Solvency assessment regime for South African medical schemes

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ABSTRACT
The objective of this paper is to set out an alternative solvency assessment regime for medical schemes. The alternative proposed is adapted from the Solvency, Assessment and Management (SAM) regime instituted in the insurance industry in South Africa. SAM aims to be a risk-based assessment of the risks facing insurers, and this paper attempts to apply similar principles to medical schemes, with adjustments for the environment and the nature of medical scheme business. In the paper, the solvency requirements are broken down into those reflecting liability risk, operational risk and asset risk. Further divisions are made within the liability risk and asset risk components. These risk components are guided by the SAM framework, but adapted to allow for the specific conditions under which medical schemes operate. These components are then aggregated to generate the medical scheme equivalent of the solvency capital requirement (SCR). A discussion around economic capital and the Pillar 2 principles in SAM is also provided in the paper. In addition to this, a standard framework is outlined in order to guide schemes in the economic capital assessment which would be required in a SAM-type system. It is, however, envisaged that schemes would need to consider their own unique competitive situation when assessing economic capital.

KEYWORDS
Medical schemes; solvency; Solvency, Assessment and Management; asset risk; liability risk

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1. INTRODUCTION

1.1 Medical Schemes and Solvency

1.1.1 Since the Medical Schemes Act (No 131 of 1998) was promulgated, medical schemes in South Africa have been required to hold solvency capital equivalent to 25% of their annual gross contribution income. This requirement is determined independently of the size of a medical scheme or any material risks faced by the scheme. In addition, Ramjee & Vieyra (2014) suggest that the 25% solvency requirement creates 'disincentives for scheme growth'.

1.1.2 As far back as 2003, the Council for Medical Schemes (CMS) issued a discussion paper focusing on issues of financial soundness in medical schemes. Although a risk-based approach to solvency was not explicitly mentioned, many of the discussions in the paper were similar to items in the framework outlined in this paper. Notably, discussions were outlined around measurement errors relating to outstanding claims reserves, asset structures and asset risk, as well as budgeted operating deficits and inadequate pricing.

1.1.3 Since the release of the CMS (2003) discussion paper, many healthcare actuaries have outlined the issues around the current solvency requirement, and proposed alternatives. In 2004, Kendal & McLeod (2004) prepared a discussion document for the CMS outlining a potential risk-based approach to solvency. This was based on the Risk-Based Capital (RBC) approaches used for Australian health insurers and US Managed Care Organisations. Some of these approaches were also similar to the model used at the time for South African life insurers. The study found that, in general, both approaches would require some medical schemes to hold more capital than the 25% solvency requirement while others could hold less.

1.1.4 In a presentation to the Actuarial Society Convention, Theophanides (2009) outlined some of the principles around RBC approaches, as well as the use of such approaches globally. Specifically, the presentation outlined the advantages of RBC approaches, and the fact that the general direction of the financial services industry around the world is towards these types of models. The Solvency II regime was also mentioned, although no detail was provided since at the time the framework was still being developed.

1.1.5 At a subsequent Actuarial Society Convention, Raath (2012) presented a commentary on the current solvency regime for South African medical schemes and proposed alternatives. It was noted that that the current requirement seems not to have any scientific basis to it, and that in general the industry favoured an RBC-style approach. Solvency II, which by this stage was further developed, as well as its South African equivalent were also examined, but it was noted that the standard formulae used were both complex and still under development.

1.1.6 During the course of 2010, the Financial Services Board (FSB) introduced the Solvency, Assessment and Management (SAM) regime to regulate South African insurers. SAM is an adaptation of the Solvency II capital adequacy, risk governance and risk disclosure regime implemented for European insurers and reinsurers, to take account of the specific circumstances of the insurance industry in South Africa. The SAM standard formula is set out in a sequence of discussion documents and position papers published by the FSB referencing different aspects and different stages of the process.

1.1.7 SAM is an evolving process, with final implementation in the insurance industry set to take place during 2016. The diagram below, taken from the SAM roadmap[1] published in 2010, shows the original process flow for SAM implementation in the insurance industry. This has been delayed such that the parallel runs outlined for 2013 are being performed now in 2015, and implementation originally set for 2014 is now taking place in 2016. The SAM papers referred to in this paper were published by the FSB as part of this process.

1.1.8 The purpose of this paper is to outline a solvency regime for South African medical schemes that is aligned to the SAM framework. It is understood that the SAM framework is still under development and changes may still be made. However, the

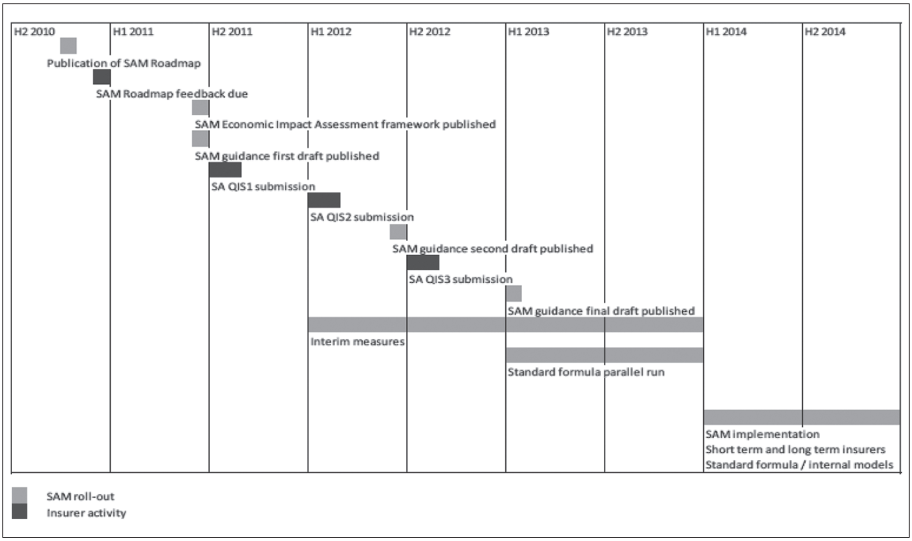

Figure 1 Original process flow for SAM implementation in the insurance industry

1 SAM Roadmap first published by the Financial Services Board (FSB) in November 2010. Accessed from https://sam.fsb.co.za/SAM%20Documents/SAM%20Library/FSB_SAM_Roadmap_v1%200.pdf

work that has already been performed in support of SAM is extensive, and much of it would be directly applicable to medical schemes.

1.1.9 It is noted that South African medical schemes are regulated by a different regulatory body, and are governed by a different Act of Parliament, from the short-term and long-term insurance industries. It therefore stands to reason that the SAM regulatory regime cannot be implemented for medical schemes without some adaptation for this different environment. The terminology used under SAM has also been slightly altered in this paper to be more relevant in a medical scheme environment.

1.1.10 SAM is a principles-based regulation based on an economic balance sheet, and utilising a three pillar structure of capital adequacy (Pillar 1), systems of governance (Pillar 2), and reporting requirements (Pillar 3).[2] This paper considers the methodologies set out in SAM to measure capital adequacy and how they could be applied to a medical scheme environment. SAM considers two measures of capital, namely regulatory capital and economic capital. Regulatory capital is considered as part of Pillar 1, while economic capital forms part of Pillar 2.

1.1.11 A previous study attempting to specify a SAM-type methodology for medical schemes was performed by Ganz (2012). The study focused only on liability risks, and did not consider the other components of the SAM regime. This paper builds on the work already performed, and attempts to extend it to outline a full solvency regime based on the SAM principles, and using SAM methodologies where they are applicable and reasonable.

1.2 Regulatory Capital Requirement

1.2.1 Pillar 1 of SAM stipulates the quantitative requirements that insurers and reinsurers must satisfy to demonstrate that they have adequate financial resources. The economic balance sheet approach to be adopted under SAM integrates the interdependencies between all assets and liabilities, calculated at market consistent values. [3]

1.2.2 SAM and Solvency II require that the regulatory capital requirement is calibrated to correspond to a Value at Risk (VaR) that enables an insurer to absorb losses against all quantifiable risks to a confidence level of 99.5% over one year. A 99.5% confidence level is also referred to as reserving for a one-in-200 year event in this report.

2 Adapted from the SAM Roadmap first published by the Financial Services Board (FSB) in November 2010. Accessed from https://sam.fsb.co.za/SAM%20Documents/SAM%20Library/FSB_SAM_Roadmap_v1%200.pdf

3 Ibid.

1.2.3 SAM provides for two levels of regulatory capital, namely the solvency capital requirement (SCR), which satisfies the one-in-200 year event requirement, as well as a minimum capital requirement (MCR) which reflects the absolute minimum necessary to protect policyholders. The MCR is generally calculated using a much simpler formula, but SAM provides that the MCR must fall within a corridor between 25% and 45% of the SCR.[4] This MCR is designed to facilitate different levels of interventions by the regulator of insurers. If a SAM-type regime is applied to medical schemes, once a final standard formula for the SCR has been approved, CMS would need to determine an appropriate level for the MCR and appropriate levels of regulatory intervention.

1.2.4 This paper sets out proposals for a standard approach and formula which could be used to set the SCR for medical schemes under a regime similar to SAM. All of the calculations and modelling in the paper have been performed using data which is publicly available from the CMS Annual Report (2014/15) and earlier CMS reports.

1.2.5 SAM allows the SCR requirement to be calculated using an internal model that better reflects the particular risks faced by the insurer than the standard formula. However, these internal models should be approved by the regulator prior to their use by insurers in calculating the SCR.

1.3 Economic Capital Requirement

1.3.1 Pillar 2 of SAM and Solvency II seeks to ensure that an insurer is able to meet the solvency capital requirement at all times. The process of assessing this is known as an Own Risk and Solvency Assessment (ORSA).[5] In SAM, the requirement is to perform an ORSA, with no prescribed process but rather a set of principles to which insurers must adhere.

1.3.2 It is noted that the economic capital requirement of any given insurer could differ materially from the prescribed SCR requirement. Specifically, the economic capital requirement necessitates taking a view of the business over the longer term (the SCR is calculated over a one-year time horizon). This could either be a fully integrated view, or an approach considering a series of one year periods. The economic capital calculation will therefore be specific to the individual insurer, and take into account the strategic plan and risk appetite of the insurer.

1.3.3 Economic capital refers to the capital needed by the insurer to satisfy its risk tolerance and support its business plan, and is determined from an economic

4 SAM Final Position Paper 74 v4, approved by the SAM steering committee on 27 March 2015. Accessed from www.fsb.co.za/Departments/insurance/Documents/Position%20Paper%2074%20(v%204)%20 FINAL.pdf

5 SAM Roadmap first published by the Financial Services Board (FSB) in November 2010. Accessed from https://sam.fsb.co.za/SAM%20Documents/SAM%20Library/FSB_SAM_Roadmap_v1%200.pdf

assessment of the insurer's risks and the relationship between these risks and the risk mitigation strategies in place. The economic capital requirement must be calculated over a time horizon that is consistent with that needed for effective business planning. The ORSA requires insurers to understand risks and future solvency over a planning horizon, typically three to five years (Bennett & Strydom, 2014).

1.3.4 This paper makes some comments on potential approaches to the economic capital calculation, based on an extension of the approach outlined to calculate the SCR for medical schemes. However, it is expected that a standard approach to economic capital could only serve as a guideline. Given the nature of economic capital, each scheme would need to determine independently whether and what adjustments are necessary to the standard approach, or whether a full internal model is necessary.

1.4 Capital Requirement Components

1.4.1 The Members' Funds of a South African medical scheme are accounted for as either Accumulated Funds or Revaluation Reserves in terms of the existing accounting treatment. Currently the Revaluation Reserves are purely an accounting concept reflecting historical gains on assets, mostly equities, which have not yet been realised since the assets continue to be held. These Revaluation Reserves are not included in the solvency capital calculation for medical schemes.

1.4.2 Under SAM, the risk modules considered are the non-life underwriting risk module, the life underwriting risk module, the market risk module, the counterparty default (concentration) risk module and the operational risk module.[6] Since medical schemes cannot accept life or non-life underwriting risk, a single Liability Risk module is proposed. It is further proposed that the SCR requirement is made up of the Liability Risk and Operational Risk modules only. The market risk and the counterparty default (concentration) risk modules are considered together in a separate Asset Risk module. The proposal in this paper is to use the Asset Risk module to determine an appropriate reduction to the free assets of a medical scheme when determining whether the SCR requirement has been met or not.

1.4.3 Should the new solvency regime be adopted as proposed, the Revaluation Reserve would be replaced by an explicit Asset Risk Reserve, calculated according to the principles outlined in this paper. This Asset Risk Reserve would then be deducted from the total Members' Funds of the scheme (including the current Revaluation Reserves) to generate the revised Accumulated Funds under the new regime.

6 SAM final Position Paper 48 v4 approved by Steering Committee 5 December 2014. Accessed on www.fsb.co.za/Departments/insurance/Documents/Position%20Paper%2048%20(v%204)%20FINAL.pdf

1.4.4 The approach set out under SAM is to include the market risk and the counterparty default (concentration) risk modules in the calculation of the SCR requirement. No deduction is then made from the free assets when determining whether the SCR requirement has been met under SAM. This has the effect of requiring an insurer with a larger free asset base to have a greater SCR requirement than an otherwise identical insurer with a smaller free asset base.

1.4.5 The approach proposed in ¶1.4.3 above links the asset risks of a medical scheme to the free assets, and leaves the SCR requirement to reflect only the liability and operational risks.

2. CAPITAL REQUIREMENT FOR LIABILITY RISK

2.1 Liability Risk Principles

2.1.1 The objective of a solvency regime is to ensure that the medical scheme has sufficient free assets to finance an extreme adverse event or series of extreme adverse events and continue operating for the next 12 months without needing an injection of capital. Liability Risk is concerned about the risk associated with the healthcare liability accepted by a medical scheme in exchange for the contributions it receives. A liability risk arises if circumstances could cause the value of the healthcare liability to be greater than the income (less expenses) generated to fund it.

2.1.2 The capital requirement to cover Liability Risk is made up of the following three categories:

- The capital required to finance any operating deficit budgeted for the next 12 months.
- The capital required to finance the adverse events that could cause the actual operating deficit to be greater than budgeted. The adverse events can fall into two further categories:
  - Adverse events that can be derived by extrapolating the past volatility of claims and expenses; and
  - Catastrophic events that cannot be derived from past experience.
- The capital required to finance any shortfalls in the balance sheet provisions established at the start of the year. The primary provision, and the only one considered in this paper, is the provision for outstanding claims.

2.1.3 Each of these risk categories making up the Liability Risk are dealt with in the sections below.

2.2 Provision for Operating Deficit

2.2.1 Medical schemes in South Africa are not-for-profit entities, and will often budget for operating deficits as a way of distributing excess free assets to members. Furthermore, it can be observed from the CMS Annual Report (2014/15) that claims for most medical schemes in the last quarter of the year (particularly December) are much lower than the other months, meaning that even those schemes which budget for a marginal operating surplus would be expected to have budgeted deficits for many months in the year.

2.2.2 The provision for operating deficit component of the capital requirement to cover Liability Risk would ensure that the medical scheme has adequate financial resources to cover the known, or budgeted, operating deficits occurring in the next 12 months. The provision should logically be calibrated to the highest year-to-date budgeted loss in any of the next 12 months.

2.2.3 In terms of the current accounting treatment, medical schemes are not required to set aside technical reserves to cover these budgeted losses. To the extent that this situation changes under the IFRS 4 guidance on accounting for insurance contracts, the provision for including budgeted operating deficits as part of the capital requirement to cover Liability Risk will need to be reviewed.

2.2.4 The budgetary processes followed by South African medical schemes are not always fully disclosed to the regulatory authorities and a proxy method may need to be developed in order to calibrate the provision for operating deficit. The proxy proposed in this paper is to use the actual operating position of the medical scheme as measured for the previous year and expressed as a percentage of gross annual contributions.

2.2.5 In order to estimate the impact of seasonality on year-to-date operating results, the claims seasonality data provided in the annexures to the 2014 CMS Annual Report can be used. A year-to-date claims ratio at the end of each month can be calculated by averaging the monthly ratios up to that point. The largest deviation of this ratio from the final claims ratio for the year can then be used as the seasonality allowance. This is then subtracted from the previous year-end operating position to calculate the worst projected monthly operating position, and hence the applicable provision for operating deficit.

2.3 Claims (and Expenses) Variability Risk

2.3.1 The Claims (and Expenses) Variability Risk would cover the possibility that the actual claims and expenses for the forthcoming year are greater than the amounts which were budgeted. This risk is calibrated by comparing the historical claims and expenses against the budget set. Industry data on the variability of claims and expenses against budget are not readily available for medical schemes, but industry data on the variability in the components (notably actual claims and contributions) making up the operating results can be extracted from the CMS Annual Reports.

2.3.2 SAM, for reasons outlined in Final Position Paper 77 approved by the Steering Committee in 2013, does not contain an explicit healthcare module. However, the work performed by CEIOPS[7] in respect of the healthcare module of Solvency II can be used to derive a standard formula for the Claims (and Expenses) Variability Risk.

2.3.3 Ganz (2012) argues that medical scheme business is pursued on a basis which is not similar to life, and outlines a potential standard formula based on Quantitative Impact Study 5 (QIS5) performed in respect of Solvency II, but combines all of the liability risks into one formula. For the purposes of this paper, the individual risks are separate, and hence the principles outlined in QIS5 of Solvency II are used, with the exception of the adjustment for reinsurance which is deemed unnecessary in the medical scheme environment.

2.3.4 In the healthcare module of QIS5, healthcare claims are assumed to follow a lognormal distribution. The 99.5% VaR for the Claims (and Expenses) Variability Risk, or SCR_{CV}, is thus calculated as:

$$SCR_{CV} = NC * \rho(\sigma_{CV})$$

where NC = annual net contribution income
σ_{CV} = *standard deviation of claims ratio (as defined below)*

$$\rho(\sigma_{CV}) = \frac{e^{N_{0.995} * \sqrt{\ln(\sigma_{CV}^2 + 1)}}}{\sqrt{\sigma_{CV}^2 + 1}} - 1$$

where $N_{0.995}$ = 99.5*th percentile of a standard normal distribution*

2.3.5 The standard deviation of the claims ratio can then be estimated and used to generate an SCR_{CV} for each medical scheme. The Solvency II process specifies multiple methodologies to estimate the standard deviation. For the purposes of this paper, the standard deviation for each medical scheme has been calculated individually, across five years, using the following formula adapted from Solvency II:

$$\sigma_{CV} = \sqrt{\frac{1}{NC_{ave}}} * \sqrt{\frac{1}{N-1} * \left(\sum_{years} \frac{1}{NC_{year}} * \left(RCl_{year} - NC_{year} * ACR \right)^2 \right)}$$

where NC = net contribution income
RCl = risk claims incurred
N = number of years' data
ACR = average claims ratio across all years

7 Committee of European Insurance and Occupational Pensions Supervisors Advice for Implementing Measures on Solvency II: SCR Standard Formula Calibration of Health Underwriting Risk. Accessed at: https://eiopa.europa.eu/CEIOPS-Archive/Documents/Advices/CEIOPS-DOC-68-10%20_L2_%20 Advice_on_Calibration_Health_Underwriting_%20Risk.pdf

2.3.6 The results are plotted in Figure 2 showing the SCR_{CV}, for each medical scheme calculated for a single year (2014) using the previous five years' data on claims and contributions. The results are expressed as a percentage of gross annual contributions for consistency with the current solvency regime and to allow them to be combined later. Open-membership and restricted-membership medical schemes are indicated by dark and light dots respectively. A log scale has been used for the horizontal axis.

2.3.7 The CEIOPS method combines all insurers' data and provides a single standard deviation, and thus VaR as a proportion of contributions, to be used by all insurers across all of the EU countries. This seems a reasonable approach given the short time series available and the variability of the results by medical scheme (it is unlikely that a one-in-200 year event can be derived from a time series with only five observations, so some aggregation is likely to be necessary). The CMS Annual Report (2014/15) defines a large scheme as one with more than 30 000 members, while a small scheme is defined as one with less than 6 000 members. All other schemes are classified as medium schemes. Table 1 below shows the aggregated results where the schemes have been combined by type and scheme size as outlined above.

TABLE 1 SCR components by scheme size – variability risk

	Open	Restricted	All Schemes
Small	4.66%	15.43%	14.72%
Medium	13.25%	10.26%	11.17%
Large	7.90%	11.02%	9.61%
All Schemes	9.25%	12.85%	11.86%

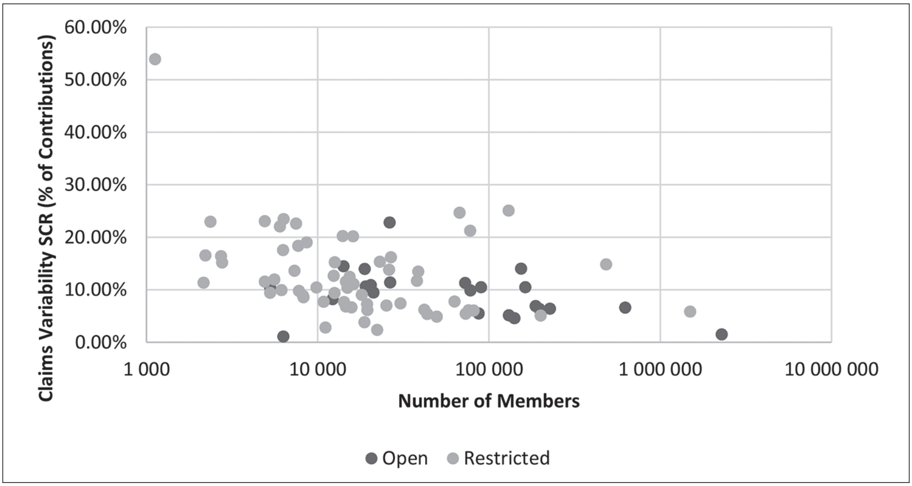

FIGURE 2 Plot of claims (and expenses) variability SCR

2.3.8 For the purposes of determining the SCR_{CV}, medical schemes should not use the values derived from the individual scheme data. It is suggested that the data be rather aggregated in some way, consistent with the approach used in Solvency II, with an adjustment to take into account the distribution of scheme sizes in the medical scheme market. Table 1 above represents one possible approach for this aggregation, but other approaches could produce more consistent and smoother results. A discussion on the optimal approach would be required at an industry level prior to any implementation.

2.4 Catastrophe Risk

2.4.1 In terms of SAM, the capital requirement should cover any natural or man-made catastrophes that would result in material losses for the insurer. Because of the demarcation issues around insurers and medical schemes, SAM does not have a dedicated health module as Solvency II does. In the Solvency II context, catastrophe risk refers to an accumulation of claims caused by a single adverse event rather than exposure to a single large claim. The effect of a single large claim is unlikely to be material except in very small schemes, and would arguably already be captured in the Claims (and Expenses) Variability Risk outlined in 2.3 above.

2.4.2 Large amounts of research have been performed around catastrophic healthcare expenditure, but most of this appears to have been in the context of individual households. Data and research around catastrophic healthcare events within insurance arrangements are limited, and Solvency II appears to be the source of the vast majority of it. The approach proposed in this paper has been adapted from the CEIOPS work performed in respect of Solvency II. Alternate approaches are possible but, as with any catastrophe provision, data are likely to be limited.

2.4.3 The health catastrophe risk in Solvency II is calibrated according to a series of health catastrophe standardised scenarios. Three scenarios are provided:

- pandemic such as bird flu;
- arena or stadium accident; and
- office block accident.

2.4.4 The pandemic scenario envisages an adverse event arising from a pandemic that leads to non-lethal claims that give rise to substantially higher medical claims. Modelling for the immediate treatment in a major pandemic, such as bird flu, shows how private healthcare treatment facilities quickly reach capacity thereby limiting the extent of medical scheme expenditure. Pandemics of a lesser scale are arguably already captured in the historical claims volatility data. Consequently pandemic risk has not been modelled specifically for the purposes of this paper.

2.4.5 The arena or stadium accident envisages a scenario where a concentration of the general population is affected by a catastrophe such as the destruction of an arena or stadium. This risk is material for the larger medical schemes that have a threshold level of penetration in the general population.

2.4.6 In the Solvency II health catastrophe risk module, this risk ($SCR_{cat,arena}$) is calculated as follows:

$$SCR_{cat,arena} = S * I_p * x_p * E_p * MS_p$$

where S = 50% *of capacity of largest stadium in the country*
I_p = *insurance penetration*
x_p = *proportion of affected people injured*
E_p = *exposure i.e. average cost of treatment*
MS_p = *market share of scheme*

2.4.7 The largest arena or stadium in the country is the FNB stadium, with a capacity of 90 000. The official medical scheme insurance penetration is approximately 16.6%. The Solvency II parameterisation indicates that medical injuries affect 30% of the exposed population. In addition, Solvency II recommends that the cost exposure for medical expense cover should be estimated as the average claim paid for hospital treatments in respect of accidental causes (i.e. trauma). From the Towers Watson client base, this average was approximately R24 000 in 2014 terms.

2.4.8 Applying the numbers outlined above implies that the arena catastrophe risk (in 2014 terms) should be equal to R53 784 000 multiplied by the market share of the scheme for which the risk is calculated.

2.4.9 The office block accident envisages an adverse event arising from a catastrophe that results in the destruction of an office block housing medical scheme members. Medical scheme memberships drawn from employer groups will be impacted most by this scenario.

2.4.10 In the Solvency II health catastrophe risk module, this risk ($SCR_{cat,conc}$) is calculated as follows:

$$SCR_{cat,conc} = S * x_p * E_p$$

where S = *largest concentration of members in a single building*
x_p = *proportion of affected people injured*
E_p = *exposure i.e. average cost of treatment*

2.4.11 The largest concentration of members will need to be calculated individually by each medical scheme. As above, the Solvency II parameterisation indicates that medical injuries affect 30% of the exposed population. In addition, Solvency II recommends that the cost exposure for medical expense cover should be estimated as the average claim paid for hospital treatments in respect of accidental causes (i.e. trauma). From the Towers Watson client base, this average was approximately R24 000 in 2014 terms.

2.4.12 Applying the numbers outlined above implies that the building catastrophe risk (in 2014 terms) should be equal to R7 200 multiplied by the largest concentration of members for the medical scheme for which the risk is calculated. For the purposes of calculating catastrophe risks in this paper, the largest group was assumed to be 2% of membership for open-membership schemes, and between 10% and 25% for restricted-membership schemes depending on size.

2.4.13 These numeric values will need to be divided by gross annual contributions to standardise the allowances with the rest of the liability risks. Then the catastrophe risk (SCR_{cat}) can be calculated (assuming independence of the two catastrophes) as:

$$SCR_{cat} = \sqrt{SCR_{cat,arena}^{\ 2} + SCR_{cat,conc}^{\ 2}}$$

2.5 Outstanding Claims Reserve Risk

2.5.1 The capital requirement for the outstanding claims reserve risk should cover the event that the provision for outstanding claims is understated due to the claims reported after the reporting period being greater than estimated.

2.5.2 The CMS Annual Report (2014/15) provides data on the percentage of the established provision for the prior year which was actually used. The errors inherent in the historical outstanding claims provisions as at the end of each year are provided in the following year's CMS Annual Report. The variance between the provision and the actual claims for 86 schemes over the five-year period between 2009 and 2013 is shown in Table 2 below.

TABLE 2 Distribution of outstanding claims provision variances

Deviation of actual claims from recorded provision	Count of observations
–20% to –10%	49
–10% to –5%	75
–5% to –2.5%	56
–2.5% to 0%	53
0% to 2.5%	43
2.5% to 5%	24
5% to 10%	30
10% to 20%	20

2.5.3 A similar approach can be followed to estimate the VaR for the Outstanding Claims Reserve Risk as was used for the Claims (and Expenses) Variability Risk. The VaR (99.5%) calibration for the Outstanding Claims Reserve Risk can thus be determined by deriving the standard deviation from the historical variances for each medical scheme and the same VaR formula applied. Because of the way the data are structured (percentage of provision as opposed to actual numbers), it is not possible to use the estimation formula for standard deviations as was used in the Claims (and Expenses) Variability Risk. Thus standard deviations were calculated using the traditional sample standard deviation formula, and used in the VaR formula.

2.5.4 The results are plotted in Figure 3 below showing the VaR (99.5%), and hence the SCR component, in respect of Outstanding Claims Reserve Risk for each medical scheme by average number of members over the five years. Open–membership and restricted-membership medical schemes are indicated by dark and light dots respectively. A log scale has been used for the horizontal axis.

2.5.5 The outstanding claims provisions are made up of two components, namely the notified but not paid claims, and the incurred but not reported (IBNR) claims. The volatility of the historical data will depend on the relative weights of these two components of the outstanding claims provision. The higher the weight of the IBNR component, the greater the volatility that can be expected. An accurate calibration of this risk would require the outstanding claims provision to be determined as at 31 December where there is a 100% weighting to the IBNR component with no claims notified but not paid.

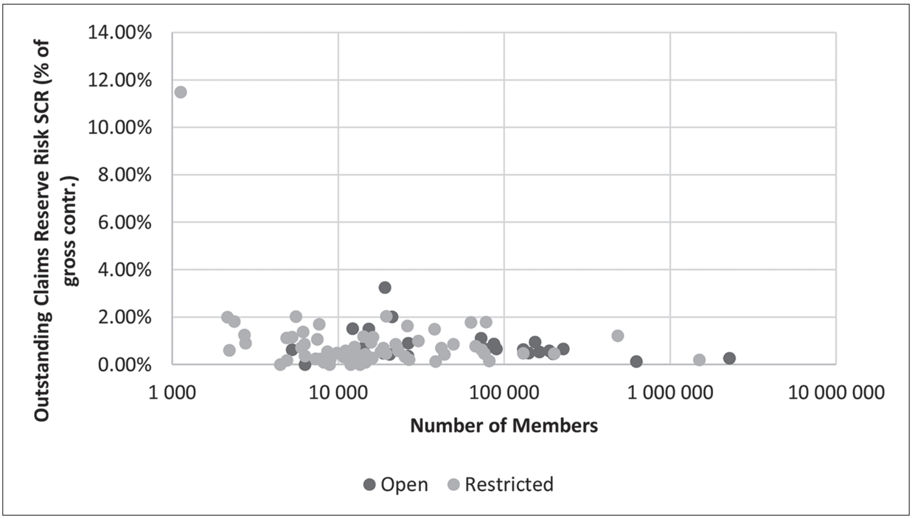

FIGURE 3 Plot of outstanding claims reserve risk SCR

2.5.6 Given that that the time series used to estimate the standard deviation in the outstanding claims provision is short, it is also proposed to aggregate schemes for the calculation of this component.

2.6 Correlation of Liability Risks

2.6.1 The risks highlighted in 2.3, 2.4 and 2.5 above would not typically occur at the same time. On the other hand, the risks are not completely independent of one another as there may be scenarios where they do occur at the same time. The calculation methodology suggested in the CEIOPS paper dealing with Health Underwriting Risk in Solvency II suggests correlations between the various risks as follows:

— 50% correlation between the Claims (and Expenses) Variability Risk (SCR_{CV}) and the Outstanding Claims Reserve Risk (SCR_{IBNR}). Solvency II refers to this combined risk as the Underwriting Risk (SCR_{under}).
— 25% correlation between the Catastrophe Risk (SCR_{cat}), and the combined risk above.

2.6.2 The formula below indicates how the three risk allowances should be combined with the provision for budgeted deficits to create the total liability risk (SCR_L):

$$SCR_L = \sqrt{SCR_{under}{}^2 + SCR_{cat}{}^2 + 2*0.25*SCR_{under}*SCR_{cat}}$$
$$+ \textit{Provision for budgeted deficits}$$
$$\textit{where } SCR_{under} = \sqrt{SCR_{CV}{}^2 + SCR_{IBNR}{}^2 + 2*0.5*SCR_{CV}*SCR_{IBNR}}$$

and the provision for budgeted deficits is calculated as set out in section 2.2.

2.7 Current Position of Registered Schemes

2.7.1 Under the assumptions outlined above, the Liability Risk SCR has been calculated for each medical scheme registered as at 31 December 2014 using information taken from the CMS Annual Report (2014/15). The Liability Risk SCR (using actual rather than aggregated Claims (and Expenses) Variability Risk) expressed as a percentage of annual gross contributions is plotted against the average number of members for each of the medical schemes in Figure 4 below. Open-membership and restricted-membership medical schemes are indicated by dark and light dots respectively. A log scale has been used for the horizontal axis.

2.7.2 The impact of the Claims (and Expenses) Variability Risk on the overall Liability Risk SCR is evident from the graph. The variability across medical schemes is increased as a result of the short time series available relative to the rarity of the assumed event. The three outlier schemes are small restricted schemes with large operating deficits in 2014, and hence a large budget deficit provision.

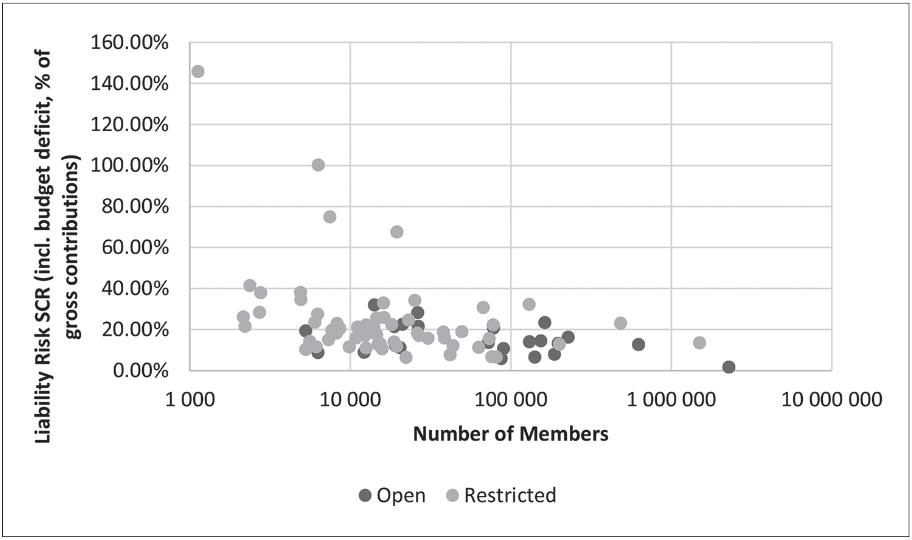

FIGURE 4 Plot of liability risk SCR

2.7.3 As discussed previously, the most reasonable approach to this problem is to aggregate schemes by size to give additional data points. An approach has been suggested in this paper, but further research and calibration may be necessary to produce a reasonable and consistent approach to this aggregation.

3. CAPITAL REQUIREMENT FOR OPERATIONAL RISK[8]

3.1 In addition to the more explicit asset and liability risks, SAM requires that sufficient capital is held to cover operational risks. Operational risk is defined in SAM as the risk of loss arising from inadequate or failed internal processes, or from personnel and systems, or from external events not covered elsewhere. This is a risk which is difficult to quantify given both the complexities of individual systems and the scarcity of any type of data on these types of events.

3.2 It is also noted in both SAM and Solvency II that holding additional capital may not be the most appropriate way of mitigating operational risk, and that a requirement to manage this risk through exposure limits or other requirements which set system standards and the like may be more appropriate.

8 This section draws heavily from SAM Position Paper 61 v5 approved by Steering Committee 30 June 2014. Accessed on www.fsb.co.za/Departments/insurance/Documents/PositionPapers/Position%20Paper%2061%20(v%205).pdf

3.3 In spite of this, SAM currently recommends a standard formula for calculating an explicit capital requirement for operational risk, which can be translated for medical schemes as follows:

— 3% of the prior year gross annual contributions, plus
— 3% of any extraordinary growth in the prior year's gross annual contributions (extraordinary growth is growth exceeding 20%).

3.4 The requirement above has been derived from the SAM standard formula, treating medical scheme risk as similar to non-life insurance.

3.5 Operational risk is diverse in its composition, and the measurement of operational risk may suffer from a lack of sufficiently uniform and robust data and well-developed valuation methods. The formula for operational risk provided by SAM has thus been adopted at face value for the purposes of this paper.

4. CAPITAL REQUIREMENT FOR ASSET RISK

4.1 Asset Risk Principles

4.1.1 As stated earlier the objective of a solvency regime should be to ensure that the medical scheme has sufficient free assets to finance an extreme adverse event or series of extreme adverse events and continue operating for the next 12 months without needing an injection of capital. Asset Risk is concerned with adverse events that would impact on the value of the free assets. The principle applied in this section is that sufficient free assets to fund the SCR requirements for Liability and Operational Risk outlined in the previous sections should be available following a 1-in-200 year asset adverse event.

4.1.2 As outlined above, SAM recommends a total balance sheet approach, meaning that all assets should be considered when calculating the capital requirement for asset risk as opposed to an approach where only those assets required to back the liabilities plus the capital requirement for Liability Risk are stressed. The latter is the approach currently used for life companies under SAP104.

4.1.3 SAM requires that the capital requirements for each risk module (Liability, Operational and Asset Risk in this paper) are directly combined when calculating the overall SCR.[9] In this paper, the proposal is to allow the capital requirement for Asset Risk to be deducted from the free assets before the assets enter the solvency calculations. This means the revised Accumulated Funds will be essentially equivalent to the asset values less the 99.5% VaR.

9 SAM final Position Paper 48 v4 approved by Steering Committee 5 December 2014. Accessed on www.fsb.co.za/Departments/insurance/Documents/Position%20Paper%2048%20(v%204)%20FINAL.pdf

4.1.4 The capital requirement to cover Asset Risk is required to finance any adverse events which could cause investment returns and/or asset values to be less than required. The adverse events fall into two broad categories, namely:

— Adverse events that can be derived by extrapolating the past volatility of investment returns;
— Credit concentration risk events that cannot be derived from past experience.

4.1.5 The SAM Asset Risk module is made up of six sub-modules, reflecting Interest Rate, Equity, Property, Spread & Default, Currency and Concentration Risks. These modules broadly reflect different asset classes, and each of these has its own standard calculation and techniques applied to it. In terms of the adverse events listed in ¶4.1.4 above, the first five modules of SAM correspond to the first category and the Concentration Risk module to the second.

4.1.6 Medical schemes have a much narrower range of investment options, and tend to hold a substantially higher proportion of cash investments, than most insurers, particularly life insurers and short-term insurers who write long-tailed business. The restrictions on particularly property investments and overseas investments also mean that the SAM sub-modules are unlikely to be materially relevant for medical schemes.

4.1.7 It is thus proposed that the five 'asset class' risk modules are combined into a single 'Asset Return Risk' sub-module, with appropriate correlations between the asset classes. The 99.5% VaR is then calculated using the returns on the entire asset portfolio, and the contribution of each asset class to that VaR is calculated.

4.2 Asset Return Risk

4.2.1 As outlined above, in contrast to the approach used in SAM, the approach taken in this paper is to consider the VaR using the annual returns from a standard diversified medical scheme asset portfolio. The portfolio weights have been set using the asset mix of a set of Towers Watson clients, and could be modified to the extent that the weights do not reflect the asset mix of the rest of the medical schemes industry.

4.2.2 The invested assets are defined as the current assets not invested in medical savings or cash, plus the non-current assets. The standard diversified medical scheme asset portfolio is assumed to be made up as follows:

— 35% in SA equities
— 5% in SA property
— 10% in Global bonds
— 15% in SA bonds
— 5% in SA Inflation Linked Bonds (ILBs)
— 30% in SA cash

4.2.3 From the CMS Annual Report (2014/15), the typical medical scheme has 32% of total accumulated funds which are classified on the balance sheet as 'Cash and Cash Equivalents', which presumably reflects cash holdings used to fund routine expenditure. The remainder of the assets could thus be regarded as 'invested' assets. Thus for the calculations outlined in this paper, the standard diversified medical scheme asset portfolio weights in 4.2.2 would apply to the invested assets, which would then be weighted with the cash holdings to produce an estimated asset portfolio for each scheme.

4.2.4 The returns on this standard portfolio have been simulated using the Towers Watson capital markets model. The Towers Watson model specifies the returns distribution of each individual asset class over a one-year period, as well as the dependence structure between asset classes. The VaR for Asset Return Risk has been prepared for the standard diversified medical scheme asset portfolio using 40 000 simulated returns, each over a one year period. The results are set out in Table 3 below:

Table 3 VaR for asset return risk (% of total assets)

	VaR (99.5%)
SA equities	46.55%
SA property	22.80%
SA bonds	7.55%
SA ILBs	0.00%
Global bonds	0.00%
SA cash	0.00%
Typical portfolio	18.57%

4.2.5 Global bonds show a negative correlation with the other classes, and cash and index-linked bonds very rarely experience a negative return over one year. This has generated a negative VaR figure for these asset classes, meaning that even a one-in-200 year event (at a portfolio level) generates a positive return. Any negative VaR figures are set to zero in Table 3, since SAM does not permit positive returns on some asset classes to be used to offset the impact of one-in-200 adverse events on other asset classes.

4.3 Credit Concentration Risk[10]

4.3.1 SAM considers credit concentration risks for all assets. However, since the vast majority of medical scheme assets are held in debt instruments and cash deposits, it

10 The introduction to this section draws heavily from SAM Final Position Paper 44 v4 approved by Steering Committee 30 June 2014. Accessed on www.fsb.co.za/Departments/insurance/Documents/Position%20 Paper%2048%20(v%204)%20FINAL.pdf

is expected that defaults on these instruments will provide the vast majority of the credit concentration risk. Concentration risk in SAM is assessed in terms of exposures to counterparties that exceed a given threshold. The thresholds are 3% of total assets where the credit risk is rated A or higher and 1.5% of total assets where the credit risk is rated BBB or lower.

4.3.2 SAM also prescribes the percentage of the exposures that exceed these thresholds that must be held as capital for concentration risk. These percentages are 12% for assets rated A or higher and a greater percentage derived from a sliding scale on assets rated BBB or lower. The maximum percentage is 73% for assets which are unrated or lower than CCC-rated.

4.3.3 The limited number of counterparties in South Africa, and the limit of 35% on the medical scheme exposure to any large bank, ensures that the credit concentration risk will be similar across most medical schemes.

4.3.4 The credit concentration risk for the SA cash holdings for a medical scheme is calculated as 11% of the total cash holdings using the SAM formula and assuming the following counterparties:

— 30% in a counterparty with a credit rating of A or higher;
— 20% in each of three counterparties with a credit rating of A or higher;
— 5% in a counterparty with a credit rating of A or higher; and
— 2.5% in each of two counterparties with a credit rating of BBB or lower.

4.3.5 SAM suggests combining the credit concentration risk with the asset return risks assuming that the two risks are 50% correlated. The additional concentration risk has thus been added to the VaR for asset return risk for cash investments to provide an overall VaR formula for Asset Risk.

4.4 Current Position of Registered Schemes

4.4.1 Industry information on medical scheme free assets has been used to determine the capital requirements for Asset Risk. In the absence of detailed asset breakdowns, the standard diversified medical scheme asset portfolio weights outlined in ¶4.2.3 are assumed to apply for the assets not explicitly allocated as 'Cash and Cash Equivalents' for all medical schemes.

4.4.2 The Asset Risk Reserve has been calculated for each medical scheme registered as at 31 December 2014 using information taken from the CMS Annual Report (2014/15). The Asset Risk Reserve expressed as a percentage of total assets is plotted against the average number of beneficiaries for each of the medical schemes in Figure 5. Open-membership and restricted-membership medical schemes are indicated by light and dark dots respectively. A log scale has been used for the horizontal axis.

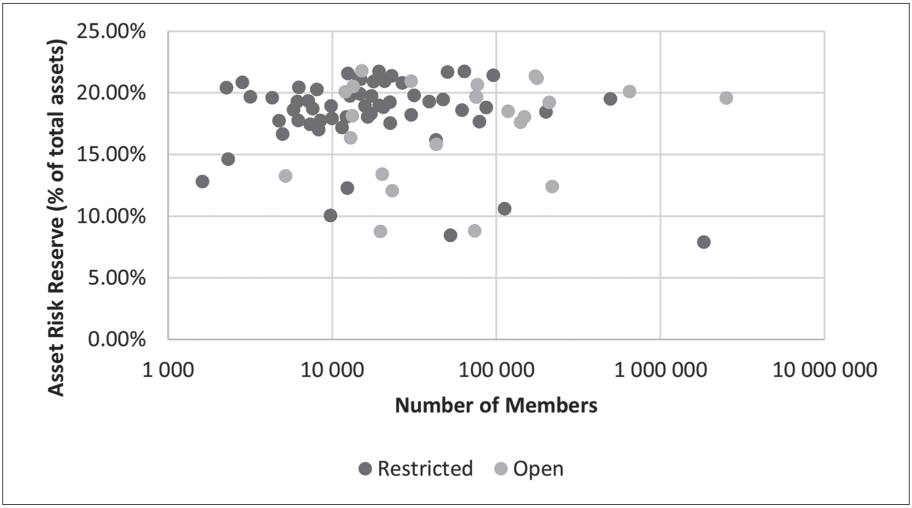

FIGURE 5 Asset risk reserve – registered schemes (% of assets)

4.4.3 It can be seen from the graph that most schemes have Asset Risk Reserves of between 15% and 25% of total assets, although some schemes with a high proportion of accumulated funds allocated as 'Cash and Cash Equivalents' on the balance sheet have smaller requirements. It is important to note that assumptions have been made about the distribution of invested assets (outside of the cash holdings shown on the balance sheet), and thus these reserves do not necessarily reflect actual asset holdings of schemes.

5. SUGGESTED APPROACH TO ECONOMIC CAPITAL REQUIREMENTS

5.1 General Principles

5.1.1 As outlined previously, the economic capital requirement will depend on the unique circumstances and longer-term strategy of each medical scheme. It will consequently need to be considered specifically by each individual scheme's management and Trustees. An internal or partial internal model will likely be necessary to assess this accurately. However, the guiding principles outlined in SAM (i.e. meeting the SCR at all times over the planning cycle) should be used to inform the setting of economic capital.

5.1.2 In spite of the limitations outlined above, this section attempts to outline a standard approach that can be used as a template to set out economic capital requirements. This will not be applicable for all medical schemes, and many schemes will choose to calculate their economic capital requirements using a full internal model which bears no reference to this approach.

5.1.3 This approach may, however, be useful to schemes in guiding thinking around economic capital. In particular, smaller schemes with limited resources and expertise may choose to adopt this framework with minor tweaks.

5.2 Liability Risk

5.2.1 In respect of Liability Risk, a similar approach as was used to calculate the one-year solvency requirements could be used for the Catastrophe Risk and the Outstanding Claims Reserve Risk. It is unlikely that changes in the environment affecting these risks could be accurately forecast and modelled, and thus the single year factors remain our best estimate of the future experience.

5.2.2 In respect of the Claims (and Expenses) Variation Risk, it is noted that although the accumulation of risks should be considered when setting economic capital requirements, it would be unreasonable to assume 100% correlation between benefit years. Consequently, any projections assuming accumulation of these types of risk will reduce the probability of occurrence below one-in-200 years, and hence become inconsistent with the SAM principles. Thus, for the standard economic capital calculation, years are assumed to be independent, but simulated over the planning period.

5.2.3 The formulaic approach used in the one-year projection is not suitable for projecting over the longer term, as accumulations of risk cannot be adequately dealt with. As a standard approach, a distribution could be fitted to the past data, and a simulation approach then used to generate the claims distributions over the planning period assuming independence across years.

5.2.4 It is acknowledged that the assumption of independence between benefit years could be inappropriate for some schemes. However, in the absence of definitive evidence at an industry level, the assumption has been made. Research performed within Towers Watson (and presented at the ASSA Healthcare CPD Day 2015) suggests that hospital claims over quarters can be considered independent once adjustments for tariff increases and seasonality are made.

5.2.5 The SAM and Solvency II approaches both use lognormal distributions as the standard for claims modelling, and based on this a lognormal distribution has been fitted to the data. Because there are too few observations to fit each scheme individually, the schemes have been combined into the following bands based on the assessed VaR over the one-year period:

— Less than 7.5% (32 schemes)
— Between 7.5% and 12.5% (29 schemes)
— Between 12.5% and 20% (17 schemes)
— Over 20% (12 schemes)

5.2.6 The 99.5% cumulative VaR is plotted for each of the risk bands outlined previously, and shown in Figure 6 below.

5.2.7 Figure 6 shows that the variability risk increases over a longer period since years are assumed to be independent and hence accumulations can occur over time.

5.2.8 The economic capital requirement considers one-in-200 year adverse events occurring over periods longer than 12 months. The capital requirement is calculated at six points over the next five years, namely at the start of the period and at the end of each of the next five years. The economic capital requirement could then be determined as the maximum capital requirement over all points in the planning period.

5.2.9 Trustee action over the planning period should be taken into account in the calculation of the economic capital requirement. For medical schemes with budgeted operating deficits, the planning period should be set as the period over which the trustees can reasonably return the scheme to a break-even operating position. For schemes with free assets below the regulatory capital requirement, the planning period should be set as the period over which the trustees can reasonably build free assets to cover the regulatory capital requirement. For all other schemes, a three-year planning period would be suggested.

5.2.10 In respect of budgeted operating deficits, a similar approach to what was set out over the one-year period could be used, with adjustments to reflect the trustees' strategy in respect of future contribution increases, as well as the replacement of year-

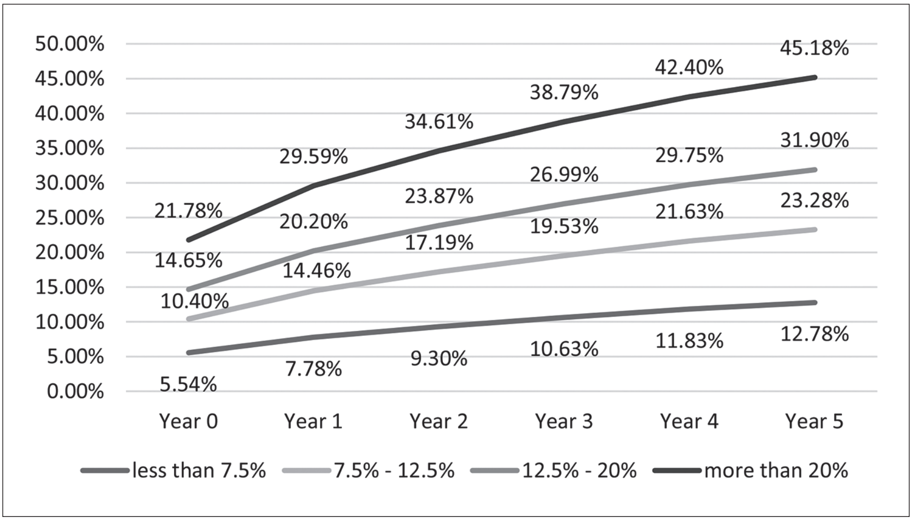

Figure 6 Plot of variability risk economic capital requirement

to-date results with period-to-date i.e. taking account of accumulated deficits from the current point, as opposed to writing off deficits at the end of each year. Consistent with the principles outlined earlier, the worst possible period-to-date result as a percentage of gross annual contributions over the planning period should be taken.

5.3 Operational Risk

5.3.1 The absence of usable data for assessing operational risk means that very little sophisticated modelling and projection work can be performed. In the absence of this, it would appear to be logical to retain the provision outlined in Section 3 for use in the standard approach to the economic capital requirements.

5.3.2 It is however noted that an ORSA in the SAM context is broader than simply economic capital requirements. Schemes would thus be required to consider the optimal way of managing operational risk. As outlined in Section 3, this is likely to be through exposure limits, system standards and the application of strict service level agreements (SLAs) with administrators and managed care organisations.

5.4 Asset Risk

5.4.1 For the economic capital requirement, the capital must cover the regulatory capital requirement calculated at all times over the planning period. The medical scheme will then require a positive return on assets in order to maintain solvency as a percentage of contributions. No discounting is allowed for in the Liability Risk component of the economic capital requirement as any investment shortfalls arising relative to the contribution increases will be reflected in the Asset Risk component.

5.4.2 The required positive annual return can be calculated as the increase in gross annual contributions for each year. Logically, if the free assets increased in line with the required return, the solvency capital, when expressed as a percentage of gross annual contributions, would not be eroded. The extent to which asset returns fall short of the increase in gross annual contributions would thus represent an erosion of the solvency capital.

5.4.3 The required return can be derived from the historical increases in gross annual contributions for the currently registered medical schemes measured over the last five years. Table 4 below sets out the distribution of required returns for the 82 registered medical schemes when expressed as a percentage above price inflation.

5.4.4 At an industry level, the median increase in contributions is in the range of CPI plus 0% to 2.5% for the last five years. The required return for the longer-term asset projections have thus been set as CPI plus 1.5%. The required return is lower than the underlying medical inflation rate due probably to the impact of members moving to more affordable benefit options offered by the medical schemes over the five years.

Table 4 Distribution of required returns

Required return as % above price inflation	Count of schemes
10% to 20%	9
5% to 10%	10
2.5% to 5%	13
0% to 2.5%	21
–2.5% to 0%	11
–5% to –2.5%	6
–10% to –5%	7
–20 to –10%	5

5.4.5 The exercise outlined in Section 4 whereby the capital requirement for Asset Risk is calculated independently of the capital requirement for Liability Risk includes a level of prudence. For the longer term projections required for the economic capital requirement, it will be important to take proper account of the correlation of the Asset and Liability Risks. SAM[11] assumes a 25% correlation between the life and non-life underwriting risks (the equivalent of the Liability Risk) and the Asset Risk. Using this correlation, a theoretical combined risk (SCR_{comb}) can be specified in terms of the Asset Risk (SCR_A) and Liability Risk (SCR_L) as follows:

$$SCR_{comb} = \sqrt{SCR_A^{\,2} + SCR_L^{\,2} + 2 * 0.25 * SCR_A * SCR_L}$$

5.4.6 Using this formula, a reduction factor can be applied to the Asset Risk in years following Year 0. This may mean a lower economic capital requirement for Asset Risk in Year 1 than Year 0 as a result of the allowance for diversification (i.e. less than 100% correlation between the Asset and Liability Risks).

5.4.7 The results are shown in Figure 7, for five portfolios reflecting increasing allocations to equities from 0% to 50% and corresponding decreasing allocations to cash.

5.4.8 The results are calculated using a reduction factor for the 'average scheme' with a Liability Risk VaR of between 12.5% and 20%.

5.4.9 The figures in the graph have been generated using the Towers Watson capital markets model over periods from one to five years, assuming that asset returns are independent across years. The one-in-200 year scenario has been calibrated

11 SAM final Position Paper 48 v4 approved by Steering Committee 5 December 2014. Accessed on www.fsb.co.za/Departments/insurance/Documents/Position%20Paper%2048%20(v%204)%20FINAL.pdf

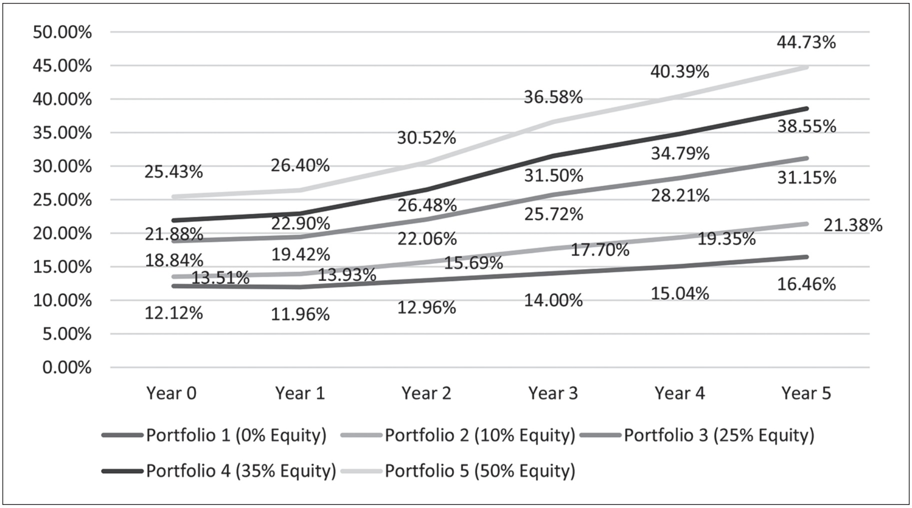

FIGURE 7 Economic capital asset risk – registered schemes

cumulatively across each of the periods and forecast to the end of the last year, and measured against the required return calibrated cumulatively up to the beginning of the last year.

6. SUMMARY

6.1 The purpose of this paper is to explore a solvency regime for South African medical schemes that is aligned to the SAM framework. Ideally the regulatory capital requirements should be determined using information currently available in the statutory reporting and not capable of manipulation. A standard formula that can be applied across all medical schemes is preferred, but the formula must be underpinned by sound actuarial principles that can be challenged and debated at an industry level.

6.2 A standard formula SCR (SCR_{Total}) for the regulatory capital requirement is proposed in this paper to cover the combined Liability and Operational Risks facing a medical scheme as follows:

$$SCR_{Total} = SCR_L + SCR_O$$

$$where\ SCR_L = \sqrt{SCR_{under}{}^2 + SCR_{cat}{}^2 + 2*0.25*SCR_{under}*SCR_{cat}} + Provision\ for\ budgeted\ deficits$$

$$SCR_{under} = \sqrt{SCR_{CV}{}^2 + SCR_{IBNR}{}^2 + 2*0.5*SCR_{CV}*SCR_{IBNR}}$$

the provision for budgeted deficits is calculated as set out in section 2.2.

$$\textit{and } SCR_0 = 3\% \textit{ of gross contributions} + 3\% \textit{ of any increase in gross contributions over } 20\%$$

6.3 Further work is required to develop tables of standard values for SCR_{CV} and SCR_{IBNR} from aggregated industry data. The standard values will vary by factors such as medical scheme size of membership, and whether membership is open or restricted.

6.4 CMS would need to determine an appropriate level for the minimum capital requirement, expressed as a percentage of the standard formula SCR, and the appropriate regulatory intervention should this level be breached by a medical scheme.

6.5 The proposed standard formula SCR does not cover the Asset Risks facing the medical scheme. These Asset Risks are rather covered by the establishment of an Asset Risk Reserve that would replace the Revaluation Reserve. The Accumulated Funds of a medical scheme that can be used to meet the regulatory capital requirement will then be calculated as the Members' Funds less the Asset Risk Reserve in terms of the proposal set out in this paper.

6.6 A standard formula is proposed below for the Asset Risk Reserve (SCR_A) in this paper. Further work is required to finalise the factors incorporated into the calculation of the SCR_A.

$$SCR_A = 0.4665 * \textit{equity holdings} + 0.2280 * \textit{property holdings} + 0.0755 * \textit{SA bond holdings} + 0.1106 * \textit{cash holdings}$$

6.7 A comparison of the current solvency levels reported by the 82 registered schemes as at 31 December 2014 to the regulatory capital requirements proposed in this paper is set out in Appendix A. Appendix B sets out details of the calculations for Liability and Operational Risk components of the regulatory capital requirements for a sample scheme.

6.8 Similar methods to those used to derive the regulatory capital requirements could form a basis for ORSA economic capital calculations as envisaged in SAM. These calculations would require that medical schemes take a longer-term approach. The guiding principle should be that a scheme should be in a position to meet the regulatory capital requirements at any point during a planning period determined according to the reserve and budgeted operating deficit position of the scheme.

6.9 The regulatory capital requirement calculations outlined in this paper are comparatively simple, and medical schemes and the regulator could perform them without incurring significant additional costs. It is, however, acknowledged that performing an ORSA is a complex calculation requiring specialist actuarial and risk management expertise. Although most medical schemes already make use of actuaries for the annual pricing review, a requirement to perform an ORSA could add a significant cost burden to schemes, especially the smaller schemes. There is then an argument to extend the standard formula approach recommended in this paper for the regulatory capital requirements to the economic capital requirements that could be adopted by the smaller schemes.

ACKNOWLEDGEMENTS

The authors would like to thank the healthcare consulting teams of Towers Watson in Johannesburg and Cape Town for their insights as well as their assistance with some of the technical work which forms part of the analyses. In addition, the investment consulting team provided support and insight around the asset components and the Towers Watson capital markets model.

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APPENDIX A

CURRENT POSITION OF REGISTERED SCHEMES

A.1 This appendix sets out the position of the 82 registered medical schemes as at 31 December 2014, both under the current solvency regime and the regime proposed in this paper. For the purposes of the appendix, the proposed regulatory capital (SCR) requirements, both including and excluding the allowance for budgeted operating deficits, has been compared with the current 25% solvency requirement as well as the current reserve position of the registered schemes. In this appendix, the Asset Risk has been excluded from the SCR, and the Revaluation Reserves have been excluded from the current solvency measure.

A.2 Table A1 below shows the number of medical schemes that meet the current 25% solvency requirement cross-tabulated with the number that meet the SCR requirements proposed in this paper, excluding the allowance for budgeted operating deficits. The table shows that most schemes meet both requirements, and only five schemes meet the SCR but not the 25% requirement.

Table A1 Comparison of solvency regimes, *excluding* budget deficits

		Meet Current 25%	
		N	Y
Meet SCR	N	2	2
	Y	5	73

A.3 Table A2 shows the number of medical schemes that meet the current 25% solvency requirement cross-tabulated with the number that meet the SCR requirements proposed in this paper, including the allowance for budgeted operating deficits. The table shows that most schemes meet both requirements, and only two schemes meet the SCR but not the 25% requirement.

Table A2 Comparison of solvency regimes, *including* budget deficits

		Meet Current 25%	
		N	Y
Meet SCR	N	5	2
	Y	2	73

A.4 The tables show that the current 25% solvency requirement is sufficient to cover the proposed SCR requirements for the vast majority of medical schemes. Figure A1 plots the current solvency of the 82 registered schemes against the proposed SCR requirements. Any schemes above the grey line meet the SCR requirement, while those above the black line meet the current 25% solvency requirement.

A.5 Figure A1 shows that many medical schemes meet both the SCR and the 25% requirements comfortably, and could arguably be said to be over-capitalised. The extent of any over-capitalisation can only be determined once a full assessment of the economic capital requirements is completed for each of the medical schemes.

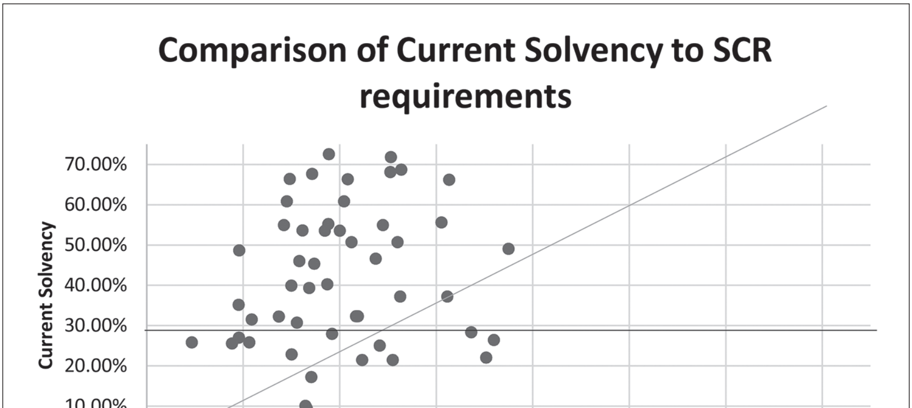

Figure A1 Solvency comparisons – registered schemes

APPENDIX B

WORKED EXAMPLE SCHEME – SIZWE MEDICAL FUND

B.1 This appendix sets out a worked calculation for the Sizwe Medical Fund, as a demonstration of how the regulatory capital (SCR) requirements proposed in this paper could be calculated. It sets out each of the components and shows how they are calculated, using Sizwe's data as an example. For comparison, Sizwe had a calculated solvency of 45.3% as at 31 December 2014, according to the CMS annual report.

B.2 Table B1 below breaks up the SCR for Sizwe into the components outlined in sections 2 and 3. It shows a total combined SCR for Sizwe of 17.35%.

Table B1 Sizwe Medical Fund – SCR breakdown

Sizwe Medical Fund – SCR Summary	
Liability Risk	14.35%
— Claims (and Expenses) Variability	14.04%
— Outstanding Claims Reserve	0.95%
— Catastrophe	0.35%
Operational Risk	3.00%
Provision for Operating Deficit	0.00%
— Operating Position	–7.10%
— Seasonality	4.67%
Total SCR	**17.35%**

B.3 The Claims (and Expenses) Variability Risk for Sizwe is 14.04%. This was calculated using the data contained in Table B2 below and the formulae from section 2.3.

Table B2 Sizwe Medical Fund – CMS report data

Year	Claims	Contributions	Claims Ratio
2009	1 417 186 000	1 574 519 000	90.01%
2010	1 651 602 935	1 792 322 950	92.15%
2011	1 806 549 377	1 989 171 638	90.82%
2012	1 928 180 000	2 141 046 000	90.06%
2013	1 839 190 000	2 233 029 000	82.36%
2014	1 746 605 141	2 186 769 493	79.87%

B.4 The table shows an average claims ratio of 87.18% over the six years, with a dramatic decline over the last two years. These numbers are then inserted into the standard deviation formula outlined in 2.3.5, producing a standard deviation of 5.21%. This is then inserted into the VaR formula in 2.3.4 producing an SCR component of 14.04% of net contributions. Since net contributions are equal to gross contributions for Sizwe, the SCR component is set at 14.04% of gross annual contributions.

B.5 To calculate the Sizwe provision for the Outstanding Claims Reserve Risk, the data in Table B3 below was used. This produced a standard deviation of 9.86% of the provision, which corresponds to a VaR, or SCR component, of 27.58% of the provision. The provision for Sizwe as at 31 December 2013 was 76 534 000, or 3.43% of gross annual contributions. Thus 27.58% of the provision translates to 0.95% of gross annual contributions.

Table B3 Sizwe Medical Fund – utilisation of provision

Year	Claims
2009	96.00%
2010	96.40%
2011	96.80%
2012	117.00%
2013	92.20%

B.6 In respect of catastrophe risk, Sizwe's share of the medical scheme market was 1.34% in 2014, and the largest concentration of members was assumed to be 2% of principal members, or 1 047 people. This combined with the figures outlined in section 2.4 produced a provision of 722 098 for the arena accident scenario and 7 539 840 for the office block accident scenario. These, when combined according to the diversification formula, produce a provision for catastrophe risk of 0.35% of contributions.

B.7 The combined liability risk SCR is thus calculated according to the formulae outlined in 2.5.2. The Claims (and Expenses) Variability Risk contributes the largest proportion of this SCR, as would be expected. The operational risk provision is 3% of gross annual contributions. Sizwe's contribution income decreased by 2.1% from 2013 to 2014, well within the 20% range.

B.8 In terms of the provision for budget deficit, Sizwe's operating position to 31 December 2014 was a surplus of 7.1% of gross contributions. The seasonality pattern is set out in Table B4 overleaf.

Table B4 Sizwe Medical Fund – seasonality

Month	Month CR	YTD CR
January	78.40%	78.40%
February	83.10%	80.75%
March	88.80%	83.43%
April	68.10%	79.60%
May	96.60%	83.00%
June	86.70%	83.62%
July	90.30%	84.57%
August	72.40%	83.05%
September	86.40%	83.42%
October	87.40%	83.82%
November	73.80%	82.91%
December	45.20%	79.77%

B.9 Table B4 above shows that the highest year-to-date claims ratio for Sizwe was 84.57% in July. This compares to the overall claims ratio of 79.9% for the year (note that this differs from the December figure above as membership and contribution income was not constant over the year). This produces a seasonality impact of 4.67% of gross annual contributions. This is lower than the budgeted operating surplus for the year, and hence no allowance for budgeted operating deficits is necessary.

B.10 Since the budget deficits allowance is zero, the 3% allowance for operational risk is added to the liability risk to produce a total SCR for Sizwe of 17.35%. The 45.3% solvency for Sizwe thus covers the SCR 2.61 times.