

**THE OVERHAUL OF  
LLOYD'S REALISTIC DISASTER SCENARIOS  
2003 UPDATE**

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## **1 INTRODUCTION**

This paper has been produced by the members of the Loss Modelling Team within the Risk Management Division of Lloyd's, which is a new team with responsibility for improving the quantification of risk within the Franchise (i.e. within both the Franchisor, the Lloyd's Corporation, and within Franchisees, Lloyd's Managing Agents).

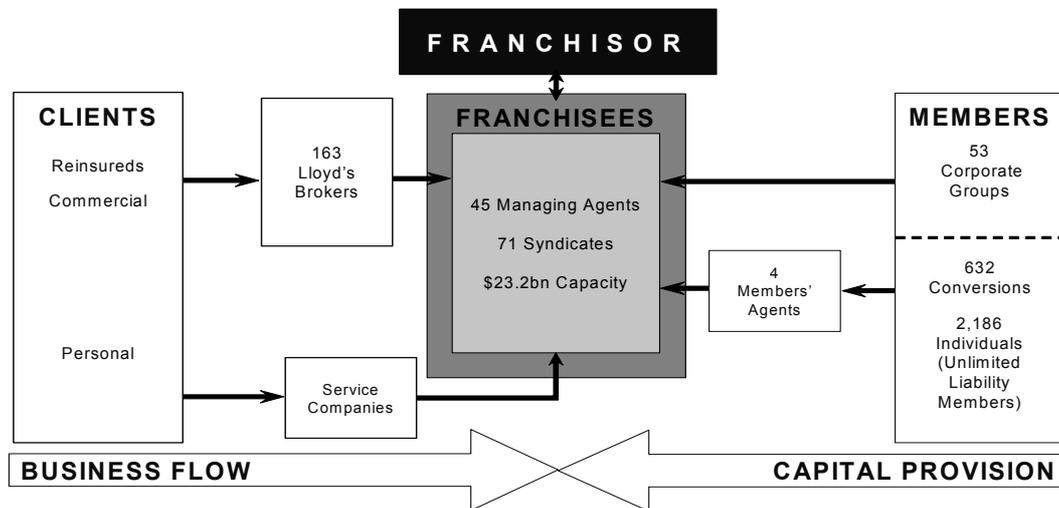
We provide an overview of Lloyd's Realistic Disaster Scenarios and give an update on the RDS Overhaul that is to be completed by April 2004. We have also commented on the role that catastrophe risk modelling can play in managing risk and improving the market's performance, and have expressed our own opinions on the value and problems that such models might deliver. The views expressed in this paper are our own and are not necessarily shared by our employer.

## 2 CONTEXT AND HISTORY

### 2.1 Lloyd's

Lloyd's is unique within the insurance world, as a market with separate underwriting entities (syndicates) backed by capital providers (names) underwriting on either a limited or unlimited basis. Only individual names may underwrite with unlimited liability and no new names may enter the market on this basis after 1<sup>st</sup> January 2003, following the recommendations of the Chairman's Strategy Group (CSG) that reported in 2002.

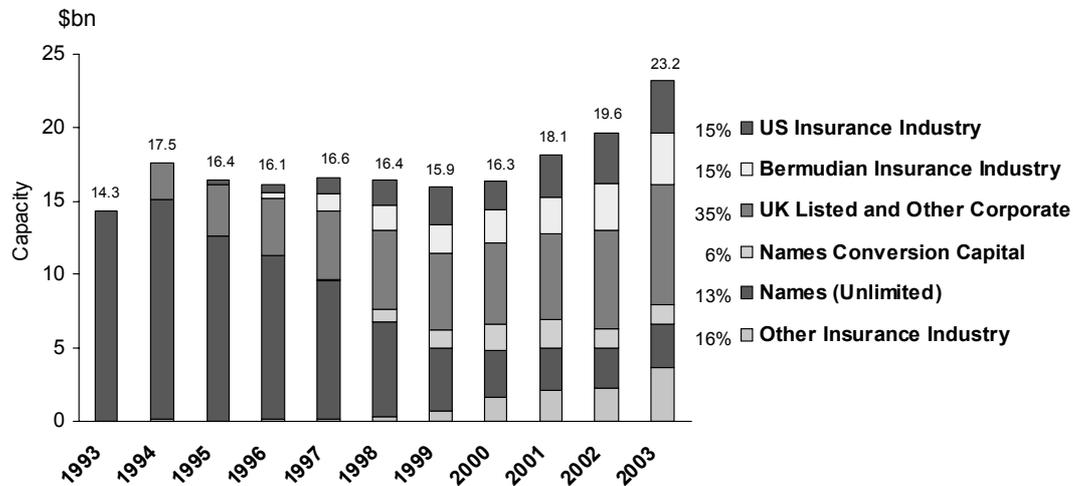
**Figure 1: Overview of Lloyd's market in 2003**



*Source: Lloyd's Members' Services Unit, Admissions, Broker Services, July 2003*

Lloyd's names can support either a single syndicate (on a dedicated basis) or a number of syndicates (on a spread basis). The former practice has become more common in recent times with the increasing role of corporate capital, following its introduction in 1994 and the emergence of the Integrated Lloyd's Vehicle (known as an "ILV"), where the managing agent and corporate name are under common ownership. The development of Lloyd's capital basis is summarised in Figure 2 overleaf.

**Figure 2: Evolution of the Lloyd's Capital Base**



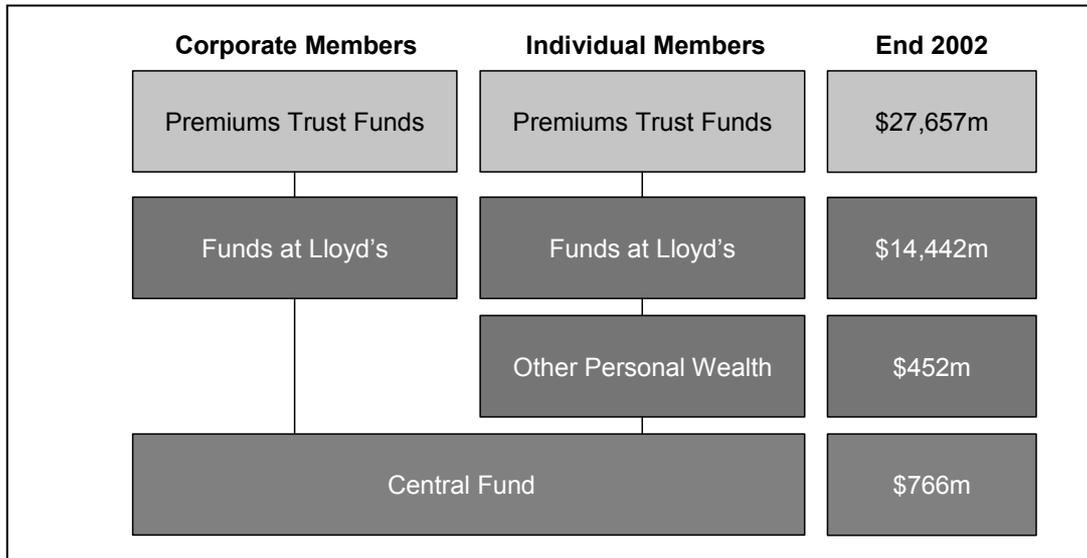
Source: Lloyd's Members' Services Unit, January 2003

Syndicates and names operate within a security structure with a mutual pool of assets, the New Central Fund (NCF), at its core. The NCF is used to fund losses where the resources of a member have been exhausted as a result of its underwriting losses. Under normal conditions, where a member is able to fund its losses, members are only responsible for their own underwriting results, from their share of the syndicates they support.

Lloyd's Chain of Security comprises of four components, as described in Figure 3 overleaf.

The first of these components is the "Premiums Trust Funds" containing the working capital of syndicates; the second is the capital lodged by members as their "Funds at Lloyd's", based on a requirement calculated using Lloyd's Risk Based Capital (RBC) system; the third is a charge on individual members other declared assets or "Other Personal Wealth" and the fourth is the NCF. As well as an insurance contract providing protection to the NCF, Lloyd's may also call from members' Premiums Trust Funds an amount up to 3% of members' premium limits in aggregate, in any one year [Sellek].

**Figure 3: Lloyd's Chain of Security**



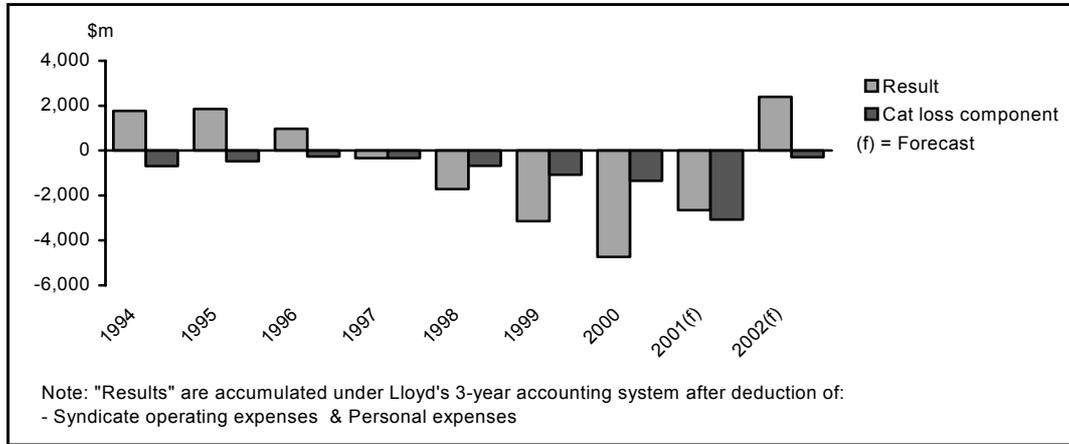
Source: Lloyd's Global Results 2002

## 2.2 Systemic and Catastrophic Risks

The above description of Lloyd's gives an idea of the breadth of activity and significant financial resources available to the market to ensure the security of policyholders. Through these strengths, Lloyd's is able to take its place as a major player in the catastrophe, large and specialist risk markets. However, as Piper Alpha (1988), Hurricane Andrew (1992) and the Northridge Earthquake (1994) demonstrated, significant aggregations of risk can occur within the market that can impact the underwriting performance of Lloyd's.

The importance of catastrophic risk to the performance of Lloyd's is illustrated in Figure 4 overleaf.

**Figure 4: Contribution of catastrophe loss to Lloyd's global results over recent years**



Source: Lloyd's Global Results 2002, Market Risk & Reserving, July 2003

The late 1980's and early 1990's saw the emergence of Lloyd's greatest challenge with the massive accumulation of losses arising from Asbestos, Pollution and Health liability claims from the US. The concentration of these losses within a portion of the membership threatened the very survival of the market, leading to the Reconstruction and Renewal (R&R) process and the creation of Equitas, reinsuring the market's pre-1993 run-off liabilities.

Realistic disaster scenarios were first raised in a bulletin issued in June 1994 entitled "Syndicate Business Plans – Best practice Guidance", which stated that "every syndicate will be required to produce a 'disaster plan' showing the impact of realistic disaster scenarios". A further bulletin in May 1995 suggested a number of scenarios, with estimated original insured loss figures. [Humphreys]. These scenarios have evolved over time to form the basis of the present RDS process.

### **3 CURRENT REALISTIC DISASTER SCENARIO (RDS) PROCESS**

#### **3.1 Objective and Uses**

The objective of the current RDS process is to provide estimates of syndicates' exposures to key aggregating risks within the market. The loss estimates provided by syndicates are on both a gross (before reinsurance) and net (after reinsurance) basis, and include details of anticipated reinstatement premiums receivable and payable following each event, from which a final net result is derived.

The results of the process are put to a number of uses: to estimate syndicates' aggregation exposures; to estimate the market's overall exposure to catastrophes; to provide input into the Risk Based Capital assessment that underlies the Funds at Lloyd's requirements of members; to assess the resilience of the Chain of Security; to report to Central Fund insurers; to evaluate the potential exposure to particular reinsurers; and to provide information to the FSA and other regulators.

#### **3.2 The RDS Events**

There were sixteen RDSs in the 2003 RDS exercise, five of which are "Specified" by Lloyd's and which must be completed by all syndicates, covering:

- Californian Earthquake;
- Florida Windstorm;
- New Madrid Earthquake;
- European Windstorm;
- Japanese Earthquake.

As these events are specified in terms of their location and magnitude, syndicate results can be aggregated to arrive at an estimate of the Lloyd's market exposure.

The remaining eleven events are less tightly defined, requiring judgement from syndicates to reflect their own maximum potential exposures, covering:

- US Windstorm – \$50 billion event;
- Marine Event – either a collision between a tanker and a cruise vessel, or loss of a major US owned passenger vessel;
- North Sea – loss of major complex;
- Aviation Collision – 2 aircraft over a major US city;
- Major Risk Loss – to the syndicate’s largest single risk;
- Space Storm – based on loss of six in-orbit satellites;
- Liability – from one of: US “laddering”; UK pensions mis-selling; failure/collapse of major corporation; failure of a merger; or failure of a construction project;
- Political Risks – a deteriorating political and economic environment in the syndicate’s largest exposed country;
- Second Event – assume that a US windstorm comparable to Hurricane Andrew occurs shortly after an earthquake comparable to the Northridge Earthquake, which is then used to assess the adequacy of reinsurance protections;
- Alternatives A and B – further events chosen by the syndicates themselves.

The Second Event RDS must be completed by all syndicates.

### **3.3 Syndicate Returns**

The RDS process is run annually, based on exposures as at 1<sup>st</sup> April, with syndicates required to enter data using software downloaded from the Lloyd’s Market Returns Website.

The required data is comprehensive, detailing not only gross, net and reinstatement premium estimates, but also broken down by broad business class, with reporting of the aggregate exposure and “PML” multipliers used in determining the gross loss.

Reinsurance recoveries are reported by individual reinsurer using London Outwards Reinsurance Scheme (LORS) codes. Aggregation of these figures enables the identification of key reinsurers and the security profiling of Lloyd's prospective reinsurance receivables. Data is also required on the estimated cash-flow profile for each scenario and the anticipated sources of funding for the largest catastrophe for each syndicate.

### **3.4 RDS Playback**

As time has passed, we have been able to provide clearer guidance with less ambiguity in the definition of events. However, a great range of judgements are involved in the calculation process and syndicates' returns reflect this.

Notwithstanding these modelling uncertainties, there are still wide variations in the risk appetites of syndicates. To protect the Franchise, Lloyd's needs to ensure that no syndicates are running exposures that are markedly out of line with the market's risk profile and the risk tolerance of their investors. For this reason, we have in the past provided summary benchmarking data to syndicates and this year, for the first time, will provide a detailed analysis of each syndicate's position within the market. A sample analysis for £Sterling exposures is shown in Appendix I.

This analysis provides a graphical summary of the range of results presented by syndicates as well as a ranking of each syndicates' results. For instance, a syndicate will be told the ranking of its gross and net loss estimates under the Californian Earthquake scenario in absolute monetary terms and as a proportion of capacity. They will then be able to gauge their relative loss exposures in comparison with the rest of the market.

## 4 THE RDS OVERHAUL

### 4.1 Background

The proper measurement and management of catastrophe exposures was highlighted in the Chairman's Strategy Group Consultation Document, issued in mid 2002, which set out underwriting guidelines for Franchisees.

*Lloyd's has experienced significant losses in the past due to catastrophic events. The market should and will continue to underwrite such risks in the future. However, improved analytical approaches and more controlled risk exposure guidelines are required to limit the exposure of each syndicate and the market as a whole to such catastrophe risks. For the underwriting of catastrophes, the following guidelines are proposed:*

- (a) *"Catastrophe exposure should be analysed using tools or methods that are approved by the franchisor."*

*The franchisor will not mandate the use of specific catastrophe modelling tools or software. Each franchisee, however, will be required to show that it uses one, or a selection of, analytical tools or techniques that, together, give a thoughtful and objective picture of the exposures they have.*

- (b) *"Each franchisee should manage to a minimum return period agreed by the franchisor."*

*The franchisor will propose a return period for each major class of catastrophe exposed business that each franchisee should manage to.*

- (c) *"The maximum gross and net exposures to a single Lloyd's specified Realistic Disaster Scenario (RDS) event for a syndicate are up to 75% and 20% of syndicate capacity respectively."*

*The capacity (and hence capital) of any syndicate should not be threatened to a considerable extent by any one RDS event. Franchisees cannot be allowed in future to risk unreasonable exposures to their syndicates' own capital or the Central Fund in this way.*

Against this background, the Franchise Business Plan for 2003, identified seven strategic imperatives with the second being "to have an outstanding risk management capability throughout the Franchise". A number of development projects were then identified through which this imperative would be achieved, including the subject of our paper, "Review and overhaul the Realistic Disaster Scenario model".

As an inexact science, the estimation of catastrophe exposures through the RDSs has been under constant development since its introduction in 1995, with new scenarios being introduced and more precise guidance provided on the scenarios and modelling assumptions that syndicates should use. However, the CSG proposals, with the increased reliance that would be placed on RDSs through the Franchise Guidelines, and the creation of the Franchise structure highlighted the importance of catastrophic risks and presented an opportunity to make significant improvements to the existing arrangements.

Moreover, developments in risk modelling software and their adoption within the market created an opportunity to realise the benefits of more accurate risk assessment, and align the RDSs with up-to-date technology and the more comprehensive exposure data that was being used to support it.

Consideration of key aggregation risks to Lloyd's and the opportunities presented by improvement in risk modelling and exposure data led to the identification of four work-streams that form the basis of the RDS Overhaul. These are discussed briefly below.

## **4.2 Natural Catastrophes**

An increasing number of Franchisees now use catastrophe risk modelling, software provided by companies such as RMS (Risk Management Solutions), AIR (Applied Insurance Research) and EQECAT. This development is in line with the recommendations from the Chairman's Strategy Group quoted above.

We were presented with the opportunity to exploit the increased adoption of catastrophe modelling software and the technical knowledge that has developed within the Franchisees. To do this, we have established a Natural Catastrophes Market Experts Group (MEG) comprising technical specialists from around the market. This group is helping us develop a new approach to the assessment of aggregate exposures for the main risks underlying the five existing Specified RDSs.

Our work with the MEG is on-going, with a target completion date of the end of this year, including a consultation process involving the wider Franchisee community. However, we have already identified a number of key changes that we intend to introduce, which are discussed below.

### **4.2.1 Insured Industry Loss**

A principle aim of the overhaul process is to improve the consistency (particularly between syndicates) and robustness of the results. A great deal of debate and uncertainty surrounds the “return period” or probability that is allocated to particular catastrophic events, both within the market and between the risk modelling companies. We therefore propose to use the more objective and intuitive measure of the insured industry loss to classify our scenarios.

By using the insured industry loss we will be able to verify that the individual syndicates (and Lloyd’s itself) have an appropriate level of exposure, which will allow them to benefit from the depletion of industry capital that will result from a major loss event.

### **4.2.2 A Number of Different Sized Scenarios**

In order to gain a deeper understanding of the risk profile of syndicates and the Lloyd’s market, we also intend to set more than one scenario within each of the five main hazard areas. For example, we may specify a \$10 billion, \$30 billion and \$50 billion scenario in assessing the Californian Earthquake hazard. The results from this assessment will show the relative proportion of the loss that can be expected to rest with the market, improving our understanding of its relative resilience and the risk profile of the Chain of Security.

### **4.2.3 Scenarios Defined on an Expected Average Loss Basis**

We also intend to provide detailed assumptions for a hypothetical scenario based on the *average* of events that lead to insured industry losses of the assumed size. That is, each “scenario” will not correspond to a particular event, but to the average of a range of plausible events that would give rise to a similar industry loss. The benefits of this approach are that there will be less ambiguity in the assumptions used by syndicates and the scenarios will generate a more stable result that is less sensitive to the particular experience of single exposures.

This latter point can be illustrated by considering a simplified case with two properties, A and B, and two plausible events I and II. In event I, A is 100% destroyed and B is undamaged, and the reverse occurs in event II (A undamaged, B 100% destroyed). If a Lloyd's syndicate insured only one of the properties then our choice of which single event should define the RDS would determine whether a total or zero loss was recorded, whereas the property is definitely at risk. If, instead, we took the average damage from the two plausible events, both properties would show a 50% loss, which is a fairer measure of the risk.

Whilst there are potential dangers in adopting an approach that will understate the volatility that can be expected in practice, we believe that the benefits in the robustness and consistency of the results override this.

#### **4.2.4 ACORD Data Standards for Exposure Data**

Lloyd's endorsed the ACORD data standards initiative earlier this year, which provides exposure data standards for open market property and binding authority business, and will allow the efficient transfer of data between clients, brokers, insurers and reinsurers. Further details can be accessed at the link given at the end of the paper. Developments to improve the provision, transfer and use of exposure data are critical to the success of our own project and to increasing the efficiency of the Lloyd's market.

### **4.3 Terrorism Risks**

The attacks on the World Trade Center had a fundamental impact on the perception of terrorism risk, particularly in relation to aviation business and the potential for terrorists to strike targets in the United States of America. The potential risk to insurers from terrorist attacks is now firmly on the agenda for management, rating agencies and the regulators. This work-stream is therefore seeking to develop a scenario by which we might quantify the potential impact for Lloyd's of a major terrorism attack.

At the time of writing this paper we have not yet finalised the scenario that syndicates will be asked to model, which will come under an ad-hoc RDS exercise in the fourth quarter of 2003. However, it is our intention to look at a scenario with concentrated property exposures in the US and to ask syndicates to calculate their exposures both with and without assumed recoveries under the US's Terrorism Risk Insurance Act 2002 (TRIA) programme. This will allow us to understand the potential liquidity exposure to Lloyd's that will arise in funding the original loss prior to any recovery from the federal programme.

Terrorism risk is clearly difficult to model. In contrast to the forces of nature, the hazard can be characterised as intentionally malicious, with the aim of maximising damage and disruption, adapting its behaviour in response to the efforts of counter-terrorism organisations. This adaptation can be seen in the selection of softer, non-military, targets in the attacks on the UN in Iraq and in Bali.

Whilst we will attempt, through the aforementioned Terrorism Risk RDS, to highlight the potential of this risk and arrive at some measure of the potential loss and funding impact were a major event to occur, the truly unpredictable nature of a future occurrence (not least, in which country it might occur) means that greater reliance has to rest on the aggregation monitoring and modelling systems of the syndicates, and on the judgement of underwriters.

In this regard, we have seen the widespread adoption of geographical aggregation monitoring systems that are able to calculate a syndicate's exposures within a given damage "footprint". For example, a "footprint" might be a 250m radius circle, centred on a landmark building or zip-code, within which a syndicate's aggregate exposure would be calculated and a limit placed by the syndicate upon the maximum value that it will accept. More sophisticated systems are able to search geographical concentrations of risk, without having to specify a target building.

We intend to repeat the Terrorism Risks RDS in the April 2004 annual exercise, and use this and other research to keep abreast of the potential exposure to Lloyd's.

#### **4.4 Liability Risks**

In our opening remarks we mentioned the major threat that was posed to Lloyd's by its long tail liability exposures. Many things have changed in the liability market, benefiting from the lessons learned in that time, such as restricting cover to "sudden and accidental" injuries to workers and stricter definitions of events in reinsurance programmes. However, the fundamentally unpredictable nature of the occurrence of claims and their quantum means that the aggregation of liability exposures must take its place amongst the key risks faced by Lloyd's.

We do already have a non-specific RDS for liability risks, as described in section 3.2. However, we believe that much more work needs to be done to gain a better understanding of the potential sources of liability aggregations and to develop our modelling capabilities to understand the nature of new cases and the range of potential outcomes. We shall be reviewing the existing liability RDS prior to April 2004, but will also, in the meantime, be carrying out regular reviews of emerging and potential sources of risk, in collaboration with the market, developing our own understanding and expertise in this area.

#### **4.5 Marine and the rest...**

The final work-stream under the RDS Overhaul is for “the others”, under which we intend to review all of the existing RDSs, although we do not expect to make fundamental changes to the scenarios themselves, and to consider whether there are any other aggregation risks that should be addressed through an RDS.

At present, we are working with a group established under the Lloyd’s Market Association (LMA) to look at the realism of the existing Marine RDS scenario, to place it in a similar context to the natural catastrophe events and to arrive at a more consistent approach amongst underwriters towards selecting their “PML” assumptions (which define the proportion of the total value at risk that is damaged). Given the importance of the marine market to Lloyd’s, and vice versa, we are aware that the sensible implementation of appropriate aggregation measures will have a significant bearing on the effectiveness of the new Franchise arrangements.

## **5 What Value Loss Modelling?**

In this final section, we discuss some of the concerns we have regarding the use of models in supporting key business decisions. These are encapsulated in George P E Box's quote "*All models are wrong – but some models are useful*".

In modelling catastrophes we are all at a distinct disadvantage, in that there simply aren't enough of them, happening often enough, to be confident about their frequency and magnitude. This difficulty is further exacerbated by the fact that underlying exposures and their vulnerabilities (for example in looking at the earthquake resilience of new buildings in California – are they built to code? – or the vulnerability of new technologies used in businesses and our homes) are not constant. Most frustrating, we won't know the implications of these changes until the next catastrophe occurs.

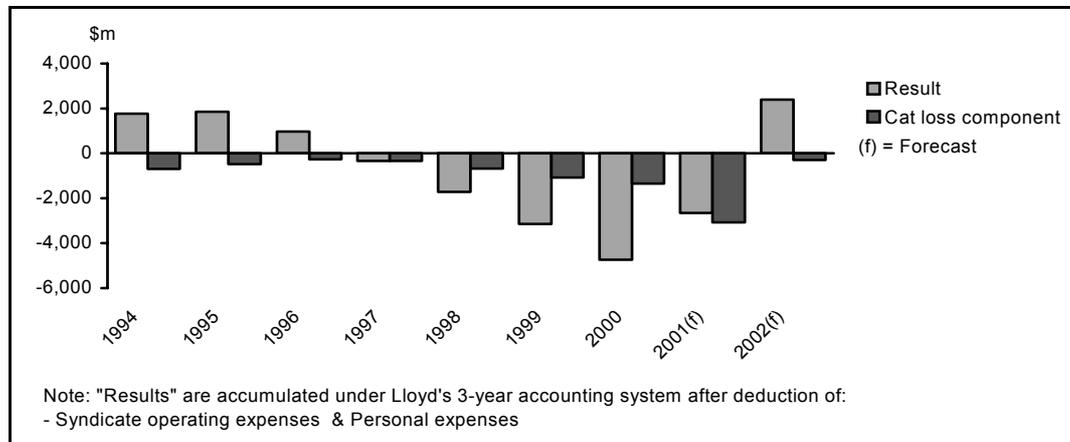
### **5.1 Risk Pricing**

It is useful to consider the existing (or, we should say, traditional) mechanism that is used to price catastrophe risks (and other less predictable risks, like liability business), whose functioning can be discerned in the infamous "underwriting cycle".

In the absence of a consistent and objective measure of catastrophe risk, the market mechanism of supply and demand supports pricing decisions over the longer term.

Figure 4, which is repeated overleaf and describes the performance of the entire Lloyd's market rather than just catastrophe underwriting, helps illustrate this point.

**Figure 4 (again): Contribution of catastrophe loss to Lloyd's global results over recent years**



Source: *Lloyd's Global Results 2002, Market Risk & Reserving, July 2003*

The market mechanism works through (re)insurers providing catastrophe risk cover at a price that is low enough to win business from competitors but hopefully high enough to ensure the continued profitability or survival of the insurer.

Every once in a while a catastrophe will arrive that tests the adequacy of pricing and those who charge enough (or have enough capital from other sources) will survive to reap the benefits of reduced competition in the market, until the apparently attractive returns entice others (or simply increased capacity from existing players) into the market, increasing the downwards pressure on pricing. Figure 4 shows that, although the attrition of unprofitable underwriting was already turning the market during 2001, the catastrophic losses of 2001 accelerated the market's return to profitability.

In theory, in the long run, the market mechanism should properly price catastrophe risks, although the destruction of value in the Property & Casualty industry in the US that was funded through favourable investment returns, witnessed at the trough of the last cycle, suggests the "price" includes a fair amount of "discounting"!

Admittedly, this is a trite description of a complex and subtle process; great pain (for investors and employees) is a necessary part of the market's "discipline". Clearly, great value would arise from being able to consistently and objectively price catastrophe risk exposures – which is the promise offered by catastrophe risk models.

## **5.2 Catastrophe Risk Models**

In our work on the overhaul of the natural catastrophe RDSs, we have been fortunate to meet with personnel from the three main risk modelling companies and a number of their clients working within the Lloyd's market.

The models themselves are remarkable achievements in terms of their scale, their programming and the science that underlies the modelling of both the natural hazards and the vulnerability of insured properties. The people who use the models have to deal with massive volumes of data and many have developed an intuitive understanding of the models' output. Their specialist skills and the increasing use of risk modelling software by insurers means that they are much in demand. The catastrophe risk modelling industry is one to watch!

For those who are new to the area, we set out below a brief description of the basic methodology that underlies the catastrophe risk models, which is based on three components of risk: hazard, vulnerability and exposure, over which is overlaid the financial modelling of the (re)insurance contracts themselves.

### **5.2.1 Capturing Hazard Occurrence and Magnitude**

The most interesting scientific challenge in modelling catastrophes is to predict the likelihood and magnitude of future events, whether an earthquake, flood or windstorm.

Historical event records, supplemented in some cases by pre-historic geological records of major events that have affected the build up of sediment or rock formations, are combined with present day understanding of the nature and underlying mechanism of these forces of nature to build a picture of a hazard's potential. Typically, this picture is captured in a loss catalogue from which the modelling process will sample, generating the range of potential losses.

### **5.2.2 Capturing Vulnerability**

Modelling this component of risk relies upon the application of engineering knowledge, to understand the nature of different structures and to predict their behaviour under different conditions (e.g. varying levels of ground acceleration during an earthquake).

A great deal of empirical analysis underlies the assessment of vulnerability, which by its nature can only be “after the event”, and the wide variety of structures involved mean that many different classifications of properties are needed to capture these variations. Nonetheless, the models are able to incorporate both an estimate of vulnerability and of the uncertainty that will surround the extent to which a particular building will be damaged.

### **5.2.3 Capturing Exposures**

Exposure information is the foundation on which risk modelling is built. Collecting this data should be akin to a stock-taking exercise, recording the location, value and attributes of each item. Historically, this data has been of variable (i.e. often poor) quality.

However, the widespread adoption of risk modelling software, the recognition by underwriters of the importance of obtaining accurate exposure information and the stronger bargaining position that underwriters hold as a result of the current state of the insurance cycle has led to a marked improvement in the quantity and quality of exposure information being provided. It is against this background that we hope that the ACORD data standards initiative will ease the transfer of data and enable greater focus to be placed on its quality and realising its value.

### **5.2.4 Modelling Financial Contracts**

The third area of expertise, to add to the scientific and engineering ones described previously, relates to modelling the financial behaviour of insurance and reinsurance contracts. This is an area where the idiosyncrasies of the (re)insurance market present a further, though probably less threatening, challenge to the risk modelling process.

## **5.3 Responsible Use of Models**

From the above it can be seen that there are many sources of uncertainty in the modelling process, and the risk modelling companies provide estimates of the uncertainties in their results. However, we believe (and we would welcome evidence that this belief is mistaken) that, when pricing risk, too great an emphasis can be placed on the central (or expected) results of the modelling process by model users and that too little weight is given to the range of values that the actual losses might take.

There are differing opinions as to the greatest sources of uncertainty, whether it is the probability of occurrence of the hazards, the proportion of damage suffered by the affected properties or the actual data that describes the properties themselves. The quality of the final results can only be as good as the least reliable of these components, which is a significant challenge to the level of certainty that can ultimately be achieved using the models.

What the catastrophe models offer, based on scientific data and research, is the opportunity to understand the dynamics of (and therefore the uncertainties underlying) the loss process. From this fuller understanding, more appropriate pricing of the risk (particularly the uncertainties) should follow.

### **5.3.1 Calibration to Catastrophic Losses**

An important test of the models is the extent to which they can reproduce the losses from past events. However, this approach does have inherent dangers, particularly if there are flaws in the data used to describe the event, the underlying exposures, the insurance contracts and the losses themselves.

Also, given the reliance placed on empirical analysis in calibrating the models, there won't be many independent events against which to objectively test the models, other than when a new catastrophe occurs. As mentioned previously, purely from a modelling perspective, it would be good to have more catastrophes!

We are concerned that the risk modelling companies may be under pressure to focus on matching the losses from past events. The convergence of the different catastrophe models around past loss data may reduce the extent to which a healthy diversity of opinion is available to the market and the wider insurance industry in evaluating and pricing risk, with the potential to generate a systemic risk on a par with that which drives underwriting cycle.

### **5.3.2 Watching the Competition**

Another lesson that we have learned from our work on the overhaul of the natural catastrophe RDSs is that there is very strong competition between the three main risk modelling companies. This provides definite advantages in terms of the pressure on the companies to keep abreast of each other, improving the functionality and accuracy of their software and models.

However, we believe that competitive pressure, in combination with the need to meet the expectations of clients, might force companies to converge further than just in relation to past catastrophes. This pressure might generate a collective behaviour where loss estimates are a function of clients' and competitors' results and the resulting "consensus" will lack an objective basis.

## **5.4 The "Value Added" of Risk Models**

The above comments are not intended to undermine the value that risk models can deliver, but try to point to a few factors that users should be aware of in using the models. We therefore finish by explaining why we believe that businesses should be investing in risk modelling, whether from the main software providers or based on their own systems.

### **5.4.1 Exposure Data**

The most important data available to an underwriter in managing a portfolio concerns potential aggregations within that portfolio. Aggregate exposure information, particularly geographical location data, lies at the centre of the risk modelling process. The fact that underwriters using catastrophe risk modelling software have to know where their risks are, their value and their characteristics and that the data must meet a minimum standard of completeness and quality, means that crucial exposure data is being captured as part of the business process.

### **5.4.2 Analysing the Data**

Underwriters are able to analyse their data to gain a far better understanding of the make-up of their risks, whether for use in pricing, aggregations monitoring, reinsurance programme design, or reporting to regulators, Lloyd's or the rating agencies.

Realising the value of data will help generate a continuing demand for adequate exposure information from clients. This will support better quality underwriting decisions and encourage clients to take the collection and provision of exposure data seriously. Clients who do so can be expected to have better risk management practices in place (they know their risks) and to have a reduced propensity to claim.

### **5.4.3 Embedding Systems**

The change in the capital base of Lloyd's, as illustrated in Figure 2, has been accompanied by consolidation amongst the syndicates operating in the market and the emergence of a smaller number of larger syndicates, often backed by corporate capital. The performance of a syndicate now depends as much on the robustness and consistency of its underwriting systems and procedures as it did formerly on the individual skill and/or flair of its underwriter.

Catastrophe risk models provide a common platform on which to assess, price and monitor exposures, with the potential to work to a consistent basis. However, as with all systems it is important that these systems are embedded in the business process and are properly managed, in order that they can deliver improved levels of risk control.

## **6 CONCLUSIONS**

In this paper we have sought to describe our on-going work on the overhaul of the RDSs and to make some comments on the use of catastrophe risk models.

There is no simple answer to the problem of predicting large and rare events, but a systematic approach to understanding their dynamics and the uncertainties that inevitably emerge in trying to estimate potential losses will provide returns in terms of improved aggregations management and consistency in pricing. We expect developments in this area to continue for a number of years, with renewed interest when the next major catastrophe emerges, when everyone's modelling will be put to the test!

## **7 REFERENCES**

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Humphreys, Robert – "*What is the purpose of the Lloyd's specific Realistic Disaster Scenarios?*" - Fellowship Dissertation for CII, 2002

Lloyd's Global Results, 2002

Sellek, Roger – "*Coping with Catastrophe Risk within a Risk Based Capital framework*", to appear in Aon Re Hazards & Capital Risk Management Conference Series, 2003

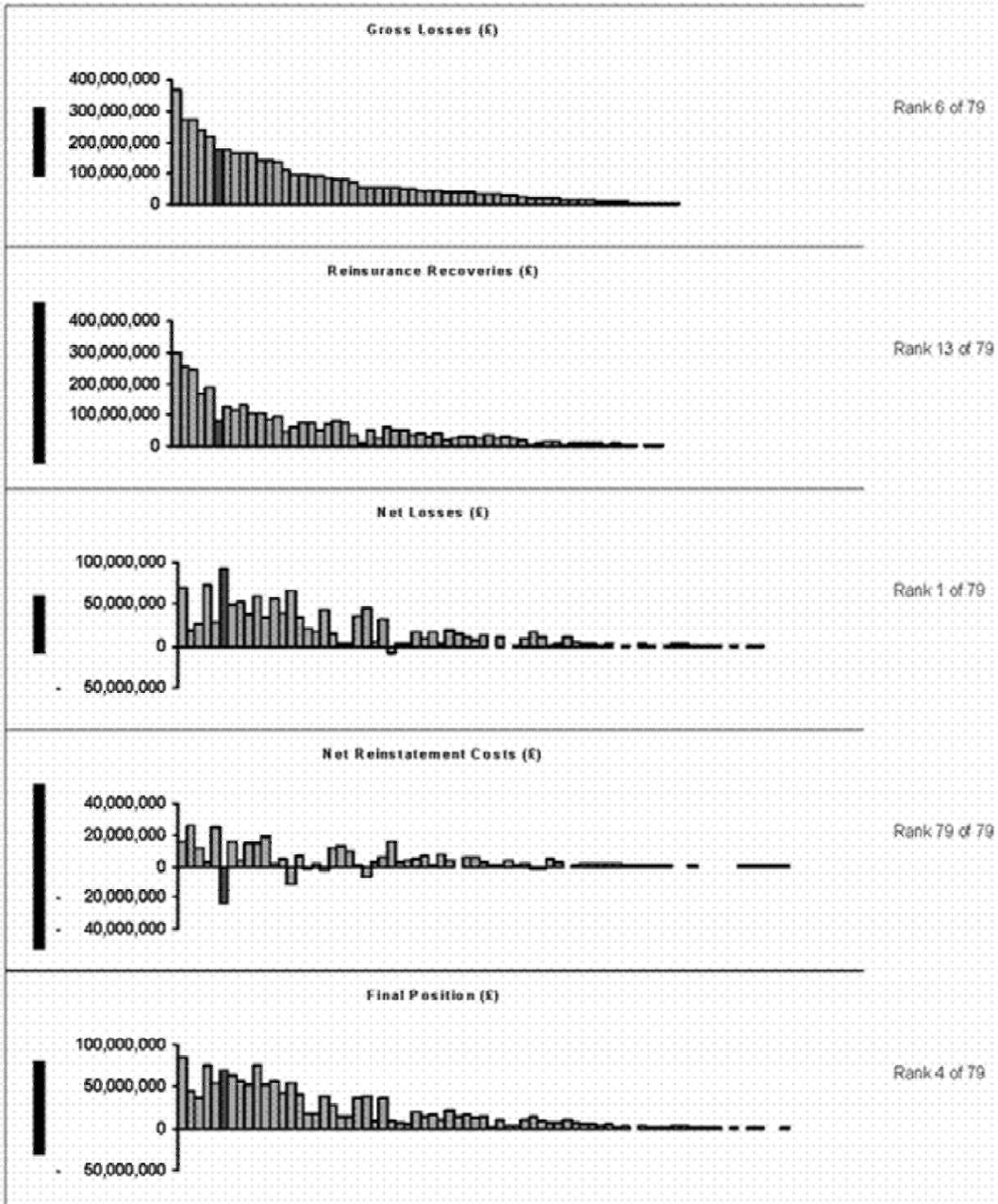
## **8 ACORD DATA STANDARDS LINK**

Go to [www.acord.org](http://www.acord.org); search for "Property & Casualty XML Documentation". You will have to complete a terms and conditions agreement before gaining access to the guidelines.

## Appendix I

### Specific US Earthquake 2003 Benchmarking Analysis for Syndicate ##

#### Results in £Sterling, sorted by Gross Loss



Notes:  
Syndicates sorted by Gross Loss  
The analysis is based on RDS Returns as at 1 April 2003  
Figures do not include any adjustment for bad debt