

## **Exposure To Risk In The London Market**

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## SUMMARY

The aim of this discussion paper is to attempt to follow the way in which risk is assessed at various stages in the insurance process. The thread is as follows. Data is presented to an underwriter. Risk is assessed by the underwriter and the business may be accepted. Data is logged. Claims are lodged or an expectation that they will be lodged arises. More data may be collected. From this data, a requantification of the cost of the assumed risk, given that an event has/ has not occurred, is made. This data is logged and by means of extrapolation in a reserving process (by class, by whole account, by individual proportional treaty or lineslip where required) the results can be used by the underwriter as part of his assessment of the risk inherent in future business.

Section 1 of this discussion paper sets out the underwriters' viewpoints and requirements together with notes on the effect of the capital structure supporting the underwriting.

Section 2 sets out difficulties which may arise with the data used in the estimations inherent in the extrapolation process.

Section 3 deals with the statistical methods used in the analytic process and challenges some frequently made assumptions.

Readers may find it helpful to note that although the three sections should be read as part of a single paper, each section is viable on its own.

## 1. THE UNDERWRITER'S ASSESSMENT OF RISK

This section of the paper presents the findings of a series of interviews with 10 underwriters from all four traditional sectors of the Lloyd's market. The aim was to better understand the approaches to risk assessment adopted by these underwriters. Although, between them, the underwriters in question are in control of £1.15 billion of capacity during 1995, some 11.25% of the Lloyd's total, their views may not be typical of those in the Lloyd's market in general. However, by virtue of their size, most of the syndicates considered will be leading a significant proportion of the business they write and should, therefore, be best placed to comment on the issues raised. In certain areas, the information obtained from the underwriters has been augmented by personal experience obtained in the market.

The underwriters interviewed were the active underwriters, except in two cases where I chose to speak to the deputy, of a variety of syndicates as described below.

Syndicate	Description
1	PI And Property (Non Cat XL)
2	PI, EL, GL
3	Casualty, Property Reinsurance, Personal Lines, Commercial
4	Short Tail Marine plus General XL
5	Short Tail Marine plus General XL
6	Short Tail Marine
7	Motor
8	Motor

9	Aviation
10	Aviation Reinsurer

The questions asked were split under four separate headings as follows:

1. Underwriting Risk
2. Business Risk
3. Rate Setting
4. Capital Structure

The issue of capital structure is even more Lloyd's specific than the other sections but it raises some interesting points. The questions asked, together with a summary of the answers given is set out below under these headings.

## **1.1 Underwriting Risk**

### **Questions**

- i) For each category of business, what type and extent of information do you require before accepting a risk ?
  - a) in theory
  - b) in practice
- ii) Which exposure units and rating factors are most critical?
- iii) Is it lack of time, market practice or other factors which are the biggest constraint on the quality and quantity of information you can realistically request?
- iv) How soon are you in a position to follow the run-off of reserves for each business category or each risk and do you always use this information at the time of underwriting?

### **Comments**

The type and extent of information required by the underwriter is voluminous and well known. It is more constructive to comment on interesting features. The motor market is most conducive to a statistical approach to rating and is the only section of the market able to apply statistical rating across all sections of the book. Rating factors starting to gain more and more prominence include whether the proposer is a smoker or not and whether he owns or rents his home.

Given the difficulties in applying statistical rating methods to many other classes of business and the general cynical attitude towards the feasibility of such an approach, it is not surprising that the most frequently mentioned critical factor was the claims history of the risk in question although underwriters will attempt an analysis of the financial strength of their corporate insureds as well.

All the underwriters questioned agreed that time pressure and the method of placement of most risks (by broker in a subscription market) were important factors in determining the extent of risk-related information that they requested or reviewed. However, two of the underwriters expressed some concern regarding the way data deemed pertinent to the assessment of the risk could be used within the limitations of the systems available to them and some, notably those who received proposal forms for the bulk of the risks they underwrote, were sceptical about the quality of data they were receiving. Many of the questions on the proposal form were often misunderstood or misinterpreted.

Most syndicates appear to update claims information on their systems on a regular basis with the exception of those claims requiring attorney assessment where this usually happened towards the year end. All but one of the underwriters, who performed the task on an "as appropriate" basis, reviewed the progress of class reserves on either a monthly or quarterly basis. The motor syndicate underwriters both conducted monthly reviews and would undertake a more detailed review on a regular basis. The information so gleaned is used to adjust rates crudely across the entire class but insureds with a good claims record would often be exempted from any derived rate increases, particularly in a soft market. Considerable difficulty in interpreting trends in class reserve utilisation was expressed by certain underwriters. The performance of the Ships Physical Damage reserves for the 1989-1991 underwriting years was cited as a case in point. These years were characterised by

low rates and low deductibles and probably encouraged shipowners to belatedly lodge claims which did not exceed the deductible for the year in which they were actually incurred to these years of account instead.

The claims history of an individual insured is always available at renewal and will always affect the rate charged.

## **1.2 Business Risk**

### **Questions**

- i) Do you explicitly allocate the following to each category of business:-
  - a) underwriting expenses (administration, remuneration, accommodation, IT, claims processing etc) and reinsurance costs and recoveries.
  - b) investment income arising from the cash flows attributable to that class on a gross and/or net basis.
- ii) Do you know the gross loss ratio which would typically allow a class to make a specified level of profit taking all other factors into account? Is the effect of differing levels and types of reinsurance purchase on this loss ratio quantified?

- iii) Do you explicitly or implicitly allow for the **variation** in the following by charging a risk premium for that variation:-
- a) investment income
  - b) claims inflation
  - c) currency movement
  - d) expenses
  - e) legal hazard
- iv) Do you know which risks are most susceptible to moral hazard? Do you underwrite these risks? If so, how do you quantify the cost of moral hazard?

### **Comments**

Only two of the ten underwriters were able to allocate underwriting expenses and reinsurance costs and recoveries fully across different classes of business. One of the underwriters allocated reinsurance costs and recoveries only and another, a motor underwriter, allocated the major expenses (salaries, accommodation and IT) only. The remainder undertook no allocation whatsoever although two of the underwriters were in the process of developing a system to do this.

The only evidence of allocation of investment income arose from a long tail syndicate which, in fact, allocated the income arising from reserves hypothecated by class. However, this underwriter took no account of the timing of cash flows (premiums, claims, RI, profit commission etc.) and treated each class' investment income as a float from which the class was expected, as a minimum, to fund all underwriting expenses. All the other underwriters, regardless of the tail or nature of their business, do not allocate investment income although two of the underwriters



on short tail syndicates pointed out that this was not an important issue for them. The long tail underwriters (and this is a view advanced, if not attained, by most such underwriters in the market) aim for an underwriting profit and treat investment income as a "bonus". However, on large, atypical, individual "deals" investment income can be paramount and is factored into the price.

As a result of the above, most syndicates were unaware of the loss ratio target they needed to attain on individual classes for a particular year of account, given the particular mix of business, reinsurance protection and so on, in order to make a predetermined level of profit. Two of the short tail syndicates claimed to be close enough as they allocated everything bar investment income and the two syndicates developing a system for this purpose expected to be in a position to do so once the system had been developed.

Perhaps not surprisingly, none of the underwriters made an explicit allowance for variation from the anticipated values for investment return, claims inflation, currency movement, expenses and retrospective changes to the legal system in countries where they accept risks. To a certain extent, the profit margins they seek encompass a reward for all risks they accept when they underwrite and not just the risk that claims will be more than budgeted. However, certain of the risks cannot be charged for at all, explicitly or implicitly, because doing so would expose a comparative disadvantage relative to other players in the market. Currency risk is one such example if there is established insurance capacity in the country in question. Many of the underwriters shy away from writing business on terms and conditions which expose them to what they deem to be unacceptable hazard from the local legal system.

Individual risks known to be subject to moral hazard (eg. a shipowner known to

have made fraudulent claims) would not be written by any of the underwriters although one said he would be happy to do so if he could reinsure the risk out and another said he would be prepared to take the risk if he felt he could charge enough! It is accepted that a book of business is always exposed to moral hazard and, in as much as individuals cannot be singled out, the rates charged for the business incorporate a loading, derived from experience, for the cost of this moral hazard.

### **1.3 Rate Setting**

#### **Questions**

- i) Do you have a minimum rate for a risk? How, technically, is it determined and how religiously do you stick to it?
- ii) What are the acceptable reasons for ignoring a minimum rate?
- iii) Do you know how sensitive to minor deviations from central assumptions the minimum rate is?

#### **Comments**

Those underwriters who had minimum rates derived them, without exception, across a class of business. The derivation was usually performed very roughly and based purely on the past experience of the syndicate in that class of business. None of the underwriters interviewed rated catastrophe business formulaeically although there are syndicates within the Lloyd's market which have developed their own catastrophe rating models or purchased relevant software.

The rate so determined was invariably treated as a guideline only. The underwriters placed significant importance on the nature of the individual risk and their perception of the risk management status of the insured. Most, though not the motor underwriters, thought it impossible to determine a rate which was relevant to the risk they were underwriting because the quality of data available, and the changing nature of both the individual risk and the terms and conditions under which the policy was written, rendered past experience "irrelevant".

This guideline rate would be overlooked for a variety of reasons but the most prevalent were:

- a) promoting client continuity/ establishing a good relationship with the client
- b) "buying in" good business
- c) the availability of cheap reinsurance rendering the net rate profitable.

Only two of the underwriters knew how sensitive the rate they had derived was to changes in central assumptions but this was a slightly academic question in that the derived rates did not appear to be "built up" but were mostly experience based.

## **1.4 Capital Structure**

### **Questions**

- i) Would the type and nature of the risks you underwrite (or the way you underwrite them) change if your capital structure changed? If so, in what way?

## Comments

It is helpful to understand the differing expectations of typical Lloyd's Names and limited liability capital.

Consider a Name who has £100 to "invest" in Lloyd's and an institution which has £100 to invest in insurance opportunities.

A Lloyd's Name can support a premium income limit which varies depending on the size of his total investment and the spread of syndicates on which he underwrites. Typically, this will be at least 3 times the capital identified. The Lloyd's Name might expect a return of some 10% of premium limit after all expenses if he religiously believed the Business Plan. Let us be more conservative and assume he makes 6%, on average. This translates to a return of 18% (6% times gearing of 3) on capital. However, Lloyd's capital is held outside the Lloyd's system and the Name will be able to invest the capital for a return. This is the "making your money work twice" point although the capital is, of course, at risk twice. At present, a risk free return might be in the region of 7%. This would give the Name a total return of 25% on capital, on average, on this conservative basis.

(Much Lloyd's capital is illiquid. For example, many Names underwrite on the back of a letter of credit secured on their homes. The return on capital here would be the "return" the name makes on his home.)

Unlike a Lloyd's Name, an investor in insurance requires paid up capital and the investment return on this capital whilst it is being employed is part (and often most) of the overall return to the investor which is typically quoted. How many insurance

opportunities result in an expected return of 25% per annum?

This is a much simplified treatment of the issue. The risk/ reward aspects arising from unlimited liability and the high gearing (and hence volatility of results) within Lloyd's, as well as numerous other factors all have a bearing on the expected return.

Many of the underwriters were in favour of long term (ie. non-annual venture) capital backing their syndicates because they felt that it is very difficult, at present, for them to enter into meaningful long term relationships with their clients or to expand their businesses to take advantage of new long term opportunities which require capital. The knowledge that their capital may disappear next year and the difficulty in allocating both costs and returns from these projects to different years of account, militate against this type of business development.

Two of the underwriters felt that one of the most significant advantages long term capital would give them would be the ability to smooth results across the underwriting cycle. Presumably, this would require the introduction of a price mechanism for syndicate participations if capital other than venture capital provided this support.

Three of the underwriters felt that the returns expected by Names (as described above) were very onerous and that they would welcome the ability to be more flexible (ie. cheaper) with their pricing. They perceived that limited liability capital would provide this flexibility.

## 2. LONDON MARKET DATA

- 2.1 The actuary, whether carrying out a reserving exercise or advising on premium rates, commences from a pattern of claim development in order to establish ultimate claim amounts (or ratios). To be fully useful, such a pattern of claim development needs to have run for a considerable number of years in the case of liability business (or the liability content of a portfolio of *treaties*).
- 2.2 Historically, although the larger and more capable offices (both Lloyd's Syndicates and Companies) had established effective statistical systems, many of the smaller ones had not. In both cases, the coding structures used stemmed from the needs of the underwriter, usually focusing on the more important sources of business (to that office).

Up until about the mid 1980s, computer systems were either totally absent or were inadequately designed. In a way, the help provided by the LPSO to Lloyd's syndicates and the ILU to the Marine companies made the position worse by providing the basis for the accounting necessary without establishing a firm basis for the development of statistical reports in triangulation form. Minor problems abounded. For instance, in the case of LPSO

- (i) A failure to link changes in outstanding claim amounts to claim settlements.
- (ii) Bulk claim advices of several small claim settlements arising from different risks; similarly with currency conversion adjustments.

- (iii) Claim outstanding totals advised on proportional treaties on a yearly basis without any attempt to link to claim settlement advices.
- (iv) Currency adjustments arising from changed exchange rates of miscellaneous currencies not linked to premium reserves retained.
- (v) Failure in the Marine market to establish outstanding claim amounts.

2.3 Gradually, during the 1980s, the position improved; partly as a result of pressure from regulatory authorities, both external and internal, and from auditors to ensure that proper reserves were set up; partly as a result of pressure from the growing number of actuaries working in the field.

We are now able to obtain, in most cases, something like 10 years or more of claim development patterns.

There are, however, two residual types of difficulty that must be faced. The first arises from the nature of the market and is the more intractable. The second type refers to pure error in the statistics which can be overcome with care but is endemic to the system.

## 2.4 **Nature Of The Market**

Difficulties in establishing claim development patterns arising from the nature of the business:

- (i) There is no homogeneity in the business and hence considerable difficulty in establishing class groups that are large enough to be

viable statistically and yet reasonably homogeneous.

- (ii) The portfolio of business written is determined by the changing nature of reinsurance business offered from around the world and by individual underwriters who respond to those offerings and whose attitude may change from year to year or who may be (and often are) replaced. Hence there are very often marked changes in the claim development pattern from one underwriting year to the next, thus damaging to a major extent the rationale of the link ratio method of estimation.
- (iii) There was a failure to split out, at a sufficiently early date, latent claims such as asbestosis, which do not arise statistically on an underwriting year basis, or claims from large losses such as catastrophes which have their own settlement patterns which are different from those of smaller claim aggregations.
- (iv) The London LMX spiral, in particular, and the effect of underwriting retrocessional treaties generally brought into the picture a type of claim development pattern almost impossible to forecast.
- (v) While the gross account may be relatively easy to analyse statistically, the net account, under the effect of the reinsurance treaties outwards, may produce very erratic effects, even when the catastrophe claims have been split out. Further, the figures of inwards treaties which have been commuted may not be deleted from the totals of figures applying at earlier points of duration.



- (vi) With reinsurance being written in a world-wide currency, problems underlie the statistics. It is only in recent years that computer storage capacity has become sufficient to allow for retention of claim figures in both original currency and in the accounting currency (either £ or US\$) and by transaction. The requirements for Syndicates to maintain accounting (and hence statistics) in £, US\$ and Can\$ has prevented major problems arising from the conversion of US\$ to £ but some of the smaller companies still keep their statistics in £ only. The most intractable problems then arise if US\$ are converted to £ at a rate varying from year to year or with premiums and paid claims at a rate fixed by underwriting year but with outstanding claim amounts converted to £ at the rate applying at each year-end.
- (vii) Claim figures net of reinsurance recoveries not kept gross of failed recoveries together with parallel statistics of the failures.

## 2.5 Errors in statistics

While computer-produced statistics are on the whole considerably more accurate than clerically-produced statistics, errors can still arise and large errors, which would be spotted on manually produced work, can slip through unless special arrangements are in place to trap them.

Statistical totals should always be reconciled to accounting totals. Raw data can often be very rough. It is then possible to smooth the data by means of some running average technique but the exercise can be dangerous if the causes of the roughness are not investigated, at least to some extent, so that an understanding of the causes can be obtained.

On the one hand there is danger of smoothing out what is a true statistical variability and thereby reducing the ability to analyse such variability. On the other hand there is the danger of allowing pure error in data compilation to be taken as statistical variability.

The sort of problems that can arise and should be corrected for are:

- (i) Errors in currency coding, with resultant errors in figures converted to the accounting currency.
- (ii) Errors spotted and corrected in a quarter subsequent to the quarter in which the error occurred, with a consequent hiccup in the figures.
- (iii) Outstanding claim amounts not updated when settlements (or partial settlements) are entered.
- (iv) (A frequent one until very recently) Reinsurance recoveries not entered until a quarter subsequent to the quarter in which the incoming claims figures have been entered, with resultant extreme "bumpiness" in net figures.

### **3. ASSUMPTIONS MADE BY ACTUARIAL AND STATISTICAL METHODS**

#### **Regression models and confidence intervals**

- 3.1 The usual Least Squares Regression Model and linear models used for the purpose of estimation but not to produce confidence intervals make assumptions that do not include Normality of error distribution. i.e.
- (i) Constant Mean Response which is a function of parameters that are not time dependent.
  - (ii) Errors or deviations from the mean that are IID (Independent, Identically Distributed) random variables with constant variables.

These assumptions imply the absence of serial correlation. For certain classes of business there is known to be serial correlation e.g. earthquake activity, volcanic disturbances etc. For such phenomena a different type of model, Time Series, is more appropriate. Using such a model, confidence intervals might be appropriate for such risks. (Autoregression)

It is quite a questionable assumption to make that London Market risks are generally free of serial correlation. But the application of methodology currently is concentrating on using models that make the assumption of no serial correlation. In the paper "A Practical Guide to Measuring Reserve Variability Using Bootstrapping, Operational Time And a Distribution Free Approach" [1] all the methods described made the assumption of no serial correlation. The orientation of the paper was to insurance in general rather

than to the London Market. However, there is a tendency to assume that methodology well established in a general insurance context is applicable to the London Market without explicit recognition of the peculiarities of London Market data.

- 3.2 When confidence intervals are constructed using the least squares model, the further assumption is made:

(iii) Normality of errors.

Confidence intervals are then calculated using t-distribution tables. This assumption of Normality implies a symmetry in the distribution of errors. It could be argued that London Market business is inherently asymmetrical. The structure of risk layering also means that the impact of catastrophes on insurers is asymmetrical.

Given this asymmetry and the convenience of assuming Normality there is some interest in using a Log-Normal distribution. This distribution may indeed fit certain classes of losses quite well [2]. However, there are serious limitations in using Log-Normal distributions. Individual losses may follow a Log-Normal distribution but London Market data is usually an aggregate of numerous losses. The Log-Normal does not have the additive property of the Normal distribution. If the Central Limit Theorem applies, there is a tendency to Normality rather than to a Log-Normal distribution for the aggregates. Often an account has zeros and there is the question of adding a constant to avoid logs of zeros. For non-proportional reinsurance there is concern that the tail weight of the Log-Normal distribution is often inadequate to represent catastrophe risks. [2]

### 3.3 Conclusion

Consideration of the particular nature and diversity of London Market data suggests caution in calculating confidence intervals for use in reports where the presentation implies that the assumptions can be relied on to hold true. Where the nature of the business does change over time so as to give rise to larger losses i.e. there is progressive deterioration, the assumption of independence of errors with no serial correlation breaks down. Asymmetry is inherent in much of what relates to London Market business. But confidence intervals always take the form of a symmetrical statement. This is usually inappropriate in the London Market.

### REFERENCES

- [1]. A Practical Guide to Measuring Reserve Variability Using: Bootstrapping, Operational Time And a Distribution-Free Approach by Julian Lowe. 1994 General Insurance Convention pp 157-196. The Institute and Faculty of Actuaries.
  
- [2]. Statistical Aspects of Fire Insurance by Patrick Carroll. International Congress of Actuaries 1988 Volume R pp 557-569.

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