How to estimate Risk Margins under IFRS

Jessica Leong, FIAA, FCAS, MAAA
Lead Casualty Specialty Actuary
<table>
<thead>
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Overview of IASB’s philosophy
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Balance sheet at Market Value

Current Exit Value

[Sad faces]
Overview of IASB’s philosophy
Overview of IASB’s philosophy

- Balance sheet at Market Value
- Current Exit Value
- Current Fulfillment Value
Four Components of Current Fulfillment Value
Four Components of Current Fulfillment Value

Central Estimates of Liabilities
Four Components of Current Fulfillment Value

Central Estimates of Liabilities

Discount
Four Components of Current Fulfillment Value

- Central Estimates of Liabilities
- Discount
- Risk Margin
Four Components of Current Fulfillment Value

- Discount
- Risk Margin
- Residual Margin
- Central Estimates of Liabilities
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Three methods to estimate Risk Margins

1. Cost of Capital
2. Confidence Level
3. Conditional Tail Expectation
Three methods to estimate Risk Margins

1. Cost of Capital
2. Confidence Level
3. Conditional Tail Expectation
Cost of Capital method

- Market value of liabilities?
Cost of Capital method

- Market value of liabilities?
- Market value of an asset
Selling you my General Liability book

Discounted reserves = $236 million

1st offer: $236 million
Selling you my General Liability book

Discounted reserves = $236 million

1st offer: $236 million  TOO LOW
How much capital?

Mean = $236 m

99.5th percentile = $295 m

Capital = $59 m
Selling you my General Liability book

Discounted reserves = $236 million

1st offer: $236 m → TOO LOW

2nd offer: $236 m + $59 m
Discounted reserves = $236 million

1st offer: $236 m → TOO LOW

2nd offer: $236 m + $59 m → TOO HIGH

Selling you my General Liability book
Selling you my General Liability book

Discounted reserves = $236 million

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

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

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

Discounted reserves = $236 million

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

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

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

Seller

$B \text{ risk margin}

$236 \text{ m}

$A \text{ investment}

$236 \text{ m Reserve}

$59 \text{ m Capital}
Future Cash Flows

$59 m Capital
- capital release
- interest on capital

$236 m Reserve
- reserve release
- interest on reserves

Insured:
- claims paid
Future Cash Flows

Buyer

$59 m Capital

$236 m Reserve

$59 m Capital

capital release

interest on capital

reserve release

interest on reserves

Insured

claims paid
## Expected Future Net Cash Flow

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<th>Yr</th>
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<tr>
<td>1</td>
<td>=Capital (0) – Capital (1)</td>
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<td>$59.0</td>
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<td>$59.0 – Capital (1)</td>
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<tr>
<td>1</td>
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<td>=Capital (0) * rf</td>
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\[(3) = (1) + (2)\]
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\[(3) = (1) + (2)\]
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<td>1</td>
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<td>$2.3</td>
<td>$9.0</td>
<td>=$9.0 * 1.10^-1</td>
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<td>$5.9</td>
<td>$2.1</td>
<td>$8.0</td>
<td>=$8.0 * 1.10^-2</td>
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= $35.0 m
Transaction

Seller

$ B risk margin

$236 m

$59 m Capital

$236 m Reserve

Buyer

$35 investment
Transaction

Seller

$24 risk margin

$236 m

$59 m Capital

$236 m Reserve

Buyer

$35 investment

$236 m
Selling you my General Liability book

Discounted reserves = $236 million

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

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

3\textsuperscript{rd} offer: $236 m + $24 m
Selling you my General Liability book

Discounted reserves = $236 million

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

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

3\textsuperscript{rd} offer: $236 m + $24 m  \rightarrow  JUST RIGHT
Equation

$24 \quad $59 \quad $35

Risk Margin = Capital_0 - What you will invest
Equation

\[ Risk \ Margin = Capital_0 - \text{What you will invest} \]

\[ Risk \ Margin = Capital_0 - \sum \frac{\text{What you get}}{(1 + \text{CoC})} \]
Risk Margin = Capital_0 - \textit{What you will invest}

Risk Margin = Capital_0 - \sum \frac{\textit{What you get}}{(1 + CoC)}

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

\[ n = 1, \text{Capital}(0) = \$100, \text{Capital}(1) = \$0, \text{rf} = 4\%, \text{CoC} = 10\% \]
Simple Example

n = 1, Capital(0) = $100, Capital(1) = $0, rf = 4%, CoC = 10%

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

\[ n = 1, \text{ Capital}(0) = \$100, \text{ Capital}(1) = \$0, rf = 4\%, \text{ CoC} = 10\% \]

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

\[
\text{Risk Margin} = \$100 - \frac{(\$100 - \$0) + \$100 \times 4\%}{(1 + 10\%)}
\]
Simple Example

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

\[ \text{Risk Margin} = $100 - \frac{($100 - $0) + $100 \times 4\%}{(1 + 10\%)} \]

\[ \text{Risk Margin} = $100 - \frac{$104}{1.10} \]
Simple Example

\[ n = 1, \text{Capital}(0) = \$100, \text{Capital}(1) = \$0, \ rf = 4\%, \ CoC = 10\% \]

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

\[ \text{Risk Margin} = \$100 - \frac{($100 - $0) + $100 \times 4\%}{(1 + 10\%)} \]

\[ \text{Risk Margin} = \$100 - \frac{$104}{1.10} \]

\[ \text{Risk Margin} = \$100 - $94.54 \]
Simple Example

\[ n = 1, \text{Capital}(0) = \$100, \text{Capital}(1) = \$0, \text{rf} = 4\%, \text{CoC} = 10\% \]

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

\[ \text{Risk Margin} = \$100 - \frac{($100 - $0) + $100 \times 4\%}{(1 + 10\%)} \]

\[ \text{Risk Margin} = \$100 - \frac{$104}{1.10} \]

\[ \text{Risk Margin} = \$100 - $94.54 \]

\[ \text{Risk Margin} = $5.45 \]
Another Cost of Capital Method

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
Another Cost of Capital Method

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

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

Cost of Capital:

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

Another Cost of Capital:

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

$n = 1$, Capital(0) = $100$, Capital(1) = $0$, $rf = 4\%$, $CoC = 10\%$

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

\( n = 1, \text{Capital}(0) = 100, \text{Capital}(1) = 0, \text{rf} = 4\%, \text{CoC} = 10\% \)

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

\[
= 100 \times \frac{(10\% - 4\%)}{1.10}
\]
**Simple Example – Another Cost of Capital Method**

\[ n = 1, \text{Capital}(0) = $100, \text{Capital}(1) = $0, rf = 4\%, \text{CoC} = 10\% \]

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

\[
= \frac{$100 \times (10\% - 4\%) }{1.10}
\]

\[
= $5.45
\]
Risk Margin Methods:

Cost of Capital:

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

Another Cost of Capital:

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

Cost of Capital:

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

Another Cost of Capital:

\[
\text{Risk Margin} = \sum_{t=0}^{n} \frac{\text{Capital}_t (\text{CoC} - r_f)}{(1 + \text{CoC})^t}
\]
Three methods to estimate Risk Margins

1. Cost of Capital
2. Confidence Level
3. Conditional Tail Expectation
Three methods to estimate Risk Margins

1. Cost of Capital
2. Confidence Level
3. Conditional Tail Expectation
2. Confidence Level

Mean = $236 m
2. Confidence Level

Mean = $236 m

Confidence level = 75^{th} percentile
2. Confidence Level

Mean = $236 m

Confidence level = 75th percentile
Value = $263 m
2. Confidence Level

Mean = $236 m

Confidence level = 75\textsuperscript{th} percentile

Value = $263 m

Risk Margin = $27 m
Three methods to estimate Risk Margins

1. Cost of Capital
2. Confidence Level
3. Conditional Tail Expectation
Three methods to estimate Risk Margins

1. Cost of Capital
2. Confidence Level
3. Conditional Tail Expectation
3. Conditional Tail Expectation

Mean = $236 m
3. Conditional Tail Expectation

Mean = $236 m

Confidence Level = 75\textsuperscript{th} percentile
3. Conditional Tail Expectation

Mean = $236 m

Conditional Tail Expectation = Average above the 75$^{th}$ percentile
Conditional Tail Expectation = Average above the 75th percentile Value = $319 m

Mean = $236 m
3. Conditional Tail Expectation

Conditional Tail Expectation = Average above the 75th percentile
Value = $319 m
Risk Margin = $83 m
3. Conditional Tail Expectation

Mean = $236 m

Conditional Tail Expectation = Average above the 50th percentile
3. Conditional Tail Expectation

Conditional Tail Expectation = Average above the 50th percentile
Value = $285 m

Mean = $236 m
3. Conditional Tail Expectation

Conditional Tail Expectation = Average above the 50th percentile
Value = $285 m
Risk Margin = $49 m
### Which method is right for me?

<table>
<thead>
<tr>
<th>Methods</th>
<th>Cost of Capital</th>
<th>Confidence Level</th>
<th>Conditional Tail Expectation</th>
</tr>
</thead>
</table>
## Which method is right for me?

<table>
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<tbody>
<tr>
<td>Cost of Capital</td>
<td>$24</td>
</tr>
<tr>
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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
Solvency II Method

Solvency II:

1. Calculate SCR at each year-end
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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
Solvency II Method

Solvency II:

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

Cost of Capital:

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

\[ n = 1, \text{Capital}(0) = $100, \text{Capital}(1) = $0, rf = 4\%, \text{CoC} = 10\% \]

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Risk\ Margin = \sum_{t=0}^{n} \frac{SCR_t (CoC - rf)}{(1 + rf)^t}
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Simple Example – Solvency II Method

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\[
Risk Margin = \sum_{t=0}^{n} \frac{SCR_t(CoC - rf)}{(1 + rf)^t}
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\[
Risk Margin = \sum_{t=0}^{n} \frac{(Capital_t - Risk Margin_t)(CoC - rf)}{(1 + rf)^t}
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Simple Example – Solvency II Method

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Risk \ Margin = \sum_{t=0}^{n} \frac{(\text{Capital}_t - Risk \ Margin_t) (\text{CoC} - rf)}{(1 + rf)^t}
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\[
Risk \ Margin = \frac{($100 - Risk \ Margin)(10\% - 4\%)}{1.04}
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Simple Example – Solvency II Method

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\[
\text{Risk Margin} = \frac{($100 - \text{Risk Margin})(10\% - 4\%)}{1.04}
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\[
\text{Risk Margin} \times \frac{1.04}{0.06} + \text{Risk Margin} = $100
\]
Simple Example – Solvency II Method

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Risk Margin = \sum_{t=0}^{n} \frac{SCR_t(\text{CoC} - rf)}{(1 + rf)^t}
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Risk Margin = \sum_{t=0}^{n} \frac{(\text{Capital}_t - Risk Margin_t)(\text{CoC} - rf)}{(1 + rf)^t}
\]

\[
Risk Margin = \frac{($100 - Risk Margin)(10\% - 4\%)}{1.04}
\]

\[
Risk Margin \times \frac{1.04}{0.06} + Risk Margin = \$100
\]

\[
Risk Margin = \$5.45
\]
Solvency II Method

Solvency II:

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

Cost of Capital:

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

Guy Carpenter
Solvency II Method

Solvency II:

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Risk Margin = \sum_{t=0}^{n} \frac{SCR_t (CoC - r_f)}{(1 + r_f)^t}
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Cost of Capital:

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

- SCR measures risk over a one-year time horizon
- IFRS: ultimate time horizon may be more suitable
  - *fulfillment* value
EXCEPT!!!!

- SCR measures risk over a one-year time horizon
- IFRS: ultimate time horizon may be more suitable
  - fulfillment value
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Timeline

- Discussion paper 2007
- Exposure draft 2010
- Re-exposure draft 2012
- Release of IFRS

?
Timeline

- “Proposed convergence of FASB and IASB in Fair Value Accounting”

Top Ten Casualty Actuarial Stories in 2003

Re-exposure draft in 2012