

# Longevity Swaps on Guaranteed Annuities in South Africa

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## BACKGROUND

Conventional annuities provide an income for life, guaranteed by an insurance company or a pension fund, regardless of how long the purchaser lives. South Africa has seen an increase in the sales of conventional annuities through life insurers from ZAR 3.5 billion in 2004 to ZAR 5.3 billion in 2014. We are seeing an increase in population life expectancy across the world and developed annuity markets are having to evolve to better understand the impact of impaired lives' annuities to the remaining pool of non-underwritten lives. The South African market has undergone a similar phenomenon with many impaired lives self-selecting out of guaranteed annuities and into living annuities. Improvements in medical diagnostic techniques are rapidly adopted in certain sectors of the South African healthcare market and we have seen material gains in the access to healthcare of lower socioeconomic groups since the end of apartheid.

Insurers are having to come to grips with the recently experienced improvements in longevity and are starting to better understand the drivers of their experience and translate the statistically significant risk factors into their pricing models. At the same time, they have to grapple with producing a credible expectation of future increases in longevity. The guaranteed annuity market is price-sensitive and insurers are incentivised to offer a competitive price for annuities sold through independent intermediaries in order to compete with other insurers and to demonstrate value of conventional annuities relative to living annuities in the eyes of customers. Getting the pricing on annuities wrong can have adverse consequences for an insurer as basis changes are brought through to reflect more onerous future longevity assumptions. Annuity writers who underprice their annuities are likely to win increased volumes: the misestimation of future longevity is a good example of the so-called 'winner's curse.'

Viewed through a risk lens, the sale of a conventional annuity has the effect of transferring the investment risk and longevity risk from the purchaser to the insurer. We know that 'longevity risk' is not a single risk, but rather a collection of risks. See the Longevity Risk Taxonomy box for useful definitions of terms used with longevity risk in UK Actuarial Profession discussions on longevity.

The insurer's board of directors should have a risk appetite for longevity risk expressed through one or more risk appetite statements. They are likely to reflect, *inter alia*, a tolerance for shortfalls in earnings (an earnings at risk statement) and/or risk to the solvency position (thresholds for capital adequacy ratio). The risk appetite of the insurer may require risk mitigation techniques to be applied to reduce earnings volatility and/or to improve the capital position of the firm. Reinsurance is one of these techniques.

## QUOTA-SHARE REINSURANCE

An approach that is commonly used is traditional quota-share reinsurance, where the insurer pays a lump-sum premium to the reinsurer and in return the reinsurer pays an agreed portion of all the annuity claims.

Traditional quota-share reinsurance tends to have a dampening effect on the impact on earnings of longevity risk and investment risk: when experience is good, the upside is less pronounced and when experience is bad, the financial downside is reduced. Quota-share reinsurance can help to stabilise a company's earnings and so helps bring the company in line with the risk appetite expressed by the board.

Traditional quota-share reinsurance will also protect the insurer against the emergence of previously unrecognised patterns or future trends in longevity. Recognising a material change in the long-term trend assumption can be costly and can adversely affect the strength of the insurer's balance sheet. If severe enough, or compounded with other adverse circumstances, it could lead to a loss of confidence by stakeholders such as non-tied distributors; current and prospective policyholders; current and prospective

## Longevity Risk Taxonomy

1. **MODEL RISK:** The risk that an incorrect model has been chosen for the calibration of mortality curves.
2. **BASIS RISK:** The risk that the population chosen for model calibration differs from the population of insured lives covered by the product.
3. **TREND RISK:** The risk that changes in future mortality differ from what has been assumed, arising from causes such as new medical advances improving diagnostic or treatment protocols.
4. **VOLATILITY:** Over a short time horizon, experience may fluctuate from seasonal or environmental variations – an unusually mild winter or hot summer, or lower-than-normal deaths that are due to diseases.
5. **IDIOSYNCRATIC RISK:** Variation arising from random individual variation within a portfolio.
6. **MISESTIMATION RISK:** Uncertainty that exists over a portfolio's actual underlying mortality rates because they can only be estimated to a degree of confidence linked to the scale and richness of the data. This is commonly referred to as 'level' risk.

shareholders; or regulators and rating agencies. Quota-share reinsurance will have a dampening on the financial cost of basis changes and so protects the balance sheet and helps to bring the insurer in line with its risk appetite.

A reduced longevity risk exposure should result in a reduction in the risk-based capital requirement for a life insurer while the reinsurer will need to establish the capital for the risk that they have now taken on. The reinsurer's capital will come at a cost which will be charged to the insurer through the reinsurance premium. Reinsurance provides insurers with an effective way of reducing their capital requirements and works well for an insurer who is willing to pay the cost of capital but is unable or unwilling to allocate the capital to the annuity product line. Capital allocation challenges may arise from the limited existing resources of a firm and/or with the high costs associated with issuing small tranches of equity or debt. It is for this reason that reinsurers are viewed as sources of capital by some firms when making capital allocation decisions.

The challenge of a traditional quota-share treaty is that investment risk and longevity risk are decreased simultaneously. This may not align with the insurer's risk objectives if the insurer wishes to decrease its longevity exposure but maintain its investment risk exposure; or it may misalign with the reinsurer's risk appetite where they have an appetite for increased exposure for longevity risk but not for increased investment risk. The latter case is particularly relevant for South Africa where foreign-owned insurers may be reluctant to take on illiquid corporate debt in South Africa.

**LONGEVITY SWAP**

An alternative risk transfer mechanism is the longevity swap, which sees the insurer make a series of pre-agreed fixed payments to the reinsurer (the 'fixed leg') in return for the reinsurer making payments to the insurer based on actual longevity experience (the 'floating leg'). The payments made under each of the legs are typically netted off with only the difference transferred.

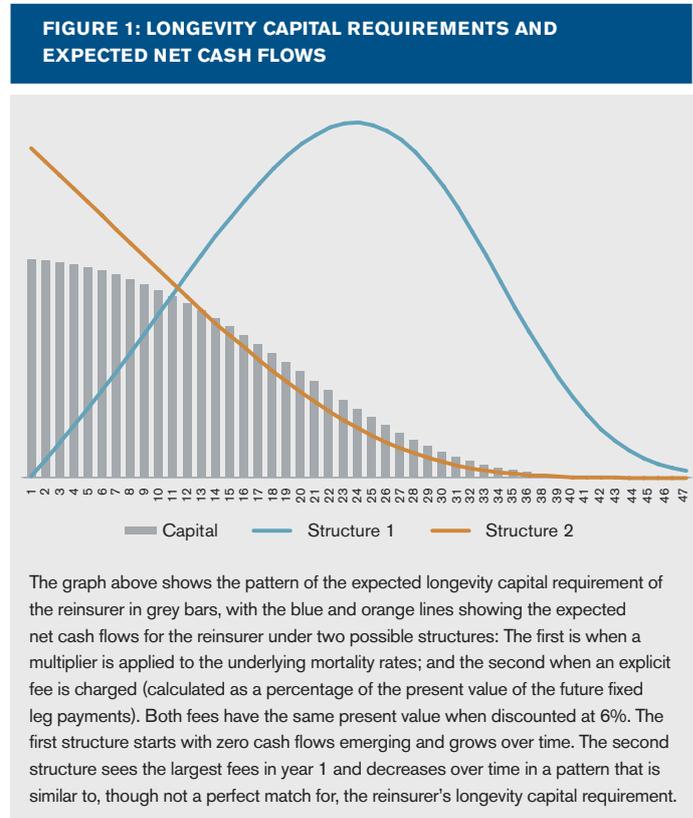
Longevity swaps come in two major classes: indemnity swaps and index-based swaps. Indemnity swaps see the floating leg payment being linked directly to the insurer's portfolio. Index-based swaps see the floating leg payments being linked to a predefined objectively calculated index, for example a specific national population metric.

The term of the longevity swap is also something that can vary, with short-term swaps being made available in the market (so called 'shortevity' swaps) with a term of around five to seven years, swaps with a term that is expected to cover the bulk of the benefits covered around 25 years, and terms that provide cover until complete runoff of the reinsured portfolio.

**FEES**

In addition to the fixed leg, the insurer will typically pay a regular fee to cover the reinsurer's expenses, profit margin, and cost of capital. The separate fixed leg and fee structure has the advantage of promoting transparency in that it allows the parties to hold a technical discussion around the expected longevity rates for the fixed leg while holding a parallel commercial discussion around the level of the fees. The resulting rates used for the longevity swap typically reflect a commonly held best estimate view of mortality, which provides a useful reference point for the actuary when setting a basis for valuation work. This same structure also allows for a

better matching of cash flows to profit recognition for the reinsurer. The alternative approach is to build the profit loading into the base longevity rates, but this results in the reinsurer receiving cash from fees at a much later date in the lifetime of the contract. See Figure 1 for further explanation.



Fees on longevity swaps are typically defined as a percentage of the present value of the future fixed leg or floating leg payments. Neither produces great certainty for the insurer who has to pay this fee because the discount rate that is used for the present value may be subject to fluctuations at the whim of investment markets. Where a simple discount rate is defined (for example interest rate swaps) it may be possible to effectively hedge the variability in the level of the fees.

Fees that are a function of the floating leg are more risk-sensitive: the reinsurer continues to get paid as long as the reinsurer has an obligation to the insurer. This aligns with the reinsurer's need to establish reserves and hold capital and so is a good match for the reinsurer's needs.

Fees that are a function of the fixed leg do not exhibit the same sensitivity to the risks of the reinsurer and introduce a potential mismatch for the reinsurer, the cost of which is likely to be passed onward through higher charges to the insurer. A fee of this nature does, however, provide more certainty about the level of fees to be paid as it does not suffer from administrative complexities of fee recalculation arising from late reporting of deaths.

When discussing fees, one of the topical issues is whether it is appropriate for the reinsurer to charge the insurer fees for payments that are in the policy's guaranteed period. The argument against inclusion is that the reinsurer is not taking any longevity risk on these payments and so there is no need for capital to be held nor

any need to be rewarded. The arguments for inclusion are practical simplicity in calculating the fees, and fees are set based on an expected new business portfolio that includes an expected mix of guarantee periods. The payments made to policyholders in the guarantee period can make up a significant proportion of the value of the liabilities and this is something that insurers should explore during fee negotiations.

### INDEX-BASED SWAPS

Index-based swaps are less common than indemnity swaps, but still have a reasonable representation in the lists of global longevity hedging transactions. The largest known index-based swap was made by the Dutch insurance, pension, and investment firm Delta Lloyd when it entered into a EUR 12 billion index-based longevity swap in August 2014. Index-based transactions suit project sponsors that do not require full reinsurance of the underlying portfolio.

The use of index-based swaps exposes the insurer to basis risk, which arises from the mismatch between the insurer's portfolio and the swap's reference population. Solvency Assessment and Management (SAM) only allows<sup>1</sup> the benefits of reinsurance to be recognised if the insurer can demonstrate that the basis risk is either not material or if the basis risk can be appropriately reflected in the Solvency Capital Requirement (SCR). Little public data exists to provide quantitative analysis to support or oppose any claims of materiality for this basis risk—especially under stress. SAM requires<sup>2</sup> that the insurer test two scenarios that identify how the shock is attributed between company-specific versus industry-wide events: 75:25 and 25:75. It is possible that the regulator may require an insurer to only recognise 25% of the change in longevity rates.

Index-based swaps do have a place in our financial ecosystem—especially in publicly traded instruments such as the Kortis Capital bonds (a 2010 USD 50 million catastrophe bond issue that pays out based on the difference in mortality improvements of U.S. males age 55 to 65 and UK males age 75 to 85). Participants in the capital markets want instrument payouts to be based on objective publicly available measures, allowing a trading desk to perform research and take a view. This is more difficult to do when access to historical data in the underlying portfolio is restricted. Index-based swaps allow for instruments to be issued that are not dependent on the size of an insurer's underlying portfolio. If we are to ever have a deep and liquid longevity market it will require universally accepted, standardised longevity metrics which are most likely to be index-based.

### INDEMNITY SWAPS

Indemnity swaps are the more common form of longevity swaps in the insurance market. The floating leg of an indemnity swap functions in the same way as the payments made by a reinsurer for a traditional quota-share treaty. The insurer enjoys full protection for the business reinsured under a wide variety of scenarios, including those used for calculation of longevity capital requirements.

One of the elements of indemnity swaps that is worth noting is that reinsurers typically do not share in noncontractual payments made to policyholders. Most actuaries will first consider the case of an ex gratia payment and accept this as being reasonable and move on. Where things can get difficult for the insurer is the case of overpayments made to customers who are no longer alive. Insurers

should check the treaty to see whether the reinsurer will follow the fortunes of the insurer or whether the insurer stands alone on such operational risks.

### COUNTERPARTY RISK AND COLLATERAL

Both quota-share treaties and longevity swaps introduce counterparty risk for the insurer: the risk that the reinsurer is unable or unwilling to make its payments. For a quota-share treaty this exposure is equal to the full value of the ceded liability; and will often be mitigated through the use of a trust account where assets are held in the name of the reinsurer but where the insurer has first call on the assets in the event of certain trigger events (such as a reinsurer not making a payment or being declared insolvent). Another common approach is for the assets to be deposited back with the insurer. Whatever the legal form, the economic substance of the arrangement is that the insurer has access to the assets in the event of default, while the reinsurer maintains the economic interest in the assets (i.e., investment returns).

The mortality swap is different in that the insurer's initial exposure to the reinsurer should be zero<sup>3</sup> on a best estimate basis. As experience develops, the value of the fixed leg and floating leg will be reassessed and the difference in value will reflect an exposure of one party to the other. Both parties will want to reduce their exposures by having the other party post collateral. The definition of the collateral calculation basis is an important part of the longevity swap treaty negotiation and if not properly defined can result in a mismatch between the values of the floating leg for solvency and collateral purposes leaving the insurer with an unwanted residual exposure. The mortality swap introduces the possibility of one party having to post collateral, which introduces liquidity issues for both if that party does not have instruments on hand that meet the minimum standards as defined in the treaty. Under the quota-share treaty, collateral was only a concern for the reinsurer, but here it is a concern for the insurer as well. The insurer's liquidity risk should be noted and managed in line with its standard risk management practices. Insurers will do well to quiz their reinsurers on their capability to post collateral under stressed scenarios and should use this information as a key part of its assessment of an allowance for counterparty risk in longevity stresses—either for stress and scenario testing in the Own Risk and Solvency Assessment (ORSA) or the calculation of the SCR.

Whether reinsuring with quota-share or longevity swaps, the insurer is relying not only on the strength of the reinsurer, but also on the strength of the legal contracts that are in place—both the reinsurance treaty and any trust/collateral arrangements that have been put in place. Insurers that rely heavily on reinsurance will want to explore the consequences of combined reinsurer defaults with failures of the legal contracts as part of their ORSAs. The consequences should help justify the costs associated with regular expert legal review of the contractual arrangements.

### SHORT-TERMED SWAPS

Short-term mortality swaps are a particularly interesting product and—if the insurer is not careful—potentially dangerous when incorrectly used. A big danger in their use relates to their values when calculating the longevity capital requirement for SAM. The longevity capital component is defined as a combined stress to the level of mortality and a stress to the future improvements of

<sup>1</sup> QIS 3 Technical Specification SCR.12.3.

<sup>2</sup> QIS3 Technical Specification SCR.7.3.7.

<sup>3</sup> Assuming that that reinsurance contract properly allows for the right to offset payments made to the reinsurer against payments that are due from the reinsurer.

mortality.<sup>4</sup> It is highly unlikely that the full impact of a longevity shock would be recognised by an insurer in a 12-month time horizon and so the short-term longevity swap would not provide adequate cover for the stress unless it is assumed that replacement cover is made available at the end of the current swap period—an assumption that is not permissible in the SAM SCR calculations.

The table in Figure 2 shows the coverage ratio provided under the SAM longevity shock by a seven-year indemnity longevity swap on selected combinations of age and escalation for the whole of a life annuity. The coverage ratio is the percentage of the change in gross liabilities that is covered by the hedging instrument; 100% indicates a perfect hedge. It can be seen that a seven-year swap can provide between half and three-quarters of the cover of a full-term indemnity swap, depending on the age and nature of the contract.

**FIGURE 2: COVERAGE RATIO OF SHORT-TERM SWAP**

Age	Male		Female		Joint Life	
	Level	5% esc	Level	5% esc	Level	5% esc
60	71%	62%	64%	55%	58%	52%
65	75%	66%	67%	59%	62%	56%
70	80%	72%	73%	65%	68%	62%

CALCULATION BASIS: Annuities have been valued annually in advance using the CSI Annuity Mortality 2001-2004 table with improvement rates of 0.5% per annum and a valuation interest rate of 6%. The short-term swap index recognises the 10% relative decrease in mortality rates and an absolute 1% increase in future mortality improvements per annum over each of the seven years of the term of the swap but no increases after that date. No allowance is made for counterparty default risk.

Short-term swaps introduce so-called ‘rollover risk’ to the insurer—the risk the insurer is unable to obtain replacement cover at the end of the swap term; or is able to obtain the cover but on substantially worse terms. Insurers using short-term swaps will want to explore the consequences of not being able to obtain replacement cover as part of their ORSAs.

### INFLATION-LINKED BENEFITS

Reinsurers will often request that the inflation risk associated with the portfolio that is being covered by a mortality swap treaty remain with the insurer. This is partly a question of risk appetite on the part of the reinsurer, which is looking to take on insurance risk not investment risk. This can be executed by defining the payments made under the fixed leg payment as being a function of an inflation index.

### ACCOUNTING FOR LONGEVITY SWAPS

The standard accounting for longevity swaps poses an interesting challenge for the reader of an insurer’s and reinsurer’s accounts: under a quota-share treaty, a lump-sum reinsurance premium is paid, and the proportion of business reinsured and the attractiveness of reinsurance can be easily assessed; while under the mortality swap the reinsurance premium is accounted for on a monthly

basis. Reinsurers driven by top-line reporting metrics may want to recognise the premiums at the inception of the contract, allowing them to show a single premium when the office recognises a new annuity contract.

This can be achieved by structuring the mortality swap so that it is treated as a quota-share reinsurance treaty (premium paid up front; floating leg payments made to the insurer) with a deposit back arrangement where the funds deposited back are repaid to the reinsurer in a series of fixed instalments (premium returned; fixed leg payments made to the reinsurer). Whatever the legal form of the contract, the economic substance should remain unchanged from what has been discussed already.

Where this restructuring approach is not followed, assessments of profitability on reinsurance contracts can be made by considering metrics supplied in supplementary reporting such as the ratio of the value of new business over the present value of future premiums.

### RECENT INTERNATIONAL TRENDS IN PENSION BUY-INS AND BUYOUTS

Pension funds trustees are in a similar situation to insurance company boards when it comes to analysing the risks they want to keep within the pension fund and the risks they want to pass on. Insurers in South Africa and abroad have used the willingness of trustees to off-load both investment and longevity liabilities as a handy source of new business. These transactions, known as buy-ins and buyouts, are typically viewed as good for the sponsoring company as it allows the management team to focus on its core business rather than concerning themselves with the vagaries and volatility of having a pension fund on the balance sheet. While the profit margins achieved by insurers is unclear, it is understood to be a lucrative line of business, with many insurers entering into the market to take on the investment and longevity risk of pensions funds.

Some pension funds, however, may be quite comfortable with holding the investment risk, but do not want to hold the longevity risk. It is in these instances that a longevity swap may be appropriate for a pension fund. The longevity swap may involve an insurer as the contracting party or it may be initiated through a cell, with a swap being put in place between the cell and reinsurer. The latter approach is seen as a way of cutting out the middleman, leading to a better deal for the pension fund. This style of deal is particularly appropriate for larger pension funds that are dealing with wholesale volumes of risk and want to transact at wholesale prices provided by reinsurers, rather than higher retail prices that are provided by direct insurance companies.

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<sup>4</sup> QIS3 Technical Specifications SCR.7.3.

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