EXAMINERS' REPORT

November 2014 examinations

Subject F104 — *Pension & Other Benefits*
Fellowship Principles

INTRODUCTION

The attached report has been prepared by the subject's Principal 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.

GENERAL COMMENTS

The exam tested a broad array of benefits and contexts, some of which are highly topical. It was thus disappointing that the application questions were so poorly attempted. Candidates often did not use the information that was given and in many cases did not indicate what had not been given. In many cases, it was clear that candidates had not thought through what was being asked before committing pen to paper (or finger to keyboard) and candidates are encouraged to spend more time planning.

QUESTION 1

Candidates did fairly well in the first part of the question and seemed to understand the concepts of probability and expected costs leading to either a surplus or a deficit in a fund. Most candidates did not consider that the cost of a benefit may differ to what was expected because the increase scale in the assumption differed to that used in practice.
The second part of the question was very poorly answered due to candidates not addressing the question that had been asked. Most of the candidates failed to recognise that an AOS had already been performed and went on to list the information required to perform one. Very few recognised the need for past and future data or homogenous grouping.

i. Probability of providing the benefit – the number of contingent benefits provided differs to what was expected based on the probabilities assumed and the benefits are not actuarially neutral. For example:
    - Number of deaths;
    - Number of withdrawals;
    - Number of early retirements;
    - Cash benefits versus transfers where they are not cost neutral;
    - Number of members taking up an option versus expected; and
    - Number of members that are married versus single on retirement or death.
    The expected cost of the benefit –the cost of the benefit is linked to a certain increase index that grows at a rate that is different to what is expected. For example:
    - Salary increases awarded are higher than assumed;
    - Merit salary increases awarded that are not allowed for in the salary increase assumption
    - Pension increases are linked to an index that changes at a rate that differs to what was expected;
    - Pensioners are outsourced during the period and a special increase is given at outsource that differs to assumed at the beginning of the valuation period;
    - Benefits are enhanced in some way; and
    - Younger spouses becoming eligible for spouse's pensions.
ii. Future experience:
    Need to know about events that may arise that will affect the employment and earning prospects for the members. The employer may also be able to provide information about salary inflation in the short term. General inflation trends may assist for longer-term salary inflation.

    Past experience:
    Collect data over a period of investigation long enough to give credible results but short enough to be relevant to future periods.
    Need to collect salary information, by age, gender and duration of employment to control for heterogeneity at at least two points in time the census dates must be known.

QUESTION 2

Considering that this was a bookwork question, the answers were generally disappointing. Most candidates did well in the first part of the question. Candidates understood the concept of MCR in the second part of the question but very few thought to spread the PUCMCR over the control period as opposed to the future working lifetime of members. Candidates seemed poorly prepared for the third part of the question which was entirely bookwork.

i. AASCR = (Value future service allowing for future salary increases)/(PV of total future earnings)
    = 29025/ (10125/0.06) = 29205/168750 = 17.3%
    PUCSCR = Value of next year of service allowing for future salary increases/(PV earnings for that year)
    =1845/(675/0.06) = 1845/11250 = 16.4%

ii. The contribution rate obtained by adjusting the Standard Contribution Rate to allow for any Actuarial Surplus. There are various ways of amortising the Actuarial Surplus and hence of adjusting the Standard Contribution Rate. The method used should be appropriate for the purpose.

AAMCR: Assume deficit amortised over future lifetime of the scheme
29205+(7650-7155)/168750 = 17.6%
PUCMCR: Assume deficit is funded over the control period
(1845+495)/11250 = 20.8%

iii. Main aims
    - recognising the realistic costs of accruing benefits;
    - avoiding distortions resulting from fluctuations in the flow of contributions from the employer to the pension scheme;
    - consistency in the accounting treatment from year to year (although not necessarily from company to company); and
    - disclosure of appropriate information.

    Stability and Realism: The AA method will only be stable if there are no new members - this is unrealistic in an open scheme. The PUC method will produce a stable result only if the age/sex and salary distribution remains stable and allows for new entrants so is more realistic. The PUSCR is more 'realistic' in the sense that it better reflects the actual cost of accruing benefits whereas the AASCR would tend to overstate it.

QUESTION 3

The first part of the question is a common application of benefit projections and asset-liability modelling, both of which are covered in the core reading. A surprising number of candidates did not see that the question was asking them to perform a stochastic benefit projection on a given investment strategy and to vary the contribution rate until a desired target was reached. Very few candidates gave a balanced answer covering an overview of the model, key parameters and assumptions and a description of what the model did. The weakest candidates gave a description on how to calculate a suitable benefit target, which is a very different question.
The second part of the question was generally well-answered. Some candidates came up with novel and practical incentive schemes which gained credit. Most candidates missed extremely obvious points like offering additional voluntary contributions.

i. Require a model where key parameters such as price inflation, salary inflation (including promotional increases), investment returns and annuity prices are modelled stochastically.
It is desirable that the model incorporates other sources of income in retirement e.g. State benefits
Key inputs would be:
- Current age/date of birth
- Current level of retirement savings (may want to include all savings and not just those in the fund)
- Retirement age
- sex
- Marital status and spouse's age
- Current salary (for contribution purposes)
- Pensionable pay percentage
- Current net of tax salary
- Employer contribution rate net of fees and administration
- Investment choice (if applicable)
- Annuity choice at retirement
- Different employees may have different targets so may need to have the employee enter in the target
- Constraints on maximum employee contribution rate

The model will start with a dummy member contribution rate, or the current contribution rate.
Given the probability density functions of the stochastic random variables, a scenario is generated. The total contribution is equal to the projected salary in that period multiplied by the sum of the employer and member's contribution rate. The member's current savings plus the total contributions received in each period are accumulated with fund return net of investment expenses until retirement age. Typically do not allow for decrements pre-retirement. The lump sum value is then converted into an income stream using the price of the annuity. Income tax is then deducted (will need to model anticipated changes in the tax regime) and the net post-retirement income is divided by the projected salary at retirement to give the NRR. One may need to adjust for any legislative restrictions. Whether the NRR was above or below the target is recorded. For the same contribution rate, a large number of simulations are carried out. If more than 95% of the observations lie above the target, a lower contribution rate can be adopted and the process repeated. If fewer than 95% of the observations lie above the target, a higher contribution rate is required.

The model should be well-documented and easy to understand. It should be clear to the user what the output means and that the results are not guaranteed.

ii. Offer higher employer contributions if members contribute more ('matching');
Offer incentives e.g. lucky draw prizes;
Provide a guarantee e.g. on fund return;

Introduce a minimum contribution rate;

Reduce administrative complexity around increasing contribution rate and make it difficult to reduce the contribution rate;

Allow for AVCs;

Introduce flexible remuneration models that allow individuals to increase their contributions by, say, selling leave; and

Communicate with members around the importance of saving for an adequate retirement benefit

Improve disclosure to improve confidence.

QUESTION 4

The first part of the question was competently done although many candidates made the "pension" more attractive by throwing in a lump sum benefit or allowing the purchase of a living annuity. This would defeat what the trustees are aiming to achieve. Some candidates got sidetracked into talking about the commutation terms although the question clearly precluded this discussion.

In the second part of the question, very few candidates used numerical examples to explain their points although most understood the effect that the change would have. Candidates missed that to do any commutation you would need an actuarial reserve value on a best estimate basis (which was stated in the question) and hence you would have everything at hand for neutral commutation factors. Some candidates thought the proposal was to use a single factor for everyone despite the question clearly referring to factors in the plural.

i. Make the pension more attractive to people with low longevity. This could be done by offering a spouse's reversionary annuity, guaranteed annuity period, higher initial level and lower increases

Enhance the pension terms although this is likely to be costly. Similarly, make terms for the lump sum poor e.g. introduce penalties into the design.

Make pensions seem fairer. The fund may have a large number of blue collar workers who may be cross-subsidising white collar workers in terms of the annuity rates applied. This makes the annuities poor value for money for the blue-collar workers. The fund design may need to be amended to allow for different categories of members

Other aspects of fund design may need to be amended depending on why members are taking the lump sum e.g. if they are using it to settle mortgage debt, the fund may wish to adjust their policy on pension based lending.

The maximum commutation percentage could be limited (although this may be contrary to legislation and public policy). A minimum pension or a pension relative to the lump sum could be set. Alternatively, the lump sum could be based on the member's contribution only.

Restrict eligibility

-   restrict who is allowed to take a lump sum (e.g. must have a pension over a specified level); and
-   restrict how the lump sum can be applied (e.g. paid straight to mortgage provider)

ii. If the fund wishes to neither discourage nor encourage commutation, then actuarially neutral terms are appropriate.

The commutation factors calculated for the statutory actuarial valuation are likely to be prudent (e.g. an annuity factor of 20 when a best estimate factor actuarially neutral factor would be 18). This will actually result in larger pensions being paid out and the fund experiencing a loss. For example, if a member has an actuarial reserve value of R3 million at retirement and wants to take R1 million in cash, on an actuarially neutral basis, their pension should decrease by R55 556 p.a. (1million/18) but on the valuation basis the pension will decrease by only R50 000 p.a. (1 million/20). The overall financial impact of this loss will only be fully known once the member dies. However, it is possible that the fund will experience a retirement strain at the next statutory valuation. The losses are greater the more the member commutes.

If the option terms are not actuarially neutral then the cost of the option should be formally calculated and included in the valuation. This is likely to add to the cost of the valuation and will increase the cost to the sponsor.

In certain regulatory regimes, the valuation basis would be best estimate. Even then the suggestion would not be appropriate as the assumptions were a best estimate at the time the valuation basis was performed, which could be 3 years ago. If economic and statistical experience have changed, the valuation basis may no longer be best estimate and there will still be a mismatch between the actuarial reserve value basis and the commutation basis. If the statutory valuation basis is now too optimistic, members will forgo too much of their pension and the fund will generate a surplus on commutation. Members may even time their retirements to select against the fund (although this is unlikely).

The individual commutation factor may include certain information that was not known at the valuation e.g. marital status and age of spouse and hence will be more accurate.

It is important to note that the actuarial reserve value needs to be calculated at the exit date using an up-to-date basis in any event and this would use the required commutation factors so this is really no extra work. Although it could be argued that using valuation assumptions will result in more stable factors that may be perceived as fairer by members, the market arbitrage opportunities that it represents may be more obvious to members.

QUESTION 5

i. For those earning 4/3x the fixed benefit or more, the new benefit will be lower at inception. This group may have or can afford to buy top-up cover to ensure their needs are met. It may fail to meet the needs of this group whereas for lower earners the reformed benefit will be higher than the old benefit and may more than meet their needs. This assumes that needs are earnings-related, however, and for disabled claimants the costs of rehabilitation may be better reflected by a fixed amount.
In addition, the fixed amount may help all recipients to secure a minimum standard of living.
The fixed benefit may exceed the income lost for low-earning disability claimants thus discouraging their return to work.
The old benefit is fixed in nominal terms which means it meets needs less well over time.
The new benefit will vary at the discretion at the State so it is unclear how well needs will be met
If funding increases security, then the reformed scheme may be able to better meet needs.
If funding reduces the cost of benefit provision which is passed on to recipients in the form of higher benefits, this may result in needs being better met. If the reformed scheme is easier to administer then benefits may begin to be paid more quickly.

ii. Both systems are subject to the risk of fraud e.g. paid on natural death or disability from natural causes and from self-inflicted accidents.

There is a risk that the benefits are unappreciated and tax revenue could have been put to better use. This may result in political risk.
It may fail to meet the needs of recipients.
The benefit may be more expensive to provide than anticipated resulting in increased taxation which may be politically unpopular.
These increased costs could arise from increased reporting rates from income groups for which the benefit is now relatively high or from catastrophes or morale hazard in the workplace.
Risk of inadequate liquidity or that there is inadequate carrying capacity in the economy due to the benefit size.

iii.   Note that this specifically refers to funding and not financing
   - General average premium
      o the contribution rate is set such that a level rate will be payable throughout the lifetime of the scheme
      o Initially: $\frac{\text{present value of all future benefits expenditure}}{\text{pv of salaries for tax revenue in all future years}}$
      o Then $\frac{\text{present value of all future benefits expenditure- fund to date}}{\text{pv of tax revenue in all future years}}$

- o Substantial fund builds up during the early years

- Terminal funding
  - o Under such a system the contribution income required in any period is the amount required to finance the capital value of the benefits awarded in that period, ie benefits are prefunded at the time they are awarded.
  - o $\frac{\text{present value of benefits awarded in a year}}{\text{pv of salaries for tax revenue in that year}}$
  - o No fund until the first benefit is paid.
  - o Rate of increase of the fund will depend on the size of the benefits awarded and the number of recipients.

- scaled premium
  - o work out a contribution rate to apply for a period of time (the control period) that would be sufficient to provide the benefits to be paid over the control period. However we then apply this contribution rate over a shorter period during which the fund grows continuously, then before the fund starts to fall a new contribution rate is calculated.
  - o The contribution rate thus steps up over time
  - o This means that the fund is non-decreasing

iv. The investment strategy will depend on:
- the nature and term of the liabilities. The liabilities involve the payment of a regular income. It is unclear how the income level will change in the future.
- the State may wish to maximize returns subject to an acceptable degree of risk.
- the liquidity needs of the scheme and the timing of tax revenue collection. This is particularly important if scaled premium were to be adopted as the benefits should be paid from investment income;
- the attitude of the State to risk and particularly downside risk – likely to be risk-averse due to underfunding;
- the ability and willingness of the state to meet any shortfall e.g. funds available in the budget or will taxes need to be raised;
- the anticipated funding level of the scheme– at best this scheme will be partially funded;
- the size of the fund – may be substantial but size will depend on the funding method adopted which in turn may be influenced by the carrying capacity of the economy for this investment.
- tax on various asset classes and returns (although the State may have special concessions);
- any regulatory restrictions or professional guidance;
- net returns on various asset classes (or returns and expenses);
- if the fund were to adopt a matched strategy then investment could be made in government and corporate bonds of appropriate term with coupons to match benefit payments. If the payments are likely to keep pace with inflation, inflation-linked bonds could be used. If the payments are likely to be level then fixed-interest bonds;
- if the fund is v large then it may be difficult to find sufficient bonds of the appropriate duration. Government simply issuing more may distort the bond market. Foreign bonds may introduce currency mismatch risk unless from a country in a monetary union.
- degree of acceptable self-investment requires consideration;
- some cash investment may be necessary to meet liquidity requirements and if the liabilities are likely to increase over time and sufficient inflation-linked bonds are not available some equity and property may be required to provide some sort of real return.
- property rentals may prove a good match for the monthly benefit outgo particularly if scaled premium financing is used as the underlying investments are held in perpetuity and hence properties' poor marketability may not be a problem.

v. Cost is a function of number of claims and cost per claim
Death benefit:

- If the decline in mortality is due only to a change in the rate of natural death then the number of claims will go up as the dependent accidental death rate would increase.
- If the accidental mortality rate also declines then the number of claims will decrease.
- Cost per claim will increase as annuity to dependents will cost more.
- Overall effect depends on split between accidental and natural death.

Disability benefit
- Number of claims would go up due to increase in dependent rate (unless the independent disability rate also declines).
- Cost per claim would increase.
- Overall expect an increase.
- Number of taxpayers may increase resulting in a lower cost per taxpayer.

QUESTION 6

The product described in this question is a real product that is used by a number of South African funds. It was introduced to stop rising death cover premiums from reducing retirement contributions. This question was extremely poorly answered. In group assurance, both the premiums and cover are typically salary-related. This was illustrated with the current arrangement. The new arrangement would be similarly configured.

The question was quite clear that the benefit was a multiple of salary. Despite this, many candidates discussed benefits in currency terms despite arguing for salary-related benefits in question 5. Many candidates thought that everyone in the age-band would get the same death benefit in currency terms. Others thought that older members would get more cover because they earned more without noting that this would be true under the existing system.

Others misread that the fund will pay a contribution of 2% to the insurer to either mean that the fund would pay 2% of fund credit or that the fund would self-insure!

Some candidates gathered a reasonable number of marks by discussing what people need at various stages of the life cycle and discussing how the design was confusing and may not be insurable on good terms.

Both currently cost the same amount. However, if insurance becomes more expensive the future, for example due to the scheme aging, adverse experience (due to its size, the scheme is likely to be experience rated) or insurance cycles, the death cover will be reduced under the new arrangement while under the old arrangement the contribution towards risk benefits would increase which might reduce contributions towards retirement. Whether or not this is an advantage depends on the relative value placed on death and retirement benefit.

Under the old system, every member received the same insured death benefit. There was thus cross-subsidy from younger members to older members and from females to males. It would also result in larger total death benefits for older members (as the member's accumulated fund should grow with age). If children tend to be born earlier in the lifecycle, this may result in too little cover at younger ages and too much at older ages.

Under the new system, younger members receive more cover than older members with cover "stepping down" as one progresses between age bands. This may result in a better fit to needs but this depends on contribution rates, real investment returns, fees (how accumulated credit grows) and the shape of the mortality curve.

The new arrangement may have fewer members breaching free cover limit/evidence of health limits as salaries for younger workers are typically lower (and underwriting requirements are usually lower for younger workers).

The new arrangement may have experience rating implications in that there may be less credibility in bands than assessing the scheme as a whole.

The new arrangement could be more expensive due to admin complexity and thus get slightly less cover for the premium paid.

Cover for the new arrangement may not be available at existing underwriter.

The fund would need to change the rules which may incur a charge.

The new arrangement may be difficult to explain to members and families. Younger members getting more cover may take little convincing but older members who are losing cover might object (and the older members may well be trustees!) Reputational issues may arise – particularly if others in the market do not offer this sort of benefit.

Female members might feel aggrieved that they are still subsidizing males under the new arrangement which still involves cross-subsidies within age bands.
The new structure may appear unfair as there will be sudden step downs in cover as one moves from one band to the next.

QUESTION 7

The entire question was very badly answered with a number of candidates not even attempting part i. Overall the answers for parts ii. and iii. were extremely weak. Most of the candidates had incomplete answers or did not attempt the question at all, most likely due to having run out of time.

i. 2014
    Increase $(1.089/1.0525) -1= 3.47\%$
    $3.47/6.43 = 53.93\%$ of inflation
    2011
    Increase : $(1.0778/1.0405) -1= 3.58\%$
    $3.58/5.62 = 63.79\%$ of inflation

ii. It depends on the minimum percentage chosen and what is already done in terms of practice and the fund rules. Where the practice/rules are already more generous, it will have no effect. For funds with no pensioner members the provisions will similarly have no effect.

   If however, the new pension increases are to be more generous and regulations require funds to be fully funded (or restoring a full funding level if in deficit):

   - The cost of pension benefits will increase.
   - At the next statutory valuation, a more conservative increase rate may need to be adopted which will increase liabilities both in respect of active (and deferred) members and pensioners.
   - The extent of this change will depend on how prudent this assumption has been historically
   - The standard contribution rate would increase
   - The increase in liabilities will reduce the funding level and some funds may be underfunded.
   - Depending on other regulations, underfunding may trigger other penalties
   - For underfunded funds, the valuation basis will most likely need to remain conservative and the lower actual increases granted will emerge as surplus over time
   - the modified contribution rate would also increase (degree depends on spreading regime)
   - The increase in contribution rates would be most severe in closed funds.
   - In an open fund, the increased cost may result in sponsors closing the fund to new members.
   - In extreme cases, where sponsor covenant is weak, the fund may simply be discontinued
   - Will need to change investment strategy to better match higher pension increases which may introduce frictional costs.
   - This may be extremely difficult for funds that use annuity investments to back the pension liabilities although a higher increase percentage can usually be purchased once the annuities commence payment.
   - There may be administrative costs to compliance e.g. communicating with members, admin system changes etc
       Surplus build up in funds that previously granted generous increases and now stick to the statutory minimum
       Changing behavior of members and the impact that changing behavior may have (for example: fewer members commute at retirement)
       Differentiating between the impact on funds with and without pensioners
       Recognition that the minimum percentage needed to have a lower limit i.e. could not fall to zero

Recognition that imposition of a minimum increase limits the scope for discretionary increases in future.

iii. For funds that are discontinuing, the new measures may trigger a third party guarantee to ensure benefit entitlements are met if the sponsor is insolvent, or may result in a non-insolvent sponsor paying additional funds in for ethical reasons. If the fund is already underfunded and more assets cannot be found, the new measure may simply result in a different distribution of assets between active and pensioner members. If the regulations were not applied in the discontinuance valuation, this may need to be redone which will have cost implications for the fund and reduce assets for distribution further.

END OF EXAMINER'S REPORT