<u>**L.M.X.**</u>

<u>**Excess of Loss Reinsurance of**</u>
<u>**Lloyd's Syndicates and London Market Companies**</u>

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## Acknowledgements

## 1.1 Preamble

**The London Market** comprises Lloyd's Syndicates and London Market Companies (companies in London or London operations of large composites writing Lloyd's type business). These entities write a wide variety of business, both insurance and reinsurance, and cover all classes of business including such exotic business as professional indemnity and aggregate products liability. Because of the nature of the business it is a necessity to obtain protection covering single risk accumulations and pure catastrophe exposure by way of excess of loss reinsurance. Much of this excess of loss reinsurance is written by other Lloyd's Syndicates and London Market Companies. This effectively means that the reinsurance comes back into the London Market, and that reinsurance protection is required for this further tranche of business which again largely comes back into the London Market. This is what is known as the incestuous nature of the London Market and why it has its own peculiarities and why it therefore needs special consideration.

The aim of the LMX Working Party was to set down the nature of the London Market and the special considerations which apply to LMX business.

## 1.2 Reinsurance Programme/Definitions

The way an insurance company's reinsurance programme usually works is in the following order (briefly and simply):

a) facultative reinsurance of individual inwards policies

b) proportional and non-proportional cover of particular classes or sub-divisions of business

c) excess of loss coverage of all the company's casualty business on an individual loss basis (this is normally arranged in layers and may be referred to as the **Casualty Programme**).

d) excess of loss coverage of all the company's business on an each and every loss basis (referred to as the **Generals or Global Programme**). It is now standard for the Generals to have an absolute Casualty exclusion clause.

A typical London Market operation has a similar reinsurance programme to the above, with the following complications:

a) the layers of the Casualty Programme and Generals Programme are referred to by the writer of this business as LMX business.

b) LMX business written by the London Market operation will often not be protected by any of the sections of its reinsurance programme listed above. It will have an LMX reinsurance programme which will protect LMX business written (again arranged in layers and referred to as the **LMX Outwards Programme**).

There are therefore in effect 2 different levels of LMX business, as follows:

a) **LMX (excluding LMX on LMX)** comprising excess of loss reinsurances of Lloyd's Syndicates and London Market Companies but excluding coverage for their LMX writings.

b) **LMX on LMX** comprising excess of loss reinsurances of LMX business (either "LMX (excluding LMX on LMX)" or "LMX on LMX").

Table 1.1 shows the flow of insurance to the LMX market, in a greatly simplified form. Chapter 5 gives an actual example of a London Company's overall outwards reinsurance programme and its LMX outwards programme in some detail.

## 1.3 Peculiarities of LMX Business

### a) Co-reinsurance

Traditionally LMX contracts have been placed for 100% cover without co-reinsurance. This is really an historical accident. The argument for its retention is that most loss settlements of large losses in the London Market are market settlements and individual Syndicates very often do not control those settlements to any great extent, unless they are the leaders. However, because of the spiral effect of large losses on the market (which will be explained later) there has been a move to ensure some co-reinsurance and the current figure is normally 5%. I.e., a company will try to place 95% of each layer of its LMX Outwards Programme, although there will be occasions when this will not be possible, e.g. if market conditions are tight or the company is not happy with the security of potential reinsurers.

Note that we are using the term **co-reinsurance** (and also for conciseness **coinsurance**) in this Paper in a fairly loose way to mean the proportion of an outwards reinsurance contract retained by the reinsured company (although co-reinsurance is the term used by Kiln). It should probably more strictly be termed the **self-retention** of the reinsured.

### b) Non-adjustable Premiums

LMX contracts used to be placed for a stated monetary premium which was non-adjustable. This was based on the fact that for this type of account many factors affect exposure more than the size of the premium income, e.g. the volume of excess of loss reinsurance and its geographical distribution, the size of lines and aggregate exposures. In general premiums are now adjustable, the adjustment base normally being the catastrophe exposed premium income.

## c) **Hours Clause**

One of the major problems is the definition of one loss or one occurrence. In a major catastrophe, where the LMX reassured is himself writing a reinsurance account, he will have a number of claims each of which may have a 72-hours clause for hurricane and similar clauses for other catastrophic perils. Where a catastrophe is prolonged each of the reassured's clients may select different hour periods. The Outwards Programme could therefore contain a modification of its hours clause to the effect that:

"The reassured shall not be prejudiced from making a collection on the basis of 'one loss occurrence' for any one loss occurrence due to his reassureds selecting different hours periods for the same loss occurrence, provided that all such original contracts themselves contain hours clauses not exceeding those set out in the reinsurance agreement."

However, this problem is in fact usually overcome by omitting the hours clause entirely from the LMX wording.

## 1.4 **Premium Rating and Exposure**

Leaders of LMX business tend themselves to be London Underwriters and have a close understanding of the various exposures written generally in the market and specifically by individual Syndicates or Companies. LMX premiums are reviewed each year by these leaders who take into account all the factors in setting the new annual premiums for each excess of loss contract. Actual premium rating is considered more fully in chapter 2.

The leaders have questionnaires designed to draw out each reassured's exposures, both on individual risks and in the aggregate on the various classes of business written. Special consideration is given to:

a) Catastrophe and global reinsurance writings: size of individual lines written; whether on lower or higher layers; the aggregation of liability in specific areas e.g. USA (Gulf Coast), Australia; and of course premium income.

b) LMX writings.

c) Size and distribution of the reassured's third party writings; to reflect the exposure to a single major loss, with products liability and professional indemnity being of particular relevance; war, kidnap and ransome; aviation exposures, including products, grounding and personal accident; direct and treaty exposures to major perils such as earthquake, flood and hurricane.

The information required is considered more fully in chapter 6.

The writing of LMX business requires special skills, knowledge and nerve (an LMX underwriter's views are set out in chapter 7). The London Market place is one market and all its constituent members tend to write shares in the same business and on the same exposures, e.g. oil rigs. Thus the accumulation hazard on a book of LMX business can be very large indeed. All such covers tend to be directly additional to each other and the risk of a large proportion of them being involved in the same disaster are very high indeed.

A book of LMX business will have a high profitability level in loss free years and a high risk of a large accumulating loss in bad years. To be profitable in the long run the profits made in the good years must of course exceed the losses made in the bad years.

## 1.5 Natural Catastrophe "Tails"

A hurricane is supposedly a short-tail loss. However, when a loss is large enough the effect of the operations of the LMX market is to introduce a spiral effect and make it much longer tailed. E.g., Betsy settlements continued for some ten years after the event. We will be considering here the effect of these short-tail losses and in particular looking at the impact of Alicia on two major reinsurers:

a) a reinsurer of primary companies, with no retrocession business in its account

b) a leading underwriter in the LMX market

We will take as our base figure the underwriter's loss at 31st December, some four months after the event.

For company a) the loss had increased some 6 months later by about 20% and since then has not fluctuated by more than 2 or 3%. I.e. the total amount of loss had been established within 12 months and the bulk (about 82%) known after just 4 months.

The experience for b), the LMX writer, is completely different. His progression was as follows:

| Date | Loss |
|------|------|
| 31st Dec 83 | X |
| 31st Dec 84 | 10X |
| 31st Dec 85 | 24X |
| 31st Dec 86 | 37X |
| 30th Jun 87 | 40X |

Also the loss is not expected to stop there. With the Betsy example as a guide it might be 1993 before the loss is finalised.

A loss that was known at the time of occurrence and, for writers of direct catastrophe business, was evaluated very quickly is still invading higher layers of the LMX market. Writers of higher layers in 1983 are finding that policies which they thought were clean have become total losses. Alicia is unlike a casualty loss in that the occurrence was known at the time but like a casualty loss as the amount and timing of the payments are unknown. Perhaps therefore LMX should be known as "long short-tail" business.

Note that Alicia was a relatively small loss : much less than would be occasioned by an east coast hurricane or a west coast earthquake. What size of loss is required to trigger the LMX spiral? Since 1983 there have been very large increases in the retentions of US direct writers so that a loss in excess of $1.5bn would be required.

A simple model of the LMX market showing the spiral effect and the "tail" is given in chapter 4.

John Emney suggests one way in which the long-tail effect could be reduced, as follows. Once a loss has hit a company's second layer generals it should, at its first available renewal, state its aggregate liability on covers protecting wholly or partly XL-on-XL accounts. A predetermined percentage of that amount is added to its existing loss for generals and the resultant figure used to establish the loss reserve on that particular account on a PML (potential maximum loss) basis. Loss advices are then submitted to all layers affected by the estimated PML and no further advices issued until it is obvious whether the PML will be exceeded or is too high. An acceptable percentage might be between 67% and 80%, or 80% might be used for pure XL-on-XL cover and 50% for other cover. The aim is not to forecast the exact loss but to provide an indication of the likely amount at an early stage.

## 1.6 Insolvencies

The insolvency of any reinsurers on LMX business tends to reduce the impact of the spiral, since it acts in the same way as an increase in the retrocedant's retention.

Further, this can then lead to a type of domino effect whereby the retrocedant's own solvency becomes threatened. This again reduces the spiral.

## 1.7 Piper Alpha

In view of the fact that the Piper Alpha Oil Platform claim is a recent phenomenon we felt that an examination of it at this stage (5th August 1988) might give us some valuable insights. This well-publicised loss took place in early July 1988, only a week or so after the renewal date of the master oil-rig line-slip on which such business is normally placed. It is believed, however, that the insurance was fully in place by the date of the loss, and will impact heavily on the LMX market.

There are several interesting or unusual features regarding this loss and its likely impact on the LMX market:

a) It is probably the biggest single-site loss ever suffered by the insurance industry world-wide, with an estimated cost of $1.3bn., including property damage, consequential loss and liability to third parties.

b) It is the second consecutive major loss to be suffered in Europe, although LMX business is rated mainly on American exposures.

c) Including, as it does, very substantial amounts in relation to the property damage suffered by the rig, it might be thought that the cash flow implications would be much more severe in this case than in relation to losses from a hazard such as a hurricane where there is a much greater number of considerably smaller losses. There is, however, some alleviation to this situation, resulting from the facts that:

there are three different assureds concerned, and

that the policies in relation to two of these three are written on the basis that payment falls due only as the rig is repaired or work is done on a replacement.

Overall, this has resulted in a major payment of around $250m about a month after the accident, but subsequent payments are likely to be fairly well spread out over a period of months or even years.

d) Although the insurance coverage is believed to have been fully placed before the accident, there is clear evidence that some of the underwriters involved had not fully placed the reinsurance protections which they had intended to purchase in the LMX market. This is expected to have some impact in reducing the extent of the spiral which will inevitably result from this loss.

Much of the Piper Alpha loss will be contained within the Marine market, including the Marine LMX market. Marine LMX was considered by the LMX working party but was found to be no different in principle to Casualty and Property LMX. Apart from within this section it has therefore been ignored for the purposes of this Paper.

Table 1.1

# LMX Flow-Chart

```
          ┌─────────────────┐
          │                 │
          │    Insureds     │
          │                 │
          └────────┬────────┘
                   │
        Insurance  │
                   ▼
          ┌─────────────────┐
          │                 │
          │    Insurers     │
          │                 │
          └────────┬────────┘
                   │
      Reinsurance  │
                   ▼
          ┌─────────────────┐
          │    London       │
          │    Market       │
          │    Reinsurers   │
          └────────┬────────┘
                   │
   LMX (excl       │      ┌──────────┐
   LMX on LMX)     ▼      ▼          │
          ┌─────────────────┐       │
          │    LMX          │       │  LMX on LMX
          │    Market       │       │
          │                 │       │
          └────────┬────────┘       │
                   │                │
                   └────────────────┘
```

N.b. members of the LMX Market will also
be London Market Reinsurers
and sometimes Insurers as well!

The chart does not show
exits from the LMX market

## Chapter 2 : Rating

### 2.1 Actuarial View

The subject of Premium Rating for LMX business was introduced in chapter 1 and an LMX underwriter puts forward his views in chapter 7. As far as the Actuary is concerned, paucity of claims and a high level of vertical coverage leaves little scope for projection. Risks must be viewed in the context of many similar ones at different levels to assess the exposure to a variety of catastrophes. The Actuary is able to assist more in the background by analysing the total exposure and testing the effect of specified scenarios, both actual historic and hypothetical ones, rather than in foreground premium rating. Aggregating exposure by zone is also important (e.g. US Earthquake (California) and Hurricane (East Coast)) to estimate outwards reinsurance requirements as well as cash flow and capital strains.

The actual underwriting is based on supply and demand capacity interaction. LMX underwriters are generally experienced as they must have their fingers on the pulse of the market. It is important for them to have witnessed both hard and soft markets to help in their judgement of a changing market-place. The LMX underwriter will normally see, and accept, many more risks than, say, the medical malpractice underwriter, and base his decision on far less data and fewer calculations.

For risks at a high level with a low frequency, in general an occurrence affecting one LMX underwriter will also affect a large number of others thus increasing the chances of accumulation (ensuring that the the writer's own reinsurances will be called upon to pay claims causing the LMX spiral mentioned in other parts of this paper).

One concept that is much used in LMX is that when a layer is in "deficit" the writers of LMX business are expected to pay more than the rate which would otherwise be charged. This is called **payback**. E.g. for 1985 renewals (after Alicia and CAT24) underwriters looked to paybacks of three to five years to recover. The net effect of such payback terms being placed on a programme are that the overall costs of retrocessions become so high that with reinstatement terms, a realistic retention and administration costs, it becomes almost impossible to make a profit unless the inwards loss ratio is very low. Within the LMX market where the reinsured/retrocessionaire relationship is in effect an informal reciprocal one it is difficult to see who is paying back whom since payback rates charged to the reinsured are inevitably passed on in his pricing when he becomes a retrocessionaire. The pricing spiral moves upwards, diminishing profit potential.

The major drawbacks to rating on catastrophe premium income are firstly that this is not a good measure of exposure and secondly that the constituent parts of the premium income are unclear (some reflect exposure, some may be "payback", some reinstatement premiums). If aggregate exposure could be obtained (e.g., as a minimum, divided between "US Wind" and "non-US wind") rating would basically be assessing the probabilities and possible sizes of catastrophic events, at least for LMX (excluding LMX-on-LMX). For LMX-on-LMX the concept is less clear because of the large chance that once a claim gets into the LMX market it will go right through the layers of a programme (as per the suggestion on page 51 that rates-on-line for LMX-on-LMX should be much flatter).

There are three reasonably "actuarial" ways of looking at premium rating which are used in practice and are covered in some detail in sections 2.2 to 2.4.

Appendices 1 and 2 look respectively at the possible use of the Pareto distribution and at the theoretical approach to rate setting. It is not known whether either is used in practice for LMX rating. There would appear to be too many other factors to be taken into consideration, not least being the effects of the LMX cycle and problems with assessing amounts of and changes in exposure.

## 2.2 Reinstatement Premiums

One place where actuarial expertise is used is in calculating changes in premium rates for changes in the number of reinstatements (with or without additional premiums on reinstatement). (This can be considered as being similar to calculating the premium reduction for an inner aggregate deductible). The main aim here is to be reasonably consistent and the approach suggested is to:

a) Assume only total losses (although a more sophisticted approach could be adopted) and a Poisson distribution.

b) Work back from the originally quoted premium to get the pure premium by stripping out the presumed loadings.

c) Estimate the presumed Poisson parameters from the pure premium.

d) Calculate the pure premium with the revised terms using this Poisson distribution.

e) Add back in the loadings using consistent assumptions to those used in b) to obtain the new premium rates.

## 2.3 LMX Rating Schedules

This section describes a method used to set guide rates for LMX business based primarily on the rates applicable to the company's outwards reinsurance programmes. The assumption is made that the company's outwards Generals programme is similar to business it is offerred for LMX (excluding LMX on LMX) and that its outwards LMX/Retro programme is similar to inwards LMX on LMX business. The method is one actually used by a writer of LMX business, albeit 3 or 4 years ago so the rates will no longer be applicable although the principles will not have changed. The terms used are explained in 1.2 above.

### 2.3.1 LMX (excl LMX on LMX) / Generals

The company's outwards Generals programme has the following features:

a) It is arranged to give cover up to a reasonable percentage of aggregate cover (77.8% of USA East Coast Wind Aggregate, this being considered to be the event to which the company is most at risk).

b) Rates are expressed as R.O.L. (Rate on Line. or rate as a percentage of the limit for the layer).

c) Rates will be adjusted on Wind Cat Income, when known.

### LMX Outwards Programme

Estimated Wind Cat Income: $6.5M.
Estimated East Coast Wind Aggregate: $46.3M.

| Layer | Amounts $000's Limit | Excess | % of Cat Income Limit | Excess | % of Aggregate Limit | Excess | R.O.L. | Prem $000's |
|-------|------|--------|-------|--------|-------|--------|--------|------|
| 1 | 2000 | 3000 | 30.8% | 46.2% | 4.3% | 6.5% | 35.0% | 700 |
| 2 | 6000 | 5000 | 92.3% | 76.9% | 13.0% | 10.8% | 17.5% | 1050 |
| 3 | 7000 | 11000 | 107.7% | 169.2% | 15.1% | 23.8% | 10.0% | 700 |
| 4 | 8000 | 18000 | 123.1% | 276.9% | 17.3% | 38.9% | 7.0% | 560 |
| 5 | 10000 | 26000 | 153.8% | 400.0% | 21.6% | 56.2% | 5.0% | 500 |
| Total | | | | | | | | 3510 |

As stated above, inwards LMX (excluding LMX on LMX) business can be considered as similar to the above outwards Generals business. The inwards business is therefore assessed by considering rates on line for similar layers. A measure of exposure is required, the layers being considered in proportion either to Estimated Wind Cat Income or to Aggregate Exposure (depending on what information is supplied and other circumstances). For the company being considered guide rates have been produced of rates on line below which the company would not wish to quote:

**LMX (excl LMX on LMX) : R.O.L. Scale (Cat Income)**

| Limit as % of Cat Income | Limit Excess | R.O.L. From | To |
|---|---|---|---|
| 25% | 25% | Not interested | |
| 50% | 50% | 27.50% | 33.50% |
| 100% | 100% | 14.75% | 17.25% |
| 100% | 200% | 9.59% | 11.21% |
| 100% | 300% | 6.23% | 7.29% |
| 200% | 400% | 5.00% | |
| 200% | 600% | 5.00% | |

**LMX (excl LMX on LMX) : R.O.L. Scale (Aggregate)**

| Limit as % of Aggregate | Limit Excess | R.O.L. From | To |
|---|---|---|---|
| 5% | 5% | Not interested | |
| 10% | 10% | 19.00% | 22.50% |
| 10% | 20% | 12.35% | 14.63% |
| 10% | 30% | 8.03% | 9.51% |
| 20% | 40% | 5.00% | 7.00% |
| 20% | 60% | 5.00% | |

## 2.3.2 LMX on LMX / Retro Programme

The principles are the same as for 2.3.1 above.  Cover is arranged up to 69.7% of Aggregate.

### Generals Programme

Estimated Wind Cat Income: $5.95M
Estimated East Coast Wind Aggregate: $37.26M.

| Layer | Amounts $000's Limit | Excess | % of Cat Income Limit | Excess | % of Aggregate Limit | Excess | R.O.L. | Prem $000's |
|---|---|---|---|---|---|---|---|---|
| 1 | 2000 | 3000 | 33.6% | 50.4% | 5.4% | 8.0% | 45.0% | 900 |
| 2 | 3500 | 5000 | 58.8% | 84.0% | 9.4% | 13.4% | 30.0% | 1050 |
| 3 | 3500 | 8500 | 58.8% | 142.9% | 9.4% | 22.8% | 22.9% | 800 |
| 4 | 4000 | 12000 | 67.2% | 201.7% | 10.7% | 32.2% | 15.6% | 625 |
| 5 | 5000 | 16000 | 84.0% | 268.9% | 13.4% | 42.9% | 11.0% | 550 |
| 6 | 5000 | 21000 | 84.0% | 352.9% | 13.4% | 56.3% | 8.0% | 400 |
| Total | | | | | | | | 4325 |

### LMX on LMX : R.O.L. Scale (Cat Income)

| Limit as % of Cat Income Limit | Excess | R.O.L. From | To |
|---|---|---|---|
| 25% | 25% | Not interested | |
| 50% | 50% | 37.00% | 43.00% |
| 100% | 100% | 19.85% | 23.05% |
| 100% | 200% | 12.90% | 15.00% |
| 100% | 300% | 8.40% | 9.75% |
| 200% | 400% | 8.00% | |
| 200% | 600% | 8.00% | |

### LMX on LMX : R.O.L. Scale (Aggregate)

| Limit as % of Aggregate Limit | Excess | R.O.L. From | To |
|---|---|---|---|
| 5% | 5% | Not interested | |
| 10% | 10% | 34.00% | 40.00% |
| 10% | 20% | 22.10% | 26.00% |
| 10% | 30% | 14.37% | 16.90% |
| 20% | 40% | 8.00% | 9.06% |
| 20% | 60% | 8.00% | |

## 2.3.3 Observations

The scales are shown on the graphs 2.1 and 2.2. The dotted line represents the rates charged for outwards business and the continuous line the guide rates for inwards business. If the continuous line is below the dotted line then if the guide rates are not exceeded the company is paying more for its retrocession programme than it is being paid for the business it writes.

## 2.4 Layer Consistency

This section does not set out to determine the level of rates which should be charged. Instead it looks at the relativities between layers. As intimated in 2.1 above the way layers are rated are as a rate on line or ROL. This happens to be an ideal measure for fitting a curve to. For a narrow layer the pure ROL is equivalent to the expected number of claims to the layer.

The following is a practical example. The table below shows the rates actually charged for one company's Generals Programme. The curve fitted to it was of shifted Pareto format reducing to the following for the ROL for the layer from a to b:

$$R(a,b) = 4.0835 * ((b-1.305)^{.211})-(a-1.305)^{.211})/(b-a)$$

The fitted values are shown and the fit is remarkably good showing that the rates charged for the different layers appear to be consistent and therefore there is no reason why writers of the layers should prefer one layer to another on the grounds of price (unless the slope of the curve is incorrect, which Steve Edwards suggests might be the case, particularly for LMX on LMX – see chapter 7).

| Layer | ROL % Actual | Fitted | Premium – $m Actual | Fitted |
|---|---|---|---|---|
| 2m x 3m | 40.82 | 40.79 | 0.816 | 0.816 |
| 6m x 5m | 20.21 | 20.24 | 1.213 | 1.215 |
| 7m x 11m | 11.47 | 11.45 | 0.803 | 0.801 |
| 8m x 18m | 8.00 | 7.96 | 0.640 | 0.637 |
| 10m x 26m | 5.95 | 5.97 | 0.595 | 0.597 |

Graph 2.3 shows the actual and fitted ROL lines.

# LMX (excl LMX on LMX) RATING SCALE

Graph 2.1

## CAT INCOME EXPOSURE



## AGGREGATE EXPOSURE



········ Generals excl LMX      ——— LMX excl LMX/LMX

# LMX ON LMX RATING SCALE

Graph 2.2



CAT INCOME EXPOSURE

AGGREGATE EXPOSURE

........ LMX/Retro Program          ——— LMX on LMX

# GENERALS
## RATE ON LINE

Graph 2.3



----- Fitted　　　　——— Actual

## Chapter 3 : Development

The following triangulations are of an LMX property account (with a single scaling factor applied to all the claim data). They illustrate a number of points with major implications for any attempt to reserve the account by statistical methods:

a) Very high amounts of outward reinsurance.

b) A major change in outward reinsurance between 1981 and 1982.

c) 1983 results dominated by Hurricane Alicia with gross reported claims still increasing, net reported claims capped by outwards non-proportional reinsurance and reinstatement premiums causing a longer tailed development of gross closed premiums than in other years.

d) Long tailed development of reported claims in non-catastrophe years arising from "incidental casualty" cover within property treaties. 1986 and 1987 should have a very different development as they have an absolute casualty exclusion.

The figures represent the sort of features that can be found in an LMX account. There is no implication that this account is typical, nor indeed whether there is such a thing as a typical LMX account. .

Exhibit 3.1                                                        19.

## Closed Premiums - Gross

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 317 | 399 | 421 | 455 | 474 | 477 | 478 | 482 | 483 | 486 |
| 79 | 325 | 377 | 391 | 422 | 430 | 438 | 450 | 456 | 455 | |
| 80 | 315 | 368 | 394 | 411 | 413 | 421 | 423 | 437 | | |
| 81 | 351 | 421 | 454 | 461 | 462 | 464 | 465 | | | |
| 82 | 384 | 467 | 477 | 494 | 502 | 508 | | | | |
| 83 | 417 | 540 | 637 | 683 | 706 | | | | | |
| 84 | 520 | 606 | 641 | 651 | | | | | | |
| 85 | 780 | 887 | 934 | | | | | | | |
| 86 | 781 | 839 | | | | | | | | |
| 87 | 395 | | | | | | | | | |

## Paid Claims - Gross

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 13 | 39 | 77 | 92 | 113 | 126 | 136 | 153 | 171 | 184 |
| 79 | 2 | 44 | 187 | 265 | 333 | 373 | 410 | 445 | 482 | |
| 80 | 26 | 79 | 179 | 242 | 308 | 371 | 433 | 487 | | |
| 81 | 8 | 47 | 94 | 133 | 168 | 225 | 267 | | | |
| 82 | 18 | 92 | 223 | 345 | 450 | 533 | | | | |
| 83 | 48 | 566 | 1618 | 2446 | 3021 | | | | | |
| 84 | 22 | 72 | 112 | 141 | | | | | | |
| 85 | 4 | 30 | 100 | | | | | | | |
| 86 | 1 | 27 | | | | | | | | |
| 87 | 6 | | | | | | | | | |

## Reported Claims - Gross

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 13 | 62 | 113 | 137 | 154 | 169 | 188 | 217 | 223 | 232 |
| 79 | 201 | 237 | 366 | 425 | 471 | 502 | 541 | 567 | 579 | |
| 80 | 39 | 154 | 256 | 338 | 418 | 506 | 567 | 607 | | |
| 81 | 11 | 97 | 163 | 235 | 277 | 314 | 340 | | | |
| 82 | 43 | 231 | 405 | 553 | 661 | 704 | | | | |
| 83 | 192 | 1299 | 2517 | 3225 | 3750 | | | | | |
| 84 | 56 | 150 | 225 | 269 | | | | | | |
| 85 | 14 | 138 | 201 | | | | | | | |
| 86 | 7 | 36 | | | | | | | | |
| 87 | 17 | | | | | | | | | |

## Reported Loss Ratios - Gross

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 4% | 16% | 27% | 30% | 32% | 35% | 39% | 45% | 46% | 48% |
| 79 | 62% | 63% | 94% | 101% | 110% | 115% | 120% | 124% | 127% | |
| 80 | 12% | 42% | 65% | 82% | 101% | 120% | 134% | 139% | | |
| 81 | 3% | 23% | 36% | 51% | 60% | 68% | 73% | | | |
| 82 | 11% | 49% | 85% | 112% | 132% | 139% | | | | |
| 83 | 46% | 241% | 395% | 472% | 531% | | | | | |
| 84 | 11% | 25% | 35% | 41% | | | | | | |
| 85 | 2% | 16% | 22% | | | | | | | |
| 86 | 1% | 4% | | | | | | | | |
| 87 | 4% | | | | | | | | | |

Exhibit 3.2                                                                  20.

## Closed Premiums - Net

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 44 | 18 | 5 | 11 | 15 | 15 | 11 | 38 | 36 | 32 |
| 79 | 50 | 25 | 16 | 25 | 26 | 27 | 48 | 48 | 44 | |
| 80 | 43 | 24 | 32 | 51 | 50 | 57 | 58 | 60 | | |
| 81 | 45 | 51 | 47 | 48 | 48 | 49 | 47 | | | |
| 82 | 133 | 133 | 122 | 118 | 115 | 116 | | | | |
| 83 | 162 | 146 | 158 | 168 | 177 | | | | | |
| 84 | 206 | 120 | 85 | 84 | | | | | | |
| 85 | 330 | 220 | 227 | | | | | | | |
| 86 | 387 | 372 | | | | | | | | |
| 87 | 395 | | | | | | | | | |

## Paid Claims - Net

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 4 | 13 | 25 | 29 | 34 | 39 | 41 | 43 | 50 | 47 |
| 79 | 1 | 19 | 47 | 41 | 59 | 66 | 72 | 76 | 79 | |
| 80 | 8 | 28 | 41 | 49 | 64 | 76 | 81 | 79 | | |
| 81 | 3 | 16 | 31 | 45 | 55 | 66 | 76 | | | |
| 82 | 8 | 57 | 121 | 177 | 208 | 231 | | | | |
| 83 | 6 | 72 | 156 | 162 | 191 | | | | | |
| 84 | 15 | 48 | 73 | 85 | | | | | | |
| 85 | 3 | 26 | 83 | | | | | | | |
| 86 | 1 | 27 | | | | | | | | |
| 87 | 6 | | | | | | | | | |

## Reported Claims - Net

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 4 | 22 | 37 | 46 | 48 | 53 | 56 | 53 | 52 | 51 |
| 79 | 6 | 95 | 116 | 88 | 100 | 104 | 81 | 79 | 76 | |
| 80 | 16 | 54 | 61 | 78 | 93 | 93 | 94 | 88 | | |
| 81 | 5 | 35 | 60 | 86 | 70 | 77 | 84 | | | |
| 82 | 25 | 149 | 245 | 187 | 239 | 245 | | | | |
| 83 | 51 | 281 | 225 | 236 | 255 | | | | | |
| 84 | 38 | 85 | 124 | 130 | | | | | | |
| 85 | 11 | 106 | 140 | | | | | | | |
| 86 | 7 | 36 | | | | | | | | |
| 87 | 17 | | | | | | | | | |

## Reported Loss Ratios - Net

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 9% | 122% | 740% | 418% | 320% | 353% | 509% | 139% | 144% | 159% |
| 79 | 12% | 380% | 725% | 352% | 385% | 385% | 169% | 165% | 173% | |
| 80 | 37% | 225% | 191% | 153% | 186% | 163% | 162% | 147% | | |
| 81 | 11% | 69% | 128% | 179% | 146% | 157% | 179% | | | |
| 82 | 19% | 112% | 201% | 158% | 208% | 211% | | | | |
| 83 | 31% | 192% | 142% | 140% | 144% | | | | | |
| 84 | 18% | 71% | 146% | 155% | | | | | | |
| 85 | 3% | 48% | 62% | | | | | | | |
| 86 | 2% | 10% | | | | | | | | |
| 87 | 4% | | | | | | | | | |

Exhibit 3.3                                                                     21.

## Closed Premiums - Retro

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 273 | 381 | 416 | 444 | 459 | 462 | 467 | 444 | 447 | 454 |
| 79 | 275 | 352 | 375 | 397 | 404 | 411 | 402 | 408 | 411 | |
| 80 | 272 | 344 | 362 | 360 | 363 | 364 | 365 | 377 | | |
| 81 | 306 | 370 | 407 | 413 | 414 | 415 | 418 | | | |
| 82 | 251 | 334 | 355 | 376 | 387 | 392 | | | | |
| 83 | 255 | 394 | 479 | 515 | 529 | | | | | |
| 84 | 314 | 486 | 556 | 567 | | | | | | |
| 85 | 450 | 667 | 707 | | | | | | | |
| 86 | 394 | 467 | | | | | | | | |
| 87 | 0 | | | | | | | | | |

## Paid Claims - Retro

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 9 | 26 | 52 | 63 | 79 | 87 | 95 | 110 | 121 | 137 |
| 79 | 1 | 25 | 140 | 224 | 274 | 307 | 338 | 369 | 403 | |
| 80 | 18 | 51 | 138 | 193 | 244 | 295 | 352 | 408 | | |
| 81 | 5 | 31 | 63 | 88 | 113 | 159 | 191 | | | |
| 82 | 10 | 35 | 102 | 168 | 242 | 302 | | | | |
| 83 | 42 | 494 | 1462 | 2284 | 2830 | | | | | |
| 84 | 7 | 24 | 39 | 56 | | | | | | |
| 85 | 1 | 4 | 17 | | | | | | | |
| 86 | 0 | 0 | | | | | | | | |
| 87 | 0 | | | | | | | | | |

## Reported Claims - Retro

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 9 | 40 | 76 | 91 | 106 | 116 | 132 | 164 | 171 | 181 |
| 79 | 195 | 142 | 250 | 337 | 371 | 398 | 460 | 488 | 503 | |
| 80 | 23 | 100 | 195 | 260 | 325 | 413 | 473 | 519 | | |
| 81 | 6 | 62 | 103 | 149 | 207 | 237 | 256 | | | |
| 82 | 18 | 82 | 160 | 366 | 422 | 459 | | | | |
| 83 | 141 | 1018 | 2292 | 2989 | 3495 | | | | | |
| 84 | 18 | 65 | 101 | 139 | | | | | | |
| 85 | 3 | 32 | 61 | | | | | | | |
| 86 | 0 | 0 | | | | | | | | |
| 87 | 0 | | | | | | | | | |

## Reported Loss Ratios - Retro

| Uw Yr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 3% | 10% | 18% | 20% | 23% | 25% | 28% | 37% | 38% | 40% |
| 79 | 71% | 40% | 67% | 85% | 92% | 97% | 114% | 120% | 122% | |
| 80 | 8% | 29% | 54% | 72% | 90% | 113% | 130% | 138% | | |
| 81 | 2% | 17% | 25% | 36% | 50% | 57% | 61% | | | |
| 82 | 7% | 25% | 45% | 97% | 109% | 117% | | | | |
| 83 | 55% | 258% | 478% | 580% | 661% | | | | | |
| 84 | 6% | 13% | 18% | 25% | | | | | | |
| 85 | 1% | 5% | 9% | | | | | | | |
| 86 | 0% | 0% | | | | | | | | |
| 87 | | | | | | | | | | |

## 4.1 __Assumptions__

This chapter sets out a simple example of an LMX market model. The following assumptions are made:

Each writer of LMX-on-LMX business is similar in that each writes similar business and has a similar outwards reinsurance programme with roughly the same ratio of top-of-programme to bottom-of-programme (i.e. the limit of the top layer to the deductible of the bottom layer) and programmes related to business written. It is assumed that the proportion retained of each layer is the same (often 5%) and that the proportion of the business reinsured which leaves the market is the same for each layer, so that the whole outwards programme can be considered as one entity.

## 4.2 __Parameters__

The following table defines the parameters for the simple model and gives the initial values assumed:

For a representive LMX-on-LMX writer:

| Deductible: bottom of programme | D | 200 |
|---|---|---|
| Layer or Limit: size of programme | L | 9800 |
| Upper Limit: D+L : top of programme | U | 10000 |
| Size of Programme/ Upper Limit: L/U | y | 0.9800 |

| Proportion of programme placed (i.e. incoming reinsurance reinsured out) | s | 0.9500 |
|---|---|---|
| Proportion of LMX remaining in LMX market | p | 0.9500 |
| Retention factor : p.s | z | 0.9025 |

| Actual Claim Amount Into LMX-on-LMX market | A | |
|---|---|---|
| Claim Amount less Deductible: A-D | X | |

One particular Lloyd's LMX Syndicate has co-reinsurance of 4.7%, 0.8% of the placed programme goes out of the London market, and the programme covers claims from $80,000 to $52,000,000 (i.e. s = .953, p = .992, y = .9985)

## 4.3 __The Model__

The model assumes that the spiral is purely a phenomenon of the LMX-on-LMX market. "A - The Actual Claim Amount Into LMX-on-LMX market" in the above table is assumed to be the total claim amount figure reported to the office from its reinsurers' generals programmes and should be known in a relatively short period of time. From then on it is assumed that the gross claim amount is only increased by the spiral effect of reinsurance back to the office·from other similar writers. (In practice the total amount into the market will not all be known before the spiral starts but this only affects the timing by introducing further delays, not the actual amounts).

Exhibit 4.0 shows the way in which the gross claim increases and the conditions which need to apply for the gross claim to go through the top of the programme. These are that:

$$X > L(1-z).$$

which is the same as:

$$A > U(1-s.p.y)$$

I have defined the "multiplier", m, as the final gross claim divided by A, the claim amount into the market. This is a maximum when the claim is such that the gross claim amount just reaches the upper limit of the programme, i.e. when $X = L(1-z)$. I.e. the spiral has its greatest effect when the claim is equal to this amount. The value of the multiplier at this point is:

$$m = 1/(1-s.p.y).$$

Also, the time taken, n periods (which could in practice equate to quarters) for the gross claim in to reach a proportion, k, of the ultimate amount in this case is given by:

$$k = 1-y.z^{n+1}$$

Thus in the above example the multiplier is greatest when:

$$X = 9800 * (1 - .9025) = 955.5$$
$$A = 200 + 955.5 = 1155.5$$
$$m = 1 / (1 - .9025 * .98) = 8.654$$
$$k = 28.005$$

## 4.4 Observations

Numerous relations could be investigated using this simple model. Just a few of these have been covered for this Paper, as follows:

Exhibits 4.1 to 4.4 show the progress of cumulative claims for various inward claim sizes (210, 500, 1155.5 and 1500 respectively). 4.3 is the exhibit for the claim having the greatest spiral effect and shows that in this case it will take 28 quarters for the gross claim in to exceed 95% of ultimate (with a multiplier of 8.654, as above). Exhibit 4.2 shows that the spiral is not reduced by much when the claim size is more than halved (again 28 quarters to reach 95%) and 4.1 shows that even where the claim is not much more than the programme deductible the spiral is still apparent (17 quarters to reach 95%). However, once the claim is large enough to exhaust the programme the spiral reduces considerably with a claim of 1500 taking just 12 quarters to reach 95% of ultimate and 1 more quarter to reach ultimate.

Graphs 4.1 and 4.2 give respectively the multiplier and number of quarters for the gross claim to reach 95% of ultimate, by claim into the LMX market.

Graphs 4.3 and 4.4 look at the company's net retained position. They compare what the company would have retained if there were no chance of claims circulating (i.e. the 1st estimate

or net retained at time 0) with his ultimate net retained claim amount. Note that for most other classes of business these two amounts would be exactly equal. It can be seen that the ultimate retained figure rises very steeply initially compared with the original retained amount.

Graphs 4.5 to 4.7 show for various levels of percentages of the placed programme retained in the London market, (but keeping the placed percentage as 95% and the programme as 9800 xs 200) for the claim size which just exhausts the programme:

a) Graph 4.5: the multiplier i.e. the ultimate gross claim in divided by the original claim amount into the market

b) Graph 4.6: the number of quarters before the cumulative gross claim amount exceeds 95% and 99% of the ultimate amount.

c) Graph 4.7: the original claim amount into the LMX on LMX market which will just exhaust the programme.

Graphs 4.5 and 4.6 show how the spiral increases dramatically as the percentage placed increases. Graph 4.7 is of course a straight line from U or 10000 when p=0 to U-.95*L or 690 when p=1.

Graphs 4.8 and 4.9 show the effect on the time to reach 95% of ultimate (length of the spiral) of varying the retention factor, z, and the programme size/upper limit factor, y, respectively. The conclusion is that the retention factor has a much greater effect on the length of the spiral than the programme size/ upper limit factor.

## 4.5 Conclusions

a) The length of the spiral is increased as both the percentage placed in the market and the percentage of this placement retained in the London market are increased, the size of the programme as a percentage of the limit not having such a great effect.

b) The multiplying effect of the LMX spiral is increased and the size of claim which will cause an LMX on LMX programme to be exhausted is reduced as the percentage placed in the market, the percentage of this placement retained in the London market, and the size of the programme as a percentage of the upper limit of the programme are increased.

c) With the current high values in the market for the 3 parameters (s,p and y), the final net retained figure is liable to be considerably in excess of the amount going into the LMX-on-LMX market.

d) With the high expectation that programmes will be exhausted for a claim which is not immense, those writers of LMX-on-LMX business with the highest upper limits to their outwards programmes (relative to exposure) are in the best position.

|  | Gross In | Retained Pre Coinsurance | Reinsured Pre Coinsurance | Reinsured Post Coinsurance | Retained Post Coinsurance | Reinsured Out of Market | Reinsured Back Into Market |
|---|---|---|---|---|---|---|---|
| **As long as Gross In < U:** | | | | | | | |
| 0 | A | D | X | Xs | D+X(1-s) | Xs(1-p) | Xz |
| 1 | A+Xz | D | X(1+z) | X(1+z)s | D+X(1+z)(1-s) | X(1+z)s(1-p) | X(1+z)z |
| 2 | A+Xz(1+z) | D | X(1+z+z^2) | X(1+z+z^2)s | D+X(1+z+z^2)(1-s) | X(1+z+z^2)s(1-p) | X(1+z+z^2)z |
| n | A+Xz(1+z+..+z^(n-1)) | D | X(1+z+..+z^n) | X(1+z+..+z^n)s | D+X(1+z+..+z^n)(1-s) | X(1+z+..+z^n)s(1-p) | X(1+z+..+z^n)z |

I.e. if z<>1:  A+X(1-z^n)z/(1-z)
 or if z=1:  A+Xn

Therefore the claim always goes through the top of the programme if z=1 (i.e. if s=1 and p=1 ; no coinsurance, no exits from the market). In this case the limit is reached when n>L/U. If when n first exceeds L/U, let Gross In = U + K:

|  | Gross In | Retained Pre Coinsurance | Reinsured Pre Coinsurance | Reinsured Post Coinsurance | Retained Post Coinsurance | Reinsured Out of Market | Reinsured Back Into Market |
|---|---|---|---|---|---|---|---|
| n | U+K | D+K | L | L | D+K | 0 | L |
| n+1 | L+A | A | L | L | A | 0 | L |

If z<>0, i.e. there is either coinsurance or there are exits from the market, then the claim goes through the top of the layer if:
   Gross In eventually exceeds the Programme Size, which is true if:
       A + Xz/(1-z) > U,       which reduces to:  X > L(1-z)
   In this case there is some n such that:
       A+X(1-z^n)z/(1-z) > U
   For the n for which this formula first applies, again let Gross In = U + K, and:

|  | Gross In | Retained Pre Coinsurance | Reinsured Pre Coinsurance | Reinsured Post Coinsurance | Retained Post Coinsurance | Reinsured Out of Market | Reinsured Back Into Market |
|---|---|---|---|---|---|---|---|
| n | U+K | D+K | L | Ls | D+L(1-s)+K | Ls(1-p) | Lz |
| n+1 | A+Lz | A-L(1-z) | L | Ls | A-Ls(1-p) | Ls(1-p) | Lz |

For the claim to stay in the programme and not to go out through the top:
       X < L(1-z)

| Limit | A+Xz/(1-z) | D | X/(1-z) | Xs/(1-z) | D+X(1-s)/(1-z) | Xs(1-p)/(1-z) | Xz/(1-z) |

Deductible: bottom of programme                    D         200
Layer/Limit: size of programme                     L        9800
Upper Limit: D+L : top of programme                U       10000
Proportion of programme placed                     s     0.95000
Proportion of LMX remaining in market              p     0.95000
Retention factor : p.s                             z     0.90250
Actual Claim Amount into Market                    A         210
Claim amount less deductible: A-D                  X          10
Multiplier                                         m       1.441

| n | Gross In | Final Net Retained | Reinsured Out of Mkt | Reinsured Back to Mkt | Gross In % of Ult |
|---|---|---|---|---|---|
| 0 | 210 | 201 | 0 | 9 | 69.4% |
| 1 | 219 | 201 | 1 | 17 | 72.4% |
| 2 | 227 | 201 | 1 | 25 | 75.1% |
| 3 | 235 | 202 | 2 | 31 | 77.5% |
| 4 | 241 | 202 | 2 | 37 | 79.7% |
| 5 | 247 | 202 | 2 | 43 | 81.7% |
| 6 | 253 | 203 | 2 | 47 | 83.5% |
| 7 | 257 | 203 | 3 | 52 | 85.1% |
| 8 | 262 | 203 | 3 | 56 | 86.5% |
| 9 | 266 | 203 | 3 | 59 | 87.8% |
| 10 | 269 | 203 | 3 | 63 | 89.0% |
| 11 | 273 | 204 | 3 | 66 | 90.1% |
| 12 | 276 | 204 | 4 | 68 | 91.1% |
| 13 | 278 | 204 | 4 | 71 | 91.9% |
| 14 | 281 | 204 | 4 | 73 | 92.7% |
| 15 | 283 | 204 | 4 | 75 | 93.4% |
| 16 | 285 | 204 | 4 | 76 | 94.1% |
| 17 | 286 | 204 | 4 | 78 | 94.7% |
| 18 | 288 | 204 | 4 | 79 | 95.2% |
| 19 | 289 | 204 | 4 | 81 | 95.6% |
| 20 | 291 | 205 | 4 | 82 | 96.1% |
| 21 | 292 | 205 | 4 | 83 | 96.5% |
| 22 | 293 | 205 | 4 | 84 | 96.8% |
| 23 | 294 | 205 | 4 | 85 | 97.1% |
| 24 | 295 | 205 | 4 | 85 | 97.4% |
| 25 | 295 | 205 | 5 | 86 | 97.6% |
| 26 | 296 | 205 | 5 | 87 | 97.9% |
| 27 | 297 | 205 | 5 | 87 | 98.1% |
| 28 | 297 | 205 | 5 | 88 | 98.3% |
| 29 | 298 | 205 | 5 | 88 | 98.4% |
| 30 | 298 | 205 | 5 | 89 | 98.6% |
| 31 | 299 | 205 | 5 | 89 | 98.7% |
| 32 | 299 | 205 | 5 | 89 | 98.9% |
| 33 | 299 | 205 | 5 | 90 | 99.0% |
| 34 | 300 | 205 | 5 | 90 | 99.1% |
| 35 | 300 | 205 | 5 | 90 | 99.2% |
| 36 | 300 | 205 | 5 | 90 | 99.2% |
| 37 | 300 | 205 | 5 | 91 | 99.3% |
| 38 | 301 | 205 | 5 | 91 | 99.4% |
| 39 | 301 | 205 | 5 | 91 | 99.4% |
| 40 | 301 | 205 | 5 | 91 | 99.5% |
| Ult | 303 | 205 | 5 | 93 | 100.0% |

| | | | | |
|---|---|---|---|---|
| Deductible: bottom of programme | | D | 200 | |
| Layer/Limit: size of programme | | L | 9800 | |
| Upper Limit: D+L : top of programme | | U | 10000 | |
| Proportion of programme placed | | s | 0.95000 | |
| Proportion of LMX remaining in market | | p | 0.95000 | |
| Retention factor : p.s | | z | 0.90250 | |
| Actual Claim Amount into Market | | A | 500 | |
| Claim amount less deductible: A-D | | X | 300 | |
| Multiplier | | m | 6.554 | |

| n | Gross In | Final Net Retained | Reinsured Out of Mkt | Reinsured Back to Mkt | Gross In % of Ult |
|---|---|---|---|---|---|
| 0 | 500 | 215 | 14 | 271 | 15.3% |
| 1 | 771 | 229 | 27 | 515 | 23.5% |
| 2 | 1015 | 241 | 39 | 736 | 31.0% |
| 3 | 1236 | 252 | 49 | 935 | 37.7% |
| 4 | 1435 | 262 | 59 | 1114 | 43.8% |
| 5 | 1614 | 271 | 67 | 1276 | 49.3% |
| 6 | 1776 | 279 | 75 | 1423 | 54.2% |
| 7 | 1923 | 286 | 82 | 1555 | 58.7% |
| 8 | 2055 | 293 | 88 | 1674 | 62.7% |
| 9 | 2174 | 299 | 94 | 1781 | 66.3% |
| 10 | 2281 | 304 | 99 | 1878 | 69.6% |
| 11 | 2378 | 309 | 103 | 1966 | 72.6% |
| 12 | 2466 | 313 | 108 | 2045 | 75.3% |
| 13 | 2545 | 317 | 111 | 2116 | 77.7% |
| 14 | 2616 | 321 | 115 | 2181 | 79.8% |
| 15 | 2681 | 324 | 118 | 2239 | 81.8% |
| 16 | 2739 | 327 | 121 | 2291 | 83.6% |
| 17 | 2791 | 330 | 123 | 2339 | 85.2% |
| 18 | 2839 | 332 | 125 | 2382 | 86.6% |
| 19 | 2882 | 334 | 127 | 2420 | 87.9% |
| 20 | 2920 | 336 | 129 | 2455 | 89.1% |
| 21 | 2955 | 338 | 131 | 2486 | 90.2% |
| 22 | 2986 | 339 | 132 | 2515 | 91.1% |
| 23 | 3015 | 341 | 134 | 2540 | 92.0% |
| 24 | 3040 | 342 | 135 | 2563 | 92.8% |
| 25 | 3063 | 343 | 136 | 2584 | 93.5% |
| 26 | 3084 | 344 | 137 | 2603 | 94.1% |
| 27 | 3103 | 345 | 138 | 2620 | 94.7% |
| 28 | 3120 | 346 | 139 | 2635 | 95.2% |
| 29 | 3135 | 347 | 139 | 2649 | 95.7% |
| 30 | 3149 | 347 | 140 | 2661 | 96.1% |
| 31 | 3161 | 348 | 141 | 2673 | 96.5% |
| 32 | 3173 | 349 | 141 | 2683 | 96.8% |
| 33 | 3183 | 349 | 142 | 2692 | 97.1% |
| 34 | 3192 | 350 | 142 | 2700 | 97.4% |
| 35 | 3200 | 350 | 143 | 2708 | 97.7% |
| 36 | 3208 | 350 | 143 | 2715 | 97.9% |
| 37 | 3215 | 351 | 143 | 2721 | 98.1% |
| 38 | 3221 | 351 | 143 | 2726 | 98.3% |
| 39 | 3226 | 351 | 144 | 2731 | 98.4% |
| 40 | 3231 | 352 | 144 | 2736 | 98.6% |
| Ult | 3277 | 354 | 146 | 2777 | 100.0% |

| | | | |
|---|---|---|---|
| Deductible: bottom of programme | D | 200 |
| Layer/Limit: size of programme | L | 9800 |
| Upper Limit: D+L : top of programme | U | 10000 |
| Proportion of programme placed | s | 0.95000 |
| Proportion of LMX remaining in market | p | 0.95000 |
| Retention factor : p.s | z | 0.90250 |
| Actual Claim Amount into Market | A | 1155.5 |
| Claim amount less deductible: A-D | X | 955.5 |
| Multiplier | m | 8.654 |

| n | Gross In | Final Net Retained | Reinsured Out of Mkt | Reinsured Back to Mkt | Gross In % of Ult |
|---|---|---|---|---|---|
| 0 | 1156 | 248 | 45 | 862 | 11.6% |
| 1 | 2018 | 291 | 86 | 1641 | 20.2% |
| 2 | 2796 | 330 | 123 | 2343 | 28.0% |
| 3 | 3498 | 365 | 157 | 2977 | 35.0% |
| 4 | 4132 | 397 | 187 | 3549 | 41.3% |
| 5 | 4704 | 425 | 214 | 4065 | 47.0% |
| 6 | 5221 | 451 | 238 | 4531 | 52.2% |
| 7 | 5687 | 474 | 261 | 4952 | 56.9% |
| 8 | 6107 | 495 | 281 | 5331 | 61.1% |
| 9 | 6487 | 514 | 299 | 5674 | 64.9% |
| 10 | 6829 | 531 | 315 | 5983 | 68.3% |
| 11 | 7139 | 547 | 330 | 6262 | 71.4% |
| 12 | 7418 | 561 | 343 | 6514 | 74.2% |
| 13 | 7669 | 573 | 355 | 6741 | 76.7% |
| 14 | 7897 | 585 | 366 | 6946 | 79.0% |
| 15 | 8102 | 595 | 375 | 7131 | 81.0% |
| 16 | 8287 | 604 | 384 | 7298 | 82.9% |
| 17 | 8454 | 613 | 392 | 7449 | 84.5% |
| 18 | 8605 | 620 | 399 | 7585 | 86.0% |
| 19 | 8741 | 627 | 406 | 7708 | 87.4% |
| 20 | 8863 | 633 | 412 | 7819 | 88.6% |
| 21 | 8974 | 639 | 417 | 7919 | 89.7% |
| 22 | 9074 | 644 | 422 | 8009 | 90.7% |
| 23 | 9164 | 648 | 426 | 8090 | 91.6% |
| 24 | 9246 | 652 | 430 | 8164 | 92.5% |
| 25 | 9319 | 656 | 433 | 8230 | 93.2% |
| 26 | 9386 | 659 | 436 | 8290 | 93.9% |
| 27 | 9446 | 662 | 439 | 8344 | 94.5% |
| 28 | 9500 | 665 | 442 | 8393 | 95.0% |
| 29 | 9549 | 667 | 444 | 8437 | 95.5% |
| 30 | 9593 | 670 | 446 | 8477 | 95.9% |
| 31 | 9632 | 672 | 448 | 8513 | 96.3% |
| 32 | 9668 | 673 | 450 | 8545 | 96.7% |
| 33 | 9700 | 675 | 451 | 8574 | 97.0% |
| 34 | 9730 | 676 | 453 | 8601 | 97.3% |
| 35 | 9756 | 678 | 454 | 8624 | 97.6% |
| 36 | 9780 | 679 | 455 | 8646 | 97.8% |
| 37 | 9801 | 680 | 456 | 8665 | 98.0% |
| 38 | 9821 | 681 | 457 | 8683 | 98.2% |
| 39 | 9838 | 682 | 458 | 8698 | 98.4% |
| 40 | 9854 | 683 | 459 | 8713 | 98.5% |
| Ult | 10000 | 690 | 466 | 8844 | 100.0% |

|                                              |   |         |
|----------------------------------------------|---|---------|
| Deductible: bottom of programme              | D | 200     |
| Layer/Limit: size of programme               | L | 9800    |
| Upper Limit: D+L : top of programme          | U | 10000   |
| Proportion of programme placed               | s | 0.95000 |
| Proportion of LMX remaining in market        | p | 0.95000 |
| Retention factor : p.s                       | z | 0.90250 |
| Actual Claim Amount into Market              | A | 1500    |
| Claim amount less deductible: A-D            | X | 1300    |
| Multiplier                                   | m | 6.896   |

| n   | Gross In | Final Net Retained | Reinsured Out of Mkt | Reinsured Back to Mkt | Gross In % of Ult |
|-----|----------|--------------------|----------------------|-----------------------|-------------------|
| 0   | 1500     | 265                | 62                   | 1173                  | 14.5%             |
| 1   | 2673     | 324                | 117                  | 2232                  | 25.8%             |
| 2   | 3732     | 377                | 168                  | 3188                  | 36.1%             |
| 3   | 4688     | 424                | 213                  | 4050                  | 45.3%             |
| 4   | 5550     | 468                | 254                  | 4829                  | 53.7%             |
| 5   | 6329     | 506                | 291                  | 5531                  | 61.2%             |
| 6   | 7031     | 542                | 324                  | 6165                  | 68.0%             |
| 7   | 7665     | 573                | 355                  | 6737                  | 74.1%             |
| 8   | 8237     | 602                | 382                  | 7254                  | 79.6%             |
| 9   | 8754     | 628                | 406                  | 7720                  | 84.6%             |
| 10  | 9220     | 651                | 428                  | 8140                  | 89.1%             |
| 11  | 9640     | 672                | 448                  | 8520                  | 93.2%             |
| 12  | 10020    | 710                | 466                  | 8845                  | 96.9%             |
| 13  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 14  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 15  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 16  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 17  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 18  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 19  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 20  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 21  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 22  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 23  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 24  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 25  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 26  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 27  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 28  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 29  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 30  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 31  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 32  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 33  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 34  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 35  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 36  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 37  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 38  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 39  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| 40  | 10345    | 1035               | 466                  | 8845                  | 100.0%            |
| Ult | 10345    | 1035               | 466                  | 8845                  | 100.0%            |

Graph 4.1

LMX SIMPLE MARKET MODEL
MULTIPLIERS

s = 0.95
p = 0.95
y = 0.98
U = 10000

FINAL GROSS CLAIM / CLAIM INTO MARKET

CLAIM AMOUNT INTO LMX-ON-LMX MARKET
(Thousands)

Graph 4.2

LMX SIMPLE MARKET MODEL
TIME TO REACH 95% OF ULTIMATE

s = 0.95
p = 0.95
y = 0.98
U = 10000



QUARTERS

CLAIM AMOUNT INTO LMX-ON-LMX MARKET
(Thousands)

LMX-ON-LMX SIMPLE MARKET MODEL
CLAIMS RETAINED

Graph 4.3

s = 0.95
p = 0.95
y = 0.98
U = 10000

RETAINED CLAIM AMOUNT
(Thousands)

ORIGINAL CLAIM INTO MARKET
(Thousands)

——— FIRST ESTIMATE       ----- ULTIMATE AMOUNT

32.

Graph 4.4

LMX-ON-LMX SIMPLE MARKET MODEL
CLAIMS RETAINED

s = 0.95
p = 0.95
y = 0.95
U = 10000

(Thousands)
FIRST ESTIMATE

ULTIMATE RETAINED
(Thousands)

33.

Graph 4.5

LMX SIMPLE MARKET MODEL
MULTIPLIERS

s = 0.95
y = 0.98
U = 10000
(p – variable)

ULTIMATE GROSS IN / CLAIM TO MARKET

PROPORTION OF PLACED RETAINED IN MARKET

34.

# LMX SIMPLE MARKET MODEL

Graph 4.6

TIME TO REACH FIXED PERCENT OF ULTIMATE

s = 0.95
y = 0.98
U = 10000
(p — variable)

QUARTERS

PROPORTION OF PLACED RETAINED IN MARKET

——— 95% of Ultimate          ----- 99% of Ultimate

35.

# Graph 4.7

## LMX SIMPLE MARKET MODEL
### CLAIM TO EXHAUST PROGRAMME

s = 0.95
y = 0.98
U = 10000
(p — variable)

CLAIM AMOUNT (Thousands)

PROPORTION OF PLACED RETAINED IN MARKET

Graph 4.8

## LMX MARKET MODEL
## TAIL FACTORS BY RETENTION FACTOR

$y = 0.98$
$(z - variable)$

QUARTERS (to reach 95% of Ultimate)

300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0

0.5

0.7

0.9

RETENTION FACTOR

37.

Graph 4.9

# LMX MARKET MODEL
## TAILS BY LAYER/ UPPER LIMIT FACTORS

z = 0.9025
(y − variable)

QUARTERS (to reach 95% of ultimate)

LAYER/UPPER LIMIT : Y

## Chapter 5 : Protection Programme

The Outwards Reinsurance Protection Programme of a London Market Company writing a wide cross-section of General Reinsurance and possibly Insurance business as well as LMX will normally be fairly complex. This chapter gives a brief description of an actual reinsurance programme for a London Market Company taken from the early 1980's. This programme is believed to be reasonably typical of programmes at that time.

The programme is shown in a simplified flowchart form in **Exhibit 5.1.** For the purposes of the outwards reinsurance programme the inwards business is allocated to a particular class when the policy is written. These classifications may distinguish between property/casualty, LMX/non-LMX, Marine/Aviation/Non-Marine and possibly proportional/non-proportional although there are wide variations in the number of classifications used by different companies. The reason for the use of these classifications is twofold:

a) It allows the company to have different levels of reinsurance appropriate to the types of business, size of lines written and catastrophe potential for each of the classifications.

b) It may improve the marketability of the programme.

The basic classifications used in the example programme in Exhibit 5.1 are property facultative, casualty, miscellaneous short-tail, satellites and LMX. The basic cover which has been arranged for each of these classes is shown in the appropriate box on the Exhibit. On this Exhibit the amounts shown only indicate the extent of the **vertical cover**, i.e. the cover which would be available for one loss. No indication is given of the extent of the **horizontal cover**, i.e. the extent to which the cover would be reinstated to cover more than one loss.

The distinction between vertical and horizontal cover is illustrated in **Exhibit 5.2** which shows in more detail the programme underlying the box on Exhibit 5.1 representing cover for the LMX account. The overall cover for this account shown on Exhibit 5.1 is $9,975,000 excess of $25,000. As can be seen from Exhibit 5.2 this cover is made up of a number of different layers, each with a number of reinstatements. All the layers in excess of $1,000,000 have one reinstatement. This means that if a loss exhausted any of these layers then the cover would be reinstated to provide protection against one further loss. Frequently an additional premium is payable on the reinstatement of the cover (the **reinstatement premium**).

The lower layers of cover generally have a higher number of reinstatements, since more losses may be expected for these layers, and there are also various backup covers which increase the horizontal cover. The overall effect of the various protections is illustrated graphically in **Exhibit 5.3**.

It should be noted that the first loss for the $25,000 xs $25,000 layer and the first two losses for the $50,000 xs $50,000 layer are retained by the company. This retention is known as an **aggregate deductible**. Also, the company retains 32.5% of any losses which affect the "2nd backup" protection. This was not intended as part of the programme design but has arisen because the cover could not be fully placed at the time.

Similar programmes underlie the boxes for the other classifications shown on Exhibit 5.1. In the event of the protections for any of the five basic classifications being exhausted there are three further overall protections which provide additional cover:

a) **General Catastrophe Programme.** This provides additional cover of $6,900,000 excess of $100,000. This programme protects the Property Facultative, Casualty and Miscellaneous Short-tail accounts and receives the benefit of the underlying reinsurances on these accounts in assessing the size of loss.

b) **Top and Drop.** This provides additional vertical cover for all the accounts but, if this vertical cover is not used, the protection would also **drop down** to provide additional horizontal cover if the reinstatements were exhausted on the lower layer protections.

c) **Blanket Catastrophe Cover.** This is the final level of protection which provides $5,000,000 of vertical cover across all the acccounts but which also receives the benefit of the Top and Drop cover.

As previously mentioned, this programme is fairly typical in structure for London Market Companies in the early 1980's. More recent programmes are likely to have several significant differences, for example:

a) The most important difference would be **coinsurance**. Typically, the protection programme may have a 5% coinsurance which means that 5% of all losses falling to the programme would be retained by the company. This coinsurance differs from the situation where only 95% of a policy is placed in the sense that the reinsurers know beforehand that the company will retain 5% of the losses falling to the programme and they can take this into account when deciding whether or not to write the reinsurance.

b) The terms and conditions would be tighter. For example, casualty reinsurances would be less likely to have unlimited (free) reinstatements which was a common feature in the early 1980's. Also, contracts may have more exclusions, for example, US casualty risks.
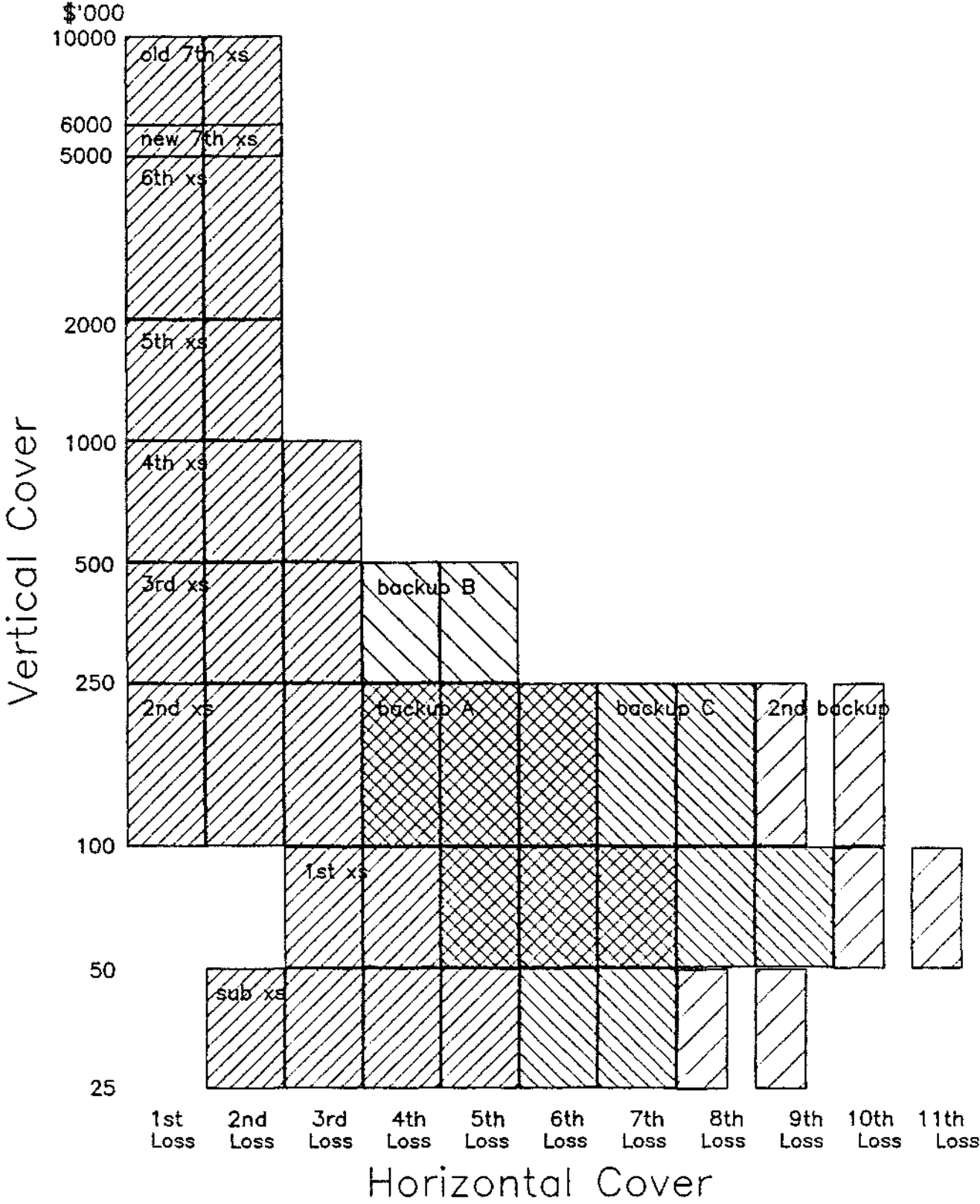
c) "Top and Drop" is no longer available.

Exhibit 5.1

# SIMPLIFIED FLOWCHART FOR EXCESS OF LOSS PROTECTIONS

| Property facultative (run—off) | Casualty | Misc Short Tail | Satellites | LMX |
|---|---|---|---|---|
| $1,900,000 xs $100,000 ea risk | $3,150,000 xs $100,000 ea loss | $30,000 xs $20,000 ea risk | $275,000 xs $25,000 ea loss | $9,975,000 xs $25,000 ea loss |

**General Catastrophe Programme**
$6,900,000 xs $100,000 ea loss
(plus $50,000 xs $50,000 in certain instances)

**Top & drop**
$5,000,000 xs LMX $250,000 ea loss
others $500,000 ea loss

**Blanket Catastrophe**
$5,000,000 xs LMX $10,000,000 ea loss
others $7,000,000 ea loss
plus benefit of Top & Drop

Exhibit 5.2

# EXAMPLE OF LMX PROTECTION PROGRAMME

```
┌─────────────────────┐
│ retention           │
│ $25,000 ea loss     │
└─────────────────────┘
         ↓
┌─────────────────────┐
│ sub xs              │
│ $25,000 xs $25,000  │
│ (excl 1st $25,000 o.r.)
│ 3 reinst            │
└─────────────────────┘
         ↓
┌─────────────────────┐
│ 1st xs              │
│ $50,000 xs $50,000  │
│ (excl 1st $100,000 o.r.)
│ 1 reinst            │
└─────────────────────┘
         ↓
┌─────────────────────┐
│ 2nd xs              │
│ $150,000 xs $100,000│
│ 2 reinst            │
└─────────────────────┘
         ↓
┌─────────────────────┐
│ 3rd xs              │
│ $250,000 xs $250,000│
│ 2 reinst            │
└─────────────────────┘
         ↓
┌─────────────────────┐
│ 4th xs              │
│ $500,000 xs $500,000│
│ 2 reinst            │
└─────────────────────┘
         ↓
┌─────────────────────┐
│ 5th xs              │
│ $1,000,000 xs $1,000,000
│ 1 reinst            │
└─────────────────────┘
         ↓
┌─────────────────────┐
│ 6th xs              │
│ $3,000,000 xs $2,000,000
│ 1 reinst            │
└─────────────────────┘
         ↓
┌─────────────────────┐
│ new 7th xs          │
│ $1,000,000 xs $5,000,000
│ 1 reinst            │
└─────────────────────┘
         ↓
┌─────────────────────┐
│ old 7th xs          │
│ $4,000,000 xs $6,000,000
│ 1 reinst            │
└─────────────────────┘
```

**backup A**
$200,000 xs $50,000
2 reinst

**backup B**
$250,000 xs $250,000
2 reinst

**backup C**
$225,000 xs $25,000
1 reinst

**2nd backup**
$225,000 xs $25,000
67.5% placed
1 reinst

KEY:
xs : excess layer
o.r. : otherwise recoverable
reinst : reinstatements
ea loss : each and every loss
excl : excluding

Exhibit 5.3    43.

# LMX PROTECTION PROGRAMME

## Chapter 6 : Information

### 6.1 The Slip

The basic information supplied to the writer of LMX business is of course the slip. This also contains or implies a number of "clauses" or **Wording** which affect the cover given and the terms. Appendix 4 gives a fairly typical example of the details contained in a Casualty slip and an abbreviated description of the various clauses (which also define in some cases the terms used in the policy, and in this Paper).

## 6.2 General LMX Placing Information

**Appendix 3** shows a standard questionnaire used for placing General LMX cover on a Lloyd's syndicate. Section 6.2.1 gives some notes on the questions asked and 6.2.2 summarises the questions.

### 6.2.1 Notes on Standard General LMX Questionnaire

The basic principle is the use of subject premium as the measure of exposure. Separate figures are given for US/Non-US and Catastrophe/Risk Excess.

Because of the long tail premium development in reinsurance business the last three underwriting years' ultimate premiums are estimates only, but can be compared with the development of the earlier years.

Special features are:

**Q9.**

**Accounted for premium income** is that closed in the period (which with weekly settlement is virtually the same as the premium paid in the period). It is the premium to which the adjustable rate for an LMX cover is applied, even though it contains instalments, adjustments and reinstatements on risks with cover incepting in earlier periods.

**Q15 & Q19**

These are the only places where any figures are given for aggregate exposures. It may seem odd that no questions are asked about US earthquakes and windstorm aggregates since aggregation in the reinsured book is fundamental to the exposure of the LMX contract. However, an LMX questionnaire can only cover details that are universally given to their reinsurers by the direct writers. This is deemed to be the case for Japan (zone 5 is Tokyo), even though it may contain an unknown mixture of aggregates and PMLs. For US business the only standard figures available are the California Earthquake reports, but they only cover policies with specific shock damage cover. They make no allowance for "fire following earthquake" claims, or the US courts' ability to insist that shock damage is covered on policies that explicitly exclude it.

**Q18**

This is a surprisingly specialist question. There are many other equally important exposures in a book of excess of loss business.

**List of ground up losses**

This is factual information about how the reinsured book has responded to various past losses. It may be misleading as large losses are infrequent and there can be large changes in a book in a short period of time, particularly when the underwriter has changed.

**List of shares in various major reinsurance programmes**

In place of US aggregation information, this list gives the LMX underwriter a feel for how the reinsured book will respond to major market losses. If it could be captured on a computer the LMX underwriter could model the response of his whole book. However, the volume of data is so great that this is not really practical.

## 6.2.2 Summary of Standard General LMX Questionnaire

A standard questionnaire for Non-Marine General LMX business is included in this Paper as Appendix 3. The sections of the questionnaire are also summarised below:

1. Syndicate numbers covered.

2. Stamp capacity by u/wtg year.

3. Premium income before all reinsurance costs by u/wtg year at 6, 12, 24 and 36 months.

4. P.I. % split by currency.

5. P.I. % split short tail, long tail and miscellaneous.

6. P.I. by u/wtg year at 6, 12, 24 and 36 months derived from:
   A: U.S. company physical damage catastrophe reinsurances in US$.
   B: Canadian company physical damage catastrophe reinsurances in Can$.
   C: US$ risk excess in US$.
   D: Fire dept excess of loss reinsurances of American professional reinsurers.

7. P.I. by u/wtg year at 6, 12, 24 and 36 months in £:
   A: Non-US$ physical damage catastophe.
   B: Non-dollar risk excess.
   C: Fire dept excess of loss reinsurances of non-American professional reinsurers.

8. If protected: LMX P.I. by u/wtg year at 6, 12, 24 and 36 months.

9. Accounted for P.I. in respect of questions 6, 7 and 8 by u/wtg year and 3 currencies.

10. Maximum known line any one reinsurance programme in respect of 6A, 6C, 7A, 7B.

11. Schedule of specific protections inuring wholly or partially to the benefit of the general excess programme.
    Minimum net retained loss for a: wind, flood, quake; b: Fire etc.

12. Maximum known line any assured/reassured in respect of property damage (P.M.L.)

13. Whether the general excess of loss contracts are knowingly exposed on any one risk.

14. Comments on underwriting policy for the next year.

15. Approximate aggregate earthquake liability from Japanese companies for zone 5 from:
    a) Pro-rata and surplus treaties.
    b) Excess of loss treaties.
    c) Facultative.

16. Details of any oil rig business.

17. Details of any incidental marine business.

18. Details of any direct/facultative South African riots business. (GNPI estimates, max gross line, inuring reinsurances).

19. Details of any contract frustration/ confiscation/ political risks. (P.I. gross & net, maximum line, maximum exposure any one country, inuring reinsurances).

    Schedule of ground up losses for listed large losses (from 1965).

    Schedule of net lines on listed layers of major programmes (e.g. master drilling rig cover, Allstate, Travelers etc.)

## 6.3 Casualty LMX Placing Information

There is a standard questionnaire for the provision of placing information for non-marine casualty LMX business similar to that for general LMX.

Basically this indicates:

a) The classes to be covered.

b) Historic total casualty premium income.

c) Analysis by currency.

d) Details of inwards casualty excess of loss business in the account to be analysed.

e) Sizes of the cedant's lines in relation to various bands of claim size (f.g.u. i.e., from the ground up) for different classes of business.

f) Current involvements with various pharmaceutical companies, professional indemnity coverages and other specific business liable to give rise to major losses.

g) Involvements in various historic losses. This part of the questionnaire is extensive and forms the major part of the total volume.

## 7.1 Background

The following is an LMX underwriter's view of LMX business given at an informal talk to members of the LMX working party on 14th June 1988. The talk was driven by some questions which we felt an LMX underwriter would probably be able to give a better answer to than any of the working party members. The questions asked are set out in this chapter with the answers supplied, or as near the answers as our notes and memories were able to provide!

## 7.2 The Market

The LMX market has been around in its present form since the mid-60's primarily because of the impact of Hurricane Betsy. 1983 was a major test of the LMX market (2 catastrophic events - Hurricane Alicia and CAT24, the Winter freeze). A number of non-specialists dropped out as a result and the market now consists almost entirely of specialists.

## 7.3 Line-Size

**What determines the size of line an LMX underwriter will write ?**

This is to some extent arbitrary. However, there are considerations which are relevant. These are directly related to a second question : why does an underwriter write LMX business ? There are two reasons:

a. Aggressive: this is to benefit from potential profits and for political cosiderations e.g. to improve the underwriter's status and position on the line-slip. In this case the underwriter will try to maximise his line-size.

b. Defensive: written to support the market or as reciprocity or as pay-back (particularly currently). The line-size will be minimised relative to lines in other areas.

The line-size will of course depend on the size of the LMX book written and income.

There are two products in the LMX market:

a. **XL-on-XL.** (Defined as "LMX-on-LMX" on page 3). This is reinsurance of other reinsurers' LMX business. The same loss inevitably goes back and forth creating a spiral. The main beneficiary is the broker with his 10% brokerage. There is a gearing element: it is worth writing if the premium rates are higher than the cost of outwards reinsurance.

b. **Non-Spiral.** (Defined as "LMX (excluding LMX-on-LMX)" on page 3). This is excess of loss cover of London Market companies and Lloyds' syndicates excluding LMX business assumed.

The line-size is not fixed solely on income because the number of lines which can be written can be varied. An underwriter may set a maximum line per progamme or per layer of programme. The ultimate consideration is how big a player in the market the underwriter wishes to be.

## 7.4 Protection

### What protection does an LMX underwriter require ?

A company differs from a Lloyds syndicate in that a company can afford an occasional bad year because it is a continuing entity whereas the names for a Lloyds syndicate change each year, so bad years are more difficult to cope with.

The state of the market is important. We have just gone through a particularly hard market. Reinsurance of lower layers is now only made for pay-back reasons (although this could change as the market softens if outward premium rates become low enough). At the top end of a reinsurance program the main consideration is the size of the maximum loss which might be sustained. Currently LMX writers are retaining more exposure at both the bottom and top end of their programmes.

An LMX underwriter tries to get a decent handle on his exposures. His aim will be to protect to the top of his aggregate exposure, if possible, depending of course on what this will cost. Exposure can be under-estimated e.g. 87J (the October 1987 UK hurricane).

The underwriter would like to see a fair amount of the outwards reinsurance go outside of the London market, to cut down the spiral. However, even for retrocessions leaving the market there is still a chance that they will return depending on where the retrocessionaires place their reinsurances.

Lloyds' underwriters reinsure excess of around 20% of their cat income, down to perhaps 10%. This is lower than for a company.

If an underwriter can obtain an 'edge' (i.e. if his net position is such that he is expected to make a profit) he will exploit it . However, the margins for profitability are very small, particularly when the brokerage of 10% each time is considered. Hence in general there can only be a very few winners in the market - most players will be losers.

## 7.5 Rating

### How are rates determined ?

Rating is usually in relation to exposed premiums expressed as a rate on the premium base (US cat income, US retro income or LMX income). There is a tendency to ignore non-US exposure (despite 87J). This implies that any additional non-US exposure can be included for zero premium (although there must be limits to this). International exposure should really be considered as well as US exposure.

Additional questions are now sometimes asked in Supplementary Questionnaires. E.g., aggregate exposure is sometimes requested.

The actual rates charged for LMX-on-LMX and for LMX excluding LMX-on-LMX (e.g. a Generals programme) are of a similar pattern. For LMX-on-LMX the rates vary from around 45% ROL (rate on line) for the lower layers of a programme to around 5% to 10% ROL for the top layers. This may not in fact be correct. For LMX-on-LMX a claim has to be rather larger to hit the bottom layer than for a straight Generals programme. However, due to the incestuous nature of the LMX market and the spiral effect, once a claim has entered the LMX-on-LMX market there is a fair chance that it will go right through the programme. Hence the ROL graph might need to be much less sloped and the "correct" rates could well be from 30% to 15% or even a fixed 22.5% !

There have been large changes in rating in recent years. These are not in fact due to large catastrophes such as Alicia because it is standard for programmes to be protected against 1 or even 2 large losses. These have had less effect than attrition of smaller losses and it is these which have have led to a contraction of the market.

## 7.6 Information

### What information is the underwriter given/ would he like ?

The information currently provided via the standard questionnaires is not great. An LMX underwriter really needs much more detailed information particularly on exposure. Without this information the underwriter's role is effectively entrepreneurial.

## Use of Pareto Model for Excess of Loss

The Pareto distribution has a number of attractions for use
in connection with excess of loss business. It has mathematical
properties which show it represents asymptotically certain risks of
large claims. It is simple, can be used in a one or two parameter
form, and fits a lot of data reasonably well. It has been stated
that "the two parameter Pareto distribution has a proven track
record as an acceptable model for excess losses". It is usually
possible to fit a Pareto distribution to the tail if not to the
whole data. In general it tends to over-estimate the tail weight
of most real data and therefore errs on the side of caution.
However, for LMX business this over-estimation may not be so
apparent because the spiral effect could well extend the tail.

It is convenient that trends such as inflation leave Pareto
parameters unchanged. When trend does not affect severity but only
frequency Pareto can model the distribution within a layer, trend
and development acting to shift claims from one layer to another
without changing the average within a layer.

A standard parameterisation of the Pareto distribution has
the cumulative distribution function:

$$F(x) = 1 - (k/x)^a$$

$$\text{with } k>0; \ a>0; \ x>=k$$

Strictly speaking, this distribution has two parameters, k
and a. In general, both k and a may be estimated from the data.
However, k is the lower bound of the data in question and in
insurance applications this could be selected in advance, e.g. to
model losses in excess of a certain size such as the deductible for
a layer. Losses can be normalised by dividing each loss by the
lower bound thereby reducing the number of parameters. For this
single parameter distribution the distribution function can be
written:

$$F(x) = 1 - x^{-q}$$

and the density function as:

$$f(x) = q.x^{-(q+1)}$$

ISO (Insurance Services Office) in the USA publishes tables
of Pareto parameters for different classes of business using
various truncation points to produce in each case a tail that a one
parameter Pareto distibution could model (reference "A Practical
Guide to the Single Pareto Distribution" by S. Philbrick, PCAS
LXXII).

When the single parameter Pareto model is applicable there are particularly simple formulae for the total loss variance which can be used as a practical way of calculating contingency loadings for Excess of Loss premiums (x-ref Appendix 2).

In practice, two particular distributions have often been found to give better fits to excess of loss data than the straight Pareto distribution.  These are:

a) **Shifted Pareto Distribution**

The standard ISO model for severity in liability lines is the **truncated shifted Pareto distribution**.  Using the same nomenclature as above, the cumulative distribution function would be:

$$F(x) = 1 - ((k+c)/(x+c))^a$$

with additional parameter c.

b) **Log-Normal Distribution**

Although this distribution is difficult to handle mathematically, a book by Aitchinson and Brown (1959) adequately explains how the **truncated Log-Normal distribution** can be handled in practice.  However, this book is now out of date, lacking awareness of what can be done using computers.  "Loss Distributions" by Hogg and Klugman (1984) has good examples of fitting the Log-Normal and other distributions to insurance data and use of the distribution when truncation and limits apply.  The Log-Normal is simple to fit to a truncated tail with parameter a such that (x-a) is Log-Normal (i.e.  log(x-a) is Normally distributed) but layering of risks is not so conveniently dealt with.

For both these distributions, the golden search method of homing in on the parameters has been found to be very suitable (usually fitting to the total claim amounts observed or expected for different layers as "areas" under the required curve).  An example of a shifted Pareto type curve fitted to actual data (albeit actual premiums charged) is given on page 14.

## Premium Formulae

The premium for an excess of loss contract should incorporate a contingency or security loading (or payment for risk, fluctuation and capacity). This security loading may be made proportional to the standard deviation of the loss amount.

The formula for the variance of the loss amount is:

$$\text{Var(loss amount)} = \text{E(freq)} * \text{Var(sev)} + \text{Var(freq)} * \text{E(sev)}^2.$$

This formula is thought to hold generally and gives the variance of the loss amount in terms of the mean and variance of severity and frequency.

If it is assumed that the number of claims is Poisson distributed (which is thought justifiable when claims are few as in the upper layers of an LMX programme) we have:

$$\text{E(freq)} = \text{Var(freq)} = n$$

and:

$$\text{Var(loss amount)} = n * \text{Var(sev)} + n * \text{E(sev)}^2$$
$$= n * A2$$

where A2 is Benktander's "second zero point moment".

If it is assumed that individual claims are Pareto distributed the number of claims in excess of an amount x is expected to be:

$$H(x) = c * x^{-a}$$

where c is a fixed constant and a is a parameter.

Consider an excess of loss layer, L xs R, with upper limit U:

$$U = L+R$$

$$k = U/R, \text{ the relative length of the layer.}$$

For a=3 Benktander has deduced a simple formula:

$$\sigma/E = 2/(\sqrt{n}.(1+1/k))$$

where $\sigma$ and E relate to the total loss amount in a year and n is the expected number of claims in excess of R. This formula is stated to be widely used in motor where values of the Pareto parameter a from 2 to 3 are common. However, for LMX business values of a much closer to 1 are more likely.

Defining q by the relation:

$$E = n.S = q.L$$

or in words:

Risk Premium = (expected frequency) * (expected severity)
            = (net rate on line) * (cover amount)

For a model (q,L) all losses may be assumed to be total so that there is no variation in severity. The expected claims frequency is q. Assuming a Poisson distribution the maximum variance is given by:

$$Max(Var) = E^2.L/(nS) = E.L$$

For a=1 there is also an exact formula:

$$Max(Var) = E^2 * (2.(k-1-\log_e k)/(n.(\log_e k)^2)$$

For values of a near to 1 the difference between the approximate and exact formulae is small. When k=1.5 the exact standard deviation is about 96% of the approximate standard deviation, the difference increasing with increasing values of k.

The conclusion is that a good approximation to the variance is given by E*L. Alternatively, the exact formula could be used as it is not very complicated.

(x-ref: Benktander's paper ICA 1988, Helsinki)

General Questionnaire

## NON MARINE GENERAL EXCESS OF LOSS CONTRACTS

1. **Syndicate Numbers covered**

2. **Stamp Capacity**

             1984 Account
             1985 Account
             1986 Account
             1987 Account
             1988 Account

3. **Overall Syndicate Premium Income**      (indicate currency
   **before all Reinsurance Costs**           & R.O.E.        )

|      | 6 mos. | 12 mos. | 24 mos. | 36 mos. |       |
|------|--------|---------|---------|---------|-------|
| 1982 |        |         |         |         |       |
| 1983 |        |         |         |         |       |
| 1984 |        |         |         |         |       |
| 1985 |        |         |         |         |       |
| 1986 |        |         |         |         | (est.) |
| 1987 |        |         |         |         | (est.) |
| 1988 |        |         |         |         | (est.) |

4. **Give approximate Nett Premium Income percentage split**

   a)  Sterling       %    b)  US$        %   c)  C$        %

5. **Give approximate split**

   a)  Short Tail      %    b)  Long Tail     %  c)  Misc.      %

6A  **P.I. derived from U.S. Company Physical Damage Catastrophe**
    **Reinsurances, in US$**

|      | 6 mos. | 12 mos | 24 mos. | 36 mos. |       |
|------|--------|--------|---------|---------|-------|
| 1982 |        |        |         |         |       |
| 1983 |        |        |         |         |       |
| 1984 |        |        |         |         |       |
| 1985 |        |        |         |         |       |
| 1986 |        |        |         |         | (est.) |
| 1987 |        |        |         |         | (est.) |
| 1988 |        |        |         |         | (est.) |

6B   **P.I. derived from Canadian Company Physical Damage**
     **Catastrophe Reinsurances in CAN $**

|      | 6 mos. | 12 mos. | 24 mos. | 36 mos. |        |
|------|--------|---------|---------|---------|--------|
| 1982 |        |         |         |         |        |
| 1983 |        |         |         |         |        |
| 1984 |        |         |         |         |        |
| 1985 |        |         |         |         |        |
| 1986 |        |         |         |         | (est.) |
| 1987 |        |         |         |         | (est.) |
| 1988 |        |         |         |         | (est.) |

6C   **US$ Risk Excess P.I. in US$** (Not included in 6A)

|      | 6 mos. | 12 mos. | 24 mos. | 36 mos. |        |
|------|--------|---------|---------|---------|--------|
| 1982 |        |         |         |         |        |
| 1983 |        |         |         |         |        |
| 1984 |        |         |         |         |        |
| 1985 |        |         |         |         |        |
| 1986 |        |         |         |         | (est.) |
| 1987 |        |         |         |         | (est.) |
| 1988 |        |         |         |         | (est.) |

6D   **Do you write Fire Dept Excess of Loss Reinsurances of**
     **American Professional Reinsurers?**   (Not included in 6A)

If so, please state P.I. in US$

|      | 6 mos. | 12 mos. | 24 mos. | 36 mos. |        |
|------|--------|---------|---------|---------|--------|
| 1982 |        |         |         |         |        |
| 1983 |        |         |         |         |        |
| 1984 |        |         |         |         |        |
| 1985 |        |         |         |         |        |
| 1986 |        |         |         |         | (est.) |
| 1987 |        |         |         |         | (est.) |
| 1988 |        |         |         |         | (est.) |

N.B.   Certain U.S. and non-U.S. professional XL covers
       do not exclude L.M.X. business.  It should be
       understood that the L.M.X. Exclusion Clause
       (when inserted) also relates to retrocessions
       of L.M.X. business and therefore the L.M.X.
       proportion of any loss on U.S. and non-U.S.
       professional XL covers is excluded.

7A.    Non-US$ Physical Damage Catastrophe Premium Income In £

|  | 6 mos. | 12 mos. | 24 mos. | 36 mos. |
|---|---|---|---|---|
| 1982 | | | | |
| 1983 | | | | |
| 1984 | | | | |
| 1985 | | | | |
| 1986 | | | | (est.) |
| 1987 | | | | (est.) |
| 1988 | | | | (est.) |

7B.    Non-Dollar Risk Excess P.I. In £ (Not included in 7A)

|  | 6 mos. | 12 mos. | 24 mos. | 36 mos. |
|---|---|---|---|---|
| 1982 | | | | |
| 1983 | | | | |
| 1984 | | | | |
| 1985 | | | | |
| 1986 | | | | (est.) |
| 1987 | | | | (est.) |
| 1988 | | | | (est.) |

7C.    Do you write Fire Dept Excess of Loss Reinsurances of
Non-American Professional Reinsurers? (Not included in 7A)

If so, please state P.I. in £

|  | 6 mos. | 12 mos. | 24 mos. | 36 mos. |
|---|---|---|---|---|
| 1984 | | | | |
| 1985 | | | | |
| 1986 | | | | (est.) |
| 1987 | | | | (est.) |
| 1988 | | | | (est.) |

Please state whether U.S. Exposures are included - if so, please
give details:-

8.    If protected hereunder please give L.M.X. P.I.
                                        (State Currency

|  | 6 mos. | 12 mos. | 24 mos. | 36 mos. |
|---|---|---|---|---|
| 1982 | | | | |
| 1983 | | | | |
| 1984 | | | | |
| 1985 | | | | |
| 1986 | | | | (est.) |
| 1987 | | | | (est.) |
| 1988 | | | | (est.) |

9.  Please state "Accounted for" Premium Income in respect of questions 6A, 6B, 6C, 6D, 7A, 7B, 7C & 8 (and/or as applicable).

|      | £ | US$ | Can$ |
|------|---|-----|------|
| 1984 | | | |
| 1985 | | | |
| 1986 | | | (est.) |
| 1987 | | | (est.) |
| 1988 | | | (est.) |

10. What is your maximum known line any one Reinsurance Programme in respect of:

6A?                                  6C?
7A?                                  7B?

11. Please schedule any specific protections you carry which wholly or partially INURE TO THE BENEFIT OF the general excess programme.

    (Please indicate if such coverage contains an E.C.O. Inclusion Clause)

    Please state minimum net retained loss for:

        1.  Wind, Flood, Quake
        2.  Fire etc.

12. What is your maximum known line any one Assured &/or Reassured in respect of:

    a)  Property Damage (P.M.L.) ?

13. Do you knowingly expose your General Excess of Loss Contracts on any one risk?

14. Have you any comments on your underwriting policy for next year?

15. What is your approximate Aggregate Earthquake Liability as regards Japanese companies in respect of Zone 5 from:

    a) Pro rata and Surplus Treaties?
    b) Excess of Loss Treaties?
    c) Facultative?

16. Do you write any Oil Rig Business (including War etc., as original) other than as per Questionnaire? If so, please give details.

17. Do you intend to write Incidental Marine Business? If so, please give details.

18. Do you write Direct/Facultative South African Riots Business? If so, please give details of the following:-

a) G.N.P.I. Estimate for 1985
1986
1987
1988

b) Max. Gross Line any one Assured

c) Any Inuring Reinsurances (Inc. Reinstatement Provisions)

Do you agree that a catastrophe loss would broadly follow the hours etc. definition (7 Days/15 miles radius any one city etc.) as per L.P.O. 416? - Or state your preferred alternative intent.

19. Do you write Contract Frustration/Confiscation/Political Risks?

If so, please give details of the following:

a) P.I. (Gross)

b) P.I. (Nett)

c) Maximum Line any one risk

d) Maximum exposure any one country

e) Any inuring Reinsurances

Please give "ground up" losses on the following:
(for purposes of current Generals)

1965     BETSY

1969     CAMILLE

1970     CELIA
           (HUMBLE OIL (Fire)
           (PARSONS ET AL (T.P. Net to General)

1972     AGNES FLOOD
           EUROPEAN STORMS
           MANAGUA EARTHQUAKE

1974     AUSTRALIAN FLOODS
           CAT. 74        (R/I assumed
                           proportion if
                           applicable:    )
           NYPRO
           CYCLONE TRACY

1976     JANUARY STORMS

1977     FORD (COLOGNE) (20.11.77)

1978     SEVERE WEATHER CONDITIONS (28.12.78-7.1.79)

1979     WICHITA FALLS (CAT. 93) (10/13.4.79)
           DAVID
           FREDERIC - Split CAT X/L     )
                    All other       )

1980     BRITISH AEROSPACE
           ALLEN
           CROWN ZELLERBACH (22.10.80)
           M.G.M. GRAND HOTEL (21.11.80)

1981     CAT. 22 (7/8.5.81)
           CALGARY HAILSTORM (28.7.81)
           CAT. 81 J WINTER LOSSES

1982     CAT. 81 J WINTER LOSSES
           IWA (23.11.82)
           WASHINGTON PUBLIC & SUPPLY SYSTEM (22.3.82)

1983     AUSTRALIAN BUSH FIRES
           SASKATCHEWAN HAIL (24.6.83)
           ALICIA CAT. 15
                  - Split Direct Cat. XOL
                    R/I Ass. Cat. XOL
                    All other
           U.S. WINTER FREEZE CAT. 24
                  - Split Direct Cat. XOL
                    R/I Ass. Cat. XOL
                    All other

1984        U.K./EURO STORMS (12/14.1.84)
               GULF RESOURCES (5.5.84)
               HAILSTORMS MUNICH (12.7.84)
               CRICKLEWOOD FIRE (24.8.84)
               LAPORTE INDUSTRIES, FIRE (15.9.84)

1985        UK WINTER WEATHER (10/17.1.85)
               BRISBANE STORM (18.1.85)
               WIND, HAIL, TORNADOES (29.5 TO 1.6.85) CAT. 71
               ARLINGTON PARK RACE TRACK (31.7.85)
               "ELENA" (30.8.85 TO 3.9.85)
               MEXICAN QUAKE (19.9.85)
               "GLORIA" (26/27.9.85)

1986        MONTREAL HAIL (29.5.86)
               AMAX (7.6.86)
               SYDNEY FLOODS (4/5/6.8.86)

1987        UK WINTER WEATHER (10/23.1.87)
               NEW ZEALAND QUAKE (2.3.87)
               EDMONTON TORNADO (31.7.87)

ANY OTHER LOSS EXCESS OF 75% OF EXCESS POINT

The information contained in the questionnaire is for the
guidance of Reinsurers but is not warranted.

APPENDIX

**What are your net lines on the following?**

| a) | Master Drilling Rig Cover | | | | |
|---|---|---|---|---|---|
| | (R/I Lloyd's & Companies) | $ 55,000,000 | xs | $ 45,000,000 | |
| | | $150,000,000 | xs | $100,000,000 | |
| | | $150,000,000 | xs | $250,000,000 | |
| | | $200,000,000 | xs | $400,000,000 | |
| | | $250,000,000 | xs | $600,000,000 | |
| | | $300,000,000 | xs | $850,000,000 | |

| | Buffer | $ 17,500,000 | xs | $ 27,500,000 |
|---|---|---|---|---|
| | T. & D. | $100,000,000 | xs | $ 45,000,000 |

| b) | Allstate | $ 50,000,000 | xs | $100,000,000 |
|---|---|---|---|---|
| | | $ 50,000,000 | xs | $150,000,000 |
| | | $ 50,000,000 | xs | $200,000,000 |
| | | $ 50,000,000 | xs | $250,000,000 |

| c) | Travelers | $ 25,000,000 | xs | $ 55,000,000 |
|---|---|---|---|---|
| | | $ 30,000,000 | xs | $ 80,000,000 |
| | | $ 20,000,000 | xs | $110,000,000 |
| | | $ 20,000,000 | xs | $130,000,000 |
| | | $ 40,000,000 | xs | $150,000,000 |
| | | $ 30,000,000 | xs | $190,000,000 |

d) Factory Mutual System

Please detail by layer your risk exposure to the following Companies

1) Allendale Mutual Ins. Co.

2) Protection Mutual Ins. Co.
   Risk Excesses

3) Arkwright Boston

| e) | I.R.I | $ 50,000,000 | xs | $ 40,000,000 |
|---|---|---|---|---|
| | | $ 50,000,000 | xs | $ 90,000,000 |
| | | $ 50,000,000 | xs | $140,000,000 |
| | | $ 65,000,000 | xs | $190,000,000 |

| f) | State Farm | $ 85,000,000 | xs | $275,000,000 |
|---|---|---|---|---|
| | | $ 85,000,000 | xs | $365,000,000 |
| | | $ 85,000,000 | xs | $455,000,000 |
| | | $ 85,000,000 | xs | $545,000,000 |

| | | |
|---|---|---|
| g) Aetna Casualty & Surety Co. | $ 30,000,000 xs $100,000,000 | |
| | $ 30,000,000 xs $130,000,000 | |
| | $ 30,000,000 xs $160,000,000 | |
| | $ 35,000,000 xs $190,000,000 | |
| | $ 35,000,000 xs $225,000,000 | |
| | $ 35,000,000 xs $260,000,000 | |
| | $ 40,000,000 xs $295,000,000 | |

h) Fire Insurance Exchange

```
$ 30,000,000 xs $ 30,000,000
$ 40,000,000 xs $ 60,000,000
$ 50,000,000 xs $100,000,000
$ 62,000,000 xs $150,000,000
```

i) United States Fidelity &
Guaranty
Property Risk Programme

```
$  9,000,000 xs $  1,000,000
$ 10,000,000 xs $ 10,000,000
$ 30,000,000 xs $ 20,000,000
```

j) Employers Ins. Co.
of Wausau

    Risk Excesses

```
$ 20,000,000 xs $  7,000,000
$ 20,000,000 xs $ 27,000,000
```

    Cat. Prog.

```
$  8,000,000 xs $  6,000,000
$  7,000,000 xs $ 14,000,000
$ 20,000,000 xs $ 21,000,000
$ 30,000,000 xs $ 41,000,000
$ 30,000,000 xs $ 71,000,000
```

k) Prudential Assurance Co.

```
£ 10,000,000 xs £ 10,000,000
£ 25,000,000 xs £ 20,000,000
£ 30,000,000 xs £ 45,000,000
£ 35,000,000 xs £ 75,000,000
```

l) Munich Reinsurance Co.

```
DM42,500,000 xs DM137,500,000
DM45,000,000 xs DM180,000,000
```

m) New Zealand South British Group
(Second Loss Cover)

```
NZ$  7,500,000 xs NZ$  7,500,000
NZ$ 25,000,000 xs NZ$ 15,000,000
NZ$ 35,000,000 xs NZ$ 40,000,000
NZ$ 50,000,000 xs NZ$ 75,000,000
NZ$ 65,000,000 xs NZ$125,000,000
NZ$ 65,000,000 xs NZ$190,000,000
NZ$ 65,000,000 xs NZ$255,000,000
NZ$100,000,000 xs NZ$320,000,000
```

n) N.R.M.A.

```
A$ 10,000,000 xs A$  10,000,000
A$ 40,000,000 xs A$  20,000,000
A$ 75,000,000 xs A$  60,000,000
A$145,000,000 xs A$ 135,000,000
```

o) Royal Ins. Co. Ltd.

```
£  5,000,000 xs £  5,000,000
£ 10,000,000 xs £ 10,000,000
£ 20,000,000 xs £ 20,000,000
£ 50,000,000 xs £ 40,000,000
```

| p) | Royal Insurance Co. Ltd. | £ | 15,000,000 | xs | £ | 15,000,000 | |
|---|---|---|---|---|---|---|---|
| | UK WATER DAMAGE ONLY | £ | 35,000,000 | xs | £ | 30,000,000 | |
| q) | Zenkyoren | Y | 30,000 M | xs | Y | 60,000 M | Ex. Quake |
| | | Y | 30,000 M | xs | Y | 90,000 M | Ex. Quake |
| | | Y | 20,000 M | xs | Y | 120,000 M | |
| | | Y | 20,000 M | xs | Y | 140,000 M | |
| | | Y | 20,000 M | xs | Y | 160,000 M | |
| | | Y | 20,000 M | xs | Y | 180,000 M | |
| | | Y | 20,000 M | xs | Y | 200,000 M | |
| r) | AIG (USA/Can) | $ | 15,000,000 | xs | $ | 35,000,000 | |
| | | $ | 25,000,000 | xs | $ | 50,000,000 | |
| | | $ | 25,000,000 | xs | $ | 75,000,000 | |
| | | $ | 20,000,000 | xs | $ | 100,000,000 | |
| | AIG (2nd Loss Cover) | $ | 12,500,000 | xs | $ | 22,500,000 | |
| | (International) | $ | 15,000,000 | xs | $ | 35,000,000 | |
| | | $ | 25,000,000 | xs | $ | 50,000,000 | |
| | | $ | 25,000,000 | xs | $ | 75,000,000 | |
| | | $ | 20,000,000 | xs | $ | 100,000,000 | |
| | Blkt Layer | $ | 80,000,000 | xs | $ | 120,000,000 | |
| s) | CIGNA (USA/Can) | $ | 20,000,000 | xs | $ | 50,000,000 | |
| | | $ | 20,000,000 | xs | $ | 70,000,000 | |
| | | $ | 25,000,000 | xs | $ | 90,000,000 | |
| | | $ | 25,000,000 | xs | $ | 115,000,000 | |
| | | $ | 25,000,000 | xs | $ | 140,000,000 | |
| | | $ | 45,000,000 | xs | $ | 165,000,000 | |
| | | $ | 40,000,000 | xs | $ | 210,000,000 | |
| | CIGNA (International) | $ | 10,000,000 | xs | $ | 10,000,000 | |
| | | $ | 15,000,000 | xs | $ | 20,000,000 | |
| | | $ | 25,000,000 | xs | $ | 35,000,000 | |
| | | $ | 40,000,000 | xs | $ | 60,000,000 | |

PLEASE INCLUDE ANY OTHER INTERESTS ON THE ABOVE MENTIONED

**Appendix 4**

**Example of Slip**

**A4.1: Slip Details**

REINSURED

(As Appropriate - the Reinsured)

PERIOD

12 months at 1st January 1988, Losses occurring during basis.

TYPE

Excess of Loss Reinsurance.

CLASS

To indemnify the Reinsured for all losses of whatsoever nature in respect of all business allocated to their Casualty Account.

TERRITORIAL
SCOPE

Wheresoever arising.

LIMIT

£125,000 or US or C$250,000 each and every loss

IN EXCESS OF AN ULTIMATE NETT LOSS OF

£75,000 or US or C$150,000 each and every loss.

WARRANTY

*No loss shall be payable hereunder, unless the Reinsured sustain loss from more than one Assured or Reassured in the same loss.

REINSTATEMENT

Three full reinstatements each at 100% additional premium.

PREMIUM

Premium hereon shall be calculated at 10.20% of the Reinsured's Nett Premium Income on the business protected "accounted for" during the period of this reinsurance. Subject, however, to a Minimum and Deposit Premium of £10,938 plus US$70,000 payable in four instalments as follows:

25% at 1.1.88
25% at 31.3.88
25% at 30.6.88
25% at 30.9.88

To be adjusted no later than 90 days after expiry.

DEDUCTIONS

10%, Reinstatements 5%.

GENERAL
CONDITIONS

Ultimate Nett Loss Clause.
Losses Discovered or Claims Made Clause.
Definition of each and every loss.
Currency Conversion Clause.
Aggregate Extraction Clause.
Standard Run Off Clause, risks written basis.
E.C.O. Inclusion Clause.
Nuclear Energy Risks Exclusion Clause.
Nuclear Incident Exclusion Clauses.
Non-Marine London Market War Exclusion Clause.

WORDING

As expiring as far as applicable, to be agreed.

**A4.2: Clauses** (abbreviated).

**Insuring Clause.**

Repeats the cover given in the slip as "LIMIT".

**Warranty.**

Same as "WARRANTY" in the slip. *(N.b. this particular warranty is unusual and specific to this contract).

**Period.**

Expands on the period of cover. Also explains the procedure for obtaining run-off of coverage written prior to the expiry date in the event of non-renewal.

**Losses Discovered or Claims Made Clause.**

For losses on contracts covering on a **losses discovered** or **claims made** basis, i.e. the date of discovery of the loss or the date when the claim is made determines under which contract the policy is collectible, such losses are covered if this date falls within the period of this reinsurance (irrespective of the date on which the loss occurs). The date of the first discovery or when a claim is·first made is the date applicable to the entire loss.

**Ultimate Nett Loss Clause.**

This is defined as the sum actually paid by the Reinsured in settlement of losses or liability after making deductions for all recoveries, all salvages, and all claims upon other reinsurances, whether collected or not, and includes all adjustment expenses arising from the settlement of claims (other than employees' salaries and the Reinsured's office expenses).

**Definition of "Each and Every Loss".**

Each and every loss and/or occurrence and/or catastophe and/or disaster and/or calamity and/or series of losses and/or occurrences and/or catastrophes and/or disasters and/or calamities arising out of one event.

**Premium Clause.**

Repeats the "PREMIUM" information given in the slip.

To ascertain if the minimum premium has been exceeded dollars are converted to sterling at rates of exchange applying at the date of inception of the policy. If an additional premium is due the premium is paid pro-rata to the Reinsured's Nett Premium Income in Sterling, US and Canadian Dollars.

**Nett Premium Income** is gross premium less commission, taxes and similar deductions, brokerage and profit commission, cancellations and return premiums and less premiums given off by way of reinsurance, recoveries under which inure to the benefit of this reinsurance, and after deduction of premiums in respect of business excluded from the protection of this reinsurance.

**Currency Conversion Clause.**

Losses in currencies other than Sterling, US and Canadian Dollars are converted into Sterling at the rate of exchange ruling in London on the date of settlement of the original loss. For a loss in Sterling and US and/or Canadian Dollars, the excess and deductible are apportioned in the proportion that the amount of each currency bears to the Reinsured's total loss, with the calculations involved being in a common currency using the same ratio as in the Insuring Clause (i.e. £1 = 2$).

**Reinstatement Clause.**

In the event of loss or losses the reinsurance will be reinstated but the Reinsurers shall never be liable for more than £125,000 or US or C$250,000 in respect of each and every loss nor for more than £500,000 or US or C$1,000,000 in all.

In respect of a loss or losses aggregating to the first £125,000 or US or C$250,000 reinstated hereunder an additional premium is payable at 100% of the final basic earned premium (with similar wordings for the other two reinstatements). Each reinstatement premium is in respect of a Total Loss, lesser amounts being calculated in proportion. It is paid when the loss is settled, is provisionally adjusted on the basis of the Deposit premium, and is paid in the same currency or currencies in which the loss is paid (using rates of exchange as at the date of inception).

Losses are considered in date order of occurrence but this does not preclude the Reinsured from making provisional collections in respect of claims which may not ultimately be recoverable.

**Nuclear Incident Exclusion Clauses.**

Various market standard exclusion clauses applying to applicable classes of business and territories are listed, with amendments.

**Extra Contractual Obligations Clause.**

This section firstly excludes **ECO** "howsoever arising, such ECO being defined as any award made by a Court of competent jurisdiction against an Insurer or Reinsurer, which award is not within the coverage granted by any Insurance and/or Reinsurance contract made between the parties in dispute". It then extends coverage to cover any loss arising from a claims related ECO awarded against the Reinsured or incurred by the Reinsured where they have paid their share of a claims related ECO awarded against one or more of their co-insurers. Also covered is all loss from ECO incurred by the Reinsured as a result of participation in Insurance or Reinsurance which provides cover for such loss.

A **Claims Related ECO** is defined as the amount awarded against an Insurer or Reinsurer found liable by a Court of competent jurisdiction to pay damages to an Insurer or Reinsurer in respect of a claim made under an Insurance and/or Reinsurance contract, where such liability has arisen because of:

a) the failure of the Insurer or Reinsurer to agree or pay a claim within the policy limits or to provide a defence against such claims as required by law or

b) bad faith or negligence in rejecting an offer of settlement or

c) negligence or breach of duty in the preparation of the defence or the conduct of a trial or the preparation or prosecution of any appeal and/or subrogation and/or any subsequent action resulting therefrom.

**War and Civil War Exclusion Clause.**

Excludes loss or damage occasioned by War, Invasion, Acts of Foreign Enemies etc., or confiscation, nationalisation, destruction of or damage to property under the order of a government or public or local authority.

**Aggregate Extraction Clause.**

For losses on risks covering on an aggregate basis, the amount of a loss from one event is that percentage of the aggregate loss to the Reinsured on the original contract that the total loss from the particular event bears to the total aggregate losses to the original Insured or Reinsured.

**Inspection of Records.**

Allows inspection of the books of the Reinsured, as far as they concern the contracts falling within the scope of the reinsurance, by an authorised representative of the Reinsurers at any reasonable time during the continuance of the reinsurance or any liability thereunder.

Other clauses for this reinsurance which are not worth expanding here are:

**Amendments and Alterations.**

**Loss Clause.**

**Errors and Omissions Clause.**

**Arbitration Clause.**

One other clause, which is not included in this reinsurance but is common and of some import as it covers the situation where the underlying business can be on either a losses occurring or claims made basis, is as follows:

**Interlocking Clause.**

If the Reinsured are liable in respect of any one loss or series of losses arising out of one event under two or more contracts issued to the same Insured and/or Reinsured and such policies incept in different years, the each and every loss any one Assured or Reassured excess and indemnity provided for in the Schedule shall be reduced to the proportion that the Reinsured's loss on the business protected hereunder bears to the total loss sustained by the Reinsured on the portfolio protected irrespective of inception dates of original contracts.