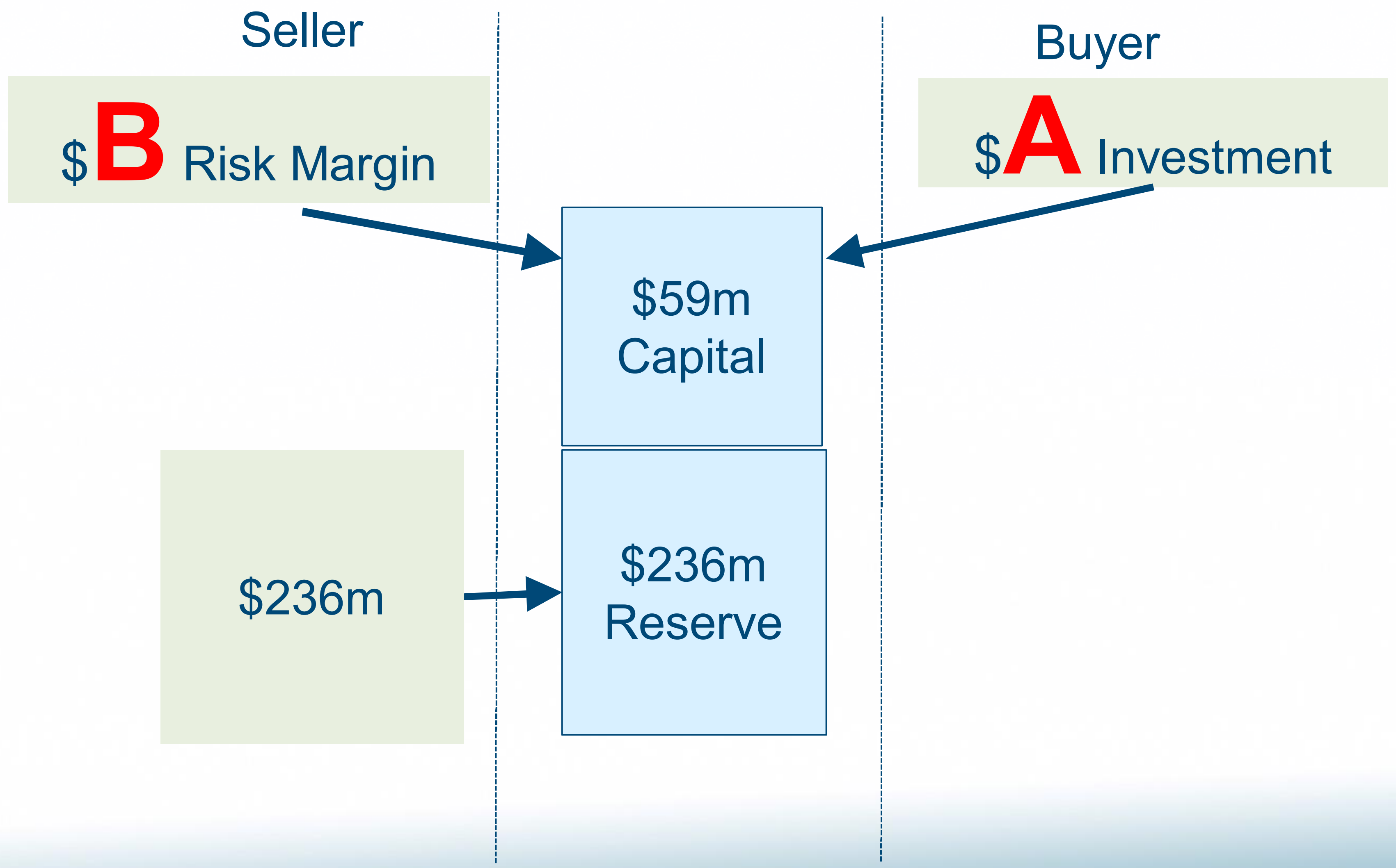
Transaction



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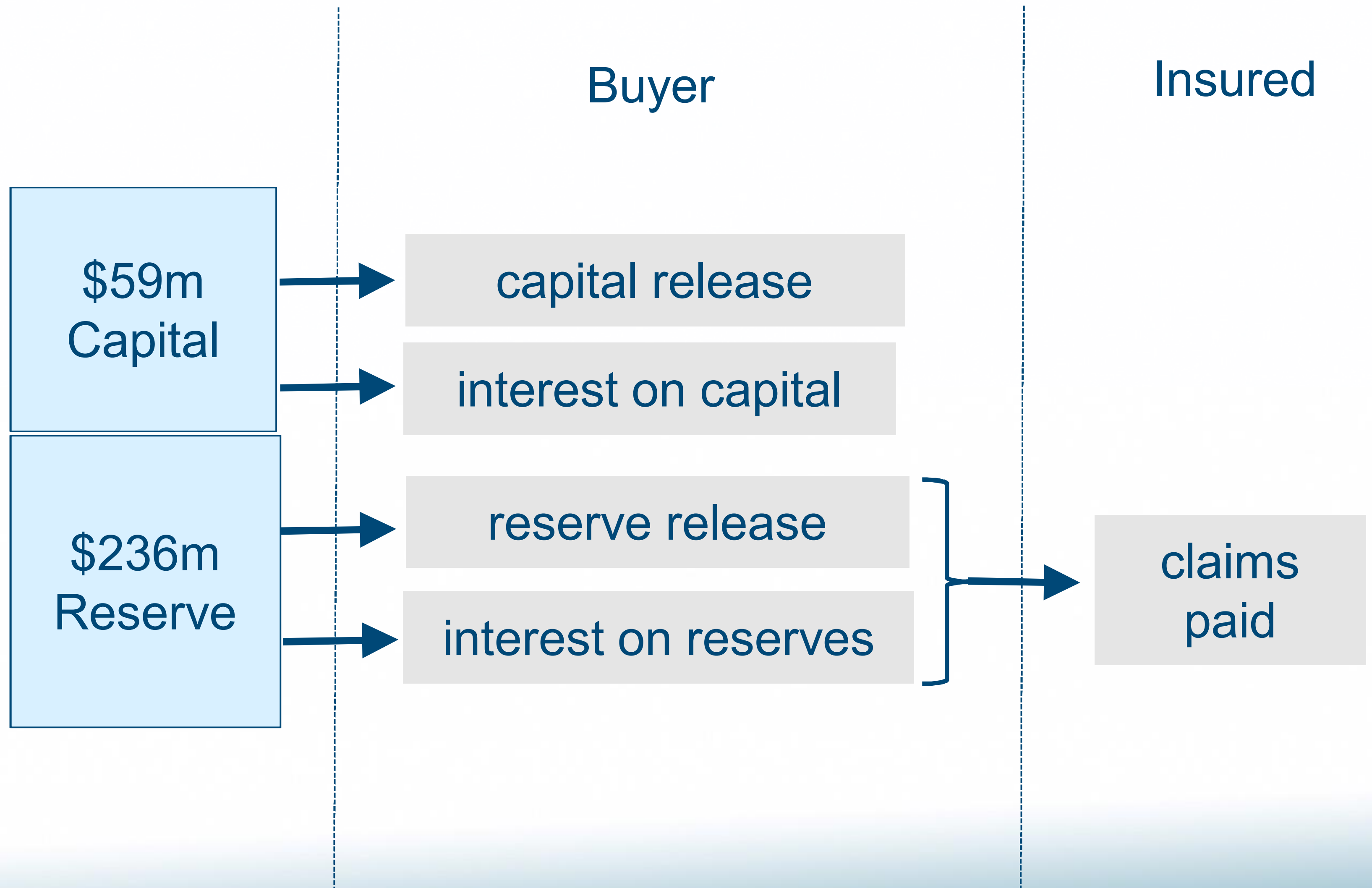
Future Cash Flows



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Future Cash Flows

Buyer

Insured

$59m Capital

capital release

interest on capital

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Expected Future Net Cash Flow Table

Yr	Capital Release	Interest on Capital	Net Cash flow
	(1)	(2)	(3) = (1) + (2)
1			
2			
3			
…			
…			
35			

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Expected Future Net Cash Flow Table

Yr	Capital Release	Interest on Capital	Net Cash flow
	(1)	(2)	(3) = (1) + (2)
1	?		
2			
3			
…			
…			
35			

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Cashflow at t = 1

Capital Release

= Capital at time 0 *less* Capital at time 1

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Cashflow at t = 1

Capital Release

= Capital at time 0 *less* Capital at time 1

= $59.0 m *less*

$$\boxed{\begin{array}{c}\text{99.5}^{\text{th}}\text{ perc} \\ \text{of Reserves} \\ \textit{less} \\ \text{Reserves}\end{array}}$$

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Cashflow at t = 1

Capital Release

= Capital at time 0 *less* Capital at time 1

= $59.0 m *less* $\boxed{\text{99.5th perc of Reserves } \textit{less} \text{ Reserves}}$

= $59.0m *less* $52.3m

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Cashflow at t = 1

Capital Release

= Capital at time 0		*less*	Capital at time 1
=	\$59.0 m	*less*	99.5^{th} perc of Reserves *less* Reserves
=	\$59.0m	*less*	\$52.3m
=	\$6.7m		

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Expected Future Net Cash Flow Table

Yr	Capital Release	Interest on Capital	Net Cash flow
	(1)	(2)	(3) = (1) + (2)
1	$6.7		
2			
3			
…			
…			
35			

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Expected Future Net Cash Flow Table

Yr	Capital Release	Interest on Capital	Net Cash flow
	(1)	(2)	(3) = (1) + (2)
1	$6.7	?	
2			
3			
…			
…			
35			

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Cashflow at time 1

Interest on Capital

= Capital at time 0 x Risk free rate

= $59.0m x 4%

= $2.3m

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Expected Future Net Cash Flow Table

Yr	Capital Release	Interest on Capital	Net Cash flow
	(1)	(2)	(3) = (1) + (2)
1	$6.7	$2.3	
2			
3			
…			
…			
35			

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Expected Future Net Cash Flow Table

Yr	Capital Release	Interest on Capital	Net Cash flow
	(1)	(2)	(3) = (1) + (2)
1	$6.7	$2.3	$9.0
2			
3			
…			
…			
35			

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Expected Future Net Cash Flow Table

Yr	Capital Release	Interest on Capital	Net Cash flow
	(1)	(2)	(3) = (1) + (2)
1	$6.7	$2.3	$9.0
2	$5.9	$2.1	$8.0
3			
…			
…			
35			

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Expected Future Net Cash Flow Table

Yr	Capital Release	Interest on Capital	Net Cash flow
	(1)	(2)	(3) = (1) + (2)
1	$6.7	$2.3	$9.0
2	$5.9	$2.1	$8.0
3			…
…			…
34			$0.3
35			$0.3

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Expected Future Net Cash Flow Table

Yr	Net Cash flow	Discounted Net Cash flow at RRoC
1	\$9.0	= \$9.0 x 1.10^-1 = \$8.2
2	\$8.0	= \$8.0 x 1.10^-2 = \$6.6
…	…	…
34	\$0.3	= \$0.3 x 1.10^-34 = \$0.0
35	\$0.3	= \$0.3 x 1.10^-35 = \$0.0

Buyer's Investment = \$35.0 m

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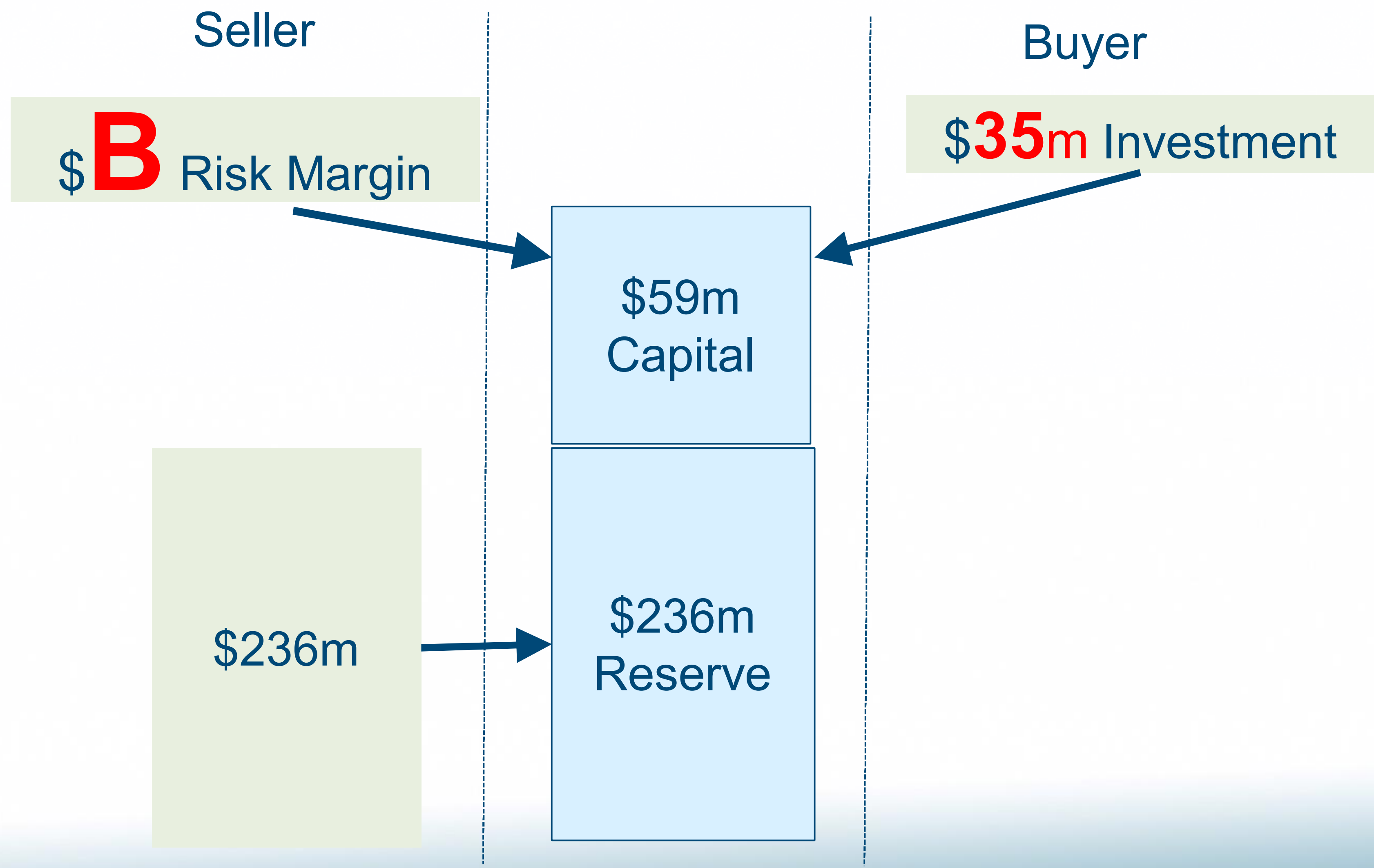
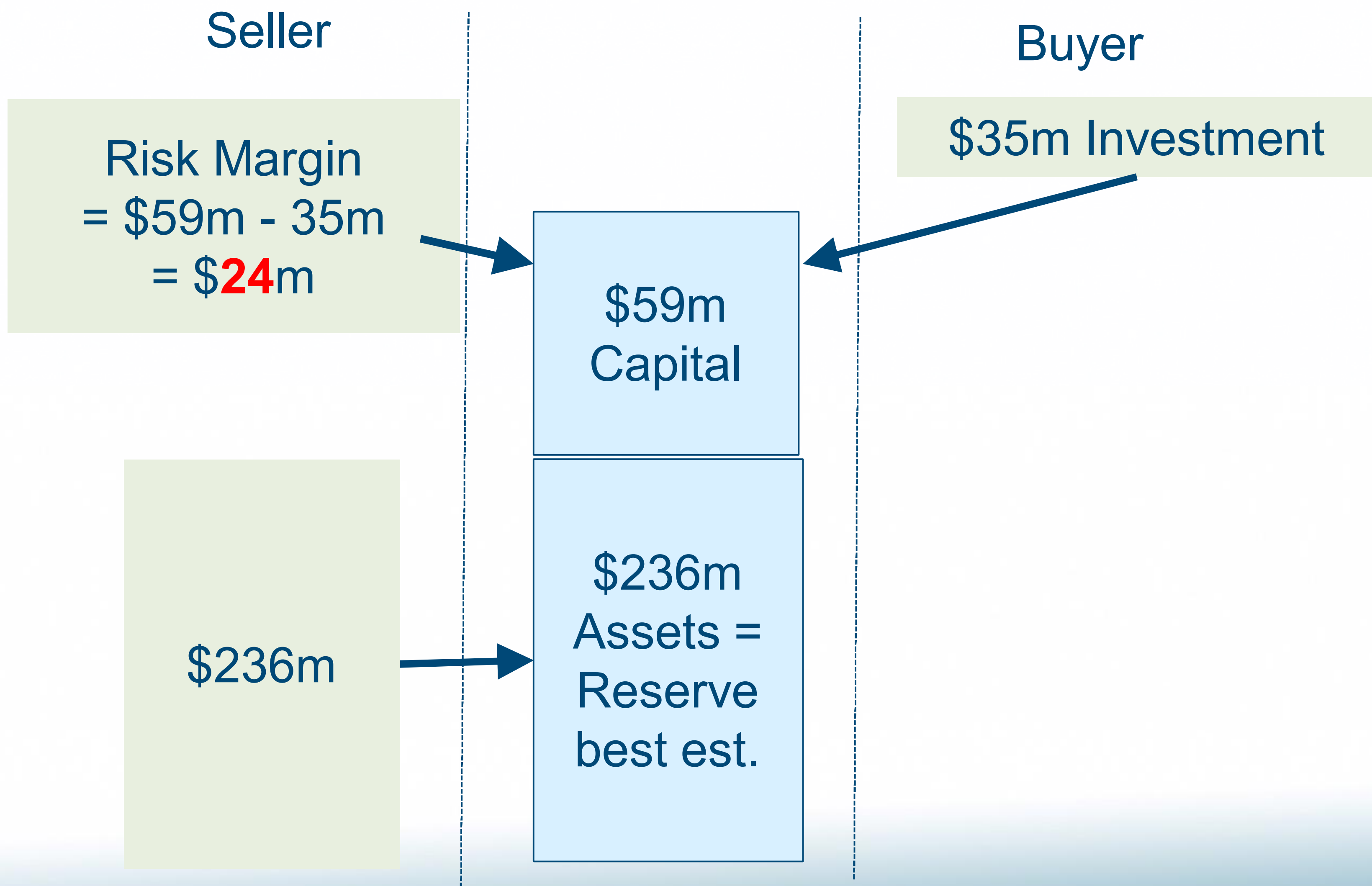
Transaction



Transaction



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Selling you my GL book

1st offer: $236 m → TOO LOW

2nd offer: $236 m + $59 m → TOO HIGH

3rd offer: $236 m + $24 m

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Selling you my GL book

1st offer: \$236 m → TOO LOW

2nd offer: \$236 m + \$59 m → TOO HIGH

3rd offer: \$236 m + \$24 m → JUST RIGHT

Equation

Capital at time 0 = Risk Margin + What the Buyer will Invest

Equation

Capital at time 0 = Risk Margin + What the Buyer will Invest

Risk Margin = Capital(0) - What the Buyer will Invest

Equation

Capital at time 0 = Risk Margin + What the Buyer will Invest

Risk Margin = Capital(0) - What the Buyer will Invest

Risk Margin = Capital(0) – (Discounted capital runoff and interest on capital)

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Equation

Capital at time 0 = Risk Margin + What the Buyer will Invest

Risk Margin = Capital(0) - What the Buyer will Invest

Risk Margin = Capital(0) – (Discounted capital runoff and interest on capital)

$$\text{Risk Margin} = Capital_0 - \sum_{t=0}^{n} \frac{\begin{array}{c}(Capital_t - Capital_{t+1}) \\ + Capital_t \times r_f\end{array}}{(1 + CoC)^t}$$

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Simple Example

$n = 1, Capital_0 = \$100, Capital_1 = \$0$

$r_f = 4\%, \quad CoC = 10\%$

$$\text{Risk Margin} = Capital_0 - \sum_{t=0}^{n} \frac{\begin{array}{c}(Capital_t - Capital_{t+1}) \\ + Capital_t \times r_f\end{array}}{(1 + CoC)^t}$$

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Simple Example

$$t = 1, \quad Capital_0 = \$100 \quad r_f = 4\%, \ CoC = 10\%$$

Risk Margin $$= Capital_0 - \sum_{t=0}^{n} \frac{(Capital_t - Capital_{t+1}) + Capital_t \times r_f}{(1 + CoC)^t}$$

$$= 100 - \left(\frac{100 + 100 \times 4\%}{1 + 10\%} \right)$$

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Simple Example

$$t = 1, \quad Capital_0 = \$100 \quad r_f = 4\%, \; CoC = 10\%$$

Risk Margin $= Capital_0 - \sum_{t=0}^{n} \frac{(Capital_t - Capital_{t+1}) + Capital_t \times r_f}{(1+CoC)^t}$

$$= 100 - \left(\frac{100 + 100 \times 4\%}{1 + 10\%}\right)$$

$$= 100 - 94.54$$

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Simple Example

$$t = 1, \quad Capital_0 = \$100 \quad r_f = 4\%, \; CoC = 10\%$$

Risk Margin $= Capital_0 - \sum_{t=0}^{n} \frac{(Capital_t - Capital_{t+1}) + Capital_t \times r_f}{(1+CoC)^t}$

$$= 100 - \left(\frac{100 + 100 \times 4\%}{1 + 10\%}\right)$$

$$= 100 - 94.54$$

$$= 5.45$$

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Risk Margin Methods

1. Derivation from First Principles
2. Cost of Capital Method
3. Solvency II Method

Equation

Cost of Capital

1. Calculate capital required at each year-end

2. Multiply by the cost of capital less the risk-free rate

3. Discount at the cost of capital and sum.

Equation

Cost of Capital

1. Calculate capital required at each year-end
2. Multiply by the cost of capital less the risk-free rate
3. Discount at the cost of capital and sum.

$$\text{Risk Margin} = \sum_{t=0}^{n} \frac{Capital_t \times (CoC - r_f)}{(1 + CoC)^t}$$

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Simple Example – Cost of Capital Method

$t = 1, \quad Capital_0 = \$100 \quad r_f = 4\%, \; CoC = 10\%$

$$\text{Risk Margin} = \sum_{t=0}^{n} \frac{Capital_t \times (CoC - r_f)}{(1 + CoC)^t}$$

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Simple Example – Cost of Capital Method

$$t = 1, \quad Capital_0 = \$100 \quad r_f = 4\%, \; CoC = 10\%$$

Risk Margin $$= \sum_{t=0}^{n} \frac{Capital_t \times \left(CoC - r_f\right)}{(1 + CoC)^t}$$

$$= \frac{100 \times (0.10 - 0.04)}{1.10}$$

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Simple Example – Cost of Capital Method

$$t = 1, \quad Capital_0 = \$100 \quad r_f = 4\%, \; CoC = 10\%$$

Risk Margin $$= \sum_{t=0}^{n} \frac{Capital_t \times (CoC - r_f)}{(1 + CoC)^t}$$

$$= \frac{100 \times (0.10 - 0.04)}{1.10}$$

$$= 5.45$$

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Equivalence of Risk Margin Formulas

$$Capital_0 - \sum_{t=0}^{n-1} \frac{(Capital_t - Capital_{t+1}) + Capital_t \times r_f}{(1+CoC)^{t+1}}$$

Derivation from First Principles

$$=$$

$$\sum_{t=0}^{n-1} \frac{Capital_t \times (CoC - r_f)}{(1+CoC)^{t+1}}$$

Cost of Capital Method

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Risk Margin Methods

1. Derivation from First Principles

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Solvency II Method

Solvency II

1. Calculate SCR at each year-end

2. Multiply by the cost of capital less the risk-free rate

3. Discount at the risk-free rate and sum.

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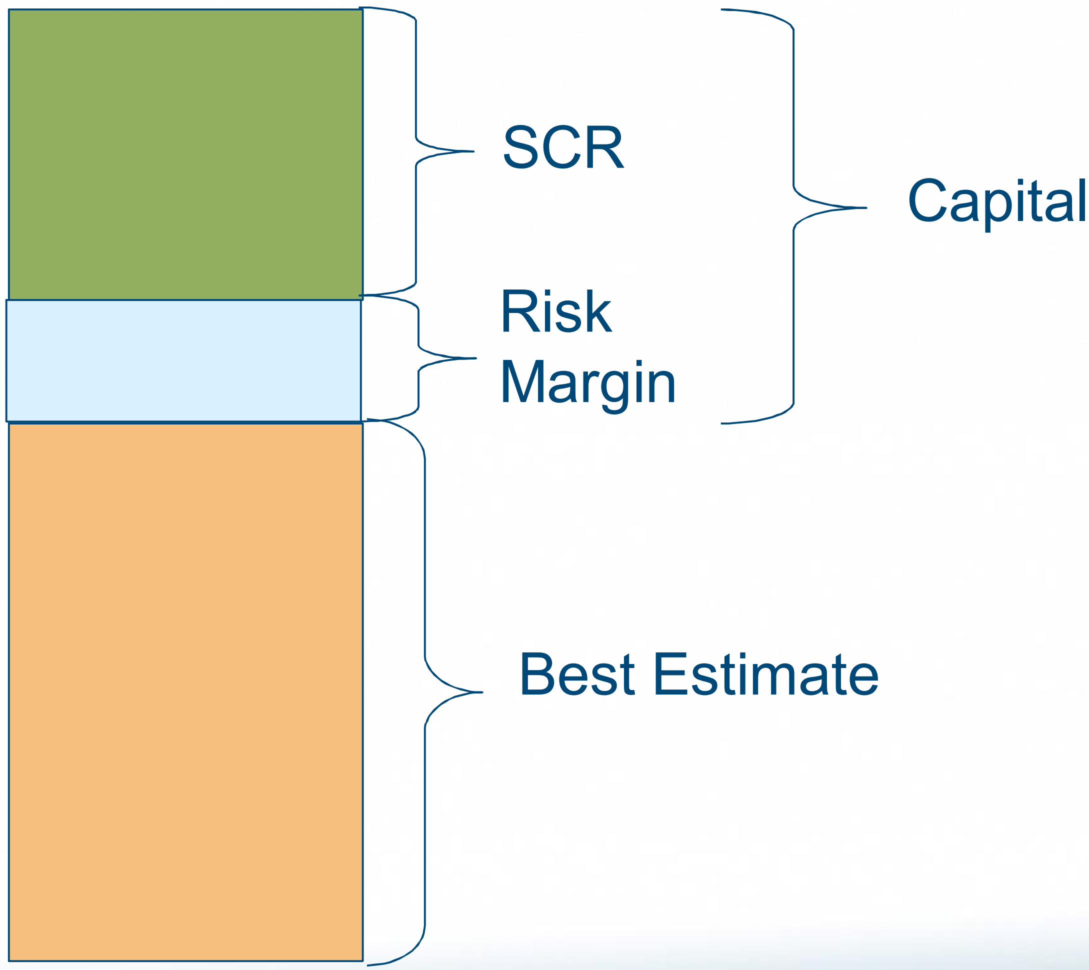
Solvency II Method



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Solvency II Method

Solvency II

1. Calculate **SCR** at each year-end
2. Multiply by the cost of capital less the risk-free rate
3. Discount at the **risk-free** rate and sum.

Cost of Capital

1. Calculate **Capital** at each year-end
2. Multiply by the cost of capital less the risk-free rate
3. Discount at the **cost of capital** and sum.

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Solvency II Method

Solvency II

$$\sum \frac{SCR \times \left(CoC \quad r_f\right)}{\left(1 + r_j\right)}$$

Cost of Capital

$$\sum \frac{Capital \times \left(CoC - r_j\right)}{\left(1 + CoC\right)}$$

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Simple Example

$t = 1, \quad Capital_0 = \$100 \qquad r_f = 4\%, \quad CoC = 10\%$

$$RM = \frac{SCR \times (CoC - r_f)}{(1 + r_f)}$$

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Simple Example

$t = 1, \quad Capital_0 = \$100 \qquad r_j = 4\%, \quad CoC = 10\%$

$$RM = \frac{SCR \times (CoC - r_f)}{(1 + r_f)}$$

$$RM = \frac{(\$100 - RM) \times (0.10 - 0.04)}{1.04}$$

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Simple Example

$$t = 1, \quad Capital_0 = \$100 \qquad r_j = 4\%, \quad CoC = 10\%$$

$$RM = \frac{SCR \times \left(CoC - r_f\right)}{\left(1 + r_f\right)}$$

$$RM = \frac{(\$100 - RM) \times (0.10 - 0.04)}{1.04}$$

$$RM\left(1 + \frac{0.06}{1.04}\right) = \frac{\$100 \times 0.06}{1.04}$$

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Simple Example

$$t = 1, \quad Capital_0 = \$100 \qquad r_j = 4\%, \quad CoC = 10\%$$

$$RM = \frac{SCR \times (CoC - r_f)}{(1 + r_f)}$$

$$RM = \frac{(\$100 - RM) \times (0.10 - 0.06)}{1.04}$$

$$RM\left(1 + \frac{0.06}{1.04}\right) = \frac{\$100 \times 0.06}{1.04}$$

$$RM = 5.45$$

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Solvency II Method

Solvency II

Cost of Capital

$$\sum \frac{SCR \times (CoC - r_f)}{(1 + r_f)} = \sum \frac{Capital \times (CoC - r_f)}{(1 + CoC)}$$

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Risk Margin Methods

Derivation from First Principles

- Cost of Capital Method
- Solvency II Method

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Risk Margin Methods

Derivation from First Principles

- Cost of Capital Method
- Solvency II Method

Required

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Risk Margin Methods

Derivation from First Principles

- Cost of Capital Method
- Solvency II Method

Use

Required

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Risk Margin Methods

Derivation from First Principles — Understand

- Cost of Capital Method — Use
- Solvency II Method — Required

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