THE SECURITISATION OF INSURANCE RISK

1997 GENERAL INSURANCE CONVENTION

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Working Party Members

Amer Ahmed
Richard Bulmer (Chairman)
Peter Clark
Jon Collins
Graham Fulcher
Maurizio Lualdi
Esmée Robinson
Jeff Sayers
Alan Spence
Stephen Walker
THE SECURITISATION OF INSURANCE RISK

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THE SECURITISATION OF INSURANCE RISK

1 INTRODUCTION

1.1 In 1992 the Chicago Board of Trade launched a series of insurance futures and options contracts. These are based on indices linked to the incidence of natural catastrophes in specified regions of the USA. At the time, this was hailed as a major and revolutionary development within the insurance industry. However, although trading volumes in these contracts have picked up in recent months, volumes remain relatively limited, apparently because there are currently more natural buyers than sellers of such instruments.

1.2 There were then few major developments in securitisation until 1995. However, during the last two years, several insurance entities have issued a diverse range of investment instruments where the investment return is linked in some way either to the incidence of insurable events or the performance of an insurance portfolio. Instruments which have been launched or proposed include:

- Catastrophe bonds, where the return on the bond is linked to the incidence of natural catastrophes.

- The securitisation of an individual insurance portfolio, where the return on an investment instrument is related in some way to the profitability of insurance business written within the portfolio.

- Contingent capital facilities, where the issue of debt or equity capital is linked to the incidence of natural catastrophes or the performance of an insurance portfolio. In some cases, the provision of capital is not dependent on the prior occurrence of an insurance event.
1.3 Against this rapidly changing background, the Working Party has produced this paper with the following objectives:

- to explain why there has been an increasing level of interest in the securitisation of insurance risk.
- to describe the more significant investment instruments which have been launched or proposed in the last two years.
- to analyse these instruments, and to discuss their individual advantages and disadvantages. A substantial proportion of the early issues failed or were withdrawn, and we explore in this paper why this was so. More recent issues have met with a greater degree of success.
- to suggest possible future developments which may take place during the next few years in the area of securitisation of insurance risk. In particular, we consider whether or not, as some people suggest, securitisation will fundamentally change the way insurance and reinsurance are written.

1.4 For the purpose of this paper, we have defined securitisation of insurance risk to be 'any method which facilitates investment directly in insurance risk'. However, there is no unique definition which commands wide acceptance in the market.

1.5 We have considered securitisation from a number of perspectives:

- the insurer;
- the investor;
- the traditional reinsurer.

If securitisation is to develop, it needs to be attractive to all parties which are involved.
1.6 A new exchange for catastrophe risks, 'Catastrophe Risk Exchange' (CATEX) was opened in New York in October 1996, and a similar exchange is planned for Bermuda. A brief description of these exchanges is included in section 4 of the paper for completeness, although they do not fall strictly within some definitions of securitisation.

1.7 We have also provided a brief update of the current position regarding insurance futures and options (see section 5). This subject was covered in detail in a paper by J P Ryan et al, presented to the 1993 General Insurance Convention.

1.8 A number of case studies based on recent securitisation deals are set out in the Appendices to this paper. These case studies are referred to extensively throughout sections 2 and 3 of the paper.

1.9 The views expressed in this paper do not necessarily reflect the views of our employers, or even of all members of the Working Party. In such a new and rapidly developing area, we were not surprised to find that members of the Working Party had divergent views on certain issues.

1.10 The content of the paper was finalised at the end of June 1997 and does not reflect any subsequent developments. The Working Party intends to provide an update of recent developments in its presentation to the 1997 General Insurance Convention.

1.11 The case studies in the paper are based on information within the public domain, including in some cases material published by the issuers of the relevant investment instruments. Although we have attempted, where possible, to validate this information, we accept no responsibility for any errors which are contained in the paper. We recommend that readers of this paper should seek their own professional advice before taking any action relating to the securitisation of insurance risk.
2 SEURITISATION IN THE INSURANCE INDUSTRY

What is securitisation?

2.1 The securitisation of insurance risk can be thought of as any method which facilitates investment directly in insurance risk. An actuary might choose to define it as the repackaging of insurance-type cashflows into security-type cashflows.

2.2 Essentially, an insurer issues an investment instrument (for example a bond) under which the payments (coupons and/or redemption payments) to investors are related in some way to the claims paid by the insurer. Securitisation is thus a possible alternative to reinsurance.

2.3 However, securitisation is not restricted to the insurance industry, and is much more developed in other sectors of the economy. In general, securitisation can be defined as the pooling and repackaging into securities of future expected cashflows which are contingent on future events.

2.4 Securitisation originated in the United States residential mortgage market around 15 years ago. Fixed interest securities were issued with coupon and redemption payments being dependent on the future performance of portfolios of residential mortgages. The risks to which investors were exposed included:

- the risk of default on the part of the householders;
- the possibility of early redemption of the mortgages.

2.5 Since then, securitisation has been applied in many other areas including future credit card payments and personal loan payments, and now to the insurance industry.

2.6 Tables 1 and 2 on the next two pages show details of some of the securitisation deals that have been proposed or completed so far in the insurance industry.
Table 1 - Securitisation deals

<table>
<thead>
<tr>
<th>Insurer</th>
<th>Date</th>
<th>Amount</th>
<th>Description</th>
<th>Indexed?</th>
<th>Risks covered</th>
<th>At risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hannover Re</td>
<td>1995</td>
<td>$85-100m</td>
<td>Notes/preference shares</td>
<td>No</td>
<td>Multi-continental cat risk</td>
<td>Both</td>
</tr>
<tr>
<td>AIG Combined Risk</td>
<td>May 1996</td>
<td>$10-25m</td>
<td>Zero coupon note</td>
<td>Yes</td>
<td>Multi-continental cat risk</td>
<td>Capital</td>
</tr>
<tr>
<td>Cat Limited</td>
<td>N/C</td>
<td>$25-50m</td>
<td>Note issued at discount</td>
<td>No</td>
<td>NE US - hurricane losses</td>
<td>Capital</td>
</tr>
<tr>
<td>ACE</td>
<td>N/C</td>
<td>$35m</td>
<td>Note</td>
<td>Yes</td>
<td>US catastrophe</td>
<td>Capital</td>
</tr>
<tr>
<td>California Earthquake Authority</td>
<td>N/C</td>
<td>$3,500m</td>
<td>Note</td>
<td>No</td>
<td>Californian earthquake</td>
<td>Coupon</td>
</tr>
<tr>
<td>US Automobile Association</td>
<td>N/C</td>
<td>$500m</td>
<td>Note</td>
<td>No</td>
<td>East Coast-hurricane</td>
<td>Capital</td>
</tr>
<tr>
<td>Hannover Re</td>
<td>Nov 1996</td>
<td>$100m</td>
<td>Portfolio linked swap</td>
<td>No</td>
<td>Range of classes &amp; territories</td>
<td>N/A</td>
</tr>
<tr>
<td>St Paul Re/George Town Re</td>
<td>Dec 1996</td>
<td>$68.5m</td>
<td>FRN/Preferred equity</td>
<td>No</td>
<td>Range of classes &amp; territories</td>
<td>Mixed</td>
</tr>
<tr>
<td>Winterthur</td>
<td>Feb 1997</td>
<td>$290m</td>
<td>Convertible subordinated bond</td>
<td>No</td>
<td>Swiss auto hail (frequency of losses)</td>
<td>Coupon</td>
</tr>
<tr>
<td>Reliance Nacional</td>
<td>Mar 1997</td>
<td>$50m</td>
<td>FRN at discount</td>
<td>Yes</td>
<td>Range of classes &amp; territories</td>
<td>Capital</td>
</tr>
<tr>
<td>US Automobile Association</td>
<td>Jun 1997</td>
<td>$477m</td>
<td>Notes</td>
<td>No</td>
<td>East Coast-hurricane</td>
<td>Mixed</td>
</tr>
</tbody>
</table>

Note: See paragraphs 2.7 and 2.8 for an explanation of this table.
Table 2 - Contingent financing deals

<table>
<thead>
<tr>
<th>Insurer</th>
<th>Date</th>
<th>Amount</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii Hurricane Relief Fund</td>
<td>October 1994</td>
<td>$500-750m</td>
<td>Credit line</td>
</tr>
<tr>
<td>Nationwide</td>
<td>February 1995</td>
<td>$400m</td>
<td>Surplus notes</td>
</tr>
<tr>
<td>Allstate</td>
<td>June 1995</td>
<td>$1,500m</td>
<td>Credit line</td>
</tr>
<tr>
<td>Florida Windstorm</td>
<td>August 1995</td>
<td>$1,000m</td>
<td>Credit line</td>
</tr>
<tr>
<td>Underwriting Association</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Farm</td>
<td>October 1995</td>
<td>$3,000m</td>
<td>Credit line</td>
</tr>
<tr>
<td>Florida Joint Underwriting Association</td>
<td>December 1995</td>
<td>$1,500m</td>
<td>Credit line</td>
</tr>
<tr>
<td>Arkwright</td>
<td>May 1996</td>
<td>$100m</td>
<td>Surplus notes</td>
</tr>
<tr>
<td>RLI Corporation</td>
<td>October 1996</td>
<td>$50m</td>
<td>Equity puts</td>
</tr>
<tr>
<td>California Earthquake Authority</td>
<td>November 1996</td>
<td>$1,000m</td>
<td>Credit line</td>
</tr>
<tr>
<td>Horace Mann</td>
<td>April 1997</td>
<td>$100m</td>
<td>Equity puts</td>
</tr>
</tbody>
</table>

Note: See paragraphs 2.7 and 2.8 for an explanation of this table.
2.7 In each case the table lists:

- the insurer;
- the date of the issue (N/C refers to deals which were not completed);
- the notional amount of the issue or financing;
- a description of the broad nature of the deal.

2.8 For each securitisation deal, Table 1 also shows:

- whether the securitisation was based on an index (and if so the index used) or whether it was based on the actual losses of the insurer (a so called ultimate net loss deal). In some cases (denoted 'index trigger') the securitisation is based on the actual losses of the insurer, but is triggered if the size of a catastrophic loss exceeds a specific value based on an index;
- a brief description of the risks covered by the deal;
- whether capital, coupon or both are at risk in the event of an insurance loss. Deals which involved the issue of both principal-protected and principal-at-risk bonds are denoted 'mixed'.

Why has the insurance industry started looking to the capital markets as a source of risk capital?

2.9 In the last 5 years, the property insurance industry has paid out over $60 billion in losses. This includes increasingly severe catastrophes such as Hurricane Andrew ($16 billion) and the Northridge earthquake ($12.5 billion). Estimates of the capital backing the US insurance industry are currently of the order of $250 billion.

2.10 Catastrophe modelling software produced by market leaders such as EQECAT or RMS, suggest that the probable maximum loss from a Californian earthquake or a Florida hurricane is of the order of $50 to $100 billion. However, a loss of this magnitude would be too large and sudden to be managed by the insurance and reinsurance industries.
2.11 US wealth in stocks and bonds is approximately $13 trillion. Including real estate in this estimate increases the figure to over $19 trillion. The daily standard deviation of this total investment portfolio is of the order of 70 basis points or about $133 billion (figures from "The Emerging Asset Classes" report by the reinsurance brokers Guy Carpenter). Thus the average daily fluctuation in total financial wealth is greater than the loss incurred resulting from an extreme catastrophe.

Why should securitisation work in the insurance industry?

2.12 We have considered the driving factors behind securitisation from the perspectives of the three key interested parties: insurers, investors and reinsurers.

2.13 Brokers and bankers also have a clear interest in developing securitisation. Indeed, many of the leading publications on securitisation to date have been produced by the major brokers and banks. These organisations are investing large amounts of time and energy into research and development to be at the forefront of product development and access to the capital markets. If securitisation becomes a serious alternative to reinsurance, these leading-edge companies hope to be well placed to assist in structuring and placing deals.

The insurer's perspective

Cost benefit

2.14 One theory is that the transactional costs of securitisation deals should be below traditional reinsurers' and brokers' expenses. Securitisation will thus act as a catalyst towards more efficient market pricing. A more efficient market, combined with potential multiple-year securitisation deals, will improve certainty about future reinsurance and risk management costs, and thus stabilise the high price volatility of traditional reinsurance.
2.15 However, there are a number of counters to this argument. For example, the entry costs into the securitisation arena are currently very high, as it is uncharted territory for all but a handful of major brokers, bankers and insurers. Also, significant basis risk is involved in many deals. (Many securitisation deals are based on published market indices. Basis risk is the risk to the issuing insurance company which arises from any mis-match between the performance of the index and the performance of the insurance company's own portfolio of risks.) Basis risk removes the possibility of pure arbitrage and therefore reduces the market forces pushing towards pricing efficiency and the development of insurance futures and options markets (see paragraph 2.36).

Coverage benefit

2.16 The flexibility and innovation of securitisation deals so far suggest that it would be possible to use this approach to cover unusual risks which would be difficult to place in the traditional reinsurance market.

Capacity benefit

2.17 Securitisation would allow insurers to tap into an alternative and enormous capital base. The sheer size and opportunistic nature of the capital markets are such that risk capital can be provided at times when reinsurance capacity is in short supply.

Security benefit

2.18 An alternative source of capital means a diversification of the sources of protection. Furthermore in most cases the new carriers, who are mainly investment fund managers, subscribe capital up front with the investment return being dependent on the incidence of insurance risk. This has resulted in a significant improvement in credit risk for insurers.
The investor’s perspective

2.19 Investors have historically invested in insurance risk via equity and bond holdings in insurance companies. The value of this investment is affected not only by the pure insurance risk, but also by management risk, run-off risk, general stock market volatility, etc. Securitisation issues facilitate investment directly in the insurance risk only.

2.20 What do investors want? We can list various features such as diversification, return, liquidity, simplicity, etc., but in essence they require an appropriate trade-off between risk and reward.

2.21 Insurance securitisations are often thought of as having similar investment characteristics to high-yield bonds. Banks package such bonds to provide a range of risk/return characteristics to suit their investors. There are parallels with insurance-linked securities, which can be structured to provide high risk/high return or low risk/low return combinations, with the capital at risk or guaranteed. Appendix F contains a comparison of the risk/return characteristics of the unitholders and preference shareholders in the St Paul Re securitisation issue.

2.22 Empirical evidence would suggest that insurance claims are not correlated with the performance of the other major asset classes. There can be exceptions to this, a recent example being the drop in the Japanese stock market following the Kobe earthquake. However, analysis shows that the correlation coefficients between insurance claims and other asset classes are not statistically distinguishable from zero.

2.23 Investment theory highlights the advantages of an asset that is not correlated with the rest of the investment portfolio, i.e. a zero beta asset. Standard efficient frontier arguments show that, by introducing such an asset, we can reduce the portfolio volatility without reducing the overall yield. Thus adding catastrophic risk to an investment portfolio should improve the overall portfolio performance.
2.24 On a more simplistic level, insurance risk brings additional diversification to an investor's portfolio. Furthermore, each securitisation deal itself can include diversification across a range of risks. For example, the St Paul Re securitisation issue was based on a diverse portfolio of risks.

2.25 The current soft reinsurance market is one explanation why securitisation has not developed as rapidly as some had predicted. If traditional reinsurance solutions meet the insurers' requirements then there is likely to be limited momentum behind the search for new risk capital. Perhaps more importantly, if the price of reinsurance is low, the potential returns available to investors are not attractive enough to drive the process ahead. It is interesting in this context to consider the experience of the California Earthquake Authority (see Appendix A). This was a securitisation deal that failed, because it was replaced by a single layer of traditional reinsurance, underwritten by Berkshire Hathaway at a significantly lower price than the proposed catastrophe bond price. This left the potential investors convinced that, if Berkshire Hathaway was prepared to write the business at a lower price, they had clearly missed out on a good investment opportunity.

2.26 It is also worth noting that investors have already put millions of pounds into other non-insurance securitisation issues, some of which are based on much more surprising variables than insurance risk. Examples of these include aircraft leasing, railway rolling stock, tequila exports, Hollywood films and royalties from David Bowie's back catalogue!

The reinsurer's perspective

2.27 Traditional reinsurers can consider securitisation as both a threat and an opportunity.
2.28 A reinsurer may wish to develop the securitisation approach for a number of reasons:

- as an aggressive move to provide competitive advantage, and improve overall returns from writing insurance and reinsurance business;
- as a defensive response, to prevent the major banks and other competitors stealing away business;
- as a marketing advantage, i.e. it may not be a core element of their business, but they are committed to being innovative and market leaders, and hence want to be at the leading edge of such developments.

2.29 Securitisation enables reinsurers to offer a broader and more comprehensive service to clients. Reinsurers may also use securitisation to develop new roles. For example, they may get involved in the placement of securitisation deals. They would be desirable investors to have on an issue to encourage investors from outside the insurance industry that this is a worthwhile deal.

2.30 Reinsurers may also be able to find a role as "basis hedgers". If reinsurance capital is scarce, a small insurer may find securitisation an unattractive alternative, due to significant basis risk (if index-based) or because it is too expensive (if specific to that insurer). However, a reinsurer might be prepared to offer traditional reinsurance to a number of such insurers, and then hedge its position via an indexed securitisation issue, such as a catastrophe bond.

2.31 The degree of threat posed by securitisation depends upon the type of reinsurer. Catastrophe bonds are clearly a threat to a single-line catastrophe reinsurer. Indeed, one impact of securitisation may be that reinsurers will shift their business focus from a line-of-business approach towards holistic risk management. This will include management of overall return on equity and consideration of both the asset and liability sides of the balance sheet. Thus the distinction between reinsurer and bank will become less clear.
2.32 Some traditional reinsurers will not get involved with securitisation. They may view it as a passing fad, or they may be content to let others do the ground work and suffer the initial expenses of establishing such products. However, they should still view it as a threat, especially as it is a route for the major banks to compete directly with them. Will they have to get involved in securitisation just to stay in the game? Will securitisation be the next 'Direct Line', i.e. the traditional competition says that it will never work and takes no action until it is too late and the market place has been revolutionised? Or, as some major reinsurers believe, will securitisation never be a serious alternative to more traditional reinsurance and risk management solutions? We offer some views about possible future developments in section 7 of the paper.

Problems

2.33 Although securitisation represents an exciting new opportunity for insurers, investors and reinsurers, the development of this market has been constrained by a wide variety of problems and difficult technical issues. Some of these problems are summarised below.

2.34 Many external investors to date have preferred securitisation deals based on external insurance indices rather than the performance of an individual insurance portfolio. However:

- there is currently a severe shortage of suitable indices which have achieved broad acceptance in the market;
- there are many difficult technical issues involved in the construction of such indices;
- investors may be concerned that insurers could manipulate the data underlying the indices;
- insurers may be concerned by the possibility of a mismatch (basis risk) between the performance of an index and the performance of their own portfolio of risks.
2.35 A substantial education process is required before investors are prepared to accept the potential benefits described in paragraphs 2.19 to 2.26. Institutional investors are presented with a wide variety of investment opportunities, many of which are much easier to understand than insurance securitisation deals. Insurance-based securities tend to involve potentially extremely volatile, unpredictable cashflows, which limit the appeal to investors. Issuers of such instruments will need to provide sufficient information in a clear format to enable investors to understand the pattern of risks and potential returns obtainable from their investment. Some non-insurance company investors may be concerned by a perceived imbalance in the access to information, with insurance company investors being at an apparent advantage in understanding such instruments.

2.36 Insurance risk and the performance of insurance portfolios are not homogeneous across the market or even within individual classes of business. Consequently, any market in tradable insurance securities is likely to be relatively illiquid because there is no natural hedge. Although insurance futures and options could be regarded as providing such a hedge, basis risk is likely to severely limit the opportunities for arbitrage between insurance-based securities and insurance futures and options. This in turn reduces the market forces pushing towards pricing efficiency.

2.37 There are many legal, regulatory, tax and accounting issues which need to be resolved before a securitisation deal can be completed successfully. These issues (see section 6) differ from case to case, and have resulted in high transaction costs for the deals completed to date. New technical issues are still being detected, which may not have been considered in previous deals. Consequently, there may be a risk of future litigation against the relevant professional advisers, if a deal goes wrong because of any of these technical issues.
2.38 Investors tend to prefer issues which have been awarded a credit rating by a rating agency. However, rating agencies are having to develop new techniques to analyse insurance-based securities.

2.39 Traditional reinsurance is able to offer additional options and services, often free of charge, although these could be provided by the reinsurance brokers involved in securitisation deals.
3 STRUCTURE OF SECURITISATION DEALS

3.1 In this section we give an overview of the dynamics of the principal types of securitisation deals which have been attempted to date. Tables 1 and 2 (see paragraph 2.6) summarise the securitisation deals attempted to date, and appendices A to K describe and analyse a number of these deals in more detail. Some have been successful whilst others have failed, and we have tried to analyse the factors which have determined the success or failure of the deals.

3.2 Several types of deal fall under the broad title of securitisation. These include mechanisms for risk transfer, liquidity facilities and survival vehicles. The structure of a typical securitisation deal is illustrated by the diagram on the next page.

Catastrophe Bonds

3.3 The first attempt to find capital market solutions for the insurance industry was made by the Chicago Board of Trade (CBOT), which started trading futures and options based on a catastrophe loss index in 1992. Catastrophe futures are customised over-the-counter (OTC) financial instruments tied to an index of industry losses (see section 5 for consideration of some of the issues surrounding the construction of insurance indices).

3.4 Catastrophe bonds can be tied to an index. Alternatively, they can be linked to the catastrophe losses of an individual insurer. This reduces the liquidity of such an asset and also involves greater cost and complexity. However, it avoids the basis risk which is a fundamental problem associated with any index-based instrument.

3.5 The structure of a catastrophe bond is simple. Typically the bond will have a term of 12 months, with an additional 12 months for reporting. The coupon is at a premium over the risk-free rate, but the coupon and, in some cases, the capital repayment are at risk if there is a catastrophic loss in excess of a specified amount. This amount may be based on the loss to the insurer or based on an index, as discussed above.
STRUCTURE OF A TYPICAL SECURITISATION DEAL

Initial Securitisation Cashflows

- Insurance Company
- Premium
- Reinsurance Policy
- Special Purpose Vehicle
- Securities
- Capital
- Investors

Investment in fixed income securities

Cashflow if no trigger event occurs

- Insurance Company
- Premium + Investment Proceeds + Capital
- Special Purpose Vehicle
- Investors

Proceeds from the fixed income securities

Cashflows if trigger event occurs

- Insurance Company
- Reinsurance Recovery
- Special Purpose Vehicle
- Balance of cashflows (if any)*
- Investors

Proceeds from the fixed income securities

* the balance returned to the investors depends on the structure of the issue, and in particular whether the capital invested is at risk.
3.6 It is usual to create a trust or a special purpose vehicle (SPV) through which to issue the securities and invest the funds. However, in some cases the deal takes place directly between the insurer and investors.

3.7 Examples of catastrophe bonds are the proposed Cat Limited bond (see Appendix B) and the United States Automobile Association issue (see Appendix C). A more complex example is the AIG Combined Risks bond, discussed in Appendix D.

**Securitisation of an Individual Portfolio**

3.8 This involves the issue of an investment instrument where the performance of the instrument is linked directly to the performance of an insurance portfolio. Such instruments are sometimes called "portfolio swaps".

3.9 Suppose an insurer (call them I) wishes to protect or hedge a specific part of their portfolio, and they approach a reinsurer/bank/broker (B) to set up the deal.

3.10 An independent actuary may then be commissioned to estimate the expected payments from the portfolio. This analysis is used to define the terms for the transaction or swap. I agrees to pay B the fixed payments determined under the portfolio swap arrangement, whilst B pays the amount of the actual claims. In addition, I pays B a premium for providing this hedge.

3.11 At maturity of the swap, the independent actuary determines the value of the remainder of the portfolio, which B then pays to I.

3.12 B would look to establish an equal and opposite (except the fees!) arrangement (i.e. swap transaction) with a group of institutional investors, perhaps creating a SPV to issue securities on the back of this deal.
Contingent Capital Facilities

3.13 Contingent financing occurs when a bank extends a line of credit to an insurer. The use of this facility may be conditional upon a predefined insurance event or may be exercised at the option of the insurer. In this case, the intention of the insurer will be to use this facility only in the event of a catastrophe. Therefore, to the bank, this product is a straightforward credit risk analysis, but to the insurer it is an alternative for reinsurance.

3.14 Thus banks are able to price contingent capital facilities competitively, since they are loans against the credit-worthiness of an insurer, rather than being based on the expected frequency and severity of reinsurance losses.

3.15 Since contingent financing is designed to provide a company with capital, there is no benefit to the profit and loss account of such a structure, and hence no stabilisation of the insurer’s earnings.

3.16 Using an event trigger, rather than using an option which the insurer can exercise at any time, will improve the pricing of a contingent financing deal. However, most deals completed to date have not been linked to a specific insurable event.

3.17 A good example of a contingent capital facility is the Nationwide contingent surplus notes issue, discussed in Appendix J.

3.18 In some instances, contingent capital facilities have been developed one step further into contingent equity. This is where, on exercising the financing option, equities are issued by the insurer to the bank or reinsurer. In such a case, the distinction between the credit risk and insurance risk that the bank is taking on becomes more blurred. A case study of a contingent equity issue is discussed in Appendix K.

3.19 It is worth noting that banks are usually the providers of contingent financing solutions, rather than traditional investors. This is an area where the distinction between banks and reinsurers is becoming blurred.
Credit Risk - 'Slip Equalisation'

3.20 Investment markets can also be used by insurance companies to hedge reinsurer credit risk.

3.21 Suppose insurer I wishes to take out traditional reinsurance with reinsurer R, but is concerned about security, perhaps because R has a poor credit rating. I approaches a reinsurer/bank/broker B to arrange cover for this credit risk.

3.22 B may be able to front the deal (e.g. if B is AAA rated, I will reinsure with B who then reinsures with R; thus I obtains AAA rated security and B takes on the credit risk). Alternatively, B may guarantee (i.e. write credit insurance upon) the security of R.

3.23 B will then look to place an equal and opposite deal with institutional investors, perhaps via the use of a SPV which then issues securities based on a pool of credit protection deals.

Commentary on deals to date

3.24 Tables 1 and 2 (see paragraph 2.6) contain details of the securitisation deals attempted or completed to date, divided into true securitisation deals and contingent financing deals. Case studies on many of the individual securitisation deals are set out in the Appendices to this paper.

3.25 By comparing the attributes summarised in tables 1 and 2 (and other factors described in the Appendices) with the success (or otherwise) of the securitisation deals, a number of broad conclusions can be reached.
3.26 It is difficult to see a clear preference for either indexed or ultimate net loss deals. (Indexed deals are where investment performance of the bond is linked to the performance of an external index, whereas ultimate net loss deals are linked to the performance of an individual insurance portfolio.) Indexed deals have the advantage of being analysed more easily by non-insurance investors, many of whom feel unable to form an opinion on the likely outcome of insurance risk. They also help to reduce the perception of many investors that there is a serious imbalance between insurer and investor in the access to information about the risk being covered. However, some investors have concerns about the reliability and stability of indices and, more importantly, it is clear that, due to the severe lack of homogeneity of insurance risk, most insurers would prefer securitisations based on their own losses and therefore may be prepared to pay a considerable premium to remove any element of basis risk. Notwithstanding this fact, any successful forwards market or indeed an efficient securitisation market permitting insurers to issue rapidly off-the-peg rather than tailored deals, will need to be based on an established and accepted index (see section 5 on Insurance Futures and Options).

3.27 Investors prefer deals where the risk is diversified. This is considered one of the main reasons for the success of the St Paul Re, Hannover Re and Reliance National deals and for the failure of the Cat Limited and ACE offerings. It is likely that this preference will reduce over time as more new issues are made (and particularly if a secondary market in existing issues can be established) so that investors can diversify by investing in a number of issues rather than expecting to achieve diversification through one issue. The current situation could be compared to equity investors showing a marked preference for investing in conglomerates.
3.28 Investors initially showed a preference for issues where only their coupon payments are at risk and their capital is protected. Many investment funds are guided by internal investment rules in the types of investments they can make and would not be permitted to invest in issues where there is a significant probability of losing all their investment (whatever the expected return). The three main unsuccessful issues by companies during 1996 (USAA, Cat Limited and ACE) all had capital at risk while by contrast the very successful over-subscribed issue by Winterthur had only a very modest amount of risk (with the at-risk coupon representing only a very small part of the overall return). The revised (and successful) USAA issue featured two tranches of notes with different levels of risk/return and the St Paul Re issue was altered from the initially offered deal to feature a similar mix of principal-protected and principal-unprotected instruments. Principal-at-risk issues appear to be becoming more acceptable to the market.

3.29 The preference by some investors for capital-protection appears illogical and inefficient. In many capital-protected issues much of the capital raised is invested (often under trust) in zero-coupon bonds of a sufficient amount to guarantee repayment of the capital at the eventual redemption date. The remaining part of the capital then covers the insurance risk. This means that the investors' situation is just the same as if they had carried out two investments, the first in zero coupon bonds and then a smaller investment in insurance risk with capital fully at risk. Presumably, given a free choice the investors would be unlikely to choose to use the insurer as investment managers for a portfolio of untradeable fixed term zero coupon bonds, so it could be argued that they should prefer to participate solely in the capital-at-risk issue with the freedom to invest the remaining capital as they choose. This should be contrasted with the Winterthur issue where many investors purchased the securitisation instrument precisely because of the attractiveness of the convertible bond which was "blended" with the pure insurance risk.
3.30 Securitisation deals to date have overwhelmingly been based on short-tailed (principally property catastrophe) risks. Securitisation of longer-tailed (e.g. liability) risks will be much more difficult, because of the longer period required to produce a reliable estimate of the ultimate amount of such longer-tailed claims.

3.31 Although this is not shown in Tables 1 and 2, the AIG, USAA, St Paul Re and Reliance National deals all involved an offshore special purpose vehicle (SPV) acting as reinsurer. ACE and Cat Limited both proposed to issue the notes as a direct obligation of the company and this may have contributed to their lack of attraction to investors.

3.32 In almost all cases to date, the full amount of capital has been invested up-front, with no subsequent recourse to the investors in the event of a loss. This has advantages for the insurer of greater security and is an essential part of the SPV approach where the capital subscribed is used to capitalise the SPV and permit it to write a reinsurance contract. However, it could be argued that such an arrangement is inefficient and that there is scope for deals to be designed which give an improved leverage to investors.

3.33 Increasingly, issues are being assigned a rating by a credit agency. This rating can be based simply on the credit worthiness of the insurer (reflecting the risk of them defaulting on their obligations to pay back capital/coupons if the absence of loss occurrences results in such payments being due) or, more recently, on an assessment of the probability of capital loss due to insurance risk. The role of rating agencies in actually assessing the insurance risk involved in a deal in terms of a default probability, will be a very important factor in establishing a viable securitisation market. This is because it will increase the confidence of non-specialist investors, particularly in ultimate net loss deals. In addition, the attitude of rating agencies (as well as regulatory authorities) when assessing the financial strength of a company which has entered into a securitisation deal will be a crucial factor in determining the attractiveness of securitisation to insurers.
3.34 No two deals have been alike in terms of the underlying structure used. The need to establish a unique structure (and deal with the resulting legal, tax and accounting issues) has meant that transactions costs to date have been very high. Standard structures, if these are developed, will be another breakthrough in the growth of securitisation.
4 CATASTROPHE RISK EXCHANGES

History

4.1 The Catastrophe Risk Exchange (CATEX - Onshore) was originally founded by a former New Jersey insurance commissioner. It is licensed by the New York Department of Insurance as a neutral reinsurance intermediary, and opened in October 1996.

Aim

4.2 The fundamental aim of CATEX is to act as a facilitator, taking the tools of the capital market to permit efficient trading of insurance risk. Once trading has become active, CATEX hopes that it will be possible to use the prices of the trades to build prospective price-based insurance indices and 'exchange rates' between different types of risk.

Operation

4.3 CATEX is effectively a computerised risk exchange or trading room, enabling parties to swap insurance risk of any type, either for other risks or (in some cases) for cash. For example, a US property insurer which feels that it is over-exposed to Californian earthquake risk could swap its exposure for the excess motor exposure of a European casualty insurer. There are four parties that can trade at CATEX: Insurers, Reinsurers, Intermediaries and Self-Insureds.

4.4 CATEX has no guaranteed mechanism for trading risk, does not act as a clearing house or provide counterparty guarantee, and does not provide premium and claims handling services. Instead, it provides a secure Intranet system, enabling subscribers to post risks for trading, to access details of other risks being offered and to enter into negotiations with other parties. Initial postings and negotiations can be conducted anonymously with parties eventually agreeing to a simultaneous identity disclosure. The details of any concluded deals are disclosed to all subscribers.
4.5 CATEX subscribers receive access to a range of tools including a detailed history of trades, an Internet search engine, company rating services, on-line news services, loss data services, catastrophe modelling programs and electronic documentation and contract signing features (including suggested standardised contracts designed to remove adverse selection of the actual policies being swapped).

4.6 At April 1997, CATEX - Onshore had 33 subscribers (with another 18 likely to join in the near future). 16 offers had been posted but no trades had been made.

Bermuda

4.7 CATEX are planning (subject to parliamentary approval) to open a second exchange on the Bermuda Stock Exchange (BSX) in the near future. The principles underlying the exchange will be similar, but there will be fewer restrictions on parties that can trade and CATEX are hoping to attract captives, private investors, hedge funds and investment banks. In this way they will effectively give the insurance industry direct access to the capital markets.

4.8 The BSX is also planning for CATEX-Bermuda to become the natural home for the development of the insurance capital markets. Their plans include allowing the trading of insurance derivatives (possibly using indices derived from CATEX trades) and giving listings to the Special Purpose Vehicles established to facilitate securitisation deals (therefore effectively establishing a secondary market in securitisation issues).
5 INSURANCE FUTURES AND OPTIONS
   - A BRIEF UPDATE

5.1 Insurance futures and options were covered in detail in a paper by J P Ryan et al which was presented to the 1993 General Insurance Convention. The purpose of this section of the paper is to provide a brief update only of the current position and of some recent developments.

5.2 Trading of insurance futures and options on the Chicago Board of Trade (using the PCS indices which are principally based on surveys of insurers) is growing but remains at a low level. Trades in respect of East Coast hurricane risk comprise a large proportion of the relatively small amount of business transacted.

5.3 The main reason for the lack of trading appears to be that there are currently more natural buyers than sellers of such instruments (i.e. there are more parties looking to cede rather than accept insurance risk).

5.4 In addition, concerns have been expressed about the use of the PCS indices. Some speculative investors are concerned at the perceived opaqueness of the index measurement and the potential risk of manipulation by the surveyed insurers, while some insurers are concerned about the basis risk between their portfolios and the traded indices.

5.5 A new index, the Guy Carpenter Cat Index (GCCI), began reporting in the summer of 1997. The index is claimed to be based on a more transparent published methodology, using aggregate data reported by around 30 companies. The index will track losses from wind, storm, rain, hail and snow (but excluding fire, flood and earthquake) in 10,000 distinct geographic units which are then aggregated into areas.

5.6 Use of the individual units could lead to tailored Over the Counter products offering insurers the ability to effectively eliminate basis risk and could also be used by insurers trading on the BCX (see below) to measure and manage basis risk compared to the regional indices.
A new insurance risk market is shortly to be established on the Bermuda Commodities Exchange (BCX). The initial members (who will also own the market) should include AIG, Guy Carpenter, Chase Manhattan and Goldman Sachs, and the market will use services supplied by CBOT. This exchange will trade catastrophe derivatives based on the GCCI for the US nation and for 6 US regions.

Other possible future developments in the area of futures and options include:

- the launch by Risk Management Solutions (RMS) in the near future of a catastrophe index based not on actual losses but on computer loss modelling of industry exposures. It is not known if there are any plans to trade on this index;

- the introduction of indices based on the Lloyd's market. A recent report has suggested an extension of the auction process (which itself could be viewed as a securitisation of insurance risk) to include forwards and options for the purchase of future syndicate capacity as well as the introduction of derivatives based on syndicate (as well as market aggregate) results. This could be one way of allowing some investors to trade on an annual basis while retaining three year accounting for the market;

- the trading of options based on the price of insurance (rather than losses). These options (which are understood to be under consideration by LIRMA) would be one way for both insurers and insureds to protect against the effects of the insurance cycle on insurance prices;

- the development of techniques for pricing insurance derivatives and insurance risk in the context of an illiquid market where there is no natural hedge so that the theories of zero arbitrage do not automatically apply. Again, this is an area where the actuarial profession should have an important role to play;
the creation of an index which could be used as the basis for futures and options contracts tracking UK insurance losses.

The Instrat Index, launched by Sedgwick in 1993, is based on the gross loss incurred experience (for property business) of the top 8 UK insurance composites, as recorded in their DTI returns. In its current form, this index is considered too broadly based and to suffer from infrequent reporting and substantial reporting lags (reporting takes place around 8 months after each calendar year end). The index is therefore considered inappropriate to act as the basis for a credible UK derivative instrument, and it has mainly been used as a tool to illustrate how such instruments might function.

A number of reinsurance brokers are understood to have developed UK indices. However, none so far has gained wide acceptance, one reason being that potential users are reluctant to endorse an index provided by a competitor.

A respected and independent body, such as the Institute of Actuaries (with its reputation for compiling investment indices and with its considerable involvement in the areas of insurance and derivatives) may have a very important role to play in the development of UK insurance indices.

To gain wide acceptance in the market, such an index will need to be seen as: calculated using transparent, consistent and objective methods by a respected body; free of the risk of manipulation; representative of the actual losses suffered by insureds, which may imply the need for area-based indices; providing frequent and rapid reporting and giving insurers the ability to assess their basis risk against the index.
6 TECHNICAL ISSUES

6.1 There are many hurdles to be overcome to securitise insurance risk in any particular case. An important element of this is obviously to find a structure and terms which are mutually acceptable to both the issuing insurance company and investors. However, a major additional challenge is to find solutions to the legal, regulatory, tax and accounting issues in each case, from the perspectives of both the insurer and investor.

6.2 The recent growth of securitised insurance risk has resulted in the availability of a number of novel investment and risk transfer products which cannot be placed easily into the current legal, regulatory, tax and accounting frameworks in terms of either the investors in the products or the insurance companies which issue them. If we examine the way in which such contracts are likely to be considered within the current requirements of the UK and USA, this is likely to give some insight into the future guidance which may be issued on the treatment of such products. The wide variety of tools which have been designed for securitised insurance risk renders any global consideration inappropriate, and the individual features of each instrument will give rise to opportunities for individual negotiation on how they should be treated in each case.

6.3 We understand that some of the instruments which have been launched successfully, required a large amount of work to be undertaken in each of these technical areas, and that each individual case has given rise to new issues specific to that case.

6.4 The purpose of this section is solely to outline some of the legal, regulatory, tax and accounting issues which may arise rather than to suggest solutions, which will in any case vary depending on individual circumstances. The readers of this paper should seek their own professional advice before taking any action relating to the securitisation of insurance risk.
Legal and Regulatory Issues - Investors

6.5 Investors will need to establish whether or not they could be regarded as carrying on insurance business within the relevant country of jurisdiction. For example, in the UK a licence is required to carry on insurance business. If a contract is deemed to be insurance and no licence is held, the investor will not only face the possibility of criminal proceedings, but will be unable to enforce the terms of the contract.

6.6 To avoid these problems, the investor will need to determine whether the bond could constitute a contract of insurance under the following definition:-

"a contract for the payment of money or some corresponding benefit which becomes due upon the happening of an unknown event, and where the insured party has an insurable interest in the subject matter of the contract".

6.7 Securitised products rarely result in the payment of a premium by the insured to the investors. There is however a contract between the insurer and the investor, and there is some type of insurable interest. The absence of a premium is not, on its own, sufficient to prevent a product being considered as a contract of insurance. The insurable interest between the two parties will be more distant if the loss event is not linked directly to the performance of the insurer's own portfolio, but rather to some index based on industry-wide losses.

6.8 The comments above suggest that a number of the products sold to date could be regarded as insurance contracts under the UK regulatory framework. In practice, investment in a single product is unlikely to be regarded as carrying on insurance business, although investors who choose to purchase a number of these products may need to consider the implications of such a practice.
6.9 In addition to the regulatory issues, investors will wish to ensure that the issuer of the contract has sufficient assets to meet its liabilities under the contract. Most of the issues to date have utilised special purpose vehicles (SPV’s) which receive premiums from insurers and capital from investors, and which pays claims to insurers and coupons and capital repayments to investors. The SPV is often domiciled offshore for tax purposes. The domicile of the SPV will be important as it determines the insurance company regulations and solvency conditions under which it conducts business. The domicile may also be relevant in the case of insolvency as, in a number of countries, policyholders rank prior to creditors. The use of a SPV ensures that, from the perspective of the insurer, the securitisation deal is structured as a reinsurance contract.

6.10 Investors will need reassurance that claims handling procedures are appropriate to avoid payment of invalid claims, and that the business written and attached to the reinsurance contract placed with the SPV, or forming the portfolio used to determine the performance of the assets backing the bonds, are limited appropriately to the terms published in the prospectus.

6.11 Security of investors’ funds will be improved if funds are segregated by the insurer in cases where multiple tranches of bonds are issued. The country of jurisdiction is again an important feature.

6.12 In some cases, investors may be precluded by their existing articles of association from participating in catastrophe bond issues, or in issues where capital is not protected.
The most common arrangement is for the insurer to place a reinsurance contract with a dedicated SPV. The terms of the contract may not fit comfortably with other parts of the reinsurance programme, particularly if the contract has been written to mirror the terms of the bond, and as a consequence has a number of non-traditional features. If the coverage overlaps with other parts of its reinsurance programme the insurer will be exposed to the risk of receiving proportional recovery in cases where the main programme contains a double insurance clause, so diluting the benefits of the securitisation deal.

The reinsurance contract is between the SPV and the insurer, and so no contractual agreement exists between the investors and the insurer. As the SPV will normally have few, if any, assets unrelated to the securitisation deal, the insurer is exposed to the failure of the SPV. In order to reduce this risk there may be restrictions on the assets which the SPV may hold. However, this may significantly reduce the return available on the bonds, making them less attractive to investors. Alternative conditions may be applied such as the deposit of collateral or the establishment of trust funds.

The insurer will have legal duties of disclosure in the prospectus for bond investors. The prospectus will need to identify clearly the nature of the securities and the risks involved. Ensuring full and adequate disclosure may be difficult if the business backing the securities is written, or the reinsurance with the SPV is entered into, after the bonds have been issued. The problems of fair representation of the bonds become greater where they remain in force for several years, in which case the manner in which investors are locked into the contract, and the way in which the SPV will ensure that it generates sufficient business to cover the bond payments, will need to be addressed.
6.16 The placement of a reinsurance contract with a SPV may impact the technical solvency level of the insurer. In the UK, a debt owed by a reinsurer may be utilised as an asset for solvency purposes provided that it satisfies certain qualifying conditions. However, in some European countries the solvency credit is affected by local regulation, and the domicile of the SPV may be an important factor affecting qualification.

6.17 There may be advantages to the insurer in obtaining a credit rating for the security under offer. However, this may result in a number of additional regulatory requirements.

6.18 If the bonds are offered overseas, the company will need to be mindful of the local marketing legislation, and particular care needs to be taken if the investors include insurers or other regulated institutions which will need to conform to constitutional documents or statute limitations.

**Tax Issues**

6.19 Tax issues in the context of the securitisation of insurance risk tend to fall into one of the following categories:

- withholding taxes, particularly in cases where the contract involves any interest or other regular payments;
- the deductibility of payments and the taxation of receipts at the commencement and maturity of the contract, and in respect of any early termination options;
- stamp duties, value added tax (and its equivalents) and any specific insurance-related taxes such as insurance premium tax in the UK.

Tax issues and their solution will obviously be specific to each individual insurer and investor.
6.20 Accounting guidance has lagged behind the rapid development of securitisation deals. The current available guidance draws from the accounting bodies' attempts to formalise the treatment of:

- finite risk transactions - banking transactions which are structured in the form of insurance contracts, and
- conventional derivatives and other financial derivatives.

6.21 In relation to finite risk transactions, the US Financial Accounting Standards Board (FASB) has issued guidance which requires any reinsurance contract which does not qualify as an insurance contract to be accounted for on a deposit basis. Transfer of investment risk is not deemed to be insurance. In the UK, accounting guidance has been issued, stating that all contracts in which there is a "significant transfer of risk" should be accounted for as insurance contracts regardless of the legal details of the contract, and as securities otherwise. Applying this guidance (which is consistent with the accounting principle of substance over form) to many recent risk transfer securities would result in them being treated as insurance contracts.

6.22 FASB, the Internal Accounting Standards Committee (IASC) and the UK Accounting Standards Board (ASB) have all issued discussion documents or standards in relation to the measurement of financial instruments and hedge accounting. In particular these documents consider:

- measurement in terms of both the value stated in the balance sheet (e.g. market value) and the point at which gains and losses should be recognised (on realisation or when the market moves);
circumstances when securities have been hedged. Here the gains or losses can be deferred for inclusion in the profit and loss account in the same period as the hedged position. Equivalent considerations could theoretically be made in cases where an insurance derivative is used by insurers to reduce insurance exposure, with linkage of the underwriting result to the gain or loss on the derivative;

- disclosure in the accounts of the risk level and profile of the main financial instruments. This is particularly important because the amounts shown in the balance sheet may not reflect either the level of the exposure or of the risk.

6.23 The accounting guidance in relation to both finite risk transactions and conventional and other financial derivatives suggests that:-

- CBOT Cat Futures should probably be accounted for as a standard derivative for investors who are not insurance companies. Movements in their value should appear in the profit and loss account. In the case of insurance companies, although the derivative may have been purchased to give the effect of reinsurance cover, the gains and losses on the Cat Future will probably have to be treated as a conventional investment, and so cannot be used directly to offset the underwriting result. Full narrative disclosure of the terms and nature of the investment will be required in all cases;

- CATEX Swaps appear to present no particular problems, as they can be handled as inwards and outwards reinsurance arrangements in the normal manner;

- bonds and preference shares will need to be considered on an individual basis, and present a number of problems, particularly for the sellers of the securities. The investors can probably handle them under traditional accounting standards. The insurance company selling the securities (whether via a SPV or not) is most likely to handle the gains and losses in the profit and loss account as a combination of the underwriting
result and an interest charge. Alternative treatments may be appropriate in certain cases. An example is the Winterthur deal in which the company issued subordinate bonds convertible to Winterthur shares after 3 years. The annual coupon of 2.25% is at risk if the loss event is triggered. This coupon is 0.76% above the yield on a comparable government bond of 1.49%. The excess (0.76%) can be considered as a premium for coverage amounting to 2.25% of the bond value (a 33% rate on line). It could therefore be argued that the contract should be treated as a reinsurance in the accounts;

- additional difficulties arise for the insurer issuing the securities if underwriting losses in a year are recouped by lower interest payments in subsequent payment periods, so creating a mismatch between the two cashflows under standard accounting practices;

- insurance securities sold to another insurer may present both liquidity and flexibility advantages over traditional reinsurance arrangements to both parties. They may, however, be considered as a reinsurance arrangement. In this case it would be included within the calculation of total business written by the purchaser for the purpose of solvency and other calculations, so reducing their capacity to write standard business. The premium could be considered as the excess coupon offered over the risk-free rate, whilst a claim could be the reduction of interest payable as a result of the performance of the security.

6.24 The treatment of insurance derivatives for legal, regulatory, tax and accounting purposes has not been formalised at the current time. Although there are certain guidelines that give some help in determining what an appropriate treatment might be, individual negotiation with the various regulatory bodies will be necessary by insurers and investors alike.
CONCLUSIONS

7.1 Securitisation is a controversial subject, and there is a wide diversity of views concerning the future development of this area.

7.2 We conclude this paper by setting out below 10 of our own predictions about the future development of securitisation in the insurance industry, and we hope that this will provoke an interesting and useful debate.

7.3.1 The number of securitisation deals will continue to grow rapidly as insurers increasingly appreciate their benefits and investors grow in their understanding of and confidence in such instruments.

7.3.2 Securitisation will not replace traditional reinsurance, but will be complementary. Securitisation is a particularly effective solution when there is a substantial mismatch between premium flows and claim flows. However, securitisation loses many of its advantages for relatively stable classes of business with a high frequency and low average severity of claims.

7.3.3 The returns offered to investors and the resulting price available to 'ceding' insurers will come down as:

- investors become more comfortable with the concept of securitising insurance risk, and do not require as high a premium to take on such risks;
- the administrative overheads of launching a securitisation deal (including the solution of legal, regulatory, tax and accounting issues) reduce with increasing familiarity and economies of scale;
- more deals are completed and as a result investors are more keen to be involved.

7.3.4 The traditional reinsurance market will reform itself to compete effectively with securitisation. In particular, friction costs, for example commissions, will reduce.
The distinction between traditional reinsurance, securitisation and other innovative risk financing techniques such as finite risk insurance and alternative risk transfer will become increasingly blurred.

Insurance futures and options will continue their relatively slow development due to:-

- the lack of homogeneity of insurance risk, particularly for classes of business with a low frequency and high severity of claims;
- the shortage of suitable indices to act as the basis for such instruments;
- the lack of correspondence between the performance of these indices and of individual portfolios of risks (i.e. the inability to deal with 'basis risk').

In contrast, securitisation deals which meet the specific requirements of individual insurers will continue to develop rapidly in number and size.

However, we also believe it is possible that there will eventually be a substantial market for insurance futures and options and a secondary market for securitised instruments as the need grows for such instruments to be tradable and hedgable.

Securitisation deals will increasingly be issued with capital being unprotected as:

- investors become more comfortable with such instruments;
- insurers seek to launch issues which require a smaller initial commitment of capital by the investment community;
- insurers and investors realise that capital-protected issues are inefficient and (it could be argued) illogical.
7.3.8 Insurers will make increasing use of credit derivatives to hedge the credit risk which is implicit in their purchase of traditional reinsurance contracts, and will thus follow current trends in the banking industry.

7.3.9 Unitised investment funds which invest exclusively in instruments involved in the securitisation of insurance risk will become commonplace. We are aware of the existence of at least one fund of this type (see Appendix C).

7.3.10 Actuaries will have a significant role to play in securitisation deals, with their principal involvement being in the modelling of:

- the risks against which the insurer requires protection;
- the pattern of investment returns which may be expected by investors in such instruments;
- alternative reinsurance and capital/securitisation structures, including the use of stochastic asset liability modelling techniques.

We believe that actuaries will also be involved in the development of new option pricing techniques to enable insurance futures and options to be priced appropriately.
CASE STUDIES

Appendix

Catastrophe bonds

- A California Earthquake Authority
- B Cat Limited
- C United States Automobile Association (USAA)
- D AIG Combined Risks

Securitisation of an individual portfolio

- E Hannover Re
- F St Paul Re
- G Winterthur
- H Reliance National

Contingent capital facilities

- I Hawaii Hurricane Relief Fund
- J Nationwide
- K RLI Corporation

Note

The case studies are based on information within the public domain including, in some cases, material published or provided to us by the issuers of the relevant investment instruments. The case studies are provided purely to illustrate the general descriptions and analyses contained in the main body of the paper. Although we have attempted, where possible, to validate the information in the case studies, we accept no responsibility for any errors which remain.
Appendix A - California Earthquake Authority
(Issue failed)

Introduction

State law in California requires all insurers selling property cover to homeowners to offer an earthquake endorsement. Following the Northridge earthquake in 1994 it is estimated that around 90% of the insurers who had previously offered homeowners cover in California either withdrew from the market altogether or reduced their exposure significantly due to this requirement. In order to address this crisis the California Earthquake Authority ('CEA') was established.

The solution adopted by the CEA was to establish a state run reinsurance pool to provide earthquake reinsurance cover for those insurers that agreed to participate in the pool. The total amount of coverage that CEA targeted was $10.5 bn. This was the maximum coverage, the actual amount being scaled down based upon the participation percentage of the insurers. The coverage was structured in a number of layers, which are summarised below (all financial amounts being subject to scaling as mentioned above):

- $1 bn of non-reimbursable funding from participating insurers;
- $3 bn xs $1 bn additional commitment from participating insurers;
- $2 bn xs $4 bn of reinsurance coverage;
- $1 bn xs $6 bn of State debt, recoverable from CEA policyholders;
- $1.5 bn xs $7 bn of earthquake bonds;
- $2 bn xs $8.5 bn of reinsurance coverage.
Structure of earthquake bonds

It was proposed that the earthquake bonds would be 10 year bonds, with semi-annual coupon payments well in excess of the risk-free rate of return available on US government bonds. The principal of the bonds would not be at risk, and would be secured by investment in Treasury Bills. The payment of the coupons would, however, be contingent upon the accumulated loss from earthquakes in each of the first four years of the contract not exceeding $7 bn. Should the losses exceed this figure then subsequent coupons would cease until the coupon payments had covered the loss. The bonds would be reissued after 4 years, or when cover was exhausted if this occurred earlier. It was estimated that bonds with a nominal value of around $3.5 bn would need to be issued to ensure the coupon payments would be sufficient to provide $1.5 bn of cover.

Outcome and analysis

The earthquake bonds were never issued. Instead, Berkshire Hathaway stepped in to underwrite the whole of the $1.5 bn xs $7 bn layer. The main reason for this was that the proposed terms of the earthquake bonds were so attractive that it was possible for Berkshire Hathaway to undercut the price of the bonds whilst still leaving themselves a very healthy expected return. To put some figures on this, the estimated expected return on the earthquake bonds was around 16% per annum. The other main reason cited as to why the bonds did not succeed was the relatively high level of legal and administrative costs associated with the issue when compared with the costs of traditional forms of reinsurance. In addition, the structure of the bonds was such that investors would have needed to commit $3.5 bn of capital. The traditional reinsurance offered by Berkshire Hathaway did not involve the commitment of anything like this degree of capital.
It might seem logical that the reaction of those involved in the field of insurance securitisation would have been to regard the 'failure' of the CEA earthquake bonds as a significant blow to the securitisation market. In fact many expressed the opposite view. Until Berkshire Hathaway stepped in, there had been a large amount of scepticism displayed by the investment community. However, when a company with the status of Berkshire Hathaway effectively undercut the potential bond investors, the market's reaction changed to one of "If they were prepared to invest in it, then it looks as if we missed out on a good deal!".
Appendix B - Cat Limited (Issue failed)

Introduction

Cat Limited was formerly known as Centre Cat and is a Bermuda-based insurance company specialising in property catastrophe reinsurance. The company is 43% owned by Morgan Stanley Partners Fund, with a further 16% being owned by Zurich Insurance Company.

Bermuda-based companies are often found to be at the forefront of innovative insurance-based developments and Cat Limited is no exception to this rule. It has recently become the largest shareholder of a joint venture with Chubb Corporation and the Employers Reinsurance Corporation to capitalise a new company, Enterprise Reinsurance Corporation. This new company is designed as a risk financier for risk-bearing transactions in relation to property, casualty, life and health insurance business.

It is not surprising, therefore, that Cat Limited was one of the first companies to test the attitude of the capital markets to a bond offering designed to supplement the company's catastrophe reinsurance capacity.

Structure of the bond offering

The proposal was to offer a $50m bond on the US markets underwritten by Morgan Stanley. Cat Limited placed a $25m minimum subscription on the bond and a minimum investment of $1m by individual clients.

The bond was termed a "Hurricane Bond" and was designed essentially to provide Cat Limited with high level excess of loss coverage on an occurrence basis. The proposal was launched after the June 1996 renewals in order to include all business written by Cat Limited during 1996. In purchasing the bond, investors were to receive an enhanced yield (which has not been disclosed) but their principal was at risk if Cat Limited's own ultimate losses from a single hurricane event on a net basis exceeded $50m. The amount of principal lost would be equal to the excess of the ultimate net losses over this $50m trigger.
Outcome and analysis

The Cat Limited issue differed from some other ventures into the capital markets to date because the return achievable on the bond was directly linked to Cat Limited's losses rather than some type of broader index. The company may be considered to be well suited to this kind of issue, as it is one of only a handful of companies who regularly publish their aggregate exposures to catastrophe events.

A number of other features of the bond were never disclosed, in particular the time period allowed for the loss to reach maturity and the method of estimation of its ultimate position. No public information is available on how the offering's principal would be invested.

The issue was withdrawn in August 1996, shortly after the bond was first announced. A number of reasons for its failure were cited by the company. The equity markets suffered some turbulence at the time of the offering which distracted investors away from new investment instruments and back to more conventional investment sectors. Although Cat Limited believes that the market was happy with the bond in principle, investors needed more time to understand the complexities of the bond and to be comfortable with the pricing mechanism. In addition, the issue was too late in the year and the hurricane season was already underway. This would have affected the price of the bond.

Cat Limited believes that there is a place for insurance bond issues based on company losses rather than index losses. They have already stated their desire to launch a similar bond at some future stage.
Appendix C - United States Automobile Association (USAA) (Issue succeeded at the second attempt)

Introduction

USAA is a personal lines insurer based in San Antonio, Texas, and is the fifth largest private passenger automobile insurer and the fourth largest homeowners insurer in the United States based on direct written premiums. It is unusual among US insurers in having a high concentration of policyholders among members (and former members) of the US armed forces, many of whom are based around army and air bases. Because of this, USAA has an unusual degree of catastrophe concentration in its portfolio.

USAA has had two attempts at issuing catastrophe linked bonds. The first in 1996 was unsuccessful while the second was completed successfully in June 1997 and indeed was oversubscribed. This placement was by far the largest such deal by the date of its completion and generated considerable interest.

Structure of the unsuccessful 1996 issue

This was an attempt to place privately $500 million of catastrophe linked bonds with individual United States capital market investors.

The structure was simple. The bond was for a 12 month maturity, and the return on the bond was at a premium to that on a risk-free bond. However, the principal was to be at risk if USAA suffered a loss over $1 billion from a single catastrophe before 31 July 1997.

The bond issue was handled by Merrill Lynch in the United States, with the bond issuer being a dedicated Cayman Islands special purpose vehicle. This SPV would in turn have been liable for 95% of a layer of $1 billion excess $1 billion covering USAA's losses due to property damage from any single hurricane on its homeowners (and other personal insurance) policies in 20 US East Coast states. The reinsurance policy would only pay out if the hurricane measured 3 to 5 on the Saffir-Simpson hurricane scale, so the deal was an ultimate loss cover but with an index trigger.
Analysis of the unsuccessful 1996 issue

The straightforward structure of the bond should have been easy for potential investors to understand. From the investors' viewpoint the assessment of the probability of a catastrophe of the size which would trigger loss of the principal would be the key to the potential financial return. However, the possible loss of the principal meant that the bond was perceived to be unattractive to risk averse investors, and this may have been the reason for the bond's failure. For risk averse investors, the premium of the return over that of a risk-free bond may not have been adequate to compensate for the potential loss of principal. The bond issue is also said to have failed because of too short a period from the offer being made to the date it had to be completed, inadequate information being made available, and unsuccessful marketing. It also followed a series of hurricanes that made the potential market nervous. These factors and the insufficiently attractive pricing make it unsurprising with the benefit of hindsight that the bond did not succeed.

Structure of the successful 1997 issue

The bond issue was for $477 million, and was again a private placement. There were two tranches of bonds. The first was bonds of $163.8 million in which the subscribers faced no risk of loss of the principal. Subscribers to the other $313.2 million of bonds faced the risk of loss of all the principal. This structure obviously broadens the range of investors who might have been interested in subscribing to include both investors who can place principal at risk and those who are averse to this risk.

USAA are covered for 80% of a loss caused by a single hurricane of Category 3, 4 or 5 on the Saffir-Simpson index of hurricane intensities resulting in insured property damage losses of between $1 billion and $1.5 billion to USAA policyholders in the East Coast areas from Texas to Maine.

In the event of no covered losses, the principal at risk bonds pay a rate of return of the London Interbank Offered Rate (LIBOR) for one-month Eurodollar deposits plus 576 basis points. The bonds with the principal not at risk pay the lower rate of LIBOR plus 273 basis points.
In the event of covered losses, the maturity of the bonds which would otherwise be after one year can be extended by six months as an extended claims reporting and settlement period. The principal is not at risk during this extended period, and interest is payable. On the principal not at risk bonds, the bonds can be extended by a further 10 years, with no interest being payable during this period.

USAA have never experienced a loss of a size equivalent to a current value of $1 billion. The preliminary private placement memorandum contained modelled historical experience from hurricanes in the covered states. This showed the worst three historical hurricanes (as would apply to the USAA bonds) being the storm of September 1926, Hurricane Hazel (15 October 1954) and Hurricane Andrew (24 August 1992) with estimated USAA losses of $794 million, $551 million, and $548 million respectively. Estimated "annual probability of exceedance" figures were also given of 1.8%, 2.7% and 2.7% respectively. None of these losses would exceed the trigger amount on the bonds. However, sample large loss occurrences were also given from over 17,000 modelled hypothetical hurricanes showing sample losses exceeding the trigger point. Probabilities of exceedance were again given.

We understand that the principal protected notes were rated AAAr and Aaa by Standard & Poor's and Moody's respectively, and the principal at risk notes were rated BB- and Ba3 respectively.

Technically, the bonds are issued by Residential Reinsurance Limited, a special purpose vehicle established by USAA in the Cayman Islands. USAA have entered into a reinsurance agreement with Residential Reinsurance Limited in respect of the losses the bonds cover. The placement agents were Merrill Lynch, Goldman Sachs and Lehman Brothers.
Analysis of the successful 1997 issue

The second bond issue shows that USAA were not deterred by the failure of the 1996 issue, but returned to the market having learnt lessons and modified the terms of the issue. It is in this way that securitisation issues are likely to be increasingly successful as features desired by investors are incorporated.

The two tranches of bonds and the credit ratings improved the marketability of the bonds and it is likely that this structure will be used for further bond issues.

One investor in the bonds was Cat Bond Investors, a joint venture of PXRE Corporation and Phoenix Home Life Mutual Insurance Company that was created specifically to invest in catastrophe bonds, showing the potential interest in such bonds. Cat Bond Investors are reported to have sought to purchase $9 million of the USAA bonds, but had to settle for $3 million. The overall degree of over-subscription has been reported as two times. Interestingly, there was a greater level of over-subscription for the principal-at-risk bonds than for the principal-protected bonds. It would appear from this that there is now a sound market for securitisation issues, and this should encourage both insurers and investors to develop further issues. A broad range of investors was also attracted, and this successful issue is seen by some as a significant point in the development of securitisation.
Appendix D - AIG Combined Risks

Introduction

The purpose of the AIG Combined Risks Principal-at-Risk Insurance-Linked Bonds was to provide coverage against the possible incidence of catastrophes in a number of different geographical areas. The issue was fronted by AIG, and was hailed at the time as being the first UK insurance bond issue.

Structure

The AIG transaction comprised a bundle of five bonds, each linked to a different geographical area as follows:

<table>
<thead>
<tr>
<th>Region</th>
<th>Trigger ($bn)</th>
<th>Region limit ($bn)</th>
<th>Rate on line (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W Europe</td>
<td>3.0</td>
<td>1.3</td>
<td>12.8</td>
</tr>
<tr>
<td>Japan</td>
<td>5.0</td>
<td>1.3</td>
<td>11.2</td>
</tr>
<tr>
<td>Caribbean</td>
<td>1.0</td>
<td>1.3</td>
<td>10.4</td>
</tr>
<tr>
<td>Australasia</td>
<td>1.0</td>
<td>1.3</td>
<td>8.0</td>
</tr>
<tr>
<td>USA</td>
<td>7.5</td>
<td>1.3</td>
<td>22.0</td>
</tr>
</tbody>
</table>

|                |                | 6.5                | 12.9             |

The bonds are at risk for one year only. Each bond has an industry loss trigger level. If insurance losses exceed the trigger, the principal of the bond is used to pay the reinsurance claim. There is then a reporting period which lasts for 14 months.

The structure of the transaction is illustrated in the diagram on the next page.
AIG Combined Risks

Client → AIG: Premium
Claim equal to accrued investment if catastrophe occurs

AIG → SPV: Premium
Claim equal to accrued investment if catastrophe occurs

SPV → Investor: Invest in insurance-linked bonds
Investment if no catastrophe

Investor → SPV: Accrued investment if no catastrophe
Essentially:

- the insurer pays a premium to AIG which is then passed on to the special purpose vehicle (SPV);
- the investor invests in insurance-linked bonds issued by the SPV;
- the SPV invests the received monies in two year US treasury strips. The amount subscribed by the investors plus the reinsurance premium, when invested in two year US treasury strips, grows to the Region Limit after two years.

Investors were provided with the results of models showing the probabilities of qualifying events. The probabilities of breaching the triggers, based on the model, are set out below:

<table>
<thead>
<tr>
<th>Region</th>
<th>Probability of breaching trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>W Europe</td>
<td>8.9%</td>
</tr>
<tr>
<td>Japan</td>
<td>26.1%</td>
</tr>
<tr>
<td>Caribbean</td>
<td>4.4%</td>
</tr>
<tr>
<td>Australasia</td>
<td>8.8%</td>
</tr>
<tr>
<td>USA</td>
<td>19.2%</td>
</tr>
</tbody>
</table>

The probabilities of 0, 1, 2 ... qualifying events were calculated to be as follows:

<table>
<thead>
<tr>
<th>Number of qualifying events</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>51%</td>
</tr>
<tr>
<td>1</td>
<td>39%</td>
</tr>
<tr>
<td>2</td>
<td>9%</td>
</tr>
<tr>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td>4</td>
<td>0%</td>
</tr>
<tr>
<td>5</td>
<td>0%</td>
</tr>
</tbody>
</table>

100%
The expected annualised returns to the investors if 0, 1, 2, ..., 5 qualifying events occurred were calculated to be as follows:

<table>
<thead>
<tr>
<th>Number of qualifying events</th>
<th>Return per annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>14%</td>
</tr>
<tr>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>2</td>
<td>-9%</td>
</tr>
<tr>
<td>3</td>
<td>-24%</td>
</tr>
<tr>
<td>4</td>
<td>-44%</td>
</tr>
<tr>
<td>5</td>
<td>-100%</td>
</tr>
</tbody>
</table>

It can be seen that capital is at risk if more than one qualifying event occurs during the risk period. Overall the expected return of 6.91% per annum was 0.69% in excess of the return obtainable on US treasury bills.

**Analysis**

This issue was launched successfully. Although investors' principal was at risk, sufficient information was made available for them to understand and quantify the risk, and to compare this with the enhanced returns obtainable on the bonds.
Appendix E - Hannover Re

Introduction

Hannover Re has been involved in two securitisation deals, with both of them being placed by Citibank. Hannover Re's principal objectives were:

- to maintain sufficient long-term committed capacity at a reasonable price;
- to ensure highest quality security; and
- to preserve confidentiality and protection of proprietary techniques and methods.

In both cases, the performance of the bonds was linked directly to the underwriting result of Hannover Re.

Structure of first transaction

The first catastrophe portfolio securitisation transaction ("Kover") was undertaken in 1995. It was based on a catastrophe portfolio which was strictly defined by specific rules:

- about two risks per country;
- no US business; and
- attachment point greater than $400 million.

The catastrophe portfolio had an established track record stretching over more than 10 years. A special purpose reinsurance company was set up to accept a 50% quota share of the catastrophe business. In turn, the special purpose reinsurance company was funded by eight US institutional investors for a period of six years. The total volume of funds was between $85 and $100 million, and these funds are held in a trust for the benefit of Hannover Re until the risk liabilities have been extinguished.
Structure of second transaction

The second transaction was undertaken in 1996, and involved a Multi-line Catastrophe Excess Loss Performance Linked Swap (the "K2 swap"). Instead of a special purpose vehicle, a derivative style structure was used to simplify the administration. The deal is thus not a retrocession but a proper derivative transaction.

The provided volume of risk capital of $100 million was placed again with a small number of North American institutional investors. The underlying portfolio consists of a worldwide natural catastrophe excess of loss reinsurance portfolio, but also includes some aviation excess of loss reinsurance. Investors participate on a proportional basis in the performance of the portfolio, although the potential loss payments can be capped at the initial notional amount.

Our understanding of the structures of the two transactions is summarised in the diagrams on the next two pages.
Hannover Re

Structure of second transaction

Fixed swap payment
PLUS swap gain
amount if combined
ratio less than
reference ratio

[Matching swap
arrangements. Citibank
is acting effectively as an
intermediary]

Swap loss amount
if combined ratio
greater than
reference ratio,
subject to maximum
notional amount
Appendix F - St Paul Re

Introduction

St Paul Re is the sixth largest US reinsurer, conducting business internationally, principally via reinsurance brokers. Despite reduced pricing levels of catastrophe excess of loss reinsurance both in the US and worldwide from the levels seen in 1993 and 1994, St Paul Re and other reinsurers still believe rates to be attractive. The company wished to expand its capacity for this short-tail high-severity, low-frequency business sector. The shortage of proportional retrocessional capacity in the traditional reinsurance markets for catastrophe risks, particularly in the US, and the limited global capacity of the reinsurance market led St Paul Re to investigate the use of the capital markets.

In December 1996 St Paul Re, assisted by Goldman Sachs, completed a $68.5m securitised reinsurance deal which provided the company with an additional $45m reinsurance capacity. Full details of the arrangement have not been disclosed. However, the basic structure is described below.

Structure

Two types of securities were offered to investors totalling US $68.5m, which was then used to set up a dedicated special purpose vehicle (SPV), George Town Re:

- notes maturing in 10 years time for which interest payments are dependent on the performance of reinsurance business ceded to George Town Re, and on the investment return of the company. The principal is not at risk in this part of the deal. The capital raised from this source amounted to $44.5m;

- preference shares redeemable in the year 2000, where both the dividends and redemption value are dependent upon the performance of the reinsurance business ceded to George Town Re and the company's investment return. $24m was raised from this source.
The notes were rated by Standard and Poor's as AAAr and by Moody's as Aaa, whilst the preference shares were not rated. The combined offering was designed to be attractive to a range of investors, via the relatively low risk notes and higher risk preference shares.

The structure of the deal is illustrated in the diagram at the end of this Appendix.

**George Town Re**

George Town Re was capitalised from the transaction with $23.2m of the capital raised being invested in zero-coupon securities to provide for return of the principal to noteholders after 10 years. The remaining $45m was available to the company as collateral against reinsurance provided by George Town Re to St Paul Re. In this manner St Paul Re can access the capital market for additional capacity without any impact on the St Paul companies' balance sheets.

St Paul Re has no ownership or control over George Town Re. The voting stock is held by a charitable trustee, and the company has an independent board of three directors from independent investment, brokerage and law firms.

**Reinsurance of St Paul Re by George Town Re**

The retrocessional contract between St Paul Re and George Town Re comprises a 10 year obligatory surplus treaty with an annual aggregate coverage limit of $45m. Five classes of St Paul Re's excess of loss reinsurance treaty portfolio are covered by the contract, and the cessions are subject to a number of cession rules, diversification and size constraints. The classes covered by the treaty comprise high-severity, low-frequency reinsurance business as shown below. The maximum proportion of the George Town Re portfolio which may come from each class is also shown:

- US and Caribbean property catastrophe excess of loss (max. 75%)
- European property catastrophe excess of loss (max. 25%)
- Other property excess of loss (max. 25%)
- Retrocessional and Lloyd's market short-tail excess of loss (max 25%)
- Marine and aviation excess of loss (max. 25%)
The benefits to St Paul Re

The additional reinsurance now available via George Town Re has allowed St Paul Re to increase its capacity in selected reinsurance sectors by around 50% without an impact on the St Paul companies' balance sheets. This has attracted new business which they are able to lead. It has also allowed St Paul Re to accept larger lines on existing business. The expansion of their portfolio in established areas, particularly in respect of US and Caribbean catastrophe exposure, has allowed a greater efficiency in the use of staff and other resources. The structure of the contract complements the existing programme and does not create displacement or duplicate cover when combined with the main reinsurance arrangements.

Benefits and risks to investors

The combination of notes and preference shares offered is attractive to a wide variety of investors. The notes provide a relatively low-risk low-return investment whilst the preference shares offer an attractive higher return adjusted for the risk associated with a potential for principal erosion. Investors can use the St Paul Re offering to diversify their portfolios by purchasing securities for which the risks are largely uncorrelated to the financial risks associated with more standard investments. The careful structuring of the surplus reinsurance arrangement between George Town Re and St Paul Re ensures that the reinsurance portfolio accepted by George Town Re is sufficiently broad to give a relatively stable return, when compared with portfolios which cover a narrower selection of catastrophe risk classes.

Information supplied with the offering suggests that the likelihood of total loss of preference share capital is low.

The offering

The offering was restricted to two categories of institutional investors:

- Qualified institutional buyers;
- Institutional accredited investors.
Resales are limited to qualified institutional investors, and all sales were also restricted to certain US states and foreign jurisdictions where it has been indicated that the purchase of such securities does not require an insurer's or reinsurer's licence.

**Distinguishing features of the issue**

In December 1996, this transaction was the largest successful transaction by a US company at that time. It is also unusual in that it provided multiple tranches of securities. It has also shown that the long term of the facility (10 years), and linkage to a defined reinsurance portfolio rather than an insurance index, can be attractive to investors if structured appropriately.

The $68.5m raised in the placement was a lower figure than that discussed earlier in the placement process because, during the course of the transaction, the structure of the facility was changed from a purely principal-protected deal to a combination of principal-protected and principal-unprotected securities.

The St Paul companies first published proposals on raising capital using a special purpose vehicle in November 1996. Comparison of the final offer to investors with the earlier version indicates that the offer was significantly restructured and scaled down in order to achieve a successful sale. The earlier proposal was intended to raise $204m of capital purely by the sale of 10 year notes. $100m of this capital would have been available as capacity for the quota share reinsurance, whereas the final offering provided only $45m of additional capacity. In addition, the reinsurance coverage afforded to St Paul was structured originally as a primary coverage and an excess coverage with an attachment point of 170% of the primary coverage limit.

Notwithstanding the comments above, the deal is still one of the most successful securitisation ventures completed to date.
Appendix G - Winterthur

Introduction and purpose

Winterthur is a Swiss-based insurance company.

The bond was designed to protect against the 'catastrophe' risk of more than a fixed number of motor vehicles, insured comprehensively with Winterthur in Switzerland, being damaged during any single major hail or other storm event.

The actual potential loss protected by the product was one that Winterthur could easily absorb from their capital. This risk was chosen from among Winterthur's portfolio, on advice from Credit Suisse Financial Products ("CSFP"), to be one that was well-defined, tangible and objective with a reliable past claims history, and which should therefore be most attractive (or least off-putting) to investors.

The main purpose of the issue, which was lead managed by CSFP and placed primarily with Swiss institutional investors, was to introduce those investors to the concept of securitisation and to gauge the market potential of further securitisation of larger risks.

Structure

The issue is a three year subordinated convertible bond.

Each bond has a face value of 4700 Sfr. At maturity the holder of the bond can convert the bond into 5 registered Winterthur shares at an effective price of 940 Sfr. (This is approximately 20% higher than the price of the shares at the time the bond was issued).

The bonds pay an annual coupon of 2.25%. However, if in any year Winterthur has to pay out damage claims on more than 6000 vehicles due to any single storm event, the coupon for that year will not be paid.
The bond can thus be thought of as consisting of three separate elements:

- a capital repayment in three years
- a 3 year European option on Winterthur's shares
- coupon payments which are contingent on claims experience

A comparable bond with a guaranteed coupon payment would have commanded a coupon rate of around 1.49%. This implies a 'premium' for the risk of 76 basis points per annum which, for an exposure of 225 basis points, equates in reinsurance terms to a rate on line of around 33%.

The offer document contained a detailed analysis of past claims history, using a simple observed frequency of storms producing more than 6000 claims and an expected frequency derived from fitting a Compound Poisson Pareto model to the number of storms producing at least 100 claims. Both models produced an expected event frequency of 15-20 %, implying an expected contingent coupon of around 1.8%.

**Analysis**

The bond issue proved extremely successful and, in stark contrast to some other issues, was fully (or even over) subscribed almost immediately after issue of the prospectus.

The keys to this successful placing (even though risk was not indexed and had minimal diversification) were:-

- extensive pre-marketing to prospective clients;
- a high level of demand in the market for convertible Winterthur paper;
- generous pricing (compared to the past claims history);
- the choice of risk to be securitised (see above).
Most important of all, the issue succeeded because of the very small amount of risk transfer involved with a claim leading to forfeiture of just one year's coupon. This only represents a small part of the overall return.
Appendix H - Reliance National

Introduction

Reliance National Insurance Co. is a major US-based property insurer and reinsurer. They also have operations in Europe, South America and Asia Pacific.

The risks covered under the issue, which took place in March 1997, were extremely diversified. They included US and non-US property, aviation, satellite launch and rig business. The loss trigger for the issue was indexed losses based on the SIGMA index.

Reliance were advised in the transaction by Sedgwick.

Structure

The notes are 18 month zero-coupon notes issued at a discount to par, with a LIBOR-based floating rate.

In the event of any of the defined insurance losses (as measured by the SIGMA indices) occurring during the first twelve months of the term, part of the principal under the deal is lost.

The notes were issued by a special purpose vehicle, SLF Reinsurance domiciled in Barbados, which in turn issued a reinsurance cover to Reliance National.

Analysis

It is believed that the issue was oversubscribed, and that the amount of the issue was around $50 million.

The key reasons for the success of the issue, despite the entire capital being at risk, were the considerable diversification within the issue and the use of index-based loss triggers, which make the risk easier to assess by investors.
Appendix I - Hawaii Hurricane Relief Fund

Introduction

The State of Hawaii, concerned about the lack of availability of homeowners insurance after a major storm (Iniki), created a fund to provide hurricane coverage for insurers.

Structure

Initially, the Hawaii Hurricane Relief Fund purchased traditional catastrophe reinsurance cover at a cost of approximately $80 million per annum. However, the cost of this cover became a political issue with the insurance commissioner pledging to reduce the cost of homeowners insurance mainly by reform of the reinsurance programme. The approach adopted was to arrange a credit facility which could be accessed in the event of another catastrophe.

Voters in the state of Hawaii approved a measure allowing the state the option to issue $500 million of bonds to investors. When issued, these bonds would be secured by a surcharge of up to 7.5% on all insurance premiums in the state. The state fund pays a commitment fee of around $1.8 million per annum to various investors and banks for this credit facility.

State insurers still pay an amount of the order of $90 million each year into the Hawaii Hurricane Relief Fund. However, most of this amount now accumulates to help meet the cost of a future catastrophe, rather than being used entirely to pay reinsurance premiums.

Effectively the state has elected to retain the hurricane risk within the fund, and to allow the fund to accumulate insurers' contributions should no loss occur. The exposure to another catastrophic loss is covered by the fund's option to issue the revenue bonds to investors following such a catastrophe.

The fund has decided to increase the credit facility to $750 million for the current year.
Analysis of the risk/reward structure for the investors

The investors:-

- agree to purchase $500 million of revenue bonds from the state of Hawaii in the event of a major catastrophe;
- receive a commitment fee of $1.8 million per annum (equivalent to 36 basis points).

If a hurricane loss occurs, the investors:-

- purchase $500 million of revenue bonds;
- are entitled to a rate of interest of LIBOR plus between 1.25% and 1.5% on the revenue bonds;
- are then exposed to the credit risk of the state of Hawaii not repaying principal or interest;
- must finance the capital provided. In addition, investors must finance their risk capital backing the underwriting guarantee, whether or not a hurricane occurs.

Insufficient information about the terms of the deal is available to enable us to assess the attractiveness of this arrangement to investors. However, such an assessment is likely to include a comparison of investors' own financing costs with the commitment fee (before any bonds are issued) and with interest receivable from the revenue bonds.

Analysis of the benefits and risks for the State of Hawaii

Benefits

- There is an improvement in the cashflow position of the Hawaii Hurricane Relief Fund.
- The ultimate overall long-term cost of the current programme, including interest and capital payments on the long term average outstanding debt, is expected to be lower than the cost of purchasing traditional reinsurance protection.
Risks

- If, after a major hurricane loss, the state is unable to renew the credit facility and needs to obtain reinsurance protection again, the cost of such protection may be prohibitively expensive.

- The pattern of capital repayments on the revenue bonds must be broadly appropriately. If it is too slow, an excessive level of debt will be created in the long term. If the pattern of repayments is too rapid, this could result in short-term financing difficulties for the Hawaiian insurance industry following a major loss.
Appendix J - Nationwide

Introduction

Morgan Guaranty Trust ('MGT') has undertaken a 10 year commitment to allow Nationwide (a company based in the US) the right to issue fixed coupon contingent surplus notes to MGT. However, MGT also has a corresponding agreement with Nationwide CSN Trust ('the Trust'). Surplus notes are deeply subordinated debt, providing capital when access to the equity markets is difficult or impossible. The issue of the surplus notes is not dependent on any external insurance event but is an option exerciseable by Nationwide.

Purpose

The purpose of the contingent surplus note issue is to improve Nationwide's solvency protection programme. Subsidiary objectives are to:

- reduce the cost of reinsurance;
- increase the amount of reinsurance available to Nationwide;
- diversify sources of protection;
- increase the level of certainty regarding the future development of Nationwide's solvency position.

Structure

The structure of the issue is illustrated by the diagram on the next page.

Initially, the following security purchases and commitments take place:

- The Trust issues $392 million of 30 year trust notes and $8 million of trust certificates to external investors.
- The Trust uses the proceeds of these issues to purchase $400 million of 10 year US Treasury notes.
Nationwide CSN Trust Notes - Security Purchases and Commitments

US Treasuries

$400m

10-year U.S. Treasury Notes

Nationwide CSN Trust

10-year commitment to buy Surplus Notes

MGT

Nationwide

10-year commitment to buy Surplus Notes

$392m

30-year Trust Notes

$8m

Trust Certificates

Note Investors

Certificate Investors
- MGT enters into a 10 year commitment with Nationwide, permitting Nationwide to deliver up to $400 million of fixed coupon surplus notes to MGT.

- Nationwide CSN Trust enters into an identical 10 year commitment with MGT, permitting MGT to deliver up to $400 million of fixed coupon surplus notes to Nationwide CSN Trust.

Before Nationwide exercise their option:

- Nationwide pays semi-annual fees to MGT.
- MGT pays semi-annual fees to Nationwide CSN Trust.
- Nationwide CSN Trust receives interest payments on the US Treasury notes.
- Nationwide CSN Trust pays interest to note investors and scheduled payments to certificate investors.

When Nationwide exercise their right:

- Nationwide CSN Trust swaps US Treasury notes for surplus notes from MGT.
- MGT sells the US Treasury notes and delivers the sale proceeds to Nationwide in exchange for receiving surplus notes.

After Nationwide have exercised their right:

- Nationwide pay interest and repayment of principal on the surplus notes direct to Nationwide CSN Trust.
- Nationwide CSN Trust uses this cash flow to pay interest and principal on the securities to external investors.

If Nationwide have not exercised their right by the end of year 10:

- The US Treasury notes mature.
- The Nationwide CSN Trust will call the surplus notes at a standard call premium.
• The external investors will be paid the remaining proceeds from the Treasury notes and call premium.

Analysis
The external investors are accepting a credit risk based on the security of Nationwide, which has an AA claims payment rating.

The issue fits in well with current market conditions in that:

• there is a well-developed surplus note market;
• there is a smaller, but reasonably developed, contingent surplus note market;
• the investor base is currently reluctant to accept explicit event triggers.

It also has the advantages that:

• contingent surplus does not flow through the income statement;
• a reinsurance payout is taxable, whereas surplus note proceeds are not;
• coverage is available for a 10 year period.
Appendix K - RLI Corporation

Introduction

In the latter part of 1996, Centre Re announced a deal with RLI which is a possible alternative to catastrophe bonds and other capital market reinsurance instruments. The product was called a Catastrophe Equity Put.

RLI writes property and casualty business and has significant exposures in California. The structure of the product is such that it would only respond to a major catastrophe loss. The purpose of the product appears to be the protection of RLI's surplus so that, in the event of a major loss to the insurance industry, the company is able to maintain its security ratings, continue trading and take advantage of favourable market conditions in the aftermath of the major loss.

Structure

Under the arrangement, in the event of a Californian earthquake exhausting RLI's existing catastrophe reinsurance programme, Centre Re will purchase $50m of convertible preferred RLI shares. The term of the agreement is 3 years and RLI will pay approximately $1m a year for the option.

RLI's current surplus is approximately $190m. If the loss was so severe that it exhausted the company's catastrophe protections and reduced the surplus to a level where the funding available under the Catastrophe Equity Put would not put the company back into a stable trading position, then the contract would become void and Centre Re would not be required to buy the shares - a minimum surplus level of $60m has been agreed for the purposes of this deal.

50% of the shares would be convertible to common stock after three years, and 50% would be convertible after four years. In the interim RLI is entitled to repurchase the shares from Centre Re at the then current market price. Centre Re also has the option to accept up to a 25% quota share in the business written by RLI after purchasing the shares.
As an indicator of the level of exposures that RLI has in California, the company suffered a $200m gross loss from the Northridge Earthquake in 1994 when it had $150m of catastrophe reinsurance protection.

**Analysis**

Northridge produced a total market insured loss of approximately $12.5 bn. Therefore, if RLI's current book of business is similar to that in 1994, the Centre Re contract could be expected to respond to a market loss of $12.5 bn. The current market rate on line for a $10 bn franchise reinsurance covering US earthquake exposures is of the order of 10%. This compares with the 2% rate on line that RLI are paying to Centre Re for the option described above. However, the Centre Re contract is void if the loss is so large that it reduces the company's surplus to below $60m. A franchise reinsurance that was structured similarly might perhaps have a rate on line of 5% to 6%.

From an accounting perspective, the additional equity generated under this structure could be attributed to surplus whereas this is not necessarily the case with debt-style products.