EXAMINERS' REPORT

November 2015 examinations

Subject F104 — *Pension and 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.

QUESTION 1

i. The cashflows in question would relate to:
   —— Employer and member contributions
   —— Benefit payments on events such as resignation, retirement, death, disability or transfer
   —— Expenses
   —— Risk premiums
   —— Investment returns
   —— Investment switches
   —— Other income, such as reinsurance recoveries

ii. A model can be set up over the period from the last valuation date to the current valuation date.

   Results check

   —— In a defined contribution fund, the closing member credit for a specific member is equal to the opening fund credit plus invested contributions plus allocated investment returns less expenses less any benefit payments for that member.
   —— Any other liabilities should be modeled too
   —— The assets should also be modeled as opening assets plus net positive cashflows plus actual returns earned.
   —— Actual data relating to all cashflows and non-cashflow returns on assets can be fed into the model. The data should be accurate both in terms of timing and amounts.
   —— And this should verify the closing fund credits.
   —— Any changes to other liabilities should be considered e.g. a release in a contingency reserve
   —— Check build-up of contingency reserves.
   —— Investment switch instructions should be taken into account.

   AOS

   —— Then each element in the model will need to be changed separately from actual to expected identify possible reasons for a surplus to have arisen, for example, if expected expenses were higher than actual expenses
   —— Or contributions paid differed to contributions allocated.
   —— If risk premiums decreased below what was expected in setting the premium
   —— Changing the net investment return earned on the assets to the allocated investment return on the liability will detect any surplus due to mismatching.
   —— Any other financially significant event should be taken into account and modeled.

iii.   The following should be taken into account:
— Legislation pertaining to the treatment of surplus in a DC scheme;
— The scheme rules regarding application of surplus;
— The size of the surplus, if it is small there may be no need to do anything with it;
— The source of the surplus will indicate how it is best applied;
— How this fund or similar funds have treated such surpluses in the past;
— The cost relating to different methods of applying the surplus and the implications of those costs;
— The employer's right – usually the employer would not be entitled to any surplus in a DC scheme; and
— The tax implications of different methods of applying the surplus

This question started off with a book work question and led the candidates into a low level application of bookwork. Most of the candidates scored reasonably well overall with only the weakest of candidates getting less than half the marks. Parts i. and iii. were fairly well done. Part ii. was less well done.

QUESTION 2

— switch assets to bonds to increase the liability on liquidation in order to increase any payout received on liquidation of the sponsor and provide a better match on buyout. This is potentially problematic if position improves and the fund is now unmatched.
— investing in assets that pay out in the event of sponsor default, such as derivatives including credit default swaps. It may not be possible to find any suitable assets or these may be expensive.
— considering alternatives to cash payments if the sponsor is unable to afford them, such as a charge on the sponsor's fixed assets. This may cause liquidity problems for the fund and be difficult and expensive to manage or enforce. Its usefulness depends on rankings relative to other creditors
— including ratchets in contributions so that if the sponsor's financial position improves then the scheme shares in this improvement. The problem is that the position may never improve.
— set up contingent contributions so the sponsor has to make up the deficit more quickly if the scheme's financial position deteriorates. If there is a correlation between the fund's performance and the employer's performance this may be unaffordable.

This question was based on bookwork and required a very small degree of application.

Stronger candidates scored well while weaker candidates did not consider investments and contributions specifically and showed confusion between the fortunes of the sponsor and fund.. Considerable confusion was evident as to what a "charge on fixed assets" is (earmarking of specific assets on insolvency) with certain candidates implying that the fund would manage the fixed assets of the employer.

QUESTION 3

   i.   Financial risk of the guarantee costing more than anticipated. This may be from more members having the guarantee bite or the extent of the shortfall on the DC benefit being greater than anticipated. This may arise from factors such as high salary increases, particularly close to retirement, adverse investment returns, higher than expected expenses or higher than expected annuity prices.

Adverse investment performance may result in the liability in respect of this underpin increasing and the fund may become underfunded.

The fund faces the risk that the employer covenant is weak and hence the fund remains underfunded or the long-term viability of the fund is threatened.

There is also a liquidity risk with respect to having funds available immediately to pay for the guarantees.

The fund also faces model and parameter risk in respect of the valuing of this liability, for example using too optimistic a basis for projecting the DC benefit or using a deterministic model instead of a stochastic model.

Reputational risks of perceived unfairness of members without an underpin
Various operational risks may arise (e.g. fraud, poor record keeping)

   ii.   This requires a stochastic model.

The most important assumption item to vary would be the investment return assumption, but the result will also be sensitive to the annuity rate assumption and the salary inflation assumptions and all should be consistent.

No need to model pre-retirement decrements.

Distributions would need to be found for the variables modelled stochastically.

Given that the employer would like the buyout to be completed as cheaply as possible, there may be some pressure for the distribution to have a relatively high mean return and low standard deviation as this would reduce the cost of the guarantee. Members, on the other hand, would prefer the converse. Given the difficulties involved in selecting and parameterising the distribution, the model may need to be sensitivity tested using a variety of distributions.

For each run, specific parameter values should be selected from the distribution by Monte Carlo Simulation, for example.

For each member with an underpin, the DB benefit would need to be valued at the normal retirement date. This would require projecting annuity values at the exit date as well as taking into account the accrual rate and past service.

The model would take the current DC fund credit and a variable addition, X, representing the value of the underpin. Future net contributions would be calculated by deducting expenses and risk premiums

as projected. This value would be projected with investment returns and future net contributions to the normal retirement date.

If the DC value was equal to or higher than the DB value, the model would record X as being large enough. The exercise is repeated a large number of times for the same value of X and a different set of assumptions drawn from the same distribution for each iteration. The probability of X being sufficient is then calculated. If above 97.5%, the value of X can be reduced and the model rerun (and vice versa) until the smallest value of X is found.

Generally competently done although weaker candidates gave a generic list of risks for part i. instead of providing risks relating to a hybrid arrangement.

QUESTION 4

i.   The cost of accrual rises with age (if $i > e$). The PUSCR calculates an average contribution rate applicable to the cost of accrual of the members' benefits over the year (or control period) following the valuation date.

 For the Attained Age method (AAM), the Standard Contribution Rate (SCR) is determined as the stable rate of contribution that, if paid over the expected future membership of a beneficiary, will accumulate with investment returns to the value required to provide the benefits that are expected to accrue over that future period of membership.
In a closed scheme the age of the membership will rise and hence the cost of accrual will rise at each successive valuation. Therefore, at any valuation the calculated PUSCR will understate the cost of future accrual (because it only looks at the "cheapest" year) while the AAM will provide a more stable contribution rate.

The actuarial liabilities will be the same under both methods.

A surplus will build up initially under the AA method which will be drawn down in later years.

The PUC has a stable funding level

 Accept any point relating to the need to consider the accounting standard applied by ABC Limited

ii.   <u>The purpose of the valuation</u>

The objective of the purchaser should be to understand the true liability of the pension fund, which would favour the use of a best-estimate basis. On the other hand the purchaser would want to pay as little as possible and hence might prefer a pessimistic basis to assist in negotiations. On balance the actuary would want to use a best-estimate basis for the base results and also run the valuation on a conservative basis in order to demonstrate the risks to ABC Limited.

Some sensitivity testing may be helpful to understand the risks

<u>Degree of accuracy required</u>

Assumptions would need to be extremely accurate as any understatement of the liability would be locked in permanently by the purchase price.

<u>Maturity</u>

This is a mature scheme and thus there is less time to make up any deficit should it arise. This may reinforce the need for prudence.

Although the fund has a long history, the employer is small and the fund is long closed. This may mean the member data are too sparse to use in setting the basis. The membership may be skewed (typically in favour of executives).

Small funds have greater variations in experience and this reinforces the need to show the results on a prudent basis as well.

<u>The relative significance of the assumptions</u>

If the fund is mainly pensioners, the assumptions around the post-retirement discount rate and mortality may be much more important than the pre-retirement assumptions.

The relationship between parameters e.g. the pension increase assumption and the post-retirement discount rate will be critical.

<u>Consistency</u>

The actuary will need to ensure a consistent basis for assets and liabilities. ABC limited is listed and hence accounting standards prescribed in that country will need to be used once XYZ Co is purchased. The likely basis to be used after purchase should also be considered.

Surprisingly few candidates considered the specifics of the situation presented for part ii.

QUESTION 5

i.   On average, member s of an IT company and a mining company have different profiles and needs.

The benefit design of each company's scheme can be expected to cater to the needs of the average individual in that scheme. Although they may use different categories in order to tailor benefits to different groups of members

As such

- The contribution structures may differ in terms of the portions paid by the employers and the members
- The absolute size of the contribution rate and how the rate is structured might be different between the two schemes
- The employer may cover the cost of risk and insurance benefits in the mining company since mortality rates are expected to be high – the same is unlikely to be true of the IT company.
- The overall contribution rate might be lower in the mining company, in an effort to increase take home pay of lower paid workers
- Or the BITS employees might be able to select from a range of contribution rates.
- This may be mitigated to the extent that categories are used and there are similar categories on each fund.
- The members of the two schemes can be expected to have different attitudes towards the treatment of their benefits at retirement
- Miners may expect to have a short life expectancy after retirement due to the nature of their work
- And may prefer to take their retirement benefit in cash as opposed to an annuity.
- The mining fund is likely to be a provident fund to cater to this need.
- The IT fund is likely to consist mainly of white collar workers who are more financially sophisticated
- And can expect to have a reasonable lifetime during retirement
- The IT scheme might therefore be a pension fund that forces annuitisation at retirement.
- Benefits on death and disability can be expected to differ between the two schemes
- The absolute size of the benefits and the cost thereof is likely to be higher in the mining scheme than in the IT scheme
- Because of the nature of work of average member of the mining scheme which leads to a higher mortality rate during working years than most other types of employment
- Alternatively the mining fund may offer some flexibility in relation to risk benefits
- to cater to the needs of different groups in the workforce who do not have as dangerous jobs as a miner (for example the IT department).
- The normal retirement age in the mining scheme is likely to be lower than that of the IT scheme due to the nature of the work in the mining company
- The mining fund may facilitate other benefits such as
- Housing loans and education benefits which are unlikely to appear in the IT scheme.
- Guarantees offered in the one fund might differ from the other eg: guarantees on retrenchment might be more likely in the mining fund.
- BITS employees may have investment choice since they are more financially sophisticated.
- Eligibility criteria may differ due to higher turnover in one industry compared to the other or high proportion of part/full time workers.

ii.   Change will depend on the risk profile of the MINECOR employees relative to the BITS employees, which may be negligible due to similar work carried out (both in IT), and the relative sizes of the MINECOR and BITS funds (impact may be very small if the MINECOR group is small)

If the MINECOR employees are older, the rate per mille will go up for both death and disability.

If the MINECOR employees have a higher male proportion, the death premiums will go up and the disability premiums down.

Rates may also increase if the insurer considers the working conditions of the MINECOR employees to be significantly more hazardous (in practice this is unlikely as schemes are rates as a whole!)

If the transfer is very large, it may mean the difference between experience and bookrating. This could make the BITS rate increase or decrease depending on past experience.

Of course, there could be no impact on existing BITS members if the MINECOR book is segregated and insured separately. And if the risk benefits operate on a defined contribution basis, the contribution would remain fixed and the benefits would vary.

After a while the rates can be expected to stabilize.

The first part of the question was a low level application of book work however candidates scored very poorly missing some obvious differences that could be expected between the design of two funds. Overall the question was not well answered.

QUESTION 6

i.   From the employer's perspective:
   — Liquidity risk since large lump sum payments need to be made from company money
   — There is a specific return on contributions that is being promised without employing an investment strategy to meet the return requirements
   — The employer may find that they have insufficient assets to pay benefits
   — And may face reputational risk if they fail to make benefits payments of the promised amounts on time.
   — Difficult to attract employees due to low benefit security.
   — No assets are accumulating therefore might be difficult to liquidate fund or change the strategy.
   — Payments required at inopportune times
   — Opportunity cost exposure if monies used to pay benefits could be better invested.

From the members' perspective:
   — Low level of benefit security since monies are not set aside in advance
   — No legal separation between the employer's money and the benefits promised through the scheme

— Completely aligned to the fortunes of the employer – if the employer fails they lose their current and retirement income.

ii. Consider how much the employer will fund in advance as this determines the pool of available assets.
As only future contributions will be pre-funded, the initial asset pool will be zero. Any asset pool is likely to build up slowly as this is a mature fund and liquidity needs will be high.

To achieve a return of CPI+5% it will be necessary to have a portfolio that is weighted towards real returning assets, such as equities, property and index-linked bonds. The fund is constrained by the asset availability in the market – this would need to be established.

The investment strategy should take account of the risk-appetite of the trustees of the fund and the ability and willingness of the employer to uphold the guarantee should the investments perform poorly. The trustees will prefer a higher level of benefit security. The employer will be mostly concerned about covering investment shortfall and costs.

It may be possible to invest in portfolios that provide guarantees relating to CPI that may assist in achieving the CPI+5% target, but guarantees are expensive and limit upside potential in the investment strategy. The expenses relating to all available strategies will need to be considered and the impact of taxation laws on various portfolios (capital vs income yielding assets) needs to be established. The size of the fund will dictate the initial investment size and ability to invest in classes like property. Asset size will determine whether the fund can employ a segregated mandate or a pooled strategy. The currency in which benefits are paid needs to be considered. All regulation and professional guidance relating to retirement investment strategies will need to be adhered to. One should also consider strategies of similar schemes that have achieved success for the same exercise and practicalities.

iii. The target of CPI+5% rate of accumulation can be built into the liability side of the ALM. Assumptions can be made about the level of future salary increases, and applied to contribution rates to project final benefits. An assumption about CPI will be required. Various investment strategies can be tested deterministically, based on assumptions regarding returns of various asset classes and mixes. Sensitivity analysis and scenario testing can be used to indicate the level of risk associated with each investment strategy. Alternatively a stochastic model can be used to establish a distribution of returns per strategy and the likelihood of reaching the CPI+5% target by the time benefits are expected to be paid. Use an appropriate time horizon based on the scheme maturity. Perform mean-variance optimization exercises to determine the most appropriate strategy.

As expected candidates scored well in the earlier parts of the question since it was weighted towards bookwork. The last part of the question was not well answered with some candidates failing to make any attempt at all.

QUESTION 7

i.   If nothing else changes then the cost of providing this benefit will double. In the longer term, qualifying families may have more children to access the higher grant which increases costs further. If fertility increases among those who are working, contributions could decrease due to more maternity leave.

This could mean increasing marginal tax rates. This would increase the value of any exemption on contributions which might encourage higher contributions. However, higher tax rates mean less disposable income which means contributions become less affordable and may then reduce. On balance, the latter effect should dominate. As fertility is affected by income levels, it is possible that fertility levels will drop if tax rises.

Alternatively, government may raise the funds by reducing or removing retirement tax incentives which would decrease contributions.

If switching to a funded approach, the situation will be worse as contributions will need to be made in respect of both current and future generations.

If contribution rates are not sufficiently flexible and scheme membership is voluntary, then members will simply withdraw or become paid up – taking their contribution to zero.

Some savers may find the state benefit is now more generous than what they can provide for themselves. They may stop saving entirely in order to ensure they don't fail the means test. Alternatively, the state may alter the means test so fewer people qualify for the benefit, which would reduce costs and encourage private saving. Alternatively the means-test could be more strictly enforced.

If benefits are integrated, contributions to private and occupational arrangements may drop further.

ii. <u>Arguments against removal</u>

— may be a cost-effective way to guarantee that everyone achieves a certain standard of living in retirement
— may be redistributive if taxes are raised from those with more wealth / income and means-tested benefits are then paid to those with little wealth / income. Alternatively, it targets those most in need.

<u>Arguments for removal</u>

— it is regarded by many as degrading to human dignity to offer what amounts to charity
— may discourage people from providing for themselves
— may create a poverty trap whereby increases in a person's income (or assets) merely reduces the value of their State benefits
— may encourage people to squander (or hide) existing wealth so that they meet the means-tested requirement earlier rather than later
— may be perceived as unfair to those who do provide for themselves
— means-tested benefits are not taken up by all who are entitled to them, in particular if the rules are complex.

iii. The number of births for each 5-year period can be calculated as follows:

	Number of years	Probability of live birth per year	Number of births over 5 years
15-19	5	0.0732	0.366
20-24	5	0.1006	0.503
25-29	5	0.1048	0.524
30-34	5	0.0802	0.401
35-39	5	0.0606	0.303
40-44	5	0.0484	0.242

Total births so far = 2.339
Total births remaining = 2.5-2.339= 0.161
Fertility rate 45-49 = 0.161/5*1000 32.2

This question was poorly done considering that it is covered in the notes. Part ii. was a variation on a Self-Assessment Question and part iii was explicitly covered in Chapter 14 of the notes. Very few candidates attempted the calculation.

QUESTION 8

i.   Reducing the pre-retirement discount rate will increase the size of the active member liability, all else equal. As the real pre-retirement discount rate will reduce. Reducing the size of the salary increase assumption will reduce the size of the active member liability, all else equal, as the real pre-retirement discount rate will increase. The actual direction of change in the active liability will depend on the direction of change in the real return assumption.
The real return is 9.9% − 8.43% = 1.47% in 2010 and 8.78% - 7.62% = 1.16% in 2013.

Reducing the post retirement discount rate will lead to an increase in the active and pensioner liability, all else equal, as the real post-retirement discount rate will be reduced

The change in the inflation assumption has an indirect impact since the salary increase assumption is directly linked to inflation (CPI + 1%). The pension increase assumption may also link directly to the inflation assumption. The overall impact of changing the assumptions is an increase in the liability.

ii.

— Stronger discount rate
— Stronger mortality basis
— Capital Adequacy Requirements that are allowed for in the outsource price
— Cost loadings
— Profit loadings
— Data verification process costs included in outsource cost
— Basis on outsource may have intentionally allowed for higher future pension increases

iii.   <u>Employer interests</u>
— Good benefit offered at normal retirement date hence good staff retention mechanism
— If the employer is paternalistic they will have soundness of mind regarding the new policy
— Providing insurance benefits at retirement is more costly than paying pensions out of the fund
— Agreement creates a member expectation that may be difficult to change at a later stage
— Liability reflected in the financial statements of the employer is likely to increase due to the arrangement
— The basis used in the statutory funding valuations is static, usually only updated every three years, it is difficult to interpret the potential impact that the new arrangement with the insurer will have on the future funding level
— Setting the funding basis to be consistent with the insurance basis may push up the required employer contribution rate to undesirable or even unsustainable levels
— Basis used in the funding valuation is likely to be weaker than the insurance basis used per individual quote, as such a loss is likely to be suffered every time someone retires from the fund. This is likely to cause the valuation basis to change to a more prudent basis which would crystallise these losses that would otherwise arise over time. However this may also increase the contribution rate which may partially offset this effect.
— Insurance quotes are highly sensitive to changes in the economic environment, this will likely increase the volatility of future valuation results
— Funding valuations are usually only completed 6 months to one year after the valuation date. It may be too late to correct if the new arrangement leads to large losses in the fund
— If the agreement is legally binding the cost thereof might become too onerous for the employer and may lead to negative implications eg: restructuring or liquidation (this would be a fairly extreme outcome)
— Consistent treatment between retiring members

— Employer removes mortality and investment risk of pensioners and extinguishes liability of pensioners.

Member interests
- — New arrangement may be seen to provide a greater level of benefit security
- — Capitalised value calculated by the insurer likely to be higher than the value that would have been calculated on the fund basis
- — New arrangements might be simpler for members to understand
- — Members may not be happy to lose their link with the fund after retirement
- — All retiring members should be provided with financial advice in order to assist them with the disposal of the lump sum at retirement
- — Inconsistent treatment between members who commute and those who don't depending on how the commutation value is determined (in fund or by insurer)
- — Inconsistent treatment between members who withdraw compared to those who retire since insurance quotes would not be provided on withdrawal i.e. basis on withdrawal differs to that on retirement
- — Although new pensioners have the security of an insured benefit at retirement, active member benefits suffer reduced security due to the losses made by the fund per retirement
- — Scope of receiving discretionary increases in later years may be removed.
- — There is more flexibility for members when disposing of retirement capital.
- — Members might get better pensions than promised in the rules depending on the insurer they choose due to competition in the market.

Overall the marks for this question were relatively high. Candidates scored well in the second part of the question which was straight forward bookwork. Most candidates failed to follow through in their answers for the third part of the question.

END OF EXAMINERS' REPORT