Actuarial Society of South Africa

EXAMINATION

30 MAY 2011

Subject F202 — Life Insurance Specialist Applications

EXAMINERS' REPORT

Question 1

i. **List the sources of surplus available for distribution to the with profit policyholders**

This was a straightforward bookwork question. Most candidates scored very well.

The sources of surplus are:
- Investment income (and capital appreciation) on reserves held.
- Release of any bonus loadings in the premiums received.
- Expense surplus.
- Mortality surplus.
- Withdrawal surplus.
- Surplus from other contracts.
- Mismatching surplus.

ii. **Describe in detail how you would determine suitable bonuses to declare over the next year**

While most candidates demonstrated understanding of the principles of bonus declaration, only a few were sufficiently familiar with the specifics of conventional with profits business to be able to score well.

First, need to update assumptions (future investment income, inflation, expenses, and withdrawals) in line with recent experience and current expectations

Bonus earning capacity of existing business
Realistic valuation, using the gross premium method, in conjunction with asset shares to assess the suitable level of reversionary bonuses for in force business.

Find the future bonus assumption that will equate

> Value of guaranteed benefits plus value of future bonuses less value of future premiums with the value of the asset share by contract type and duration

This is the bonus earning capacity of existing business. If regular bonus only is allowed for, the answer should be (much) higher than the intended level of reversionary bonus so as to leave room for terminal bonus.

Asset share should include:
- contributions from without profit and unit-linked business if appropriate.
- transfers to shareholders.
- possibly a charge for use of capital and guarantees.
- Profit from lapses and surrenders.

This will probably indicate that we cannot support the current level of reversionary bonuses, especially if we have been slow to bring down the rate in the past. The rate may need to be reduced for policies with long outstanding terms.

Although any cuts will need to take into account PRE and PPFM.

Competitor bonuses will also be considered. However, it is likely that such business has not been written for many years, potentially reducing the importance of maintaining competitive bonuses.

Sensitivity testing will be carried out, to ensure that reversionary bonus can be maintained over at least some changes in financial situation.
Alternatively, stochastic projection methods may be used.

The target funding levels should be considered.

Terminal bonus

For policies close to maturity, compare asset share, calculated on as close to the actual experience as we can get, with the proposed maturity value. TB will be set to achieve equity.

Exact equity is not the aim, since some smoothing is required.

Falling yields recently should give significant capital gains on in-force business, boosting asset share. Smoothing would indicate paying less than this asset share.

The degree of smoothing will reflect PRE, and the company's bonus philosophy.

The company may have some internal smoothing mechanism, e.g. terminal bonus must be within 10% of last year's levels for each duration.

Model office

Model office projections will be used to project the future solvency position of the office. One can also investigate the consistency of the investment policy and impact of changes in future investment conditions.

The model office will be particularly useful for investigating how we plan to move terminal bonus rates over the next few years.

Analysis of surplus

It will be necessary to investigate the sources of distributable surplus. If the surplus is stable, increasing and recurring, then regular reversionary bonus will be suitable. If it is reversible, then terminal bonus is preferable. One-off surpluses may be distributed via a special bonus.

One should ensure that the methods used to determine the bonuses are consistent with Company A's PPFM.

iii.   Describe how you would calculate the PGN110 reserve for the product

This was similar to sub question (ii) in that most students found it difficult to apply PGN110 principles to conventional with profit business.

Unlike a normal point guarantee, the cost of the guarantee in a reversionary bonus fund is not calculated per policy at the maturity of the policy.

The policy conditions and PPFM will normally indicate that there is cross subsidisation between different cohorts of policyholders and that bonuses will be adjusted in such a manner to aim that over time the assets are paid out as bonuses.

However, there is a risk (and thus a cost to shareholders) that investment returns are so poor that the assets are utilised before all of the policies have moved off the books. The cost of the investment guarantee is thus that the vesting bonuses need to be paid out and that the shareholders will have to honour this obligation in adverse investment conditions where the bonuses declared (and cancellation of terminal bonuses) cannot recoup the shortfall.

As this is a reversionary bonus product with terminal bonuses, it is unlikely that the cost will be significant, unless the level of terminal bonuses is relatively low.

One will have to use a stochastic model to determine the cost of the guarantee. The bonus declaration operates on a global level, so one needs to determine the value of the assets, the value of the liabilities and the bonus declared at a portfolio level. Then each policy must be rolled forward one month with per policy decrements, after which the global level summation is once again performed and the process repeated.

In the global summation of the assets, the shortfall or surplus arising from the difference between the per policy asset value and the per policy benefit payment must feed through to the build-up of the assets.

The above process is then performed until the last policy runs off, or where the assets in total become negative at some earlier point.

In the cases where the assets do not become negative, there was a surplus arising and thus no cost arose for the shareholders.

Where the assets do become negative, the cost is calculated by discounting the value of the bonuses on the portfolio as a whole at the point the assets are depleted.

The above ignores the fact that according to PGN104 one should inject capital when it becomes clear that the shortfall will not be recouped in three years. However the argument is that any such injections will be treated as shareholder loans that will be recouped should the assets recover. One will therefore obtain the same cost whether one ignores the injections of capital plus interest or includes them.

Where a charge for the cost of the guarantee is made, the present value of the charges can be subtracted for the cost of the shortfalls as described above. However this is unlikely for a reversionary bonus portfolio, unless a specific adjustment is made to the expected returns before determining the affordable bonus rates.

One will also have to consider the PRE and PPFM to ensure that the correct cost is calculated. The Board will have to ratify that should the portfolio fail, terminal bonuses will be cancelled, as well as future zero reversionary bonuses will be declared. If not, the calculation will have to take into account the minimum bonuses above zero that will be declared to minimise the reputational risk.

The PGN110 reserve is then the present value of the deficits less the present value of the charges for the guarantee.

The calculations can either be performed using a real world market consistent model and deflators to determine the cost, or using a risk neutral market consistent model.

The advantage of using a risk neutral model is that the fewer simulations are required for the simulation to converge.

A risk neutral model generates the same investment return paths that a market consistent real world model would generate, but only with a different probability density function for the paths. So therefore the same bonuses have to be declared for that path whether the path was generated from a risk neutral or a real world market consistent simulation.

Preferably perform at least 2 000 simulations, as per PGN110.

Question 2

i)   Discuss the major shortcomings of the current simplified measure:

This was an application question that was relatively well answered. In particular, candidates who used the main features of the CAR regime as a basis for generating ideas were able to score well.

At the highest level, the formula ignores many significant risks, including:

- Market risk.
- Interest rate risk and term structure of interest rate risk.
- Lapse and surrender risk.
- Foreign exchange risk.
- Market volatility risk.
- Credit risk.
- Liquidity risk.
- Longevity risk.
- Operational risk

With such a simplistic approach, there is only a weak link between the risks borne by an insurer and its capital requirements. This may fail to adequately protect policyholders.
For example, the requirement for risk cover (0.1% of total sum at risk) ignores the risk profile of an insurer's business in terms of age, socio-economic class, underwriting standards, etc.
It also ignores insurers' own experience.

There is little comparability between different insurers that have different risk profiles. The approach is therefore not equitable between companies. It is also unlikely to act as an effective early warning system for the industry.

The method does not take into account the riskiness (credit risk and market value volatility) of the assets supporting the liabilities.

It also does not reward diversification between various risks.
Similarly for diversification within risks, for example in the benefits gained from economies of scale in a large mortality book.

It does not assess an insurer's ability to survive a run-on-the bank scenario.

Does not take into account the nature of the risks covered by products sold.

The management actions that an insurer may take to protect its solvency are ignored, for example reducing bonus rates (or other appropriate example).

It does not assess the impact of large shifts in market conditions influencing market values of investments, interest rates, exchange rates, etc.
Not all companies have the same exposure to market risk: some may have very high equity exposure and should arguably hold more capital against extreme equity events – this is allowed for in CAR calculations.
Also, it ignores the risks introduced by the assets that the capital itself is invested in.

It does not reward an insurer for any strategies it uses to mitigate risk, for example matching, hedging, or reinsurance.

The calculation does not provide information which would be useful to companies' risk management processes.

The calculation does not provide the kind of information regarding the cost of capital which could be used in product design and pricing, and calculations of shareholder value.

Previous years' expenses may not be a good indicator of the future.

Policy liabilities may be negative, which could actually reduce the capital required.

It does not take into account the level of prudence in the policyholder liabilities. A company which has calculated reserves using large discretionary margins will have to hold more capital than a similar company which has not.

(ii) **Describe the factors that the regulator should consider when deciding whether to adopt the CAR methodology.**

This was one of the questions where better prepared candidates were able to demonstrate application skills, while other candidates failed to consider wider issues.

The regulator should consider the aims of its solvency assessment regime, which should include:

- Requiring sufficient capital for policyholder protection but

- Not to the extent that the requirements are prohibitive or endanger the viability of the industry

- Stability in the financial system

- Minimising the need to intervene to assist a troubled insurer

- Enhancing comparability between different insurers

The implementation costs to the industry should be compared to the expected benefits that will be derived from the modernisation.

Additional resources and time will be required for insurance companies to comply with the new measure.

System changes might be required. Overall, this would increase costs to the insurers which could be passed onto consumers in the form of increased product charges.

The CAR calculation is an existing framework that has already been implemented in another country, so there is no need for the regulator to spend time and money developing its own.

The regulator can liaise with the South African regulator to benefit from their experience.

It should consider whether the CAR calculation adequately covers the risks that insurers are assuming, given the products sold in the country.

The regime should be proportionate. It should not be overly complex if the products sold are simple.

South Africa is moving towards a Solvency II-type regime (SAM). The regulator may want to consider whether it would be more appropriate to move to such a (more sophisticated) regime.

The CAR is a form of risk based capital so would be a good first step in changing managements' approach to capital management. Converting to a fully risk based, internal capital approach will require significant change management at all levels (including the board). By introducing the CAR as an interim measure, will assist with the change management process by introducing the move in stages.

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However, the regulator might prefer to wait until the introduction of SAM, which might result in changes to the South African regulatory regime. Implementing the CAR as an interim measure may require substantial work that may need to be re-done once the new regime is in place.

Are the parameters in the CAR calculation suitable for the country, or do they need to be recalibrated? Is there sufficient data to calibrate to?
In particular, risks related to foreign assets may be critical in a small country where there may be limited investment markets.

The regulator should ascertain whether it is able to process and use the extra information provided by insurers i.e. whether the regulator is adequately staffed?

The regulator may make use of dry runs by requiring insurers to provide CAR results on a test basis. This would allow all parties to understand the potential effect on capital requirements of changing to the CAR calculation.
The regulator might be loathe to introduce a system which significantly reduces the capital held by the industry (weakening policyholder protection), but would also want to avoid having a large number of insurers need to recapitalise overnight.
A phase-in period could be considered.

Does sufficient actuarial expertise exist in the market to implement the new regime?

Are there South African insurers operating in the market, and could the adoption of CAR be seen by local insurers as an unfair advantage?

The regulator may be concerned that extra costs and complexity may discourage new entrants into the market, or discourage foreign investment in local insurers.

If the calculation can be disclosed to investment analysts, the information might help to support share prices.

On the other hand, dividend payment streams are in theory constrained by the capital requirements. If this test should bite for some of the insurers it could be detrimental to their share prices.

Need to consider what the impact would be on any mutual companies in the country as these do not have ready access to capital to recapitalise.

The introduction of a minimum capital requirement (MCAR) may have an undesirable impact on small companies.

The impact on competition with other financial institutions should be considered, especially whether there is a level playing field.

The regulator should consider whether regimes from other countries would be more appropriate.

Question 3

> **(i)** **Discuss the possible advantages to both the company and the policyholders of selling this product, explaining possible reasons for the launch**

This was a very simple application question which was well answered.

Company

The company will be hoping to write the business on profitable terms and thereby make money for its shareholders.

This bond will extend the range of products on offer and so might make the company appear more attractive to investors.

The company might be trying to match the product range of its competitors.

Alternatively it might be losing market share elsewhere and be hoping to make up for that with the new product.

The product might help the company break into a new target market that was previously untapped.

This will expand its client base and so the company will in future be able to cross sell other products to these investors.

The product might also help the company to improve its image as an investment product specialist.

Market research might have highlighted a demand for this type of product.

Allows the company to sell an investment policy with a guarantee, but which is not capital intensive.

If the company is in an XSE position, it may be able to use its tax position to sell an XSI product more competitively or profitably.

Policyholders

Bond policyholders will have a chance to share in the potential growth of the stock market whilst being protected from the downside, due to the guarantees.

Diversification across the stock market is obtained without having to invest in many separate stocks oneself.

The return on death will not be less than the premium paid.

(ii) **State the two asset combinations that are most commonly used to back guaranteed equity products.**

Most candidates were able to earn the marks available. However, some appeared to be unfamiliar with these simple derivative structures.

The two combinations are:

Zero coupon bond plus a call option

Shares (or units in an ALSI tracker) plus a put option

(iii) **Describe the risks to the company involved in launching this product**

This question required candidates to consider the practical implications of a new product design. It was not well answered, with many either failing to identify the key risks, or producing solutions that were not sufficiently tailored to the product in question.

The ultimate aim of writing any product will be to make a profit for the shareholders, so the overall risk is that the profit made is below target, or even worse, a loss is made on the contracts.

The contracts will almost certainly be backed with derivative contracts.

These will be tailor-made for the company to meet their specific risk profile and so will be over-the-counter contracts, rather than exchange-traded.

This implies that there will be no clearing house to guarantee the contract, so the company is at risk of loss from default of the counterparty.

There is a risk that the investors do not fully comprehend the risks they are taking on and that they are subsequently unhappy with the final payout of their policy, which may lead to reputational damage.

The risk can be reduced by fully explaining the risks in the marketing literature.

There will be a mismatch in expenses between large and small single premiums, and thus an element of cross-subsidy.

An average premium will have to be assumed when setting the terms.

There is a risk that the mix of business by size is different from that assumed, leading to insufficient charges to meet expenses.

The terms are independent of age and there is a death strain at least for early durations. Therefore there is a risk that the average age of investors is higher than assumed in pricing.

There is a risk that insufficient volumes are sold to recoup the development costs.

If the company agrees to purchase a specific volume of some derivative from the investment bank, there is a risk that volumes are lower than expected, resulting in the purchase of a now unneeded asset or possible a penalty payment.

If the price of the derivative depends on the volume required, the low volumes of business might increase the unit cost of the derivative, reducing profitability.

This is a totally new product so the company has no directly relevant experience on which to base any of its pricing assumptions. There is therefore a risk due to inappropriate assumptions.

The death benefit is guaranteed to be at least the original single premium. Therefore there is a risk of loss on death at early durations, due to initial expenses not having been recouped.

The extent of the loss will depend on the commission terms to be offered.

If the investment profile can be closely replicated by a combination of bonds, equities and derivatives, then the investment risk is largely passed to the policyholders and investment bank once these replication assets have been bought.

However, there is still the period between the product terms being signed off and the investment of the monies, during which the price of the derivatives could move against the company.

The make-up of the maturity value is quite complicated and it is not obvious that it can be replicated with the base derivatives on offer.

The terms of the contract are guaranteed and so there is no scope to increase charges once a contract has started. The company is therefore at risk that expenses turn out to be higher than assumed in the pricing basis.

Higher than expected inflation will increase the above risk but since the term is only five years, the effect should be relatively small.

Development costs are very uncertain, since new systems are likely to be required. Also the new systems might not be ready in time or deliver the full functionality required.

The surrender value is not guaranteed in advance, so the risk of loss on withdrawal is much reduced.

However the initial expenses will cause the asset share to be below the premium paid and there might be some pressure not to pay out surrender values much below the premiums paid.

This would result in losses on early withdrawals but the company could aim to subsidise these form lower payouts in respect of later withdrawals, so that overall the withdrawals are cost-neutral.

Since surrender terms are discretionary, the exact payouts for later withdrawals could be determined after analysing the withdrawals at early durations.

There is a risk that another competitor will launch a similar product at the same time, or slightly earlier, capturing a significant proportion of the market premium invested during our offer period.

If the competitor's terms are more attractive than ours, then we are unlikely to sell much business unless the competitor reaches their limit very quickly, leaving our product as the only one open for investment.

The company might have no previous experience of specialised over-the-counter derivatives. This may lead to inappropriate derivative contracts being entered into or inappropriate monitoring being put into place. This risk is increased if the company does not have its own in-house investment expertise.

There is a risk that the investments are taxed on a different basis than assumed in the pricing which will reduce the profitability of the contract to the company.

The taxation regime could change over the five year period. The contract needs to include wording that such changes are for the account of the policyholder.

(iv)   Explain how you would estimate the embedded value on this product

This question was largely bookwork and well prepared candidates were able to produce good solutions.

Determine a set of assumptions on a realistic basis.

Assumptions will include interest on rand reserves, tax, mortality, expenses and withdrawals.

Use reinsurers' data if available, since there is no relevant experience within the company.

Adjust for any expected differences over the next five years, compared to the recent past.

Choose model points to represent the expected mix of new business.

Project forward cashflows for assumed volumes of business and statutory reserves.

The surplus emerging each year will be the excess of assets over the statutory reserve.

Assume the surplus is distributed as soon as it arises.

Calculate the shareholders' share of the surplus, net it down for tax and discount it back at the required risk discount rate.

The risk discount rate will reflect the return on capital required by the suppliers of that capital.

This is a new type of product for the company, so the risk discount rate is likely to be higher than that required on existing products (unless the company uses a companywide risk discount rate).

Sensitivity analysis should be performed to assets the possible impact of different scenarios

Since the assets backing the liability are closely matched, the amount of capital required will be low, mainly linked to operational risk and counterparty risk, which in general are not significant.

(v)   The marketing manager has now proposed the following modifications to the original design of the contract:

These two sub questions were more difficult application questions and were not well answered.

(a) Link the maturity value to the growth in the NASDAQ index

If the equivalent derivatives are cheaper, then it could result in a more attractive product, or higher margins.

Offshore exposure may be more attractive and thus increase sales.

For the majority of investors, having exposure to a foreign (rather than domestic) stock market will seem much more risky, due to the extra currency risk and different economic situation.

The limits of exchange control for the life insurer need to be taken into account. As long as the guarantee remains rand denominated, then the amount of foreign capacity required will be minimal.

On the other hand, this will again have to be explicitly explained to the policyholders, lest they misunderstand the currency risks they are exposed to.

The effect of this modification on sales will therefore depend on the target market and their level of sophistication.

We would want to know the size of price differential, as well as the volatility in the price differential to see if it will still exist when the derivatives need to be purchased.

It would be far from ideal if the price differential reversed before the derivatives are purchased.

If the company purchases the derivatives in advance, then an assumption has to be made as to the expected sales volumes. If it gets this wrong it will be left with exposure that it did not want.

If the company waits until the sales volumes are known, then it runs the risk of the price differentials reversing, which could lead to a loss.

An alternative to offering better terms would be to take the difference as additional profit.

This might be considered inequitable unless the risk associated with these profits was considered higher, possible due to more uncertainty over sales volumes.

The interest rate environment in the US will differ from South Africa. The NASDAQ may exhibit lower volatility than the ALSI. These factors would affect the terms at which the product may be sold.

(b) Split the investment up into ten identical policies, which may be surrendered separately, as well guaranteeing the surrender values

It is not uncommon for investment products to consist of clusters of identical policies and so this modification might be necessary in order to achieve the desired level of sales.

Legal opinion should be sought on whether this structure is in accordance with the spirit of Section 54 of the long term insurance Act.

Clustering improves the attractiveness of the product by allowing much more flexibility over when policyholders can access their money.

Section 54 limits access in the first five years of a policy to either one withdrawal or one loan equal to the premiums plus 5%. The excess of this amount may only be taken after the five year period.

This issue would therefore be more important if the product was to run for ten years say.

A fair value to give policyholders on partial early surrender will be closely related to the value of derivatives (and possible shares) held by the company in respect of contracts being surrendered.

The value of these will be quite volatile and will not be known in advance, so any guaranteed surrender values could lead to a large gain or loss, depending on the timing of the surrender.

This allows for scope for anti-selective surrenders, which means policyholders are far more like to surrender when the assets backing the contract are worth less than the surrender value, than the other way around.

Since all money will be invested on the same date, the risk of a large loss on mass surrender would be very high.

The suppliers of capital would require a very high risk margin within the risk discount rate to allow for this, making the product terms unmarketable.

Therefore, the surrender terms should not be guaranteed.

END OF EXAMINERS' REPORT