

EXAMINATIONS

September 2002

Subject 304 — Pensions and Other Benefits

EXAMINERS' REPORT

Introduction

The attached subject report has been written by the Principal Examiner with the aim of helping candidates. The examiners are mindful that a number of interpretations may be drawn from the syllabus and Core Reading. The questions and comments are based around Core Reading as the interpretation of the syllabus to which the examiners are working. They have however given credit for any alternative approach or interpretation which they consider to be reasonable.

The report does not attempt to offer a specimen solution for each question — that is, a solution that a well prepared candidate might have produced in the time allowed. For most questions substantially more detail is given than would normally be necessary to obtain a clear pass. There can also be valid alternatives which would gain equal marks.

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Chairman of the Board of Examiners

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- 1**
- Cash commutation is usually an option available to members
The theoretical cash commutation factor can be determined by setting up an equation of value to be actuarially neutral on a given set of assumptions
The equation of value is the pension to be surrendered multiplied by a suitable annuity
- May use different commutation factors for different categories of members if benefit levels differ between categories
A common principle is that the sponsoring employer should not be exposed to a significant extra cost / selection against the Scheme
However there is generally little evidence of selection
Administrative simplicity is a major consideration
Commutation factors are often “smoothed” to produce a practical table
The factors may be determined by the scheme rules
or may have to be certified as reasonable by the actuary (e.g. relative to market condition regarding interest rates and life expectancy)
Full cash commutation may be allowed on the grounds of ill-health
The commutation factors may make allowance for discretionary pension increases
Conversion terms may be fixed for a long period of time or changed in line with market conditions
As such they may represent good / poor value to the member over different time periods relative to the pension given up
Commutations factors that are fixed, effectively, become a part of the benefit structure which can be exercised as an option by the members
Constant factors aids effective retirement planning for members
Changes to the factors could be driven by changes to inflation, interest rates or life expectancy
Legislation
Consistency with other factors
Industry practice/competition
Commutation of spouses' pension allowed?
What basis should be used?

There was a wide range of marks earned in this question. Many candidates discussed the actuarial basis (in particular mortality considerations) but did not cover all relevant factors.

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- (i) The net replacement ratio is equal to
after tax income
in the year
after retirement
divided by after tax income in the year before retirement
- (ii) property loans probably paid off
less incentive to save
subsidised travel costs and other costs
no need to pay pension scheme contributions
no cost of travelling to work

no need to pay contributions for state benefits
unlikely to be supporting dependants
probable decline in general level of activity throughout
the course of retirement

- (iii) This objective could be achieved through
a flat rate pension
a capped final salary pension
a defined contribution scheme with contributions
independent of earnings
means testing any form of benefits
progressive taxation regime in retirement
early retirement options for high earners

- (i) *Well answered.*
(ii) *Most students made 3 or 4 relevant points here.*
(iii) *Means testing and flat rate pension were mentioned by almost all students. Many of the other forms of benefits were missed.*

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the scheme could be insured,
so the employer pays the insurance premiums

alternatively, the scheme could be self-insured
so the employer pays the cost of claims paid each year

alternatively a reserve could be established
the liability could be deemed to be accruing over the
prospective working lifetime to retirement
or possibly to the expected date of death
so that a calculation of the type $\frac{N}{NS} \times \text{total life assurance}$
benefit could be conducted for each member of the scheme
and the actuarial value of the possible payment of this
accrued liability
using actuarial funding assumptions could be determined

the difference in the available fund compared to the accrued
liability could then be spread to form part of next years
contribution
the future service cost could be calculated by considering the
next years' accrual
assessed on a basis consistent with the past service
calculation
so that the actuarial value of the possible payment of this
liability at any time in the future could be determined
together with the risk cost ie the mortality rate (qd)
multiplied by the unreserved (ie future service) element of

the total liability
sensible comments on hybrid and for stop-loss insurance

OR an alternative approach to the solution would be:

The insurance premiums will be calculated allowing for:

- The expected risk cost over the following year (if based on a re-current single premium approach)
- or the expected risk cost spread over a given period e.g. 3 years (if based on a 'unit rate' approach with a guaranteed rate period)

The expected risk cost is the life assurance benefit multiplied by a suitable mortality rate

with the mortality rate either based on experience rating

or a "standard" rate based on occupation and geographic location

The insurance premium will also include an expense loading

and an insurance company profit loading

Most candidates touched on both insured and self-insured approaches but few went into great enough detail.

- 4** Reduce the pension accrual rate
Increase the normal retirement age
Any other part of the existing benefit structure could be reduced or removed
Increase the employee's contribution rate
Review the definition of pensionable salary e.g. exclude bonus payments
Change the definition of the defined benefit e.g. change from the pension being based on final salary to average of career earnings
or define it in monetary rather than real terms
Review the events on which the defined benefit is payable e.g. on ill health, early retirement etc.
Limit any members options that may not be actuarially neutral e.g. commutation, early retirement
Make some benefits discretionary rather than guaranteed e.g. pension increases
Consider "buying out" existing liabilities e.g. existing pensions in payment or deferred pensions
Ensure any risk benefits are purchased from the cheapest insurer
Integrate the scheme benefits with any state provision
Review eligibility requirement e.g. introduce a minimum starting age and or waiting period
Switch from final salary to a defined contribution scheme
or set up a hybrid of defined contribution and final salary
Review Investment policy;
to maximise return subject to an acceptable degree of risk
review diversification of assets
review asset types held

& currency fluctuations

Consider Asset Liability model to look at any asset-liability mis-match

Review Funding method adopted e.g. advance funding to reduce volatility

Consider the spread of surplus to reduce the employer's cash-flow payment or reduce volatility of employer's contributions

Almost all students identified that easiest way to reduce costs was to reduce benefits but not all then went on to explore the various ways that this could be done. Many concentrated mainly on investment issues (maximising return to reduce future costs etc) and closing the scheme and opening a money purchase scheme for the future.

5 (i)

The formula is $\frac{N_t + N_{t-1} + N_{t-2}}{E_t + E_{t-1} + E_{t-2}}$

Mortality rates are

$$q_{60} = 0.0090$$

$$q_{61} = 0.0100$$

$$q_{62} = 0.0111$$

$$q_{63} = 0.0120$$

$$q_{64} = 0.0129$$

and $q^1_{60} = 0.0137$

$$q^1_{61} = 0.0167$$

$$q^1_{62} = 0.0187$$

$$q^1_{63} = 0.0210$$

$$q^1_{64} = 0.0231$$

medical advancements

better access to healthcare in retirement (e.g. private plans)

better standard of living in retirement/(higher pensions)

specific reason for high rates 12 years ago (e.g. disease)

change in eligibility of State scheme to include wealthier people

removal of ill-health retirees from the analysis

better understanding of diet/lifestyle in recent years (pre retirement)

Random fluctuations

Data could be wrong

Change in composition of the group

- (ii) In relation to the current mortality investigation, comments are
the mortality rate increases with age
for all ages, and for all years included in the investigation
the mortality rate is lower in the most recent year
and this is true for all ages
which might be as a result of a genuine improvement in life
expectancy during the period under review
although the actuary would need to assess whether this could
be the result of random fluctuation or other factors
the improvement in mortality rate with age and time is broadly
consistent with each age and time period
and presumably random fluctuation is the explanation for the
small discrepancies that do exist
Looking at the investigation 12 years ago, many of the
conclusions are the same except
generally it appears from the table that the mortality rate was
improving at a faster rate
and the difference in the mortality rates between ages is greater
and the rates themselves are not quite as consistent
although probably within the bounds of random statistical
fluctuation
Comparing the two investigations,
it appears from the tables that the rate of improvement in
mortality within the duration of each investigation is much
higher than the rate of improvement between the two
investigations
and some explanation of this effect is required
similarly, the improvement in the rate between the
investigations has been far more marked at age 64 than at age
60
- (iii) it appears to be true from the results of the investigation that
the mortality rates of state scheme members is improving
and that it would be reasonable to assume that further
improvements will emerge
as such the results could be extrapolated on some basis in
order to model the anticipated future improvements
and ultimately tables for each age, applicable to certain set
future time periods, could be produced
although this could be seen to be spurious accuracy
so that only one table with general applicability to deaths at an
“average” future time period may be adopted
care would need to be taken in any extrapolation that a
satisfactory explanation was available for the apparent
anomalies highlighted in part (ii) and that these could be
appropriately allowed for

it would also be necessary to smooth the results before they could be used

- (i) *Well answered.*
- (ii) *Most candidates made the points about mortality increasing with age and rates being lower for most recent investigation but few further comments were made. Most candidates concentrated on the comparison of both investigations and did not make any observations on the two investigations separately.*
- (iii) *Again few comments made here, given the marks available.*

- 6** The scheme is currently likely to be mature
e.g. assets > say $\times 7$ salary roll, liabilities > 70% bond backed
No future benefit accrual — may be with or without any salary linkage

Investment

What is the employer's attitude to risk?
Need to consider an appropriate current investment position
and the changes needed in the short/medium / long-term
Investment freedom will be influenced by any current surplus or deficit
Matching assets will need to be considered
Asset distribution to have regard to any current legislation e.g. MFR
Asset distribution to have regard to long term funding basis
Negative cashflows
and a need to realise assets will be a feature in the future
Consider the use of an asset liability model

Valuation Method

Attained Age Method most appropriate if the scheme is to be closed to new entrants

as the Attained Age method allows for gradual ageing of existing membership
Consider an allowance for any asset mismatch (mis-match reserve)
Together with future expense reserve
and any legislative risk reserve
Buy out costs (Immediate annuities and deferred annuities) need to be considered if
future benefit accrual is ceasing

Valuation Basis

Probably market based assumptions
Need to allow for future mortality improvements
Need to allow explicitly for any options (e.g. early retirement)
And any discretionary benefits (e.g. pension increases in payment)
Need to consider the funding position on any statutory funding basis (e.g. MFR)
May need to consider salary growth assumption if future benefit accrual has ceased
but accrued benefit is still linked to final salary

Impact of funding

Size of the scheme relative to the size of the employer e.g. materiality
Employer difficulties in addressing deficit or control of surplus
Statutory accounting requirements

Salary roll will decline therefore the monetary cost rather than cost as a percentage of salary becomes more important
Requirements on possible wind-up and any priority orders

In "Investment Strategy" most candidates concentrated on discussing matching in general terms. In "Valuation Method" some candidates simply discussed the pros and cons of the various funding methods and in some cases did not actually come to a conclusion on the approach that they would recommend.

In "Impact on Funding" very few candidates made many relevant points.

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- (i) investment return on assets
amounts of future contributions
mortality rate pre retirement is not required (+ other demographics)
annuity rate at retirement
including options such as
 - amount of spouses pension
 - pension increase rate
 - age of spouse at retirement
 - frequency of payment of pension
 - fixed term or payable for life
 - guaranteed period of pension
Expenses of the contract
Proportion taken as cash
Legislative constraints
salary growth
inflation
- (ii) Points to be covered include
 - Investment return assumptions is critical
 - Comment on impact of, say, additional 1% return per annum in period to retirement
 - Return will depend on class of assets the monies are invested in
 - With a high expected return from risky assets e.g. equities
 - Compared to lower risk assets e.g. gilts
 - Say that assumption chosen in calculation is appropriate to the assets class selected
 - But that there is no certainty that this return will be achieved
 - Sensible comment about probability of various future contribution patterns e.g. fixed percentage of salary, fixed monetary amount, fixed duration
 - State assume that will survive to retirement
 - And cover the benefit if doesn't survive
 - Comment that pension conversion terms (i.e. annuity rates)

cannot be known with any certainty
But will probably depend largely on the investment return
available to insurers on a matching asset
Which will be bonds
Either fixed interest or index linked depending upon the
pension increase rate selected
And illustrate the impact that say, a 1% difference in bond rates
would have on annuity rates
Sensible comment on selection of options on annuity
Emphasise throughout how uncertain the results of the
calculation are,
But mention that some greater certainty can be achieved by
investing in matching assets (to the annuity) throughout the
duration of the contract

- (iii) Volatile income
Or risk of reducing capital if choose to take fixed income
Which potentially could reduce to zero before death
Leaving the member dependent on the state at the end of his
life
May incur heavy administrative and advice costs
May not understand how the arrangement works
May not provide spouse with sufficient fund if member pre-
decease's
Or may be tax charges or changes on residual fund in this case

- (i) *Generally well done.*
- (ii) *Reasonably answered in the main.*
- (iii) *Generally well answered with most candidates identifying the main risks.*

- 8**
- (i) On one measure the scheme is in deficit and therefore the trustees must be concerned about security.
If investments are all moved into corporate bonds it is that (Company accounts) valuation which shows a deficit. Therefore unless there are other margins in that valuation, a corporate bond investment strategy would serve to “match” the liabilities and preserve the deficit.
Over the long term the bond strategy may be expected to produce a lower return than equities and hence the cost of the scheme will increase to the company.
That increase in cost over the long term may be just as likely as short-term fluctuations in the accounting cost to ‘force’ the company in considering the viability of the scheme.
If the company stops pension provision in the future this is a concern for the trustees as members will stop getting benefits.
Also need to consider the possibility of wind up and the priority liabilities.

Trustees should be seeking to maximise return subject to reasonable degree of risk.

The company's attitude seems to be very short term rather than the longer time horizon over which the trustees view the scheme.

Cannot match mortality risk

Strength of sponsoring employer

there may be constraints in legislation or the governing documentation

concern over lack of diversification

- (ii) Corporate bonds vs. equities
 - higher priority than equities regarding payment of income (or capital redemption) less risky
 - depends on the gearing of the company issuing bonds/equities
 - both issued by corporate entities
 - similar marketability
 - pre-determined payments no scope for extra return
 - Vs. Government bonds
 - minimal default risk with Govt.bonds
 - some default risk with corporate bonds
 - more risk on income and capital redemption
 - compensated by higher yield
 - smaller issues
 - less marketable
 - less variety (of terms,coupon etc.) depending on development of corporate bond market
 - may not be index-linked corporate bonds available
 - Vs. Cash
 - less secure
 - higher return? depending on shape of yield curve
 - less marketable/liquid
- (iii) Objectives of the ALM study
 - Period over which the exercise is being conducted
 - The acceptable level of accuracy of the results (tolerance)
 - The acceptable level of risk the client is willing to accept
 - All the usual membership data, assets etc that was used for the funding valuation is needed.
 - Any options and guarantees not explicitly valued in the funding valuation are required for the fully realistic ALM assessment.
 - The funding method and assumptions used in the funding valuation and the conclusion as regards the future contribution rate.
 - Realistic, no margin, assumptions for pay, inflation and investment growth.
 - Realistic demographic assumptions including withdrawal, proportions taking transfer values, new entrants, cash commutation proportions, early retirements, and any other options.
 - Covariances (standard deviation/correlation) of the asset classes.
- (iv) Give credit for any suitable answer.
 - Company cost in the accounts fluctuates by $>x\%$ once every y years

Actual contributions increase to more than £xm in any year in next 10
Ongoing funding level < x% once every y years
Discontinuance funding level < x% once every y years

- (v) Set the parameters, no of simulations etc as described in (iii)
Decide on the underlying stochastic model e.g. Wilkie model.
Model will attach probabilities to future economic scenarios and the associated investment returns.
Set the demographic assumptions as per the valuation but with margins stripped out, options put in etc.
These may be deterministic or stochastic.
Any economic assumptions must be fully realistic.
Run the model to produce a series of cashflows both from the assets and liabilities.
Run 1000's of simulations as required.
Consider the valuation results on one investment strategy, looking in particular at the volatility of the results over all the simulations.
Repeat the exercise for the alternative investment strategy (ies).
Consider the mean, standard deviation of the results.
Do a sensitivity analysis.
Use optimisation techniques to get a sensible investment strategy.

Limitations; infinite no. of possible answers, does not allow for external influences (e.g. war, tax changes), may produce impractical answers e.g. 100% property investment, some asset classes may be limited e.g. index-linked corporate bonds.
data error
limitations on model itself.

- (i) *Most candidates concentrated on issue of matching and the lack of diversification.*

Only a small number of candidates noted that returns would be lower and therefore costs of the scheme would increase.

Most candidates made the point that the Trustees should be seeking to maximise return subject to an acceptable level of risk.

Few candidates made many additional comments.

- (ii) *Many candidates simply listed the characteristics of each asset class and did not give adequate indication of how each characteristic varied between each.*

(iii) *Most candidates scored reasonably well in this part of the question and demonstrated knowledge of all of the data and assumptions required in order to carry out an ALM.*

(iv) *Many candidates scored poorly on this part of the question by imprecise in their answers.*

(v) *Most candidates were able to describe the process involved in an asset liability modelling exercise.*