

May 2018

Subject F202 — Life Insurance

Specialist Applications

EXAMINERS REPORT

QUESTION 1

An insurer company writes a range of risk-only lump sum products. The product design includes stand-alone and accelerator versions of the benefits and all products have a long-term premium guarantee. An analysis of the company's critical illness claims experience has shown recent experience to be worse than that shown in industry experience studies.

- i. Discuss the possible reasons for the difference observed between the company's critical illness claims experience compared to that of the industry and whether this should be of concern to the company.**

This question was answered reasonably well by most candidates. The better candidates picked up reasons across the range of all possibilities (product, UW, claims and mix of lives). Better candidates also set out good reasons as to whether the study was a cause for concern or not. Some candidates ignored this part of the question and missed marks.

Different mix of business / lives

The company may be attracting different lives with worse experience than the rest of the industry.

- The company may have a different target market
- The company may be using different distribution channels

The company may have a higher proportion of products that have high expected incidence rates (lots of severity linked payouts, multiple claims payments etc.)

The company may be experiencing selective lapsation over time resulting in the insured pool getting unhealthier. Experience worsening relative to the industry would only occur if this was happening to a higher extent for the company.

The company may have made some special offers recently that allowed lives in on more generous UW terms, again resulting in an insured pool that is potentially unhealthier.

Underwriting and Claims

The risk of anti-selection risk is high for critical illness cover. The company may have more generous underwriting terms.

- There could be differences in UW practice, lighter or fewer questions / medicals or;
- differences in the ratings applied (lighter loadings) that could be exploited.

The company may have made UW changes recently.

Need to assess whether worse experience is on newer policies (likely an UW issue) or later durations of older policies.

There could be differences in claims handling philosophy. The company may have a more generous view on borderline claims.

Product

The company's product design could be outdated relative to the market.

As changes in disease trends, diagnostic techniques, screening and health awareness increase the product and terms should change.

There are lots of differences in products in the market. Analysis is not as straight forward as comparing death incidence.

The study may not necessarily be comparing like with like. The company may have a very comprehensive or generous product only (or selling more of these). The study may be weighted towards other products.

Other differences between products' experience being compared could include:

- Number of disease paid out may differ
- Payouts on same diseases may differ
- Definitions of diseases may differ
- Pay-outs may be linked to the severity of the disease on some products.
- The policy may pay out more than once, but likely only for unrelated claims
- There will be stand-alone or accelerator versions

Any product differences that encourage anti-selection will result in worse experience – e.g. more diseases or higher payouts.

Different rating factors used for pricing could influence lives attracted. This could encourage anti-selection.

The Industry Study

Higher experience in terms of incidence is not necessarily a concern. The company may have anticipated the worse experience than industry averages and be charging appropriate rates. e.g. targeting a niche or new market or a very generous product.

It is stated that that the recent experience is worse. How recent and how long is this? It could just be claims volatility. Was the experience prior to this in-line or better?

Is the experience on a numbers or amounts basis (claims numbers and lives exposure or claim payouts and sum assured exposure).

- If it is on a numbers basis it implies the company has a higher claims rate than industry average. The claims cost may not be higher though,
- If it is amounts then the claims cost is higher. it could be that the company is experiencing volatility or is experiencing worse experience on its higher covers. This again could point to anti-selection.

Check the industry data and methodology used for the study.

- Is the most recent experience influenced by IBNR estimates or actual experience? If IBNR is included this could be quite different on a per company basis.
- How were outstanding claims awaiting assessment handled?

Check that the study is representative of the industry, are all competitors included?

ii. Explain why a long-term guarantee on the critical illness product may be an undesirable feature from the company's point of view.

This question was not answered as well as anticipated. Most candidates covered the points regarding the extra risk taken on by the company. Not many candidates made the points relating to critical illness experience being more difficult to predict than other products in general. Poorer candidates also missed the points related to the increased costs / premiums, impact on solvency and reserves / profit release.

The company must make prudent assumptions about its future claims experience as it cannot adjust future premiums to allow for worse than expected or worsening experience.

This is a particular problem with critical illness rates, as past experience is not necessarily as good an indicator of future experience.

An increase in the incidence of notified diseases could result from

- General worsening health or lifestyle trends;
- Improved or more efficient methods of diagnosis;
- Medical advances that allow much earlier detection;

- Increased screening for diseases through health incentive programmes or government programmes;
- Increased health awareness will result in more people being aware of potential diseases.

Future health and lifestyle trends can be modeled and there are data and methodologies in the actuarial, demographic and health sciences fields.

It is much more difficult to attempt to predict medical / technological advancements or their potential impact on the number or stage or reported diseases.

The guarantee will also require prudence for other assumptions. (expenses, particularly claims expense, interest rate, lapses)

The prudent assumptions may lead to higher premium rates which may be uncompetitive.

The prudent assumptions will lead to higher reserves which will impact the release of profit over time.

The guarantee will need to be modelled under SAM and will result in an increase to the capital required to support the product.

The extent to which a charge can be included in the premium for the cost of capital will determine the extent to which the feature influences the product's ultimate return on capital.

The guarantee may be expensive and consumers may not value the benefit of the guarantee relative to its cost.

It has been found that 85% of the claims cost comes from the top four diseases in terms of incidence. It has been suggested that a simplified product be developed by the company that covers only these four diseases.

- iii. **Discuss the factors that should be considered in assessing this suggestion as well as the pricing assumptions that would be required should the development go ahead.**

This question was reasonably answered. Better candidates covered the points relating to the market need for the product as well as the potential impacts on the company of launching the product. Surprisingly few candidates made the points relating to the existing product as a source of experience for pricing the new product and how other pricing assumptions should differ between the two (e.g. profit margins and expenses).

General Factors

Need to consider the customer need for the product as well as the marketability of the product.

- Given that it covers the most important / common diseases implies that it meets a similar need but;
- Compared to more comprehensive products this product will only pay out on 4 diseases compared to many on the other products and at a cost that is likely to only be 15% lower.

Sales success will depend on how customers value or perceive this pricing differential with the many diseases that are now not covered.

Brokers / agents may resist selling this product due to the fact that it does not provide as comprehensive cover to their clients.

Are there competitors that offer this version of the product and if so how are their products doing in the market.

Would the product pay out on various severities of these diseases, and if so at what levels?

Given that the product is an extension of an existing product, development costs should be relatively low.

Any development costs (e.g. changing systems, literature, etc.) would need to be recouped from the extra profits arising.

Future business volumes would need to be estimated.

Would need to consider the degree to which volumes of the new product would cannibalise existing products.

The aim is to maximize profits over all disease products.

This can only be done if the new product has a higher profit margin or the new product results in higher total sales volumes.

Possibly easier (more attractive to client) underwriting as detailed questions need not be asked about pre-existing conditions other than the big 4, and questions will generally be simpler.

Pricing Assumptions

Claims inception rates would be required and would be lower overall.

Company could use its existing experience to price these 4 diseases assuming that the other product features and definitions remain the same.

The profit target or risk discount rate may be lower than for the existing product.

This may be as a result of

- the lower risk associated with less diseases offered
- improved claims certainty (predictability)
- lower anti-selection risk (selection on all other diseases removed)

There would be a lower claims expense assumption as there are fewer claims and only 4 diseases need to be assessed, rather than the skills required for the assessment of many different diseases.

Could also be a potentially lower UW expense assumption. UW now only for the major 4 diseases and not an extensive list. UW likely to be geared towards these 4 diseases anyway.

The lapse assumption would probably be similar to the existing critical illness products.

Other assumptions expected to remain unchanged. (Non-claim expenses, inflation, tax, investment returns).

The company's internal experience analysis for life and critical illness experience can be broken down into three categories:

- **Life cover experience (with no benefits attached)**
- **Life cover with a critical illness accelerator benefit**
- **Stand-alone critical illness cover**

The experience analysis shows that the experience for the stand-alone critical illness cover is worse than expected, the experience for the life cover with no benefits attached to it is as expected and the experience for the combination of life cover with a critical illness accelerator is running better than expected.

(The analysis is based on expected incidence rates.)

iv. Describe how this scenario could arise.

This question was poorly answered. Only the better candidates picked up on the mechanics of the pricing of an accelerator benefit and as such how these scenarios could arise without simply assuming “different pools of lives”. Better candidates also gave reasonable suggestions for why experience may differ between the two versions of the critical illness cover.

The expected incidence rates for the stand-alone life cover and stand-alone critical illness cover would be the best estimate expectation of the claims rate for both products.

The number of expected critical illness claims should not differ in theory between the stand-alone and accelerator versions of the product.

Whether or not there is life cover to be accelerated, a disease covered by the critical illness benefit would trigger a claim on both versions of the product.

The expected number of death claims would however be different if it had an accelerator benefit attached to it or not.

- As such, a downward adjustment would be made to the expected death rates where an accelerator benefit is attached to it.
- This would be an estimate of the number of deaths that would not result in claims due to a critical illness claim occurring prior to the death.

The life cover (without accelerator benefits attached) experience is running as expected which implies the estimate of the number of deaths is reasonable.

The stand-alone critical illness cover experience is running worse than expected. This implies that the incidence estimate is too low.

The fact the combination of the life cover and critical illness accelerator is running better than expected could imply the following scenarios.

- The expected critical illness incidence rate could be too high and we are seeing different claims behavior on the stand-alone critical illness book.
 - o policyholders who want to anti-select based on disease knowledge would more than likely buy a stand-alone critical illness policy.
 - o This would result in the two pools having different sets of experience where we would not expect this to be the case if there was no selection (or the selection was the same).
 - o One product may be running worse than the expectation and the other better than the same expectation. i.e. the expected incidence rate is between the two sets of experience rates.

- If the critical illness experience is worse than expected on both versions of the product and we know the expected death rates are reasonable, it could be that the deduction that is made to the death rates when an accelerator is added is too low.
 - This implies that more potential death claims are being accelerated than expected leading to a bigger reduction in claims cost than anticipated.

If the data is available, a more in-depth analysis should be considered looking at the critical incidence rates for both versions of the product as well as breaking the death experience into two - the experience where no accelerator is attached vs. the experience where an accelerator is attached.

QUESTION 2

i. Outline the calculation of actuarial liabilities under Solvency Assessment and Management (SAM) valuation methodology.

Question 2 was answered well overall. Passing candidates demonstrated a sound understanding of the underlying SAM principles as far as technical provisions are concerned and also demonstrated a good working knowledge of basic SCR calculations and their underlying constructions.

Actuarial liabilities are also referred to as technical provisions.

They are calculated using market consistent principles.

They consist of best-estimate liabilities and a risk margin on non-hedgeable risks.

Best estimate liabilities should be calculated gross of reinsurance.

Reinsurance recoverables should be reflected explicitly as an asset in the balance sheet.

The best estimate liability is determined as

- the discounted value of projected best estimate cash flows
- calculated on a policy by policy basis
- up to the contract boundary

The best estimate liability can be negative.

The assumptions underlying the best estimate liability should be best-estimate with no additional margins for prudence.

The best estimate liabilities can allow for future management actions (such as reviewing premiums or charges).

- that the insurer could reasonably be expected to implement.
- and which allow appropriately for expected policy behaviour.

Financial guarantees and options may need to be valued using an appropriate market consistent method such as a stochastic valuation.

The risk-free discount rate used in the calculation of the liabilities should in general be the government bond curve.

Where an insurer matches the liability with swap-based assets, the insurer can apply to use a swap curve to value those liabilities.

For some classes of business, an illiquidity premium can be added to the discount rate (subject to regulatory approval) to allow for the fact that investors are able to earn a higher return by holding the underlying instruments to maturity.

The risk margin is calculated as 6% of the projected non-hedgeable SCR at each future year-end, discounted using risk-free rates of return.

Approximate methods can be used to project the non-hedgeable SCR, subject to proportionality and materiality.

In calculating the risk margin, allowance can be made for diversification benefits between different lines of business.

An African proprietary insurance company operates under a simplified SAM regulatory regime. All the company's assets are listed instruments and include an investment in the company's own shares, and are valued at market value. Under the simplified SAM regulations, there are three stress scenarios in the standardised formula for the Solvency Capital Requirement (SCR). The results of the base valuation and the stress scenario are summarised in the table below:

	Base	Scenario 1	Scenario 2	Scenario 3
Total value of assets	380 000	380 000	350 000	270 000
Best estimate liability	250 000	270 000	235 000	180 000
Risk Margin	30 000	30 000	30 000	30 000
Other liabilities	10 000	10 000	9 000	8 000
Value of own shares	10 000	10 000	10 000	8 000

Scenario 1 is not correlated to Scenario 2 or Scenario 3, and there is a 25% correlation between Scenario 2 & Scenario 3, as summarised in the specified correlation matrix below.

	Scenario 1	Scenario 2	Scenario 3
Scenario 1	100%		
Scenario 2	0%	100%	
Scenario 3	0%	25%	100%

The basic SCR is the result of applying this matrix to the scenario stresses. The Operational risk has been calculated separately as 4 000.

ii. Calculate the “Own Funds”

“Own Funds” = Excess of assets over liabilities less regulatory adjustments

Regulatory adjustments in this case is a deduction for the holdings in the company’s own shares

$$\text{Own Funds} = 380\,000 - (250\,000 + 30\,000 + 10\,000) - 10\,000 = 80\,000$$

iii. Describing your steps, calculate the SCR and SCR cover.

First calculate the Own Funds for each scenario

$$\text{Scenario 1 Own Funds} = 60\,000$$

$$\text{Scenario 2 Own Funds} = 66\,000$$

$$\text{Scenario 3 Own Funds} = 44\,000$$

Next calculate the SCR component for each Scenario, which is the difference between the Base Own Funds and the Scenario’s Own Funds

$$\text{SCR}(1) = 20\,000, \text{SCR}(2) = 14\,000, \text{SCR}(3) = 36\,000$$

The Basic SCR (BSCR) is calculated by multiplying the SCR components by the correlation matrix, summing and taking the square root.

$$\text{Formula: } [\text{SCR}(1)^2 + \text{SCR}(2)^2 + \text{SCR}(3)^2 + [0.25 * [\text{SCR}(2) * \text{SCR}(3)]]]^{(1/2)}$$

(Note: Candidates who get the sum right should score higher than those who don’t, but credit should be given to those who try a correlation calc.)

$$[20000^2 + 14000^2 + 36000^2 + 0.25 * 14000 * 36000]^{(1/2)} = 44\,922 = \text{BSCR}$$

The SCR = BSCR + Operation Risk + Participations + Adjustments

In this case Participations and Adjustments are 0.

$$\text{So SCR} = 44\,922 + 4\,000 = 48\,922 \text{ (credit for using BSCR calculated above)}$$

$$\text{SCR cover} = \text{Own Funds} / \text{SCR}$$

$$= 80\,000 / 48\,922 = 1.64 \text{ (make allowance for rounding differences)}$$

QUESTION 3

An insurance company has written credit life insurance on a book of loans for the past five years. The credit life insurance provides protection on death, permanent and temporary disability and job loss.

The life cover and permanent disability cover provide for a lump sum equal to the outstanding balance on the insured's loan amount in the event of death or permanent disability.

The temporary disability cover and job loss cover provide for a monthly benefit equal to the loan instalments on the insured's loan for up to 12 months (or end of loan term if sooner).

The premiums are set to realise a profit margin. The insurance cover terminates with the termination of the loan facility.

The company has used a retrospective valuation method to establish reserves for the credit life business as there has not been enough experience data to perform a prospective valuation. It is now believed that enough experience data has been collected in order to consider a prospective valuation.

Describe how you would establish an appropriate prospective reserve and outline the experience investigations you would perform to set the valuation assumptions.

This question was answered well. The question covered two broad topics and better candidates provided a better demonstration of their depth of knowledge and understanding of the topics examined. In general it appeared that candidates scored higher on the experience investigation part of the question. Some candidates covered SAM in their answer which was accepted.

Establishing a prospective reserve

Liabilities will be set using a gross premium valuation (discounted cash flow) method.

Future cash flows from the policies will need to be determined.

These would include premium, claim, commission, expense and investment return cash flows as well as reinsurance if the business is reinsured.

Cash flows would need to take all decrements into account - death, disability, job loss and end of loan.

A cash flow model that projects monthly expected cash flows would be built.

The net cash flow at the end of each month would be modelled and discounted back to the valuation date using an appropriate valuation interest rate.

Net cash flow will be equal to the premiums less commission less expenses less claims plus investment income and an 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.

Would need to allow for compulsory margins as per SAP 104 on decrement and other assumptions.

Also need to consider any discretionary margins.

This may be related to the quality and credibility of the experience data used to perform the experience investigations.

Discretionary margins could be incorporated through zeroising reserves because reserves are likely to be negative given the profit margin priced in.

Consistency with the retrospective reserves in the previous valuation will need to be considered.

Retrospective reserves produce positive reserves, whereas prospective reserves will most likely be negative in this case.

Also need to consider the consistency of this valuation method with any other lines of business that the company writes.

Moving from a retrospective to prospective valuation will have an impact on the emergence of profit.

Need to determine the term over which prospective valuation need to be performed. This should just be the outstanding term of the loan on a per policy basis. Loans may be able to be repaid earlier, company will need to consider an approach to this that is conservative enough for the valuation purposes.

Would need the loan data required to perform the valuation - term, original and outstanding balance and monthly installment.

There may need to be an assumption for the financing rate in the future if this is a floating rate and not a fixed rate.

Experience Investigations

A number of experience investigations are required to determine the appropriate level of assumptions. The assumptions required would be:

- Mortality rate
- disability rate (permanent and temporary)
- Temporary disability termination (recovery) rates.
- job loss rate
- termination rate of loans (a “lapse” rate)
- valuation interest rate,
- expenses and expense inflation,
- lapse rates.

The claim incidence rates should be set with reference to historic experience and expectation of the future.

Assumptions for loan values and installments should not be required if this data is available.

The quality and credibility of historic data on which investigations are based is important. Is there enough data to set credible assumptions?

Any volatility in the experience needs to be considered. Is the volatility too great to attach a sufficient level of certainty to the projections?

Any large claims that are influencing the experience should also be considered. This can probably be dealt with by limiting their impact. Not likely an issue on a credit life book.

The job loss experience and to a certain extent, disability experience, would be impacted by the economic cycle.

What was the economic cycle during the investigation and can predictions be made for the current projection period needing to be made?

Based on the historic information determine incidence rates for each benefit for each age.

Fit a standard life table to the qx's to find appropriate table for base mortality. Need to allow for whether AIDS deaths are included or excluded from the experience and the table.

A similar method can be employed for disability. A standard table is unlikely to exist.

You could possibly rely on a reinsurer for a table or set the disability rates as a percentage of the life rates.

Job loss rates will be difficult to set. No standard table would exist and the investigation results would depend very much on the economic situation during the experience period. This is likely not to be age rated or include many other risk factors.

Testing a few job loss scenarios and using a reasonably conservative assumption for the valuation may be appropriate. This should be consistent with the methodology used for pricing the benefit.

Checking the resulting valuation bases against the pricing basis is a valuable check.

Valuation interest rate needs to be set with reference to expected assets backing liabilities.

These will be short term investments so you could use cash and money market investments, of an appropriate term, to set the valuation interest rate. It should be set consistently with current market yields.

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

Perform an expense investigation.

Only recurring expenses are relevant for a valuation.

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 start of the investigation period.

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

Once-off expenses should be excluded.

Commission should be allowed for at the contractual rate.

END OF MARKING SCHEDULE