PROJECT REPORT

FOR

FIRST INITIATIVE,
EMERGING MARKET ECONOMICS LIMITED
AND
THE GOVERNMENT OF MEXICO

ON

DEVELOPING THE FRAMEWORK FOR ISSUANCE OF CATASTROPHIC BONDS

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LANE FINANCIAL LLC.

JULY 25, 2006

1. Introductory Comments

Lane Financial LLC (LFC) is pleased to have had the opportunity to participate as advisor to the Government of Mexico in its development of an insurance solution for a portion of its risk of loss from a catastrophic earthquake event. This was a significant project for Mexico and innovative in the structure it achieved. The Government of Mexico is to be congratulated for its farsighted approach to its risk management. Importantly, the result was extremely beneficial for Mexico, both in the protection gained and in the cost it entailed.

We recognize the effort put into the development of the project by World Bank staff. We particularly want to express our appreciation to those in Mexico who were involved, including staff at Banco Nacional de Obras y Servicios Públicos (Banobras) and the Ministry of Finance (MoF) for their efforts. And, we want to acknowledge the considerable effort of General Direction of Securities and Insurance of the MoF over the past several years as a primary force moving the project to completion.

There were several agencies of the Government of Mexico involved in all aspects of the project including Banobras, the MoF and their attorneys. In this report we shall use the general term of "Mexico" to refer to the combined government units; where appropriate we shall also refer to the specific agency, such as the MoF.

2. Background

The country of Mexico is exposed to significant risk from earthquake, primarily from faults lying along its Pacific coast. The resulting risk to the infrastructure led to the establishment of the Natural Disaster Relief Fund (FONDEN) which provides post-event funding to aid in recovery from such an event. However, budgetary issues have led to insufficient funding of FONDEN and a consequent shortfall in funds available for recovery from a severe catastrophic event. In the beginning of the project, the World Bank, working with Mexico, over the past several years, examined various alternative methods of enhancing post-event funding[1]. LFC was engaged by the World Bank in the early stages of this project to provide a report examining the feasibility of a sovereign nation issuing a Catastrophe Bond.[2] A copy of that report is attached as Appendix A; the LFC report includes a discussion of the catastrophe bond market in general and describes the structure and operation of a typical catastrophe bond. Also commissioned in this time period was an actuarial study by AIR Worldwide

[1] "Managing the Financial Impacts of Natural Disasters losses in Mexico", The World Bank, November 2000.

[2] "The Viability, Likely Pricing and Important Specification Components of an Earthquake Bond for a Sovereign Issue by the State of Mexico", September 2003

Corporation[3]. The need for such a study and its place in the catastrophe bond issuance process is discussed in Appendix B. The result of all this effort was the commissioning of an insurance solution for three highly exposed zones; included within the insurance structure was a requirement for the issuance of a catastrophe bond for at least one of those zones.

Recently, in order to facilitate the process of securing this insurance solution, FIRST Initiative, an entity supported by the World Bank and others donors, engaged LFC to advise the Government of Mexico, specifically the MoF, in this effort. LFC's engagement began in late August 2005. The engagement specified that LFC would:

- Become familiar with the existing situation in Mexico and with the work done to date.
- Review and analyze certain assumptions and methodology used in evaluating possible solutions.
- Advise the MoF on proposals submitted by insurers and/or investment bankers.
- Added subsequently was a requirement to advise Mexico during the implementation of the selected proposal.

This report will review LFC's involvement in the project including fulfillment of the above requirements, will examine the overall process of securing the required post-event solution and will conclude with our observations on how the process may be improved in future projects. We begin, however, with a summary of the structure of the Mexico issue (CAT-Mex Ltd.) followed by an overview of recent pricing in the catastrophe bond market and where CAT-Mex Ltd. fits in this analysis.

3. Structure of Insurance Protection and CAT-Mex Ltd.

Swiss Re has provided insurance protection to Mexico from the risk of loss from an earthquake occurring in three specified zones. The total loss protection is $450 million, consisting of $150 million for each zone. The insurance is provided to FONDEN by European Finance Reinsurance Ltd., ("EFR") a Barbados subsidiary of Swiss Re. EFR is reinsured by Swiss Re and, additionally, Mexico's exposure to EFR is fully guaranteed by Swiss Re. Swiss Re's (and EFR's) obligation to make loss payment to Mexico is triggered by the occurrence of an earthquake of magnitude 7.5 or 8.0 and depth of 150 km or 200 km, depending on zone. Payment is "binary" which means that a single event meeting the required parameters will generate a full payment of $150 million per zone. This structure is fully in accordance with the ToR.

[3] "Recompiling, Analyzing, Quantifying and Modeling the Seismic Risk of the United Mexican States", AIR Worldwide Corporation, December 2004

An additional requirement of the ToR was that at least one of the zones (Zone B) must be covered by a catastrophe bond. CAT-Mex Ltd. Was the result of this requirement. In many ways, CAT-Mex Ltd. is a typical catastrophe bond and this is good from the investor's point-of-view. The more that the structure is familiar to an investor, particularly with a new risk being introduced to the market, the more comfort the investor will have with the transaction.

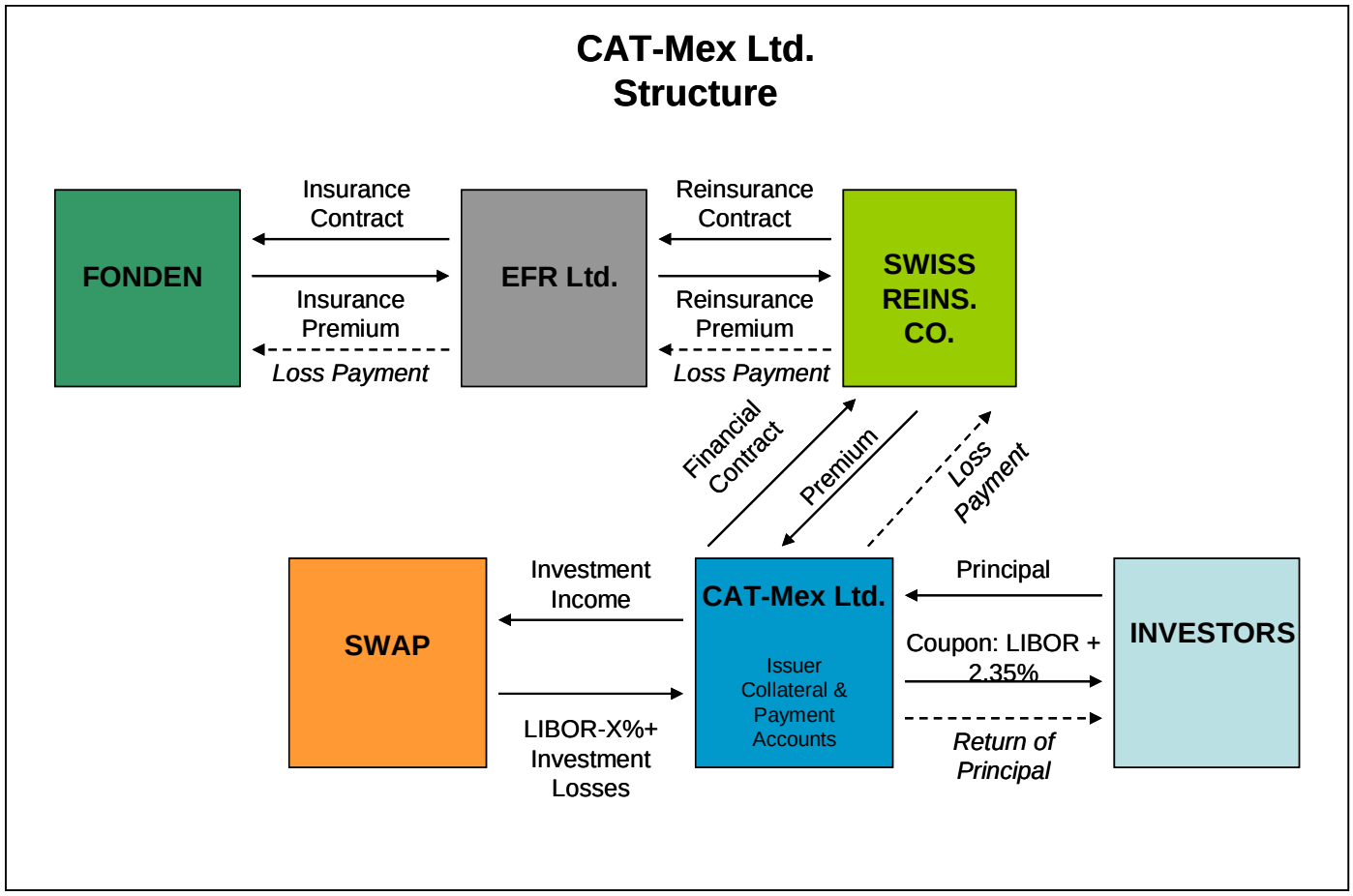
The key aspects of CAT-Mex Ltd. are:

- A Special Purpose Vehicle (CAT-Mex Ltd.), incorporated in the Cayman Islands, to provide insurance protection to FONDEN and to fund that protection through the issuance of notes to investors.
- A trust account controlled by agreement with the indenture trustee (Bank of New York) to hold investor funds and to make required payments of interest and principal to the investors and to make loss payments if a qualifying event occurs.
- An independent event verification agent (AIR Worldwide Corp.) to determine that an event meets the requirements for a loss payment.
- An administrator in the Cayman Islands (HSBC Financial Services) to perform required administration of CAT-Mex Ltd.
- A swap counterparty (Swiss Re Financial Products) to provide a fixed return and protection from loss on investments for funds in the trust account and protection from variations in short term interest rates.

Each of these relationships is governed by a specific written agreement.

The following diagram illustrates the key parties and their place in the flow of funds in the CAT-Mex structure. Essentially, FONDEN pays an insurance premium to EFR who passes it thru Swiss Re to CAT-Mex Ltd. which deposits the funds in the trust. Investor funds are paid to CAT-Mex Ltd. which places those funds in the trust as well. The swap counterparty provides a fixed rate of return and as appropriate the funds are paid to either the investors at maturity of the notes or paid to FONDEN in the event of a loss. While this structure is very typical, there is an additional protection for FONDEN built into the payment stream in the form of a deposit account; this is discussed below in Section 6 under "SPV Payment Stream".

One additional key participant is the rating agency (Standard and Poors) which examines all aspects of the transaction including the structure, participants, and AIR modeling results. The agency then issues its rating of the transaction. The investor places a great deal of importance in the rating; most will have a minimum acceptable rating. In the case of CAT-Mex Ltd. a rating of BB+ was assigned; this was as expected and was acceptable to the investors.



4. Justification for Issuance of Catastrophe Bond

In issuing a catastrophe bond and undertaking a simultaneous traditional reinsurance, Mexico is following a game plan that has been laid out by the most prolific of commercial users, namely the United States Automobile Association (USAA). USAA, a major US property casualty insurer, has issued nine consecutive cat bonds since 1997 combining its annual cat bond with its traditional reinsurance purchases. In doing so, USAA gets the advantage of being exposed to the protection providers in the both the reinsurance and capital markets. The unstated advantage is that it gets the most competitive prices from both markets. And, it varies its purchase sizes according to prices. USAA has also evolved in the design of its cat bond as its experience with the markets has grown. The cat bond issued in 2006 is much different from the one issued in 1997, and safe to say, is a much better product for its current circumstances providing much better protection.

Mexico with its inaugural issue has set the same precedent as USAA in the government-issued environment. However, to fully realize the competitive pricing benefit over time it will have to separate the issue of the cat bond from its traditional insurance placement, perhaps using different issuers. Mexico may also want to change the structure of its issue when and if it issues another bond

next year. Ideally, we would recommend regular issuance to build a universe of familiar investors and to enlarge the protection it buys.

As an example of a changed structure that may emerge over time, consider the binary nature of the bond. If the earthquake trigger is attached by an appropriately sized earthquake, Mexico will receive its payment in full and immediately. That is very desirable from Mexico's point of view. However, from an investor's point of view it can be a disadvantage, and may have been the reason that the investor universe, while adequate, was not as large as it might have been. Investors in cat bonds are more used to the possibility of partial loss, rather than the certainty of full loss. One way to achieve the objectives of both parties might be to have the bond payout as a step function. Under this structure, a first trigger would cause an immediate payment but not a full payment. However, full payment would be triggered if an even larger earthquake occurred. Such a structure was used by Munich Re in the issuance of its PRIME security.

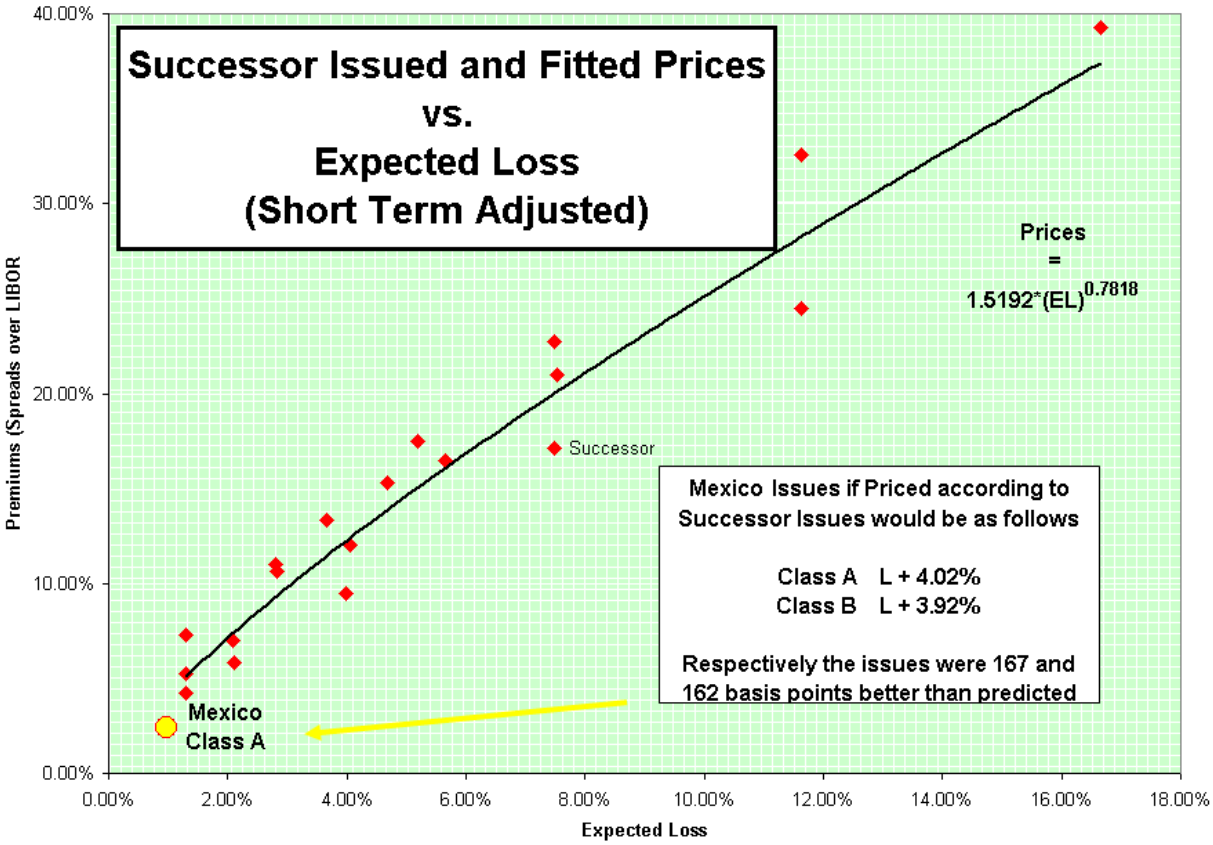
Notwithstanding these comments which may affect future issuance, the current bond may be seen as a major success in terms its path breaking official institution "first". It may also be seen as a major success in terms of its pricing. Prior to the issue, LFC as well as the competing investment banks to Swiss Re thought the market price might be in the 3.50% to 4.50% range depending on final specifications. This assessment was based on analytics and market knowledge. At 2.30% and 2.35% for Class A and B, respectively, this was clearly a superior issued price. Another test of the pricing was presented during May 2006 when Swiss Re, for its own protection, issued a cafeteria of bonds at different levels of risk and for a variety of perils. This issuance is referred to as the "Successor" series.[4] It succeeds novel ideas from Swiss Re in its Pioneer and Arbor series. As such the simultaneous issue of different risk allows an analysis of contemporary pricing in the period immediately around the CAT-Mex issue. The result of our analysis of Successor prices is displayed in Charts 1 and 2 below. The first chart shows how much the market charged for different levels of expected loss. We have fitted a simple power curve, which we often refer to as the Kreps and Major formula, to the observed prices. The graph shows that if the observed relationship were used to price CAT-Mex Ltd, the prices of the two classes would have been 4.02% and 3.92%, respectively. Swiss Re achieved prices of 167 basis points and 162 basis points lower for each of the classes.

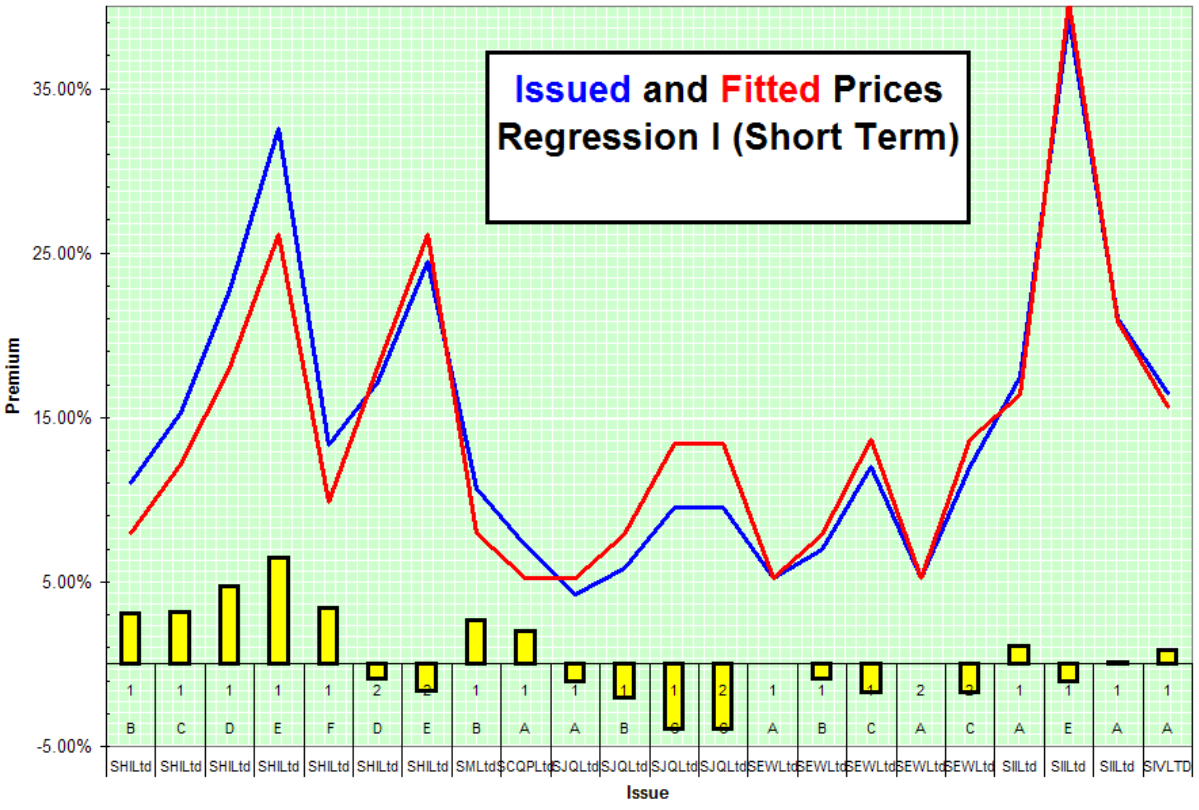
[4] Swiss Re has been a leader in introducing new structures to the cat bond market. One such innovation is the "shelf" issue under which a cat bond structure is presented to the market with allowance for total issuance over time. In the case of Successor, $1.5 billion was approved in as many as 11 Series and 36 Classes. Risks covered vary by Series. Swiss Re actually issued $950 million in their initial Successor drawdown but the Successor structure allows them to access the market quickly for part or all of the remaining amount to meet their specific needs. This is a structure that we expect to be used increasingly in the future; indeed, Successor is the third such series that Swiss Re has established, the others being the Pioneer and Arbor series.

While there is less transparency in the reinsurance market as compared with the Cat bond market, there is certainly a correlation in price levels. All things being equal (risk, term, etc.), price levels in the two markets will be similar. By inference, therefore, it is clear that not only was the Cat bond portion of the transaction priced very favorably for Mexico, the insurance for Zones A and C was just as favorably priced.

The second graph may illuminate where some of that benefit originates. In this chart, the issued, or actual, prices are compared to the fitted prices and the differences are shown as a bar chart below the prices. Clearly, a price formula that relates price exclusively to expected loss cannot capture all of the differences in market evaluations of subtleties of each of the structures. The difference bar chart shows market perception of those subtleties. Close inspection of the graph shows that among those Successor issued bonds, the ones that were expensive are the Japanese Quake bonds (SJQLtd etc). These bonds were issued at prices lower than the formula would suggest. CAT-Mex Ltd. and these Japanese earthquake bonds have both enjoyed a “diversification” benefit. Investors have accepted prices lower than the pure expected loss formula would suggest because they want the spread of business. By contrast US Wind issues and California Quake issues actually required a higher price. Investors have plenty of those perils.

The conclusion of good pricing is reinforced, and to some extent explained. Mexico is able to get lower coverage prices because of its diversification benefits.


Successor Issued and Fitted Prices
vs.
Expected Loss
(Short Term Adjusted)
Prices
=
1.5192*(EL)^0.7818
Successor
Mexico Issues if Priced according to
Successor Issues would be as follows
Class A L + 4.02%
Class B L + 3.92%
Respectively the issues were 167 and
162 basis points better than predicted
Mexico
Class A
Premiums (Spreads over LIBOR
Expected Loss
40.00%
30.00%
20.00%
10.00%
0.00%
0.00%
2.00%
4.00%
6.00%
8.00%
10.00%
12.00%
14.00%
16.00%
18.00%


Issued and Fitted Prices
Regression I (Short Term)
Premium
Issue
35.00%
25.00%
15.00%
5.00%
-5.00%
SHILtd
SMLtd
SCQPLtd
SJQLtd
SEWLtd
SIILtd
SIVLTD

5. Bidding Process for Investment Bank/Insurer

Development of Terms of Reference and Bid Submission Timetable

In mid-2005, Mexico developed the Terms of Reference (ToR) for insurers and/or investment bankers that wished to submit bids for the project. Key points included in the ToR were:

- the risks that Mexico faces from an earthquake,
- the establishment of and purpose for FONDEN,
- a detailed description of the coverage Mexico was seeking including amount, zones and earthquake parameters,
- the format for the submission of bids.

The ToR was furnished to several companies that expressed interest in submitting a bid. In response to this initial version of the ToR, Mexico received a number of requests for changes or clarifications to the terms; a revised version was issued in the fall of 2005 with a response time for submission of bids of early December. That deadline was subsequently extended to the end of January 2006 with the winning bid to be announced the first week of February.

Criteria for Assessing Proposals

Proposals were evaluated by Banobras and the MoF under criteria that included:

- Total risk protection provided;
- Amount covered by traditional insurance and by a catastrophe bond;
- Premium cost to Mexico;
- Additional administrative cost to Mexico;
- Time to complete the project and to initiate the risk protection;
- Any required indemnification by FONDEN;
- Expected rating;
- Investment and swap proposals.

As indicated above, the ToR for LFC called for LFC's participation in the bid evaluation process. The expectation was that the submitted bids would be forwarded to LFC and that we would review them for compliance with the bidder's ToR with particular emphasis on the catastrophe bond and its structuring.

Evaluation Process

Upon receipt of the proposals from the three submitting companies, legal staff in Mexico began the review process with the accompanying non-disclosure and confidentiality statements. It was the opinion of the legal staff that these statements prohibited the MoF from supplying LFC with the bids themselves for evaluation. As an alternative, the MoF decided to submit to LFC a series of questions generated by their review of the bids. The questions posed to LFC addressed a number of structuring and process issues such as:

- timing of the payment of premium,
- the purpose of an interest rate swap in the transaction,
- issues related to the investment of funds by the special purpose insurer,
- indemnification by Mexico of the insurer/investment banker,
- the process of obtaining a rating and its significance to investors,
- marketing of the catastrophe bond, including the offering memorandum, the bond's spread over LIBOR and the process for pricing the bond.

The questions were submitted to LFC on January 27, 2006 and LFC provided its response on January 30th. This was the extent of LFC's participation in the evaluation process. Without the specific proposals LFC was not able to provide its full expertise and perspective during the selection phase; we will comment on the consequence of this later in this report. However, we do feel that the decision not to provide the proposals to LFC, while understandable given the non-disclosure and confidentiality agreements, was more conservative than necessary and not consistent with standard practice in the market.

6. Implementation Process

Risk Transfer Structure

Swiss Re Capital Markets ("SRCM") assumed the lead role in the implementation of the winning Swiss Re/Deutsche Bank proposal. This was their natural role since Swiss Re was assuming the entire $450 million risk and SRCM was the lead investment banker – along with Deutsche Bank Securities - in the issuance of the catastrophe bond portion of the transaction. SRCM quickly established the core working group that would be involved in the transaction through completion including the MoF, Banobras, LFC, Deutsche Bank and the attorneys representing Mexico and SRCM/Swiss Re/Deutsche Bank; others would be added to the group as their areas of responsibility came to the fore. The process of developing the details of the overall transaction and negotiation of the various agreements highlighted three key areas that required considerable attention. We focus on these because they highlight areas of concern in any future transaction and because they provide good examples of where the process can be improved. It should be emphasized that the terms and operation of the cat

bond and of the entire insurance structure of the transaction is according to normal and accepted market practice.

Insurance vs. Reinsurance[5]: While there were many essential documents for the working group to complete and related issues to address, the critical path rested with the insurance agreement. This agreement was the heart of the transaction, detailing the circumstances under which Mexico would receive payment whether under the insurance coverage or under the catastrophe bond. The ToR for the providers specified insurance coverage, however, the Swiss Re/Deutsche Bank proposal was to provide reinsurance to FONDEN. A Swiss Re affiliate was, therefore, inserted between Swiss Re itself and Mexico to act as insurer to Mexico in order to adjust the implementation of the Swiss Re proposal to Mexican insurance regulation.

SPV[6] Payment Stream: Mexico required the proposal to include a catastrophe bond in at least one of the three specified zones. While there were a number of reasons for this requirement, an important one was the pre-funded nature of the catastrophe bond. Insurance recovery from Swiss Re carried an – acceptable – credit risk to Swiss Re. The catastrophe bond essentially eliminates this risk through the mechanism of the deposit of investor funds to a trust account at the time of issuance of the bonds. The trustee then administers that account under the clear terms of the controlling agreement which details when and under what set of circumstances funds would be paid to FONDEN or returned to investors.

However, in addition to the usual protection afforded by the trust account, Mexico was able to negotiate additional structural protections that afforded Mexico greater security for payments due them. This goes beyond what is customary in a normal cat bond. Under normal payment procedures a loss payment would be paid from the trust account to Swiss Re which would then pay Mexico. The additional protections negotiated by Mexico require Swiss Re to establish a deposit account to which a loss payment is made by the trustee. The deposit account carries standing payment instructions directing the bank (Bank of New York) to make payment to Mexico on the date the loss payment is due. The standing instructions may not be revoked by Swiss Re during the term of the transaction. This procedure eliminates any risk that Swiss Re could receive funds from the trust but fail to pay those funds to Mexico.

[5] Reinsurance is insurance purchased by an insurance company for its own protection.
[6] The SPV is the Special Purpose Insurer established to issue the catastrophe bond and to make loss payments on the occurrence of a qualifying loss event.

7. Conclusions and Recommendations

A Favorable Result:
The purpose of this review is to examine the process by which Mexico secured earthquake insurance and what can be learned from that process for future projects. First, however, we need to recognize the very positive results:

- Most important is that Mexico was able to secure a very good deal. The price (premium) was quite advantageous to them – as discussed in section 3 above - particularly in the extremely tight insurance market following record industry losses in 2005. (Additionally, see exhibits following this section.)
- Mexico received the "headline" in terms of publicity by being the first sovereign to issue a catastrophe bond.
- Mexican risk was introduced to the market, bringing an awareness of the diversifying nature of Mexican risk to a new set of investors – whether they actually participated in this transaction or not – thus opening more opportunities in the future.

Lessons Learned:
This was a new experience for many of the parties involved and the key participants should feel a great deal of satisfaction from the result. However, one benefit of a review such as this is in providing the ability to look back at the process and to learn where improvements might be made for future such transactions. In our view, there are four primary areas on which to focus.

- Use of Advisors: Lane Financial was engaged by FIRST Initiative to work with Mexico in developing the structure under which the insurers/investment bankers would provide their proposals. This included a review of prior work in analyzing the risks faced by Mexico, the needs of Mexico post event and the best approach to providing some immediate financial assistance. While LFC was provided with considerable documentation in the forms of previously completed studies and the risk analysis conducted by AIR, we feel that a meeting with the key individuals in Mexico at this early stage would have proven beneficial to both LFC and concerned parties in Mexico. Such a meeting would have given Mexico a better understanding of LFC's capabilities. And, it would have given LFC a clearer understanding of the decision process and agency interplay in Mexico. We feel that LFC would have had a better perspective on the project as a whole and that Mexico would have been able to make better use of LFC's capabilities. This issue of the use of advisors carries over to the next two issues as well.

- Improving the ToR: We feel that involving LFC more completely in the process of developing the Terms of Reference for the insurers/investment bankers would have reduced some ambiguity that seemed to exist in that

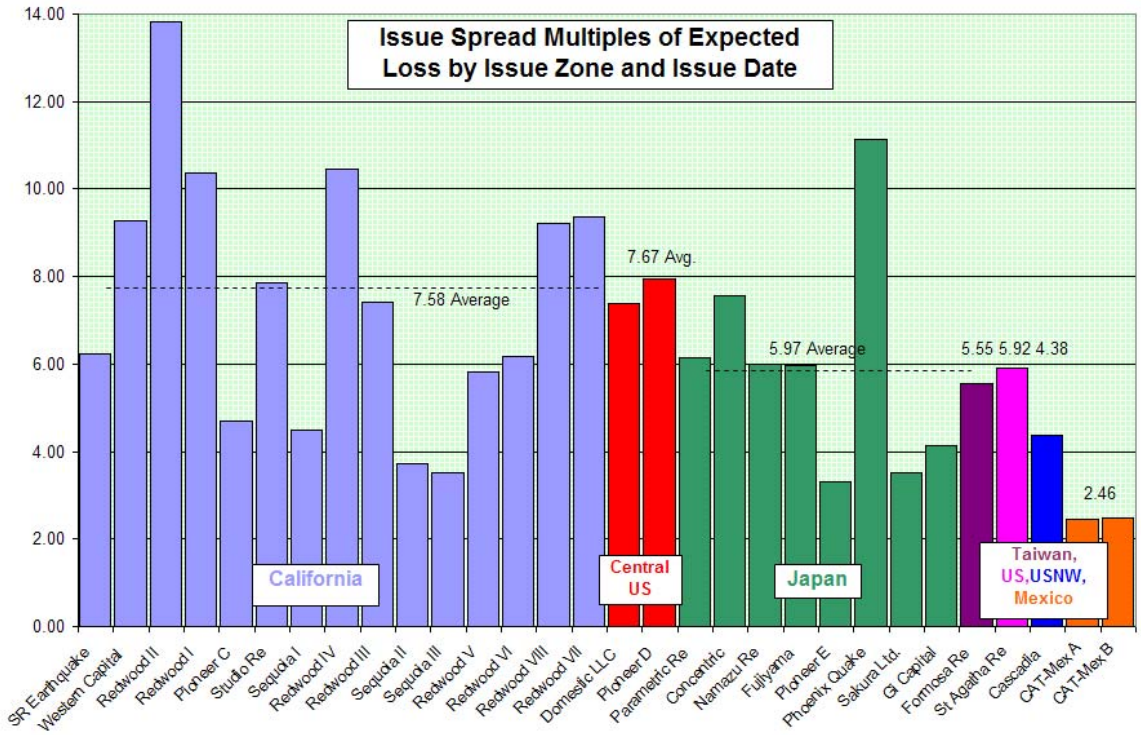
document. LFC did review and provide comment on an early version of the ToR but we were not given that opportunity with subsequent versions which included important changes from the early version. We recognize that the providers themselves had the opportunity to provide feedback on the ToR and that these changes were made as a result. However, utilizing a concerned third-party such as LFC would have given an extra level of scrutiny to a key document. Time and effort spent by the providers in interpreting or clarifying language in the ToR could have been better spent in developing a more focused response. In practical terms, the issue of ambiguity in the ToR was most evident when the matter of access to funds in the SPV came up as Swiss Re's documentation was drafted. Mexico's intent was without doubt that they would have direct access to and receive direct payment of funds in the SPV and language in the ToR indicated this structure. However, separate language in the ToR was less clear and gave Swiss Re the opening to propose a structure under which SPV payments would be made directly to themselves. While this issue was satisfactorily resolved from Mexico's point of view, it took considerable effort and time to do so; it was one if the reasons why closing was delayed for almost three weeks.

- Recognize Structural Consequences: The two points mentioned above come together when we look at the review process for the proposals submitted by the insurers/investment bankers. We earlier commented that legal staff in Mexico interpreted the confidentiality agreements accompanying the proposals to mean that they could not be referred to LFC for our review, evaluation and comment. This was unfortunate because we feel that such a review was one of the specific areas in which our expertise would have been of greatest value. (Perhaps the legal staff would have felt more comfortable with LFC's direct involvement had we been able to meet with them early in the process.) Limiting LFC's involvement to responses to a set of ten questions did not make use of our ability to interpret and contrast differences in the proposals. We were limited by the nature of the questions submitted which were in turn colored by the understandable lack of experience in this area by those conducting the review. Had the proposals been more competitive this limitation would have been of much more consequence. In this case, there was a clear price advantage to the Swiss Re/Deutsche Bank proposal over the competing proposals; in a future transaction this price difference may be non-existent so that interpretation of structural differences will likely be of greater importance.

- Future Structural Considerations: In section 3, we discussed possible structural approaches for future transactions such as whether a binary trigger should be used. Both the needs of Mexico and the desires of investors should be considered and trigger construction including the parametric requirements can be adapted to these needs. Examples of

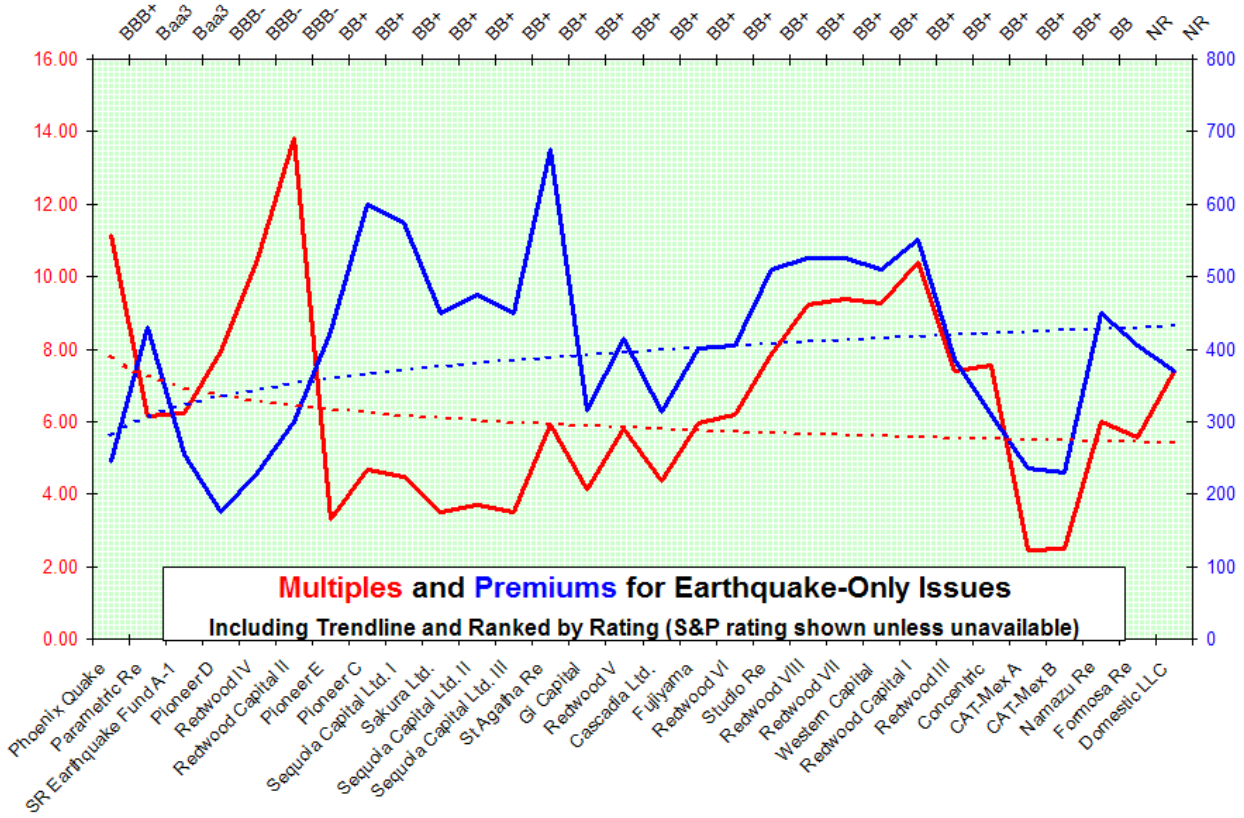
other considerations include whether coverage should be on a first event or on multiple events or whether a portion of the coverage should be on a contingent basis. Many of these issues will depend on Mexico's desire to develop a multi-year combined solution to its risk management.

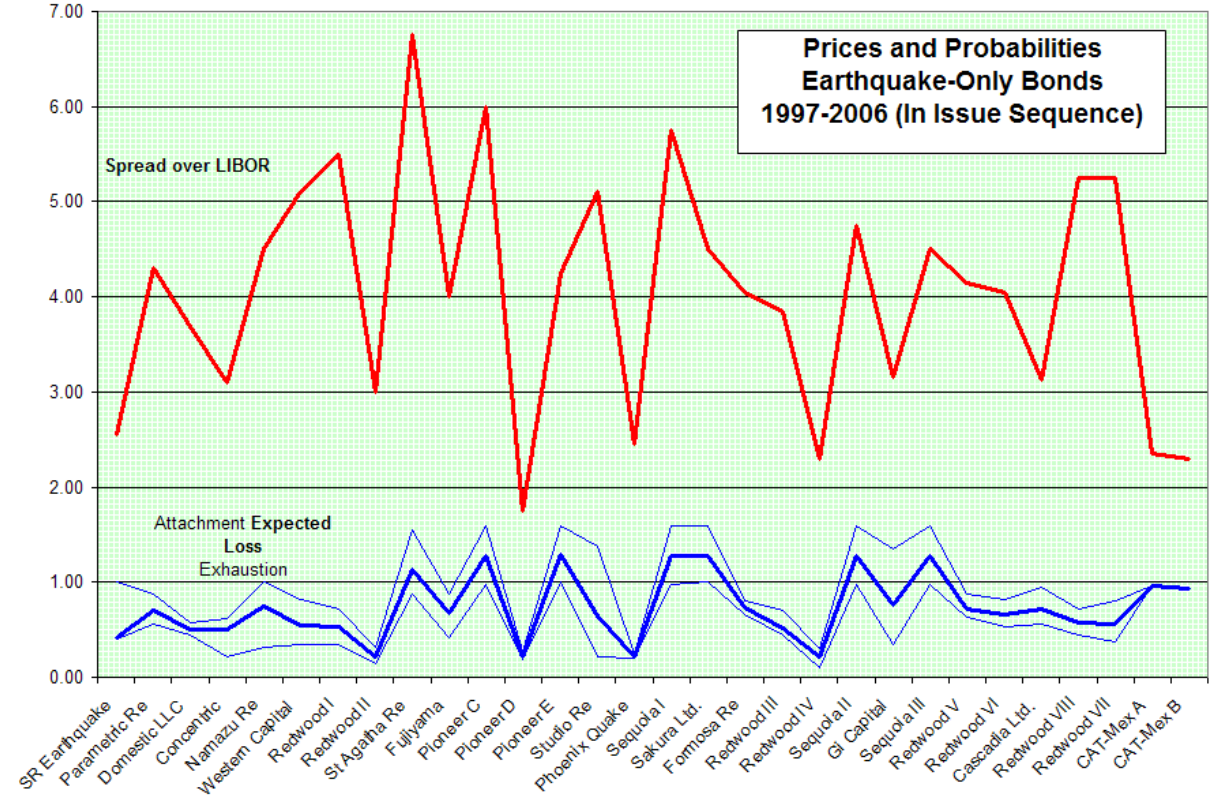
- SPV Ownership: Further to the illustration of structural consequences, we believe that if we had access to the various proposals, we would have noted and commented on the issue of SPV ownership, the resulting cash flow effect, the differences in the approaches to this detail taken in the proposals, and the consequence of ownership by Mexico vs. ownership by the insurer (or reinsurer). The structure that would provide the most direct access by Mexico to the funds in the SPV would be one under which Mexico itself sponsored and established the SPV. There would thus be no intervening party as there was in this case with Swiss Re as the sponsor. Offsetting this benefit, however, are procedural issues that may be difficult for Mexico to accept. For instance, the SPV would need to be incorporated in a favorable regulatory locale such as Bermuda or the Cayman Islands. There would be the direct expense of incorporation and subsequent documentation of the catastrophe bond that can easily exceed $1 million. (While Mexico paid these expenses in this transaction, they were among the overall fees paid and not as explicit.) We assume there would likely be regulatory or statutory changes or approvals that would be necessary in order for Mexico to sponsor such an entity, further complicating the process. In short, this is not an issue to be taken lightly in any future transaction and, in fact, a structure such as that accomplished with CAT-Mex under which the payment stream is guaranteed or made more direct from the SPV to Mexico may be the best alternative for Mexico.



Averages of all Earthquake-Only Issues by Zone of Coverage

	Amount Issued	Issue Spread	Attachment Probabilities	Expected Loss	Multiple
California	$1,643	4.47%	0.99%	0.74%	7.58
New Madrid	$206	2.69%	0.43%	0.36%	7.17
Japan	$765	3.78%	0.97%	0.76%	5.97
Taiwan	$100	4.05%	0.81%	0.73%	5.55
Mexico	$150	2.33%	0.95%	0.95%	2.46
US	$33	6.75%	1.55%	1.14%	5.92
US Pac NW	$300	3.13%	0.94%	0.71%	4.38


BBB+ Baa3 Baa3 BBB- BBB- BBB- BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB+ BB NR NR
16.00 14.00 12.00 10.00 8.00 6.00 4.00 2.00 0.00
800 700 600 500 400 300 200 100 0
Multiples and Premiums for Earthquake-Only Issues
Including Trendline and Ranked by Rating (S&P rating shown unless unavailable)
Phoenix Quake
Parametric Re
SR Earthquake Fund A-1
Pioneer D
Redwood IV
Redwood Capital II
Pioneer E
Pioneer C
Sequoia Capital Ltd. I
Sakura Ltd.
Sequoia Capital Ltd. II
Sequoia Capital Ltd. III
St Agatha Re
GI Capital
Redwood V
Cascadia Ltd.
Fujiyama
Redwood VI
Studio Re
Redwood VIII
Redwood VII
Western Capital
Redwood Capital I
Redwood III
Concentric
CAT-Mex A
CAT-Mex B
Namazu Re
Formosa Re
Domestic LLC


7.00 6.00 5.00 4.00 3.00 2.00 1.00 0.00
Prices and Probabilities
Earthquake-Only Bonds
1997-2006 (In Issue Sequence)
Spread over LIBOR
Attachment
Expected Loss
Exhaustion
SR Earthquake
Parametric Re
Domestic LLC
Concentric
Namazu Re
Western Capital
Redwood I
Redwood II
St Agatha Re
Fujiyama
Pioneer C
Pioneer D
Pioneer E
Studio Re
Phoenix Quake
Sequoia I
Sakura Ltd.
Formosa Re
Redwood III
Redwood IV
Sequoia II
GI Capital
Sequoia III
Redwood V
Redwood VI
Cascadia Ltd.
Redwood VIII
Redwood VII
CAT-Mex A
CAT-Mex B

APPENDIX A

The Viability, Likely Pricing and Important Specification Components of an Earthquake Bond for a Sovereign Issue by the State of Mexico

TECHNICAL REPORT

FOR

THE INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

ON

ON THE VIABILTY AND LIKELY PRICING OF ISSUING “CAT BONDS” FOR DEVELOPING COUNTRIES

MORTON LANE Ph. D.

PRESIDENT,
LANE FINANCIAL LLC.

September 29, 2003

INTRODUCTION

An inordinately large number of natural catastrophes occur in the developing world. That is, they occur in those areas least likely to be able to handle the disaster's human and economic consequences and quickly return to functioning societies. In the developed world, when disasters hit, governments respond with aid but a large measure of restitution is provided by private insurance markets. In the developing world, the usual sources of help are international reconstruction agencies like the World Bank and IMF, donor governments and charities. The insurance markets provide very little help.

Private insurance markets could provide help of course but often the developing countries are unable to afford the premiums that are demanded in order to provide adequate financial return to the shareholders of the insurers. On the other hand, the repayment of reconstruction loans from the likes of the World Bank is also expensive and can provide an economic drag for years to come.

There is, therefore, a desire to get the benefits of insurance financing, i.e., non-recourse reconstruction financing - but at somewhat lower cost. One way in which that may happen is through the nascent "cat bond" market which disintermediates the insurance market and goes directly to the capital markets. Investors in the capital market require a financial return of course, but in principle they should welcome, and therefore pay up for, developing country risk that would be a diversifying alternative asset.

At present, the cat bond market is small and will require certain pioneering countries, with official aid, to develop the market. The purpose of this paper is to lay out those costs that pioneering issuing countries might have to pay in the present cat bond market. The example of earthquake risk in a hypothetical developing country is used as a practical example. The paper lays out the history and functioning of the cat bond market together with an examination of past prices paid for coverage. A pricing model is proposed and a discussion of certain non-investor costs are outlined in the context of the tactical and strategic issues the developing countries must answer for entering this market.

THE CATASTROPHE BOND MARKET

Some six to eight years ago, the capital markets were introduced to a new security – the catastrophe bond. Popularly known as "Cat bonds", these securities are more specifically referred to as "Insurance Linked Notes" (ILS). The distinguishing feature of these bonds is that the ultimate repayment of principal depends on the outcome of an insured event. Fashioned as floating rate notes, the bonds pay a fixed spread over LIBOR (the London Inter-Bank Offered Rate). Loosely speaking, the fixed spread may be analogized to the premium payment for the underlying insured event, and the floating rate, LIBOR, is the payment for having cash tied up in the bond to provide payment against the insured event, should a payment to the insured be necessary.

The principal insured risks covered by cat bonds are catastrophic in nature. Insured losses due to wind or earthquake are by far the majority of issues. Earthquake bonds have covered Japan, Taiwan, Monaco, California and the mid-west of the USA. Losses due to severe wind are focused on hurricane in Florida but also include typhoon (i.e. Asian windstorm) and European windstorm. Other insured losses have included weather, auto-lease residual values, space launch, aviation, life and oil platform risk. All so far have been "short tailed"[7] in nature although some new life securitizations promise to change that.

Still an experimental market, there is a regular stream of cat bond issues amounting to an issue-rate of a little over $1 billion per year. All told approximately $8 billion dollars of securities have been issued since the market began. Table 1[8] lists all "publicly disclosed" securities issued. In actuality the market is not public. It is a private placement market, most securities having been registered in the USA as Regulation 144A securities, only eligible for purchase by suitably qualified investors. The non-public nature of the securities means that while the list of issues in Table 1 is thought to be exhaustive, it cannot be guaranteed as complete or 100% accurate. Other private transactions could easily swell the known numbers by 25-50%.

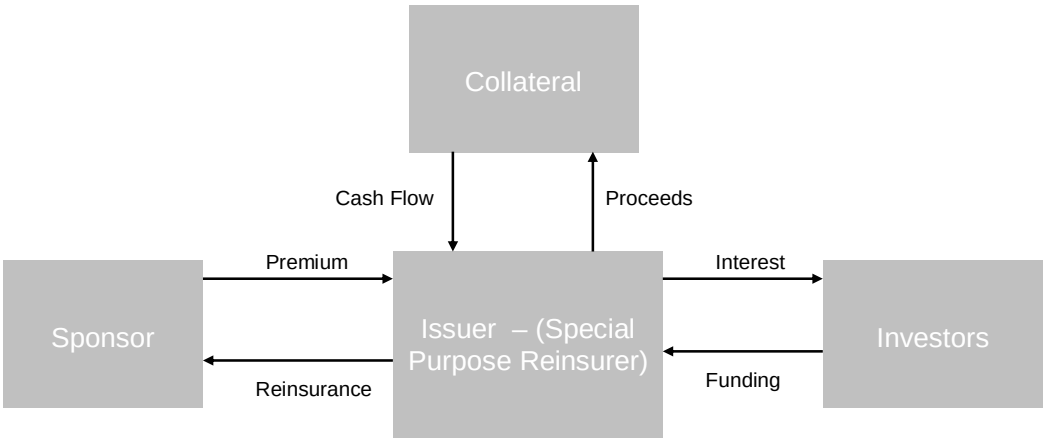
The average size of issue is around $100 million, although this varies considerably from year to year and depends on how the size is measured. The largest single issue was $477 million (in 1997) and early issues were as small as $10 million. It is now, however, considered to be uneconomic to go through the cost of securitization for amounts less than $50 million. In recent years, there has been a tendency to issue deals with several "tranches" so that size of tranche is an alternative measure of issue size. Even more recently, Swiss Re has introduced a form of shelf registration, in sizes up to $2 billion each, but individual take downs may be in much smaller pieces, which the investor may, or may not, accumulate over time.

[7] Short tailed in this context means losses are determinable in a relatively short period of time.
[8] All Tables referred to in the text will be found in the Appendix.

The typical maturity of cat bonds is nowadays around 3 years with the maximum issued term at 10 years and the minimum seldom less than one year. The reinsurance market cycle is a calendar annual one so many early deals conformed to that term. Recently it has been realized, however, that economies can be achieved on issue-cost by issuing longer maturities. The term to maturity may also be driven by the price cycle in the underlying reinsurance market. Just as corporate finance officers will issue longer debt when interest rates are low, so will the risk manager tend to issue longer maturity cat bonds when cat bond premiums and reinsurance rates are at the low part of the reinsurance price cycle in order to "lock in" the lower premium rate for a longer period of time. When high premiums prevail, the tendency will be to issue shorter maturities.

How It Works:

Basic Catastrophe Bond Structure



Process

1. Sponsor establishes Special Purpose Reinsurer as Issuer of Bonds and as source of reinsurance protection.
2. Issuer sells Bonds to Investors; proceeds are invested in Collateral Account.
3. Sponsor pays Premium to Issuer; this and Bond proceeds investment are source of interest paid to Investors.
4. A qualifying event results in funds being withdrawn from Collateral Account and paid to sponsor; at maturity, remaining principal – or if there is no event, 100% of principal – is paid to Investors.

Salient Advantages

To Issuers – The potential for loss payment is pre-funded. Because of AAA-rated investments, there is no "security risk".

To Investors – Pure, diversifiable insurance risk. No management, adverse selection or book-drift risks.

Issuers include reinsurance companies, insurers and in some cases insureds. The majority of issuers have been reinsurers where the nature of the cat risk is most felt in their accumulations of risk. The most consistent issuer, however, has been an insurer, USAA, who has single handedly issued seven deals for a total insured risk of $1.7 billion. To date, three insureds have issued directly to the market, Tokyo Disneyland (part of Oriental Land), Universal Studios and Taiwan.

Each entity has considerable earthquake exposure which they covered by issuing securities directly to the capital market, rather than going to the insurance market.

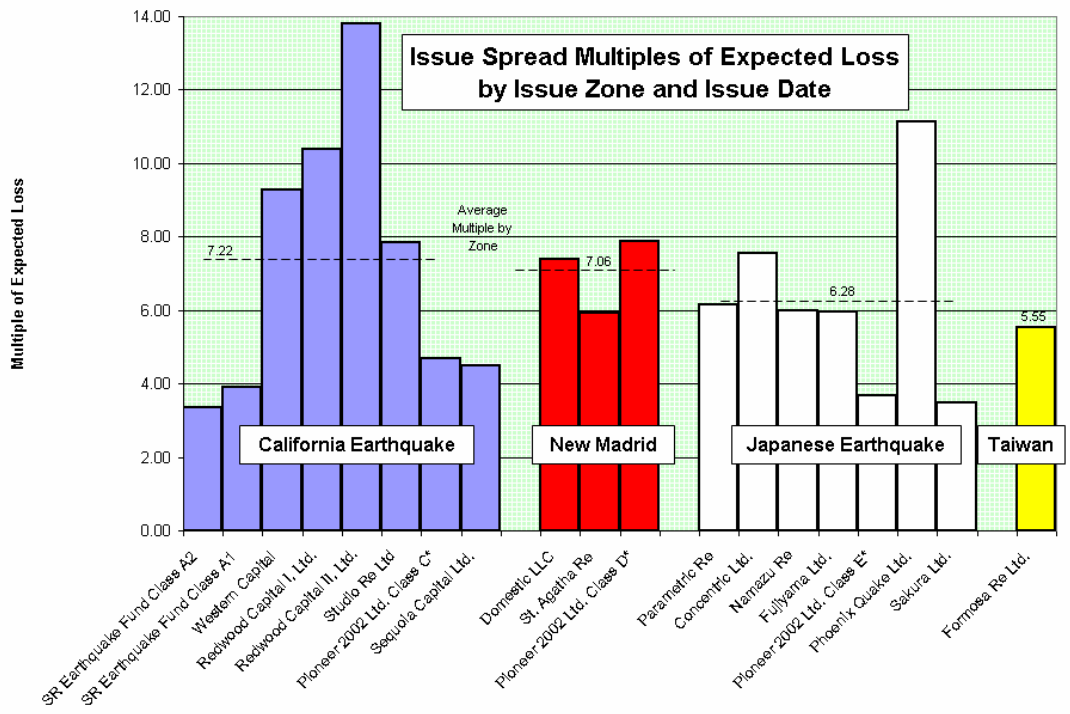
Direct issue of an earthquake bond by Country would be perceived as another issue by an insured, part of a perhaps growing trend of disintermediation in the insurance market as a whole. At the very least it represents a competitive alternative to other traditional coverage. And, it would carry the distinction of being one of the first Cat bonds issued by a sovereign entity (although Formosa Re was issued by a governmental agency).

Cat bonds sold in the USA, the largest investor market, must be distributed by a registered broker dealer. Investment banks led by Goldman Sachs, Lehman Bros and Merrill Lynch have placed most securities. At the same time reinsurers themselves have entered the capital markets by forming their own broker-dealers. The major reinsurer issuer in this regard is Swiss Re Capital Markets. Swiss Re issued or participated in nearly all of the 2003 securitizations, of which more later. Other participants include Morgan Stanley, Guy Carpenter, Lane Financial, Credit Suisse First Boston, Aon, MMC Securities and Deutsche Bank, each of whom has issued one or more deals.

EARTHQUAKE BONDS

Of all the issues listed in Table 1 (79 securities), some 50 involve earthquake risk. Nearly half the issued bonds by amount have contained earthquake risk. Many, however, contain other risks in a portfolio with

Figure 1



Averages of all Earthquake-Only Issues by Zone of Coverage

	Amount Issued	Issue Spread	Attachment Probabilities	Expected Losses	Multiple
California Earthquake	$872.70	4.46%	1.08%	0.74%	7.22
New Madrid Earthquake	$185.75	4.06%	0.80%	0.62%	7.06
Japanese Earthquake	$641.55	3.94%	0.97%	0.76%	6.28
Taiwan Earthquake	$100.00	4.05%	0.81%	0.73%	5.55

earthquake risk. Only 19 issues have had earthquake as an exclusive risk. These are listed in Table 2. Eight issues have dealt exclusively with California earthquake risk (counting both SR tranches as two issues). Three deals have dealt with mid west US earthquake risk often known as the New Madrid quake (although one of these, St Agatha, contained California quake risk as well). Seven deals have dealt with Japanese earthquake risk and one covers earthquake in Taiwan. The average coupons of all these earthquake-only deals are laid out in Table 3 below.

Clearly, the amount of issuance has been greatest for the California zone. And, to some extent, that has been reflected in the prices. Table 2 gives a clue as to the relative demand by zone. Particularly since 9/11 there has been considerable demand for coverage in California. Insureds have realized that any wide-scale earthquake in California contains concentrations of worker's compensation losses as well as property losses. Accordingly, this demand is reflected in the fact that California deals have to pay on average a higher coupon. In Figure 1 above, that premium is 4.46% over LIBOR versus 3.94% for Japanese quake. Of course, a higher average spread by itself does not speak exclusively to zonal differences. It could be that California deals were issued at higher probability attachment points, as they appear to be. A better gauge is the multiple of expected loss at issue. Here there is again some evidence of relative supply and demand for different zones in pricing; the multiples are 7.22 vs. 6.28.

The significance of this observation is that there appears to be a demand in the investor community for zones where there is little or no current supply. Put another way, it may be predicted that an earthquake bond issued by Country will price closer to Japan or Taiwan than California. This seems intuitive but is borne out by the simple average analysis above. It is demonstrated in practice in the very recent, August 2003, Taiwan earthquake bond (Formosa Re) that was reportedly significantly oversubscribed. It will be further demonstrated below in the section focused on explaining prices empirically.

Before leaving the general overview of earthquake-only bonds three other observations are in order. First, from Table 1 it will be obvious that earthquake bonds tend to be issued for longer maturities than cat bonds as a whole. The average size of issue is 44 months compared to approximately 38 months for all cat bonds. While this could suggest that Country should issue for longer than three years, and thereby save on issue costs, this has to be balanced against other factors such as novelty of issue and size in determining final characteristics.

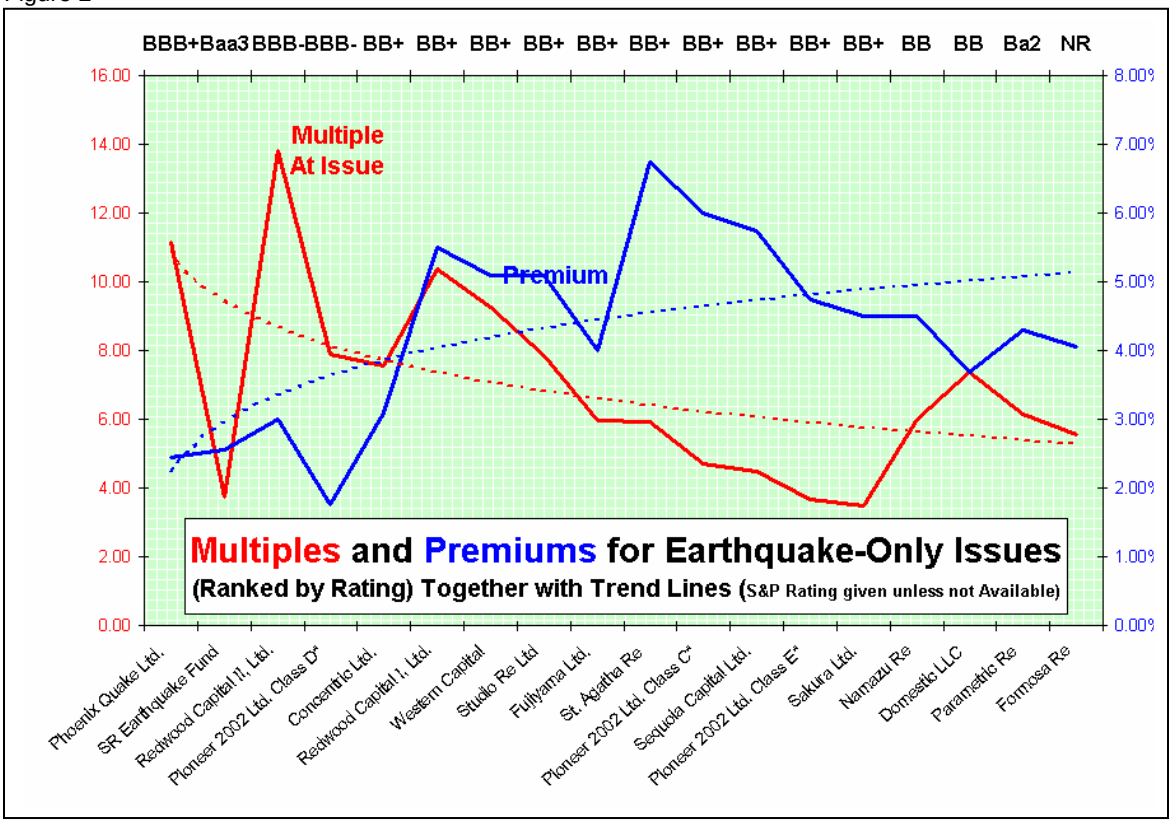
Second, Table 2 shows that nearly all earthquake-only bonds have been issued with a rating of BB+ to BBB+; only one bond, Formosa Re, has been issued with no rating. Figure 2 below also represents the range of credit ratings for past issues.

Third, it is worthwhile to examine certain unique features of the Formosa Re bond. This bond was an indemnity bond whose exposure is based on the number of earthquake policies Taiwan will write in the next few years. That number is uncertain but is expected to rise from current levels. As the policy count rises the exposure, and therefore the expected loss also rises. The bond

therefore has an unusual structure whereby the premium is adjusted each quarter as the expected loss rises. This is in sharp contrast to previous cat bonds where exposure levels were adjusted over time to give the same risk for the fixed premium. In those structures, attachment points were adjusted, in Formosa premium is adjusted. At issue the initial quarter's spread is 3.30%. The spread is based on a predetermined sliding scale depending on the expected loss. In theory, the spread could increase to as much as 10.40% if a huge number of policies were sold. Over the anticipated life of the bond the expected spread is 4.05%. This is commensurate with a "best estimate" of the annual expected loss of 0.73%. This uncertainty in the spread to be paid over the life of the bond contributes to investor uncertainty, for which a price, in terms of higher average costs, may have been paid. The fact that it starts off initially as a "BB+"-like bond that that is designed to almost automatically become "B"-like as it nears maturity is almost certainly the reason that a major rating agency declined to rate the transaction. However, based on the lifetime anticipated expected loss and spread, a shadow rating of BB+ may be inferred.

Now, it has already been mentioned that Formosa Re was oversubscribed in spite of its uncertainty and lack of a rating. While its unusual features may eliminate certain potential investors, what is apparent is that there is a significant market that is willing to accept an unusual structure in order to acquire a diversifying risk whether that is Taiwan or Country. Indeed if Formosa had been a conventional structure, with parametric features, its issue spread would likely have been much lower than 4.05%.

Figure 2



The historic relationship between initial rating and premium is shown in Fig 2. While the (dotted) trend lines are illustrative rather than statistical they demonstrate the basic characteristics of past issues. Clearly the higher the rating (top axis) the lower is the premium (right axis) and the higher is the multiple of premium to expected loss[9] (left axis). Generally, the rating agencies will give higher ratings to lower expected loss, but other factors can offset this advantage. Notice that the analysis is done on all issues since the start of the market so that a variety of soft and hard market conditions have been encountered. These differences in market conditions may account for some of the sharp deviation from trend.

[9] Higher multiples at lower expected loss levels is thought to arise because the market has a minimum charge for commitment of capital – even for extremely remote events. At lower and lower expected loss levels, the premium declines towards that irreducible minimum in absolute terms, but, in relative terms, the multiple rises.

MEASUREMENTS OF LOSS

Perhaps the single most important decision facing the issuers is the way in which the earthquake loss (and therefore the payment under the bond) is determined. The record of decisions on this subject makes for quite an interesting history. Initially conceived of as surrogate insurance, cat bonds were confined to the strictures of the definitions of insurance. Most importantly, insurers will only pay for a loss; they will never repay an insured incident that will cause a gain to the insured. This is known as the principle of indemnity. The consequence for investors in cat bonds that are based on indemnity losses, is that they have to wait to see exactly how large the real earthquake losses are before they know the magnitude of their own bond loss. Add to this the observation that indemnity losses take an awfully long time to develop and you have a recipe for a disconnect between issuers and investors. Issuers, having paid for coverage, have no desire to settle up before they are sure that substantially all claims have been met.

To bridge the gap between issuers and investors most bonds contain an extension provision. Under this, repayment of the bond at maturity is "extended", in some cases automatically but usually at the election of the issuer, when a qualifying event is deemed to have occurred. This allows for determining if the event is a loss event under the terms of the bond. In the event that moneys are held unnecessarily the investor is compensated at LIBOR plus a small premium (say 30 basis points), a much lower rate than the on-risk premium.

There is no standard in the terms under which a deal may be extended. Much depends on the further definition of insured loss. And at best, from an investor point of view, extensions are unsatisfactory. As a substitute for indemnity loss early securitizations used "industry loss" as measured by Property Claims Service (PCS) or Sigma, the reporting division of Swiss Re. Issuers accepted payments determined by estimates of loss for the whole industry rather their own company loss. Known as Index deals, they provided some improvement for investors, but a Parametric index based on a geo-physical measure of the earthquake is even better. The first deal to use this device was appropriately dubbed Parametric Re and covered Japanese earthquake. When the loss estimate is based on a geo-physical measure such as the well known Richter scale, precise magnitudes of the events can be given rather quickly. Furthermore, scientists in every country strive to give independent measures of earthquake magnitude. The estimates of event severity have been obtained from the US Geological Survey (Pioneer, Studio Re and Domestic Re), the Japanese Meteorological Authority in the case of the Japanese deals and the Central Weather Bureau for Taiwan.

The short reporting time beneficial to most investors can be a detriment to most issuers if it does not capture substantially all of the issuer's losses. Two ways to mitigate this are (1) circumscribe the area of loss definition to correspond closely to the issuer's zone of exposure or (2) develop a synthetic portfolio – a modeled loss whose specifications are kept in escrow pending an event. The event is then run through the model to determine the amount of loss to the bond.

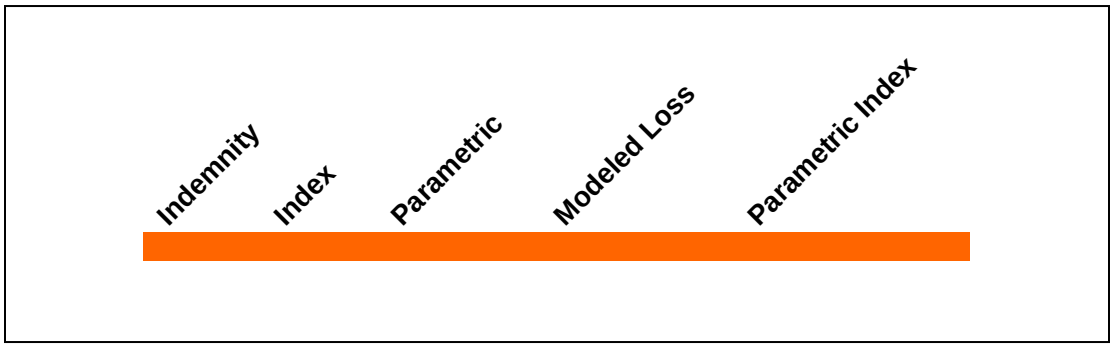
A variant is a catastrophic index based on physical or parametric trigger. Essentially, the catastrophic loss index is a rudimentary modeled loss that remains fixed though several deals. The Phoenix, Arbor and Pioneer deals all use this last device.

These measurement possibilities form a spectrum of alternatives similar to that illustrated below. In each case an independent measure of the probabilities of loss levels to the structure is made by an independent risk measurement agency. Of the 19 earthquake-only deals, 14 have been evaluated by EQECAT, 4 by RMS (Risk Management Services) and 1 by AIR (Applied Insurance Research). It is also worth observing that in other deals not involving earthquake exclusively, more deals are done by RMS and AIR.

Whichever modeling agency is chosen to do the work, it will be important that the analysis be rigorous and comprehensively documented. A certain clarity and reliability is necessary for investors. More important, however, is that the material will have to be reviewed by one or more of the rating agencies. For efficiency this almost confines the selection to one of the firms listed above and rules out new competitors. Rating agencies take the input from modelers and do their own stress-testing of results before offering their assessment in terms of letter rating. Some say that they are too rigorous and it is important to anticipate their procedures beforehand rather than be disappointed with a lower rating.

From the point of view of Country, unlike other issuers, the interest of the investors coincides with its own. Country would like to have a quick payout of losses to set against disaster disbursements. Accordingly, it is strongly recommended that the Loss measurement in a cat bond issued by Country be based on some form of Parametric Index.

Figure 3



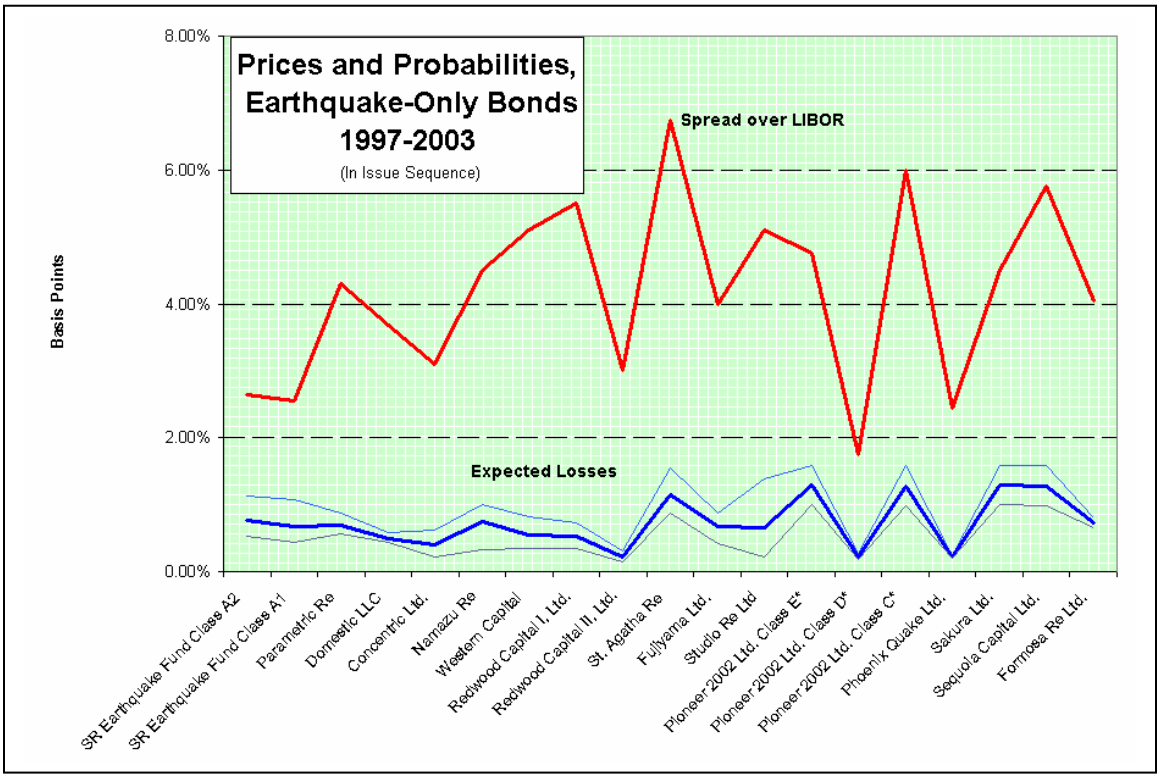
This is not to suggest that the payment be broadly drawn so as to guarantee a payment for any earthquake. Such a structure would contain too high a probability of loss and be too expensive for issue. Instead, the zones of coverage should be drawn so as to provide loss payments commensurate with calculated needs within Country. In particular this might suggest a two (or more)

zone approach centered on areas of greatest development in Country, similar in structure to the zones around Tokyo in Parametric Re or Circle Maihama. The effect would be to provide larger payouts when the event is most devastating, i.e., in these zones, but lesser amounts when the event is in rural areas. The structuring of the payout regime to simultaneously meet the needs of Country and the investors, while being consistent with the probabilistic outcomes of the modeler and acceptable to the rating agency is a most critical task. Typically driven by investment banks, it is important to ensure a competition for ideas and a realistic but independent view of the objectives of the parties involved.

PRICES AND PROBABILITIES

The earthquake-only bonds issued to date have been in a rather narrow band of probabilities and prices. These are listed in Table 3 and illustrated in Figure 4 below.

Figure 4



The attachment probabilities have been in the range of a low of 0.24% and a high of 1.59%. The average of all attachment points is 0.98%. The average expected loss over all earthquake-only bonds is 0.73% and the exhaustion probabilities average is 0.52%. The average bond has a conditional expected loss of 74%, i.e. if there is a loss the issuer would expect to recover 74% of principal. Of course that amount differs from bond to bond depending on structure. In Phoenix Quake the conditional expected loss is 92%, in Studio Re the expected payout, given a loss, is 47%. Each difference in structure is reflected in price as is demonstrated in the next section.

Since Country's cat bond is a novelty in itself it is recommended that the proposed structure be consistent with the averages issued to date. This implies an attachment probability around 0.98%, i.e., one in 100, or 1%. Similarly, the expected loss should be around 0.74%. The corresponding rating should be BB+ to BBB-.

EMPIRICAL PRICING

The overview analysis has provided insights into the average issue price over time and demonstrated a price difference between zones. An empirical analysis based on a model can, however, lend more precision to the exercise. The analysis confirms the average price differentials and gives a basis for predicting what premiums Country is likely to have to pay under different structures.

Several models are available to assess prices but Lane Financial has chosen to focus on three. The first of these is referred to here as the Kreps model. It says that premium ought to be expected loss plus a "load" equal to a fraction of the standard deviation of the bond's risk. Unfortunately, prospectuses seldom provide the standard deviation and so here it is approximated as the square root of the expected loss.

In the empirical analysis that follows, 25 securities are used for analysis. This includes all the earthquake–only bonds listed in Table 2 plus half a dozen other securities (also listed) which include significant earthquake risk. Inevitably, the choice is somewhat arbitrary but experience and judgment suggest this as a reasonable set. One could argue for leaving out two early securitizations, SR Earthquake A-1 and A-2, that date from 1997 and seem somewhat anomalous to the results herein, but they are included in the empirical data set for completeness.

It will also be appreciated that there is a problem with taking deals from as far back as 1997, when quite different market conditions may have prevailed. However, earthquake deals do not suffer from the other problem of empirical analysis of cat bonds, that of seasonality. There appear to be no earthquake seasons so the sole distortion over time ought to be hard and soft markets.

Returning to the Kreps model the data suggests that price ought to be given by the formula:

Premium = Expected Loss + 43.5%*[Standard Deviation]

An alternative model proposed by Rodney Kreps and John Major (K&M) is that premium ought to be equal to a power function of expected loss. Fitting this form (which Kreps and Major found quite useful for explaining reinsurance prices) to the same data produces the equation:

Premium = 41.3%*[Expected Loss]^0.454

A third model, that we label the LFC model, takes the power model a step further. It breaks premium into expected loss plus a load, as with the Kreps model, but it also breaks the expected loss component of load into two components (probability of attachment and conditional expected loss) and

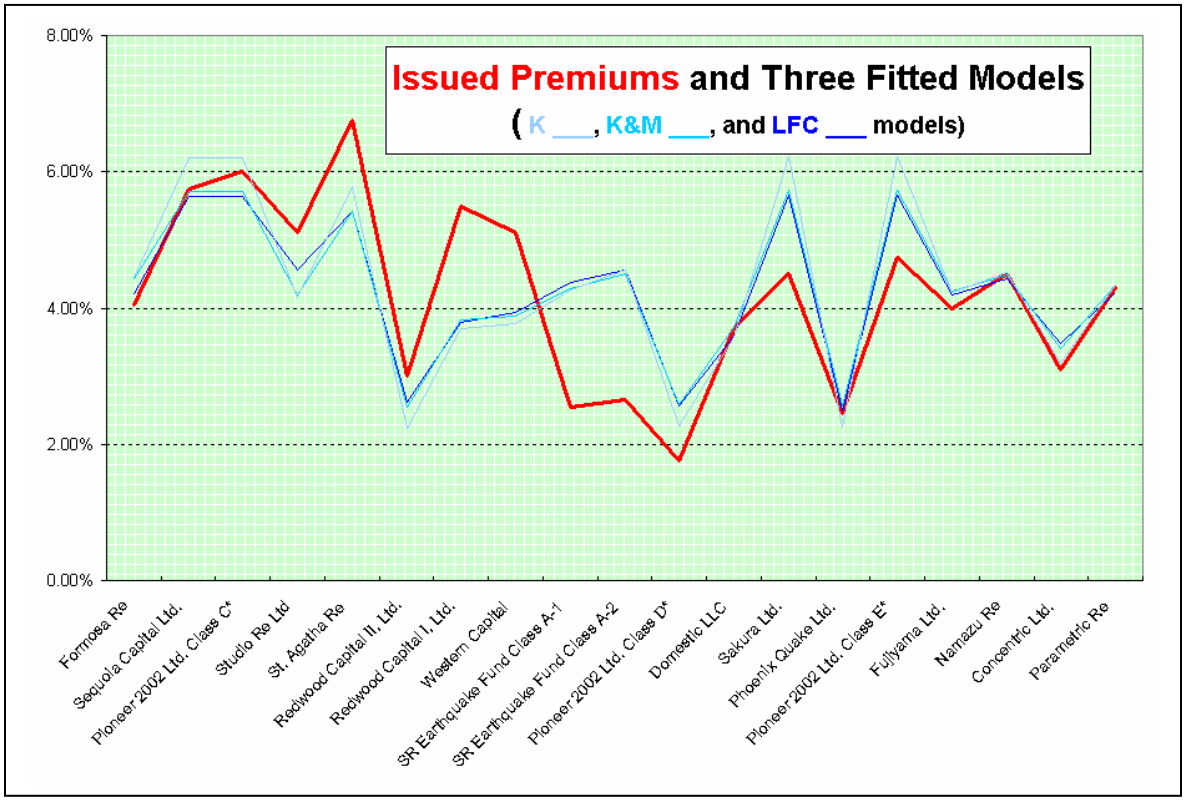
asserts that the markets discriminate between these two components. The resulting equation from fitting the same 25 securities is as follows:

Premium = Expected Loss + 19.2%*[PFL^0.352]*[CEL^0.111],

where PFL represents the probability of attachment for each bond and CEL stands for the Conditional Expected Loss[10].

Truth to tell, none of these model fits provide regression statistics that an econometrics professor would be proud of. At the same time all three provide similar (in-sample) predictions of price. This is shown visually in Figure 5 below. The blue lines representing the three models clearly track the same values, if not always close to the actual premiums. Accordingly, in this report we will hereafter refer only to the LFC model predictions.

Figure 5



[10] Conditional Expected Loss is the expected loss given the occurrence of a loss event and is calculated as Expected Loss divided by the Attachment Probability. "Loss Given Default" is an analogous concept in credit analysis.

Of most interest is to examine whether the models do indeed show a difference between price explanations based on loss statistics or on zone. This is done in Figure 6 which groups the securities by zone. One thing is immediately clear: all Japanese deals trade at a premium to the purely statistical explanation of price. In contrast, nearly all California quake deals trade at a price higher that the purely statistically predicted price. (Both SR 1997 Earthquake deals are exceptions; they have already been noted as anomalous). Clearly, the market is discriminating by supply and demand by zone, and this is not accounted for in the regressions. Dummy variables could be used for a more thorough analysis but the data does not support over-egging the omelet.

Another way to use the fitted model is to provide a matrix of prices that could be expected given various model statistics. These are given in the tables in Figure 7 below. This could be an important gauge in the structuring process. This is especially true if Country were looking for a guide to price, separate and aside from that provided by the placement agent. During the structuring process, which would presumably iteratively examine several alternative structures, reference to the table could be invaluable. For example, a geo-physical box definition around Country's most developed area which produced an expected loss of 1% and an attachment of 1.40% would, according to Fig 7, cost 5.12% (before any additions or deductions for size and or novelty). This is likely quite expensive. Redesign of the box may be necessary to produce lower costs.

As a rule of thumb, the premium to be paid to the investor should be the matrix price in Fig 7 less (1) multiple of expected loss for scarcity value of Country as a zone, plus (1/2) of expected loss for "unconventionality" if any, plus another (1/2) multiple of expected loss for size if over $200 million.

Figure 6

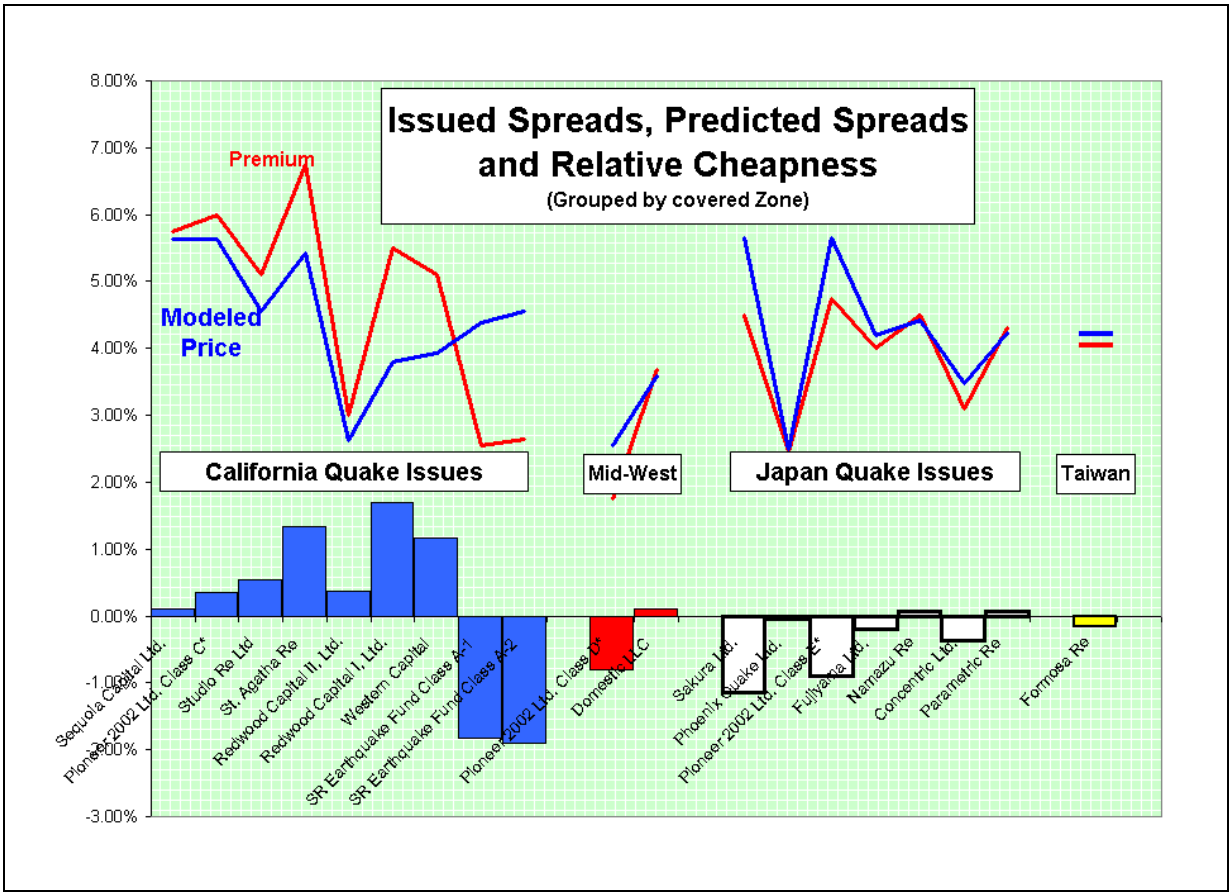
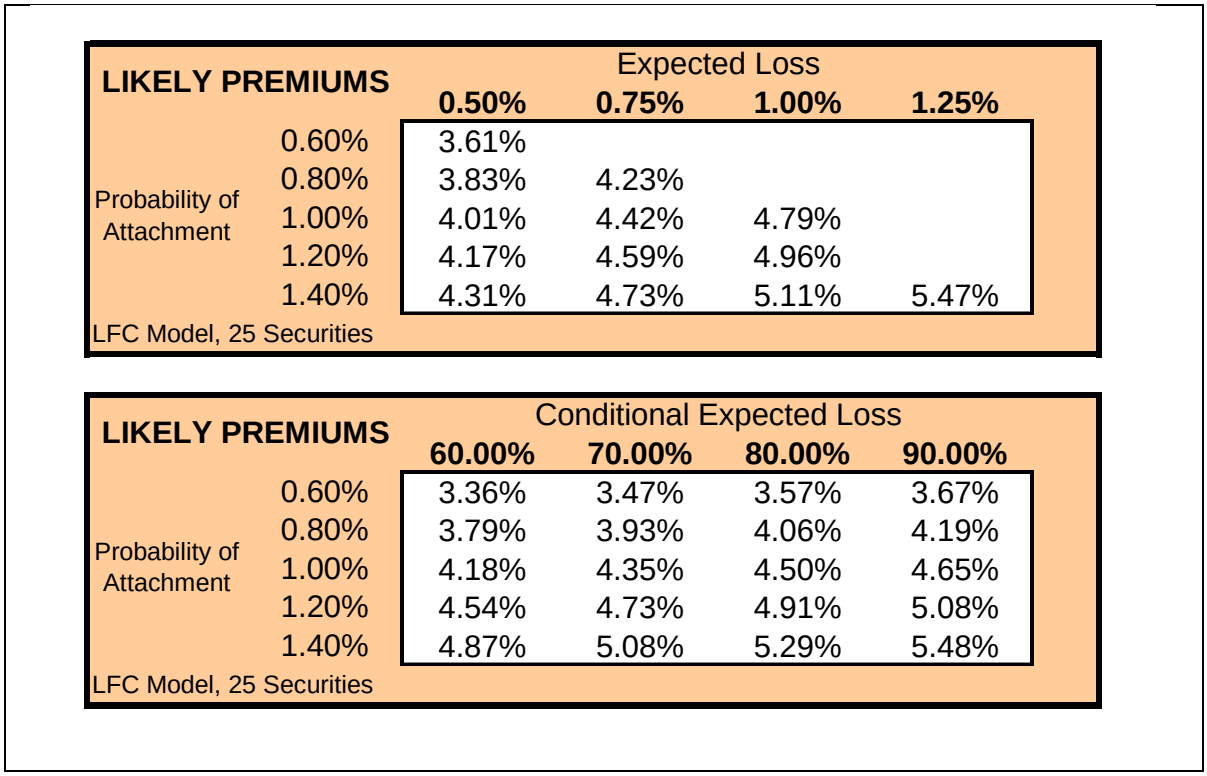

Issued Spreads, Predicted Spreads and Relative Cheapness
(Grouped by covered Zone)
Premium
Modeled Price
California Quake Issues
Mid-West
Japan Quake Issues
Taiwan
8.00%
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
-1.00%
-2.00%
-3.00%
Sequoia Capital Ltd.
Pioneer-2002 Ltd. Class C*
Studio Re Ltd
St. Agatha Re
Redwood Capital II, Ltd.
Redwood Capital I, Ltd.
Western Capital
SR Earthquake Fund Class A-1
SR Earthquake Fund Class A-2
Pioneer-2002 Ltd. Class D*
Domestic LLC
Sakura, Ltd.
Phoenix Quake Ltd.
Pioneer-2002 Ltd. Class E*
Fujiyama Ltd.
Namazu Re
Concentric Ltd.
Parametric Re
Formosa Re

Figure 7



LIKELY PREMIUMS

Expected Loss

Probability of Attachment	0.50%	0.75%	1.00%	1.25%
0.60%	3.61%			
0.80%	3.83%	4.23%		
1.00%	4.01%	4.42%	4.79%	
1.20%	4.17%	4.59%	4.96%	
1.40%	4.31%	4.73%	5.11%	5.47%

LFC Model, 25 Securities

LIKELY PREMIUMS

Conditional Expected Loss

Probability of Attachment	60.00%	70.00%	80.00%	90.00%
0.60%	3.36%	3.47%	3.57%	3.67%
0.80%	3.79%	3.93%	4.06%	4.19%
1.00%	4.18%	4.35%	4.50%	4.65%
1.20%	4.54%	4.73%	4.91%	5.08%
1.40%	4.87%	5.08%	5.29%	5.48%

LFC Model, 25 Securities

FURTHER FINAL OBSERVATIONS

Economic Observations

The preceding sections have dealt with the cost of issuing a Cat bond for Country from the point of view of the premiums payable to the investor market. Unfortunately, these are not the only costs of the process. Legal, investment banking, modeling and rating agency fees need to be added to the ultimate cost to Country. And these are only the most visible fees. Special purpose vehicles will need to be set up and administered. This latter group is not as large as the first four cost classes, but they all add up and have to be managed.

Typically the set-up costs can add 150 to 300 basis points to the cost of issuance, i.e. 1.5% to 3.0%. That cost can be amortized over the life of the bond and so the rationale for longer maturity securities is evident. The annual cost of the set up is then some 40 to 80 basis points, depending on the maturity of the bond.

Investment banking fees and rating agency fees are usually quoted as % of deal size and do not enjoy economies of scale. However, legal fees and modeling fees can be quoted in dollars rather than % and so appear cheaper when spread over larger deals.

A one-off deal is often more expensive than a packet of transactions. Thus, if the intention is to issue every year for several years, that feature can be a part of the negotiation of final fee arrangements.

Finally, it is important to remember that this is still a young and quite small market. It has been dominated by a few (deal arranging) players. It will be important for Country to engender a sense of competition for their business among these players and new competitors, so as to lower the cost of issue to the state.

Structuring Observations

For the most part, this technical report has examined the conventional features of cat bonds which may be part of a yet-to-be-determined strategy on the part of Country. Even within the orbit of conventional issues, however, quite a bit of strategy remains to be determined. Within the bond itself we have already discussed the structuring process - the tactical aspects. Separate and outside the bond are the strategic issues. Is this to be a one-off bond or is the strategy to build up coverage from the market over time? USAA has just done this for its most recent issues. By patiently issuing sequentially over time it has built up a near $500 million coverage. On the other hand Taiwan has locked-in investors to a level of coverage that is closer to the action with each expansion of its policy book. Taiwan's own exposure grows as the book expands of course,

but part of it is growing at a more remote attachment point. Even with a parametric bond such strategic possibilities should be evaluated.

A most important strategic issue is whether the cat bond should be complemented with other financing options such as debt. For example, if $1.0 billion of coverage is required, that is unlikely to be immediately available from the cat bond market. However, it might be available from the combined efforts of the cat bond and reinsurance market. Then again, it might be prudent to put a debt facility in place that provides liquidity in the event of large loss. This is contingent financing and, when drawn, has to be repaid. Nevertheless, contingent financing is usually quite cheap, until drawn. Contingent debt could be arranged from the public markets or privately through institutions such as the World Bank. It could be arranged with attachment points below, alongside or above the cat bond. Contingent debt can also be placed at the same time as a cat bond as was done in the Circle Maihama deal thereby reducing issue costs.

Another feature, not discussed herein, but which should be part of a strategic review is whether or not to issue contingent cat bonds. These do not provide protection in the event of a first loss but can be exercised (automatically or by election) to be on-risk after some preceding event. For example, Country might decide that it is willing to tolerate a medium size earthquake in rural areas without any protection. This it might do, on the quite reasonable theory that it already does it and that it can handle the first (moderate) loss. It then needs protection against subsequent loss which would potentially deplete an already stressed treasury. A contingent cat bond is like a second event cover. It, like contingent debt, is typically quite cheap until it goes on risk. An on-risk protection against a large loss in Country's most developed area together with protection against the second of two regional earthquakes might be a very cost effective program. This would again be especially true if the issues were conducted jointly.

It is beyond the scope of this report to examine these possibilities, but it is important to register the fact that the call for conventionality that we make for lowering investor costs should not pre-empt a full review of the possible ways to make the program optimally serve Country's interests.

Appendix

Catastrophe Bond Summary Tables

Table 1

Catastrophe Bonds 1997 - 2003
Issuer, Cedent, Issue Date, Amount, Maturity Covered Events

Issuer	Ceding Insurer	Issue Date	Amount - $ Millions	Maturity-Initial	Covered Events
Palm Capital Ltd.	Swiss Re	July-03	22	June 15, 2007	North Atlantic Hurricane
Oak Capital Ltd.	Swiss Re	July-03	24	June 15, 2007	European Wind
Sequoia Capital Ltd.	Swiss Re	July-03	23	June 15, 2007	California Earthquake
Sakura Ltd.	Swiss Re	July-03	15	June 15, 2007	Japanese Earthquake
Arbor I Ltd.	Swiss Re	July-03	95	June 15, 2006	North Atlantic Hurricane, European Wind, California Earthquake,
Arbor II Ltd.	Swiss Re	July-03	27	June 15, 2006	North Atlantic Hurricane, European
Phoenix Quake Wind II Ltd.	Swiss Re	June-03	85	July 3, 2008	Japan Earthquake Japan Wind
Phoenix Quake Ltd.	Swiss Re	June-03	192.5	July 3, 2008	Japan Earthquake
Phoenix Quake Wind Ltd.	Swiss Re	June-03	192.5	July 3, 2008	Japan Earthquake Japan Wind
Residential Re 2003 Ltd.	USAA	May-03	160	June 8, 2006	US Gulf, East Coast and Hawaii
Studio Re Ltd	Gulfstream Insurance (Ireland) Ltd.	December-02	$175	July 7, 2006	S. California Earthquake
Pioneer 2002 Ltd. Class A	Swiss Re	June-02	100	June 15, 2006	N. Atlantic Hurricane (US Gulf and Caribbean)
Pioneer 2002 Ltd. Class B	Swiss Re	June-02	84	June 15, 2006	European Wind
Pioneer 2002 Ltd. Class C	Swiss Re	June-02	72.7	June 15, 2006	California Earthquake
Pioneer 2002 Ltd. Class D	Swiss Re	June-02	72.8	June 15, 2006	Central US Earthquake
Pioneer 2002 Ltd. Class E	Swiss Re	June-02	88.6	June 15, 2006	Japan Earthquake
Pioneer 2002 Ltd. Class F	Swiss Re	June-02	28	June 15, 2006	Five prior perils; attaches above
Fujiyama Ltd.	Nissay Dowa General Ins. Co., Ltd.	May-02	70	May 16, 2005	Japan Earthquake
Residential Re 2002 Ltd.	USAA	May-02	125	June 1, 2005	US Gulf, East Coast and Hawaii
K3	Hannover Re	April-02	230	[April 2005]	US Hurricane and Earthquake
St. Agatha Re	Hiscox Syndicates Ltd.	April-02	33	April 15, 2005	California and New Madrid
Redwood Capital II, Ltd.	Swiss Re	March-02	200	January 1, 2004	California Earthquake
Redwood Capital I, Ltd.	Lehman Re	December-01	165	January 1, 2003	California Earthquake
Atlas Reinsurance II p.l.c.	SCOR	December-01	150	January 7, 2005	California and Japanese Earthquake* UK & NW European Wind**
Trinom Ltd.	Zurich Insurance Co.	June-01	$161.9	June 18, 2004	US Gulf & East Coast Hurricane California Earthquake
SR Wind Ltd.	Swiss Re	May-01	120	May 6, 2005	French Wind Florida/Puerto Rico Hurricane
Residential Re 2001 Ltd.	USAA	May-01	150	June 1, 2004	Hurricane loss in 20 Gulf and Atlantic
Halyard Re BV	Sorema SA	March-01	17	April 5, 2002	European Windstorm Japan Earthquake
Gold Eagle Capital 2001 Ltd.	American Re	March-01	120	April 7, 2002	Eastern US Hurricane
Western Capital	Swiss Re	February-01	100	January 7, 2003	California Earthquake
Mediterranean Re p.l.c.	Assurances Generales de France I.A.R.T. ("AGF")	November-00	129	November 18, 2005	Earthquake: Magnitude 5.0 within 200 km. radius of Monaco
PRIME Capital Hurricane Ltd.	Munich Re	November-00	165	January 7, 2004	NY Hurricane Miami Hurricane
PRIME Capital CalQuake & EuroWind	Munich Re	November-00	135	January 7, 2004	California Earthquake European Windstrom
NeHi	NeHi Re, LP	July-00	50	July 1, 2003	NE US Hurricane Hawaii Hurricane & Tropical Storm
Alpha Wind 2000-A Ltd.	Arrow Re	May-00	90	May 15, 2001	Florida Hurricane
Residential Re 2000 Ltd.	USAA	May-00	200	June 1, 2001	Hurricane loss in 20 Gulf and Atlantic coast states and Wash. DC
Atlas Reinsurance p.l.c.	SCOR	March-00	200	April 4, 2003	European Wind US and Japan Earthquake
Namazu Re	Gerling	November-99	100	December 2, 2004	Japan Earthquake
Kelvin, Ltd.	Koch Energy Trading	September-99	44.6	February 14, 2003	Temperature variation in 19 US cities
Residential Re III	USAA	Jun-99	200	June 1, 2000	Hurricane loss in 20 Gulf and Atlantic coast states and Wash. DC
Juno Re	Gerling	June-99	80	June 19, 2002	US Hurricane: 26 Atlantic, Gulf and
Concentric Ltd.	Oriental Land	May-99	100	May 1, 2004	Japan Earthquake
Circle Maihama	Oriental Land	May-99	100	May-04	Japan Earthquake
Halyard Re	Sorema	May-99	17	[May-03]	Japan Earthquake; Japan and European Wind
SECTRS 1999-1	Namur Re SA	April-99	360	April 30, 2002	Trade Credit Insurance
Domestic LLC	Kemper Insurance Co. & affiliates	March-99	80	April 30, 2002	Midwestern US Earthquake
Reliance/SLF Re IV	Reliance National and affiliates	February-99	10	December 31, 1999	Property-US; Property-ROW; Aviation-US & Japan Carriers;
Trinity Re 1999	Centre Solutions	December-98	55.6	December 31, 1999	Wind - Florida
Gemini Re	Allainz	December-98	150	January 31, 2003	Wind and hail in Germany
Gramercy Place Insurance Ltd.	[Toyota Motor Credit]	July-98	566.3	Oct. 25, 1999, 2000	Amount by which residual value of
Pacific Re	Yasuda Fire & Marine Ins. Co. Ltd.	July-98	80	May 31, 2003	Typhoon - Japan
X.L. Mid Ocean	Mid Ocean Re and XL Global Re	July-98	200	July 31, 1999	US & Caribbean Hurricane and
Residential Re II	USAA	June 15, 1998	450	June 1, 1999	Hurricane loss in 20 Gulf and Atlantic coast states and Wash. DC
Mosaic Re	USF&G	June 1, 1998	50	July 9, 1999	Property - US
Reliance/SLF Re III	Reliance National and affiliates	April 1, 1998	20	June 30, 2001	Property-US; Property-ROW; Aviation-US & Japan Carriers;
Trinity Re I	Centre Solutions	February 1, 1998	83.6	December 31, 1998	Wind - Florida
Reliance/SLF Re II	Reliance National and affiliates	January-98	10	June 30, 1999	Property-US; Property-ROW;
Parametric Re	Swiss Re	November-97	100	November 15, 2007	Earthquake-Japan
SR Earthquake Fund	Swiss Re	July-97	137	July 16, 1999	Earthquake - California (single event)
Residential Re I	USAA	June-97	477	June 15, 1998	Hurricane loss in 20 Gulf and Atlantic
Reliance/SLF Re I	Reliance National and affiliates	March-97	10	June 30, 1998	Property-US; Property-ROW;
Winterthur	Winterthur	November-96	280	[October 31, 1999]	Storm damage to insured autos.
George Town Re	St Paul Re	October-96	68.5	March 1, 2007	5 lines of coverage XS $1 million each
[Unknown]	AIG Combined Risks	July-96	10	August 30, 1998	European Wind; Japan Earthquake;Caribbean Wind; US Wind; Australasia Wind

Table 2

Earthquake Only Securitizations 1997 - 2003
Issue Date, Cedent, Covered Events Rating and Amount

Issue Date	Issuer	Ceding Insurer	Covered Events	S&P Rating	Moodys Rating	Amount $ Millions
August-03	Formosa Re	Central Re	Taiwan Earthquake	NR	NR	100
July-03	Sequoia Capital Ltd.	Swiss Re	California Earthquake	BB+	Ba3	23
July-03	Sakura Ltd.	Swiss Re	Japan Earthquake	BB+	Ba3	15
June-03	Phoenix Quake Ltd.	Swiss Re	Japan Earthquake	BBB+	Ba3	192.5
March-03	Pioneer 2002 Ltd. Class C*	Swiss Re	California Earthquake	BB+	Ba3	72.7
March-03	Pioneer 2002 Ltd. Class D*	Swiss Re	Central US Earthquake	BBB-	Baa3	72.75
March-03	Pioneer 2002 Ltd. Class E*	Swiss Re	Japan Earthquake	BB+	Ba3	63.55
December-02	Studio Re Ltd	Gulfstream Insurance (Ireland) Ltd.	S. California Earthquake	BB+	Ba2	175
May-02	Fujiyama Ltd.	Nissay Dowa General Ins. Co., Ltd.	Japan Earthquake	BB+	NR	70
April-02	St. Agatha Re	Hiscox Syndicates Ltd.	California and New Madrid Earthquake	BB+	NR	33
March-02	Redwood Capital II, Ltd.	Swiss Re	California Earthquake	BBB-	Baa3	200
December-01	Redwood Capital I, Ltd.	Lehman Re	California Earthquake	BB+	Ba2	165
February-01	Western Capital	Swiss Re	California Earthquake	BB+	Ba2	100
November-99	Namazu Re	Gerling	Japan Earthquake	BB	Ba2	100
May-99	Concentric Ltd.	Oriental Land	Japan Earthquake	BB+	Ba2	100
March-99	Domestic LLC	Kemper Insurance Co. & affiliates	Midwestern US Earthquake	BB	Ba2	80
November-97	Parametric Re	Swiss Re	Japan Earthquake	NR	Ba2	100
July-97	SR Earthquake Fund	Swiss Re	California Earthquake	NR	Baa3	137

* This represents the accumulation of Pioneer issues at the same price and statistics; Series E raised from 425 bps to 475 bps.

Other transactions involving significant earthquake risk.

June-03	Phoenix Quake Wind II Ltd.	Swiss Re	Japan Earthquake Japan Wind	BBB-	Ba1	85
June-03	Phoenix Quake Wind Ltd.	Swiss Re	Japan Earthquake Japan Wind	BBB+	Baa3	192.5
December-01	Atlas Reinsurance II p.l.c.	SCOR	California and Japan Earthquake UK & NW European Wind	BB+	Ba2	150
November-00	Mediterranean Re p.l.c.	Assurances Generales de France I.A.R.T. ("AGF")	Monaco Earthquake French Windstorm	BB+	Ba3	129
November-00	PRIME Capital CalQuake & EuroWind	Munich Re	California Earthquake European Windstrom	BB+	Ba3	135
March-00	Atlas Reinsurance p.l.c.	SCOR	European Wind US and Japan Earthquake	BBB-	NR	200

Table 3

Earthquake Only Securitizations 1997 - 2003
Pricing, Probabilities

Issue Date	Issuer	Covered Events	Principle Rate-bps	Annual Attachment Probability	Annual Expected Loss	Annual Exhaustion Probability
August-03	Formosa Re*	Taiwan Earthquake	405	0.81%	0.73%	0.66%
July-03	Sequoia Capital Ltd.	California Earthquake	575	1.59%	1.28%	0.98%
July-03	Sakura Ltd.	Japan Earthquake	450	1.59%	1.29%	1.01%
June-03	Phoenix Quake Ltd.	Japan Earthquake	245	0.24%	0.22%	0.20%
March-03	Pioneer 2002 Ltd. Class C**	California Earthquake	600	1.59%	1.28%	0.98%
March-03	Pioneer 2002 Ltd. Class D**	Central US Earthquake	175	0.27%	0.22%	0.19%
March-03	Pioneer 2002 Ltd. Class E**	Japan Earthquake	475	1.59%	1.29%	1.01%
December-02	Studio Re Ltd	S. California Earthquake	510	1.38%	0.65%	0.22%
May-02	Fujiyama Ltd.	Japan Earthquake	400	0.88%	0.67%	0.42%
April-02	St. Agatha Re	California and New Madrid Earthquake	675	1.55%	1.14%	0.87%
March-02	Redwood Capital II, Ltd.	California Earthquake	300	0.31%	0.22%	0.14%
December-01	Redwood Capital I, Ltd.	California Earthquake	550	0.72%	0.53%	0.34%
February-01	Western Capital	California Earthquake	510	0.82%	0.55%	0.34%
November-99	Namazu Re	Japan Earthquake	450	1.00%	0.75%	0.32%
May-99	Concentric Ltd.	Japan Earthquake	310	0.62%	0.41%	0.21%
March-99	Domestic LLC	Midwestern US Earthquake	369	0.58%	0.50%	0.44%
November-97	Parametric Re	Japan Earthquake	430	0.87%	0.70%	0.56%
July-97	SR Earthquake Fund Class A-1	California Earthquake	255	1.07%	0.68%	0.44%
July-97	SR Earthquake Fund Class A-2	California Earthquake	265	1.13%	0.76%	0.53%

*Formosa Re spread is dependant on EL which is recalculated periodically; we use 405 bps, the spread resulting from the quoted EL of 0.73% rather than the initial spread of 330bps.

**This represents the accumulation of Pioneer issues at the same price and statistics; Series E raised from 425 bps to 475 bps.

Other transactions involving significant earthquake risk.

June-03	Phoenix Quake Wind II Ltd.	Japan Earthquake Japan Wind	350	0.55%	0.49%	0.45%
June-03	Phoenix Quake Wind Ltd.	Japan Earthquake Japan Wind	245	0.24%	0.22%	0.20%
December-01	Atlas Reinsurance II p.l.c. Class B	California and Japan Earthquake UK & NW European Wind	675	1.33%	0.90%	0.53%
November-00	Mediterranean Re p.l.c. Class B	Earthquake: Magnitude 5.0 within 200 km. radius of Monaco Windstorm: France	585	1.47%	1.16%	0.93%
November-00	PRIME Capital CalQuake & EuroWind	California Earthquake European Windstrom	750	1.69%	1.33%	1.07%
March-00	Atlas Reinsurance p.l.c. Class B	European Wind US and Japan Earthquake	370	0.29%	0.23%	0.19%

Appendix B

Comments on the Role of a Modeling Firm in the Issuance of a Catastrophe Bond

Evaluation by an investor of the risk assumed when investing in a catastrophe bond is an involved and complicated process. It is not one that a typical investor could undertake. It is customary, therefore, for the issuer to contract with a modeling firm such as AIR Worldwide Corp, EQECAT Inc. or Risk Management Solutions Inc. to evaluate the risk of loss from a catastrophic event (such as earthquake or hurricane) and to assign probabilities to the possibility of loss from a covered event.

These modeling firms have developed sophisticated computer models for this evaluation. They have developed proprietary databases of buildings and infrastructure in the geographical area of concern, including cost, type of construction, replacement values, etc. The model is then used to estimate loss based on a specific event. For example, they develop a database down to the local postal zip code for the entire state of Florida, then evaluate the loss caused by a category 3, 4 or 5 hurricane striking in specific areas. It is a complex and very detailed process.

In the case of Mexico, AIR developed such a database to include residences, commercial buildings, public buildings, schools and hospitals and further, the type of construction and the structure's exposure to damage from an earthquake. They evaluated the concentration of these structures in the various states – for instance, 32% of the structures are located in the state of Mexico and the DF. They next evaluated the exposure in nine different zones in which both the risk of the occurrence of an earthquake and the concentration of structures were high. The resulting report was used by Mexico in developing the proposed three zone coverage for this project.

AIR then developed a summary report for investors to use in their evaluation of the CAT-Mex bond. The report included an explanation of the AIR methodology and an indication of the probability of a loss occurring that would be sufficient to cause the investor to lose his investment. As is customary, the AIR report was an integral part of the investor Private Placement Memorandum and AIR participated in presentations to prospective investors.

As indicated above, both the modeling process and the report to investors are key to the ability of the investor to evaluate a cat bond. For this reason, the modeling firm must be independent from the issuer. The investor will take comfort from the firm's experience in modeling other similar transactions and from its independence. Likewise, the rating agency that assigns a rating to the cat bond must be familiar with the modeling firm and its process. While other companies – whether in Mexico or elsewhere – may theoretically have the expertise to model earthquake risk, the experience and acceptance in the marketplace of a firm such as AIR play a key role in acceptance of the transaction by investors and in the ultimate success of the transaction.