Solvency projections: what’s the point unless you get some value from the results?

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ABSTRACT
The SAM ORSA requires balance sheet and solvency projections. We note that the embryonic approaches that many companies (especially non-life insurers) are currently taking to do solvency/capital projections is very approximate and hence may not provide the business with suitable insights into the impact of future business developments on the business’ risk profile. This paper will briefly comment on some of the current approaches that are used in the South African market by life and non-life insurers.

The focus of the paper will be on a useful but practical model office approach to solvency/capital projections. The technique that will be described is based on life insurance model office techniques that are commonly used in Europe. This approach will be demonstrated through a case study where a UK-based life company applied this approach to analyse the key issues affecting their future solvency position and which used the tool to develop their response to mitigate the issues that were foreseen – ultimately this tool was used in deciding to merge the business with another company. The methodology will be developed and applied to the SAM ORSA requirements to demonstrate how this technique could be used to analyse future risks and extract additional value from the ORSA projections.

We will also explore whether this technique can be adapted to use for non-life companies and we will discuss the practical implications and approaches. This paper summarises the modelling methodology used and the application of the results of the modelling performed, as well as demonstrating that these techniques can potentially be used under SAM. The results are relevant to both life insurers and potentially short term insurers depending on their business models.
INTRODUCTION

Solvency Assessment and Management (“SAM”) is formalising the requirements of risk management within the South African insurance industry and the actuarial function remains a key part of these requirements. The SAM Pillar 1 solvency calculations, which cover assets, own funds, capital requirements and technical provisions, have become more complicated than the previous solvency measures. Even using the “standard” formula for capital calculations does not mean the calculation is simple to apply in practice.

SAM Pillar 2 requires firms to implement a risk management system and to perform an Own Risk and Solvency Assessment (“ORSA”). The ORSA effectively requires a firm to understand the risks it faces and the implications for its solvency – both at the current point in time and over a future planning horizon (typically three to five years). This understanding is to be based on the risk profile of the business and includes an analysis of any differences compared to the risks captured and capital required under Pillar 1.

South African firms are at various stages in developing and implementing SAM and many firms are performing dry runs of their ORSA process in the lead up to the formal submission of an ORSA report to the regulator in 2015 as part of the FSB’s comprehensive parallel run.1

One of the elements of the ORSA is the projection of solvency requirements – this can be a complex calculation that could involve nested stochastic calculations to project stressed balance sheets into the future. (See Figure 1.)

In this paper we look at the concept of a model office and the application of this concept in a SAM environment, specifically to the solvency projections required for the ORSA. Note that the work we have done for this paper focuses on the standard formula Solvency Capital Requirement (SCR) – the techniques could be extended to certain other forms of economic capital models that firms may use in practice but this is beyond the scope of this paper.

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1 Details are contained in the FSB’s 2014 SAM Update. https://www.fsb.co.za/Departments/insurance/Documents/SAM%202014%20update.pdf
WHY DO YOU NEED TO DO SOLVENCY PROJECTIONS?

Whilst solvency projections provide management with detailed information about the business, SAM requires a capital projection as part of the ORSA – this requirement is observed in the draft requirements and is clear from a number of areas:

— Position Paper 34 (v 7): Own Risk and Solvency Assessment:\(^2\) the recommendations for the ORSA requirements include:

The frequency of the assessment should be of such a nature that the assessment provides relevant information for current decision-making. (Page 17)

— The ORSA should also inform the Board as to the potential impact that this may have on the current (and likely future) solvency position of the insurer (group)

— Underlying the ORSA should be the assumption that the insurer will continue as a going concern for the foreseeable future. This assumption should be validated by the assessment.

— The insurer should assess its ability to continue in business and assess the adequacy and quality of economic capital over a longer time horizon (typically 3–5 years) than used to determine regulatory capital requirements. This time horizon should correspond with the business planning time horizon. (Page 17)

\(^2\) See https://www.fsb.co.za/Departments/insurance/Pages/assesManage1.aspx which contains a zip file with the finalised position papers including this one.
Adequacy of current and future internal (economic) capital resources given its risk appetite and tolerance levels. (Page 20)

Forward looking nature of the ORSA: Forward looking economic capital should be determined, taking into account the following:
— Overall risk management strategy
— Future cash flow position
— Business plans and new business strategies
— Changes in the external environment (such as economic, demographic and environmental changes)
— Contingency plans
— Product design and pricing

An insurer and insurance group should evaluate the results and conclusions from its forward looking capital projections and use this to inform business decisions, business strategy and the ERM framework. (Page 22)

— Position Paper 107 (v 6): Own Risk and Solvency Assessment – Further Guidance:3 elaborates on these requirements: this paper expands on position paper 37 and provides further guidance in respect of the above – for example:

— 1.40. The process of assessing overall solvency needs should enable the insurer (group) to properly identify and manage significant risks it faces or could face in the short and longer term and project its capital over the business planning period. Projections and scenario analysis should be made to consider likely changes to the risk profile and business strategy over the business planning period. Sensitivities of assumptions used should also be tested.
— 1.49. The assessment needs to cover whether the insurer (group) has sufficient financial resources or realistic plans to raise additional capital, if and when required. The assessment of financial resources should consider the business plans and be forward looking over the business planning period. In assessing the sufficiency of financial resources it has to take into account the quality and volatility of own funds and their loss absorbency capacity under various scenarios.
— 1.51. Not only should the quantitative assessment cover the insurer (group)’s own (economic) bases, but should also include an assessment of the regulatory capital and own funds over the business planning period. The purpose of this is to assess continuous compliance. The assessment of solvency should cover at least the SCR, MCR and Own Funds over the business planning period.

3 See https://www.fsb.co.za/Departments/insurance/Documents/PositionPapers/Position%20Paper%20107%20(v%206).pdf
— Guideline 9 – Forward looking perspective: The assessment of overall solvency needs should be forward looking.” The paragraphs in this section detail the forward looking nature of the ORSA and includes commentary on the period (i.e. use the business planning period – 3 to 5 years typically), the entity’s ability to remain a going concern, scenarios to be tested, capital planning and “stress tests, reverse stress-tests, as well as scenario analyses.

Capital projections will thus become an important requirement from a regulatory perspective, both for the ORSA itself and for stress testing exercises where the results of the stress tests can be analysed over future time periods. Position Paper 96 titled General Stress Testing Guidance for Insurance Companies states that scenarios should be considered that do not only take into account the initial strain, but also future developments.

However, it is crucial that the tool developed to perform these projections becomes integrated into the business planning process and into the management information that is reported – this is really useful information to help manage the business – and hence the tool should be easily accessible and quick to run.

Furthermore, a suitable solvency projection model can be used to understand risks that may emerge over time as the risk profile of the business or asset mixes change (both due to returns in future and market movements), blocks of policies mature etc., and hence allow management to plan for this in advance. It is key that the projection tool allows for these changes, as well as for the insurance cycle, business strategies, the need for capital injections and/or dividend payments etc.

An effective model will assist not only in the projection of expected and strategic scenarios, but will also assist in considering stresses and downside scenarios.

Insurance companies are complicated businesses and the capital, reserving and cashflow calculations require complex models to simply calculate the balance sheet and capital requirements at a point in time. Projecting these requirements can be a multifaceted exercise that needs to factor in how the business changes over time, for example, the impact of new business. In addition, where guarantees are valued, nested stochastic calculations may then be required.

However, a balance should be struck between acknowledging these complexities, and applying a proportionate approximation to develop a solvency projection which can be adopted and used as a management tool. It is important to acknowledge that, although the model provides additional information about the business, the limitations of the model in predicting future outcomes should be kept in mind.

EMERGING MARKET PRACTICES
South African insurance companies are developing their solvency projections as part of their ORSA dry runs. These calculations are often embryonic at this stage which reflects both the changing nature of risk management in the industry and the fact that SAM (as a regulatory driver of such developments) is not fully implemented as yet.
For example, we have observed companies that currently use:

— A simple addition of a rand based amount of capital over time. This approach is clearly very approximate and requires significant judgement for these amounts to bear any relationship to the risk a business faces over time. This approach is most suited to a business where no changes to the risk profile are envisaged and hence the overall business risks are stable over time.

— Capital that increases in total in line with some sort of high level risk driver (e.g. premiums or sum assured). This approach captures some of the change in risk profile but would only be suitable where a specific risk (or related risks) dominates all other risks faced by the business. This risk would need to be directly related to the risk driver that is used as the driver only captures changes in volume and not changes in risk (e.g. as a product approaches maturity the value of guarantees may change significantly but premiums and sums assured would not reflect this).

Both of the techniques above provide management with very little insight into the business over time beyond that already shown in the business planning process. Neither technique is very useful in activities such as stress and scenario testing. Hence, neither approach is particularly useful in the risk management nor in decision-making processes within a business.

The KPMG 2013 Technical Practices Survey4 concluded that risk driver projection techniques were commonly used by the firms that were surveyed (Figure 2).

Companies that are developing economic capital (or internal capital)5 models will often use sophisticated projection software which can also calculate the solvency projections required. Clearly this is a sophisticated approach that provides management with a significant level of detail and insight into the risks faced by the business. The economic capital model may also be used for exercises such as stress and

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4 See www.kpmg.co.uk/email/09Sep13/286049/Technical_Practices_Survey_2013/index.html; the survey covers 35 insurance companies, mainly in the UK and Europe.
5 Economic capital models are defined in this paper as firm specific capital models based on economic valuation methodologies. Internal models are defined similarly; they are built using the same methodologies and have been (or will be) approved by the regulator for use under SAM Pillar 1.
scenario testing, and would typically be used for decision-making and across the risk management process.

This is clearly one of the most sophisticated approaches to capital projections available in the global insurance industry. However, such complex models often require significant time to calibrate the assumptions, to run the models and to analyse the results and hence would only be used at specific points in time (e.g. annually as part of the firm’s assessment of their capital needs with some sort of approximation to provide more regular management information).

“Lite” capital models\(^6\) may be used to supplement the shortcomings of the economic capital model and to complement the use of economic capital models, although they themselves have some advantages and disadvantages (most notably the time it takes to calibrate such models).

It is also worth noting that lite capital models and economic capital models are often expensive to build and maintain, and hence are not necessarily suitable for many companies apart from the most complex companies for which the standard formula is not an adequate representation of the risk profile of the business.

So what can be used as an approximate methodology that is relatively easy to implement? This paper suggests the use of a “model office” approach with a methodology that uses risk drivers to project different elements of the company’s financial statements and solvency requirements.

WHAT IS A “MODEL OFFICE”?\(^7\)

A model office is exactly that! It is a model that is built to project the financial statements of the company. The model uses the relationship between the building blocks of the profit and loss statement (i.e. projections of best estimate cashflows) and the balance sheet to provide a projection of the financial statements.

Thus a model office could be extended to incorporate solvency projections and hence become a tool that could be used by a firm to approximate their capital projections whilst utilising the existing tools and information that is already available and being produced (e.g. the base balance sheet and capital requirements, as well as the cashflows used to calculate these requirements).

The tool does not require an economic capital model (but could be extended/adapted to incorporate some such models) and can be built using a spreadsheet (incorporating suitable controls).

As with all models, this tool should be used with an understanding of its limitations and recognition that this is a tool rather than perfect foresight, and that judgement is required to interpret the results and use them accordingly.

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\(^6\) A lite capital model is one that uses approximations to estimate capital requirements. These models normally use an economic capital model as the starting point and one of a number of techniques to estimate a firm’s capital requirements in response to changes in its risk profile. Examples include curve fitting and replicating portfolios.

\(^7\) Note that this is not at all the same as an “internal model” described in the SAM/Solvency II regulations.
Globally, model office tools have been used by many companies for exercises such as business planning, scenario testing etc. and their use is mainly for internal purposes.

However, as noted above, because financial statements and projected cashflows often have a direct relationship with capital requirements (due to the methodology used to calculate the capital requirements), this concept can be extended to also project the solvency position of an insurance company.

To demonstrate this, a case study follows.

CASE STUDY: COMMUNICATION WORKERS’ FRIENDLY SOCIETY
Communication Workers’ Friendly Society8 (“CWFS”) started in 1895 as a branch of the Postmen’s Federation.9 The Society sold and managed insurance products for the Royal Mail i.e. “communication workers”. These products were largely participating products.10

In early 2011, CWFS announced that it would merge with Forester Life, also a mutual financial services company. The announcement noted that “discussions between the two organisations have been taking place for some time following a proactive decision by the CWFS Board to join forces with a larger organisation in order to reduce costs and enhance member benefits.”11

In the years leading up to the merger, the actuarial function of CWFS was fully outsourced and reported to the Board of CWFS in response to its various responsibilities (solvency reporting and bonus declarations for example) as defined by the UK regulations. Essentially, CWFS had two key issues that it was trying to manage:

1. Expense overrun the expense charges (or expense loadings) levied on policyholders did not meet the full level of expenses incurred by the company. These expenses were effectively financed out of the only source of capital available: policyholder’s funds (i.e. the free surplus portion and hence future bonuses). This was recognised as a long term problem that needed to be dealt with. Short term issues such as the reduction in sales over the 2009 financial year (resulting from a tax dispute)12 served to exacerbate this issue as surrenders/terminations outstripped sales (because this resulted in fewer policies to levy charges against but a relatively fixed and inflating expense base remained).

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8 A “friendly society” is a type of mutual insurer i.e. there are no shareholders involved and the policyholders all share in any profits or losses.
9 See www.foresters.com/UK-EN/Documents/CWFS.pdf.
10 A participating or with-profit product provides the policyholder with a share of the profits generated by the product, and also provides downside risk in that the sum assured plus vested bonuses can never decrease over time. This product is particularly relevant to mutual organisations as it provides a mechanism to return profits to policyholders – there are no shareholders.
12 See www.thisismoney.co.uk/money/saving/article-1694323/Merger-looms-for-troubled-savings-group.html.
It may be argued that the simple answer was to increase the expense charges levied against policyholders to align this to total expenses and hence remove the overrun. However, this would simply disguise the mechanism by which policyholder benefits were being eroded by the expense overrun (i.e. rather than reducing free surplus and future bonuses directly, this approach would reduce individual asset shares and hence benefit payments via the bonus setting mechanism which was designed to equate individual asset shares with benefit payments). This was also against the principles of treating customers fairly, not to mention CWFS’ principles and practices of financial management (the document which explains how the Society was run).

2. Investment losses CWFS lost a significant portion of its free surplus in the turbulent equity markets and after the credit crunch in 2007/08 lost a significant portion of its free surplus (a newspaper article in mid-2010 noted that investment losses for the financial years 2008 and 2009 totalled GBP10.5m and GBP1.9m respectively13 – a large proportion of its total assets of around GBP100m). This exacerbated the impact of the expense overrun as it reduced the free surplus and hence shortened the time available to management to address the expense overrun (since it also shortened the time that it would take for the expense to be recovered).

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13 See www.thisismoney.co.uk/money/saving/article-1694323/Merger-looms-for-troubled-savings-group.html.
overrun to consume the free surplus and hence for company to become insolvent under UK regulations).

At the time, the Financial Services Authority (“FSA”) in the UK required companies to measure their solvency position on two Pillars:  
1. **Pillar 1** this consisted of two “peaks”:
   - **Regulatory peak 1** Essentially a solvency test based on a gross or net premium valuation with capital requirements derived using various percentages of different risk drivers (e.g. sum assured, premiums and expenses).
   - **Realistic peak 2** Essentially a more realistic valuation of policyholder liabilities based on asset shares (this was only required where the with-profits funds totalled more than GBP500 million and hence CWFS was not required to report on this basis).

2. **Pillar 2** used an “internal capital assessment” (“ICA”) to define the capital requirements at a 1 in 200 year confidence limit. Most companies used a modular based approach which was very similar to the form of the standard formula under the Financial Service Board’s (“FSB”) forthcoming SAM regulations. The shocks used for each module were derived by each company and reviewed by the regulator – a capital add-on was enforced by the regulator where it was felt the shocks were understated compared to the regulator’s benchmarks. In many ways, this was an internal model approach as each model was specific to, and developed by, an individual firm.

For CWFS, the outsourced actuarial function built actuarial cashflow projection models to do the calculations above (and others, such as bonus declaration investigations, as required).

However, these calculations were “as at” a point in time (i.e. as at the relevant valuation date).

Thus the CEO requested that a model office be built to help him, and the board, understand CWFS’s financial position into the future. This was particularly needed to explain the impact of the expense overrun and analyse the different options that CWFS was exploring. The model office was thus designed to incorporate a projection of:

- The balance sheet
- The profit and loss statement
- The Peak 1, Pillar 1 reserving and capital requirements
- The ICA

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14 And currently until Solvency II is implemented although twin peaks has been enacted and hence the Financial Services Authority (“FSA”) has been replaced by the Prudential Regulatory Authority (“PRA”) and the Financial Conduct Authority (“FCA”).
15 Note that these “Pillars” do not relate at all to the Solvency II / SAM Pillars but rather pre-date them and pertain to the “Solvency I” regulations in the UK.
CWFS MODEL OFFICE

The CWFS Model Office consisted of several pieces that interacted with each other to drive the output from the model (see Figure 5).

1. **Assumptions** a number of assumptions were used to supplement the cashflow projections from the actuarial models (for example, investment returns, tax etc.).

2. **Actuarial projection model** this was used to produce (for each product):
   - Best estimate cashflows (required to project the profit and loss statement)
   - Demographic measures such as the number of policies, total sum assured etc. (required to project the capital requirements)
   - The starting balance sheet (the starting point for the projections)
   - A projection of reserves and asset shares (also required in the projections)
   - And other elements required to project the inforce business into the future

3. **New business profit tests** were used with projected new business volumes to allow the model office to incorporate sales of existing policies and test the impact of additional products that were being developed by CWFS.

4. **Balance sheet and profit and loss statement**
   - The model started with the management account figures for a particular valuation date (these were updated monthly and hence used to “true up” the model office to that point in time although the projections were still based on the output from the previous valuation runs using the actuarial projection model; in this way management could use the model independently of the
actuarial function and the full set of capital calculations, including the time it took to update assumptions, capital models etc.).

— Cashflows from the actuarial projection model and the new business model (essentially profit tests combined with sales volumes as noted above) were used to project the starting profit and loss statement from the management accounts forward on a monthly basis; tax was applied in the projection as well.

— The profit or loss from the projected profit and loss statement drove the balance sheet as the profits or losses drove the assets in the balance sheet projection. Projected reserves were used in places to allow for this element of profit. Various simplifications were used for immaterial items such as current assets/liabilities.

— Pillar 1 required capital was approximated as a percentage of the projected reserves. This was a suitable approximation since reserves drove the capital requirements, but more so because Pillar 2 was the “biting” solvency measure and hence Pillar 1 was less material.

— Pillar 2 capital (i.e. ICA) was projected separately (as discussed below).

5. The ICA was projected using the latest ICA calculations (see Figure 6). These were done once per year in detail and after the financial statements were prepared. Hence the model office always needed to adjust this, even to derive

![Image of CWFS Model Office Diagram]

**Figure 5** Diagram of CWFS Model Office
the opening position of the model office in most periods. However, the beauty of this calculation is that this projection of the past to the current valuation date was done using the same methodology as the projection for future periods! The only difference is that actual amounts were used to project the past to the current date whereas modelled cashflows were used to project into the future. In summary, the ICA projection was done by:

— Firstly, the opening realistic balance sheet, and stressed balance sheets for each risk module were used directly from the latest available ICA (at t = –x).
— The opening (t = 0) realistic balance sheet was based on management accounts and so did not need to be rolled forward to the opening position.
— The base balance sheet was projected using the profit and loss statement and balance sheet projections described above.
— However, the stressed balance sheets for each risk module also needed to be rolled forward (from t = –x). This was done using different elements of the balance sheet and profit and loss statement projections. For example, equity and property risk capital depends directly on the value of these investments and hence the risk capital is projected in line with the projected value of these investments. Mortality risk for many products depends largely on the sum at risk (i.e. total sum assured less reserves held), expense risk on projected expenses etc. Each element of each stressed balance sheet was thus linked to a risk driver and projected forward.
— The methodology above provides a projection of the stressed balance sheets for each risk, from which the risk capital requirement can be calculated.
— Matrix multiplication is then used to allow for the impact of diversification across all risks and hence to derive the ICA at each point in the projection.

Overlaying this was the financial statements for each entity in the structure of CWFS, including the links to the Communication Workers’ Union and the service company that managed the Society.

Clearly there are a number of simplifications in the CWFS model office projection and these were identified as future developments of the model – in practice, the merger took place before these developments were incorporated.

The model office was a key tool that was used to explain the expense overrun and its implications to the board. Management was also able to use the model office to investigate the options open to them (for example, the impact of opening a new sales channel, white labelling, opening new distribution channels, developing new products etc.).

**MODELLING OF ICA IN MORE DETAIL**

Figures 6 and 7 show only the ICA calculation at each point in time and the overall projection and are intended to illustrate the key elements of the model. The ICA projection is also one of the most complex pieces of the solvency projection due to
Figure 6 Diagram of ICA calculation at each point in time
the diversification factors and level of detail available. The starting point is the most recent capital calculation which may be several months old. The first step is to project this to the current valuation date, and this projection uses the same risk factor-based approach as the future projections except:
— The projection to the current valuation date uses actual figures from the financial statements.
— The projections into the future use the projected best estimates of the financial statements.

The ICA projection described in Figures 6 and 7 and used for CWFS can be thought of in much the same way as the different levels of simplification allowed in the risk
margin calculation under SAM\textsuperscript{16} – a fact that means that this methodology also provides a means to calculate the risk margin (see details in “Application of technique to SAM environment: life insurance” below). The main difference is that all of the risk capital sub-modules were projected and then combined to derive the future capital projections.

However, the approach also required some additional sophistication to make it more accurate and hence to provide the level of detail required by CWFS. Levels 3 and below of the risk margin approximations were not considered suitable, and level 1 is potentially too complex and costly.

Hence a level 2 type projection was initially adopted. A level 2 simplification is described as “approximate the individual risks or sub-risks within some or all modules and sub-modules to be used for the calculation of future SCRs”. This essentially involves using different risk drivers to project the individual risks or sub-risks.

The CWFS model office takes this approach one step further, and towards the sophistication of the level 1 approach, where the key elements of the detailed stressed balance sheets for each risk are projected in line with a driver from the base balance sheet projection. This assumes that the capital requirements at each future point in time will be relative to these drivers.

The key to making this work is to select drivers that reflect the risk profile and allow for any changes over time to keep the projected capital requirements as close as possible to that derived from a full calculation.

This approach has the advantage that it uses more of the available information to do the projections and hence provides a better projection than the more simplistic approximations (the quality of which is dependent on the quality of the underlying modelling). Although the approach could be further developed to use stressed projections as well (i.e. build a model office for each stress), this is not recommended, due to the complexity of the resultant model(s). It is unlikely that this overly complicated approach would yield significant benefits.

OUTPUT OF THE MODEL OFFICE
The model office output includes the balance sheet, profit and loss statement and solvency position of the company. The output showed that the expense overrun was growing over time. This was effectively a function of the difference between the inflation of the expenses and the number of policies on the books.

The output also showed the free assets and balance sheet on the Pillar 2 (i.e. ICA) basis. The free assets reduce to become negative within four years due to the expense overrun. (See Figure 8.) The base case in the model showed that the expense overrun reduced the free surplus so that within four or five years the business was insolvent on the Pillar 2 basis. (See Figure 9.)

\textsuperscript{16} See www.fsb.co.za/Departments/insurance/Documents/SA\%20QIS3\%20Technical\%20Specifications.pdf, page 68
Figure 8 Output from the model office: comparison of expense loadings (i.e. charges levied on policyholders) to projected expenses

Expense overrun: the difference between the loadings and the expected expenses; the base case showed that this grew over time.

Figure 9 Output from the model office: projected excess assets (i.e. free assets after capital requirements)
As noted, the model office was also used to analyse several scenarios to test the options that management were considering to help manage the expense overrun. Management were aiming to increase sales of products (by developing new products or markets) and hence spread the total expenses across a wider policy base. Unfortunately, most of the options available to CWFS required a capital investment upfront which also had a direct impact on the free surplus and, in combination with the expense overrun, none of these options provided the business with a viable way of avoiding regulatory insolvency.

The model office was used to show the impact of these scenarios on the financial statements and solvency position of the company. This was done by incorporating the different scenarios into the model office. For example, the development and launch of a new product. The model office already allowed for new business and was structured to cater for the inclusion of additional products quickly (each product was modelled separately and fed into the total new business sheet). The projected sales volumes and profit tests for the new product were combined to add these cashflows into the overall CWFS model office projection. However, the model office showed that the additional sales volumes required to reduce the expense overrun were not achievable in the timeframes available.

The output from the model office was also used to show the impact of the different scenarios on the financial status of CWFS:

— In some cases the time to insolvency was extended, but not avoided.
— In some cases the time to insolvency was accelerated due to the capital expenditure required upfront.
— In some cases the company became less solvent in the short term but recovered over time as sales caught up with expense (and management actions to reduce expenses); however, the risk in these scenarios was too great to bear as the solvency margin was too low in the short term.

Ironically, CWFS’s financial circumstances meant that the mutual business model presented a catch-22 situation whereby only by spending policyholder money in the short term could the Society hope to return to a strong solvent position in the long run – clearly a risky position to be in.

All of the scenarios tested and the base case would use up the free surplus over time. This free surplus could otherwise be returned to policyholders in the form of future bonuses.

In the end, the company decided that the interests of policyholders were best served by the merger with Forester Life. The deal with Forester Life meant that the expense charges could be more closely aligned with policyholder charges and hence more of the free surplus of the Society would be returned to policyholders in the long term.
APPLICATION OF TECHNIQUE TO SAM ENVIRONMENT: LIFE INSURANCE

Clearly the model office used for CWFS was a useful tool in analysing the options available to the Society and testing different scenarios to use in management decision-making about the future of the Society. As with all models, the approach has its limitations and significant judgement was needed to interpret and understand the results.

In a SAM environment, a model office could also be built to project solvency requirements for an insurance company. We have firstly done this for a life insurance company.

Such a model is relatively easy to implement (it can be built in a spreadsheet) although this depends on the complexity of the company and the factors used in the projection. The model is easy to explain to senior management and materially correct results can be achieved if the model is developed with a sufficient level of granularity (by product, by policy group, by risk type etc.). Hence it can provide a useful tool for management decision-making and hence the ORSA.

To ensure that the model is as materially accurate as possible, it is key to select appropriate factors that can capture both volume and risk level changes.

The following example is derived from a live case where such a model office is being built for a long term insurer in South Africa. The initial prototype of this model has been built for this company and will be used in their ORSA dry run.

As illustrated in Figure 10, the key elements required from the model office are all available from the calculations required by SAM – hence the model office can be built from this foundation with a few key elements that need to be added:

![Figure 10 Diagram of SAM Pillar 1 Model Office](image-url)
1. New business projections are required and should be based on budgets and business plans which the business is likely to have produced on an annual basis.

2. Profit tests for combinations of different sales volumes and business mixes can be derived from pricing models or developed for the model office.

3. The starting point will be derived from a combination of the following which most companies will have already produced:
   - QIS 3 (or later SAM Pillar 1 calculations) for the opening balance sheet on a SAM basis.
   - QIS 3 (or later SAM Pillar 1 calculations) for the standard formula solvency capital requirements.
   - Latest Long Term returns submitted to the regulator for the current capital requirements (if needed).

4. The cashflow models used to calculate the best estimate liabilities (“BEL”) can be used to project the profit and loss statements on a best estimate basis:
   - Real world returns would need to be incorporated into the projection since the model office is to be used to understand the likely future balance sheet rather than perform a market consistent valuation of the business (per the BEL).
   - The projected balance sheet can then be derived from the projected profit and loss statement.
   - The BEL should be projected in the actuarial models and entered into the model office as an input – the change in BEL would also drive some of the profit and loss statement (this is only needed to ensure that the financial statements are consistent).
   - The risk margin should be calculated using the same methodology as proposed for the SCR projection (but using the sub-set of risks applicable to the risk margin calculation).

5. SCR projection: as far as possible, the SCR projection will be based on the formulae used at each step of the calculation (i.e. the change in basic own funds, the application of correlation matrices etc.). For the remaining elements, risk drivers will be used to project them. An example of the starting point using the standard formula SCR per QIS 3 is shown in Figure 11 – this structure will enable the projections to be aligned to the projected balance sheet and profit and loss statement.
   - The operational risk capital can be calculated using the formula provided; most elements will be projected or can be produced by the actuarial models.
   - The value of participations can be projected using an assumed return or be held constant if they are not material to the business or the business strategy.
   - Etc.
6. **MCR projection:** this is formulaic and hence can be derived from the projected SCR, balance sheet and profit and loss statement.
Care must be taken to ensure that all of the risk drivers and other elements needed for the calculations are included in the model office and the output from the actuarial models where necessary. However, the approach is quite flexible and clearly changes can be made as needed.

EXTENDING THE MODEL OFFICE TO A SHORT TERM ENVIRONMENT

The main issue in extending the model office approach to a short term environment is that traditionally short term insurers do not use cashflow models that project the same level of detail as life insurers’ cashflow models do.

In order to implement the approach outlined above, the modelling of certain cashflows for a short term insurer is needed to project the profit and loss account, and ultimately the balance sheet. The key cashflows that are needed are premium income and claim payments. In order to determine the profit and loss at each future period the technical provisions would also be needed.

In order to develop these calculations for a short term insurer, the following assumptions are needed for each type of policy:

— Premiums (could be assumed to be received upfront)
— Loss ratio for each type of policy
— The term of each policy
— The risk profile of each policy – i.e. what the expected percentage of total claims is for each month in the term of the policy
— The development pattern of the policy – i.e. how claims payments will run off

Future claim payments can then be calculated as follows. The risk profile vector and the development factor vector can be combined to produce three vectors:

— A claim payment vector
— Claims provisions vector and
— A premium provisions vector

These vectors can then be multiplied by the initial premium and loss ratio, and hence all future payments, claims and premium provisions could be calculated for a specific projection period.

This can be done for all future projection periods to produce the cumulative claim provisions and total claims payments during each period.

Once this calculation has been completed, the balance sheet and SCR calculations can be done similarly to the calculations outlined above for a life insurer. The premium and reserve risk capital requirement could be directly calculated from the technical provisions that have been calculated per the above – it is not necessary for this to be approximated at all.

The catastrophe risk component can be approximated, for example, based on the change in premium volume compared to the opening SCR and balance sheet. This would assume that the exposure to this risk is proportionate to that of the opening SCR.
This approach would be appropriate to insurers with simple policies and limited reinsurance. The approach could be developed further to allow for policies with premiums that are not received upfront and also to allow for non-proportional reinsurance structures.

It is also worth noting that the timeframes over which short term policies are active can be quite short (usually between one month and one year for many policies). Thus the inforce business will run off very quickly compared to a life insurance business and the new business projections will become a more important component of the model office.

SHORTCOMINGS AND FUTURE DEVELOPMENTS
This section provides an overview of the limitations and potential future developments – this is not an exhaustive list. The methodology described in this paper provides a general overview of the structure of the model and the techniques that can be used as building blocks for the model. It goes without saying that it will be important for any company that uses this approach in practice to develop and tailor the methodology to reflect the unique characteristics of that business. A key element that requires tailoring will be the factors used to project different elements of the balance sheet.

It is possible to develop the methodology further, for example:
— Change the risk drivers used, including using a combination of risk drivers
— Use more sophistication in some parts of the model (e.g. more sophisticated asset projections (perhaps incorporate an economic scenario generator to allow for economic conditions), build an allowance for any guarantees within products, management actions, dynamic policyholder behaviour etc.)

A key area of this methodology is the assumption implicit in the projection of the risk sub-modules – the methodology assumes that these can be projected in proportion to the best estimate profit and loss and balance sheet projections. The model effectively assumes that the relationship between the elements within the best estimate projection and the elements within the associated capital requirements remain relatively stable over time. This may not be appropriate for all companies although it is a reasonable assumption/methodology to start with.

As with all models, it is vital that the model is tested/validated to understand any limitations. The output should be used with judgement and as a tool to understand the impact and likely future capital requirements and risk profile.

The methodology is only as good as the underlying models and assumptions used. It is very important to update the base capital position frequently (at least annually, and/or in response to significant changes in the business (risk profile, products, economic environment and any factors that may affect the future financial position of the business)). The model can be built to use the most recent information available for elements of the model (i.e. it does not have to be fully updated to remain useful). For example, management accounts can be used to update the opening profit.
and loss and balance sheets; the modelled output can then be used to provide future projections as per the methodology (the projection methodology can be structured such that it produces the latest opening position based on available information and the projection thereafter).

Companies should also decide whether to use the projection factors on diversified or standalone capital and at what level to do the capital projection. The methodology in this paper suggests using the most detailed starting point (the stressed balance sheets for all risk sub-modules) but it is possible to use a less granular approach (depending on the complexity of the business).

The model could be developed further to factor in and report on the uncertainty in the projections (for example, including a “funnel of doubt” around the central projections).

Finally, it is worth noting that this is only one projection technique and that there are a number of other projection methodologies that could also be used; some may be more suitable to a particular company than others.

CONCLUSION
A model office could be used under both current South African regulations and in a SAM environment as a useful tool in both projecting solvency requirements and in stress and scenario testing.

The tool can provide management with useful insights into the business and potentially be used to identify risks which emerge over time as the business profile changes (e.g. when a particular product runs off or when asset mixes change significantly).

The tool can also be applied to short term insurance although there are a number of differences and key changes that need to be made to incorporate the technique into a particular business.

The more complex the business is, the more complex the model office would have to be. The technique is best suited to smaller companies where the number of spreadsheets can be easily controlled. For larger companies, these projections would most likely be incorporated into the software used for economic capital or internal models.

A further extension of the model is into a group environment. This was not tested for this paper but several model offices could be linked to a group model office that incorporates the SAM group capital calculations over the projection period and allows for any group issues (for example, transferability and fungibility of capital across the group).

Additional metrics, such as IFRS reporting and economic capital models could be added to the model office – as well as any other metrics used to manage the company (e.g. embedded value, new business value add etc.) – so long as the model is still viewed as a tool for management decision-making. The model office could link into the business planning process as needed and also be used in stress and scenario testing.
As with all models, the model office methodology is heavily dependent on the assumptions made and inputs used (“garbage in, garbage out”). These assumptions extend not only to the starting position but also to future periods and the assumptions underlying the projection models as well. Significant judgement and interpretation of the results is key to making use of the models. And a degree of professional scepticism is needed to ensure that the results of the model are interpreted rather than blindly reported.

To repeat, the model office should be used with an understanding of its limitations and recognising that this is a tool rather than perfect foresight: judgement is required to interpret the results.

With this in mind, this tool can be developed to provide useful information to management and be used to meet regulatory requirements – and hence enable the business to get significant value out of the results of the solvency projections.