

**Subject F202 — Life Insurance  
Specialist Applications**

13 May 2010 (am)

**EXAMINERS REPORT**

## **Question 1**

### **i. Why is retrospective valuation method appropriate and how will an appropriate retrospective reserve be established?**

*This question was poorly answered, with most candidates failing to recognise that the reserves required were the IBNR, outstanding claims reserve and AURR (as for group life contracts). Many candidates attempted to project asset shares, which scored no marks.*

On the assumption that premiums are sufficient, the premium received for the month will be sufficient to cover claims, commission and expenses for the month.

Hence really only interested in claims incurred already (i.e. historic risk events), so IBNR and Outstanding claims reserves are a good measure.

It complies with PGN 104 but must be at least equal to an appropriate prospective reserve.

Simple to calculate.

This is a generally accepted method for this type of business in South Africa.

Will need to establish an IBNR, Outstanding claims reserve and an AURR (if required).

As the premiums are received monthly in advance no UPR will be required.

Investigate the past claims run-off over an appropriate time period to determine the IBNR (using an appropriate run-off triangle method).

Consider the following when determining the IBNR:

- Look at ultimate loss ratio and consider whether this is at a reasonable level taking into account the underlying business.
- Any large once-off experience items in the run-off that will need to be removed.
- Is there any evidence to indicate that the historic experience will not be a good guide to what will happen in the future (e.g. improvements in claim processing etc). If so, make an appropriate adjustment.

Convert the result to a percentage of premiums or a number of premiums.

Allow for appropriate compulsory margin in calculation.

For the Outstanding claims reserve, make sure the appropriate sum assured is used and hold relevant amount as required.

Depending on the accounting policies of the company, the Outstanding claims reserve may be established by the accountants. Hence need to confirm that there is no double counting and that the overall reserve established is sufficient

Make sure an appropriate level of expected claim related expenses are included in the reserves. This may be implicitly allowed for in the IBNR and Outstanding claims reserve.

If premiums can only practically be reviewed in a number of months from now and investigation highlights that current rate is insufficient, need to establish an AURR.

Based on the expected shortfall and time to review, establish an appropriate reserve to cover IBNR and OS claims.

In accordance with IFRS need to perform liability adequacy check to ensure compliance for published reserves.

**ii. How would you establish an appropriate prospective reserve and outline the experience investigations.**

*This was a simple question which was generally well answered. Even still, this question tended to distinguish the better prepared candidates from the rest.*

*It was, however, concerning that many candidates proposed using a risk discount rate to determine the prospective reserve, with some discussing how a risk discount rate might be derived.*

Need to determine the expected future cash flows from the policies, taking into account the relevant decrements, the cash flows will include: Premiums, claims, commission, expenses and investment returns.

Hence liabilities will be established using a gross premium valuation method.

Build a cash flow model that projects monthly expected cash flows allowing for all appropriate decrements (i.e. Death, permanent disability and termination of contract).

Determine the net cash flow at the end of each month and discount back to the valuation date using an appropriate valuation interest rate.

Allow for compulsory margins as per PGN 104. Also consider discretionary margins, especially consider zeroising because reserves are likely to be negative.

Net cash flow will be equal to the premiums less commission less expenses less claims plus any interest rate adjustment to allow for the timing of cash flows. E.g. premiums, commission and expenses at start of month and claims at end of month.

Need to consider the term over which prospective valuation need to be performed. Valuing as whole life policies may not be appropriate.

The actual term over which the cash flows are projected will depend on how certain the future cash flows are and the level of prudence that is required for the company.

The term should probably not exceed 5 years and will be at least 1 year.

What is very important is that the term is not varied from year to year unless there is strong evidence to change the term.

The assumptions required would be: Mortality rate, permanent disability rate, outstanding balance, termination rate of credit cards, valuation interest rate, expenses and expense inflation. Will need a number of experience investigations to determine the appropriate level of assumptions.

Mortality rate should be set with reference to historic experience and expectation of the future.

Based on the historic information determine  $qx$ 's for each age.

Fit a standard life table to lower and higher ages to find appropriate table for base mortality before allowing for AIDS deaths.

Use PGN 105 model to fit AIDS deaths to arrive at overall allowance for mortality.

A similar method can be employed for Permanent disability, but without PGN 105 reference. It may also be appropriate to relate the Permanent disability rates to the underlying mortality  $qx$ 's. Especially if there is not sufficient volumes of Permanent disability experience to allow fitting to a standard table.

Both claims and premiums will depend on the outstanding balance on the credit card at the time of death, so will need to project this.

Will need to investigate historic relationship of the outstanding balance as a proportion of the credit card limit.

Determine the trend and see if this varies by age or some other factors (e.g. credit card type).

Investigate termination rate of credit cards.

See if these vary by duration, age, type of credit card or even limit.

Valuation interest rate needs to be set with reference to expected assets backing liabilities. Expected to be mostly short term investments so use cash and money market investments, of an appropriate term, to set the rate.

Should be set consistently with current market yields.

Make an appropriate allowance for tax taking into account the tax position of the company.

Perform an expense investigation. As this is a valuation, will only be interested in recurring expenses (i.e. no initial expense allowance).

Using the historic information split the expenses into fixed, premium related, claim related and per policy.

Ensure that appropriate allowance is made for expense inflation since the investigation period.

Once-off expenses should be excluded.

Expense inflation needs to be set with reference to the interest rate and the observed historic experience.

Commission should be allowed for at the contractual rate.

### **iii. The factors that need to be consider before deciding on an appropriate valuation methodology.**

*This question was poorly answered. It was noticeable here (as in a number of questions) that a number of candidates produced solutions that were very generic. For example, some candidates would write: "Has admin been considered?" or "Admin may be affected", rather*

than: “There may be increased admin costs because ...” Such generic answers were a symptom of candidates not tailoring their answers to the specifics of the question.

Consider any specific guidance, current legislation and FSB notices that are relevant. In particular the requirements of PGN 104.

PGN 104 states that the FSV liabilities must be prudently realistic. Furthermore, the guidance requires that profits 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.

These requirements of PGN 104 needs to be considered when determining the term over which the cash flows are projected and the need for (and level of) discretionary margins.

The quality of historic data on which investigations are based. If the information is not of good quality, will not be able to perform a prospective valuation.

The credibility of the historic experience. Is the company correct in saying that the data provided is credible? If you have access to industry experience or other similar company’s experience, this will assist in deciding whether the information is credible.

Prospective reserves will probably be negative, so only to the extent that other positive liabilities exist will negative liabilities be allowed on this block of business. Cannot hold overall negative liabilities for a life company.

Level of prudence required in valuation. Retrospective will always provide positive reserve, whereas prospective will most likely be negative.

Moving from a retrospective to prospective valuation will have an impact of the emergence of profit. It will therefore have tax implications.

Need to carefully consider the exact implications of this and whether the company is aware of the impact of the change. May consider discretionary margins to ensure profit emerges appropriately.

How does the regulator feel about the approach? If you decide on the prospective valuation, may they feel that more capital (i.e. over and above the amount included due to the lapse risk) is required given the negative reserves.

Need to consider the consistency of the basis and methodology with the rest of company’s valuation basis.

How to model uncertain premiums and cover amounts? Is there enough credible historic information to allow you to project these, with a reasonable level of certainty?

What is the observed volatility based on the experience? Is this volatility too great to attach a sufficient level of certainty to the projections?

What are the additional administration requirements (if any). Does the current administration system provide all the relevant information to allow a prospective valuation method?

Will your current valuation systems be able to handle the change in valuation methodology? If any changes are required, how involved are these changes and will you have enough time

to perform all the appropriate system checks before implementing the new valuation methodology?

What will the additional resource requirements be to implement the new valuation methodology?

How does the economic cycle impact on the expected experience? If the cover is expressed as a proportion of the credit card limit, this proportion may well increase if the economy experiences a downturn.

The effect on disability of the economic cycle needs to be considered.

## **Question 2**

### **i) Advantages and disadvantages of a compulsory premium growth product:**

*This question was relatively well answered. Most candidates identified the importance of the lower initial premium, as well as the commission impacts. However, few identified the match to risk premiums and expenses of growing premiums, and fewer still mentioned the difference in lapse risk at longer durations.*

The product should be attractive to clients, as it allows the client to pay a lower initial premium for the same amount of cover.

The risk attached to this is that premiums are more likely to become unaffordable over time. (In a low inflation environment premiums may increase at a rate higher than inflation / salaries.)

The initial commission (and therefore total initial expenses) will be lower.

This will reduce new business strain and improve return on capital.

Lower commission may make it less attractive to intermediaries.

However, the company will be able to offer significant commission on premium increases.

This will reward intermediaries for “good business” with low lapses.

This alignment of interests may help improve persistency.

Premiums growing at 5% p.a. provide a better match to:

The risk premiums, which grow exponentially with increasing age.

The maintenance and claims expenses, which tend to grow with inflation.

This better match implies a different pattern of reserves and profit signature:

Level premium business is characterised by large new business strain, significant negative rand reserves immediately thereafter, with significant reserves building up over the term.

Compulsory growth business is characterised by less new business strain, less significant negative rand reserves, and a smaller reserve built up over the term.

The smaller reserves which occur at significant durations in force imply that the effect of lapse experience differing from that assumed will be less than for level premium business. For many level premium policies, it would be advantageous to the insurer for the policy to

lapse (at later durations where risk premiums and expenses exceed the office premium), as there is no surrender value payable.

Compulsory growth business is therefore less at risk of being sold in the life settlements industry.

The possibility of unaffordability as premiums increase, raises the need to properly communicate to clients (through policy documentation) the premiums they may expect to pay in future, to prevent later dissatisfaction.

Policy administration is somewhat more complex. In particular, Company A will need to consider how to deal with clients who cannot afford premium increases; e.g. annual or one-off decrease in cover. {Award mark for other reasonable example.}

A disadvantage of a lower initial premium, is that it may encourage churning. (Although this risk would already be posed by competitor products.)

Lapse and re-entry is also a greater problem at longer durations, as the difference between the office premium and a new business premium is far less than for level premium business.

There may be a greater anti-selection risk attached to compulsory growth business because of the lower initial premium.

## **(ii) Offering a standalone dread disease benefit**

*Most candidates produced reasonable solutions to this question. However, some concentrated on pricing issues that were essentially the same as under the existing benefit. This approach gained few marks, as the key pricing considerations would be those where the new benefit differed from the old.*

*Again, some candidates produced generic solutions regarding how a new product should be priced, but failed to anchor their answers in the specifics of the benefit in question.*

The pricing should consider the competitive position of the new benefit, and the expected sales that will be generated.

### Underwriting:

Underwriting changes may be required, so that the results of tests and procedures are a better reflection of the dread disease risks, rather than primarily mortality risks.

For similar policies, one with death cover and standalone dread disease, and the other with death cover and dread disease as an accelerator, the amount at risk is greater for the policy with the standalone version, and therefore the underwriting should be stricter.

This may be reflected in lower cover amount thresholds for given tests or procedures.

There may be increased anti-selection risk due to the possibility of a double claim.

Given the greater risk associated with standalone benefits, Company A may reconsider its claims conditions, as well as the maximum cease age of its dread disease benefit. {Award a mark for other sensible example. }

Claims experience:

Company A will have claims experience for both mortality and dread disease risks. However, even given a 30 day survival period clause, the existing experience may include a significant number of valid dread disease claims that were submitted as death claims. This would be as a result of beneficiaries waiting and claiming a death benefit instead. It may be difficult to estimate this effect accurately, and the company may have to rely on reinsurer data, or incorporate prudent margins in the pricing.

Similarly, the availability of standalone dread disease benefits will result in more unaccelerated death cover. It therefore becomes more important to ensure that claims assumptions are not biased (downwards) by death claims removed from claims statistics due to dread disease claims. I.e. there is a select effect involved in removing death benefits from exposure when an accelerator claim occurs.

The experience analysis for death cover may need to be split between accelerated and unaccelerated cover.

The new benefit may increase sales volumes, but it is likely to cannibalize the existing version. This will lower the credibility of experience.

This may require the company to increase its reinsurance cover, or allocate more capital.

The importance of the 30 day survival period clause is increased: There is greater potential for unhappy clients whose claims are invalidated by the rule. The company may need to tighten the wording of its clause, and should compare with competitors.

Other issues:

Administration may need to be reconsidered: specifically, how the company adjusts the office premium (or not) when a standalone benefit expires; and how commission is calculated on the benefit. (Death and dread disease accelerator benefits would usually be considered together, with whole life commission rates used.) {Award a mark for other sensible example. }

The company should include development costs in its pricing.

There may be an impact on expense experience. Previously policies will have been taken out of force on average earlier due to accelerations. There may therefore be a larger pool of policies over which to spread the expense base.

**(iii) Determining a retention limit**

*This was a challenging question and was generally not well answered. Some candidates scored well by showing that they could apply basic actuarial techniques to a practical situation.*

*Solutions needed to address the reason why the company would want such a reinsurance treaty (as this would greatly influence the retention limit required), and discuss how simple modelling could be done to arrive at an appropriate limit.*

The first step is to understand why the company wants to use such reinsurance. The primary reasons are generally: to stabilize the emergence of profit (by avoiding claims fluctuations), and/or to protect solvency.

Any assessment would need to take the following into account:

- The current maximum cover allowed on the benefit, and any expected increases during the period of reinsurance.
- The insurer may want the retention limit to be indexed, to allow for inflation / expected increases in risk appetite.
- The rates offered by reinsurers: the more expensive the rates, the more likely the company is to opt for a higher retention limit.
- Reinsurers may be prepared to give better terms if a substantial amount is retained, or require it as a precondition for doing business, as this creates an alignment of interests.
- Any limits on the amount of cover reinsurers are willing to take, either per life or in aggregate.

It is not only the reinsurance rates themselves that are important, but also the cost of administering the reinsurance arrangements. The higher the retention limit, the less the number of policies reinsured.

Company A will model expected future claims (from existing business and possibly expected future new business):

If the company's aim is profit stability:

It will probably employ a 1-year time horizon (as with a reporting cycle).

It would need to determine an appropriate tolerance level for fluctuations in its profits, and an associated level of confidence required (although various levels may be investigated).

It would then set the retention limit to the highest level that meets the above constraints (assuming that reinsurance rates are not so favourable as to improve Company A's profitability.)

It would calculate the expected cost of the reinsurance arrangements to assist management to decide on the constraints above. This cost, in simple terms, would be expected reinsurance premiums and administration costs, less reinsurance claims, adjusted for any reserving effects.

If the company's aim is to protect solvency:

It would use a longer time horizon. The time horizon, and confidence level, would probably be in line with those assumed in its required capital calculations (assuming that an internal model is used).

Company A would calculate the effect on its CAR (the mortality risk element of OCAR will be reduced, inter alia).

It would calculate capital required and therefore return on capital expected, at different retention limits.

One approach would be to calculate expected future claims stochastically: For each year of projection, each life is modelled as either having claim or not, with probability equal to the appropriate expected annual rate of claim.

The result is then a distribution of expected total claims for the benefit as a whole. The claims would be adjusted for the retention level assumed.

The company would then choose the retention limit which maximizes its return on capital, subject to the constraints on available capital.

{ Examiner comment: Other valid calculation techniques should earn similar marks. }

#### **(iv) ASISA dread disease code**

*This question was well answered, with many candidates producing interesting and convincing arguments. In general, candidates appeared to have a good understanding of the issues involved. However, many did not mention the effect that comparability would have on increasing premium competition.*

ASISA codes are publicly available, which should help allay fears of collusion.

Some of the issues pertaining to claims definitions are highly complex, requiring significant medical input to draft. Standard definitions, being less expensive to develop, therefore make it easier for small insurers to compete.

There is an enormous information asymmetry between insurers on the one hand, and intermediaries and clients on the other. Most clients would have difficulty in understanding differences in claims conditions between competitors.

There is therefore the risk of insurers offering cheaper products with materially poorer benefits, but where this is not clear to the layman.

This holds risks for client dissatisfaction when claims are rejected.

Standard definitions allow greater comparability between competitors.

This allows the competitiveness of price to be better assessed, which increases competition (through commoditization).

Combined industry efforts should produce better definitions, given a greater pool of knowledge and expertise.

As the need to gain competitive advantage from longer lists is reduced, it should lead to definitions which are a more appropriate match to client needs.

On the other hand, there is the risk that such standardization may reduce product innovation.

### **Question 3**

#### **i. How you would calculate the value of the life company.**

*This was a very straight forward question. Well prepared candidates scored very well.*

Will base the value on the appraisal value of the company, i.e. embedded value plus the value of new business as it is a growing life company and the value of new business will be a significant proportion of the overall value of the company.

Determine set of assumptions on a realistic basis.

The assumptions will include investment return, tax, mortality, expenses (and expense inflation), withdrawals, new business volumes and new business margins.

Use experience analysis provided by the firm to determine realistic values for the assumptions.

Adjust for any once-offs which may have distorted past experience or where future trends are likely to be different.

Based on the total in-force data or use what information is provided to set appropriate model points.

For the without profit business, project forward cash flows and supervisory reserves to determine surpluses arising each year.

For Unit Linked business this will involve a projection of the unit accounts and the relevant management fees expected to be charged.

Will therefore require an additional assumption on the return expected to earn on unit reserves.

Depending on the range and individual size of unit funds, may need to differentiate in the return expected on different unit funds (e.g. aggressive, balanced and conservative funds).

For with profits business, need to project future bonuses.

If the current reversionary bonus is unsupportable on realistic assumptions, could assume it is gradually reduced from its present level to that which is sustainable in the longer term.

Project forward earned asset shares and assume that terminal bonus rates are set such that payouts are equal to asset shares at maturity.

If the with profit policyholders are entitled to profits from without profit policyholders, the asset share calculation needs to allow for the contribution from the surpluses arising on

without profit business.

Also allow for the shareholder transfers in the asset share calculations.

Can then determine the cost of bonus in each future year. The shareholders share of profits is 10%.

Net down the shareholder profits for tax.

The shareholders net entitlement is then discounted to the calculation date at the risk discount rate to determine value of in-force.

The risk discount rate depends on your (and your clients) view of the risk associated with the insurance companies business.

Add the VIF to the shareholder share of the free assets.

Determine an appropriate value of the cost of holding capital from value to arrive at the EV. The cost of capital will be determined based on a projection of future capital requirements. The capital amount may be based on a percentage of liabilities. (Also give marks for other sensible suggestions using other risk measures).

Based on discussions with management and history of new business sales, determine an appropriate level of new business sales in the future.

Model the profitability of new business using cashflow projections as for the embedded value calculations.

Alternatively use a simpler method of a multiple of profit arising on last year's new business.

**ii. Describe how the value determined in i) above is expected to develop over time.**

*This question was not well answered. Many candidates did not consider the elements of the appraisal value that they had discussed in (i).*

Easier to analyse the change over time by looking at the elements making-up the appraisal value. (i.e. Free assets, VIF, cost of capital and the value of new business).

Free assets will grow with expected return on assets and the expected transfer from VIF. As liabilities are established on a best estimate basis plus margins the transfer from VIF is expected to be positive.

Furthermore it will grow with any additional capital injections made by shareholders.

The free assets will be reduced by new business strain, tax payments and dividend payments.

The VIF will increase with the unwinding of the risk discount rate and the value added by new business.

The VIF will reduce with the expected transfer to free assets.

The cost of capital will unwind with the RDR and reduce as a result of the release of expected cost of capital over time.

The cost of capital will increase with the new cost of capital added by new business.

The new business value will be updated with any changes in the new business margins, new business volumes and multiplier used at that point.

The multiplier is expected to reduce over time as the life company becomes a more established entity.

**iii. Discuss the factors that the investment bank needs to take into account when deciding on the whether or not to go ahead with the investment.**

*This question tended to separate the better candidates from the others. In general it was not well answered, especially considering the standard nature of the question.*

The return achieved by the investment bank over the 5 years will be made up of the realised profit from buying and selling the 10% shareholding, the dividends received over the period, less any tax.

The 20% return will be greater than the RDR assumed in the calculations as this will allow for new business growth as well.

The return will be affected depending on the method by which the investment will be financed.

May consider using a higher risk discount rate to determine the value of new business than that for in-force business since there are additional unknowns.

Will need to consider how easy it will be to find a buyer for the 10% shareholding at the end of the 5 year period.

In addition the price will be based on the expectation at that time of new business value still left in the company.

Hence the expected return will be very sensitive to the change in the new business multiplier between the purchase and the selling date.

A suitable multiplier will depend on the prospects for new business growth in the country, using the current distribution channels. So will need to assess the market for insurance and the company's competitors.

This will include an assessment of the overall expectations of the insurance industry and how this particular life company compares to the market average. Is this a particularly successful company?

What price they will be able to negotiate and how this relates to the appraisal value calculated using a set of best estimate assumptions.

How the risk of investing in a growing life company compares to other investments. Does the expected return compensate sufficiently for the risk taken?

The quality of the existing management and how likely they are to stay at the firm for the foreseeable future. With only a 10% shareholding the investment bank is unlikely to have major control over the management of the company.

What are the external factors, outside of management's control that may influence the value of the company? Example a downturn in the economic conditions over the 5 years may severely reduce the value of the company in five years time.

How does the projected operating profit of the company compare to the historic profits shown by the company?

Has there been any major litigation against the company around the products it sells? Is there a significant risk of potential future litigation?

How sensitive is the return to the various assumptions made. Will need to consider a number of scenario tests. These should include adjustments to the main drivers of the value of the company (e.g. new business margins, new business multiplier, the risk discount rate, mortality rates).

Whether new capital may be required to be injected into the company to continue to support the new business growth.

The market value of similar quoted companies, if available.

**iv. Give reasons why you may have used a different basis when compared to the basis used by the internal actuary preparing the embedded value report for the management of the life company.**

*Most candidates identified the primary issues, namely that there may be different views on the riskiness of the business, and that the view may be influenced by the purpose of the calculation. However, many candidates struggled to generate sufficient ideas.*

As you are acting for the buyer you are likely to have a more conservative view of expected risk experience. Hence use a different mortality basis.

The same applies to the other elements of the embedded value basis (i.e. withdrawals, expenses and investment returns).

The experience assumptions may be out of line with the market which you have adjusted for in your calculations.

Your view of the inherent risk associated with the life company may be different to that of management, hence you will use a different risk discount rate in your calculations.

You will need to allow for the tax position of your client which will be different to that used in the embedded value reporting used for the management of the life company. This will be done via a tax adjustment (based on the clients expected tax rate) to the shareholder profit stream determined in the embedded value calculations.

Your investment horizon will only be 5 years. Hence, you may decide to ignore certain risks that are only expected to materialise long into the future.

The previous embedded value report may have been prepared almost a year ago. Since then the economic circumstance (and future outlook) will have changed and hence updated for your calculations.

**END**