

EXAMINERS' REPORT

November 2018 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.

- In a society where everyone earned the same, $n\%$ of the population would earn $n\%$ of the income. So a graph of cumulative percentage of the population (horizontal axis) vs cumulative percentage of income (vertical axis) would show a straight diagonal. ✓
- In reality, societies typically have a few people who earn a lot and rather more people who earn less. The same graph in such a society will result in a concave curve. ✓
- The greater the degree of inequality, the greater the area between this curve and the “perfectly equal” diagonal. ✓
- The Gini coefficient is the ratio of this area to the total area under the perfect equality line. ✓
- A perfectly equal society therefore has a Gini coefficient of 0, and a perfectly unequal one, a Gini coefficient of 1. ✓
- Therefore, an increase in the Gini coefficient implies a reduction in equality – the gap between the rich and the poor is increasing ✓

ii.

- The increase in the Gini coefficient implies that there are either more people earning very little ✓, or that the wealthy very high income earners are earning more and more (or both). ✓
- If income tax collected has remained the same in real terms, then (assuming tax scales haven't been vastly adjusted) it is likely that the country is experiencing both – increases in income at the high end while income earned by poorer people has reduced. ✓
- In fact if tax scales are progressive, it is likely that most of the change has come from a reduction in income at the low end (since the additional tax paid on increases on the high end will be higher than that lost at the low end) – but more information is required. ✓
- The effect will depend on the specifics of the taxation regime. ✓
- An increase in the number of low income individuals is likely to result in an increase in the number of recipients of the old age pension. ✓
- This would be due to people earning less due to lower salaries or more unemployment, and therefore saving less for retirement ✓
- Both due to savings being applied to lower salaries, and due to individuals reducing savings to increase take home earnings. ✓
- This would not take place immediately, but if the higher inequality levels persist, the pensioner base would grow over time. ✓
- The government would likely be able to anticipate the changes and effect measures to increase tax revenue to compensate, for example by increasing taxation at high income levels. ✓
- Alternatively, the level of the state pension could be reduced ✓ but this may be to the detriment of the population in need of help ✓
- If unaddressed, this development may lead to budget deficits in the long run. ✓

Comments: This question was largely bookwork. part (i) was reasonably well answered however part (ii) was disappointing. Candidates did not seem to incorporate the information given into part (ii) and didn't follow a logical approach to answering the question.

QUESTION 2

i.

- In both, benefits are either paid according to need
- or in accordance with an agreed schedule of benefits.
- Mutuality: When contributions are paid according to risk
- Solidarity: When contributions are not related to risk, but rather shared equally...
- or paid according to ability.

ii.

With this design,

- Benefits are calculated in accordance with an agreed schedule
- However, across the age groups the premiums reflect risk to a degree
- As age has the largest effect on mortality
- Hence at a fund level, this is mutuality.
- However, within each age group there is risk pooling and cross subsidy e.g.
 - 50 year olds cross subsidise 54 year olds
 - Females will cross-subsidise males
- Hence at an age-band level the design reflects solidarity.

iii.

- If self-insured, can manage the liquidity risk by ensuring sufficiently liquid investments are held backing this liability.
 - But this will result in lower returns which increases the likelihood that reserves are inadequate.
 - This is probably not significant given the reserves are likely to be small
- May fully reinsure and purchase a group life insurance policy
 - Counter-party risk introduced
 - Reinsurers profit margin must now be covered, most expensive option
 - And cover may not be available on this sort of design.
 - If not very large, may be entirely book rated which may result in higher rates than if own experience were used.
- Or partially reinsure and take out catastrophe cover
- Or purchase cover for large benefits
 - Cover taken out may be insufficient for risks faced e.g. difficult to determine retention limits.
 - Comments about counter-party risk and cost apply.

Comments: Most candidates performed reasonably well in part (i), a bookwork question.

A number of candidates confused the concept of solidarity and mutuality in part (ii). Most failed to recognize that the structure had elements of both solidarity and mutuality.

For part (ii) most candidates mentioned reinsurance but failed to generate enough other points worthy of marks. In some cases students managed to mention the risk management strategies but failed to identify the shortcomings of each.

QUESTION 3

i.

- At retirement there is no longer a subsidy with respect to the medical scheme contributions
- Some retiring members may choose to exit the scheme to reduce costs after retirement.
- Alternatively retiring members may reduce the cost of health care by reducing their level of cover.
- At later ages healthcare can become particularly expensive, to the point of exclusion, if self-funded.
- Unless the pension paid increases, the pension will reduce in real terms making access to healthcare less affordable.
- Even if the pension does increase, medical inflation tends to exceed general inflation
- As do medical scheme contributions.
- Pensions that are guaranteed to increase in line with inflation are likely to be very expensive.

ii.

- The finances required for the government to subsidise the balance of costs will have to come from somewhere
- ✓ If taxes are increased in any way to channel more money towards healthcare employers may react by reducing the contributions towards retirement funds
- And members may reduce their contribution rate where possible
- In an effort to increase take home pay.
- Especially since the subsidy provided by the government is for people over the retirement age.
- ✓ If the subsidy is not generous enough, future retirees may still not have access to healthcare (or even a reasonable lifestyle) due to reduced levels of savings
- ✓ Higher participation in medical schemes of people past retirement age will likely drive up the medical aid contributions for all scheme members.
- ✓ Since overall costs of healthcare will increase with the skewed increase in demand of an older generation.
- Employers may prioritise the provision of healthcare over retirement benefits
- And may choose to contribute less towards retirement funds
- Or close schemes completely at the extreme.
- In the long term, improved healthcare at the older ages will likely lead to improved mortality at the older ages.
- In defined contribution funds the cost of annuitizing at retirement will increase
- due to longevity allowances
- Retiring members will end up with relatively lower pensions than before.
- In defined benefit funds pension increases may be negatively affected
- Or employers may have to cover deficits that arise due to allowance for improving mortality.
- Employer contributions to DB (balance of cost) funds will increase.
- ✓ The retired population will ultimately find themselves in the same position as before the subsidy was introduced under these circumstance.

Comments: The answers seem to be reasonably obvious for part (i) given the information in the question. However, many candidates failed to link the information given in the question to the answers provided.

Part (ii) was badly answered. Candidates often failed to answer what was asked or did not generate enough points.

QUESTION 4

(i)

- The CU standard contribution rate is the present value of all benefits that will accrue over the control period
- With reference to service in that period and
- earnings projected to the end of that period
- plus the present value of all benefits accrued at the valuation date
- multiplied by the projected increase in earnings over the control period
- expressed as a percentage of the present value of members' earnings over the control period.

ii.

- It is true that the Current Unit Method produces the lowest contribution rates
- When the term to retirement is high
- And the level of accrued benefits is low.
- This profile would be typical for a growing employer that is actively recruiting
- Since the average age of the fund is likely to be low
- And the level of accrued liabilities in the fund will be low.
- As the membership in the fund stabilises and the level of accrued benefits increases
- The component of the CUSCR that links accrued liabilities to projected earnings of the control period will increase dramatically.
- Specifically in a scheme with a large number of new recruits, projected salary increases may be high
- Placing a higher weight on the earnings increase component of the SCR even in early years.
- The rate of increase in the contribution may be too high for the employer.
- Over time the contribution level may stabilise
- But at a much higher level than they started off at.
- Keeping the contribution rate low doesn't affect the actual cost of the scheme
- It only affects the pace at which the costs are met
- The CUM has a very slow pace of funding
- This may be in breach of regulation
- And not realistic for the employer in the long term.
- Switching to the PUM may satisfy these conditions
- But the switch will dramatically increase the liability value
- And the employer may have to make one or a series of lump-sum contributions to fully transition.
- This may occur at a time when the employer is unable to afford
- Either due to economic or opportunity cost.

iii.

- Contributions are artificially low in the CUM
- Which means that employers using the CUM are unlikely to ever breach the tax limit.
- If the limit is ever breached it is likely to be later on
- In which case taxes are recouped later than otherwise would be the case.

Comments: Part (i) was bookwork and was well-answered by most. Students seemed to be overwhelmed by part (ii) and didn't tailor their answers to the specifics in the question – this is a new scheme of a growing employer. Candidates don't seem to realise that switching to the PUSCR requires as switch to the PUAL as well. Part (iii) was higher order, only one candidate performed well

QUESTION 5

i.

Using the AASCR/EASCR since contributions are to be level over the lifetime

$$C * S * a_{R-n} @ j = S * ((1 + e)/(i + i))^{R-n} * RR * a'_R$$

Where

C is the total contribution rate

S is the starting salary

R is the retirement age

n is the current age

$$j = (1+i)/(1+e)-1$$

i is the investment return

e is the salary increase rate

RR is the desired Replacement ratio (for defining terms)

We assume that salaries are paid annually in arrear, for simplicity.

Solving for C:

$$C = \frac{1.02^{67-30}/1.04^{67-30} * 80\% * 17.065}{a_{37} @ j} = 0.2546$$

Adding expenses:

$$C_{net} = 0.2546 + 0.0085 + .012 + 0.0025 = 0.2776$$

Dividing between member and employer

Recommended contribution rate for men: 13.88% of salaries

[5]

ii.

Sensitivity testing:

This involves varying one assumption at a time to observe the sensitivity of the outcome to the assumption.

Investment return:

This was assumed to be 4%. It may be useful to test a return of 3% or 5% (would accept 2% and 6% as well).

The contribution rate required with 5% i becomes:

$$C = \frac{1.02^{67-30}/1.05^{67-30} * 80\% * 17.065}{a_{37} @ j} = 0.2088$$

$$C_{member} = (0.2088 + 0.0085 + .012 + 0.0025)/2 = 0.1159$$

And with 3%:

$$C = \frac{1.02^{67-30}/1.03^{67-30} * 80\% * 17.065}{a_{37} @ j} = 0.3079$$

$$C_{member} = (0.3079 + 0.0085 + .012 + 0.0025)/2 = 0.1654$$

So the contribution range is from 11.6% to 16.5% depending on investment returns, i.e. a 1% change in investment return changes the required member contribution by 2% - 3%.

iii.

The main points:

- The recommended contribution for the base case member was 13.88% of salaries, which is nearly the maximum permissible contribution

- If any of the assumptions turn out worse than expected, the required contribution rate will exceed the permitted level ✓
- And the base case was male and single, where married and female members will need higher contributions ✓
- Recommend that the trustees review maximum contribution level ✓
- But this may be restricted by regulation ✓
- Alternatively, the assumptions could be revisited and checked ✓
- Also, is it reasonable to ask for the fund to deliver an 80% NRR after 37 years of service? ✓ Maybe a lower NRR or a longer service period should be the base. ✓

Comments: Part i was disappointing overall. Few candidates noted that this was a basic EASCR calculation with an expense adjustment and split between employer and member. Consequently some extremely complex calculations were performed. These gained credit but candidates wasted time. Some candidates showed poor mathematical rigour or failed to show workings. Part ii was reasonably done. In Part iii many candidates missed the main point being that the recommended contribution rates for males was very close to the maximum and hence for female members or if experience were adverse a contribution higher than the maximum rate would be required.

Some candidates picked up in part i, that the investment return assumption was real but the salary inflation assumption was not stated to be real, which was the intention. Credit was given for any inflation assumption made.

QUESTION 6

- The data is currently kept by a single administrator in a unique format
 - Data records are likely to have different formats for different administrators
 - There is risk that administrators are unable to merge data into their own formats
 - Or that errors with respect to interpretation of data and changes in data format are made during the hand over process.
 - The current administrator is likely to have efficient processes in place with respect to the volume of data that comes with a government scheme
 - The trustees need to consider if there are any other administrators to handle the vo
 - And if those administrators are able to handle large volumes of data.
-
- The effective date of the data handover and change in administrator needs to be considered
 - It should ideally be at the fund's year end date
 - Since valuation and financial reports are usually produced at these dates
 - So the data is likely to be more complete for handover
 - The actual date of the handover should occur after the completion of any valuations and audits
 - To prevent a delay in reporting
-
- The trustees need to consider the time it will take for data handover to be completed
 - And how benefit accruals and payments will be handled during the handover process.
 - There is the risk that benefit payments are duplicated
 - Or not paid at all if there is no clarity as to which administrator will handle payments.
-
- The cost of the exercise should be considered
 - There is likely to be a fee payable to the old administrator for the handover process.
 - The new administrator may be required to implement system changes or hire more staff
 - The costs are likely to filter through to the fund.
-
- Data integrity issues should be considered
 - Checks and balances need to be carried out after the handover of data is complete
 - This is likely to incur further costs
 - In a large fund it may be difficult to pick up missing or duplicated data
-
- Legislation in place may inhibit the process
 - For example information protection laws may slow down any movements in data

Comments: Performance in part (i) was very poor. Candidates failed to recognize that implantation would require thought through the practical elements of the transfer.

Part(ii) was also badly done. Candidates were not prepared for a question on data and the risks that may be involved in transferring large data from one administrator to another. Obvious points like cost of the exercise and legislation were made but not nearly enough to generate sufficient marks.

QUESTION 7

i.

The investment risk in a DC fund is mainly borne by the members.

- If the fund's investments perform poorly, member benefits are reduced/If the fund's investments perform well, member benefits increase√
 - o Poor performance could be due to choosing a poor manager√
 - o Having an investment strategy that is inappropriate√
 - o Markets performing badly√
 - o Expenses of investment being too high√
 - o Changes in taxation of investment returns√
 - o Poor reinvestment decisions√
 - o Counterparty default√ [max √√√√ for examples of poor performance)
- This applies to retirement benefits as well as withdrawal benefits, and also death benefits if the fund value is paid on death√
- The risk is worst close to retirement (or other benefit event) as the markets are subject to volatility and close to retirement, a sudden downswing can be locked in√
- Over the long term, the main risk is consistent underperformance of investment markets leading to low replacement ratios√
- In a fund with a single investment strategy, this risk is exacerbated as the strategy may be inappropriate for certain members (one size does not fit all): √
 - o Members with high assets and income may desire more risk/Members with low incomes may be unhappy with high risk strategies√
 - o Members approaching retirement may need to change their strategy to avoid volatility√

ii.

Creating individual member choice means that members are making choices which means that they will be subject to biases. √

- Blindly applying heuristics – e.g. splitting funds 20% each portfolio√
- Chasing winners – switching out after poor performance and missing the upswing√
- Herding behaviour – following others√
- Choosing unnecessarily expensive option√
- Not making a choice at all (and ending up in a default which may be inappropriate) √

Individuals also tend to be too risk averse, which means that they may end up in a low risk low return fund over the long term, and face inadequate retirement outcomes. √

Individuals may not be financially sophisticated enough to make a good decision – for example understand that they should switch into a certain fund as they approach retirement. √

There is also a lot of inertia, where individuals do not actively make a switch because it is work. √

This can be somewhat remedied by:

- Creating really good defaults which will ensure that those who do not make a choice have a good choice made for them√
- Creating life-styling options (ideally as a default) which switch members with age into appropriate lower risk funds√

- Smart life-styling can account for the nature of post-retirement investments desired by the member as well√
- Limit switches to one a year, or impose a fee, to avoid chasing winners√
- Communicate investment returns to showcase long term returns not short term swings√
- Educate members√
- Provide role models in the company who talk about their choices to encourage “good” herding√
- Ensure that all choices in the fund are sensible, reasonably priced and deliver appropriate returns.√

iii.

The fund members are primarily invested in Fund B, which is a bond fund and unlikely to be the best match for salary inflation√ (even if the bonds are index linked, they won’t keep up with salaries).√

- This may be due to a fund design problem, for example B is the default√
- Or due to lack of financial sophistication / risk aversion√

The investment return is R5m where the assets at the end of the year were R86.3m and at the start of the year approximately $R86.3 + R20 - R9 - R5 = 92.3$.√ So the return on average assets is $(5*2)/(86.3+92.3) = 5.6\%$, i.e. only 1.6% over inflation√. This is not a great return and is probably caused by over-investment bonds.√

There were more exits from the fund than contributions.√ This is unusual for a fund where most members are in their 30s√. It is possible that one high net worth individual retired√. Otherwise, there must have been significant turnover and withdrawals.√

If this trend is to continue, liquidity may be affected.√ However, this will be managed by the managers of the portfolios√. It is possible that they have however put in place some measures such as waiting periods on large disinvestments to protect themselves from such risk√.

If withdrawals are the trend, and members expect to only work for the company for a few years, this could explain the high investment in Fund B√, as it may be perceived as more stable in value than a Balanced fund.√

Of members who invested in one of the 3 Balanced funds, the vast majority are in the high risk fund. This is somewhat surprising, and again may be the result of a default√, or possibly brand recognition of manager E.√

Not all members should be investing in high risk funds, so it may be worth investigating who is in E and what their characteristics are.√

Investigate:

- What the defaults are and how they are communicated – this may shed light on investment choices being made√
- What does the investment selection form look like and how this may be affecting member choices√
- Characteristics of members invested in various portfolios – to understand whether members are choosing appropriately to their circumstances√
- The performance of each portfolio – to see if the volatility/risk profile is in line with expectations√
- Is switching happening and how often – to see if members are making switches to chase returns√
- What is the reason for the high amount paid in benefits and is it likely to persist – to evaluate whether there will be cashflow issues in the future√

In part i, candidates generally did not make enough distinct points. The poorer attempts gave a list of investment risks. Part ii was well done. In part iii, there was a complication in that the asset balances

did not add up to the total assets. One candidate identified this and was given credit for points made regarding the fund being underfunded. In general, part iii was poorly done with few candidates offering a variety of reasons as to why this asset distribution could be observed. Most candidates did not calculate the return on assets appropriately.

QUESTION 8

i

- Actuarial certification may be required to: (no marks for this point)
 - establish a new occupational fund
 - gain tax concessions
 - change fund rules
- Actuarial valuations may be required regularly (for example triennially) to:
 - Establish solvency levels
 - Establish contribution rates for DB funds
 - Recommend how any deficit is funded.
- Actuary may be required to sign off shareholder disclosures
- The actuary may be obliged to act as whistleblower in certain situations.

ii

Data

- Salary data would need to be obtained for fund members who were active over the full period of investigation...
- Age,
- gender and
- service data may also be required
- As well as price inflation information.

Process

- Divide data into homogeneous groups, e.g. age, gender etc
- For each group divide salary at the end of the period by salary at the beginning of the period.
- The effect of price inflation is typically stripped out...
- ...And the productivity increase is generally assumed fairly stable...
- ...or can be identified by reference to the net of inflation increases for workers at older ages.
- The remainder is typically the promotional salary scale.
- Actual versus expected salary increases can then be calculated to ascertain appropriateness of the assumptions
- (in total or by component part)

iii.

Impact on the members

- Unless there is a rearrangement of government budgets, there will need to be an increase in general taxes to fund the new scheme.
- This may cause members to reduce their savings in the occupational schemes
- Either by a reduced savings rate or decreased participation
- To the extent that these are possible.
- Alternatively members may reduce consumption in other areas
- There is a possibility that members may reduce their work effort if the increase in taxes is large enough.
- Members will also start to receive the state benefit, which may increase consumption in older ages
- But this additional consumption may effectively be over-provision if the member's needs were previously fully met by the employer scheme.
- This may be particularly true for low-income earners for whom the state scheme's benefit represents a larger replacement ratio than workers earning a more significant amount.

(4.5 marks available)(Max 3.5)

Impact on the funds

- To the extent that members can reduce participation or contribution rates, the fund may experience reduced expense recoveries
- While many of their expenses may remain relatively fixed e.g. cost of regulatory compliance
- This increases the expense charges that the fund will need to apply to members in order to avoid a solvency strain.
- Which may make the funds worse value for money which may encourage more members to reduce participation.
- Funds targeting very low-income earners may find that they are no longer economically viable and may need to close altogether
- The DB funds which are closed to new members may already be small and similar comments apply
- If expense charges do not change, the solvency levels of the funds are likely to decline over time.

(3.5 marks available)

(Max 2.5)

Impact on sponsoring employers

- May be pressure on the employer to integrate occupational benefits with the state scheme.
- E.g. by changing the definition of pensionable salary for DC funds
- Or changing the accrual rate in a DB fund
- If the employer contributes to the fund:
 - Reduced participation may mean lower payroll costs
 - (unless the employer operate on a total cost to company basis)
 - Which may be partially offset by an increase in corporate taxes if contributions are tax deductible.
- Employers may lose some of the sorting and incentivising benefits of DB funds if these are forced to close.
- The new benefit is only offered from age 65, this may be higher or lower than the employer's desired retirement age.
- If members opt out of the employer's scheme, the employer may lose its ability to influence the age at which members retire.
- It's possible that the employer offers other benefits through the retirement fund e.g. death and disability benefits.
- The employer may need to find alternative mechanisms to ensure appropriate risk coverage for members
 - so as to avoid anti-selection which would push the costs up for remaining members
 - or to control appropriately for externalities

(6.5 marks available)

(Max 3 for points excluding risk benefits coverage plus max 2 for risk benefits coverage)

This question was disappointingly handled overall. Part i was bookwork but candidates did not recognise it as such. Part ii was also bookwork and it was clear that this section had not been studied in depth by most candidates. In recent years there have been a number of questions similar to part iii. It was thus disappointing that almost all the candidates ignored the most significant point which was that if taxes increase to fund the new scheme, contribution rates or participation in the employer scheme may fall.

END OF EXAMINERS' REPORT