Calculating the SAM non-life risk margin

Under the microscope: SAM non-life risk margin

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Insurers in the South African insurance market are required to calculate an estimate of technical provisions under the Solvency Assessment and Management (SAM) framework. The estimate of technical provisions consists of a best estimate liability and a risk margin.

This article outlines considerations in calculating the risk margin for non-life insurers under the SAM requirements.

Definition of the non-life risk margin

Paragraph 14.1 in Prudential Standard FSI 2.2 states that the risk margin *"is the part of the technical provisions that ensures that the value of the technical provisions is equivalent to the amount that another insurer would be expected to pay to take over and meet the insurance obligations of the insurer."*

The FSIs therefore define the risk margin in terms of a transfer scenario, where technical provisions are transferred from the original insurer to a reference insurer. This scenario is outlined in par 14.3 in FSI 2.2.

The Financial Soundness Standards for Insurers (FSIs) permit the calculation of the risk margin using either the full calculation methodology, or one of the prescribed simplified methodologies under certain conditions.

The following sections outline key considerations and common mistakes when performing the risk margin calculation using both the full calculation and simplifications.

The items covered include:

- Projection frequency of SCR using full calculation
- SCR projection starting from t = 0 or 1?
- Past and future premiums
- Appropriate runoff of reserve risk capital requirement in runoff scenario
- Possible simplifications for calculating risk margin

Projection frequency of SCR using full calculation

IMPACT OF PROJECTION FREQENCY USED IN ESTIMATING THE RISK MARGIN

The FSIs specify that the risk margin must be calculated using the following formula under the full calculation:

$$CoCM = CoC \times \sum_{t \geq 0} \frac{EOF_{RU}(t)}{(1 + r_{t+1})^{t+1}}$$
$$= CoC \times \sum_{t \geq 0} \frac{SCR_{RU}(t)}{(1 + r_{t+1})^{t+1}}$$

Where:

$EOF_{RU}(t)$	The amount of eligible own funds for period t as calculated for the reference insurer.
$SCR_{RU}(t)$	The SCR at time t as calculated for the reference insurer.
r_r	The risk-free rate for time t.
CoC	The cost of capital rate, defined as 6%.

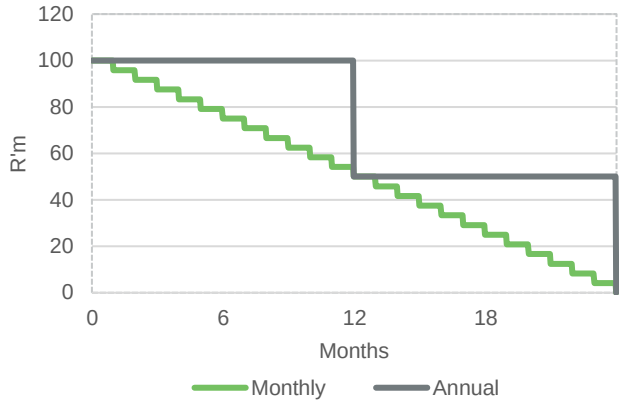
The SCR in this equation is a subset of the actual SCR held, excluding hedgeable market risks and loss-absorbing capacity of deferred taxes.

The formula above shows that the risk margin is calculated using future projection of the SCR. However, the FSI does not explicitly define *t* to be years, months or some other time period of frequency of calculation.

To illustrate the difference, let's consider an example where an insurer has an SCR of ZAR 100 million. For the purposes of this calculation, we made a simplifying assumption that when calculating the full projected SCR, the SCR will run off linearly over a two-year period. The impact of discounting is also ignored for this example.

The area below the graphs in Figure 1 demonstrates the impact on the calculated risk margin.

FIGURE 1: SCR RUNOFF BY PROJECTION FREQUENCY



The table in Figure 2 illustrates the calculated risk margin using different projection frequencies.

FIGURE 2: RISK MARGIN BY PROJECTION FREQUENCY (ZAR MILLIONS)

SCR PROJECTION FREQUENCY	RESULT
Annual	9.0
Quarterly	6.6
Monthly	6.1

The cost of capital rate for each of the scenarios above was calculated converting the cost of capital rate to an effective rate for the relevant period. That is, the quarterly cost of capital rate was calculated as $(1 + CoC)^{\frac{1}{4}} - 1$ and the annual cost of capital rate was calculated as $(1 + CoC)^{\frac{1}{12}} - 1$. (The results are not materially different if other approaches are used to convert the annual cost to monthly and quarterly.)

The table in Figure 2 illustrates that the calculated risk margin differs based on the choice of SCR projection frequency. The differences will increase under shorter SCR runoff patterns. The impact is significant for non-life insurers writing mostly business with short contract boundaries where much of the SCR runs off after the first few months.

FSI-PRESCRIBED PROJECTION FREQUENCY

As mentioned earlier, the FSIs do not explicitly specify the SCR projection frequency that should be used in calculating the risk margin.

Deeper inspection suggests that the FSIs are most consistent with an annual projection of SCR in calculating the risk margin. Evidence to support the argument for an annual SCR projection frequency includes:

- The FSIs state that the SCR for the reference insurer is calculated every year under the proportional approach (level 2 of the simplification hierarchy).
- The FSI specification refers to "the years" where the assumptions of the duration approach are outlined (level 3 of the hierarchy).
- The annual Quantitative Regulatory Return explicitly refers to the annual runoff in SCR on the "TP2.4S" tab.
- The cost of capital rate, stated as 6%, is defined as an annual rate and therefore the risk margin formula as specified can only directly be interpreted as requiring an annual frequency.
- Annual intervals are prescribed under Solvency II in calculating the risk margin. The risk margin calculation and parameterisation were taken directly from Solvency II.

On the other hand, recent guidance issued by the Prudential Authority (PA) on the Iterative Approach for determining risk margin states *"The projection period can use monthly, annual or as a simplification, greater than annual intervals."* The iterative risk margin has been adopted in South Africa exclusively by life insurers, where the distinction between annual or monthly frequency is far smaller given the much slower runoff of the SCR.

SOLVENCY II-PRESCRIBED PROJECTION FREQUENCY

The Solvency II technical specification explicitly states that the risk margin should be calculated using annual projection frequencies of the SCR. We have engaged with several experts that operate under a Solvency II regime, who confirmed that non-life insurers typically use annual projection frequencies in calculating their risk margins.

Our investigation shows strong evidence that annual projection frequencies of the SCR in calculating the risk margin are common and possibly even universal practice under Solvency II.

LACK OF INDUSTRY CONSENSUS IN PRACTICE

Despite this evidence for an annual projection, as of writing this in 2021, several South African non-life insurance companies calculate the risk margin using both monthly and annual SCR projection frequencies. While industry practice should not dictate regulations, it can be difficult for a Head of Actuarial Function (HAF) or external auditor to insist on a practice that is not uniform across the industry.

Official confirmation from the PA may be the only way to create industry consensus.

SCR projection starting from t = 0 or 1?

Under the FSIs, the risk margin calculation applies a cost of capital rate to the projection of future SCRs starting at time 0.

The FSI explicitly states that the transfer scenario in calculating the risk margin takes place at time 0. Hence, the reference insurer would be required to raise the eligible own funds as at time 0, equal to the SCR at time 0.

The formula for calculating the risk margin is also explicit that it applies for t ≥ 0 thus including 0.

In the authors' experience, this practice is universal in South Africa. It is also consistent with Solvency II.

This rationale under SAM, however, stands in contrast to the calculation of the market value margin under the Swiss Solvency Test. Details on this are included in the sidebar.

Past and future premiums

The full risk margin calculation requires insurers to project the SCR under a defined transfer scenario, where the portfolio of insurance obligations is transferred to a new insurer without an existing book.

FSI 2.2 defines the risk margin as:

The risk margin must be calculated by determining the cost of providing an amount of eligible own funds equal to the SCR necessary to support the insurance obligations over their contract boundary.

The SCR projections includes a component for non-life underwriting risk. The premium risk capital requirement, which forms part of this non-life underwriting risk module, is calculated using premium volume measures. These volume measures are calculated as a function of past and future premiums by line of business.

Insurers often include an allowance for past and future earned premiums for expired and future business in the risk margin calculation without careful consideration of the implications of transfer scenario.

This section will consider which premiums should be included in calculating the non-life risk margin under this transfer scenario.

INCLUSION OF FUTURE EXPECTED EARNED PREMIUMS

The risk margin transfer scenario entails a transfer of existing insurance obligations, up to the contract boundary. The reference entity must raise the capital to support this business. In a practical scenario, it is likely that the reference entity will renew policies beyond the contract boundary or write new business. However, the cost of capital required to meet the capital requirements in respect of this new business must be met by the profit margins within the premiums.

The reference entity does not need to be remunerated by the transferring entity for the cost of capital associated with future business.

Therefore, when considering future expected earned premiums in the risk margin calculation, the calculation must be consistent with only the existing obligations transferred up to the contract boundary.

SWISS SOLVENCY TEST APPROACH TO CALCULATING THE MVM

Under the Swiss Solvency Test (SST), market-consistent valuation of technical provisions is defined as the discounted estimate of technical provisions plus the Market Value Margin (MVM).

SST assumes that the SCR at time 0 absorbs losses up to a 1-in-200 loss over a one-year time horizon. After suffering the losses, the insurer will have no risk-bearing capital at the end of the first year. The transfer of the portfolio of assets and liabilities is assumed to take place, under which the reference insurer requires compensation for raising additional SCR during runoff of the insurance portfolio.

As such, the MVM under SST only considers the cost of capital of the SCR from time 1 onwards. The impact of this difference will be significant in a non-life context where the SCR has a short runoff period, due to short contract boundaries and due to the SCR at time 0 typically driving the size of the risk margin held.

The premium volume measure considers three different types of future expected earned premiums, namely:

1. Present value of premium of existing policies which are expected to be earned after the next 12 months ($FP_{existing}$).
2. Present value of premiums expected to be earned after the next 12 months where the initial recognition date falls in the next 12 months (FP_{future}).
3. Estimate of premiums to be earned over the next 12 months.

The first relates to existing policies at the valuation date. We recommend that the risk margin calculation include these premiums *only up to the contract boundary* as it relates to the current insurance obligations.

The second includes future expected premiums stemming from policies that will only incept in the next 12 months. The reference entity does not need to be remunerated by the transferring insurer for these policies as they a) do not form part of the insurance obligations transferred, and b) should contain adequate profit margins built into the premium to provide the required return on capital.

The third is potentially the most controversial. The first principle to apply is that the risk margin is only calculated in respect of existing insurance obligations up to the contract boundary. Expected future premiums beyond the contract boundary should be excluded from the premium volume measures used to calculate the risk margin.

Expected premiums beyond the contract boundary, whether this is from:

- renewal or existing business beyond its contract boundary; or
- from new policies

will typically include adequate profit margins to cover the cost of capital to be incurred in fulfilling these obligations.

Since these expected profits beyond the contract boundary have not been capitalised into a lower liability value, the reference entity is not paying for these profits, and will therefore realise them over time.

Typically, these profits will be higher than the required risk margin. In the unusual case where the overall book of business is not sufficiently profitable, yet a zero-day contract boundary is still assumed, one might argue that Policy Protection Rules and administrative delays in terminating or re-pricing business could result in unavoidable losses beyond the contract boundary.

This is a consequence of the FSI 2.2 paragraph 8.9 specifying that a contract boundary of less than 91 days may be treated as a zero-day contract boundary. If the exact contract boundary were used, considering the legal and practical limitations on ability to terminate or re-price, then the unavoidable losses would already be factored into the best estimate liability and the risk margin would consider the cost of capital for these obligations.

When considering whether the standard formula is appropriate, the Head of Actuarial Function should also consider whether exercising the option for a zero-day contract boundary despite these restrictions still results in an appropriate overall result, including best estimate liabilities, risk margin, and SCR.

The principal remains clear - future premiums should be included in the premium volume measure only in respect of

- Existing obligations
- Up to the contract boundary
- If loss making business is a concern, then this should be part of a larger discussion around contract boundaries and appropriateness of the standard formula.

INCLUSION OF PAST EARNED PREMIUMS

The FSI states that under the transfer scenario, the reference insurer is assumed to have no existing insurance business at the date the transfer takes place. Therefore, past earned premiums for the reference entity will be zero.

This is not merely a formula glitch. Premium risk is defined as the risk that *"relates to insurance policies to be written or renewed during the period, and to unexpired risks on existing policies."*

Past earned premiums relate to past exposure periods and have no direct impact on future risk exposures. Claims or reserve risk arising from those past premiums are considered separately and explicitly.

The inclusion of past earned premiums in the premium volume measures is intended to avoid the risk that future premium forecasts are understated. However, because the transfer scenario includes only existing obligations, there should be no forecasting error related to earned premiums arising from these existing and easily identifiable policies.

Solvency II incidentally also makes it clear that prior premiums can be excluded in favour of future premiums in runoff scenarios, which further supports the principle that premium risk is in respect of future exposure periods only. While the Solvency II specification differs slightly with regards to allowing for past premiums, its treatment of past premiums in the risk margin calculation is consistent with what is described in the paragraphs above.

Given this, we recommend that the premium risk capital requirements in calculating the risk margin should not make allowance for *any past earned premiums over the last 12 months.*

This also means that operational risk should be based on zero past premiums, with the consequence that the provision component of operational risk will remain, but the premium component will fall away.

IMPACT OF INCLUSION OF DIFFERENT AMOUNTS OF PAST AND FUTURE PREMIUMS

Let's consider a hypothetical South African non-life insurer that sells a range of personal and commercial lines of business, and let's say 90% of its business has short contract boundaries, i.e., monthly premium contracts with the ability to reprice or terminate with 31 days' notice.

We have considered the risk margin calculation under a range of scenarios. The table in Figure 3 shows the four calculation scenarios used to compare the risk margin results.

FIGURE 3: RISK MARGIN CALCULATION SCENARIOS

SCENARIO	DESCRIPTION
Base	No past premiums, no future premiums outside contract boundary, 2 months of catastrophe exposure.
1	12 months past premiums, no future premiums outside contract boundary, 2 months of catastrophe exposure.
2	No past premiums, 12 months of future premiums plus future premiums from existing policies up to their contract boundary, 2 month of catastrophe exposure.
3	12 months past premiums, 12 months of future premiums plus future premiums from existing policies up to their contract boundary, 2 months of catastrophe exposure.

The table in Figure 4 shows the resultant risk margin calculated for each scenario using a monthly and annual SCR projection frequency. All scenarios are expressed as a percentage of the risk margin calculated using annual SCR projection frequencies under the base scenario. For example, the risk margin calculated using monthly projection frequencies was 41% of the risk margin calculated using annual projection frequencies under the base scenario.

FIGURE 4: RISK MARGIN CALCULATION COMPARISONS

SCENARIO	% OF BASE - ANNUAL (MONTHLY FREQUENCY)	% OF BASE - ANNUAL (ANNUAL FREQUENCY)
Base	38%	100%
1	81%	183%
2	73%	161%
3	89%	198%

Figure 4 shows that the inclusion of past premiums had a significant impact on the resultant risk margin.

The use of monthly SCR projection frequencies as opposed to annual frequencies led to a 62% reduction in the risk margin result under the base scenario. This highlights the impact that SCR projection frequencies can have, especially because this particular insurer writes predominantly short contract boundary business.

The risk margin calculation using monthly projection frequencies showed increased sensitivity to the number of months of future premiums included. Scenario 2 also led to a lower risk margin compared to scenario 1. This was driven by the reduction in the operational risk which does not contain a premium component under scenario 2. However, the premium and reserve risk capital requirement projection was higher under scenario 2 compared to scenario 1

It is clear from the results that the exclusion of past premiums had the most material impacts on the resultant risk margins.

CONCLUSION ON PAST AND FUTURE PREMIUMS

In summary, in calculating the premium volume measures under the risk margin calculation, we recommend insurers should:

- Not include premium earned over the last 12 months.
- Include all future earned premiums stemming from business existing at the valuation date up to the contract boundary.
- Not allow for any future earned premiums stemming from new business

Appropriate runoff of reserve risk capital requirement in runoff scenario

The reserve risk capital requirement is a function of best estimate outstanding claims provisions. Given that most insurers use generally accepted actuarial techniques in estimating their claims provisions, insurers can, in most circumstances, estimate the runoff of these provisions under the runoff scenarios without intensive additional analyses.

However, insurers might make the mistake in the risk margin calculation of only considering the runoff of claims provisions held at the valuation date and not any new claims incurred after that, arising out of unexpired risk stemming from existing business as covered under “future premiums” in the previous section.

This unexpired risk will result in new claims incurred as business runs down over the future periods.

Insurers should include the allowance for the increase in claims provisions due to new claims from unexpired business over time in calculating the reserve risk capital requirements as part of the risk margin.

Possible simplifications for calculating risk margin

The FSIs permit the use of simplifications in calculating the non-life risk margin. The following section covers the use and appropriateness of the simplifications in calculating the risk margin.

Simplifications for risk margins are widely used in South Africa, but the level of rigour applied in meeting the requirements of the FSIs in using these simplifications varies widely.

USE OF SIMPLIFICATIONS UNDER SAM IN CALCULATING TECHNICAL PROVISIONS

Section 17 of FSI 2.2 outlines guidance regarding the use of simplifications in valuing technical provisions and applying the principle of proportionality.

Paragraph 17.2 of FSI 2.2 states that the actuarial and statistical techniques used to value technical provisions should be proportionate to the nature, scale and complexity of the underlying risks.

However, paragraph 17.1 in FSI 2.2 states that a simplification may only be used if the result of the simplification is not less prudent than what would otherwise have been calculated using the full calculation.

It can be difficult to establish whether a simplification adheres to paragraph 17.1 in FSI 2.2 without performing the full calculation. If an insurer opts to do that, the insurer might as well use the result obtained under the full calculation.

A practical solution to this problem is for the insurer to perform an "out of cycle" calculation to establish that the simplification is appropriate, outside of the time pressures of a valuation.

Alternatively, an insurer could show that the simplification would always lead to a more prudent result. However, the level of prudence needs to be weighed with the underlying principle that SAM is intended to be a best estimate view and excessive prudence is also not desirable.

Where an insurer makes use of a simplification to calculate technical provisions, paragraph 17.6 of FSI 2.2 requires that the insurer's regulatory returns to the Prudential Authority should include disclosure of the simplifications used and the reasons for using them.

An insurer's Head of Actuarial Function is also required to express a view on simplifications adopted. Independent reviews of control functions and external audit reviews of valuation results should identify weaknesses in the justification for simplifications.

The purpose of simplifications in calculating the risk margin is to reduce time and resources by avoiding complex modelling. However, sometimes the work required to prove that the simplification is appropriate is as complex as a more complete calculation. Perhaps counterintuitively, investing even more time in a robust and automated process to demonstrate the simplification can pay dividends in the longer term.

APPROPRIATENESS OF SIMPLIFICATIONS USED

Given the requirements in the use of simplifications in the section above, it is clear that some simplifications won't be appropriate in all circumstances. For example, the insurer might have a risk exposure where simplifications might understate the risk margin result compared to what would have been obtained using a full calculation.

Paragraph A.2 in Chapter 3 of FSI Guidance Note (GN) 2.2 states that the hierarchy of simplifications involves a higher degree of simplification at each level. The paragraph goes on to state that insurers should adopt the approach that most appropriately captures the material characteristics of their risk profiles, while satisfying the principle of proportionality.

Using methods with a higher degree of simplification will introduce a higher degree of prudence. We recommend that insurers use the highest-level simplifications that are practical. This avoids the risk of including excessive prudence in the risk margin.

Therefore, we suggest that selecting the simplification should be a pragmatic process working through the hierarchy of simplifications and considering materiality and the insurer's underlying risk exposure and proportionality. We expect that, the more complex and material the risk exposures are, the higher the typical hierarchy of simplification that will be chosen.

Conclusion

In theory, the risk margin is a well understood component of the balance sheet. In practice, different interpretations and imprecision can easily result in a sixfold difference between results for similar insurers—even before allowing for a range of simplifications and their potential misuse.

While further guidance from the Prudential Authority or Actuarial Society would be welcome, the principles and analysis outlined here may be helpful in determining your own approach at least until more guidance becomes available.

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