

Nov 2015

Subject F202 — Life Insurance

Specialist Applications

Examiners Report

QUESTION 1

An established South African Life Assurance company sells a wide range of risk, savings and annuity products. The annuity book consists of conventional annuities (including fixed increases) and investment-linked annuities (Living Annuities).

One of the European directors has commented that unisex annuity rates are currently in use in Europe through a EU ruling and is interested in the implications of this ever occurring in South Africa.

- (i) Describe how the company would implement this if necessary and the implications thereof.**

This question was reasonably well answered. Candidates that performed badly seemed to miss the points about estimating a male / female split based on current business and the difficulties in using this to estimate the future split. The better candidates also generally got the points for the more strategic issues of when the change is made in general and relative to other companies in the market.

How to implement

Unisex rates are not an issue for investment-linked annuities. The mortality / longevity risk is borne by the policyholder.

For traditional annuities, the starting point would be to estimate the mix of new business.

Looking at the current mix of new business is a good starting point. Using the mix of in-force business could result in problems if there has been a change in mix over time.

A single mortality table weighted by the proportion of female and male lives at new business point could be derived, and annuity rates calculated from that.

You could also weight the existing annuity rates by the female/male ratio

The company would probably add a slight risk margin for this new assumption introduced into the pricing. This would make the annuities more expensive overall.

The date of the change would be important and the company would need to consider when they make their change. There will be a deadline date but they could potentially make the change before this.

Implications

The company would need to monitor the new business mix carefully as this is now a pricing assumption.

The company would need to be flexible enough to be able to alter its rates should this mix change suddenly.

Valuation of liabilities can still be based on gender specific mortality rates.

If this approach is followed we would expect to make a loss on policy sale for females and a profit for males.

The new business mix could change in the run-up to the change, more males buying while it is cheaper for them and females waiting until change is made.

The new business mix could change in the run up to implementation. The first company to make the change will have the cheapest “female” rates in the market and the last company to change will have the cheapest “male” rates in the market for a while.

This introduces some anti-selection.

There might be pressure to introduce unisex rates on risk products, which would lead to similar complications.

(ii) Describe how the annuity book contributes to the company’s overall Capital Adequacy Requirements (CAR) and how this contribution will change under the Solvency Assessment and Management (SAM) regime?

This question was well answered. Candidates that performed badly seemed to only know very few and only high-level points related to SAM. Some details like shocks to mortality improvements and a yield curve would have been expected to be known. Better candidates also made a call as to the level of the SCR relative to CAR.

No TCAR, so look at contribution to IOCAR/ OCAR.

The traditional annuities would contribute the following items.

- Annuitant mortality fluctuation risk – (d) in the formula
- Expense fluctuation risk – (f) in the formula. The renewal expenses in respect of annuities would be included in the total expenses used to calculate this item.

- Investment risk – (g) in the formula. Traditional annuities are likely to be backed by fixed interest investments and the contribution to total CAR will depend on how well the assets and liabilities are matched.
- Credit risk – (h) in the formula
- Operational risk – (i) in the formula.

For investment-linked annuities only the expense fluctuation risk and operational risk will contribute to the overall CAR.

Changes under SAM

The stresses in the SAM SCR calculations are more onerous than those under CAR.

The total contribution to capital is therefore likely to be higher than under CAR.

In particular, an explicit allowance needs to be made for a permanent decrease in mortality rates, and a permanent increase in the rate of future annuitant mortality improvements.

Under CAR the capital required for a portfolio of small annuities would be less than that of a portfolio of large annuities that had the same reserve (applying the (r/\sqrt{n}) formula), but this is not the case for SAM.

Under CAR, the asset mismatch position was tested by the impact of a straight 25% increase/decrease in the yield to maturity, whereas under SAM the relative changes in yields vary by term.

In addition to the Credit Default Risk that corresponds to the CAR Credit Risk, SAM has introduced Spread Risk.

Spread Risk results from the sensitivity of the value of the assets and liabilities to changes in the level, or volatility, of credit spreads over the risk-free interest rates. Credit Default Risk results from potential losses due to credit default events.

(iii) Discuss the differences in the features and risks of non-profit annuities with fixed increases and investment-linked annuities.

This question was well answered. Most candidates picked up the issues around the longevity and investment risks. Better candidates simply generated more points.

In South Africa, annuities can be compulsory (where the source of the money used to purchase the annuity is the proceeds from a pension, provident or retirement annuity fund), or voluntary.

Conventional annuities

In exchange for premium, policyholder receives an income guaranteed for life, and increasing at a pre-determined rate.

Compulsory annuities can be for a single life where payments continue while the policyholder is still alive, or joint life where payments continue while the policyholder or his/her spouse is still alive.

Annuities with fixed increases provide a degree of protection against inflation.

However, if inflation increases significantly, the purchasing power of the annuity will be eroded despite the increases.

The payments of annuitants who live longer are subsidised by those who die early.

The life insurance company underwrites the profit or loss of the annuity pool.

The mortality risk (or longevity risk) to the company is that the annuitant group lives longer than assumed on average in the pricing basis.

The longevity risk is exacerbated by the fact that the payments are higher the longer the annuitant lives.

Guaranteed increases can create significant reinvestment problems for the company.

If the liabilities are backed by ordinary fixed interest bonds, then the interest payments can exceed the annuity payments for a number of years.

Investment linked

The single premium (after deducting expenses) is invested in a unitised portfolio that increases with growth and reinvested income.

The policyholder selects an annual income or drawdown.

The maximum draw-down is 17.5% of the remaining capital in the fund at the start of the year and the minimum is 2.5%.

This maximum and minimum is legislated and subject to change, though insurers may impose their own restrictions within that range.

On death, the balance of the fund can be used to purchase a similar contract for the policyholder's dependents.

Policyholders will not 'lose' their capital on early death, as in the case of a conventional annuity.

However, policyholders are exposed to investment and longevity risk. If the drawdown rate exceeds the net investment return, the fund and therefore the annual income available can reduce significantly.

Although the insurer is not exposed to investment and longevity risks, there is a reputational risk if policyholders run out of money.

A new type of annuity product has been proposed within the company. Annuitants will purchase a guaranteed number of retirement income units, that are payable for life. The number of retirement income units is calculated and fixed at inception. The price of the units changes in line with the investment performance of the annuitant's chosen investment portfolio (after investment and management fees). On each policy anniversary, the annual amount of the annuity payable is calculated as the number of units multiplied by the unit price. A joint-life option is also offered.

(iv) Discuss the advantages and disadvantages of this product for both the policyholder and the company. (Assume a compulsory purchase annuity.)

This question was relatively poorly answered. Many candidates did not pick up that this product was a "hybrid" of the two products discussed in prior questions. The longevity and investment risks do not both lie with one party. Better candidates were able to generate points around where these risks actually resided.

For policyholder

The starting pension will be lower than that of a traditional annuity because of the discounting effect in conventional annuities.

The higher the nominal yields at time of purchase, the higher this difference will be.

If investment returns (after expenses) are higher than inflation, then the pension will increase more than inflation.

After a few years, the annual pension may exceed that of a conventional annuity with the potential for future growth.

The policyholder is protected against the longevity risk – they will not run out of money, as is the risk with the standard investment linked annuity.

On early death, they will ‘lose’ their capital.

The policyholder is exposed to investment risk.

To make the product worthwhile, the portfolio needs to produce inflation-beating returns. This means investing in assets that are expected to give a positive real rate of return. These assets such as equities tend to be riskier than the bonds that usually back a conventional annuity.

The policyholder is particularly at risk in the first few years where a negative return on assets will leave them with a lower pension than that with which they started, and that may not be sufficient to meet their needs.

Some of this risk could be mitigated by investing in a portfolio that offers guarantees, but the expense of the guarantee will reduce the net investment returns.

Compared to the investment linked annuity, the product does not offer any flexibility in choosing a level of income.

For company

The company is able to offer another retirement option and this may increase its competitive position.

However, sales of this product may be at the expense of existing annuity products (cannibalise).

Clients who are used to the investment linked annuity concept may find it difficult to understand why two people, who differ in age or gender and who invest the same amount, receive different starting pensions.

The benefit of longevity protection will only materialise after a number of years, and policyholders may place a higher value on the more immediate benefit of flexible income that is offered by the investment linked annuity.

Administration might be complicated and may incur extra expenses, e.g. systems development.

The investment strategy needs to aim for a real rate of return on assets, whilst at the same time providing for regular cash payments, which could be difficult to manage.

The company is not exposed to investment risk, compared to a conventional with-profits annuity.

Investment capital requirements (both for CAR under the FSV regime and SCR under the SAM regime) are quite onerous for products with implicit guarantees, but with no (or little) investment risk, this product is not very capital intensive.

There is, however, a degree of reputational risk if investment returns are poor in the first few years of the product and incomes decline.

The company is exposed to a longevity risk and losses will be made if policyholders live on average longer than allowed for in the pricing basis.

If investment returns are particularly good over some time, then the annual pensions will be fairly large and the cost of paying for the unexpected longevity will be much higher.

The capital requirements are higher than for the investment linked annuity, because of the longevity risk. The SAM capital requirements for this are higher than the CAR requirements.

Feedback from the marketing department is that the initial pension payable may be too low to meet the immediate needs of some retirees. An income acceleration option is proposed. In return for a higher starting number of units, an additional fee of 3% per annum is deducted from the investment performance.

(v) Describe the impact of the acceleration option on the company and policyholders as well as any other considerations that need to be taken into account.

This question was poorly answered. Many candidates struggled to make many points other than the pension being higher at the start. Few candidates made relevant points with regards to the return required at later stages to ensure that the pension grows in real terms or grows at all in some scenarios.

Because there is longevity cross-subsidisation, the starting pension will be higher than under a standard investment linked annuity with a drawdown rate of 3%

With the higher number of units the policyholder will receive a higher pension at outset.

The growth of the value of the units will reduce through the higher fee though.

The net investment return will need to be higher than 3% to get an increase in income.

For pension increases to keep pace with inflation need a net real-rate of return of 3% per annum will be required.

The investment risk is higher for the policyholder because there is a higher annual outflow from the fund.

There is a greater risk that the annuitant will end up with a smaller pension than that with which they started.

Given relatively stable positive investment returns for the first few years, the product will behave in a similar manner to a with-profit annuity with a purchase rate of 3%, but without requiring the company to back it with as much capital.

QUESTION 2

You are responsible for measuring the shareholder value being added by the new business sales for a South African life insurance company. Currently you are using traditional measures such as value of new business and new business profit margin to assess the shareholder value added to the company. The financial director of the company is concerned that these measures being used are not appropriate.

- (i) Define “new business profit margin” and describe the purpose of this measurement.**

This question was well answered.

Define: The “new business profit margin” is defined as the ratio of value of new business (VNB) to present value of new business premiums (PVNBP)

The value of new business (VNB) is

- the present value at point of sale of the after-tax cash flows of shareholders,
- which arises from new business written during the reporting period,
- less the corresponding cost of capital on the new business.

The VNB should allow for:

- all acquisition costs and
- the cash flow arising from the statutory valuation basis and
- any embedded derivatives reserves that need to be set up as per APN 110.

New business is defined as

- the business arising from the sale of new business contracts and
- one-off premium increases in respect of in-force business during the reporting period.

The VNB should be calculated considering the APN107 requirements.

The present value of new business premiums (PVNBP) is:

- the present value at point of sale of the future premiums
- from new business written during the reporting period

Purpose:

- The profit margin on new business is a monitoring tool used by the management of the company.
- It is disclosed by listed companies in their accounts in order for investors to get an understanding of the profitability of new business in the company.

(ii) Discuss the appropriateness of using the “new business profit margin” as a measure to assess the contribution to profit (for risk and savings products) as well as practical reasons why the company may be concerned with finding a better measure for new business profit contribution.

This question was very poorly answered. Few candidates picked up the issues relating to using this measure for savings business. Without picking this point up it would have been difficult to come up with reasons for finding a better measure.

Appropriateness

This is a useful measure since it shows, on average,

- how much of each premium contributes to shareholders as profit,
- after deducting operating costs, benefits paid to policyholders and a cost of the capital required to support the business.

But it can be argued that it is not an appropriate measure for all lines of business.

Risk business:

- The premium for a risk-type product (term assurance, credit life, funeral insurance etc.) can be thought of as the cost of obtaining the service, which in this case is insurance against death or disability.
- The profit margin is the share of this premium that the insurer takes as profit for providing the service.
- $VNB/PVNB$ is PV of profit over PV of revenue to the insurer, which is an appropriate measure.

Savings business:

- The premium for investment or savings business is the money contributed by a policyholder to an insurer, for the insurer to manage on the policyholder’s behalf.
- The policyholder expects the insurer to generate an investment return on the premium and return it to the policyholder at a later point.
- The “premium” is **not** the cost of the service.

- The cost of service is actually the charges or fees deducted from the investment account balance by the insurer to pay for operating expenses, cost of capital, risk benefits (if the policy also has death or disability cover, for example) and shareholder profit.
- The correct stream of revenue for the insurer is not “premium” but rather the fees and income deducted from the policyholder’s account.
- The new business profit margin as it is defined shows a very low margin because it’s **not comparing profit to revenue**, but rather profit to the money entrusted to the insurer by the policyholder.

Reasons for new measure

New business profit margins across companies, products or business units are not comparable.

The comparisons will reflect both differences in:

- actual underlying profitability
- as well as, and in far greater magnitude, differences in product types and the mix of risk vs savings products.

For example a 4% new business profit margin is either low for risk business or very high for savings business.

Using the new business profit margin confuses the required strategic and product decisions to improve shareholder value.

For example, if new business profit margin is the measure, then most insurers should stop writing investment business altogether, even though this can be a shareholder value-creating business line.

Using the new business profit margin can create distorted sales incentives.

For example, it is much easier to sell a R2,000 per month savings policy than a R2,000 per month risk policy. Disproportionately skewing incentives towards high margin risk products could end up reducing total VNB generated through smaller average policy sizes.

- (iii) Propose a more useful measure of profitability for assessing the value added by new business. This proposal should address any shortfalls of the current measures being used, specifically for savings product, and include the advantages of your proposal.**

This question was very poorly answered for the same reasons as part (ii). Without picking up the issues it would have been difficult to come up with a better measure. The question also specifically targeted (mentions) the savings product but few candidates picked this up.

A more useful and comparable measure of profitability would be New Business Margin on Revenue = the **VNB / PVFR**

where PVFR is Present Value of Future Revenue, and

where Revenue is recognised as income flowing to shareholders, which would exclude the deposit-like components of savings business “premiums”.

For **savings business** PVFR = the present value of future charges or fees deducted from both the investment account balance and premiums by the insurer to pay for operating expenses, cost of capital, risk benefits (if the policy also has death or disability cover, for example) and shareholder profit.

For risk **business** PVFR = the present value of future premiums (i.e. the cost of obtaining the service, which in this case is insurance against the risk for example death or disability)

Advantages

- It is a consistent measure across risk and savings business
- It is easy to calculate using existing systems
- It uses familiar terminology, while adding more information
- It supports relevant component analysis to better understand drivers of margins
- It drives the correct strategic, business mix and sales-target decisions

QUESTION 3

A South African life insurance company writes regular premium unit-linked endowment business. The benefit payable on death, surrender and maturity is the value of the units.

(i) A financial soundness valuation needs to be performed.

- **Describe the principles for setting a best estimate assumptions basis and set out, with reasons, a suitable best estimate basis that can be used for calculating the non-unit reserve.**
- **Describe the adjustments required to the best estimate basis to arrive at financial soundness valuation basis. (Ignore any references to discretionary margins)**

This question was well answered.

SAP 104 provides guidance.

Requirements:

A Financial Soundness Valuation of a long-term insurer's liabilities is intended to be prudently realistic:

- allowing explicitly for actual premiums that are expected to be received in terms of the contract and
- future experience that may be expected in respect of interest rates, expenses, mortality, morbidity and other relevant factors.

A minimum level of financial resilience is introduced:

- by compulsory margins added to best-estimate assumptions of all parameters.
- Further resilience and prudent release of profits is achieved by the inclusion of additional discretionary margins.

Profits should be recognised prudently over the term of each contract to avoid the premature recognition of profits that may give rise to losses in future years.

Principles

Best-estimate assumptions should be considered separately for relatively independent groups of homogeneous policies (i.e. the policies within the groups are similar, but the groups differ from each other).

Examples of appropriate groupings that could be considered include splitting business by product type, by cohort, by distribution channel or by geographic region.

The best-estimate assumptions should be realistic, generally guided by immediate past experience, and modified by any knowledge of or expectations regarding the future.

Best-estimate assumptions should depend on the nature of the business.

The Statutory Actuary, in setting the assumptions, must take cognisance of the sensitivity of valuation results to changes in the various parameters, and may need to undertake valuations on more than one basis.

Where this is done, there is no requirement to report on the result of more than one basis.

BE basis

Economic

- Ensure that the rates used are mutually consistent and consistent with market yields to maturity of fixed interest securities;
- Unit growth rate 9%-11% gross, depending on asset allocation in the unit fund
- Non-unit interest rate 6%-8% gross, reflecting returns on fixed interest assets

Expenses

- Maintenance expense of R300-R400 pa depending on results of recent unit expense analyses.
- Expense inflation of 4%-6% pa to be consistent with economic assumptions above
- Investment costs of, for example, 0.5% -1.0% of the portfolio (depending on the arrangement with the asset management company)

Tax rate (This is an endowment policy, therefore IPF tax applies)

- IPF 30% on interest and rental income, depending current assessment of the I-E tax position of the company
- IPF CGT $13.33\% = 30\% \times 33\%$
- Dividend tax = 15%

Mortality

- not core assumption, based on recent analyses
- [Award a mark for any sensible mortality table mentioned.]

- AIDS allowance using latest ASSA model or margin to basic mortality.

Withdrawals

- based on recent analyses or
- using industry experience if own experience not credible.

Adjustment to the best estimate basis:

Compulsory margins as shown below must be added to all best-estimate assumptions in order to increase reserves.

The value of any reserves calculated on a retrospective basis should be at least equal to the corresponding prospectively calculated reserves, where the prospectively calculated reserves must include allowance for the following compulsory margins.

Assumption	Compulsory Margin
Mortality	7.5% (increase for assurance, decrease for annuities)
Morbidity	10%
Medical	15%
Lapse	25% (e.g. if the best estimate is 10%, the margin is 2.5%)
Terminations for Disability Income Benefits in Payment	10%
Surrenders	10% (increase or decrease, depending on which alternative increases liabilities)
Expenses	10%
Expense inflation	10% (of estimated escalation rate)
Charge against investment return	25 basis points in the management fee or an equivalent asset-based or investment performance-based margin

Award one mark for each assumption stated with the appropriate margin, with a maximum of 8 marks.

(ii) Explain why the non-unit reserve for a typical single premium policy is likely to be zero.

This question was relatively poorly answered. Few candidates worked out why the reserve was likely to be zero. Many candidates also ignored expenses.

In the year following the payment of the single premium the charges come from the 1% AMC, thus approximately assuming a 11% gross growth rate or say 9% net of tax rate.

Assume charges levied halfway through the year, then
charges = $100\,000 * 0.01 * 1.045 = R\ 1045$

Outgo is expenses net of tax relief [$350(\text{maintenance}) + 500(0.5\% \text{Asset management})$] * 0.70
= R 595

Thus there is significant positive cashflow in year 1.

In following years the fund will probably grow faster than expenses so future cashflows will all be positive.

This means that if there is a non-unit reserve, it is likely to be negative.

This is possible as there is a surrender penalty. The surrender penalty allows a negative reserve.

However, if this is typical, then no policy is likely to have a positive non-unit reserve.

As a result no negative reserve can be held as an offset to a positive reserve.

Therefore, the non-unit reserve is likely to be zero.

Under SAM (new statutory basis) the reserving will be on best estimate basis.

This implies holding negative non-unit reserves in this case for SAM purposes as opposed to zero non-unit reserve.

END OF MARKING SCHEDULE