EXAMINERS' REPORT

June 2021 examinations

Subject F102 — *Life Insurance*
Fellowship Principles

INTRODUCTION

The attached report has been prepared by the subject's Principle Examiner. General comments are provided on the performance of candidates on each question. The solutions provided are an indication of the points sought by the examiners, and should not be taken as model solutions.

QUESTION 1

i. Explanation:

- The earned asset share (EAS) per policy is, broadly speaking, the accumulated value of premiums less the policy's share of actual benefits and expenses paid , and therefore is an estimate of the assets available per policy.
- Profit on surrender is equal to the EAS per policy less the surrender benefit paid.
  - The profit on surrender is thus zero when the surrender benefit paid is equal to the EAS.
  - The minimum surrender benefit is zero, which means that there is always a loss on a surrender when the EAS is negative (early on in the policy term).
- The original pricing basis will include margins and profit loadings (i.e. the pricing basis is prudent).
- The profit on surrender can be specified as (EAS – SV') + (SV' – SV``), where:
  - EAS is the earned asset share;
  - SV` is the prospective reserve on the original pricing basis; and
  - SV`` is the prospective reserve on the surrender value basis.
- The difference between the EAS and the prospective reserve on the original premium basis, EAS – SV`, represents the accumulated value of the historic margins and profit loadings to date.
  - If the surrender value paid is similar to the prospective reserve on the premium basis, the insurance company retains the difference between the assumed experience (incl. margins) in the premium basis and the actual experience, which should generally lead to a profit.
  - If the actual experience is worse than expected (incl. margins), a loss will be incurred on surrender.
- The difference between the prospective reserve on the original pricing basis and the prospective reserve using the realistic basis represents the present value of future margins and profits included in the pricing basis.
  - If the surrender value basis is assumed to be equal to the realistic basis, the difference between the EAS and the realistic reserve represents the current value (at date of withdrawal) of both historic profits and future margins.
  - Through a suitable choice of the surrender value basis, the company can manage the amount of profit extracted on a surrender, in line with its corporate aims.

ii. The proposal should be measured against the following principles:

- Affordability:
  - In general, the penalty is required to recover at least:
    - the cost of initial expenses (not yet recovered at the date of alteration); and
    - the cost of carrying out the alteration.
  - The penalty may also make a contribution to company profit

- A proportion of the original 1% asset management fee would have been required to recover initial expenses over the whole policy term, which the company will no longer receive.
- It is therefore reasonable that the penalty:
  - considers the reduction in outstanding policy term in deriving the alteration penalty; and
  - is not based on the full 1% asset management charge.
- However, the penalty will not fully compensate the company for the "lost charges", because:
  - the fund value would have increased due to future premiums, for example: and
  - the fund value after the alteration is now smaller, due to the penalty, negatively affecting future management charges.
- Therefore, whether the company will be able to recover the outstanding initial expenses (and receive a contribution to profit) is dependent on whether 0.5% is large enough.
  - At early durations the company is very unlikely to have recovered initial expenses because the fund value is likely to be quite small.

- Fairness:
  - Because the penalty is dependent on the fund value, in monetary terms, a small reduction in term at later policy durations may lead to a relatively large penalty compared to a small reduction in term at earlier durations (depending on the growth of the fund value).
  - The company therefore needs to consider the fairness of the likely cross-subsidy between alterations at early durations and late durations.
- Policyholder Reasonable Expectations (PRE):
  - A small reduction in the term of the policy may result in a relatively small penalty, in percentage terms, (and vice versa), which may look reasonable to policyholders.
  - Reductions in term for policies close to maturity result in a relatively small penalty, which should be consistent with PRE that the available fund value close to maturity should be similar to the maturity value expected at the end of the original term.
- Boundary Conditions:
  - The limiting case of a reduction in outstanding term, is a surrender.
  - The company will therefore have to consider whether this penalty is consistent with a surrender penalty, when there is a significant reduction in outstanding term.
  - The company will also have to consider whether the surrender value before the alteration is consistent with the surrender value after the alteration.
- Changes over calendar time and duration:
  - The percentage penalty will be consistent over time, for a given reduction in policy term.
  - However, as it is applied to the fund value, the penalty may be relatively volatile in monetary terms over the policy duration.
- The penalty is easy to:
  - administer and document; and

    - explain to policyholders.
- In addition, the penalty should:
    - be compared to competitor products in the market; and
    - comply with any regulatory requirements and/or professional guidance.

Candidates that were well-prepared did well in part (i), which was bookwork.

In part (ii), a common error was that candidates interpreted the penalty in percentage terms only, and did not consider the consequences of the penalty being a function of the fund value. A large number of candidates incorrectly referred to the earned assets share (a concept applicable to with-profit and conventional without profit products), when the question was about a unit-linked contract. Some candidates also confused the "reduction" in outstanding term with the "remaining" outstanding term, e.g. the policyholder may request a reduction in term of 1.5 years, while the remaining outstanding term may be 10 years.

QUESTION 2

i. Factors influencing the claims experience for the critical illness accelerator benefit:

- Diagnosis rates for the conditions covered under the critical illness benefit, this is influenced by:
    - Medical advances may allow for more reliable diagnosis of certain illnesses or more routine operations.
    - Changes in lifestyle of policyholders that may influence the risk of having a medical condition.
        - For example, an increase in policyholders who stop smoking may reduce lung cancer diagnosis rates.
    - Availability of preventative medicine programmes, facilitating earlier detection and recovery from conditions before they reach the level of severity required for a claim.
- Whether the wording of claims definitions is strict and clear, loose wording of claims definitions may result in the insurer being forced to pay for medical conditions that were not priced in the product.
- Level of underwriting at the inception of the policy.
- Effectiveness of claims management procedures at the claims stage.
- State of the economy, as a worsening economy may lead to an increase in fraudulent claims.

ii. Reasons for a minimum and maximum sum assured:

- There are certain fixed costs required to sell an insurance policy and get it on the books.
- If the sum insured is too small, too much of the premium will go towards these costs and the premium will not provide value for money.

Reasons for a maximum sum assured:

- The insurance company may be concerned about anti-selection, and limiting the sum insured may result in policyholders who are looking to anti-select going to another insurance company.
- The insurer may be concerned about one large claim impacting its profitability, or the stability of its profitability.
- The insurer may be concerned about one large claim impacting its solvency and large sum assured levels increasing its capital requirements.

iii. Reasons for underwriting:

- It protects the insurer against anti-selection.
- It helps the insurer to identify the lives with substandard health risks.
- It assists the insurer in setting the special terms to offer to the substandard risks.
- Underwriting helps ensure that all risks are rated equitably.
- Underwriting helps ensure that mortality experience is consistent with the pricing basis.
- Underwriting reduces the risk from over-insurance (through financial underwriting).

iv. Types of underwriting:

Medical:

- The purpose of medical underwriting is to assess the health of the individual applying for the policy.
- Medical underwriting would be done:
  - Using the application form, which would have many medical related questions, including specific questions on health, family history, smoking status, height, weight etc.
  - Getting a report from a doctor.
  - Using specific test results (blood tests, lung function etc.).

Financial:

- The purpose of financial underwriting is to ensure that the sum assured reflects the financial circumstances of the individual taking out the policy.
- If there is over-insurance the consequences are that:
  - There is a greater chance of the policyholder lapsing the policy as they cannot afford it, this may be exacerbated by selective-lapses.
  - There could be fraudulent activity, e.g. policyholders exaggerating the severity of a critical illness (with the assistance of their doctor) if there are significant financial benefits.
- The underwriting would be done by:
  - Looking at proof of income, for individuals formally employed.

- Looking at financial statements, over several years, for individuals who own their own businesses.

Avocational/Occupational:

- The purpose of this underwriting is to ensure that the individual:
  - Does not participate in a dangerous hobby (for example skydiving); or
  - Does not have a particularly hazardous occupation (for example bomb disposal expert).
- The underwriting would be done by using a questionnaire in which the applicant would have to state their occupation and/or hazardous pursuits.
- It may also be of relevance to capture information on whether the applicant plans to visit regions which could be considered as dangerous.

v. Variation by size:

- Medical underwriting will vary by size of policy as follows:
  - The larger the policy the more underwriting would be done.
  - For smaller sums insured you may rely on the medical questions in the application form only.
- For smaller sums insured the concerns of anti-selection are significantly less, and a declaration of income/wealth may be sufficient from the applicant.
- The same avocational/occupational underwriting would be done for all sums assured (as it is easy to do, and will have a big impact on the risk, no matter the sum insured).

Part (i) was not answered well, with most candidates not focusing on the fact that the question was about actual claims experience on a portfolio. The candidates who produced the better answers tackled the question by thinking about why claims experience may differ from that expected. The weaker candidates answered simply with a list of rating factors that could influence the claims incidence. For example, "age" or "smoker status" did not gain credit unless candidates made it clear that they were referring to the age distribution or proportion of smokers in the portfolio.

Part (ii) was answered reasonably well, but many candidates did not get full marks for this relatively easy question. Many said that the sum assured would be set to focus on a target market. While possible, though unlikely, this was not the point of this question. Comments on "reinsurers" and "regulators" were not relevant for this question.

Part (iii) was answered very well, with many candidates scoring full marks.

Part (iv) was generally answered well. Some candidates, however, omitted "Financial" and/or "Avocational/Occupational" underwriting and so did not score well.

Part (v) was answered well, with many candidates getting full marks. Many candidates wrote far too much for the available marks. A few candidates misread the question and answered for

"small and big insurers", rather than "sums insured". Many candidates failed to say what underwriting would be done, e.g. questionnaire, doctor's report, financial underwriting, etc.

QUESTION 3

i. Main differences:

- For the unitised accumulating with-profit contract, one way to handle the unit part is for the unit price to remain constant and the company allocates additional units to each contract, usually annually at the bonus declaration; for unit-linked contracts the unit price will be changed, usually on a daily basis.
- For the unitised accumulating with-profit contract where the unit price changes, the change in unit price usually comprises a guaranteed part and a "bonus" part (which is at the company's discretion); for unit-linked contracts, the change in unit price solely reflects the change in the net asset value per unit.
- For the unitised accumulating with-profit contract there may be a terminal bonus payable on certain pre-defined events; for unit-linked contracts terminal bonus will not apply.
- For unit-linked contracts there is no discretion on the surrender value benefit payable, which is the bid value of units less a specified penalty; for the unitised accumulating with-profit contract the company may have discretion over the right to apply a market-value reduction, and the size of the adjustment to be applied.
- For the unitised accumulating with-profit contract some charges could be taken implicitly through the bonus rate, with no explicit charging structure; a unit-linked contract will most likely have explicit charges.

ii. Factors to take into account:

Principles of investment:

- In order to minimise risk, a company should select investments that are appropriate to the nature, term and currency of the liabilities.
- The investments should also be selected so as to maximise the overall return on the assets, where overall return includes both investment income and capital gains.
- The extent to which the appropriate investments referred to above may be departed from in order to maximise the overall return will depend, inter alia, on the extent of the company's free assets.

Policyholder return/bonus expectations:

- These will be formed from past bonuses and from marketing material.
- Higher (and real) return expectations will require greater investment in real-type assets such as equity and property to match the liabilities by nature.
- Policyholder expectations of high real returns must be balanced by the need to match guarantees with lower-risk investments.

Free assets held by the insurer:

- For death and maturity benefits there exists the risk of assets being insufficient to meet the guarantees (unless these were matched), in which case free reserves will be needed.
- The size of free assets influences the extent of mismatching that is possible: The smaller the free reserves, the less the risk that can be taken and thus the greater the matching of assets and liabilities:
  - Declared regular bonuses are guaranteed (as negative bonuses are not possible) and fixed in nature, and these should be matched by fixed-interest stocks.
  - Terminal bonuses may be real in nature and these may be matched by real-type assets (however lower volatility real assets are likely to be favoured if free reserves are low).
  - The company's administrative expenses are real in nature, requiring real-type assets to match these.
- Lower free assets may be met by greater postponement of profits (i.e. lower regular bonuses relative to terminal bonuses) to lower the value of guarantees relative to asset values.

Expected split between regular and terminal bonuses:

- The more the profits can be postponed and declared as terminal bonus, the greater the investment freedom to invest in higher-return assets in order to maximise terminal bonuses.

Asset characteristics:

- As this is a developing country, suitable asset choice might be difficult e.g. there may not be sufficient low-risk fixed interest bonds to match fixed guarantees – the insurer then needs to find the closest acceptable assets however this increases the mismatch risk.
- Illiquid and unmarketable assets (such as direct property and other assets given the developing nature of the country) are unlikely to be suitable – even if surrender values are not guaranteed, it may be difficult to meet these if too many illiquid assets are held and surrender experience is heavier than expected.

Assets held by competitors for similar products:

- The insurer may not wish to deviate too far from competitor asset allocations in order to reduce the risk of declaring uncompetitive bonuses.
- However competitor portfolios may not be disclosed.
- Competitor asset allocations may be irrelevant if circumstances differ (e.g. different product features etc.).

Other factors:

- Tax: Aim to maximise after tax returns,

- Regulatory restrictions will need to be adhered to e.g. asset limits, limits for admissible assets in solvency demonstration, prescribed assets.

iii. Methods for determining investment guarantee charges:

Option-pricing techniques:

- The options incorporated into the life contracts are analogous to options traded in the market place with guaranteed minimum values corresponding to suitable put options.
- However this method is unlikely to be useful in this case:
  - The method requires market prices for a very large number of put options (there will be many combinations of terms and exercise prices required) which will not be possible in a developing country.
  - It is unlikely that put options even exist for the insurer's assets backing this product, and it is unlikely that a suitable combination of puts will be found.

Stochastic simulation technique:

- The assets and liabilities for a new contract are projected over the 10-year period:
  - The assets should reflect the most likely assets held by the insurer.
  - The liabilities will comprise the fund values at various durations over the policy contract, including at maturity.
- Projections will need to be done for a model point representing the "average" expected profile of future new business.
- Asset projections:
  - Asset return projections will be done by an Economic Scenario Generator (ESG) which will require various assumptions including moments of asset class return and inflation distributions as well as co-variances between variables.
  - A suitable number of scenarios (possibly 50 000 or more) will be required from the ESG to produce scenarios of future asset values at various durations over the policy contract.
- Fund value projections:
  - The company's policy / formula for calculating regular bonuses will need to be incorporated in the model in order to project future fund values.
  - Expected mortality rates are required to estimate future death claims.
- Cost of investment guarantee:
  - The cost of the guarantee is based on the excess of the fund value at claim stage (death or maturity) over the value of assets at that time (nil if assets exceed the fund value).
  - The overall cost of the guarantee can be assessed from its components:
    - Probability of "biting" (A) x Average cost given that the guarantee "bites" (B).
    - "A" = the number of scenarios where there is a shortfall of assets relative to fund value at claim stage ÷ total number of scenarios.

        - "B" = the average shortfall of assets relative to fund value given that a shortfall occurs.
        - The above must also reflect the probability of a claim (e.g. death or survival to maturity).
    - The above cost ÷ model point single premium produces a premium-related cost.
- Investment guarantee charge:
    - The company may wish to adjust the above-calculated cost:
        - It may require the charge to be greater than the expected cost to provide additional security.
        - It may wish to reflect a discounted value of the cost as at policy inception.
        - It may wish to have a charge similar to competitors.

Part (i) was reasonably well answered, however, a number of candidates chose to describe features of both products rather than focussing on the differences.

Part (ii) was not handled as well as expected, due to a large number of candidates not having a clear understanding of the unitised accumulating with-profits product and not being able to apply the basic investment principles to this product. For example, a large number of candidates stated that the assets must be in the same currency as the product, which goes against the principle of diversification and maximising returns for the policyholders. Too many candidates ignored the instruction to "discuss" and simply listed brief points without explanation or justification.

Part (iii) was not answered well by most candidates, and again it reflected a poor understanding of unitised accumulating with-profits products. Many candidates assumed the cost of guarantee was based on the difference between a negative return and a zero return over a specific time interval, or between the initial premium and benefit payment, forgetting about the asset share. A number explained how to perform a stochastic profit test for total profitability from all sources which was not what was asked for.

QUESTION 4

i. How a passive valuation approach differs from an active approach:

- A passive approach uses a valuation methodology which is relatively insensitive to changes in market conditions and a valuation basis which is updated relatively infrequently, while an active approach would be based more closely on market conditions with the assumptions being updated on a frequent basis.
- Under passive approaches assumptions may be "locked in" i.e. they remain unchanged from those used when the policy was first written and the liability for it first determined.
- Under a passive approach assets would be based on historic cost or "book value", perhaps with amortisation ("write down") over time, while under an active approach the assets would be valued at market value.

- Under a passive valuation approach capital requirements may be determined using a simplified approach (such as holding a prescribed percentage of base liabilities), while under an active approach a risk-based calculation is more likely to be used.

ii. Points in response to director's comments:

"The net premium valuation method makes no allowance for future bonuses and is imprudent because it does not include future renewal expenses."

- For regular premium business while the net premium method (NPM) does not include explicit assumptions for future expenses, implicit allowance is made.
  - The NPM takes credit for future net premiums (which allow for mortality and interest only, not expenses), while the higher office premium will be received – this difference should normally be sufficient to cover renewal expenses;
    - However this is not guaranteed to always be true and this should be tested;
- For single premium business as there are no future premiums received, there is no implicit expense allowance, so unless an explicit expense reserve is held, the unadjusted NPM reserve would not be sufficient.
- Implicit allowance for future bonuses could be allowed by using a lower valuation interest rate in the NPM.
- For regular premium business, a further implicit allowance for future bonuses could be included in the difference between the office and net premiums.
- The NPM should normally lead to a prudent reserve, however this is not guaranteed and should be tested, in particular for statutory reporting purposes.

"The company's passive valuation approach uses outdated assumptions and values that distort the company's financial position."

- As assumptions are rarely changed under a passive approach, there is a risk that they become outdated.
  - Infrequent changes can lead to reserves becoming less prudent e.g. if deteriorating mortality experience is not taken into account.
  - However the NPM is relatively insensitive to assumption changes, so reserves could still remain sufficient.
  - Even under a passive approach assumptions should be reviewed to check that they do not lead to insufficient reserves.
- Under a passive approach asset values (e.g. book value) are likely to be out of date.
  - If market values are substantially higher the company could be underestimating its solvency position.
    - However this is only likely to be an issue if assets and liability values are inconsistent (e.g. asset values could be written up if appropriate to match cost of bonuses declared).
- Under a passive approach the solvency position may be relatively static and may thus not show a realistic financial position.
- The NPM is not intended to show a 'true' financial position, but rather a prudent and stable one using a simplified and pragmatic approach.

iii. Advantages:

- A more realistic financial position is reflected (more useful for shareholders).
- Important trends are more easily and quickly identified, allowing management to take corrective action sooner.
- As the calculation of capital requirements is likely to be risk-based it should be more realistic and informative than a simple percentage method – this should lead to more informed management decisions (e.g. in allocating capital to business lines).

Disadvantages:

- An active approach will be more complex and costly to perform.
- It may be more complex for management to understand and explain.
- It requires more subjectivity (more assumptions are needed).
- It should lead to greater volatility of financial results.
  - In particular there may be a big one-off change at the time of switching between methods.

Part (i) was not answered as well as it should have been. The question asked for differences in the approach, and yet most candidates listed any differences that they could think of, including features, advantages and disadvantages. Some candidates simply dumped everything they knew about both methods.

Part (ii) was not answered well as many candidates did not address the specific issues raised by the director. Many candidates gave details on the gross premium valuation method, which was not relevant. Many candidates indicated that implicit allowance is made for expenses and future bonuses, but they were not able to explain how.

Part (iii) was generally well answered.

QUESTION 5

i. Pricing of units for the internal unit-linked fund should follow the equity principle.

- This means that the interests of unit holders that are not involved in the transaction should not be affected by the transaction.
- The guidance note covers the appropriation price i.e. the price at which an insurer will create a unit since it is for expanding unit funds.

The approach to calculating the appropriation price is as follows:

- Determine the market 'offer price' value of the assets held by the fund.
- Add the expenses (including stamp duty on purchase) that would be incurred in the purchase of these assets.
- Add the value of any current assets (e.g. cash on deposit).

- Subtract the value of any current liabilities (e.g. investments purchased but not yet settled).
- Add any accrued income (i.e. interest income from fixed-interest securities and deposits, net of any outgo, such as fund charges).
- Subtract any allowance for accrued tax (if applicable).
- Divide by the number of units existing at the valuation date (before any new units are created).
- The appropriation price is then adjusted for any bid-offer spread that the product design may include.

ii. Disclosure requirements at inception of policy:

- Premium amount including frequency and rate of escalation.
- Charges, including allocation rate, asset management fees, charges for guarantees etc.
  - Whether the charges are reviewable and any conditions around the reviewability of charges.
- Description of the method of the calculation of unit prices
- Length of the term of the contract
- Investment funds available. Including:
  - Description of the level of risk related to investment funds, underlying asset mix, etc.
- Disclosures of projected maturity benefits with conditions on how these values are calculated and disclosed, including:
  - Investment/maturity guarantees.
- Minimum benefits for risk events (e.g. death or disability), including:
  - Definition of risk events, underwriting requirements, waiting periods, etc.
- Projected surrender values, including a description of the method of their calculation.
- Allowable alterations to the product including changes in premiums, partial withdrawals, changes in the term of the contract, etc.
- Initial and renewal commission payable.
- Contact details of the company.
- Regulatory requirements, e.g. contact details of an Ombud, registration details of the financial services provider.

Part (i) was standard bookwork, and most candidates did very well.

Answers for part (ii) were also generally good, with the better answers providing a wide range of different disclosures. Credit was awarded for other relevant points not given above.

QUESTION 6

i. Mortality

- Products provided to borrowers of People's MFI are compulsory and the new product is voluntary.
- Also, the new product has no underwriting and a short term, which makes it easier for customers to take out the term assurance as there is little commitment on their side.
- This may result in large anti-selection and thus higher mortality than the credit life policies.
- While micro-finance loans generally are for the same low-income market as targeted for the term assurance, there will be some implicit underwriting in the credit life pool owing to the credit checks performed for the loan (e.g. having an income). There may also be higher income brackets in the credit life pool.
- These factors suggest the term assurance mortality should be worse than the credit life book.

Acquisition expenses

- Commission to People's MFI may be low since the MFI is part of the same financial group.
- Marketing costs of maintaining the established relationship with People's MFI may be low compared to the volume of business.
- Acquisition expenses for the term assurance depend on the cost of salaries and incentives for agents working in the call centre. This may be higher or lower per unit than the commission to People's MFI.
- If the call centre is new, there will be the set up and training costs that need to be recovered for the new product.
- Acquisition expenses are likely to be higher for the new product, e.g. due to additional advertising, etc.

Ongoing expenses and contribution to overheads

- This depends on the cost of managing the relationship with People's MFI and service fees to the MFI relative to the cost of administering individual policies.
- The insurer will need to consider the expected business volumes for the existing product (cost of managing the relationship with the MFI) and new product when determining the per policy expense allowance.
- The insurer will incur claims costs that will need to be included in the per policy expense allowance for the new product.
- The insurer will need to recover the development costs of the new product.
- The per policy on-going expenses for the new product may be higher than that of the existing product due to differences in business volumes.
- The new product may also make a lower contribution to overheads due to lower business volumes.

- On the other hand, the introduction of a new product means more policies over which to spread People's Life's fixed overheads, so both products could benefit from a reduced per-policy overhead allocation.

Business volumes and mix

- Business volumes for the existing product depend on the number of MFI borrowers.
- In a stable economic and lending environment the number of borrowers and amounts borrowed may increase over time.
- Business volumes for the new product are related to new sales and renewed policies, which is strongly influenced by the level of competition in the market.
- Assumed volumes of new business may initially be lower for the new product compared to the established credit life product, due to competition and the inbound nature of the sales.
- However, over time, the term assurance new business volumes may exceed those of the credit life product owing to a larger market.
- The new product will have lower persistency than the existing product as the existing product is compulsory and linked to a loan, whereas the new policy is voluntary and depends on premium affordability and perceived product need.
- There could be selective lapses towards the end of the term assurance as healthier policyholders begin to expect that they will not die before the end of the term, whereas sicker policyholders will not lapse.

Margins

- The margin for risk and profit may need to be increased due to the increase in uncertainty for the new product.
- This can be done either through margins in each of the assumptions above, or in the risk discount rate, or both.
- However, the term assurance is subject to competitive and affordability pressures, which may limit the targeted profit margin, unlike the credit life business.

Other

- Investment return and expense inflation assumptions are likely to be similar and of little consequence given the similar short durations and protection nature (assuming re-pricing on an annual basis).
- As noted above, the risk discount rate for the term assurance product may include a margin for the new risks and uncertainties.
- Tax basis is likely to be the same given the same term and mortality protection nature of both contracts.
- Owing to the sales method, there is a greater risk of new business fraud, which could be adjusted for in the pricing.
- Cost of capital differences are unclear as the amounts of required capital cannot be established from the information given. However, this is not likely to be material given the very short term of both contract types.

Premium reviews

- Premiums for credit life policies are not subject to competitive pressures, but still are affected by overall loan repayment + premium affordability.
- Conversely, the insurer may not be able to increase premiums significantly on the term assurance due to competitive and reputational constraints.
- As a result, expected future experience for mortality, expenses and business volumes beyond just one year may need to be considered for the term assurance so that premiums are expected to be sufficient over a longer time period than the initial one-year cover period.

ii. Impact of the free health check-up benefit on the experience of the new product.

- There would be an increase in the overall expenses related to the product due to the costs of providing the check-up.
- Whether there will be an increase in per policy expenses for the policy depends on whether there is an increase in business volumes as a result of the additional benefit.
- There may be an increase in new sales due to the addition of a free attractive product feature.
- The increase in new sales may be short-lived if competitors introduce a similar benefit.
- Lapse rates may increase if the main motivation for policyholders to purchase the policy was the free benefit and they no longer see value in the policy after the annual check-up.
- Alternatively, lapse rates may decrease if it is seen as a valuable benefit that is offered only on those remaining in-force to the end of the term for example. Or if clients find out from the check-up that they are unwell, and so will want to maintain their term assurance.
- There may be a decrease in mortality rates if potentially fatal diseases are picked up early in the health check-ups.
- Conversely, the check-ups could result in healthier lives lapsing and unhealthy lives maintaining cover, leading to an increase in claims experience
- The insurer may be able to get access to anonymised data on the health of policyholders from the health check-up service provider.
- This can support better assessment of the health risk of the pool of policyholders and more accurate pricing for the policyholders on a group basis.

Most candidates struggled with part (i) which was an application of the bookwork to a real life situation. This may have been as a result of a lack of a basic understanding of the particular products and markets. Further, several failed to read the question properly and tailor the answer accordingly. For example, being inbound calls, the client initiates the sale and so does not suffer from the 'product push' associated with outbound calls, whereas several students referred to the 'push' nature of the sale. There was also a pervasive lack of understanding of some core concepts. For example, mortality rates are not worse merely because of an extra 3 months on average or because sums assured are slightly higher on average. There is a

distinction between total Rand amounts versus unit amounts. (Clearly, more policies means more Rand expenses or Rand claims, but that does not necessarily mean higher unit costs or higher mortality rates.) Also, there is a distinction between the base assumption versus margins for uncertainty and risk. In other words, a base assumption would be set higher if the experience is expected to be higher for example, which is not the same as an addition of a margin for uncertainty.

Candidates fared better on part ii, being able to identify the key points relating to mortality, persistency and costs. However, a large number indicated premiums must be increased to cater for the cost of the check-up, whereas the question stated the benefit would be free to these customers.

QUESTION 7

i. Determining the model points to use in the model:

- The model points would be chosen in such a way that they represent the mix of endowment assurance business accurately
- Each model point would represent a group of endowment policies with similar features and characteristics of the endowment assurance book.
  - E.g. term, cover, premium levels, guarantees, charging methods and levels.
- Different model points would specifically be chosen, to allow for variations in factors that directly affect capital requirements.
  - E.g. the level of management charges, mortality levels and the level of investment guarantees.

ii. Description of the model:

- The model would project all expected cashflows associated with a single policy or model point.
- The model would allow for the projection and build-up of the unit account cashflows separately from the non-unit account cashflows.
- The unit account should allow for all potential cashflows, such as:
  - premium allocations into the account,
  - management expenses out of the account,
  - risk charges out of the account,
  - surrender penalties out of the account
- The non-unit fund should allow for all potential cashflows, such as:
  - Unallocated premium amounts flowing into the fund
  - Risk charges flowing into the fund
  - Management expense charges flowing into the fund
  - Actual expense payments flowing out of the fund
  - The cost of supporting any guaranteed benefits such as death benefits flowing out of the fund
- The model would need to be able to accommodate different types and level of management charges on the unit fund.

- The model would need to allow for actuarial funding if the practice is in use.
- The model would need to make an allowance for any minimum investment return guarantees that may apply to the unit fund.
- The model would then calculate any capital or solvency reserves that need to be set up for the policy, by determining what initial capital amount would need to be added to the non-unit fund at inception of the policy, to ensure there are no projected periods with negative cashflows in the non-unit fund.
- Capital efficiency could be judged by the relative size of the initial capital amount required, when compared to the present value of the premiums under the policy when discounted at the risk discount rate.
- The model would be run for several different model points that represent the various different policy variations, to test the capital efficiency of each group or model point.

iii. Combining stochastic and deterministic modelling:

- When determining the impact of various factors on the level of capital support required by a unit-linked endowment assurance, investment performance is by far the most important.
- Investment performance also lends itself naturally to stochastic modelling.
  - You will therefore only model this factor stochastically.
  - This will give a wider range of outcomes in terms of investment performance and the resultant level of capital support required.
- Deterministic scenarios can be used to determine the impact of variations in all other factors.
  - This will save time and will keep the model simpler.
  - Results would still be reasonably accurate.

In part (i) most candidates scored around half of the available marks, most missing the point on variation of model points where factors affect capital requirements.

In part (ii) candidates generally mentioned the relevant cashflows, however, some did not mention the separate projection of the unit and non-unit funds. Few candidates described how Capital efficiency should be judged.

In part (iii) candidates often missed out on marks by not specifically mentioning the assumptions to be run stochastically and deterministically. A number of candidates mentioned the use of stochastic modelling, but didn't answer the question specifically.

QUESTION 8

i. Reasons for policyholders choosing to exercise the option:

- Policyholders in poor health can take advantage of not having to undergo additional underwriting to increase the sum assured for the benefit of their dependants.
- Policyholders may have increased or unexpected financial responsibilities that they want protection for, e.g.:
  - an increase in the number of dependants;
  - higher loan amounts;
  - unanticipated university fees, etc.
- Inflation may have eroded the value of the original benefit.
- The policyholder may not have been able to afford additional cover at outset, but is now able to afford the cover they would ideally have started out with.

ii. Process for performing an investigation into take-up and mortality rates.

- The insurer will need a reasonable volume of stable and consistent data on take up and mortality experience for the option.
  - Since the insurer has a large volume of policies; five years of policy data should be sufficient if there has not been a significant change in the insurer's practice over the period.
- Data will need to be divided into homogeneous groups for determining the take-up rates and mortality.
  - Factors that could be used to divide data into homogeneous groups for the take-up rates are: age; sex; insurer encouragement to take up the option; sales method.
  - Factors that could be used to determine the mortality of policyholders who take up the option are: age; sex; original medical status; sum assured; source of business; smoker status.
  - The number of factors used to divide data into groups will be limited by the need to ensure that there is sufficient data in each group for the analysis to be credible.
- Calculation of rates:
  - The take-up rate will be calculated as the number of policyholders taking up the option divided by the number of policies reaching the 5^{th} policy anniversary.
  - The mortality rate for policyholders will be calculated as the number of deaths divided by exposed to risk for each group.
- The take-up rates and mortality rates calculated may need to be adjusted for any unusual experience or trends in the data.
- It would be expected that the mortality rates after take-up would be somewhat above the previously assumed ultimate rates.

iii. Expected payments relating to benefits:

- The original sum assured before the option exercise date, based on the mortality of the lives underwritten at inception.
- The original sum assured after the option exercise date for policyholders who do not take up the option, based on the lighter mortality for policyholders who do not take up the option.
- Double the sum assured after the option exercise date for policyholders who take up the option, based on the heavier mortality for policyholders taking up the option.

Cashflows relating to expenses.

- Initial expenses at outset, e.g. underwriting, initial commission, etc.
- Regular policy expenses, e.g. administration, for the duration the policy is in-force, subject to inflation.
- Cost of effecting the option at the 5^{th} policy anniversary for policyholders who take up the option.
- Termination expenses for claims underwriting and the processing of death claims.

Expected receipts:

- The original premium for the duration that the policy is in-force.
- The additional premium at standard premium rates at the 5^{th} policy anniversary from the option exercise date for policyholders who take up the option.
- There will only be a small investment return as reserves are low.

The expected cashflows will depend on the probability that the policy is still in-force i.e. assumed lapse rates

iv. The restrictions are:

- Only allowing exercise at the 5^{th} policy anniversary; and
- Only allowing a doubling of the sum assured.

v. Risks relating to the relaxation of restrictions on the option:

- Relaxation of the restrictions on exercising the options increases the risk of anti-selection at the option exercise date:
  - More frequent dates to exercise the option increases the risk as there is more opportunity that it will be worthwhile for policyholders to exercise the option given their state of health.
  - The opportunity to increase the sum assured to more than double the original increases the risk as policyholders in poor health would be expected to take higher levels of additional cover.

- The impact of anti-selection will also depend on the efforts of the insurer to publicise the option and encourage policyholders to take up the option at option take up dates.
  - The greater the take-up rate the lower the anti-selection risk should be.
- If the restrictions were removed on existing business this could result in large losses as the additional cost has not been allowed for in pricing.
  - There would be no point increasing the premium on the increased sum assured at option date, as this would only further encourage anti-selection.
- Allowing for the additional anti-selection would result in an increase on new business premiums. This in turn may:
  - Make the product uncompetitive.
  - Discourage healthy lives from taking out the policy with the option at outset.
- While allowing policyholders to take a lower increase may result in a higher take-up rate, it may also result in a reduction of additional sums assured and hence lower premium income.
- The additional uncertainty in terms of timing and amounts of take-ups will make pricing more difficult.

Part (i) was well answered by most candidates. Some did not provide sufficient detail for their reasons to be understood, however.

In part (ii) candidates often made imprecise statements, for example relating to how the rates would be calculated. Many candidates explained how the two assumptions would be set instead of explaining how the investigations would be performed.

In part (iii) many candidates failed to follow the instruction to "describe", and simply provided a list of the cashflows. No marks were awarded for this. Many candidates claimed that increases/decreases in reserves were cashfllows. A surprising number of candidates thought there could be a surrender value payable and a disturbing number referred to a maturity value, demonstrating a lack of knowledge about the most basic of products.

Part (iv) was well answered by almost all candidates.

While part (v) was reasonably well answered by most candidates, many seemed to think that the extra premium to be charged would be paid on the additional cover once effected rather than on the underlying contract offering the option.

END OF EXAMINERS' REPORT