Actuarial Society of South Africa

EXAMINATION

26 May 2014

Subject F204 - Pensions and Other Benefits
Specialist Applications

MARKING SCHEDULE

QUESTION 1

i) **Describe the risks, uncertainties, general mitigating factors and regulatory environment affecting the current arrangement. Take account of the sponsoring employer, pensioners and the active members.**

> *The intention of the question was to test the candidates knowledge of the risks involved in providing pensions from within the fund in a defined contribution pension fund. Some candidates also covered the defined contribution member risks. Credit was given for these answers. A reasonable attempt was made by most candidates.*

Pensioner Portfolio

- Despite the fund being defined contribution the pensioner pool provides defined benefits once purchased

- For the beneficiary there is a risk that the promised benefits and in particular for a pensioner pool the targeted increases will not be afforded, underfunding, insolvency of sponsoring employer.

- The main way in which this risk is managed is the requirement that every fund with a defined benefit appoints a valuator, who will investigate the financial position of the fund at least once every three years and report to the Registrar

- The valuator would also be involved in the assessment of the affordability of pension increase;

- and sustainability of these in line with the pension increase policy

- requirements exist to restore the poor funding levels to 100% within specified time periods although for a pension portfolio this is likely to involve nil increases until such time as the funding level is restored

- Disclosure regulations, whistle blowing, and limits on assets in which funds may invest (in particular, limits on self-investment) also serve to reduce the risks.

- Once a benefit has accrued, i.e. pension purchased and increases granted, they may not be reduced, except where a fund, not in a sound financial condition, is being wound up, after taking into account the recovery of any debt owed by the employer.

- In terms of the Pension Funds Act, any deficit in a fund that is being wound up becomes a debt on the books of the employer.

- Pool is at risk from incorrect / low pension purchase pricing;

- New entrants at risk from overpricing

- Especially if the purchase is mandatory

- There is a risk to the pensioner pool that new entrants may not wish to buy into a pool in deficit and hence reduce future sustainability, despite requirement to purchase this may be through resignation before retirement or a change in conditions for active employees;

- the pensioner beneficiaries are exposed to the risk that their standard of living declines to the extent that inflationary increases are not targeted or achievable.

- There is a risk to sponsor that additional funding is required when not anticipated or when there are other calls on those funds within the sponsoring company.

- An investment strategy that matches the expected pension payments will help mitigate any investment risk

- While it is likely that before the sponsor is called upon there would be cessation of pension increases and the possibility of a change in the pension increase policy targeting lower relative increases

  These uncertainties may relate to some or all of the following factors:

  - The pension increase policy,
  - the profile of the pensioners by age and gender,
  - the number of members retiring in good health and in ill-health and their ages,
  - the numbers and ages of members dying after retirement,
  - the existence and age of a spouse or other dependant on the death of a pensioner,
  - the numbers and ages of qualifying spouses and dependants who die,
  - the rate of price inflation,
  - the levels of investment return achieved relative to the targets.

- There may also be less quantifiable risks resulting from pensioner's expectations that aren't automatically met.

- the risks resulting from uncertain timing of cash calls can be reduced by funding.

- At the other end of the funding scale, there is also a risk that the funds move into surplus and the allocation of this surplus to the appropriate beneficiaries;

- Including the impact of new entrants on this surplus, do they contribute towards this in the pricing so as not to reduce the surplus before and after joining or do they not share, how to manage this

- Consideration will have to be given in South African funds for future surpluses to be shared between the employer and pensioners in terms of Section 15C of the Act to the extent that the employer bears any risk

- Ideally the rules should clarify how surplus arising is applied within the Fund. If the rules are silent in this regard, then the trustees should direct how the surplus should be equitably allocated.

- Further uncertainties will also arise in relation to any options that are available to members.

- For example, a member may be able to choose, to an extent, the proportion of the pension benefit commuted for a lump sum at retirement.

- However, most benefit options provide the members with an opportunity to select against the fund by choosing the option that is of greatest value to them either economically or demographically. The extent to which such selection will affect the cost of the fund will depend on the financial sophistication of the members and also on other, not necessarily financial, factors that affect a member's preference for certain benefits. A pensioner in poor health who commuted a large portion before purchasing versus a pensioner who commutes no benefits based on expected good health.

- Where options arise in future to allow members to select outside providers the anti-selection risk would theoretically be greater

ii) Comment briefly on the main advantages and disadvantages of this investment strategy

Well answered by most candidates.

- Single investment strategy may be easier for the trustees to manage;
- Simpler appointment of asset managers and mandates;

- May reduce costs through less spreading of assets and greater ability to negotiate bulk discounts;

- Simplify and reduce administration costs

- One return calculation applied to DC member shares and to the pensioner portfolio

- No member choice but could argue member choice is significantly under-utilised and hence inefficient

- Strategy could take rough account of the combined nature of the pensioner and active member pool and hence be appropriate to the overall fund in terms of duration and cash flow

- However, likely that the portfolio for active members is likely to be too conservative while the portfolio for pensioners may be too aggressive / long term

- Depending on pension purchase factors the portfolio for pre-retirement members may be inappropriate relative to the matching of pension pricing

- Pensioner pool may experience higher volatility of pension increases if the nature of portfolio is too aggressive / long term and hence results in volatile investment returns

- NO ability for members, who ultimately face the DC risk to have some say in their investment strategy;

- Counter argument alongside the under-utilisation is the potential irresponsible or inappropriate investment decisions

iii) **Describe why the skills of an actuary would be best placed to assist the Trustees. Include the process and methodology that you would apply and the tools and techniques that you will employ in providing the advice.**

> *Poorly answered. Few candidates provided sufficient detail on the unique skills of an actuary and the methodology an actuary would employ.*

- Actuaries have a financial skill set that can consider both sides of the equation;

- An understanding of the actuarial liabilities of a pensions account;

- An understanding of investments, the various asset classes and the nature of those asset classes;

- And the ability to combine these skills to provide a holistic investment strategy or solution;

Process:

- The process would involve a detailed understanding of the pensioner portfolio, the benefit structure, the pension purchase basis, rules of the fund and pension increase policy;

- Thorough analysis of the pensioner membership including contingent beneficiaries;

- Understanding current population age and pension weighted age;

- Historic mortality and likely improvements;

- An assessment of the duration of liabilities, cashflow projections

- The analysis of liabilities would be performed on deterministic basis, a range of deterministic bases or using stochastic modelling of the required assumptions

- The next would to be gain a full understanding of the current investment strategy;

- The various asset classes in use, the various mandates, performance agreements;

- Liquidity of the portfolio

- Investment managers involved

- Projections of the current portfolio could be performed both deterministically on a range of assumptions and stochastically

ALM in more detail:

- ALM uses a stochastic model to generate economic cash flow elements

- Across all asset classes

- Based on underlying expected distribution of the returns for each class

- On asset side you can generate a range of likely outcomes from a range of investment portfolios with varying combination of asset classes

- This is then compared to a range of generated liabilities

- Liabilities typically generated on deterministic basis

- Allows for wide range of investment portfolios to be constructed based on varying combinations of asset classes where the expected returns from the various asset classes have been stochastically determined

- Demonstrate to the Trustees how a range of portfolios with different target asset allocations would achieve the desired target and risk accepted
- Shows both the probability of achieving the desired target (for example maintaining 100% funded pensioner pool) as well as the range of risk that will be accepted in maintaining the target
- Can be used by Trustees to refine the investment strategy that balances the likelihood of reaching the pension increase targets subject to acceptable levels of risk

[Bonus for all additional reasonable suggestions or explanations]

iv) **Explain how the full range of traditional asset classes could be used to develop a suitable investment strategy for the pensioner portfolio.**

Well answered by the better candidates.

- In setting any investment strategy must take account of Pension Funds Act, Regulations, Circulars etc
- Pension Funds Act, Pension Fund Circulars, Regulation 28
    - Duties of trustees to act in best interests of pensioners
    - Fiduciary responsibilities to look after the investments
    - Delegate responsibilities appropriately
    - Seek appropriate advice where lack of skill set
    - Appropriate investment strategy document
    - Limits per Regulation 28
        - the maximum amount of the fund's assets to be invested in a single company,
        - the maximum amount to be held in assets not readily marketable,
        - the use of derivative instruments such as futures and options and structured products,
        - self investment,
        - overall exposure to offshore assets.
- Investment strategy document
    - there is a defined process for investment planning and decision making,
    - there are structures for monitoring investment performance,
    - demonstrates due diligence by trustees,
    - guides asset managers on strategies and scheme's risk tolerance
    - Communication with pensioners and managing expectations with regards to increases/bonuses etc

- The trustees should consider the following asset classes, subject to overall investment objectives and risks
- The objectives to achieve a targeted pension increases subject to maintaining funding level
- SA equities including equities with offshore earnings:
    - To provide an element of inflation matching for pensions
    - Reasonable range, 35%−50%, say
    - Level would be determined through ALM to allow sufficient long term growth relative to short term liquidity needs
    - Listed high quality equities preferred due to liquidity for a pension paying portfolio
- Overseas equities:
    - Diversification benefits despite SA liabilities as in more global economy
    - To match inflation linked pension liabilities, but with a currency risk where pensions are local currency
    - Reasonable range, 0% up to 15% (less than maximum allowed of 25%)
    - Subject to overall limit with local of 75% in terms of REG 28 but likely to be no greater than 60% of typical pensioner portfolio with duration of around 10 years (other reasonable comment, i.e. not up to 75%!)
- SA property:
    - Due to liquidity may tend to avoid
    - Listed only due to liquidity constraints
    - Although listed has closer relation to equity
    - Unlisted likely to provide further diversification at a potentially unacceptable liquidity risk given the pensions pool
    - provides match for inflation linked pension liabilities
    - Reasonable range, 0% to 10%, say
    - Subject to direct limits
- Fixed interest:
    - Reasonable range, 20% to 70%
    - Likely to hold more inflation linked bonds for inflation targeting pension increases
    - Adds diversification
    - and importantly the stability
    - Large portion nominal still appropriate considering the pension liabilities can be considered as two elements in relation to current pensions paid for the remaining lifetime and future increases on those pensions
- Corporate bonds to sweeten yield subject to small exposure
    - as for RSA bonds, but with a credit risk

- only highly rated if at all due to liquidity risk of pension paying portfolio
- Index-linked bonds
  - Assist in matching benefits that increase according to a price index
  - Added diversification with stable potential inflation matching returns
  - Unlikely to be 100% of assets despite the inflation match as the cashflow matching would not be possible and would result in redemptions losing the inflation protection/guarantees
- Cash
  - % as required based on liquidity requirements
  - 5% to 10% at most
  - To meet immediate liabilities, expenses, benefits
  - Includes short dated bills and bonds

v) **Briefly set out the points that should be considered by the Trustees in relation to the purchasing of annuities for current and future pensioners.**

Well answered.

- Purchased annuities can be in form of an investment /policy in name of fund
- Investment matches the liability but the ultimate responsibility still rests with the fund
- Or, purchased annuities can take the form of individual policies in name of pensioners;
- As individual policies the risks are removed from the fund and placed entirely with the pensioners;
- However pensioners are then exposed to large life office risk rather than potentially smaller employer risk;
- Larger pool of pensioners increases cross subsidy which is both positive and negative
- Trustees assessment of appropriate providers requires expertise and involves potential reputation risks in future
- Annuity provider is profit making entity and hence potential reduction in benefits through expenses, capital charges etc
- Solvency margins may be stricter which increases solvency but at a cost of returns and therefore increases
- Inflation guarantees are available but at a price;
- Mortality risk is removed
- Policy in fund name could be transferred at later stage to individuals
- New pensioner purchase based on quoted pricing determined by provider
- Fund would need to consider single provider, versus panel of providers or no assistance at all for new pensioners

- Ability to match the current rules albeit with removal of any prior trustee discretion
- Consider costs of purchasing annuities. May decide not to do it,

QUESTION 2

i) **Using the information provided determine the projected pension and net replacement ratio for the following members**
   a. **A 25 year old new entrant earning R120 000 per annum**
   b. **A 40 year old member earning R220 000 per annum with current savings of R650 000**

> *Well answered by most candidates.*

Contributions to retirement: member 7.5% plus employer 10.0% less 2.5% risk	= 15.0%

Expected return:
   Equity = (1+5.5%) real x (1+6%) inflation
   Bonds = (1+3.0%) x (1+ 6%)
   Cash = (1+1.0%) x (1+ 6%)
	=11.83%
	= 9.18%
	= 7.06%

Under age 55 = growth portfolio = 60% x 11.83% + 30% x 9.18% + 10% x 7.06%	= 10.558%
Less admin and management expenses 0.5% of portfolio	= 10.058%
Over age 55 = MM portfolio = cash =	= 7.06%
Less admin and management expenses of 0.5% p.a.	= 6.56%
Salary increases = (1+1%) x (1+ 6%) inflation =	= 7.06%
Net rate growth portfolio = (1+10.058%)/(1+7.06%)-1	= 2.800% p.a.
Monthly =	= 0.23042% p.m.
Net rate MM = (1+6.56%)/(1+7.06%)-1	= -0.467% p.a.
Monthly =	= -0.0390% p.m.
Member 25 yrs	
First 30 years: (or if pre-planned could break into 15 and 15)	
Annuity certain (30 years, monthly in arrears, growth portfolio monthly rate) =	= 244.478
PV 30 year contributions = Salary x contribution x annuity =10 000 x 15% x 244.478	= 366 716
Future value = PV x (1+growth)^30yrs x (1+MM)^5yrs = R366 716 x (1+10.058%)^30 x (1+6.56%)^5	=8 932 022
Last 5 years:	
Annuity certain (5 years, monthly in arrears, mm portfolio monthly rate) =	= 60.720
PV 5 year contributions = Salary@30years x 15% x annuity =10 000 x (1+7.06%)^30 x 15% x 60.720	= 705 078
Future value = PV x (1+MM)^5yrs	

= PV x (1+6.56%)^5	= 968 742
Total FV member share	= 9 900 764
Annuity purchased = FV * 550 / 10 000	= 544 542
Salary at retirement = 10000 x (1+7.06%)^35 *12	= 1 306 576
NRR = pension/salary	= 41.7%
Member 40 yrs	
First 15 years:	
Annuity certain (15 years, monthly in arrears @ growth) =	= 147.203
PV 15 year contributions = Salary x contribution x annuity =18 333 x 15% x 147.203	= 404 808
Future value = PV x (1+growth)^15yrs x (1+MM)^5yrs = PV x (1+10.058%)^15 x (1+6.56%)^5	=2 341 769
Last 5 years:	
Annuity certain (5 years, monthly in arrears @ MM) from above	= 60.720
PV 5 year contributions = Salary@15years x 15% x annuity =18 333 x (1+7.06%)^15 x 15% x 60.720	= 464 590
Future value = PV x (1+MM)^5yrs = PV x (1+6.56%)^5	= 638 323
Existing savings: 650 000 x (1+10.058%)^15x(1+6.56%)^5	=3 760 180
Total FV member share	= 6 740 272
Annuity purchased = FV * 550 / 10 000	= 370 715
Salary at retirement = 220 000 x (1+7.06%)^20	= 860 929
NRR = pension/salary	= 43.1%
Available marks	

ii) **The Trustees have asked you to provide a detailed analysis and explanation as to the differences setting out the factors that impact on his projection results relative to his prior projection. State any assumptions that you make.**

In effect this amounts to a defined contribution AOS. Most candidates made a poor attempt at this. No candidates considered the effect of past salary increases and returns on the projected future values.

- Because his first projection would have been at same assumptions and with same data as the "other" 25 year old new entrant can use those results exactly for the comparison.

- NRR slightly greater (insignificant) but with significantly lower pension per annum

- Looking for AOS type analysis, identify the "loss" due to salary increases behind projection; identify the loss due to investment returns behind projection as this impacts:

  - Past benefits accrued;
  - Future projected benefits
  - Explanation of NRR affect on individual planning relative to own income

Member 25 yrs split into first 15, second 15 and final 5 to compare to Member 40	
First 15 years:	
Annuity certain (15 years, monthly in arrears, growth) =	= 147.203
PV 15 year contributions = Salary x contribution x annuity =10 000 x 15% x 147.203	= 220 804
Future value @15yrs = PV x (1+growth)^15yrs = PV15 x (1+10.058%)^15	=929 676
Member 40 had accumulated R650 000 difference =	=279 676 (at age 40)
1) Check salary increases:	
R220 000 / R120 000 ^ (1/15)-1 =	=4.12%
Assume increase applied uniformly and determine impact	
Net rate = 1.010058/1.0412 -1 = 5.699%; monthly =	=0.46297
Annuity certain (15 years, monthly in arrears, new rate) =	= 121.945
PV 15 year contributions = Salary x contribution x annuity =10 000 x 15% x 121.945	= 182 918
Future value @15yrs = PV x (1+growth)^15yrs = PV15 x (1+10.058%)^15	=770 160
Average lower salary increase all else being equal would have cost member = 929676 – 770 160	=159 516
BONUS: using excel if available for electronic exams could solve for the assumed average investment return after fees of 7.8%	
Investment losses = 770 160 – 650 000	= 120 160
At projected retirement would explain: Salary pre age 40 impact on past savings = 159516 x (1.010058)^15 x (1.0656)^5 =	= 922783
Investment returns pre age 40 impact = 120160 x (1.010058)^15 x (1.0656)^5 =	= 695111
Total impact for age 40 savings =	=1 617 894
With assumptions on increases and returns then being	

equal going forward the final impact would be future contributions due to salary from age 40 being lower	
Salary for 25yr at age 40 = 10 000 x (1.0706)^15	= 27 823 p.m.
Difference for 40 year old =	= 9489.96 p.m.
FV under age 55 portion = 9489.96 x 15% x 147.203 (annuity 15) x (1.010058)^15 x (1.0656)^5 =	= 1 212 180
FV over 55 portion = 9489.96 x (1.0706)^15 x 15% x 60.720 (annuity last 5 from prior question) x (1.0656)^5 =	= 330 418
Total FV loss due to early lower salary increases to age 40 =	= 1 542 598
Total losses =	= 3 160 492
Impact on Annuity purchased = Losses * 550 / 10 000	= 173 827 p.a.
NRR are similar though:	
Use in retirement planning is therefore relative measure, need to consider own needs relative to pre-retirement income	
To the extent that your salary income provides sufficiently you may be satisfied to replace around 75% of that income, this level will differ from individual to individual	
Based on salary levels projected to retirement might expect slight differences in lifestyle which may or may not translate into different retirement needs	
Salary and investment returns may not turn out as projected, these projections don't show a range or volatility	
Any other reasonable comments (bonus total)	

iii) **Set out additional considerations or appropriate additions, including appropriate caveats, that could be used for improving the education material and projection statements.**

Most candidates mention the standard items but overall the question was answered very poorly.

Limitations:
- Provides an illustration to assist members with financial planning for retirement.

Annuity:
- o May choose an annuity that is not in the prescribed form (e.g. pension increases, spouse s benefits).
- o cost of annuities is likely to differ
- o Annuity rates change over time

Sensitivity to assumptions
- o Results provided on deterministic basis and no sensitivity analysis
- o Investments may not perform as expected in long term
- o Fluctuations in investment closer to retirement cause substantial change in value
- o Salary may not increase as assumed
- o Contributions rates may differ – risk benefits change,
- o expense deduction from assets may change

- o may deduct administration expenses from contributions rather than as % of assets
- DC risk to member is therefore not clear from limited projection
- Range of assumptions for performance of different asset classes are not provided
- Which may influence members investment choices, transition later
- No indication of the additional saving required to ascertain additional NRR levels
- Statements date reasonably quickly for changes in market and salary

Possible additions
- Give clear statement/indication of risks (investment returns, inflation, mortality post retirement, expenses).
- Could illustrate different investment options
- Explanation why different asset classes can be expected to give different returns.
- Important for members to understand that cash and bonds also have risk.
- Statement of all assumptions.
- Provide figures on a range of investment assumptions (e.g. to show the impact of +/ change in these).
- Provide figures on a range of salary growth assumptions.
- Provide figures using a range of annuity options.
- Provide figures at an early retirement date.
- Could provide stochastic illustrations (funnel of doubt).

Caveats
- Valid only at effective date.
- Provides a guide to benefits, not a quote/guarantee.
- Investments will not necessarily perform in line with assumptions.
- Salary growth will not necessarily be in line with assumptions.
- Small changes in the assumptions adopted can lead to large variation in the results.
- Cost of annuities will depend on level of increases and spouse s benefits chosen.
- Expense allowance may need to change in the future.
- Cost will also depend on nominal and real interest rates at time of retirement and on mortality bases considered appropriate at that time.
- A member might need to consider what additional saving he will need and he might need to seek independent advice.
- Assumes nil AVCs and no changes in member and company contributions.

iv) **Determine the overall improvement in the expected retirement benefits due to the above amendments for an entrant at age 25. Rank the amendments in order of their effectiveness**.

This question differentiated the better candidates who answered this well. Other candidates answered this extremely poorly or not at all.

Consider each change in isolation as well as all changes simultaneously

1) Change lifestage only	
Expected return transition portfolio: 50% Growth, 50% MM =	=8.31%
Net rate transition portfolio = (1+8.31%)/(1+7.06%)-1	= 1.167% p.a.
Monthly =	= 0.09670% p.m.
First 30 years	
PV 30 year contributions = Salary x contribution x annuity =10 000 x 15% x 244.478 from before	= 366 716
Future value = PV x (1+growth)^30yrs x (1+ transition)^4yrs x (1+MM)^1yr = R366 716 x (1+10.058%)^30 x (1+8.31%)^4 x (1+6.56%)^1	=9 533 034
Next 4 years:	
Annuity certain (4 years, monthly in arrears, transition portfolio monthly rate) =	= 46.881
PV 4 year contributions = Salary@30years x 15% x annuity =10 000 x (1+7.06%)^30 x 15% x 46.881	= 544 382
Future value = = PV x (1+8.31%)^4 x (1+6.56%)^1	= 798 282
Last 1 year:	
Annuity certain (1 year, monthly in arrears, MM portfolio monthly rate) =	= 12.030
PV 1 year contributions = Salary@34years x 15% x annuity =10 000 x (1+7.06%)^34 x 15% x 12.030	= 183 527
Future value = = PV x (1+6.56%)^1	= 195 566
Total FV member share	= 10 526 883
Annuity purchased = FV * 550 / 10 000	= 578 979
Improved pension by	6.3%
Salary at retirement = 10000 x (1+7.06%)^35 from before	= 1 306 576
NRR = pension/salary	= 43.3%

2) Change growth portfolio only	
Expected return growth portfolio: (75% x 11.83% + 20% x 9.18% + 5% x 7.06%) – 0.5%	=10.5615%
Net rate =	= 3.271% p.a.
Monthly =	= 0.26855% p.m.
First 30 years	
Annuity (30 years, monthly arrears, new growth rate) =	=230.573
PV 30 year contributions = Salary x contribution x annuity =10 000 x 15% x 230.573	= 345 859
Future value = PV x (1+growth)^30yrs x (1+MM)^5 = PV x (1+10.56%)^30 x (1+6.56%)^5	=9 660 249
Next 5 years:	
PV 5 year contributions = from before	= 705 078
Future value = from before	= 968 742
Total FV member share	= 10 628 990
Annuity purchased = FV * 550 / 10 000	= 584 594
Improved pension by	7.4%
Salary at retirement = 10000 x (1+7%)^35 from before	= 1 306 576
NRR = pension/salary	= 44.7%

3) Change contributions (split 30 into 2)	
Annuity certain (15 years, monthly in arrears, old growth) = before	= 147.203
First 15 years	
Contributions = 7.5% + 7.5% -2.5%	= 12.5%
PV 15 year contributions = Salary x contribution x annuity =10 000 x 12.5% x 147.203	= 184 003
Future value = PV x (1+growth)^30yrs x (1+MM)^5yr = PV x (1+10.058%)^30 x (1+6.56%)^5	=4 481 728
Next 15 years:	
Contributions = 7.5% +12.5% -2.5% =	=17.5%
PV 15 year contributions = Salary@15years x 17.5% x annuity15 =10 000 x (1+7.06%)^15 x 17.5% x 147.203	= 716 742
Future value = = PV x (1+10.058%)^15 x (1+6.56%)^5	= 4 146 273
Last 5 years:	

From before	= 968 742
Total FV member share	= 9 596 743
Annuity purchased = FV * 550 / 10 000	= 527 821
Improved pension by	-3.1%
Salary at retirement = 10000 x (1+7%)^35 from before	= 1 306 576
NRR = pension/salary	= 40.4%

4) Change all	
Growth Return adjusted =	= 10.56%
Transition return adjusted = 50%x10.56%+50%x6.56%	= 8.56%
Net rate =	= 1.402% p.a.
Monthly =	= 0.11607% p.m.
First 15 years	
Contributions = 7.5% + 7.5% -2.5%	= 12.5%
Annuity certain (15 years, monthly in arrears, new growth) = before	= 142.585
PV 15 year contributions = Salary x contribution x annuity =10 000 x 12.5% x 142.585	= 178 231
Future value = PV x (1+growth)^30yrs x (1+ transition)^4yrs x (1+MM)^1yr = PV x (1+10.56%)^30 x (1+8.56%)^4 x (1+6.5%)^1	=5 362 742
Next 15 years:	
Contributions = 7.5% +12.5% -2.5% =	=17.5%
PV 15 year contributions = Salary@15years x 17.5% x annuity15 =10 000 x (1+7.06%)^15 x 17.5% x 142.585	= 694 257
Future value = = PV x (1+10.56%)^15 x (1+8.56%)^4 x (1+6.56%)^1	= 4 633 025
Next 4 years:	
Contribution = 15%	
Annuity certain (4 years, monthly in arrears, transition portfolio monthly rate) =	= 46.661
PV 4 year contributions = Salary@30years x 15% x annuity =10 000 x (1+7.06%)^30 x 15% x 46.661	= 541 830
Future value = = PV x (1+8.56%)^4 x (1+6.56%)^1	= 801 952
Last 1 year:	
Future value = from before	= 195 566

Total FV member share	= 10 993 285
Annuity purchased = FV * 550 / 10 000	= 604 631
Improved pension by	=11.0%
Salary at retirement = 10000 x (1+7.06%)^35 from before	= 1 306 576
NRR = pension/salary	= 46.3%
Total	

- Rank: Option 2 > Option 1 > Option 3

v) **Recommend which of the above options should be introduced given you calculations in iv).**

> Poorly answered.

- Overall the combination improves the projected pension and NRR
- Option 2 provides best individual enhancement to projections;
- Caution in that it relies on higher allocation to riskier assets which should in long term provide higher returns but will increase risk of the portfolio;
- Option 3 does not provide the enhancement that the Trustees may have expected as the higher contributions have less time to earn investment returns and the compound effect is lost on early contributions,
- if contributions only increased above current level a benefit would be derived
- Option 1 shows an improvement
- A combination of options 1 and 2 would provide the greatest likelihood of improving the pension and projected NRR
- If only 1 option could be chosen of those presented Option 2

Best advice use only options 1 and 2:
- First 15 years (use info above but 15% contribution) = 6 435 290
- Next 15 years (use above but 15% contribution) = 3 971 165
- Next 4 years (use above) = 801 952
- Last 1 year (use above) = 195 566
- Total = 11 403 973
- Pension = 627 219
- NRR = 48.0%

vi) Suggest some other changes that could be made to the defined contribution arrangement to improve the expected retirement benefits.

> *Well answered by some candidates but most answered this poorly, possibly due to time pressure.*

- Target higher yielding long terms investments for greater portion of assets;
- Greater diversification of higher growth assets
- Possibly slower transition into lifestage
- Consider appropriateness of final stage portfolio relative to targeted annuity,
    - cash for with profits,
    - inflation bonds for CPI linked or
    - options for members based on their intentions
- Conduct ALM study to assess appropriate mix and likely impact
- Consider impact of administration fees included as % of assets versus per member fee or contribution deduction
- Consider the appropriateness of risk benefits relative to members needs and the costs allocated away from retirement savings;
- Consider increase in member or employer contribution rates;
- Allowance for AVC
- Bonus for other suitable suggestions