

Actuarial Society of South Africa

EXAMINATION

30 May 2011 (pm)

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

EXAMINERS' REPORT

QUESTION 1

(i) role/responsibilities of the approved valuator

This was a relatively straightforward bookwork question which was answered reasonably well by most candidates.

- Act in accordance with legal obligations (mainly under the Pensions Act 1956, as amended, in particular Second Amendment Act 2001) and specifically:
- triennial valuation of Fund (and any interim valuations), with: corresponding certification of financial condition;
- plus determination of funding rate;
- and any funding plan in respect of shortfall;
- together with examination of experience;
- and hence determination of basis;
- appropriateness of insurance arrangements
- certification in terms of Reg 28 of suitability of assets and matching.
- Annual (approximate possibly) valuation as required for accounting valuations. Propose/determine suitable transfer value basis/implementation issues (section 14).
- Involvement with benefits to extent required, commutation and minimum benefit issues.
- Certify any debt on the company in winding up.
- Act in accordance with professional code of conduct and guidance of Institute and Faculty of Actuaries and of Actuarial Society of South Africa.
- Provide advice to the trustees as the primary client when requested.
- Raise issues for consideration by trustees including ethical/investment.
- Duties under Act in terms of surplus apportionment.
- Duties under Act in terms of minimum pension increases.
- Provide advice as necessary under rules.
- Provide recommendations on Pension increases in line with policy
- Advice regarding HIV/AIDS
- Advice regarding reinsurance arrangements

(ii) Considering the most commonly used valuation methods set out the factors to be taken into account in choosing a method [4]

This was a relatively straightforward bookwork question. Most candidates made a reasonable attempt at this question but failed to give sufficient points to score the available marks.

- In practice retirement schemes vary considerably in size and maturity, and in stability of membership profile.
- The funding method that will produce the greatest contribution stability will therefore vary from scheme to scheme.

- There are indeed many schemes that are closed to new entrants and so will have an ageing membership; for those the attained age method is likely to be appropriate.
- Other than security, from the Trustees' perspective, and stability and flexibility, from the sponsors' perspective, legislative and accounting constraints have a significant influence over the choice of method to be used for the on-going funding of a scheme.
- In the light of the Financial Services Board's Circular PF117, discontinuance valuation is becoming common,
- and Trustees will need to consider the coverage of discontinuance liabilities when setting a funding plan.
- This may include consideration of the winding up liabilities which are effectively determined by using a Defined Accrued Benefits method with insurance market based assumptions.
- Accounting standards do not have any direct effect on the approach that is adopted to fund a scheme.
- However, a sponsoring employer may prefer to have some consistency between the values and contribution requirements in reality and in the company's accounts. The accounting standards may therefore have an indirect effect, to the extent that the sponsoring employer has an influence in the funding decision.
- Accounting disclosures requires a Projected Unit method to be used.
- Another indirect result of the above legislative and accounting restrictions comes through client understanding. The more different calculations that are performed on different bases and methods, the harder it is for the client to understand the financial position of the pension scheme.
- The Entry Age method and the Current Unit methods are rarely if ever used.

(iii) Discuss the issues that you would recommend the company raises with the Fund's valuator when discussing future funding requirements:

Parts (a) and (b) were reasonably well answered by better candidates. Few candidates considered asset valuation, expenses and the employer's reluctance to build up surplus under part (c).

(a) Funding methods

[2]

- The attained age method produces a relatively high initial rate of contribution compared to the projected unit credit (PUC) method,
- which is designed to remain broadly stable over time for a closed group of members,
- PUC would align with company accounting
- so that there might be some room for negotiation here
- is the required rate set on solvency basis
- if economic basis has no risk premium funding on solvency too conservative
- is there room for weaker "best estimate" basis for setting rates as long as solvency reserves are maintained,
- i.e. don't specifically fund for full solvency as long as company accepts risk

(b) Assumptions

[14]

- How has the discount rate been determined?
- And in particular what relationship does it bear to returns on long dated RSA bonds or to yield curve?
- And to the actual investments held in the Fund against pre-retirement liabilities?
- Similar questions could be raised in relation to the post-retirement discount rate.
- Is it appropriate to have same rate, duration of liabilities?
- In particular is the implied net real rate of return of about 3% realistic?
- If the discount rate assumptions reflect actual asset allocation then what is actuary's view regarding a change of the investment strategy?
- Is there any allowance for an equity risk premium, what level?
- What asset liability modelling has been done?
- How does the salary increase assumptions compare with actual recent experience?
- And with company's expectations for future salary increases?
- Last review of the promotional salary scale over full range of ages, is it supported?
- Pension increase at 100% vs. 95% purchasing power, show how the pension increase assumption reflects the Trustees' policy?
- What are historic increases and expectations
- Is mortality experience statistically significant?
- How does the actual experience compare to the tables, both of which are light. Since company operates in manufacturing sector does basis allow for AIDS for actives and / or pensioners?
- And has experience shown any discernible pattern of deterioration over last 10 years?
- Company is looking at steps it can actively take to stem contribution rate increases what are possibilities for benefit reduction?
- In particular as regards early retirement, which is very generous after 60?
- As company consent needed in any case what would be effect of introduction of actuarially determined early retirement, or more market related, factors between 60 and 65, as company consent needed?
- and what is recent experience, is early assumption still appropriate, company view
- What is actual withdrawal experience?
- Adjusted and unadjusted for any retrenchment, or other special, experience?
- What would be effect of introduction of suitable experience related rates?
- Allowing for actual withdrawal benefit subject to minimum benefits?
- How does proportion married assumption compare with actual marital status of new pensioners?
- Is a pensioner also valued on basis of 90% and related assumptions or is actual status, actual date of birth of spouse and actual reversion used?
- If pensioners valued on basis of 90% and related assumptions, what would effect be of change to actual data?
- What is the commutation experience and what allowance has been made for commutation?

(c) **Other**

[2]

Value of assets

- How are the assets valued?
- Is method of valuation of assets consistent with valuation of liabilities?

Expenses

- What allowance has been made for expenses in the contribution rate?

2nd Amendment Act

- Given surplus apportionment requirements Company wants to minimise accrual of future surplus that cannot be reserved for contribution holidays.
- Hence has actuary been mindful of this in setting basis?
- Can actuary indicate the likely level of future surplus that will come to be apportioned to the “employer surplus account”?
- Rules around future surplus and how is this taken into account
- And what allowance can be made for this in the funding?

(iv) **Issues for the actuary / valuator to consider when advising the trustees on the merits of the company’s proposals.**

[8]

Poorly answered. Few considered the professional issues and the employer and Trustee responsibilities and the fact that the employer can controls some of the Fund cost.

- Employer may be placing financial interests of his shareholders ahead of members.
- It is not surprising that the employer should wish to ensure that the money being “invested” in the Fund is not in excess of requirements given the low “return” being gained on this money.
- Remind the trustees that the employer has a responsibility in terms of rules and law to maintain Fund in sound financial condition.
- And that the trustees have an equally onerous responsibility and hence must communicate any concerns they may have about the funding rate.
- Employer must be made to appreciate the risks that it runs if a less conservative actuarial approach is adopted.
- Professional code of conduct obliges actuary to point out the financial risks.
- In terms of the likelihood of higher contributions being required in the future.
- And in terms of the possibility of a capital payment being necessary if the funding position deteriorated below 100% on a realistic basis.
- Also possible credit risk of employer — hence security of members.
- Also non financial risks such as a possible loss of confidence of employees in the Fund if there is a reduction in the funding position.
- Through minimum benefits, “top up” requirements to former members and surplus apportionment requirements.

- Moreover, there is a requirement for the trustees and the company to act in accordance with the advice of the actuary / valuator, as set out in the rules.
- Rules imply that only one actuary should advise both parties in the matter.
- Any actuary independently advising employer should have regard to PCS and ASSA's code — should not make any suggestion that could be damaging to members' interests.
- The actuary / valuator must, however, make clear to both parties that his primary client is the trustees who make appointment in terms of the Rules.
- The actuary / valuator will of course at the very least wish to assess strength of the basis as proposed by the company to the trustees.
- So that, on the balance of probabilities, the resultant rate is still considered to be more likely than not to be sufficient to meet the Fund's funding objectives.
- the financial strength of the company, both now and into the future, should be considered especially if proposed basis contains no margin for prudence.
- company's ability to control increases to pensionable earnings.
- Or to keep a tight rein on the incidence of early retirements
- If the company refuses to accept a rate which is at least as strong as best estimate assumptions actuary might be obliged to resign his appointment.

QUESTION 2

[For the question you would need the AM92 annuity factors net 4% from the yellow formulae and tables book, 2002 edition]

- (i) Determine the potential current death in service benefits of the above two individuals under both the current and previous arrangements. Compare these benefits in respect of each individual as well as between the two individuals. Note any assumptions made. [11]

Few candidates calculated the accrual rate correctly. Despite this, most candidates calculated the death benefits correctly using the incorrect accrual rate. Few candidates gave any in depth comments on the results.

Old benefit:

- Married and Spouse same age as member
- Accrual = 75% / 45 yrs = 1/60th
- Pension Benefit = min(past service + future service; 40yrs) x (1/60) x 60% x Salary
- Lump sum = Salary
- John: Pension = min(5 + 65 - 25; 40) x 1% x R50 000 = R20 000 p.a.
- John: LS = R50000
- Samuel: Pension = (15 + 20) x 1% x R200 000 = R70 000 p.a.
- Samuel: LS = R200000

New benefit:

- Benefit = 5 x salary + MS
- John: 5 x R50000 + R25000 = R275 000
- Samuel: 5 x R200000 + R400000 = R1400000

Comparing:

- Convert old to lump sum (assume spouse same age)
- {Or Convert new to lump sum and annuity}
- LS equivalent = annuity x $a(x)$ + LS
- John: LSe = R20000 x 22.520 + R50000 = R500 400
- John: Old / new = R500400/R275000 = 181.96%
- OR John: Old/salary = 10.0 ; New/salary = 5.5
- John: Old benefit is significantly greater
- Samuel: LSe = R70000 x 18.823 + R200000 = R1517610
- Samuel: Old / New = R1517610/R1400000 = 108.4%
- OR Samuel: Old/salary = 7.6 ; New/salary = 7.0
- Samuel: old and new marginal difference

- Relative to the old structure little has changed at this point in time for Samuel while John's spouse will have lower benefits
- As a multiple of salary the old benefit would have given John +-10 times his salary while it would have given Samuel +- 7.5 times his salary
- And as such the level scales are indicating an inequity in benefits
- Appears as though design of scheme was in line with simply average age of population hence Samuel has equivalent benefits

(ii) Again compare the various death benefits under the two structures and comment on the changes that have been seen in relation to the relative benefit structures.

[5]

Same comment as for 2. (ii) above. Few candidates calculated the accrual rate correctly. Despite this, most candidates calculated the death benefits correctly using the incorrect accrual rate. Few candidates gave any in depth comments on the results.

Old benefit:

- Pension Benefit = $\min(\text{past service} + \text{future service}; 40\text{yrs}) \times (1/60) \times 60\% \times \text{Salary}$
- Lump sum = Salary
- John: Pension = $\min(10 + 65 - 30; 40) \times 1\% \times R80\ 000 = R32\ 000$ p.a.
- John: LS = R80000
- Samuel: Pension = $(20 + 15) \times 1\% \times R300\ 000 = R105\ 000$ p.a.
- Samuel: LS = R300000

New benefit:

- Benefit = 5 x salary + MS
- John: $5 \times R80000 + R100000 = R500\ 000$
- Samuel: $5 \times R300000 + R900000 = R2400000$

Comparing:

- Convert old to lump sum (assume spouse same age)
{ Or Convert new to lump sum and annuity }
- LS equivalent = $\text{annuity} \times a(x) + \text{LS}$
- John: $\text{LSe} = R32000 \times 21.834 + R80000 = R778\ 688$
- John: $\text{Old} / \text{new} = R778\ 688 / R500000 = 155.7\%$
- OR John: $\text{Old} / \text{salary} = 9.7$; $\text{New} / \text{salary} = 6.3$
- John: Old benefit is still greater but difference has reduced
- Assuming reasonable expected salary and return assumptions looks to be moving closer to point where 5 x multiply may in theory be appropriate, i.e. closer to average age at design time
- Samuel: $\text{LSe} = R105000 \times 17.444 + R300000 = R2131620$
- Samuel: $\text{Old} / \text{New} = R2131620 / R2400000 = 88.8\%$
- OR Samuel: $\text{Old} / \text{salary} = 7.1$; $\text{New} / \text{salary} = 8.0$

- Samuel: new benefit now reasonably better
- Relative to the old structure Samuel now has improved benefits while John still has lower benefits
- Design appears to provide a cross subsidy assuming the same contribution towards death in service benefits
- Old structure would have given John the higher benefit relative to multiple of salary and can assume this was on needs based design, argue younger members need higher benefits for younger spouse, longer period
- And as such the level scales are indicating an inequity in benefits

(iii) Set out your views on this complaint, the advantages and disadvantages of the pension vs. lump sum structure and briefly propose potential solutions (and their respective risks) to the issue? [10]

Not well answered. Few candidates considered the benefits relative to age or demonstrated an understanding of the cross-subsidies inherent in the benefit design..

- The complaint has merit
- Under new structure older members get the same multiple while still having a growing MS and thus greater relative benefits, effectively increasing benefits with age
- Old structure provided for benefits that reduced with age, as need perhaps reduced
- This has therefore prejudiced the younger members
- And it's very likely with a fixed contribution to death benefits that there does now appear to be a cross subsidy between young and old, Those greater than the average age at the time of the changes and those below
- Note the cross subsidy is not the entire equivalent death benefit but simply providing the same multiple across the age band where mortality is expected to increase with age and hence costs of providing benefit would increase

Advantages (old):

- Needs based, providing benefits on death to members with dependants
- And a lump sum for immediate expenses
- Assumed to increase automatically as new dependants are added (marriage, children) and as salaries increase
- Generous by industry standards, especially for new entrants and members with many dependants
- Members are likely to all pay the same contribution in respect of this benefit (since the same benefit applies to all), so it's good value for older members with dependants

Disadvantages (old):

- Actual benefits can differ significantly between members with the same age, salary and service – might seem inequitable to members
- Members are likely to all pay the same contribution in respect of this benefit, which is poor value for members with no dependants or longer serving / older members with high member accounts
- Generous benefits imply higher costs than industry. Some members may prefer higher net retirement contributions
- Generous benefits by industry standards and unlikely to be reciprocated should member change employers or retire. Cost of buying additional cover can be prohibitive at that stage.

Solutions:

- Could revert to old arrangement
- Not ideal as there are cross subsidies in this and within a DC fund ideal to try and remove as far as possible
- Insurance of the benefit could be difficult/risks of self insurance
- Could have fixed lower multiple and allow voluntary additional cover to be purchase
- Purchase price being ideally lower than open market, providing better value and increasing retirement savings
- Potential to set so that you reduce cross subsidies on cost
- Would then also better meet the needs as set out in old structure
- Purchase cover per age with fixed contribution

- (iv) Set out the issues that need to be considered in setting this scale and derive a scale that could be considered in line with the Company suggestions taking account of historic benefits. State any additional assumptions that are made. [14]**

Not well answered. Few candidates attempted to derive a scale and few discussed the practical issues that arise in implementing such a scale.

- Approximate only as member share can be volatile
- and would need an assumption on service period (cap of 40yrs)
- would the old design still be appropriate or should there be adjustments before trying to meet
- In setting could consider the allocation to risk contributions to scale up or scale down the age related scale

- Clarify the rules regarding the change in multiple,
- Would it be continuous, age and months or simply step at each year or after multiple year
- Clarify the actual change date e.g. age last birthday
- Minimum or maximum levels, i.e. before age 30 or after age 60
- 5 x multiple appears to apply at average age 40 to 45 and roughly speaking expect scale should be greater than this for younger and less for older but would depend on average service versus potential full service

Approximating a scale 5 year age bands:

- Targeting old structure: $1/60^{\text{th}}$ x 60% plus 1 x Assume:
 - targeting the full career individuals, i.e. start at age 20 and will have 45 years past + prospective service and therefore cap of 40 years to apply, started contributing to MS aged 20
 - Contributions annually in arrears
 - Same scale for male and female (average annuity)
 - At each age solve formula:
 - 40 years x $1/60$ x 60% x Single life annuity + 1 = Multiple (Z) + 10.0% (contribution to MS) x $(1.03)^{(x-20)}$ x Annuity certain (age – 20, @3%)
 - i.e. At age x, $Z(x) = \{40\% \times \text{Single Life Annuity}(x) + 1\} - \{10.0\% \times 1.03^{(x-20)} \times \text{Annuity Certain}(x-20, @3\%)$
- Single Life Annuity factors per Formula and Tables 2002 (yellow book)

Age	ax
20	23.081
25	22.520
30	21.834
35	21.003
40	20.005
45	18.823
50	17.444
55	15.873
60	14.134
65	12.276

- Future value of annuity certain

Age	Annuity	Accumulation $1.03^{(x-20)}$	Future value
20	0.000	1.000	0.000

25	4.580	1.159	5.309
30	8.530	1.344	11.464
35	11.938	1.558	18.599
40	14.877	1.806	26.870
45	17.413	2.094	36.459
50	19.600	2.427	47.575
55	21.487	2.814	60.462
60	23.115	3.262	75.401
65	24.519	3.782	92.720

- Calculation

Age	Old benefit Formula	Old benefit Result	Member Share (F)	Member Share (R)	Old - MS
20	$1+40\% \times 23.081$	10.2	$10\% \times 0$	0.0	10.2
25	$1+40\% \times 22.52$	10.0	$10\% \times 5.309$	0.5	9.5
30	$1+40\% \times 21.834$	9.7	$10\% \times 11.464$	1.1	8.6
35	$1+40\% \times 21.003$	9.4	$10\% \times 18.599$	1.9	7.5
40	$1+40\% \times 20.005$	9.0	$10\% \times 26.87$	2.7	6.3
45	$1+40\% \times 18.823$	8.5	$10\% \times 36.459$	3.6	4.9
50	$1+40\% \times 17.444$	8.0	$10\% \times 47.575$	4.8	3.2
55	$1+40\% \times 15.873$	7.3	$10\% \times 60.462$	6.0	1.3
60	$1+40\% \times 14.134$	6.7	$10\% \times 75.401$	7.5	-0.9
65	$1+40\% \times 12.276$	5.9	$10\% \times 92.72$	9.3	-3.4

- As expected, as you approach NRA you should have saved to provided not only for a single life annuity but a full annuity for both member and reversion for spouse. Additional lump sum in theory is not required
- Would set to nil or rather some low value 0.5 to 1 etc from age 55 years
- As they are actually still contributing to costs
- However, practically unlikely that each member will have full career service and as such could calculate assuming some average service
- Could scale up or down depending on contributions available and expected deaths by age to ensure reduction in cross subsidy,
- Additional mark for making some adjustment to final table

QUESTION 3

i) Discuss reasons why Company X may make such a request. [3]

Well answered in general.

- Remove part of the remaining defined benefit risk while the Fund is in surplus (still have pensioners).
- May be first step with pensioners to follow.
- Less regulatory and reporting issues if pure DC.
- IAS19 considerations (may want to “de-risk” the Company balance sheet)
- Simpler DC only structure is cost effective, equitable amongst employees, easier to administer for HR, will allow greater flexibility in offering benefits.
- Popular with employees? Attract good staff.

ii) Discuss reasons why defined benefit members may make such a request. [3]

Well answered in general.

- Investment performance very good in recent years. DC perceived to be “better”
- Greater flexibility offered by DC (investment choice, purchase of annuity at retirement)
- Members “in-control” of their benefits
- Easier to understand DC.
- Members know the Fund has surplus and can press to share in this if conversion occurs.
- Younger members asked? Better withdrawal (less so now that PMB’s apply) or less risk averse than older members
- Concerned about ability of Company to finance DB benefits in future

iii) Discuss the advantages and disadvantages of both approaches

[8]

Poorly answered in general. Few candidates considered to cost implication of a voluntary versus compulsory conversion.

Voluntary basis

- Less need to ensure no one is expected to be “worse-off” i.e. can offer lower enhancements (must pay PMB). Hence potentially cheaper option for Company.
- But could be more costly if enhancements are granted at a level to entice most members to take the offer
- However, members may anti-select with older members remaining. Possible overall increase in Company contributions.
- Can potentially sit with DB liability for a long time still (e.g. 1 younger member decides not to convert)
- Choice is often preferred by members – good PR.
- Less chance of comebacks in later years.
- However conversion communication likely to be required in more detail and more costly as members will require assistance in making their choice
- No disruption for members close to retirement

Compulsory basis

- Greater onus to ensure no one is “worse-off”. Higher enhancements required. More expensive.
- Especially if employment contracts promise DB benefits.
- Registrar also likely to be more cautious in approving a conversion on a compulsory basis. Compromise: consider compulsory for all only if more than 75% (say) agree to convert.
- No surprises in future contribution rate changes.
- Effectively greater enhancements upfront in return for contribution certainty under DC.

- Alternatively, members get no enhancement but the Company gives a DB minimum benefit guarantee. No direct cost upfront but long term cost is potentially high as Company bear the risk of poor investment performance with no upside.
- Members don't like be forced to do things – HR issues.
- Members close to retirement will need to be managed carefully.

iv) Outline the reasons for considering enhancements and how you would determine the theoretical enhancements. Comment on how these enhancements may be applied in practice. [14]

Poorly answered. Few candidates covered the actual risks faced by converting members and how they could be compensated for these.

- Enhancements on conversion are an established practice, particularly if surplus and reserves allow this. Defined benefit members of the Fund would therefore expect an enhancement

Reason for enhancements:

- Compensating members for the expected shortfall that arises due to the removal of the cross-subsidy of older members by younger members under a DB structure (future service shortfall)
- Compensating members for the investment risk
- Compensating members for post retirement mortality risk
- Compensating members for future expense and risk
- Will need to increase values to at least the prescribed minimum benefits if the actuarial reserve value plus other enhancements is lower than the PMB (not really an enhancement but will require surplus / reserves to be used)

Calculation of enhancement

- An enhancement for a particular risk will also help offset the enhancement required for the other risks. The order in which each risk is considered will therefore affect the theoretical enhancement required to mitigate the given risk.

- The order in which the enhancements considered will also determine how the impact of the enhancement should be assessed (e.g. against the old DB benefit or against the new expected DC benefit)
- Future service shortfall:
 - Determine present value of total DB pension less ARV less future DC contributions towards retirement. Any positive balance will be future service shortfall enhancement. Ideally done on best estimate assumptions. Will tend to be larger (as a percentage of the ARV) conversion value for:
 - Older members with more than 1 or 2 years to retirement
 - Short service members (may consider limiting the FSS as will be significantly higher for very short service members when compared to ARV)
 - Will be negative for younger members (limit to zero)
 - Depending on the gender assumptions used in the valuation basis, the FSS will differ for males and females. Unisex basis? However starting point is last statutory basis so may be difficult to move to unisex basis.
- Investment risk (various approaches):
 - Model spread of future investment returns if members follow default DC investment strategy. Can use stochastic or deterministic techniques
 - Compare the expected DC pensions under the various investment return scenarios
 - The investment risk enhancement can then be selected so as to (assuming the future service shortfall enhancement has been made – give credit for other approaches):
 - provide a DC pension that is equal to the DB pension for a lower future return than expected (e.g. 1% lower than the “best estimate” return); or
 - provide the DC pension that has a chosen probability of not being less than the DB pension.
 - The enhancement as a percentage of the ARV will vary with age (may not be needed at younger ages) and will depend critically on the default investment strategy under the DC structure
- Mortality risk:

- Determine the expected DC pension at members' normal retirement dates allowing for mortality improvements between the conversion date and normal retirement date.
- The ARV may need to be enhanced to bring the expected DC pension in line with the DB pension.
- The magnitude of the enhancement will depend on the age and gender of the member and on the mortality improvements already allowed for in the ARV
- Expense risk:
 - Company pays insurance costs and expenses under both DB and DC structure, so members not at risk on increasing costs.
 - Consider annuity expense loadings at retirement. Enhancement to compensate for this would be determined on a similar basis as used for improving mortality risk
- PMB adjustment:
 - Calculated as the positive difference between each member's PMB as at 31 December 2010 and the conversion value (after allowing for any enhancements).
 - This is the absolute minimum value and must be granted
- Practical application of enhancements:
 - Unlikely to show each enhancement above separately.
 - To difficult to explain and interaction of enhancements could lead to strange results (e.g. investment risk enhancement may be sufficient to cover mortality and expense risk as well – difficult to explain why latter are zero).
 - Overall flat percentage enhancement for all members plus possibly a member specific future service shortfall enhancement and prescribed minimum benefit enhancement would be used. A check would then be done that this provides a reasonable compensation for the above risks.