

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2012 examinations

Subject ST2 – Life Insurance Specialist Technical

Purpose of Examiners' Reports

The Examiners' Report is written by the Principal Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and who are using past papers as a revision aid, and also those who have previously failed the subject. The Examiners are charged by Council with examining the published syllabus. Although Examiners have access to the Core Reading, which is designed to interpret the syllabus, the Examiners are not required to examine the content of Core Reading. Notwithstanding that, the questions set, and the following comments, will generally be based on Core Reading.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report. Other valid approaches are always given appropriate credit; where there is a commonly used alternative approach, this is also noted in the report. For essay-style questions, and particularly the open-ended questions in the later subjects, this report contains all the points for which the Examiners awarded marks. This is much more than a model solution – it would be impossible to write down all the points in the report in the time allowed for the question.

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Chairman of the Board of Examiners

July 2012

General comments on Subject ST2

The Examiners' Report covers more points than would be expected to get full marks. This is so that alternative approaches to questions by different candidates can be accommodated within the marking scheme. Candidates are expected to show knowledge of the relevant content of the Core Reading, but those who tailor their answer to the specifics mentioned in the question will score more highly than those who answer in a more generic way.

Comments on the April 2012 paper

As usual, questions that focussed on knowledge of the Core Reading were well answered. Higher marks were scored by those that could apply that knowledge to the situations described in the questions (for example, see the comments on questions 1 and 4).

There were cases where candidates did not read the question properly and gave irrelevant answers (for example, see the comments for questions 2 and 3) or were too generic in their responses without giving the correct level of detail and missing easy marks (see the comments for question 6).

Candidates should use Examiners' Reports to practice applying their knowledge to the situations set.

- 1** (i) A stochastic model of rates of return on investments is used to simulate the future price of assets. The assumptions underlying the model must be carefully evaluated to ensure that they correspond to the company's planned investment strategy during the phase before the guaranteed annuity option is exercised.

A large number of simulations are needed in order to obtain reliable estimates. The guarantees depend on future market conditions and so factors influencing the value of the liabilities as well as assets will need to be simulated; in particular interest rates at the time of exercise will need to be simulated.

The company will need to make assumptions regarding expenses and mortality which would need to take account expected experience. The company will also need to make assumptions about future rates of exercising options, which would take into account expected policyholder behaviour and the size of the guaranteed amount relative to asset share. Allowance should be made for interactions between assumptions.

The present value of the liability can be determined by discounting the simulated cost of exercising the option at a suitable rate. The 'cost' of exercising the option is the difference between the fund at term and the price of the annuity guaranteed. Repeated simulation will generate the probability distribution of the present value of the cost of the option. A best estimate valuation would be based on the average of the simulations. A margin may be added, or a higher confidence level taken, depending on the purpose of the valuation.

- (ii) Policyholder behaviour depends mainly on whether a higher annuity than is implicit in the guaranteed annuity can be bought in the market. The main reason for such a difference is likely to be investment conditions, but mortality assumptions will also contribute.

In order to harmonise the annuity rates, companies are either going to:

- increase the annuity that a female will get for a given premium and reduce rates for males
- or they may just leave female rates the same and reduce male annuity rates

Different companies may take different approaches, but competition is likely to be a key driver, and so there is likely to be some consistency between companies.

This uncertainty makes projecting whether or not the GAO is valuable to the policyholder more difficult. In addition, there may now be more difference in take up rates between males and females. For example if market rates for males become more expensive, the take up rates for males could increase because the GAO could now be exercised due to this issue as opposed to being due to investment conditions. Or for example if female annuity rates mean that it is cheaper to buy an annuity in the market, then take up rates could decrease even if investment market conditions would suggest otherwise.

Importantly, take up rates are no longer mainly dependent on what it costs the company to pay the annuity (as this cost does not change due to the rule change), but rather they depend on the potential distortion between market premiums and actual costs. So for example the company could find take up rates for females decreasing, even if the actual cost to the company of paying the guaranteed annuity is increasing.

With all the complexities involved, the company will need to monitor what the market is doing and use this to inform it of potential take up rates. The decision may depend on the split of males and females within the current and target future market.

The question implies there is a difference between male and female mortality. The solution assumes that female mortality is lower than male. Marks were given where the opposite was assumed and stated, but arguments needed to be internally consistent to gain full credit.

In part (i) the majority of candidates were able to describe the mechanics of stochastic modelling and the better candidates applied this to GAOs defining the 'cost' to the company correctly. Part (ii) was not generally well answered with many candidates missing that existing GAO terms were not affected and also discussing how new annuity take up rates would be affected. Most lacked the higher level insight to score well with only the stronger candidates considering the items that impact the customers take up decision.

- 2** Once reversionary bonus has been allocated to a policy it cannot be taken away, whereas terminal bonus gives the company more flexibility. The marketing director's suggestion regarding bonus balance will therefore mean that the guarantees on the product will be high. This will increase the marketability of the product if policyholders prefer guarantees. Therefore, high sales volumes, and hence profit, may be possible depending on how the product compares to its competitors.

Also, the company's shareholders may want to have the profit distributed as soon as possible and so would like the higher reversionary bonus proposal.

The guaranteed benefits will be broadly matched by fixed interest assets and discretionary benefits will be matched by assets providing a real return (e.g. equity/property)

However, having a high proportion of reversionary bonus and low terminal bonus accelerates the distribution of surplus and would be expected to increase the reserving requirement. This is not good given the company has low free assets.

A higher equity backing ratio will ordinarily lead to higher payouts. A high equity backing ratio means that the returns and the asset share will be more volatile than if an investment strategy of investing in gilts was used. This means there is an increased risk for the company of the asset share at maturity being lower than the guaranteed benefits under the policy. The shortfall between the asset share and the guaranteed benefits would need to come from the company's free assets, which are limited and hence may threaten solvency. As the company has only limited free assets, it may not be able to take this level of risk through use of smoothing or mismatching reserves

The company could charge for the guarantees or pay less than asset shares at other times, to meet the cost over time, but this does not remove the short term risk of the volatile returns.

A high equity backing ratio will mean that the assets backing the liabilities will be volatile, which may significantly increase the reserves, further reducing the company's limited free assets.

Overall, the two aspects of the proposal do not fit well together and the company may need to consider offering just one or the other or use a compromise between the two. The decision may depend on the specific target market (which may expect high levels of guarantees), which itself may depend on the distribution channel chosen. For example insurance intermediaries may have more financially sophisticated customers who may prefer a high EBR.

The company may need to consider whether there are any regulatory restrictions that would relate to these proposals and would need to consider the importance of avoiding setting unrealistic policyholder expectations, e.g. it could not start with a high reversionary bonus strategy and then decide to change this if things went wrong, if it had publicised the product as having such a strategy.

The company has limited experience in with profits business and hence may adopt a more cautious approach.

A fairly well answered question with the majority of candidates identifying that high regular bonuses conflicted with high EBR. Better answers considered the pros of the suggestion as well as the cons. A sizeable proportion of students described the different bonus distribution mechanisms which wasn't required by the question and hence scored few marks.

- 3**
- (i) Equity market movements to the extent that they affect this unit-linked fund.
Dividend receipts.
Purchase/sale expenses incurred from buying/selling.
Amount of current assets/liabilities in the fund.
Accrued tax.
Approach taken to rounding.
Initial charge on purchase/allocation of units to cover management expenses, commission and profits.
Annual management charge.
Whether pricing is on a bid or offer basis, which itself depends on the relative levels of cashflow into or out of the unit fund over a reasonable period.
Foreign exchange rates if underlying assets are in a different currency to that used in pricing the unit linked fund.
 - (ii) The company could be out of the market too long between receiving money and the unit price being allocated. So the company exposes themselves to either complaints from customers (if they do not receive the unit price they expected) or market movements between the price they allocate and the price they actually get. This can equally apply to surrenders.

Time lags can be exploited by policyholders or sales people, if they can trade units at a price which is based on known market movements.

The initial charge taken may not be adequate to cover management expenses/commission etc and annual management charges may be insufficient to cover ongoing administration expenses.

The tax may be determined incorrectly and not treat all policyholders fairly. In addition the tax allowed for in the fund may not reflect the tax position of the company.

The company may not move from offer to bid basis at the right time so policyholders get the wrong unit price (which again could lead to complaints) or the company itself suffers a loss.

There may be a mass exodus from a particular unit fund which the company had not anticipated, resulting in the unit price not reflecting the sale expenses appropriately. Or the company may not be able to liquidate the underlying assets quickly enough or may have to liquidate at a lower price to pay for these high surrender claims. This is a particular risk in a fund investing in illiquid assets where the unit pricing may include a "stale" price e.g. property

The unit price may be miscalculated, either on a specific day or over a period of time. This could be due to inadequate documentation or controls. Where the error is not in line with the terms and conditions the company will need to compensate policyholders. If the errors recur and customer service suffers, there may also be a related reputational risk. Which could adversely impact new business volumes or lead to higher lapses.

There may be a regulatory/compliance risk that processes and practices may be changed as a result of changes in regulations or guidance

Part (i) was reasonably well answered with candidates who focussed on the specifics of the fund scoring well. Some candidates listed factors affecting the general economic environment (e.g stockmarket falls), and marks were only given for these comments where candidates indicated how these might affect a specific unit fund. Part (ii) was poorly answered with many candidates discussing the risks of a unit linked product rather than the pricing of a unit fund and others considered only a narrow set of points. Only the better candidates thought widely enough to score well in part (ii).

- 4** (i) Individual term assurance is a simple product: a set premium for a set benefit over a set period. For the customer, the main decision will be based on price. As internet is a low cost distribution channel, it will suit a product sold primarily on price. The internet is appropriate for simple products

As the company is a recognised brand, customers looking to buy this product are likely to visit the company's website. Customers are likely to trust purchasing this product from a recognised brand.

If the customer is also able to complete the purchase via a simple online process, then this will be an effective channel. The company may have a simplified underwriting process that allows this.

- (ii) This is an additional channel and hence should increase sales and potentially profits. The company already uses insurance intermediaries and so will not have to incur significant set up costs to add this channel to its individual term assurance product. However, there will still need to be systems changes made. It may be that the insurance intermediaries it uses currently are not active in the individual term assurance market.

The target market is likely to differ between the two types of distribution channel, so the company may have to reconsider its pricing assumptions and decide whether to price differently for the new channel. It is likely that the customers of insurance intermediaries are more affluent and financially sophisticated. Therefore mortality may be lower due to the higher socio-economic class. Persistency assumptions are also likely to be different.

Potentially there may be higher initial anti-selection risk and higher selective withdrawals in the business sold by insurance intermediaries. It is likely that the level of underwriting will need to increase for the customers of insurance intermediaries. The current level of underwriting (used for the internet sales) is likely to lead to premiums that are too high in the intermediary market, so the company will need to increase underwriting to allow premiums to be competitive. The company needs to consider whether it has the necessary underwriting skills.

The company will have to decide on the appropriate level of commission to the intermediary and the structure of that commission. High initial commission might mean that the product will have higher capital strain through this proposed new distribution channel.

The potential higher costs both of distribution and underwriting will need to be considered.

It may be that the average policy size will be significantly higher than for the business through the internet. The company may need to review its reinsurance arrangements to reflect the differences.

The lack of comparison with other companies on the website may mean that the company can write internet business on very profitable terms. These premium rates may not be competitive in the insurance intermediary market and insurance intermediaries aim to find the best contracts in terms of benefits and premiums for their clients. The company will need to consider whether, given the potential differences in pricing assumptions for the new channel, it can compete in the insurance intermediary market with reduced profit margins. Whilst still achieving the desired profitability.

This approach may be in response to similar action by competitors or in order to achieve a competitive advantage.

The mis-selling risk will change, although part of this risk will fall onto insurance intermediaries. As the company will have less control over the sales process. In addition, there may be greater risk in pricing as the company will not have experience data (mortality, persistency) for this target market and product. There will be increased counterparty risk from the potential of intermediaries not paying premiums

The company could consider alternative distribution channels or methods (e.g. mailshots, or via other existing channels it may already use)

A fairly well answered question in both parts. A minority misunderstood the question and compared selling group policies to selling individual policies. The stronger candidates realised different levels of underwriting would be required for the IFA channel and with larger policy sizes could lead to better profit. Most candidates produced an answer considering a number of different points for part (ii).

- 5**
- (i) Guaranteed in money terms
Guaranteed in terms of an index of prices or similar
Discretionary
Investment-linked
 - (ii) In general the assets should reflect the nature, term and currency of the underlying liabilities.
 - (a)
The benefit is guaranteed in terms of an index. Ideally invest in an asset whose return is linked to the same index as the benefits. If no assets linked to that specific index are available then use a similar index, e.g. CPI and RPI indices.

Would want to match asset and liability cash-flows by term. So, buy corporate or government index-linked bonds. The return is higher on corporate bonds but they introduce credit risk so this would be subject to risk appetite and any credit risk policy the company has.

However, there may not be a sufficient amount of index-linked bonds available, especially of long enough term to match an annuity. An alternative is to invest in real assets (e.g. equity/property) as they can provide a real return and match longer terms but this increases default and liquidity risks.

Another alternative is to buy fixed rate bonds, corporate or government, with a fixed to floating swap overlaid. This introduces the use of a derivative so may be restricted by the company's policy on investment in derivatives, and is also more complex.

It is likely that some cash would be required to top up any payments not met by the bond coupons.

There is a related expense reserve, which would also broadly be linked to an index, so should be matched by similar assets to the benefits. Or possibly may

consider equities if the expected rate of expense inflation cannot be matched by an asset linked to a suitable index.

A final consideration should be whether there are any valuation rules or other regulatory restrictions.

(b)

The benefit is guaranteed in money terms in respect of base sum assured and ten years' bonuses declared to date. It is a discretionary benefit in respect of future reversionary and terminal bonuses.

Investment options are likely to be restricted by PRE, for example, what the company has told the policyholder in its sales and other product literature.

Fixed rate bonds could be suitable to back the sum assured and bonuses declared to date; corporate or government will depend on the risk appetite of the company. The term of the bonds should match the outstanding duration of the policy (i.e. 15 years).

The overriding principle for investment to provide future bonuses is to aim to maximise the return. Choice of asset to provide future bonuses will be dependent on the bonus policy, e.g. the split between future regular and terminal bonus. A mixture of equity and property is most likely for future discretionary bonuses. The amount of free assets will also determine the amount of investment freedom the company has. Lower free assets would usually mean a higher proportion of bonds or vice versa.

As the policy moves through its term and more bonuses are declared, investment would shift away from equities and into bonds. The company would also consider the investment mix offered by competitors.

Most candidates scored full marks for the bookwork in part (i) however few then applied this in part (ii) to the specific products. Though a relatively simple question there were a surprising number of candidates who did not score well due to straying too far from a well-matched investment strategy or not covering the investment options in enough depth. In general candidates who used "nature, term, currency" as a structure produced better answers.

- 6** (i) An immediate annuity is a contract to pay out regular amounts of benefit provided the life assured is alive at the time of payment. The contract starts payment immediately without a deferred period. Payments may be made in advance or in arrears, with the maximum period to the first payment being the frequency period of payment.

The contract is purchased in advance by a single premium, where this premium may be the proceeds of another contract. A country's pension legislation may specify that an annuity must be purchased from part or all of a pension fund accumulated to the retirement date.

For the consumer the contract converts a capital sum into a lifetime income, removing the uncertainty of how quickly capital should be spent to provide income over the consumer's remaining lifetime.

Immediate annuities may be purchased on single, joint life first death or last survivor bases. A last survivor annuity can be used to provide for dependants' income following the death of the main life.

Immediate annuities can be payable for temporary periods only, making them suitable, for example, to pay the school fees of the insured's children.

The regular benefit payments may be level or variable, the most common variable being a fixed or inflation linked increase. An option may be available for the payments to be made for an initial number of years irrespective of whether the life insured survives the initial period. Alternatively, there may be a guarantee that, on death within a specified period, any shortfall between the initial premium paid and the amounts of annuity received to the date of death will become payable. Surrender values are not normally payable.

Different versions of the product may be offered e.g. an impaired life annuity, a group version of the contract can be used by an employer to fund for pensions for his or her employees at or after retirement, a unit linked version or a with profits annuity.

- (ii) In general, the assumptions used to determine the liabilities should have regard to the legislation and accounting principles governing the preparation of those accounts in the country concerned. All of the assumptions should be prudent, including an appropriate margin against adverse deviation.

Mortality

Assumptions will be required for the base mortality level and for the level of expected future mortality improvements. The assumptions chosen should have a regard to the country where the annuitants live.

The prudential margin would be a *reduction* in base mortality, and *faster* future mortality improvements.

Expenses

An allowance for expenses should be included which should reflect expenses expected to be incurred in administering the annuities. Allowance may also be made for a share of future expected overhead expenses.

The prudential margin would be an *increase* in expenses.

Inflation

An explicit assumption will be required to allow for the future inflation of expenses. It may also be required to allow for the future inflation of benefits, if the annuity is index-linked.

The inflation assumptions could be based upon the:

- current rates of inflation, for both prices and earnings
- expected future rates of price and earnings inflation
- differential between the return on government fixed interest securities and on government index-linked securities, where they exist
- recent actual experience of the life insurance company or industry

The prudential margin would be an *increase* in inflation.

Valuation rate of interest

A valuation rate of interest will be required which should have regard to:

- the yields on corresponding existing assets
- the level of default risk for corporate bonds
- a level of reinvestment risk

A prudential margin could be included which would *reduce* the valuation rate of interest.

Taxation

An allowance for taxation will need to be included as an assumption either explicitly or implicitly within the assumptions for valuation rate of interest or other assumptions.

The bookwork in part (i) was well answered with most candidates covering the main features and uses. The most common omissions were that increasing annuities could be with a fixed or index-linked increase and distinguishing between the two different joint life options. In part (ii) most candidates identified the main assumptions required and many stated that they should be prudent but few continued to explain what prudent meant in practice. As a result a number of relatively easy marks were missed. Many candidates also confused the assumptions for valuation interest rate, risk discount rate and future investment returns.

7 (i) Investment Performance

The annual management charges are dependent on the investment performance and hence may not generate sufficient income if investment performance is lower than expected in pricing. This is also true for the withdrawal charge. This is a particular issue because the unit-linked funds are

chosen by the policyholder, and hence the company has limited control over the choice of those assets.

Expenses/Charges

There is a risk of higher than expected administration expenses. Expense risk is greater as a result of the annual management charge being fixed and not variable.

There may be a risk of higher than expected inflation if the increase in fund value (and hence annual management charge) does not keep pace with expense inflation. Conversely, if inflation is lower than expected the initial charges may be lower than expected and not recover the actual initial costs.

The initial charges are deducted from the value of units, hence there may be related liquidity risk.

There is a risk that the charge for switches does not reflect the actual costs involved in switching units.

Mortality

Because the additional sum assured is a fixed amount, there is a risk of earlier deaths than expected. The relative size of this risk depends on the level of additional fixed sum assured applied.

Anti-selection may be worse than expected depending on the extent of underwriting undertaken.

Withdrawal/surrender

There is some risk of higher than expected withdrawals, particularly early on.

The outstanding initial charge is deducted on surrender, which reduces this risk depending on the extent to which the initial charge covers the initial expenses and commission for this product. Higher than expected surrenders will reduce the generation of future profits.

There is also a risk of the level of partial withdrawals being higher than expected in pricing which will potentially expose fixed expense levels and hence reduce profits.

Selective withdrawals may be possible if the fixed additional death benefit is relatively large.

New Business Volumes

There is a risk of new business volumes being significantly higher than expected during any particular period. This could cause administration strain and it could cause capital strain and risk of insolvency. This is particularly the

case here because new business strain could be high, depending on the regulatory reserving requirements, due to the initial expenses and commission being larger than day one charges received. As the initial charge is not unit-related it cannot be actuarially funded, but credit for that charge could be included in non-unit reserving calculations, but only to the extent that local regulations permit (e.g. the local regulations may not permit negative non-unit reserves).

There is also a risk of significantly lower than expected new business volume which exposes the company to expense risk, with fixed overheads possibly not being covered by charges.

New Business Mix

Since many of the charges are related to the size of fund, there is a risk that smaller than expected policies are sold. There is also a risk that the assumed mix by age of policyholder is different from that expected, especially as there is no explicit mortality charge.

Reputation

Deducting the outstanding charges on death, and explicit partial withdrawal charges, may be unusual and could generate a reputational risk. The product could be mis-sold or “churned” by some insurance intermediaries.

Other

There is a risk of policyholder fraud, e.g. money laundering. There is a legal risk if policy conditions are not appropriately worded. There is a risk of changes to the regulatory or tax regimes, e.g. inheritance tax changes may reduce the attractiveness of the policy. There is the risk of actions of competitors, e.g. launching a similar product and stealing market share

There will be an operational risk of unit pricing errors, and given this a new company this risk may be high. There is a risk of failure of appropriate management systems and controls.

If the company uses reinsurance, there is the risk of failure of the reinsurer. There is also some credit risk as a result of intermediaries not paying premiums to the insurer this increases the risk relating to the recovery of expenses and profits.

- (ii) Reinsurance is most likely to be used to mitigate the:

Mortality Risk

To mitigate the mortality risk, would likely reinsure only the sum at risk i.e. the fixed additional sum assured. This is because it is difficult to obtain agreement to reinsure unit-linked benefits to which the reinsurer has no link.

Original terms reinsurance is unlikely to be viable because there is no separate premium/charge made for the fixed sum assured.

Most likely to use risk premium reinsurance where premium rates would be defined by reinsurer and may be guaranteed or reviewable. Could be quota share, whereby a specified percentage of each policy is reinsured, or individual surplus treaty, whereby the reinsured amount is the excess over retention limit.

The company could use stop loss reinsurance to mitigate excessive death claims over a defined period.

New Business Strain

Company is relatively new and would want to limit new business strain and hence could use financial reinsurance. This could be asset enhancing or liability reducing. The asset enhancing version could be via financing commission.

In this case it is likely to be asset enhancing, with the reinsurer providing funds that are repaid out of surplus emerging over a specified period. It could be that the initial charges, or a proportion of them, are paid direct to reinsurer as they emerge.

Repayment is contingent on surplus emerging, therefore there is no requirement to hold a liability on the balance sheet, but the assets can be included.

Both parts were fairly well answered particularly in part (i) where candidates discussed a wide range of risks. The stronger candidates considered the specifics of the question and hence detailed how the risks applied to this particular product. Few candidates spotted that mortality charges would be significant but were wrapped up in the general charge and that the mortality risk was really earlier deaths than anticipated rather than generally higher mortality. When candidates scored poorly it was generally because they only considered a small range of risks and failed to link those risks to the specific product. In part (ii) many candidates identified relevant types of reinsurance, particularly the financial reinsurance aspect, but only the stronger ones pointed out that the unit fund would not normally be reinsured. Very few commented that original terms would not apply as there is no specific mortality charge.

END OF EXAMINERS' REPORT