

**Actuarial Society of South Africa**

**EXAMINATION**

**19 May 2020**

**Subject F204 - Pensions and Other Benefits  
Specialist Applications**

**MARKING SCHEDULE**

## QUESTION 1

*This question was the most poorly answered of the 3 questions. The question required candidates to explain how a defined benefit death benefit (spouse's and child's pension) could be funded in a defined contribution fund. The 7 parts progressed the candidate through the issues that a pensions actuary would be expected to consult to. Most candidates did not understand the distinction between benefits promised and how these are funded.*

**i) Outline possible reasons why the spouse and child pension are insured as a lump sum multiple of salary. [7]**

*This question asked candidates to explain why the insurance would be taken out on a lump sum basis, instead of insuring the benefit as a pension. Most candidates missed this point and focused on why the fund would insure at all. This question was very poorly answered.*

- Not many insurers are offering insured spouse and child pensions
- Means that benefit is likely to be expensive as less competition
- Also loaded by the insurer for the cost of making monthly payments
- And carrying out proof of life / study exercises
- Insured benefit may not be in line with Fund rules, for example:
  - Definition of spouse
  - Child cease age and conditions of study
  - Treatment of disabled children
- Insurer may want detailed information of each member's spouse(s) and children which are not readily available
- And require that this be updated regularly
- Can lead to not having cover if spouse or child arises that the insurer was not informed of
- Trustees may want to keep closer contact with dependants by paying the pension
- Although could achieve this by insuring pensions in the name of the Fund
- If the insurer is changed, it will result in different tranches of spouse and children getting different pension increases
- And the increases will differ from those provided by the Fund to retirees
- Both of the above is difficult to explain to dependants
- If pensions are also insured on a 3% PRI / affordability basis.

**ii) Show how you would determine the multiple to insure at each age and the assumptions you would need to make. [11]**

*This was a straightforward question, asking candidates how they would convert a defined benefit into a lump sum, in the specific case where age would determine the amount of the lump sum required. Poorly answered.*

- In theory the factors should differ for males and females
- Easiest to first determine factors for each gender
- At each age would need to assume:
  - The proportion married
  - Adjusted for the Fund's definition of spouse
  - The expected age of the spouse (typically male > female)
  - The number of qualifying children and their ages
  - And their likely cease age e.g. if the cease age is 18 years if not studying and 23 years if studying, the need an assumption of average cease age e.g. 21 years
  - May need a (different) assumption regarding children depending on marital status of member
  - May allow for doubling of children's benefit if no spouse's benefit payable
- The assumptions can be set based on the current membership data if this extends to dependants
- Unlikely to have full data so would use external data (population, similar schemes etc)
- Tracking the actual risk experience over time will help in refining the assumptions
- Need to determine annuities based on the spouse and child ages / cease ages
  - Using appropriate mortality table and pension increase assumption
- Insured multiple would be something like:

$$\text{PropMarried} * (40\% * \text{ann}_y + 10\% * \text{ann\_child1} + 10\% * \text{ann\_child2} + \dots) \\ + (1 - \text{PropMarried}) * (10\% * \text{ann\_child1} + 10\% * \text{ann\_child2} + \dots) + 2$$

- Consider whether the insured multiple needs to be loaded for:
  - Any margins for actual experience being worse than assumed
  - Disabled children for example
  - But consider in conjunction with risk reserve
  - Expense of paying the pensions
  - Any contribution to solvency or similar reserves in respect of pensioners
  - Don't want to be too conservative as increases insured cost.
- Combine the female and male insured multiples above to create a single insured multiple of salary
- Taking into account the male / female ratio of the membership at each age.

**iii) Discuss how you would expect the insured multiple to change with age and the reasons for this change. [4]**

*Candidates made a reasonable attempt at this question, but missed marks by not starting at a potential entry age in the early 20s and explaining how the expected benefit would progress through all the stages of life to retirement.*

- At low ages, say up to 30 years, would expect the multiple to start increasing as more members become married and have children.
- Cost of providing a spouse's pension is very high due to young age but proportion married is likely to be low but increase rapidly.
- Would expect the multiple to remain reasonably constant in the middle ages (say 30 to 45) as reduction in spouse annuity is offset in part by more children and slight increases in proportion married.
- Multiple will then reduce gradually towards 65 years as spouse annuity and child annuities reduce due to aging spouse and children.

**iv) Explain why a risk reserve is required and the factors it would mitigate against. [4]**

*The candidates focused predominantly on why a risk reserve is necessary in general, and did not focus on the specifics of this scenario and so missed a number of the available marks. Poorly answered by most candidates.*

- The risk reserve is required to smooth out the differences between the insured multiple received by the Fund against the actual cost of the death benefits.
- It would mitigate against the difference in the assumptions made in determining the insured multiple and the actual experience. All other things being equal:
  - Male member death would most likely result in a strain / female death in a surplus
  - Married member would result in a strain / single member in a surplus
  - Younger spouse would result in a strain / older spouse in a surplus
  - More and younger children would result in a strain / less and older in a surplus.

**v) Explain two ways the risk reserve could be prospectively determined and comment on the management of the reserve over time. [7]**

*Candidates missed that the reserve could be calculated deterministically or stochastically, and attempted to explain variations of a deterministic approach, or only the stochastic approach, and missed out on the marks available for the second approach. Credit was given for reasonable suggestions. Most candidates gave a reasonable explanation of the management of the reserve over time.*

- The risk reserve will be built up retrospectively based on actual experience.
- This value of the risk reserve must then be compared to the theoretical risk reserve determined on one of the 2 prospective bases set out below.
- Deterministic approach
  - Look at a worst-case scenario death e.g. highly paid older male member who is married to a spouse 15 years younger with 4 young children. Calculate difference between actual cost and insured amount. Hold a multiple of this (say 4 times) as the risk reserve
  - Alternatively perform the calc above for the 4 highest paid members
- Stochastic approach
  - For the membership, select a suitable mortality table.

- For each member generate a random number between 0 and 1. If number is less than the qx applicable to that member, member is assumed to be dead.
- Calculate the cost of the death benefit less the insured amount for each “deceased” member. Use actual member details if available or alternatively assume more conservative details than used in the insured multiple calculation.
- Run a large number of simulations of the above, say 10 000. Set a desired confidence level for the risk reserve e.g. meet 99% of claims by setting the risk reserve equal to the 9 900 worst case simulation. Could also hold a multiple of this amount (e.g. 3 times to have 3 years’ cover)
- Regardless of method used, imperative to update the approach as the risk experience of the Fund emerges over time
- Any shortfall or excess between the retrospective risk reserve and the prospective risk reserve must then be financed / allocated as per the Fund’s rules, possibly at the discretion of the Trustees
- Releasing of surplus in risk reserve should be considered with caution, especially if experience fluctuates from year to year

**vi) Describe how the introduction of Category B will impact on the Fund insurance arrangement and on members and their dependants. [4]**

*Candidates focused most of their attention on the members’ risk of underinsurance and missed the points around the impact on the insurance arrangements. Reasonable attempt by most candidates.*

- Members will be able to elect benefits that better suit their needs.
- Single members and older members with large member accounts likely to opt for Category B.
- Possible that even members with a spouse might prefer Category B if they have other life cover in place.
- Fund will need to revise the insured multiples for Category A
- As well as the level of the risk reserve (probably reduce)
- As probability of being married and having children is likely to increase for those members remaining in Category A.
- Premium should be less than Category A, so more monies saved for retirement.
- However, Category A will pay higher premium with removal of cross-subsidy, so less allocated toward retirement.

- Ideally, where a member with dependants opts for Category B, the Fund should get agreement from the spouse for such a change.

**vii) Discuss any other implications that the Trustees should consider. [5]**

*This was a broad question, allowing candidates to demonstrate their insight into the complications and implications of allowing members choices with regards to their death benefits. Candidates did not identify the broad range of implications needed to score highly on this question.*

- The Fund will have to have a default category for a new member where the Fund does not receive an election form / does not receive it in time.
- Probably safest to default to Category A
- Will need to decide on frequency of election of risk category
- Too frequent (e.g. monthly) will become administratively burdensome
- Annual is common but perhaps add option to review if life event occurs:
  - Life events would include new spouse or child or
  - Divorce or death of spouse or child.
- Insurer likely to have some form of underwriting criteria where members moves from Category B to Category A
- Likely to be an increase in costs and governance time as new structure needs to be administered and communicated to members
- Communication will be required annually with the Category election.
- Default with annual election is required if member does not respond. Stay with previous election is probably sensible
- Members may elect categories based on affordability and not on need and may find their dependants do not have the protection required
- If members can move freely between categories, expect anti-selection as members in poor health opt for Category A

## QUESTION 2

*This question asked candidates to discuss the implications of a government proposal to introduce two new prescribed assets for retirement funds. In both parts, candidates had to consider both the asset and risk characteristic of the individual assets being proposed, the implications of the different percentages proposed, as well as broader investment implications. Most candidates did not generate sufficient points on the individual asset characteristics, focussing more on general remarks around Investment Policy Statements and Regulations, which gave them limited credit. This question was poorly answered.*

**i.) Set out the factors the trustees should consider in order to evaluate this proposal. [11]**

*Fair attempt by most candidates but candidates failed to generate sufficient points to score well in the question.*

- In theory a good proposal as investing in smaller unlisted businesses should help the economy.
- If done properly, could provide retirement funds with a decent investment return.
- Offers good diversification from other asset classes.
- However, are there sufficient smaller businesses of suitable quality to invest in?
- If not, proposal could lead to forcing funds into non-sustainable poorly managed companies.
- Would also mean the fund should invest as soon as possible as better investment opportunities likely to go first.
- Time frame in which to reach the 5% PE level is important.
- A longer timeframe will help mitigate the risk of poor investments being made for the sake of investing.
- Will the 5% requirement be a once-off requirement, or will funds be required to top up to the 5% level again in future if PE investment are realised / listed?
- If the 5% is implemented in too short a timeframe, there is a danger of creating an asset bubble where PE is overpriced due to demand, and even good companies result in poor returns.
- Will commitment of capital to PE be included in the 5% or will only the actual drawn down amounts count?
- PE may not be an appropriate asset class for every fund, but
- PE is in general an asset class used by retirement funds worldwide and a 5% level is not too high.

- Probably better suited to DB funds although long term growth portfolios in DC funds can also benefit from PE.
- Valuations and pricing of PE is often problematic, DC members who leave early don't enjoy the expected later pick-up in PE returns (J curve effect).
- Members who join later then benefit from this PE pick up at the expense of the exiting members.
- If the fund offers investment choice, must ideally not allocate PE to the more liquid / conservative investment options.
- With the possible exception of some very large funds, a 5% PE allocation will not provide a diversified PE investment if invested directly.
- Will investments through a PE pooled vehicle be permitted?
- This will also allow the funds to utilise specialist PE managers.
- As fund are unlikely to have PE investment experience inhouse.
- Will PE manager fees also be legislated as part of the process? If not, open to abuse.
- Although there might not be any managers with proven track record in Modonia at present?
- Even if external PE manager is used, trustees will need to spend more time understanding the PE investments and
- Monitoring the PE manager.

**ii.) Set out the factors the trustees should consider in evaluating this alternative proposal. [10]**

*A fair attempt by most candidates but candidates failed to generate sufficient points to score well in the question, particularly on the specifics of development bonds.*

- 20% exposure to bonds, particularly development bonds, is very high
- Probably not appropriate for most retirement fund investments
- Unless following a bond strategy (e.g. in respect of pensioners)
- May be more acceptable if backed by a government guarantee
- So that developments bonds can replace any existing government bonds in the portfolio
- But would be self-defeating for government if development bonds simply replace government bonds

- If no government guarantee, then funds will need to do a due diligence of each bond issuer (development agency)
- Will have to revisit investment policy and see if 20% exposure will reduce expected risk adjusted returns:
  - For DB funds, advise employer of impact of lower expected returns on required contributions / deficit funding
  - For DC funds, advise members of expected lower retirement benefits and the need to make extra contributions / provision for retirement
- Easier to price than the PE so less cross-subsidies between different cohorts of members in a DC fund
- The term to maturity and coupons will be crucial in assessing risk
- A wide-spread, across different sectors would make diversification easier
- Depending on the cashflow position of the retirement fund, the liquidity of the bonds will also be important. Can they be traded?
- Timeframe to meet the 20% is crucial to prevent an asset bubble and distorted pricing.
- If some of the bonds are inflation linked, this might be attractive to retirement funds
- Consider the track record of the entities that will utilise the bond proceeds. Do the development agencies have a good financial and governance record?
- Important to consider why this is being legislated in the first place
- A well-managed agency, offering a competitively priced bond should have buyers without legislation compelling this.
- May result in new sectors in the economy which may present other investment opportunities in future (equity in new companies) which would benefit retirement funds.

### QUESTION 3

*This question was the least poorly answered of the three, with most candidates scoring well in the calculation question.*

**i.) Present the pros and cons of the proposed change, considering both Widgets Inc and its employees. [12]**

*Reasonable attempt by all candidates, but candidates failed to generate a sufficiently wide range of points to score well.*

- The majority of South African occupational retirement funds offer retirement ages of 65
- Age 60 is therefore relatively early
- Although the State Old Age Pension Age is 60
- Current NRA may be in place because of the nature of the work – manufacturing
- What do competitors in same industry use?
- Life expectancy has been increasing
- Trend towards later retirement ages
- Suggest an increase is appropriate
- Would need to consider the manufacturing staff – can they feasibly be expected to work after age 60?
  - May end up with two retirement ages – one for clerical and one for manufacturing
  - This is not ideal – perceived to treat staff differently – what happens if a manufacturing staff member feels able to work longer?
  - Extra admin
- Might depend on the type of manufacturing – if heavy, might be unrealistic to expect people to work longer. Easier if light manufacturing.
- How will this affect employment? Is there capacity to employ staff for the extra 5 years?
- Keep older staff, cannot employ younger staff?
- Good for retirement outcomes from the fund
  - Longer savings period
  - Shorter payment period
- Will be an impact on risk benefit costs
  - Employer offers GLA and Income disability – GLA rates will increase as staff age and costs go up.

- Expect no impact until someone over age 60
- Income disability will increase immediately – any claims after the change will be paid for 5 years longer
- Existing claimants would not receive benefits after age 60
- If self-insured – extra risk for longer. Costs expected to increase similarly to the insured costs.
- Impact the same whether the risk benefits are approved or unapproved
- Need to decide why this change is necessary
  - Could let staff stay work longer on a contract basis
    - No risk benefits
    - No admin or change needed
  - Already allowed to defer their retirement benefits in terms of law – but does not allow for further accumulation
- Not good for unemployment rates in SA
- Still need to consider employment equity
- May allow for the retention of staff with specialist/unique skills – good for the business

ii) **Identify and discuss the practical considerations Widgets Inc. would need to take into account to implement this change.** [16]

*A reasonable attempt by most candidates, but candidates struggled to generate a sufficiently wide range of points to score well.*

- **Approvals**
  - Employer approval would be required – possibly board approval
  - Approval by trustees to change retirement fund rules
  - Rule change requires approval by FSCA
    - Cannot be implemented in the fund until this
  - Letters and contracts of employment likely to refer to the NRA from the rules. Would therefore require approval of staff to change existing terms and conditions of employment
  - Allow time for staff to consider the change
- **Communication**
  - profile of staff
    - younger staff may not care as much,

- older staff would be more engaged in the communication
  - May need one on one consultations
  - Revised projections at retirement
- **Transition arrangements**
  - Staff close to age 60, what are the plans for them?
  - Any staff already over 60?
- Can make it voluntary – existing staff can choose to retire at 60 or up to 65
- New staff at 65
- **Risk benefits:**
  - Assuming (as expected) new NRA will apply to risk benefits
  - But would need to decide this
  - Also transitional arrangements – all staff? Or new?
  - If all staff, what happens for those already over 60
  - If insured – would need to get new quotes
  - May be underwriting implications
- **Investments** – will need to adjust glide path for the lifestage investments
  - Adjustment to the investment policy statement may be required
  - No immediate change to where assets are invested.
- If option is given to remain on 60 may end up with two different lifestage models – adds complexity and cost, but should not be a major impact.
- If option is given to retire from 60 to 65, more complexity in default investment.
- Could simplify to one lifestage model
  - But a one-size-fits-all lifestage model could result in those retiring at 65 being invested in conservative assets for too long.

- iii) **Briefly explain the impact on the elements shown in the benefit statement that will be affected by this change and for each, estimate the expected impact on the projected retirement pension of a member currently aged 40, with a net contribution to retirement of 13.5% of salary, and a projected lump sum accumulated at retirement of R2 000 000. State any assumptions you make.** [9]

*This was a straightforward calculation question and was well answered.*

### **Contributions will continue for 5 years' longer**

Impact – assuming salary increases occur at the end of each year:

$$\begin{aligned}
 & 0.135 * 100000 * a_{\overline{1}|}^{(12)} \quad (\text{at } i = 10.5\%) * \ddot{a}_{\overline{5}|} \quad (\text{at } i' = 1.105/1.06 - 1) * (1.105)^5 \\
 & = 13500 * 0.9477444 * 4.60900967 * 1.64744677 \\
 & = R97\,150.27 \text{ increase in lump sum available to purchase a pension at age 65}
 \end{aligned}$$

*(Could do using s-factors instead of a-factors)*

*(Credit also given for quicker but less accurate way – assuming salary increases throughout the year as acceptable to estimate.)*

*Candidates who use a return different to 10.5% earned credit for justifying why:*

- *Return might increase slightly as average to age 65 assuming the glide path still the same.*
- *Return might reduce slightly if the glide path is extended as invested in the lower risk portfolio for 5 years longer.*

### **Value at age 60 expected to grow for the additional 5 years:**

$$\text{Impact : } 2\,000\,000 * (1.105)^5 = R3\,294\,894$$

### **Conversion to pension – annuity factor at 65 lower than that at 60**

Age 60 is 23.934

Assuming life expectancy to 95, annuity at age 65 is around 21.6

*(Range of answers accepted depending on how justified. Morality improvements will increase the gap, as will assuming that if you survive to age 65, you may live longer than the 95.)*

### **Combined impact**

$$\text{Estimated annual pension at retirement at age 60} = 2\,000\,000 / 23.934 = R83\,563$$

$$\text{Estimated annual pension at retirement at age 65} = 3\,392\,044 / 21.6 = R157\,039$$

Total expected increase in pension of R73 476 per annum – 188%