

EXAMINERS' REPORT

November 2016 examinations

Subject F104 — *Retirement and Related 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 employer can close the scheme and allow future benefits to continue to accrue but only with respect to member contributions
 - This is unlikely to be a viable option if expenses and risk premiums are financed from the employer contribution.
- The scheme can be discontinued in which case no further benefits can accrue but the accrued benefits and existing assets remain in the fund.
- The trustees would still need to consider how the accrued benefits should be dealt with.

ii The trustees should take the following factors into account:

- The rules of the fund will state the minimum entitlements of the members
- And possibly provide direction with respect to the distribution of surplus
- Legislation should be consulted and will supersede the fund rules.
- When determining how the surplus should be distributed consider:
 - The source of the surplus
 - Which stakeholders have a claim on the surplus in a DC fund
 - For example should members that have already exited the fund receive a portion?
 - And what about new members
 - The employer is unlikely to have a legitimate claim on the surplus in a DC fund.
- Other benefit expectations should be considered
 - Members may be losing group life and disability cover that was provided via the fund
 - It may be necessary to compensate members for the loss of these benefits
- The costs involved in distributing surplus to the various stakeholders
- and how these would be shared
- If there are tax implications to various stakeholders receiving a share of the surplus
- Size of the surplus

QUESTION 2

i

- Select a historic period short enough to still be relevant...
- ...but long enough to give statistically credible results
- Need member data containing:
 - age
 - duration employed and
 - salary ...
- ...at regular intervals (typically annually) over the period of observation
- will probably need to divide by members by:
 - age
 - and duration if a very large sample
- for cohorts
- The analysis will involve dividing the current levels of salary by those in each group to that applied for the same group at the previous recording date.
- May need to adjust for non-annual observations
- Will need to isolate general cost-of-living adjustments ...
- ...which should be available from the HR department as these are generally applied across the board.
- The remainder would constitute promotional salary inflation.

ii

Let S = salary at age 25

Ignore all decrements before retirement

Accumulation at retirement = $0.1 \times S(1.1648^{39.5} + 1.12 \times 1.1648^{38.5} + 1.12^2 + 1.1648^{7.5} \times 1.12^3 + \dots + 1.1648^{0.5} \times 1.12^{39})$

= $0.1 \times S \times 1.1648^{39.5} \times \{1 + 1.12 \times 1.04^{-1} + 1.12^2 \times 1.1648^{-2} + \dots + 1.12^{39} \times 1.1648^{39}\}$

= $0.1 \times S \times 1.1648^{39.5} \times (1 - 1.04^{-40}) / 0.04 \times 1.04$

= 852.06S

Effective interest rate for accumulation = $1.1648 / 1.12 - 1 = 4\%$

Pension = 42.6S

Salary at retirement = $S(1.12)^{39} = 83.08S$

Replacement ratio = $42.6 / 83.08 = 51.3\%$

iii

- Firstly, the assumption in the model is prospective and while it may be based on a historic analysis...
- ... it will probably be adjusted for future experience...
- ... and will not necessarily reflect historic inflation fully.
- But let's assume that the Benefits Director's observations are correct. He is correct in that all other things equal, a lower salary inflation rate will increase a replacement ratio...

- ...However, other factors may also be different:
- If expenses are higher than expected ...
- ... or gross investment returns lower than expected...
- ...the net investment return assumption will also decrease.
- It is the gap between investment returns and salary inflation which is critical. If the gap used when setting the assumptions was higher than 4%...
- ...then the 10% contribution rate would be expected to yield a higher replacement ratio than 51.3%.
- More expensive annuities...
- ... due to for example lower investment return assumptions net of increases...
- ...would similarly reduce the replacement ratio
- Hence it is the gap between different assumptions rather than the level of one assumption which is probably driving this effect.

QUESTION 3

i

- An accrued benefits funding method...
- ... in which the Actuarial Liability is based on earnings at the valuation date.
- The Standard Contribution Rate is that necessary to cover the cost of benefits which will accrue in the Control Period...
- ... following the valuation date...
- ... by reference to earnings projected to the end of that period...
- ... and revaluation as a deferred pensioner thereafter
- Plus the present value of benefits accrued to date multiplied by projected earnings increase over control period.

ii Comparing PUSCR and CUSCR

- Assuming that $i > e$...
- and that $e > r$ (the revaluation rate)...
- in general, PUSCR is related to full projected final earnings whereas the CUSCR is related to current earnings revalued at r ...
- Therefore in a fund with no past service, the PUSCR would be higher than the CUSCR.
- However, the CUSCR also includes an element of revaluation to the CUAL, which needs to be brought in line with current salaries each year.
- Therefore, in funds where there is some past service, the CUSCR is generally higher than the PUSCR.
- This is often called the high-low rule: In funds where there is a higher liability, the required contribution rate is lower.
- The CUSCR is usually lower than the PUSCR at low ages and service and increases rapidly for high ages and service.
- Since the fund is mature, it is likely that the rates have stabilised
 - This requires the age, sex and salary distribution to be stable for PUM
 - And additionally for the past service to be stable for the CUM
- The CUSCR stabilises above the PUSCR (since the PUAL stabilises below the CUAL)
- Therefore it is likely that the CUSCR for this fund will be above the PUSCR.

iii Comparing PUMCR and CUMCR

- The modified contribution rate accounts for past service – ie for the surplus or deficit in the fund
- Switching from the PUM to the CUM is going to generate a surplus since the PUAL is higher than the CUAL
- This surplus can be used to reduce the CUSCR
- The extent of the reduction will depend on the surplus spreading period
- The shorter the period, the greater the reduction
- Comment on financial director
- Since the total cost of funding is the same in all funds regardless of funding method; only the pace of funding is affected.
- While the CUSCR can be lower than the PUSCR, this is only the case for young, immature schemes.
- For this fund, the opposite is likely to be true.

- However the change in method will lead to emergence of surplus, which may be enough to reduce the contribution rate for some time.

iv

- Security:
 - Security is higher the higher the AL for the fund
 - PUM has higher AL
 - Therefore it is more secure than CUM.
- Stability:
 - MCRs are stable if the implicit assumptions in the model... as well as the explicit assumptions of parameter value, are met.
 - CUM is less likely to be stable since more assumptions (stable past service) need to be met
 - But both unlikely to be stable since experience will vary
- Realism
 - PUM is realistic for an open scheme
 - CUM a bit less realistic since it assumes that members become deferred after control period which is unlikely
- Flexibility
 - This depends on having sufficient reserves
 - CUM not secure unless a higher than 100% FL is targeted or assumptions are conservative
 - So CUM less flexible.

QUESTION 4

i

Advantages

- Simple to administer
- Can be perceived as fair, particularly if the living standards across Scotia are fairly uniform
- Provides a base standard of living, i.e. protects the poor
 - Thus may be saving the state other expenses such as medical care for neglected older persons
- Provides for some redistribution, particularly if marginal tax rates increase with income
- Encourages older people to leave the workforce making space for younger individuals
- Pay-as-you-go has a low opportunity cost
- May foster a sense of solidarity between generations

Disadvantages

- More expensive than a means-tested alternative (every person gets benefit)
- Arguably not the best use of funds, if some of the recipients are very wealthy and don't need the benefit
- Will not meet the needs of higher earners
- Migrants may automatically qualify for this benefit which may not be the state's intention.
- Can discourage working late since the benefit will be lost
- Any state pension may cause people to under-provide for themselves

ii Under this system the contribution rate is set such that a level rate will be payable for a specified control period. The equalised contribution rate is calculated in advance so that expected income covers expected expenditure over the control period, if not in each individual year during the period. As soon as expenditure exceeds income, the contribution is recalculated so that the fund that is built up never starts to fall. This results in a stepped-up contribution and a non-decreasing fund.

iii In any given year, the take-up of the benefit may be different to what was expected due to more or fewer people coming forward to claim the benefit or qualifying under the means test. Lower than expected take-up means funds are built up where they could be better used in the economy (opportunity cost) and higher than expected take-up may require higher contributions.

There are a number of risks associated with means testing that may result in higher than expected take-up such as discouragement to save, squandering of assets and fraud. This may be costly to apply and may not prevent the wealthy from claiming benefits which may mean the government may not achieve their objectives.

Higher contributions may be politically unpopular.

Liquidity may not be available to pay the benefits as they fall due as this arises exclusively through investment income in a scaled premium environment. Even though the scaled premium method involves the build up of a fund. Also contributions may be received late or not at all. Tax revenue is unlikely to be uniform in each month.

As there is a fund, the government faces investment risk. The investment income may be lower than expected leading to liquidity risk or higher than expected leading to reinvestment risk. Capital growth may be lower than expected leading to increased contributions or higher than expected, possibly leading to pressure to increase benefits.

There is also default risk, which may leave the fund vulnerable to downside investment risk and general mismatching risk.

This may mean that the funding level may be volatile if assets and liabilities are not well matched which may introduce more contribution rate volatility which could be politically unpopular.

Giving a relatively generous benefit from age 60 creates the risk that healthy productive workers find it more lucrative to stop working at age 60 than to continue to contribute to the economy. Depending on the level of the means tests and the threshold for tax, there is considerable political risk if some workers are paying taxes to allow older people to claim a higher income than them.

Alternatively the salary distribution could be very skewed making the benefit insufficient to meet needs.

There is also a salary inflation risk if the median wage rises without a corresponding increase in tax revenue (which could happen if the median income is below the tax threshold for example).

This scheme will also be prone to operational risks and the political temptation to use the fund for other purposes.

- iv The Scaled Premium financing method involves a gradually stepping up premium in an aging population. This does ease the pressure of an ageing population without fully funding for it as would be the case with the General Average Premium method. GAP would have increased contributions more initially and then if the population ages as expected no further hikes would have been necessary. The statement thus better describes GAP.

It does not fix the underlying problem of an ageing population.

However, presumably the switch was unpopular due to higher contribution rates. These will only increase as the population ages and so it won't look "fixed" to taxpayers. In

addition, the scheme faced many risks which were unaffected by the change and other risks have been introduced by the switch.

It can be argued that moving to a partially funded system increases saving and develops capital markets. Increased investments will reduce interest rates which can stimulate economic growth. The markets should naturally develop suitable investments to meet the investment need that will arise.

However, overall saving may not rise, it may just be redirected. It depends on what government would have used the money for. The social security fund investment may simply replace other investments leading to no increase in capital investment. The carrying capacity of the economy is a critical factor.

Some may argue that even if overall savings rise it may not create real investment. The money may not be used for the creation of fixed capital, for example building infrastructure. Previously government may have used the tax money for building infrastructure.

Investment returns earned may reduce the long-term cost of benefits.

It was anticipated that candidates would find this question challenging. However, many did extremely well. Those who struggled were the candidates with a very limited understanding of the Scaled Premium method.

QUESTION 5

i. EMPLOYER

- Fund A is a DC fund and Fund B is a DB fund
 - Specifically, cash balance or notional defined contribution
- The employer faces higher risks in relation to fund B as a result.
- Required employer contributions will be constant in Fund A but variable in Fund B if there is a balance of cost basis.
- Fluctuations in contribution rates can be reduced if $x\%$ is allowed to vary
- There is likely to be fewer legislative requirements for A than for B
- The employer B will be required to disclose Fund B's funding level in the company accounts whereas employer A will not.
- As B is DB the employer may have some choices as to the timing of their contributions whereas they will be paid strictly regularly under A

MEMBERS

- Members are exposed to more risk in Fund A because there is no predetermined benefit
- Fund B creates more benefit certainty for members as the investment return allocation is known
- However this may create a risk relative to salary or general inflation unless x is altered regularly.
- This may make Fund B easier to understand
- In Fund A members may benefit from good investment performance
- Whereas in Fund B the sponsor is likely to be entitled to any profits of experience
- There is possibly more member choice available in Fund A
- For example varying contribution rates or personalised investment strategies.

ii

- Fund A and Fund B may have policies with different insurers in which case Fund A received a more competitive price.
- The underwriting on A may be more stringent than on B
- A may have more female members
- Or younger members
- Or have people employed in less hazardous pursuits than B
- The insurance covers the difference between four times salary and the individual account
 - The insurance company may believe that investment returns earned may be more than $x\%$ per annum
 - Thereby reducing the sum assured and the premium.
- If both are experience-rated, A may have lighter experience than B.

- Alternatively if A is book rated and B experience rated, B may have heavier experience than the book rate and vice versa
- If A is larger, A may have a slightly lower premium due to economies of scale
- Renewals may have been done at different times, insurance cycle may have been harder when B was quoted
- A may have lower commission or expenses

iii

- Annuity rates are usually set with reference to bond yields
- Fixed-interest stock are used for level annuities
- Inflation-linked bonds usually back inflation-linked annuities
- With-profits annuities are usually backed by a mixture of bonds and equity
- In Fund A members' individual accounts near retirement may move in line with the annuity rates generally
- Although it may be difficult to match the pension payment perfectly by duration and the actual degree of matching will depend on what annuity the member chooses
- In A, the closer matching may reduce benefit volatility as the individual heads to retirement
- However at a cost of higher expected returns.
- If annuity prices are high at retirement members in Fund B will suffer a reduced pension
 - Since their benefit movements bear no relation to annuity prices.
- The opposite is true of a low annuity price environment in which case Fund B retirees will receive higher pensions

Parts i and ii were not well done, and candidates rarely made the deeper points which were necessary to do well. In part i, quite a few candidates did not realise this was a DC/DB question and struggled to generate enough points as a result. Many students thought fund B was hybrid or Defined Ambition. In part ii, the vast majority did not understand how the death benefit would work (that it is the difference between the fund credit and the salary multiple) or that it is a fixed salary multiple. This is not the first time that candidates have struggled to understand basic death benefits.

Part iii was poorly answered and it would appear that candidates struggled to understand the problem statement. The candidates who did the best focused on explaining the investments that are typically appropriate for annuities.

QUESTION 6

i Valuing the minimum benefits

- Use a stochastic model to value the guarantee.
- This is because the guarantee “biting” would be determined by the experience of investment returns and inflation.
- For each assumption
 - Decide on a distribution
 - Use best estimate assumptions as the base
 - Ensure that the links between the parameters are appropriate
- Within the model, the value of the guarantee will be determined by the amount the minimum benefit exceeds the member share at the time of exit
- The member share is a build up of contributions, less expenses and any insurance costs, with investment returns
- The guarantee is the build up of contributions with inflation
- The probability of withdrawal at each age needs to be set; this could be a stochastic parameter but more likely to be modelled as a deterministic decrement rate.
- The values are discounted to the present using the investment return
- The model can calculate the net value of the guarantee for each person and year which is then grossed up for the full fund; or a liability with and without the guarantee can be calculated for each iteration and the difference calculated
- This calculation is then iterated for a large number of realisations of i .
- This will give a distribution of the guarantee costs.
- The median of the distribution serves as the best estimate of the cost of the guarantee
- Sensitivity testing should be carried out on the results

ii The threshold has been set at a level where the guarantee may be invoked quite often (and by definition you will always pay at least the guarantee):

- It applies to withdrawals, which means that it will often bite in situations where the market is down and the member has not been in the fund for very long. However, a short time horizon will mean the guarantee cost is relatively.
- It guarantees inflation related returns, which means that the market does not even have to be negative for it to bite
- The higher the equity component, the higher the expected returns but the greater the proportion of months when below-inflation returns are achieved.
- It guarantees the return of the total contributions without accounting for costs and death benefits– this means that the guaranteed investment return actually needs to be higher than inflation to make up the fees
- Therefore the trustee is likely right if the investment strategy is not changed.

iii Provision for guarantee:

- This is unlikely to be funded on a PAYG basis and the least onerous requirement would be to establish book reserves, but in this case it is more akin to the employer offering the guarantee than the fund.
- Alternatively, they may be allowed to apply just-in time funding or regular contributions.
- Lump sum in advance is likely to be far too onerous and impractical as you won't know what the unless the employer buys a derivative to provide for the guarantee for each new member
- Terminal funding is effectively PAYG in this case.
- Those could be new contributions (i.e. an additional cost to the employer) or taken from the existing DC employer contributions
 - Careful – this may result in the guarantee being triggered more often if the total contribution plus inflation is still the minimum benefit.

iv

- This could be achieved by investing in a guaranteed fund.
- Or using derivatives to guarantee a minimum return, for example by sacrificing upside.
- Where returns are subject to a minimum guaranteed return.
- However the cost of this would be high given that a minimum return of inflation is required.
- Therefore the returns are likely to be quite low overall.
- This will reduce benefits for all members (those withdrawing and those remaining).
- The ultimate effect may be that while everyone always gets contributions plus inflation, they rarely get any more than that.
- This will mean that insufficient benefits are achieved for retirees in particular.

Question 6 was a challenging scenario for candidates to consider. However, part i was relatively straight-forward. Better prepared candidates scored well while others simply reproduced a standard ALM model answer or chose to optimise an investment strategy instead. It was clear from part i that many candidates missed the obvious point that the guarantee did not take expenses into account. This made it more difficult to generate ideas in part ii. Part ii was badly done with many candidates showing poor logic and a failure to grasp that withdrawals may involve very short service. Part iii generated some reasonable attempts but certain candidates sold themselves short by not knowing their bookwork around financing options. Many gave investment points despite being told to avoid this in part iii.

QUESTION 7

i. Design of the state pension

- Lower the level of the state benefit
 - higher wage earners will thus need to save more privately to meet their retirement needs.
 - May result in lower income workers not having enough to meet their needs and they may not have the option to join the employer-based schemes at all if earning below the cap or may be able to afford to contribute very little if earning only slightly more.
 - similar comments apply to removing the inflation-protection
- Means-testing
 - The benefit paid at retirement could be contingent on assets or income from other sources being below a certain level.
 - Those with outside savings greater than the means test will need to save more to make up for the state benefit foregone
 - May disincentise savings for low earners
 - Could be difficult or expensive to apply
- Eligibility of the state pension
 - The state pension eligibility could be restricted in a number of ways: for example only low-income earners earning below the cap could be able to join it.
 - contribution rates may need to increase due to all the members making the maximum contributions in monetary terms being taken off the scheme.
 - Expenses per person would rise due to loss of economies of scale
 - Similar remarks would apply if members could opt out to private arrangements
- Major problems are:
 - Problematic for existing workers who face receiving less in retirement without time to make up the difference by saving
 - Politically unpopular if a PAYG scheme
 - No guarantee people will save more voluntarily for retirement.

Tax incentives on employer based schemes

- Could make contributions/investment interest/capital growth tax exempt or subject to lower tax rates
 - may stimulate savings among tax-payers
 - EET tends to be more popular with savers as it doesn't require faith that the government will not change the tax regime as one gets close to retirement.
 - costly for the government, who may wish to put an upper limit on the tax-benefit
 - Should consider the tax treatment of contributions for other benefits in employer-based schemes (e.g. death or disability benefits)
 - if all contributions are tax-free and the ancillary benefits are popular, members may have higher sign up rates than if just the savings contributions are tax-free

- However, risk benefits themselves do not constitute saving and the government may want strict limits as to tax deductibility for risk benefits
- Generally if contributions and growth are exempt, one expects benefits to be taxed.
- Taxing benefits may be difficult for those near retirement who have not benefitted from the proposed tax exemptions.
- May need to protect vested rights which is administratively very challenging
- Might want to apply lower tax rates to income benefits than lump sums to ensure members are protected from longevity risk.

ii

- Cash incentives could be offered on joining the employer fund
- Alternatively matching of contributions
- These could be in the form of ancillary benefits, e.g. death cover or disability cover
- State could offer guarantees e.g. on the investment returns or on minimum benefit levels
- The provision of central administration resources, simple-to-follow regulations, quality certification
- or other open regulation (transparency about direction regulation is taking)

Part i was not well answered, mainly because candidates did not read the question and focussed on all the possible state interventions as opposed to discussing tax interventions on private schemes only. Candidates also struggled to structure the answer well.

Part ii did not clarify if they should list or outline. However students who identified this as a bookwork list did well.

END OF EXAMINERS' REPORT

