EXAMINERS' REPORT

June 2019 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. Importance of monitoring aspects of new business sales:

General:

- May be required by the regulator as part of ongoing monitoring.
- To provide management with information, such as trends in sales/mix, to assist in strategic decision making.
- To enable the insurer to compare actual sales experience to that expected. This is particularly important for a new company, as estimates of sales/mix etc. will be an important component of the pricing assumptions and the company will not have much experience in this regard.
- Feedback into the actuarial control cycle will be of particular relevance to this relatively inexperienced company.
- Information on sales will be needed for the reserving process.

Reasons relating to specific aspects of sales:

- New business volumes:
  - If volumes are lower than anticipated profits are likely to be lower than anticipated.
  - It may also invalidate assumptions relating to per policy expense loadings.
  - If the volume of new business is much higher than anticipated this may introduce a risk of not having enough capital/financial resources to finance the new business strain.
  - This is of particular importance to a relatively new company which may not have large resources.
  - Operationally there is also a risk that the level of service being offered to clients and intermediaries may deteriorate as a result of high volumes of sales.
  - Functions such as underwriting may also suffer if sales volumes are too high.
  - This can lead to future mortality experience being worse than expected.
  - This is exacerbated as the company sells mainly protection policies.
  - It will be important to compare new business volumes with those of competitors to ascertain growth in market share.
  - It can help assess the effectiveness of marketing campaigns.
  - It may be used to assist with executive remuneration based on sales volumes.
  - To ascertain commissions and the effectiveness of the distribution channels.
- Nature/type of business:
  - This is important to monitor since supervisory reserves will depend on the nature/type of business sold.
  - Whole of life cover tends to require more supervisory reserves than term assurance.
  - Similarly, this could include monitoring the split between regular and single premium business.

- Average size of policies:
  - If policies are larger than expected new business strain could be higher than expected.
  - If policies are smaller than expected then expenses may not be adequately recouped.
  - This risk is related to the extent of cross-subsidisation between large and small policies.
  - The average size of policies may give an indication of the need for reinsurance.
- Source of business:
  - To compare the effectiveness of the call centre compared to the broker distribution channels.
  - To determine the effectiveness of specific sales agents.
  - Experience for the call centre is likely to be different to that of the brokers.
  - This is likely to be particularly so with mortality and persistency.
  - If such differences are allowed for through differential pricing then the risk is reduced.
  - Monitoring of the take-up rate of quotations can be a useful indicator of the effectiveness of sales staff.
  - It could give an indication of whether the appropriate target markets are being reached.

ii. Ways of reducing the risk:

- Limit the total amount of sum assured available (initial plus option).
- Restrict the term of the carrier contracts.
- Limit the time available during which the option needs to be exercised.
- Ensure that any exclusions on the carrier contract also apply to the option contract.
- Encourage all policyholders to take up the option, e.g. through reminder notices / automatic take-up, to reduce anti-selection.
- Keep the additional premiums required in respect of the option contract low (to help achieve the last objective), although normal minimum premiums should still apply.
- Do not guarantee the premiums that will be offered on the option contract.
- Underwrite initially as though the option will be exercised (i.e. more strictly).
- Carry out financial underwriting to detect any possible over-insurance.
- Price conservatively initially.
- Arrange for a suitable reinsurance treaty.
- Use lower reinsurance retention limits than normal.

In general this question was reasonably well answered by the well prepared candidates, with most of these giving a fairly wide range of points.

However, in part (i) many candidates interpreted this to be a general question about monitoring experience, e.g. profitability, mortality, withdrawals, expenses, etc., as opposed to one focusing on aspects of new business sales.

In part (ii) several candidates did not focus specifically on ways to reduce the mortality risk "associated with this option". Some wasted time explaining what the risks of the option were, which was not asked.

QUESTION 2

i. Setting the mortality assumptions:

- The mortality rates will be set in two parts by considering:
  - The base mortality, and
  - The mortality trend.

Base Mortality:

- The values assigned should reflect the expected future experience of lives taking out the contracts. This should take into account:
  - The target market of the insurer.
  - The underwriting controls applied.
  - The expected change in experience to the point in time at which the assumptions will on average apply.
- The estimates should be based on an adjustment to rates from a standard mortality table.
  - The company has a significant amount of past data, and therefore would use this to set the adjustment for each product offered.
  - The data would relate to an appropriate number of years, such that the volume of data is adequate without introducing excessive heterogeneity.
  - The effect of any once-off or unusual events such as catastrophes would be removed.
  - The data would be divided into homogenous groups per risk cell, ensuring that adequate credibility is retained within each cell.
  - The pricing actuary can supplement the data with data sources such as:
    - Industry-wide mortality investigations.
    - Population mortality statistics.
    - Reinsurance company data.

Mortality Trends:

- The actuary should account for expected changes in the mortality rates over time.
- Where the insurer offers guaranteed premiums, this assumption becomes more important.
- The future mortality improvement can be determined by:
  - The expectation approach – which involves expert opinion and subjective judgement.
  - The extrapolation approach – which involves projecting historical trends into the future.

- Explanatory approaches – which involve projecting trends in mortality rates from a bio-medical perspective.
- The actuary may model mortality improvements by year of birth.
- This allows the actuary to allow for specific causes which may affect mortality trends in each cohort.
- The mortality improvement can be modelled deterministically.
- Alternatively, multi-factor predictive models (GLMs) could be used, which combine the internally held data with external drivers.
- The actuary can also utilise stochastic mortality projections such as the Lee-Carter or P-spline method.
  - These models generate many different improvement rate scenarios
  - The models can, however, be challenging to calibrate.

ii. Likely impact on Foresure's new and existing business:

- Under the new ruling, the premium differential between healthy and unhealthy lives would be removed.
- This means that healthier lives will now pay more, while unhealthy lives will pay less for assurance premiums.
- Existing business would have been accepted on rates that utilised medical underwriting.
  - Therefore, unhealthy lives would have been accepted at a higher premium than healthy lives.
  - Unhealthy lives may lapse their policies and rejoin at new rates without loadings.
  - Healthier lives have no incentive to lapse their products, and are likely to stay.
  - Over the short term this is likely to result in a decrease in premium income
- New business will be based on premiums that cannot be loaded for risk based on medical underwriting.
  - Therefore, there could be a short term surge of new business from unhealthy lives that need cover.
  - This may result in new business strain.
  - This is especially so given that the insurer will need to increase its reserves to account for the higher risk profile of the new business going forward, as well as reserving for the new business.
  - The insurer may experience a slow-down in business from healthier lives, as the premiums are now more expensive.

iii. The effect on the mortality experience of Forsure:

- This ruling removes the main tool for underwriting – medical reports, and opens all insurers up to anti-selection.
- The anti-selection will be present across all insurers, not just Forsure.
- It will now be possible for unhealthy lives and high risk lives to take out policies without medical underwriting.
- Over the short-term:
  - Mortality rates will rise.

- Lives that are currently sick and in need of cover will effect life cover immediately, likely resulting in a short-term spike in mortality rates.
- There will be increased volatility in mortality experience.

- Over the medium-term:
  - Over time, higher risk individuals in poor health will take out life cover as their health fails and their need for cover increases.
  - This means that over the medium-term there is likely to be a rise in mortality rates as the system absorbs the higher risk individuals.
  - As the insurer gains an understanding of proxy rating factors and the expected mortality experience, the mortality experience should start to stabilize.
- Over the longer-term:
  - Mortality rates may continue along the same trends, albeit starting from the new higher base.
  - By this time, the insurer should have gained enough data and experience to price their products in light of the change in underwriting – leading to a stabilized mortality experience.

iv. Forsure could:

- Implement, or increase waiting periods on death as a result of pre-existing conditions or illness.
- Implement exclusions on pre-existing conditions [note that the insurer may still do medical underwriting, although it may not utilize the information for setting premiums].
- Implement no-claims discounts or cash-back on survival to a certain term.
- Implement new rating factors which are a proxy for health such as rating on level of physical activity.
- Targeted marketing to lives which are expected to be healthy based on location, affinity group or occupation.
- Avoid marketing to lives which are expected to be unhealthy.

In part (i) most candidates performed adequately. Weaker candidates did not differentiate between base mortality and mortality trends or answered the question as if they were doing an analysis of mortality experience. Very few candidates touched on points relating to the modelling of mortality trends.

In part (ii) performance was generally poor. Many candidates believed that the in-force premiums would be raised to account for the new ruling and thus suggested that selective lapsing of the healthy lives would occur. In general, candidates did not think about the split between healthy and unhealthy lives when answering the question.

In part (iii) candidates performed poorly, with most failing to appreciate the impact of the change on the mortality experience. Very few candidates pointed out that the ruling removes the main underwriting tool and that this would lead to a spike in anti-selection, nor did they point out that this trend will prevail across all insurers.

In part (iv) candidates generally gave too few points to score well. Many candidates used the example of encouraging better health through a healthy lifestyle rewards programme – however, this does not directly address the problem of attracting healthier lives to the business as it primarily addresses changing the behaviour of existing policyholders.

QUESTION 3

i. Factors to be considered:

- The onerousness of the targeted return of 2% p.a. compared to expected returns for various asset classes:
  - In a very low-inflation environment where expected inflation is close to, or less than 2%p.a., this could represent an onerous task, requiring real growth assets to match this target with considerable risk that it cannot be met.
  - In a high inflation environment where expected inflation is much higher than 2% p.a., this becomes a less onerous task and could be achieved with less aggressive investment strategies.
    - While fixed interest stocks might be useful for increasing the chances of achieving the targeted return in such a scenario, these assets (particularly longer term assets) are likely to be associated with a high risk of not meeting inflation – the insurer needs to balance expectations for inflation-beating returns (and sometimes not meeting the target) against expectations for always meeting the targeted return.
- Investments backing the unit fund would be affected by:
  - Published fund investment mandate, and whether investment choice is available to the policyholder, in which case the assets for each fund must be invested according to the published mandate for the fund (e.g. local or offshore shares only).
    - Investment choice seems unlikely, however, if there are strong expectations of an onerous targeted maturity benefit.
  - Communication to policyholders on expected returns and the extent to which the targeted maturity benefit is expected by policyholders (even if not guaranteed) – if strong expectations exist, it would suggest that a closer targeting of the 2% p.a. return is required.
    - Unless expected asset returns are considerably higher than 2% p.a. (in a high inflation environment) in which case it might not be necessary to closely match the targeted return.
  - If the product is marketed and sold mainly for its life cover benefits, the maturity value may not be considered too important by policyholders.
  - Expected returns assumed in determining the charging structure.
  - Unit fund assets and liabilities are most likely to be matched and equal i.e. the bid price of units is based on the value of unit fund assets.
- Investments backing the non-unit fund would be affected by:
  - For positive non-unit insurance liabilities:
    - Nature of risk benefits – guaranteed in monetary terms.

        - The term of the risk benefits depends on the expected mortality or morbidity of the policyholders (likely to be longer-term).
        - Expenses comprise of regular outflow for the duration of the contract.
        - These will increase with price and wage inflation.
        - The term of the expense liability depends on the extent to which expense charges and costs are mismatched over time (e.g. if charges are a fixed amount per month).
        - The best matching assets are likely to be:
            - government or corporate bonds of appropriate term for risk benefits;
            - liquid money market assets to cover on-going expenses; and possibly
            - index-linked bonds for the expense reserve for longer terms.
            - The extent of mismatching is influenced by the firm's risk tolerance and free reserves – higher free reserves may provide greater freedom to mismatch non-unit fund assets and liabilities.
    - Regulations could affect the assets in various ways:
        - Limits, exclusions, admissibility requirements.
        - Mismatching reserves and/or risk-based capital requirements.
    - Taxation: the insurer will wish to minimise taxes paid, and this could lead to a preference for income or capital gains and for certain classes over others.
    - The company may wish to use a stochastic asset-liability model to assess how well a specific investment strategy performs in delivering on the targeted maturity value and other criteria (e.g. profitability/return on capital).
    - Other points:
        - The insurer will wish to minimise investment expenses.
        - Aim for a well-diversified portfolio to reduce market volatility.

ii. Impact on investment strategy of adding the GMV:

    - There may be no change to the investments:
        - If the company has hedged the guarantee with market put options, then there may be no reason to change the investment strategy.
        - If the company decides to retain the guarantee risk, and the charges adequately cover the cost of this guarantee, then again the company might not want to change the investments; however some additional considerations apply in respect of investing the investment guarantee charges:
            - The investments should reflect the assumptions made in calculating the charge (e.g. if risk free interest rate, then risk free assets are needed).
            - The assets that the charges are invested in should have no (or negative) correlation with the assets backing the unit fund.
    - The addition of the guarantee (especially if not hedged) may increase capital requirements and the company may want to counteract this by utilising a lower-risk investment strategy that minimizes the chances of the guarantee biting.
        - This may lead to investments that have lower uncertainty of returns relative to pricing assumptions.
        - Unless asset expected returns are considerably higher than 2% p.a. in which case it may not be necessary to use low-risk assets.

- Even if the guarantee is hedged it may lead to higher capital requirements (e.g. due to counterparty risk); the company may want to counteract this by using different counterparties for investments in order to reduce concentration risk.

Overall this question was not answered well.

In part (i) most candidates produced the standard bookwork list of points, with very little effort made to apply the points to a unit-linked product. Most candidates did not distinguish between unit fund and non-unit fund considerations. Almost no-one considered the importance of the published mandate for the unit fund, which could be based on any asset class and any region. It would be most unusual (and mostly not permitted) to mismatch unit fund assets and liabilities due to the risks of doing so (regardless of the free asset position). Almost no-one considered the onerousness of the target, and those that did usually assumed it was not onerous. A number of candidates provided points that fell far short of the instruction to "describe" the factors.

In part (ii) a number of candidates provided points not relevant to the question asked which was about investment strategy, not about pricing and charging for the guarantee.

QUESTION 4

i. The cost of the return of premium investment guarantee is the maximum of:

- the excess of the single premium over the term of the policy over the value of the venture capital investment fund at maturity, if the value of the venture capital fund is lower than the premium; and
- zero, otherwise.

The cost of the guarantee can be determined using:

Option pricing techniques:

- European put option on the venture capital investment fund with exercise price of return of premiums, if available; or
- An approximation using European put options on a suitable combination of equity market indices.

Stochastic simulation of investment performance:

- Projecting forward the value of the fund using a stochastic model of returns on the venture capital fund.
- This would be done using a large number of simulations.
- The probability distribution of investment returns will be best estimate and calibrated to current market conditions.
- The best estimate of the liability for the guarantee is the median of the present value of the cost of the guarantee discounted at an appropriate rate.

ii. Impact:

- The liability for the unit linked contract will be the sum of the unit and non-unit reserves (including the liability for the return of premium guarantee).
- Assets relative to the liability for the unit fund will not be impacted as both values will have reduced due to the fall in equity values.
  - Since the liability for the unit fund is the bid value of the units multiplied by the number of units.
- The value of the liability for the non-unit fund will increase relative to the assets (which may include a number of asset classes including cash and bonds).
- The value of the non-unit reserves will increase:
  - Since charges on the investment fund are expected to reduce while on-going expenses are unlikely to be impacted by the fall inequity markets.
- In addition the cost of the guarantee is likely to increase due to a fall in the unit fund value.
- If the insurer changes the assumptions for the distribution of investment returns to reflect the increased volatility of equity markets, this will result in an additional increase to the cost of the guarantee.
- The impact on the liability for guaranteed benefits depends on the level of unit fund values relative to guaranteed maturity values – if fund values are significantly higher than guarantees then the probability of those guarantees biting is small and the liability for guarantees may not increase much, however if fund values are lower this could lead to a material increase in this liability.

Overall this question was answered very poorly, due to a combination of poor knowledge of bookwork, poor understanding and poor exam technique.

Part (i) was bookwork, which was answered well by only a handful of candidates.

In part (ii) candidate answers exposed poor understanding of reserving concepts and also poor exam technique in not reading the question properly and answering what was asked. Very few candidates structured their answer to focus on the unit fund and non-unit fund separately, and on the "relative position" of assets and liabilities for this product. Most candidates assumed there would be a mismatch between unit fund assets and liabilities, which would be most unusual or not permitted by regulation. Of those candidates that did refer to a non-unit fund many went on to explain that this fund would decrease due to lower expected future charges from the unit fund. A very small minority of candidates seemed to understand the probabilistic nature of the maturity guarantee liability and that this liability would increase even if unit fund assets are currently higher than guarantees. Almost no candidate appreciated the significance of higher volatility in markets. A large number of candidates wasted time by speculating on the size of the fall for this fund and even suggested the fund would be diversified into other asset classes (when the question made it clear this was not the case).

QUESTION 5

i. Purpose and product features of income protection:

- The product aims to replace part of the insured's income if he/she is unable to work due to disability.
- Covers claims due to accident and/or illness.
- Benefits will be paid on temporary disability (not only permanent as is the case with lump sum disability cover).
- The benefits (a regular annuity) are paid until the insured recovers, dies or the policy term ends (usually normal retirement age).
- A number of separate benefit periods can occur without the policy ceasing.
- In some instances (although rarely) the regular income may be commutable to a lump sum.
- Benefits can escalate before claim payment commences.
- Benefits can also escalate once the claim is in payment.
- Premiums are usually level, but may also increase if the benefit is increasing.
- The benefit may include a waiver of premium benefit.
- The sum insured (annuity benefit) is set so as to avoid over-insurance.
- Several definitions of disability are possible, for example: unable to do own, any, or reasonable occupation; inability to perform certain Activities of Daily Living; Functional Assessment Test.
- A partial benefit is possible if the policyholder is able to return to work on a part-time basis.
- There is not usually any surrender or maturity benefit.

ii. Risk mitigation using reinsurance:

- This is a new product for your company so the reinsurer will be able to provide technical support.
  - This will come in the form of product design, pricing, underwriting and claims management
- Reinsuring the product will allow you to share the downside of the pricing risk.
  - This could arise due to parameter risk (getting incidence and termination rates wrong), or to not understanding the market, and where the economy is in the pricing cycle
- You could enter into a financial reinsurance contract which would assist your start-up costs in launching this product.

Types of reinsurance:

- As this is a new, and risky, product, you would probably want to enter into a fairly large quota share arrangement.
- In addition a surplus arrangement could be used to protect you from large risks.
- Stop loss insurance is difficult as the ultimate cost of the risk is not known until the last claimant ceases claiming…

- Catastrophe cover could be purchased, although this is not likely to be a priority.
- The level of reinsurance will be influenced by the risk appetite of the company.
- The level of the company's free reserves will also impact the extent of reinsurance sought.

Downsides:

- Reinsurance comes at a cost, and the company will have to give away some of its profits if it enters into a reinsurance arrangement
- The reinsurer may insist on more stringent risk management than the insurer would like.
  - E.g. stricter underwriting or claims processes
- The reinsurance processes may result in a slower service offering to the policyholder.
  - This may limit the ability of the insurer to reach its growth targets.
- The insurer will have increased counterparty risk, as it is exposed to the risk of the reinsurer failing to meet its obligations.

This question was a fairly standard product features and reinsurance question. Reasonably well-prepared candidates should have scored at least 8/12.

Part (i) was basic bookwork, and given that there were many points which could have been made, well-prepared candidates should have scored full marks (or close to it) on this part. Common mistakes were:

- *Stating that the cause of disability could be "illness or disability", rather than "illness / sickness or accident/injury".*
- *Outlining what the money could be used for, e.g. school fees, paying a mortgage, etc. The main purpose of the product is to replace one's salary/income. What one does with the money is almost beside the point.*
- *Several candidates mentioned "retrenchment", which is a completely different product.*

Part (ii) was an applied question, and was generally not answered well. Many answers were far too generic, e.g. describing what reinsurance is. Many candidates did not structure their answers around the specific points asked for in the question. Well-structured answers are much more likely to score well. Under the downsides, most candidates mentioned "cost" and "counterparty risk", but surprisingly few mentioned the other points.

QUESTION 6

i. Principles to consider:

- Equity between:
  - Policyholders that surrender their policies and those that do not.
  - Policyholders and shareholders (surrendering policies should contribute a reasonable amount of profit on surrender).

- Policyholder reasonable expectations (PRE), as informed by past practice, policy contracts and marketing material.
- Affordability. The company would want to ensure that surrender values are no greater than the earned asset shares (on average over time) and are reduced for the cost of administering the surrender.
- At early durations the company would also want to consider the comparison of actual surrender values with premiums paid to date.
- At later durations, the surrender value should flow smoothly into the maturity value as the duration approaches the maturity of the policy.
- The surrender values should be compared to surrender values quoted by its competitors and auction values that may be available.
- It would want to:
  - Keep the surrender value bases stable over time.
  - Avoid discontinuities by duration.
- It would want to ensure that surrender values are easy to administer.
- It should be capable of being clearly and understandably conveyed to policyholders and advisers in policy documents and marketing material.
- It should avoid any forms of anti-selection against the company.
  - Including Lapse-and-re-entry risks.
- Meet any regulatory restrictions that may apply.

ii. The company would most likely use the following approach:

- Using a prospective method, the surrender value (SV) would be calculated as the present value of the expected cost of benefits plus expenses over the remaining term of the policy, less the present value of the expected future premiums to be collected over the remaining term of the policy.
- The costs of administering the surrender would be deducted from this present value.
- The SV would be calculated using the company's stipulated surrender value basis.
- The profit on surrender would be determined as the excess of the earned asset share (EAS) of the policy over the calculated SV.
  - There is no guarantee that the SV calculation will not exceed the EAS. The company may need to adjust SVs to prevent this from happening, on average.
  - 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).
- If the SV basis is the same as the original premium basis, the insurance company retains the difference between the assumed experience including margins in the original premium basis and actual experience to date (historic profit).
  - If the actual experience is worse than expected (incl. margins), a loss will be incurred on surrender.
- If the SV basis is a best estimate basis, the company will retain the expected present value (at the date of withdrawal) of both historic profit and future margins in the original premium basis.
  - If the SV basis is more conservative than the best estimate basis, this will reduce the profit from surrenders (compared to using a best estimate SV basis).

iii. Surrender values for unit-linked policies:

- The contract design and the pattern of expenses incurred on the contracts will be the main factors determining:
  - whether or not a surrender penalty is needed;
  - to what extent a surrender penalty depends on term and duration in force; and
  - the form it takes (cash amount or related to units).
- The surrender value will usually be the value of the unit fund less a surrender penalty.
  - While surrender values are not likely to be guaranteed, their method of calculation is likely to be specified up-front.
- The surrender penalty should be such that initial expenses (at least) are recouped.
- If initial expenses are recouped through:
  - A front-end load – then a surrender penalty may not be required.
  - A reduced level allocation to units – then a non-unit surrender penalty is required.
  - Units with a high management charge – the surrender penalty should be unit-related.
- If the company wants to employ an actuarial funding technique, then a unit related surrender penalty is required.
- Surrender penalties will usually vary by contract term and duration in force, and will reduce as policies approach maturity.

Answers to part (i) were generally good, with the majority of candidates getting full marks.

Part (ii) was a standard bookwork question, where stronger candidates made it clear that the surrender profit is (always) equal to the difference between the EAS and the SV paid. This difference can conceptually be explained by looking at SV calculated on different bases. In discussing the historic profits, weaker answers did not make it clear that the original premium basis is used in this analysis and lost marks as a result. A number of candidates did not understand the impact of a SV basis on the SV calculated. A common error was to refer to a "surrender penalty" in this context, whereas this is a phrase applicable to unit-linked products only.

Part (iii) was poorly answered, with many candidates simply repeating the general principles from part (i) of this question. The question clearly asked for considerations specifically applicable to the unit-linked product and so generic principles did not receive any credit.

QUESTION 7

i. Reasons:

- In the case of Company B's policies, the distribution of surplus is deferred more than in the case of Company A's (all other things being equal).

- This happens because of the fact that a compound reversionary bonus approach defers the distribution of surplus more than in the case of a simple reversionary bonus.
- This distribution is further deferred through the use of terminal bonuses.
- Company B is thus expected to have:
  - a lower liability guaranteed in monetary terms than Company A; and
  - a reduced probability of insolvency.
- Hence:
  - it should have more investment freedom; and
  - can therefore invest more in potentially higher risk / higher return assets such as equities and property.
- Given the relatively long time horizon of 18 years this could reasonably be expected to result in better investment returns than the "safer" assets held by Company A, and therefore a higher expected maturity benefit.
  - However, this may not always be the case because of the higher investment risk).

ii. Surplus distribution approach:

- Company C is most likely distributing surplus through a cash bonus and/or premium reduction.

This is unlikely to be appropriate for the man because:

- His primary motivation for obtaining a policy is to save for a future event.
- A cash bonus or premium/reduction would pass the investment risk back to him.

iii. Other considerations:

- Assess the value for money of the two products, for example:
  - Using historic bonus rates, typical maturity benefits can be calculated for R1 of premium for each of the two companies.
  - Whether sources of surplus, other than investment surplus, would be included in any distribution (e.g. mortality surplus).
- The man's attitude to risk.
  - The terminal bonus introduces significantly more uncertainty around the ultimate maturity value, which may be unacceptable to the man.
- Whether mortality protection is needed during the term.
  - The mortality benefit could be significantly less under Company B's bonus structure (all other things being equal).
  - This would be particularly so if the terminal bonus is typically significantly lower at shorter durations than longer durations.
- Attractiveness of other product features offered e.g. surrender values offered, minimum maturity guarantees, etc.
- Compare the two companies with respect to:
  - Financial soundness (of the with-profit funds and/or company) e.g. if one company is financially more sound, their products may be more attractive.

- Customer service the man is likely to receive.

iv. Calculations:

- In the case of Company A, assume the simple annual rate of reversionary bonus is j, then:
  $$500\,000 \times (1 + 18j) = 1\,000\,000$$
  which yields $j = 5.56\%$
- In the case of Company B there is a 25% terminal bonus, where the 25% is applied to the attaching bonus only. If the compound reversionary bonus is *k*, then:
  $$500\,000 \times [\,(1+k)^{18} + 0.25[(1+k)^{18} - 1]\,] = 1\,000\,000$$
  which yields $k = 3.32\%$

Part (i) was reasonably well answered. However, a common mistake was to assume that the simple reversionary bonus rate would be exactly the same as the compound reversionary bonus rate, and the accumulated value using a compound rate exceeds that using a simple rate.

In part (ii) some candidates did not read the question (all products are conventional) and continued to suggest that a European-style revalorisation method or US-style contribution method would be used by Company C.

Part (iii) was a challenging question. A common suggestion was to compare historic bonus rates and/or premiums. However, the two products have very different bonus distribution philosophies and as a result comparing historic bonus rates is inappropriate. Similarly, a comparison based on premiums only would be inappropriate, because the benefits for a given premium are likely to be different.

QUESTION 8

i. Guaranteed level annuity:

a. Benefits to policyholder:

- The policyholder receives a guaranteed level income for life, reducing the concern of running out of funds at older ages due to living longer than expected.

b. Risks that remain with the policyholder:

- The level income may be insufficient to cover living costs at later ages if the real value of the level income is eroded by high levels of inflation.
- There is no death benefit, and hence there is no provision for the financial needs of a surviving spouse or inheritance for other dependants.

Unit-linked "income drawdown: product:

a. Benefits to policyholder:

- Any remaining funds can be transferred to the dependants of the policyholder on the death of the policyholder.
- This may appeal particularly to policyholders in poor health at the time of purchasing the product.
- The policyholder can choose the income level through altering the percentage of the unit fund encashed.
- Growth in fund assets may allow the policyholder to increase the income received as living costs increase over time.

b. Risks that remain with policyholder:

- The policyholder remains exposed to longevity risks, i.e. there is a risk that the investment in the unit fund runs out before the death of the policyholder.
- The policyholder remains exposed to investment risk, asset returns may be low over an extended period or funds may need to be disinvested at times when the market has fallen.

ii. The appropriation price is the price at which a unit would be created and is determined as:

- the net asset value of the fund on an "offer basis"
- divided by the number of units existing at the time of calculation (before any new units are created)

The net asset value of the fund on an "offer basis" is calculated as:

- the market "offer price" value of the assets held by the fund
- plus the expenses that would be incurred in the purchase (including stamp duty)
- plus the value of any current assets (e.g. cash on deposit)
- less the value of any current liabilities (e.g. investments purchased but not yet settled)
- plus any accrued income (e.g. interest income on deposits) net of any outgo (e.g. fund charges)
- less any allowance for accrued tax, if applicable

iii. A model can be used to determine the monthly fund management charge as follows:

- Select model points that represent the expected new business under the unit-linked "income drawdown" product.
- Obtain advice from distribution channels or carry out research to determine the expected profile of targeted policyholders for each of the three investment funds.
- Project cashflows for the unit and non-unit fund for each model point.
  - This should be done on a monthly basis and for the expected future life time of each model point.

- Project returns on asset values and growth in fund values based on the investment strategy for the individual fund.
- Allow for monthly income disinvestments based on annual "income drawdown" percentage.
- Trial management charges based on fund values.
- Include management expenses, allowing for expense inflation.
- Allow for reserving and solvency requirements for the non-unit fund.
- Allow for expected withdrawals.
  - Take expected competition and future economic conditions into account.
- Investment returns on the unit fund may be projected on a stochastic basis.
  - This will require sufficient data to be available to calibrate the parameters.
- Withdrawal and mortality assumptions are likely to be set on a deterministic basis.
- Allow for the interactions between parameters (e.g. investment return and inflation).
- Net projected cashflows for the non-unit fund will be discounted at the risk discount rate.
  - This should allow for the return required by the insurer and level of risk relating to the cashflows.
- Compare the discounted net cashflows with the targeted profit criterion.
- Vary the assumed charges for each model point until an acceptable level of profit is achieved for each model point.
- Scale the result based on expected business volumes for each model point.
- Consider the aggregate level of profitability for the product – cross-subsidies among model points may be allowed.
- Assess the sensitivity of the results to variations in the assumptions (e.g. variations in the percentage "income drawdown").
- Consider whether the charging structure is marketable.
  - This is important since product features are standardised across the industry.
- Consider whether the charging structure is reasonable given the insurer's profit requirements, capital required to finance the product and the once-off development cost

Part (i) was generally well answered by candidates, with most getting full marks or close to it.

In part (ii) many candidates provided a formula and a brief list rather than following the instruction to "describe", and did not give examples where appropriate.

In part (iii) it appeared as though several candidates ran out of time, as many did not provide enough detail or a sufficient number of points to score well.

END OF EXAMINERS' REPORT

