How to Calculate Risk Margins Under IFRS

2010 Casualty Loss Reserving Seminar

Derek Jones
Jessica Leong
September 2010
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
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
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
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
Margin – Estimation Approaches

- Implicit
- Explicit
  - Add margin to parameters
  - Quantile
  - Cost of capital
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
Risk Margin Methods

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

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

- Fair value = market value
- Market value of liabilities?
- Market value of asset
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
How much Capital?

Mean = $236 m

99.5th percentile = $295 m

Capital = $59 m
Selling you my GL book

Discounted reserves  = $236 million

1\textsuperscript{st} offer: $236 m  \rightarrow  TOO LOW

2\textsuperscript{nd} offer: $236 m + $59 m
Selling you my GL book

Discounted reserves = $236 million

1\textsuperscript{st} offer: $236 m → TOO LOW

2\textsuperscript{nd} offer: $236 m + $59 m → TOO HIGH
Selling you my GL book

Discounted reserves  = $236 million

1\textsuperscript{st} offer: $236 m  \quad \rightarrow \quad \text{TOO LOW}

2\textsuperscript{nd} offer: $236 \text{ m} + $59 \text{ m}  \quad \rightarrow \quad \text{TOO HIGH}

$236 \text{ m} + \quad ? \quad = \quad \text{Market Value}$
Selling you my GL book

Discounted reserves  = $236 million

1\text{st} offer:  $236 \text{ m} \quad \rightarrow \quad \text{TOO LOW}

2\text{nd} offer: $236 \text{ m} + $59 \text{ m} \quad \rightarrow \quad \text{TOO HIGH}

\$236 \text{ m} + \text{Risk Margin} = \text{Market Value}
**Transaction**

**Seller**
- $B$ Risk Margin
- $236m$

**Buyer**
- $A$ Investment

- $59m Capital$
- $236m Reserve$
Future Cash Flows

$59m Capital
- capital release
- interest on capital

$236m Reserve
- reserve release
- interest on reserves

Buyer

Insured

claims paid
Future Cash Flows

- $59m Capital
- capital release
- interest on capital

Buyer

Insured
## Expected Future Net Cash Flow Table

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<thead>
<tr>
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Cashflow at $t = 1$

Capital Release

= Capital at time 0 \ less \ Capital at time 1
Cashflow at $t = 1$

Capital Release

= Capital at time 0 \textit{less} Capital at time 1

= \$59.0 \text{ m} \textit{less} \begin{array}{c}
\text{99.5}\text{th perc of Reserves} \\
\textit{less} \\
\text{Reserves}
\end{array}
Cashflow at $t = 1$

Capital Release

\[ \text{Capital Release} = \text{Capital at time 0} \less \text{Capital at time 1} \]

\[ = \$59.0 \text{ m} \less \$59.0m \less \$52.3m \]

99.5\text{th} \text{perc of Reserves} \less \text{Reserves}
Cashflow at $t = 1$

Capital Release

= Capital at time 0 \ less \ Capital at time 1

= $59.0 \text{ m} \ less \ 99.5^{\text{th}} \text{ perc of Reserves}

= $59.0 \text{ m} \ less \ Reserves

= $59.0 \text{ m} \ less \ $52.3 \text{ m}

= $6.7 \text{ m}$
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Cashflow at time 1

Interest on Capital

= Capital at time 0 \times \text{Risk free rate}

= $59.0m \times 4\%

= $2.3m
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<td>$5.9</td>
<td>$2.1</td>
<td>$8.0</td>
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<th>Discounted Net Cash flow at RRoC</th>
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<tr>
<td>1</td>
<td>$9.0</td>
<td>(= 9.0 \times 1.10^{-1} = 8.2)</td>
</tr>
<tr>
<td>2</td>
<td>$8.0</td>
<td>(= 8.0 \times 1.10^{-2} = 6.6)</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>34</td>
<td>$0.3</td>
<td>(= 0.3 \times 1.10^{-34} = 0.0)</td>
</tr>
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<td>35</td>
<td>$0.3</td>
<td>(= 0.3 \times 1.10^{-35} = 0.0)</td>
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Buyer’s Investment = $35.0 m
Transaction

Seller

$B Risk Margin

$236m

Buyer

$35m Investment

$59m Capital

$236m Reserve
Transaction

Seller

Risk Margin = $59m - $35m = $24m

$236m

$59m Capital

$236m Assets = Reserve best est.

Buyer

$35m Investment
Selling you my GL book

1\textsuperscript{st} offer: $236 \text{ m} \Rightarrow \text{ TOO LOW}

2\textsuperscript{nd} offer: $236 \text{ m} + $59 \text{ m} \Rightarrow \text{ TOO HIGH}

3\textsuperscript{rd} offer: $236 \text{ m} + $24 \text{ m}
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)
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)

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

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

\[ r_f = 4\%, \ CoC = 10\% \]

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

\[ t = 1, \quad \text{Capital}_0 = \$100 \quad r_f = 4\%, \quad \text{CoC} = 10\% \]

Risk Margin

\[ \text{Risk Margin} = \text{Capital}_0 - \sum_{t=0}^{n} \frac{(\text{Capital}_t - \text{Capital}_{t+1}) + \text{Capital}_t \times r_f}{(1 + \text{CoC})^t} \]

\[ = 100 - \left( \frac{100 + 100 \times 4\%}{1 + 10\%} \right) \]
Simple Example

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

Risk Margin

\[
\text{Risk Margin} = Capital_0 - \sum_{t=0}^{n} \left( \frac{(Capital_t - Capital_{t+1}) + Capital_t \times r_f}{(1 + CoC)^t} \right)
\]

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

\[
= 100 - 94.54
\]
Simple Example

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

Risk Margin

\[
= \frac{(Capital_t - Capital_{t+1}) + Capital_t \times r_f}{(1 + CoC)^t}
\]

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

\[
= 100 - 94.54
\]

\[
= 5.45
\]
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.

Risk Margin  \[ = \sum_{t=0}^{n} \frac{Capital_t \times (CoC - r_f)}{(1 + CoC)^t} \]
Simple Example – Cost of Capital Method

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

Risk Margin = \sum_{t=0}^{n} \frac{Capital_t \times (CoC - r_f)}{(1 + CoC)^t}
Simple Example – Cost of Capital Method

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

Risk Margin

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

\[
= 100 \times \frac{(0.10 - 0.04)}{1.10}
\]
Simple Example – Cost of Capital Method

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

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

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

\[
= 5.45
\]
Equivalence of Risk Margin Formulas

\[ \text{Capital}_0 - \sum_{t=0}^{n-1} \frac{(\text{Capital}_t - \text{Capital}_{t+1}) + \text{Capital}_t \times r_f}{(1 + \text{CoC})^{t+1}} \]

\[ = \sum_{t=0}^{n-1} \frac{\text{Capital}_t \times (\text{CoC} - r_f)}{(1 + \text{CoC})^{t+1}} \]

Derivation from First Principles

Cost of Capital Method
Risk Margin Methods

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

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.
Solvency II Method

- SCR
- Risk Margin
- Best Estimate

Capital
## Solvency II Method

<table>
<thead>
<tr>
<th>Solvency II</th>
<th>Cost of Capital</th>
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<tbody>
<tr>
<td>1. Calculate <strong>SCR</strong> at each year-end</td>
<td>1. Calculate <strong>Capital</strong> at each year-end</td>
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<tr>
<td>2. Multiply by the cost of capital less the risk-free rate</td>
<td>2. Multiply by the cost of capital less the risk-free rate</td>
</tr>
<tr>
<td>3. Discount at the risk-free rate and sum.</td>
<td>3. Discount at the cost of capital and sum.</td>
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Solvency II Method

Solvency II

\[ \sum \frac{SCR \times (CoC - r_f)}{(1 + r_f)} \]

Cost of Capital

\[ \sum \frac{Capital \times (CoC - r_f)}{(1 + CoC)} \]
Simple Example

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

\[ RM = \frac{SCR \times (CoC - r_f)}{(1 + r_f)} \]
Simple Example

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

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

\[ RM = \frac{($100 - RM) \times (0.10 - 0.04)}{1.04} \]
Simple Example

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

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

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

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

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

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

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

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

\[ RM = 5.45 \]
Solvency II Method

\[
\sum \frac{SCHR \times (CoC - r_f)}{(1 + r_f)} = \sum \frac{Capital \times (CoC - r_f)}{(1 + CoC)}
\]
Risk Margin Methods

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2. Cost of Capital Method
3. Solvency II Method
Risk Margin Methods

Derivation from First Principles

- Cost of Capital Method
- Solvency II Method
Risk Margin Methods

Derivation from First Principles

- Cost of Capital Method
- Solvency II Method

Required
Risk Margin Methods

Derivation from First Principles

- Cost of Capital Method
- Solvency II Method
Risk Margin Methods

- Derivation from First Principles
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