INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2015

Subject ST8 – General Insurance: Pricing Specialist Technical

Introduction

The Examiners' Report is written by the Principal Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and using past papers as a revision aid and also those who have previously failed the subject.

The Examiners are charged by Council with examining the published syllabus. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

F Layton
Chairman of the Board of Examiners
December 2015

A. General comments on the *aims of this subject and how it is marked*

1. The aim of this General Insurance: Pricing Specialist Technical subject is to instil in successful candidates the ability to apply, in simple pricing analysis situations, the mathematical and economic techniques and the principles of actuarial planning and control needed for the operation on sound financial lines of general insurers.

2. Subject ST8 deals with applications of general insurance pricing techniques across many different types of product. Candidates should expect the examiners to draw these applications from all parts of the syllabus in order to test as wide as possible a range of skills and, in particular, to achieve a fair balance between personal and commercial lines.

3. Examiners will sometimes require the use of standard general insurance actuarial and statistical techniques that are covered in earlier subjects. Candidates should ensure that they are familiar with these when preparing for the ST8 examination.

4. As well as pricing techniques, ST8 also covers the workings and use of reinsurance products, so candidates should also expect the examiners to set questions on these aspects.

5. In questions with an element of calculation, different numerical answers may be obtained from those shown in these solutions depending on whether figures obtained from tables or from calculators are used in the calculations. Candidates are not penalised for this. However, candidates may be penalised where excessive rounding has been used or where insufficient working is shown. Where questions require looking up values in tables, candidates are expected to interpolate between two values if reasonable to do so, even when this is not stated in the question.

6. Where examples are given in the solution to illustrate the points made, marks were awarded to candidates who gave these particular examples or an equally valid alternative.

B. General comments on *student performance in this diet of the examination*

1. The level of difficulty of the paper and the general performance of candidates were similar to recent sittings. There was no evidence of time pressure in this paper for well-prepared candidates.

2. Yet again, a number of candidates displayed poor handwriting at this sitting, which made it difficult for examiners to award full credit. Candidates who struggle with the legibility of their handwriting are asked to contact the Examinations Team well in advance of the sitting for advice on what support may be available.

3. Bookwork questions were generally well answered, and better prepared candidates successfully tailored the answers to the questions, instead of making more general comments. Candidates did not score well on questions 10 and 11, despite both

questions containing parts which asked for descriptions of approaches that are covered well in the Core Reading. It appears that many candidates are unable to distinguish between model fitting and model validation.

4. The comments that follow the questions concentrate on areas where candidates could have improved their performance. Candidates approaching the subject for the first time are advised to concentrate their revision in these areas.

C. Comparative pass rates for the past 3 years for this diet of examination

Year	*%*
September 2015	41
April 2015	41
September 2014	38
April 2014	41
September 2013	39
April 2013	39

Reasons for any significant change in pass rates in current diet to those in the past:

The pass rate for this examination diet is broadly in line with recent pass rates. Some variation in the pass rate between sessions is expected as different cohorts of students sit the examination.

Solutions

Q1 Medical advances increasing life expectancy following prognosis of diseases.

The rate of inflation may have changed
e.g. due to court award inflation, wages inflation, general price inflation, or changes in court awards

Changes in health & safety legislation leading to safer work environments, or other legislation affecting employees that would affect claim frequency/severity

Or a rise in "claims farming".

People may have a higher propensity to claim than in the past due to societal changes.

Potential insurance legislative/political changes
e.g. increases in compulsory covers or minimum limits.

Emergence of latent claims which may have been observed in other books of business or advised through brokers/experts.

Distribution channel differences, e.g. could lead to technological changes such as a move to online claims handling.

Changes in currency exchange rates
The underwriting cycle and general level of competition.

Changes in the state of the economy and the knock-on effect on likelihood of claiming.

Availability and cost of reinsurance.

Changes in levels of price elasticity.

Trends in weather / global warming that might affect people working in affected occupations, e.g. farm workers.

Generally well answered. A number of candidates did not limit their answer to the external environment, and so wasted time. Many gave more details than required for an "Outline" question.

Q2 (i) An increased limit factor (ILF) estimates the cost for a new limit as a multiple of the cost for the basic (original) limit.

Alternatively it may be defined as the ratio of LEVs at different limits.

(ii) (a) $2.78 - 1.82 = 0.96$
(b) $14.12 - 8.24 = 5.88$

(iii) Inflation period = 3 years 9 months

Inflation factor = $1.06^{3.75} = 1.224219$

Deflated 5,000,000 limit = $5{,}000{,}000 / 1.06^{3.75} = 4{,}018{,}584$

Deflated 10,000,000 limit = $10{,}000{,}000 / 1.06^{3.75} = 8{,}037{,}167$

ILF for 5m

$$\frac{(4{,}018{,}584 - 2{,}000{,}000) \times 4.98 + (5{,}000{,}000 - 4{,}018{,}584) \times 2.78}{(5{,}000{,}000 - 2{,}000{,}000)}$$

$= 4.26$

ILF for 10m

$$\frac{(10,000,000 - 8,037,167) \times 4.98 + (8,037,167 - 5,000,000) \times 8.24}{(10,000,000 - 5,000,000)}$$

= 6.96

ILF for 5m xs 5m = 6.96 – 4.26 = 2.70

Alternatively the limits in the ILF table may be inflated but then no adjustment is required to the limits of the reinsurance layer. The result is the same.

The base level is now applicable to a base level of 622,000.

Alternatively the ILF is 3.36 (= $2.7 \times 1.06^{3.75}$) for a base of 500,000.

Assumptions

Inflation is constant across all claim sizes.
Policies on which the ILFs are based are the same length as the policies being priced
Can interpolate between the two ILFs.
ILF factors valid as at Oct 2015.
Other valid and distinct assumptions were credited.

In part (i) many did not give enough detail to score full marks. Part (ii) was generally well done. Common errors in part (iii) were: calculating the wrong inflation period; and errors in interpolation. Some failed to give any assumptions, and most gave assumptions that were not relevant.

Q3 (i) The actual cost of claims paid or incurred during a past period of years

expressed as an annual rate per unit of exposure.

This is sometimes used (after adjustment for inflation, incurred but not reported (IBNR) and so on) as a method of calculating premiums for certain types of risks or monitoring experience, for example, motor fleets and non-proportional reinsurance. *(This second sentence is included for completeness but was not required to gain full credit).*

(ii) (a) Burning cost is likely to be more appropriate.

Although there is ten years of historical data, this will not be enough to build a model of frequency or severity given there are only five coaches…

… especially if you try to model individual perils (e.g. property damage, third party liability, lost luggage).

(b) Frequency-severity is more appropriate.

Large portfolio with low attachment point is likely to have a high claims frequency, so there should be sufficient data to build credible models.

The models reflect the underlying process of generating losses …

… and will help spot separately any trends in frequency and severity.

The individual deductibles can be dealt with more accurately using a frequency-severity approach.

(c) Frequency-severity is more appropriate.

The frequency and severity models can be built using the medical negligence experience …

… with adjustments to the data to make it applicable to the dental cover …

… however the extent to which this is possible will depend on the suitability of the data and how detailed it is.

The two years of dental experience may be used to calibrate the models …
… though two years is quite short for long-tailed liability claims.

[*A burning cost approach was accepted in this case, but candidates had to justify clearly why this is more appropriate than frequency–severity to gain marks.*]

Many failed to give an accurate definition of burning cost to gain full marks in part (i).

Part (ii) was generally well done, though in (a) a number of candidates didn't recognise that with only five coaches the amount of claims data would be too limited for frequency-severity.

Q4 (i) Require the bank to carry out adequate credit checks at point of providing loan …

Include an exclusion period at the start of the policy.

Include a waiting period, (e.g. cannot claim if re-employed within a certain time.)

Only offer cover on loans under a specified limit.

Include an excess or some other participation by the insured

Exclude temporary/contract workers.

Exclude self-employed workers.

Exclude certain occupations.

Exclude workers in probationary periods/require min length of service.

Exclude interest-only loans.

Cannot lend when on notice period or reasonably expect to be made unemployed.

Limit the number of loans an individual can have.

Proof of unemployment and that the policyholder hasn't resigned.

Limit the term of the loans.

Limit the number of loans the bank can sell.

Exclude if loan is already covered by another insurance product.

Exclude certain regions.

Have a profit share arrangement with the bank.

Exclude unemployment if the policyholder:

Had been dismissed due to a misdemeanour
Had accepted voluntary unemployment or chosen to retire
Became unemployed due to the expiry of an apprenticeship or other training contract
Became unemployed after refusing reasonable alternative employment
Had been dismissed due to an illegal act

(ii) State of economy and growth prospects in area where policyholder resides

e.g. unemployment rate and incidence of unemployment where policyholder resides (would impact likelihood of claim).

Underwriting standards of the bank

e.g. if each is individually underwritten.

Factors specific to each customer, e.g.:

age;
state of health;
size of loan;
term of loan;
occupation and/or industry;
unemployment history.
level of experience/qualifications.
gender (unemployment rates may vary by gender).

There were no major problems with this question and many candidates scored highly. A common error was to assume this was a credit insurance product, and therefore make points that were not relevant.

Q5 Return premium may apply, or some kind of profit share.

Market conditions/position in the insurance cycle may mean the premium achievable is more or less than £10k.

For example:

due to brand of insurer;
or credit rating of insurer;
or non-price benefits (e.g. help with risk management);

This may be a renewal and the underwriter is likely to anchor the premium on that paid last year.

It may be a deliberate strategy e.g. relationship with insured/broker.

The insurer may be looking to expand their book and willing to write unprofitable business to do so

or looking to contract their book, and using premium to discourage new business.

Underwriter may have more or less up to date information about historical claims

or other information which may affect future likelihood and/or size of future claims

e.g. improved risk management on the part of the insured that has not been accounted for by the actuary

such as installation of sprinklers (*or other suitable example*)

May charge less for this policy as part of a wider package with other policies.

There may be considerable uncertainty in the price
e.g. due to lack of historical data

or uncertainty in the level of the catastrophe loadings.

So underwriter relies more on market rate than actuarially calculated rate.

Underwriter may have different view of key assumptions so disagrees with actuarially calculated rate.

Either party may have made an error.

The cover may have changed between underwriter and actuary calculations.

There may be regulatory requirements on minimum or maximum premiums.

The premium may be discounted for a certain promotion (e.g. to win new business).

May charge more if taking on the policy adds to an accumulation of risk in the portfolio (e.g. by location), …

… or charge less if it aids diversification.

Allowance for price elasticity of demand / lifetime customer value / profit optimisation. (i.e. some might be very price sensitive / insensitive).

The availability/cost of reinsurance.

Allowance for cross-subsidies between risk groups.

Generally well answered, with better candidates giving a wide range of different reasons. A common error was to give various loadings, which the office premium will already have included.

Q6 (i) **Advantages**

Annual mileage should be a good indicator of the risk…
… as the more time spent on the road, i.e. more miles, increases the likelihood of a claim (all else being equal).

Most people should have a good idea of annual mileage or at least be able to estimate it fairly accurately.

The factor is acceptable to customers because of the direct relationship with risk.

The factor is easy for the customer to obtain.
The factor is unlikely to be closely correlated with other typical rating factors.

Disadvantages

It is easy for the proposer to understate in order to get a cheaper premium.

It is not verifiable, unless tracking devices are installed.

Assumes that car usage is uniform over the year, whilst the risk is likely to be highest in the dark and in the winter.

Most proposers will base their estimate on historical annual mileage however the estimate should be for the forthcoming policy year, which could be very different.

Doesn't differentiate between:
Lots of short journeys or a few long journeys
Driving at night or during the day

Extremely low mileage could correlate with poorer driving skill

May require a year end adjustment which would add to the administrative overheads

(ii) Driving licence information, to verify years held licence and motoring convictions/penalty points.

Data from insurers' trade body, (car group, engine capacity, seats, body shape, gearbox, fuel).

Data from motor registration authority (e.g. ownership length, number of keepers, actual mileage, age of vehicle).

Residual value

Information about repair costs from trade bodies

Postcode/address related information, e.g.:

car crime rates;
car accident rates.

Data for fraud detection (at point of quote/sale or claim) and ID verification

NCD verification

Previous claims history (e.g. Claims Underwriting Exchange in the UK)

Credit data, e.g. to determine whether to allow proposer to pay by instalments. Socio-economic type data (e.g. Census).

Rates of tax e.g. IPT and/or corporation taxes

Competitors' prices/ aggregator info

Benchmarks or other information from brokers/reinsurers/consultants

Industry data to help with claims development patterns

IFoA third party bodily injury working party

Government Actuaries' Department for Ogden tables, e.g. for PPOs.

Court or medical inflation indices (for TP bodily injury claims)

Information about investment returns/yields

Most candidates scored well in part (i) but struggled in part (ii) to generate a wide range of points.

Q7 (i) A system by which the premium of each individual risk depends, at least in part, on the actual claims experience of that risk …

… usually in an earlier period, but sometimes in the period covered.

The latter case is sometimes referred to as swing rated or loss sensitive, and there are often upper and lower limits defining a "collar" or "corridor".

In the context of London Market rating for example, it is rating based purely on the experience of the historic risk presented.

(The last two sentences are included for completeness but were not required to gain full credit).

(ii) (a) **Private motor**

No claims discount (NCD) or bonus/malus.

A prospective

claim frequency/number based experience system.

Policyholder may be granted a discount from the base premium depending on his or her claims experience …
… sometimes with the option to protect the level in exchange for extra premium.
As the size of private motor claims is volatile, a cost based approach would not be appropriate.

(b) **Employers' liability (EL)**

A retrospective system

based on an initial (deposit) premium

which is adjusted at the year end in the light of the difference between the actual and expected experience of that risk in the year.

A premium adjustment for actual exposure differing from expected is usually made at the same time.

This adjustment is weighted according to the credibility that is given to the risk's actual result.

Large claims are not usually excluded, but may be netted for reinsurance.

This is essentially a profit-sharing agreement.

(iii) **Advantages**

In line with the market.

so helps to avoid anti-selection

Appears to reward good risks/penalises bad claims experience.

... so may attract new business from good risks seeking cheaper premiums and retain customers with good risks

Reduces number of small claims.

Incentivises policyholders to take precautions to avoid claims.

Premiums charged should be closer to the risk taken on, so helps with underwriting.

Hence results should be more stable.

Disadvantages

Poor discrimination between risks.
Creates cross subsidies between rate groups.

Can create ill-will when no fault applies.
Can distort expense loadings.

In the case of NCD, ties customers to one insurer unless the NCD is transferable.

Claims experience is sometimes not a good indicator of risk, e.g. some policyholders may experience losses but not report them.

Policyholders may be unhappy if after many years claim-free, they have a claim and are penalised for it.

It generally goes against the pooling of risk principle of insurance.

For EL, with a fully credible risk the insurer is only providing claims handling and admin services, and therefore the insured does not get any protection.

Administration can be complex or may require expensive IT.

Candidates did not score well on this question. In part (ii) many candidates did not focus their answer on experience rating and consequently were also unable to generate valid points in part (iii). Better candidates demonstrated that they had thought through the implications of experience rating in their answer.

Q8 Separate frequency and severity trends to losses should be applied.

First project historical frequencies and severities in line with assumed trends to current values …

… and then project frequency to the mid-point of the future exposure period…

… and project the severity to the mid-point of the future time when the claim is paid

… meaning the assumed trends will contain both past and future components.

Rather than applying a constant past annual trend rate a more realistic approach is to apply an index which can reflect periods of high and low trend …

… and incorporate discontinuities caused by one-off changes e.g. in the legal environment

Whether to use all the ten years of data – relevance vs maturity.

Unusually light or heavy experience should be considered separately.

Adjustments will be required for inflation i.e. put monetary values onto constant money terms.
Although the pattern of historical frequencies by year for the individual risk provides an indication of the frequency trend to apply, we rarely rely on this.

More often we apply a standard trend …

… but will be complemented by external information, e.g. from an industry body or reinsurer.

Known or assumed future changes will also have to be allowed for in the trends.

Latent claims or events not in the data.

It is good practice to check trends with underwriters and claims staff,

and/or against trends observed in other work, e.g. reserving, burning cost trends

Trends in frequency and severity may be caused by changes in:

court awards and legislation;
the structure of the risk, e.g. excesses/limits;
economic conditions;
claims handling procedures;
changes in cover, terms & conditions, e.g. adding or removing exclusions
mix of business;

Frequency

Frequency trends may be caused by changes in:

the type of work undertaken by the employees;
strictness of underwriting;
the propensity to make claims / litigiousness of society;
new health and safety regulations for employers;
steps taken by the employer to reduce risk e.g. training;
other suitable example.

As the exposure measure is likely to be turnover/payroll, inflation adjustments will be required.

Severity

The drivers of severity trends will include:

length of time taken to settle a claim;
currency movements;
other suitable example.

Severity trending is usually applied at the ground-up individual loss level.

Losses may be considered in aggregate, or banded into two or more size based groupings or peril based groupings …

… however if this approach is followed the frequency must be similarly split.

Adjustments will be required for the impact of large losses.
Approaches include:

capping large losses;
basing trends on the historical median rather than mean;

More sophisticated methods may apply a severity trend that is a function of the size of loss.

Consider whether there might be data errors or incomplete data.

Very few candidates showed detailed knowledge of the relevant bookwork on trending. Most were able to generate a good number of considerations, but struggled to describe these in any detail.

Q9 (i) Loss A : $4m
Below $5m retention so can ignore completely.

Loss B : $20m
Loss to the XOL layer is $15m.
The first £1m is non-ranking towards the deductible, so $14m of the aggregate deductible is eroded.
The $1m that is non-ranking is recovered.

Loss C : $22m
As with B, the loss to the layer is $15m.
$1m of this applies to the aggregate deductible to bring it to $15m
So the recovery is $14m.

The aggregate deductible of $15m has been exceeded so can now ignore it.

Loss D : $9m
The recovery now is simply that to the $15m xs $5m.
Therefore the recovery is $4m.

Loss E : $10m
As with D, the recovery will be $5m.

Total recovery is therefore: $0 + $1 + $14m + $4m + $5m = $24m

Alternative solution that assumes recoveries can only be made on losses that arise after the aggregate deductible has been eroded.

Loss A : $4m
Below $5m retention so can ignore completely.

Loss B : $20m
There can be no recovery as the aggregate deductible has not been eroded.

Loss to the XOL layer is $15m.
The first £1m is non-ranking towards the deductible, so $14m of the aggregate deductible has been eroded.

Loss C : $22m
There can be no recovery as the aggregate deductible has not been eroded.

As with B, the loss to the layer is $15m.
$1m of this applies to the aggregate deductible to bring it to $15m.

Recoveries are now possible as the aggregate deductible has been fully eroded.

Loss D : $9m
The recovery now is simply that to the $15m xs $5m.
Therefore the recovery is $4m.

Loss E : $10m
As with D, the recovery will be $5m.

Total recovery is therefore: $0m + $0m + $0m + $4m + $5m = $9m

(ii) A well-defined index would be specified in the contract (e.g. LMIC / average earnings).

A base date would be specified and the value of the index at that date would be the base value.

The excess and limit are adjusted in line with the index up to the time the claim is settled.

All details of the calculations will be outlined in the contract.

(iii) **Disadvantages**

The recoveries would be more complicated, and require extra. calculation/administration

The insurer pays indemnity (claims inflation related) to the insured,…

… but is not getting this back from the reinsurer.

Reinsurance recoveries will be lower in absolute terms in the future.

This is especially true for liability as some claims can take a very long time to settle.
Can lead to gaps in cover if some are indexed and some are not (or are indexed differently).

Difficulty of finding a true rate of inflation that matches one or more of the different claim types.

Advantages

The cost of reinsurance should fall.

The reduced cover may focus minds internally on risk management

e.g. to settle claims quickly.

If some reinsurers will only offer cover with an indexation clause, a willingness to use one means the insurer has access to more reinsurers.

The real levels of upper limits are preserved.

Part (i) was not well answered with few candidates showing an understanding of aggregate and non-ranking deductibles, but those who set out a logical argument gained more marks than those who offered no explanation. A common error in part (iii) was to assume that the indexation applied to the primary insurance policy rather than the reinsurance policy.

Q10 (i) The method here describes the process for one line (model 1), the process should be repeated for the other lift curve (model 2).

Start with an out-of-sample data set, i.e. one not used in the model building process.

For each policy in the dataset, determine the expected claim frequency using model 1.

Rank all the policies in the dataset in ascending order of expected claim frequency for model 1.

Group the policies into 20 bands …
… of equal exposure.

Calculate the actual observed claim frequency for each group.

Plot the observed claim frequency against group number to create the chart shown.

(ii) If the model predicts well, the policies with the highest actual claim frequency should also have the highest expected claims frequency and vice versa.
This means the steeper the gradient of the lift curve, the more predictive the model is.

In the example shown, model 1 is more predictive than model 2.

(iii) **Plot actual against expected**

Using an out-of-sample dataset,

order the policies by increasing predicted value.

It may be necessary to rescale the predicted, or observed values, so that the average of the observed and predicted values are the same

Divide into groups of equal exposure and for each group calculate the average observed and expected value …

… or group by predicted claim size, though the exposure in each group will differ and in some cases could be small.

For each group plot the average of the observed against the average of the expected values.

A perfect fit will have points along the line $y = x$.

Points above the line $y = x$ highlight where the model under-estimates and vice versa.

If exposure in each group is different, then we can expect more volatility in actual versus expected where the exposure is low.

Instead of dividing into groups of equal exposure, the data could be split by the levels of factors…

… which will also identify where there are weaknesses in the model.

Plot residuals

There are a variety of residual plots that should be viewed to check the appropriateness of the model.

Using out-of-sample data, calculate the residuals…

… often studentised standardised deviance residuals are used.

Create plots of the residuals against the fitted values.

The plot of the residuals should be centred around zero and …

… randomly distributed with a fairly constant range across the width of the fitted values.

Any pattern indicates a poorly fitting model.

The residuals can also be fitted against the levels of factors in the model.

Again these should display no pattern and will help identify any problem factors.

Gains curves

Closely related to the lift curve.

Policies are sorted high to low according to the fitted model values.

The cumulative observed values are plotted against the cumulative exposure.

A reference line is created by dividing the cumulative observed values evenly against the cumulative exposure.

The reference line represents a model that does no better than assigning predicted values at random.

The higher the fitted values line is above the reference line the better the model.

The Gini coefficient is a measure for the lift produced by the model.

This can be thought of as the area enclosed by the model curve and the diagonal reference line …

…expressed as a ratio to the area of the triangle above the diagonal reference line.

Parts (i) and (ii) were well answered. In part (iii), most candidates recognised the gains curve as a suitable approach but descriptions were often vague. A common error in part (iii) was to talk about statistical factor selection, apparently not appreciating that the question was about model validation.

Q11 (i)

Approach 1

Statistical tests can be performed to assess the significance level of a factor.

Such as chi-sq tests for nested models where the scale parameter is known,

F tests for nested models where the scale parameter is unknown, and Akaike Information Criteria if models are not nested

The process involves testing whether a model which includes the factor is significantly different to a model which does not include the factor

Approach 2

A hat (more precisely, Hessian) matrix can be used to give the rate at which the log likelihood falls off from the optimum solution in each direction.

Steep curvature indicates that the parameter is tightly defined.

A shallow curvature indicates a poorly defined parameter.

Approach 3

Compare the model relativities with expert judgment …

… the pattern of relativities should be consistent with the definition of the factor under consideration.

A factor which displays a counter intuitive trend should be discarded or at least fully investigated.

Generate graphs of predicted values ± 2 standard deviations …

… and check whether the error ranges of the relativities are distinct.

Approach 4

Consistency of the trend over time should be checked.

This is done by interacting the factor with time.

A factor whose trend varies in a random way over time should be dropped.

If this is not possible, a random factor can be used in place of time.

From a practical point of view, if the model is going to be used for prediction, then any factor which will not be available at time of prediction should not be used.

(ii) Acceptable error distributions include: gamma, log normal, Tweedie.

Log link

(iii) (a) A no claims discount should by definition reduce the premium for every claim free year.

In the example shown, all else being equal, a policy with 1 claim free year would be charged more than one with 0 claim free years (other examples apply).

Also, due to the lack of policies with the highest number of claim free years, the relativities produced by the model are very volatile.

(b) To ensure a decreasing trend over 0 claim free years to 6, a curve could be fitted.

Given the lack of policies from about 7 claim free years it seems sensible to group 7+ together
or extend the curve to 7+ years if appropriate.

The size of the cohort could be increased to reduce the volatility.

(iv) The insurance governing body is likely to be reacting to customer complaints …

… if customers find the operation of NCD difficult to understand

… or they are simply trying to introduce some standardisation across the market.

It may make it easier for customers to transfer claim free years between insurance companies.

If the operation of the previous discounts was not transparent to customers then it helps customers understand how making a claim could impact future premiums.

If discounts were previously very steep then this new scale will mean customers will be less afraid of making a claim as the impact on premium is fairly small.

Reduces the chance of insurance companies offering discounts that are too large and risk insolvency.

(v) Offsets should be used to "fix" the relativity values of the factor, thereby imposing the required trend.

The offset values applicable in this example are:

Claim Free Years	*Offset relativity*
0	1
1	0.98
2	0.9604
3	0.9412
etc.	etc.

The difference between that explained by the offset and that explained by the actual factor must be picked up by other factors in the model, hence the whole model must be refit with this offset included.

The method described imposes the discount condition on the risk premium. In practice, further steps might be needed to ensure that the actual premium complies with the NCD condition.

(vi) The insurers will no longer be able to charge the true risk reflective premium.

Hence the premiums they charge will be inaccurate

and this uncertainty will be reflected in a higher capital charge or margin,

therefore average premiums in the market are likely to increase (notwithstanding the changes to the NCD).

The impact will depend on existing NCD scales in the market

Those with steep discounts for a high number of claim free years are likely to see their premiums increase.

Those with little or no discounts will see small discounts

The small NCD scale is unlikely to promote bonus hunger …

… and may increase moral hazard.

So if NCD scales were historically steep, more policyholders may claim now when previously they would not have.

This will push up the claims cost,

and claims handling expenses,

increasing the size of premiums in the market.

If there was no previous NCD scale, or they were historically shallower than 2% p.a., there is unlikely to be much impact.

Candidates did not score well in part (i) because their answers focused on one approach – statistical tests. In part (ii), a Poisson distribution is not an acceptable error structure for a risk premium model. Responses to the other parts were mixed. Better candidates gave clear explanations and descriptions, and well reasoned arguments.

END OF EXAMINERS' REPORT