

# EXAMINATIONS

September 1997

**Subject G — General Insurance**

*Paper Two*

EXAMINERS' REPORT

- 1 Part (i) required possible reasons for the changes in development patterns whilst many candidates noted the possibility of a move to longer tailed business, few commented on the more obvious points, in particular the sudden increase in premiums or gave possible reasons for this.

The mathematical parts of (i) and (iii) gave few problems but many points were asked in part (iii) when candidates were asked to explain the reduction in payments.

Few candidates appeared to group the fundamentals of the Bornheutter Ferguson method or knew which extra data would be required.

- (i) The payment pattern slowed down from accident year 1993 onwards at development year 1 and development year 2.

It speeded up again from development year 3 onwards.

The change appears to be purely an accident year effect as there are no calendar year effects.

This change coincided with a substantial increase in earned premium.

This could be due to the acquisition of another company, writing a longer tailed motor account, or the company could have expanded more rapidly into non-comprehensive business.

The acquisition scenario is most likely.

- (ii) (a) Sum the percentages across each row to get the cumulative percentages for each accident year.

Divide the cumulative payments to 31 December 1995 by the above percentages to get the Expected Total Payments.

Divide the Expected Total Payments at 31 December 1995 by the Earned Premium to get the Expected Loss Ratio.

<i>Accident Year</i>	<i>Cumulative Payments</i>	<i>Expected Total Payments</i>	<i>Expected Loss Ratio</i>
1989	100.0%	63.000	75.0%
1990	98.0%	66.000	75.0%
1991	93.0%	63.000	70.0%
1992	84.0%	72.000	75.0%
1993	63.0%	99.000	75.0%
1994	44.0%	112.000	80.0%
1995	23.0%	116.000	80.0%

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- (b) Add Cumulative paid to Published Outstanding and IBNR to obtain the Published Cost.

Subtract Expected Total Payments from Published Cost to get the difference.

<i>Accident Year</i>	<i>Published Cost</i>	<i>Difference</i>
1989	63.000	0.000
1990	66.180	0.180
1991	62.790	-0.210
1992	72.080	0.080
1993	102.770	3.770
1994	115.680	3.680
1995	121.380	5.380

- (iii) Express the 1996 payments in terms of the Expected Total Cost estimated at 31 December 1995. (No marks for expressing in terms of GEP.)

<i>Accident Year</i>	<i>96 Paid/ 95 Expected Total Cost</i>	<i>96 Actual/ 95 Expected Pattern</i>
1989		
1990	1.8%	90.0%
1991	4.5%	90.0%
1992	8.1%	90.0%
1993	14.4%	90.0%
1994	17.1%	90.0%
1995	18.9%	90.0%

Divide by the Expected Payment Pattern at 31 December 1995 to get 90% for each accident year.

We can see a definite calendar effect with a reduction of 10% in payments from expected.

This could have arisen because of:

Changes in claims department payment procedures;  
Changes in insureds' behaviour regarding settlement;  
Understaffing in the claims department;  
Strike in the company;  
Changes in Court procedures;  
Expected Loss Ratio estimates as 31 December 1995 were wrong;  
Other points.

- (iv) The Expected Loss Ratio Method assumes that the selected loss ratios are correct.

The Bornhuetter Ferguson Method uses the latest claim development information.

The addition of a loss ratio to a projection method adds stability against distortions in development patterns.

An issue is whether to use the Bornhuetter Ferguson Method on paid or incurred data.

In both cases we need an update of loss ratio estimates at 31 December 1996.

If we use paid data we do not need any further information.

The problem is how to allow for the 10% payment slowdown in 1996.

Using incurred data may be more stable, particularly if the drop in paid claims in 1996 is balanced by an increase in outstanding claims.

The further information required is outstanding estimates for each accident year at each development period.

- 2** *Most candidates appeared to have some understanding of the limitations of the Statutory Minimum Solvency Margin and the types of protection against fluctuations it provides. However, many of the answers were too superficial and failed to give sufficient detail for the number of marks available.*

*In part (v) few candidates scored highly and many failed to pick up on such points as different timing, whether foreign subsidiaries are included or not and the effects of reinsurance.*

- (i) Limitations are:

A period of rapid premium growth coupled with under-priced premium rates.

Alternative levels of strength when setting reserve would lead to reduced SMSM from claims basis.

Varying concentrations of risk due to:

Geographic concentrations of exposure;  
Catastrophic exposures.

The appropriateness of any reinsurance programme and the cost/benefit of the programme's ability to reduce volatility of results through:

Reducing catastrophe exposures;  
Spreading risk more widely.

The relative security associated with the reinsurance programme.

The overall quality of management and their ability to manage the business, including:

Sensible business strategies;  
Good expense/claim control;  
Guarding against fraud.

Changes in the mix of business written e.g. moving from less volatile segments to more volatile.

Changes in the mix of business leading to longer (or shorter) tails as no explicit allowance is made for investment income in the SMSM calculation.

Alternatives or changes to Investment policy:

Concentration of more volatile classes of investment e.g.  
Derivatives;

The degree to which the liabilities are matched (type, term, currency);

Varying quality of investment decisions.

(ii) **Fluctuations in Experience**

*Fluctuations in assets*

Fluctuations in market values as a result of changes in interest rates or profitability.

Fluctuations in market prices where investments are regarded as becoming riskier or the prospects for the company or industry are deteriorating.

Fluctuations in exchange rates where assets are held overseas.

Increase in corporation tax or capital gains taxes.

Failure of asset values to match inflation.

*Fluctuations in liabilities*

Cost of claims increasing through random fluctuations in numbers or amounts.

Secular changes in risk.

Changes in laws, especially relating to bodily injury e.g. Ogden.

Inflationary growth in claims costs or expenses.

Catastrophes or individual large losses not adequately protected by inflation.

*Business Risks*

Failure of Reinsurers.

Increase in volumes of business.

Effect of market competition.

Expense Overruns.

Changes in legislation e.g. admissibility.

Fraud.

(iii) Powers of intervention are:

If an insurer fails to cover the minimum margin of solvency it must:

Submit a plan for the restoration of a sound financial position;  
Modify the plan if required and then effect the plan.

If an insurer fails to cover the Guarantee Fund, then

the plan must show very quick recovery.

(iv) Actions may include:

Stop accepting new business;

Restriction on premium volumes;

Restriction of investment policy;

Custodianship of assets.

(v) **Accounts v DTI returns**

Accounts are made up within a few weeks of the year end, DTI returns within 6 months.

Therefore more information on claim development and IBNR.

No statutory need for accounts and returns to agree as they are on different bases.

Going concern/break-up basis.

Foreign subsidiaries included in accounts, excluded from DTI returns.

Accounts normally include overestimate of current years claims but reduced by release of previous years overestimates. In DTI returns releases appear in year of origin.

Accounts are net of reinsurance, DTI returns are gross and net.

**3** *In Part (i) many candidates did not indicate that the purpose of the allocation was a major influence.*

*Whilst the points that any requirements should recognise the characteristics of both the assets and liabilities were made, little attempt to expand these ideas were made.*

*Many answers were not clear on whether their comments related to actual or nominal investment returns.*

*Part (ii) was well answered.*

*In Part (iii) few candidates explained that discounting already makes an implicit assumption about the allocation of some investment return.*

*In Part (iv) many candidates listed standard investment principles but did not apply them to the question asked.*

*Whilst most mentioned that satisfying statutory solvency requirements was key, little comment was made on danger of large market value fall in equities.*

(i) Depends on the purpose of allocating investment return.

Need to recognise the different reserve characteristics of each class of business,  
different timescales for the payment of liabilities  
and the extent of likely fluctuations in claim outgo.

Whether liabilities are likely to be subject to inflation.

Need to be sensitive to changes in mix of business.

Volume of business dependent.

Should be easy to apply.

Consistency through time.

Need to recognise the nature of the assets  
e.g. some business may be subject to long delays in  
premium collection  
and there may be substantial non interest earning

assets for that class.

A management decision is needed to determine whether classes bear the effects of realised gains or losses

or whether to allocate a notional return to classes of business which the investment managers would need to achieve as the line manager has no control over investment policy.

The fairness of any allocation to shareholders needs to be considered.

If the liabilities are overseas, different investment returns may be appropriate.

- (ii) (a) In proportion to premium income:

Simple to apply;

Different classes have different levels of reserves for given premiums;

Investment income will be overallocated to classes with shorter tails.

- (b) In proportion to mean reserves:

Simple to apply;

Satisfies most criteria in part (i);

Not particularly sensitive to changes in mix of business;

Often longer tail business is more risky per unit exposure, a feature which is partially addressed by this method.

In extreme, if cease to write one class of business and reserves exist for earlier business, will receive an allocation of investment income and present an unrealistic picture of profitability of the class unless claim reserves are fully discounted.

- (iii) Expect to discount at notional rate which may vary from accident year to accident year.

Need specially discounted reserves, not likely to be those in accounts.

Investment income allocation achieved indirectly by showing the present value of technical reserves.

Allocation of investment income different if based on discounted reserves leading to less for longer tail classes and more to shareholders.

Practical except not easy to apply.

Implies stability of claim payment pattern — may not be realistic for some classes of business.

Prospective and therefore requires an interest rate assumption and requires consistency with inflation rate implied in setting reserves.

Need to adjust interest rate to allow for non interest bearing assets in class.

Allocates prospective investment income rather than actual — may be difficult to convince management it is a reflection of the contribution of investment income to profitability.

(iv) Actual format not important (letter, memo, report).

Investing totally in equities causes 2 major problems which cannot be overcome, these are to ensure solvency whilst best matching returns to characteristics of liabilities.

Must be able to demonstrate minimum level of solvency according to rules laid down by DTI

assets must exceed liabilities by specified amounts  
maximum allowable value must not exceed current market value.

Equities are liable to significant falls in market value e.g. 1974, 1987.

If investments totally in equities then if assets below liabilities almost certainly have to cease trading.

Whilst true that gilts/fixed interest stocks could fall below liabilities if inflation/interest rates increased  
those repayable in the near future almost immune to such movements.

If yield is insufficient to maintain real values then deficiency must be made up from underwriting profits.

Index-linked UK gilts might be suitable if most were not long dated and prices volatile.

Sensible comments on Matching x Z.

Equities not always provided best protection against inflation taking into account both income and capital growth.

Therefore no evidence to suggest that will provide protection against future inflation at all circumstances.

No credit for listing standard investment principles without relevant application to question.

4 Part (i) was well answered.

For Part (ii) a full solution is provided below; the areas which were not well covered were:

*Specific comments on how past trends would be assessed in past claims frequencies and severities data.*

*How future trends and inflation should be incorporated.*

*Part (iii) was very poorly answered with very few candidates correctly understanding how an aggregate deductible operates. Clearly a pre-requisite before explaining how statistical distributions can be used to model the impact of introducing this feature.*

- (i) payroll  
type of industry or occupation  
location of workforce  
materials handled  
processes involved  
exposure  
nos. of employees  
claims experience

(ii) **Base period**

Choose a reasonable base period  
minimum 5 complete policy years  
to allow for long tail bodily injury claims development  
especially latent industrial disease type claims  
and to identify trends in claims experience  
latest policy year will be incomplete as quoting prior to renewal  
may gross up for unexpired period  
but must allow for IBNR & significant development of reported claims  
and exposure will also need adjustment  
may be better to ignore or give low weight to this policy year

**Data required**

Data may need to be adjusted  
to allow for past mergers, acquisitions or changes in nature of work undertaken.  
standard rating factors as in (i) to give book rates if less than full credibility given to actual experience

For each policy year in base period

Exposure amounts i.e. payroll (or number of employees or man-hours worked)

Claims experience including

number of claims

number of nil claims

number of open claims

cumulative claim payments

outstanding claims (using insurer's estimates)

details of individual large losses/accumulations from one event

above items analysed by claim type i.e. accident or industrial disease

Projected exposure amount for next policy year

difficult to verify o/s claims estimates if new policyholder in recent past.

Data separately for manual and clerical staff or other relevant risk groups.

### **IBNR**

IBNR affects prior policy years

especially if industrial disease e.g. deafness

and development of reported claims

use incurred claim development patterns from analysis of EL portfolio

which allow fully for inflation to expected settlement dates

for policy/accident years interpolating to point at which data compiled

assuming reporting delays and development patterns for this risk are

typical

treat accident and industrial disease separately

### **Large claims**

adjust data to truncate these at appropriate cut-off point

apply grossing-up factor appropriate to risk group

these determined from analysis of whole EL portfolio

treat accident and industrial disease separately

### **Inflation**

an appropriate index e.g. national average earnings for relevant industry

or index reflecting court award inflation

consider impact of Ogden tables

applied to exposures (if payroll used) and claim costs

to bring all monetary values to level for policy year being rated

### Trends

look separately at claim frequency and average cost/claim for trends  
may exclude nil claims  
individual policy years may have very heavy/light experience  
may be sudden relatively large changes  
use judgement to project to rating year

### Credibility

$$\text{Formula } P = ZA + (1 - Z) E \quad 0 < Z < 1$$

$E$  = premium based on insurers guide rates and standard rating factors

$A$  = premium based on past experience of this risk  
i.e. projected frequency by projected exposure by projected average cost

Alternatively  $A$  would be calculated using a burning cost approach.

$Z$  = credibility factor reflecting size of risk relative to self-rating point  
at which full credibility given

commercial pressures often mean more credibility given to smaller  
risks than justified by theory

### Loadings

Risk premium needs to be loaded for

commission  
expenses  
contingencies  
profit  
less credit for investment generated from premium receipt to mean  
claim settlement date

Competition in market will affect actual premium quoted.

Premium to be adjusted at expiry of policy when actual exposure  
available.

- (iii) Determine probability distribution function  $f(x)$  of aggregate claims  
amount for cover without deductible.

Find distribution  $g(y)$  applying to cover with aggregate deductible  $D$  i.e.  
 $y = x - D$

$$\begin{aligned} g(y) &= f(x) & y > 0 \\ g(y) &= f(x)dx & y = 0 \\ g(y) &= 0 & y < 0 \end{aligned}$$

Use  $g(y)$  to give expected claims cost with aggregate deductible and variance (or std devn) as contingency loading should reflect variability.

Stochastic simulation used to determine  $f(x)$  given distributions for number of claims and individual claim amounts  
e.g. Poisson etc. for numbers and Pareto, Lognormal for amounts.

Distributions could be fitted to past experience adjusted for inflation and trends  
but individual risk unlikely to be fully credible  
and would rely to some extent on analysis of overall EL portfolio.

Expense loadings would increase reflecting fixed expenses.

Investment income credit would decrease as  $D$  increases  
and profit/contingency loadings likely larger relative to expected claims cost.

As EL a compulsory class in the UK the modified coverage would require approval by the authorities. Or bankrupt Insurer may mean insurer pays to avoid bad PR.

Input on expenses of who administers deductible needs to be considered.