



# ***Developmental Challenges in Using Catastrophic Bonds for Disaster Risk Management: The Mexican Experience***

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/\*The findings, interpretations, and conclusions expressed in this presentation are entirely those of the author. They do not necessarily represent the view of the institution or the country he represents.



# Agenda

1. A background of Cat-risks in Mexico.
2. Budgetary constraints: a motivation for the Government of Mexico to look after risk transference options.
3. Risk assessment.
4. Risk transferring structure.
5. Final remarks.





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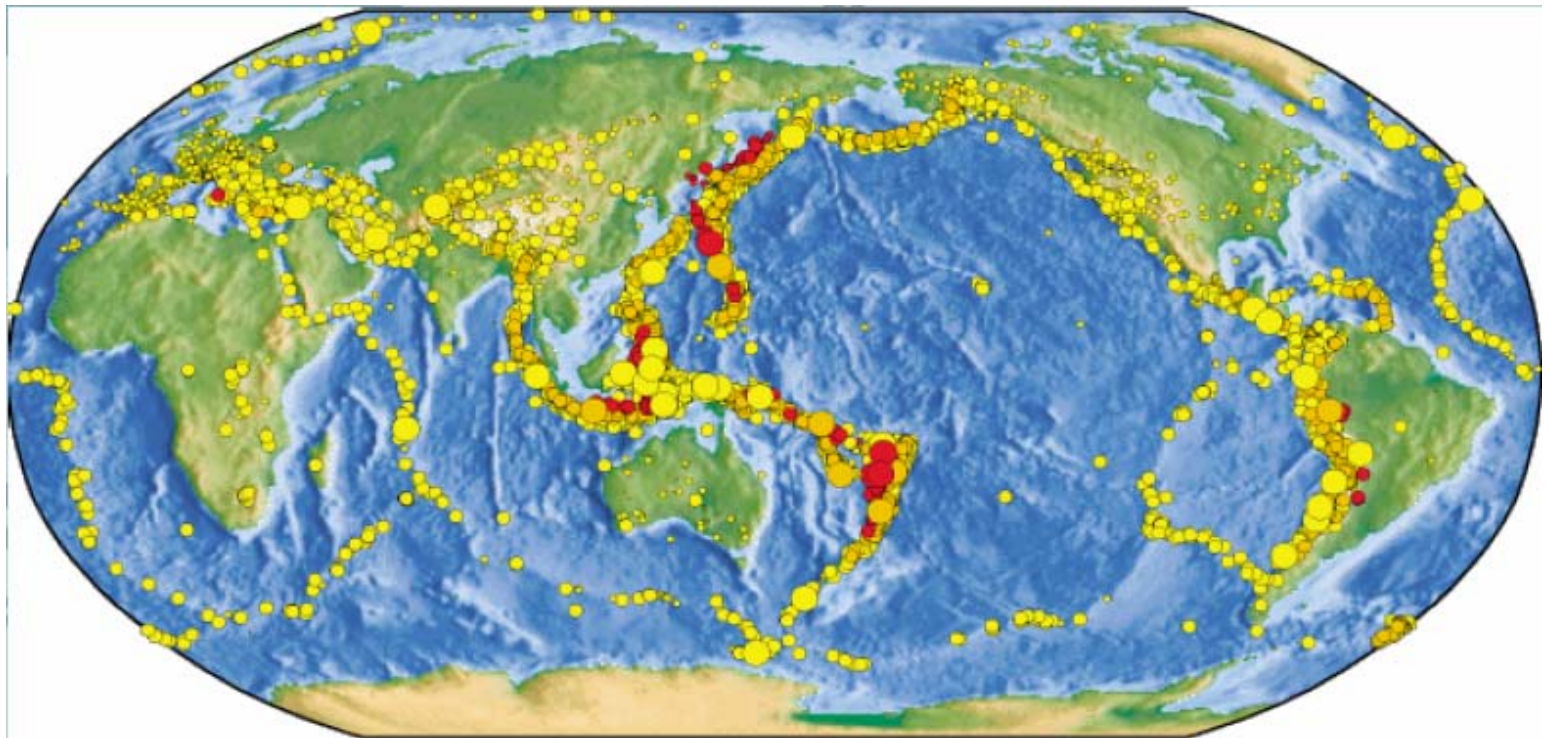
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# The Mexican territory is exposed to large earthquakes

- Mexico lies within one of the seismic regions in the world.



\*USGS Earthquake Hazard Program: Epicenters of EQs in 1998

- Shallow (0-70 km)
- Intermediate (71-300 km)
- Deep (301-700 km)



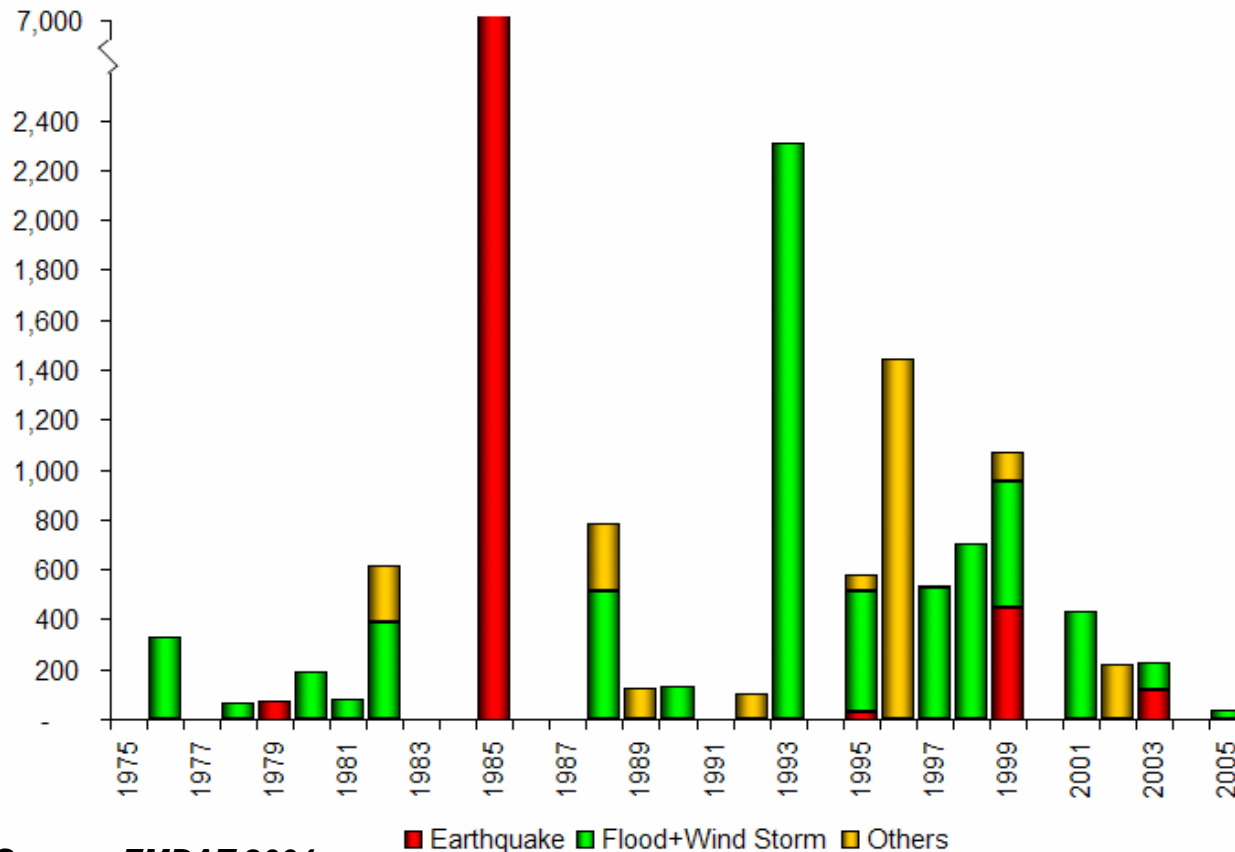


# The total disaster losses find its explanation in two main risk: earthquakes and hurricanes

- Although earthquake is the less recurrent risk, **it is the one that can cause the biggest damages.**

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Total Annual disaster losses in Mexico during 1975-2005  
(Millions of US dollars of 1984)



Source: EMDAT 2004





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5. Wish list of ideal transaction features from a Government perspective.





# Motivation for the Mexican Natural Risk Management Strategy

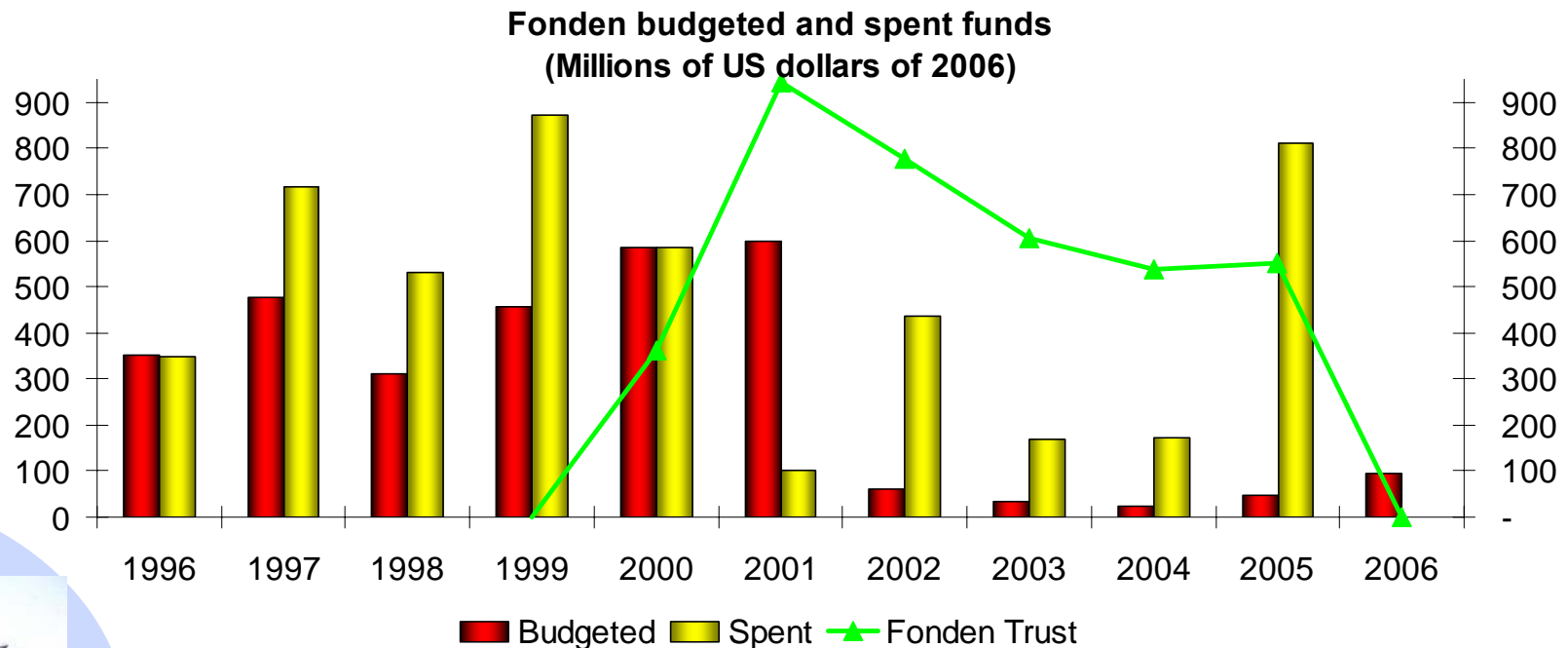
- The requirement of funds in the event of a catastrophic disaster is enormous and unpredictable, making use of the budgetary resources is unadvisable.
  - A recurrent solution is “self-insurance” through the creation of specific funds or trusts (calamity funds).
  - Mexico was pioneer in Latin America in “self-insurance” through a fund, called FONDEN. It was created in 1996 with the primary goal to attend natural disaster emergency expenses, such as hurricanes, earthquake, volcanic eruptions, etc.
- Nevertheless, in years with low fiscal revenues there are perverse incentives to stop contributing resources to the fund, or trust causing their eventual depletion.





# The Fonden resources have been reduced since 2001

- There is a political economy problem: there are always good reasons not to “save for a rainy day.”
- The federal government expenses have implicated a total layout of \$ 4,739 millions from 1996 to 2003 (2006 USD prices)





# Implementation of Mexican strategy through innovative financial instruments



- The new scheme that the Ministry of Finance has followed consists in a risk transferring strategy, which has three great advantages:
  - **Multiplies Fonden resources.** After the catastrophe, Fonden receives a great amount of resources, reducing the vulnerability of the Public Financial Situation.
  - **There is no damage justification process;** the payment requires the parametric triggers to be met (magnitude on the Richter scale, geographic location and depth of the epicenter).
  - **Creates the right incentives framework** for the Fonden, it has to meet certain criteria in order to have access to enough resources to face disasters.





## What kinds of risk were considered first?

- The first risk to transfer from the Fonden trust to the financial markets is the **earthquake risk**.
- According to the Mexican laws all federal building or infrastructure are insured.
- However, emergency expenses, the first responsibility of the federal government wasn't insured.
- We were innovating **looking for insurance coverage for emergency expenses** in the international financial markets, in order to protect the financial integrity of FONDEN and indirectly the federal public finance.





# which type of financial protection?

- The strategy followed by us was to look for a financial instrument, which, among other things, was transparent, well known by the market and of proved results.
- The Risk transference strategy contemplated, as implied by the Financial entity Terms of Reference, to use separately or jointly:
  - Catastrophe bonds (mandatory)
  - Insurance contracts (optional)
- The main difference between them are:

Reinsurance vs. cat bond		
	Credit risk	Costs
Reinsurance	Risk of default of reinsurer	Premiums cyclical and related to global market
Cat bond	Zero: Funds collected at the outset	<ul style="list-style-type: none"> <li>• Additional placement cost</li> <li>• Premium higher than cat bond due to higher pricing uncertainty</li> </ul>





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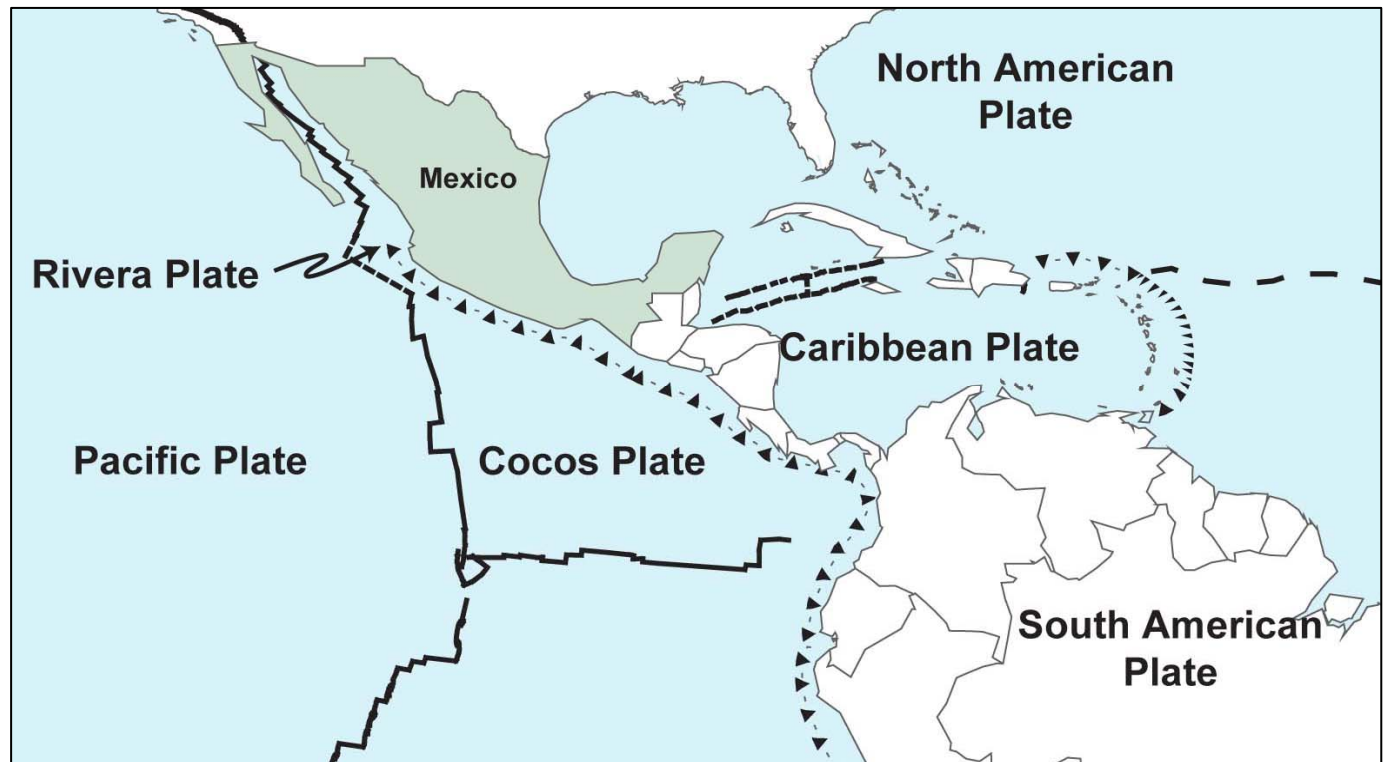
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# Main Seismic Sources in Mexico and Neighboring Regions

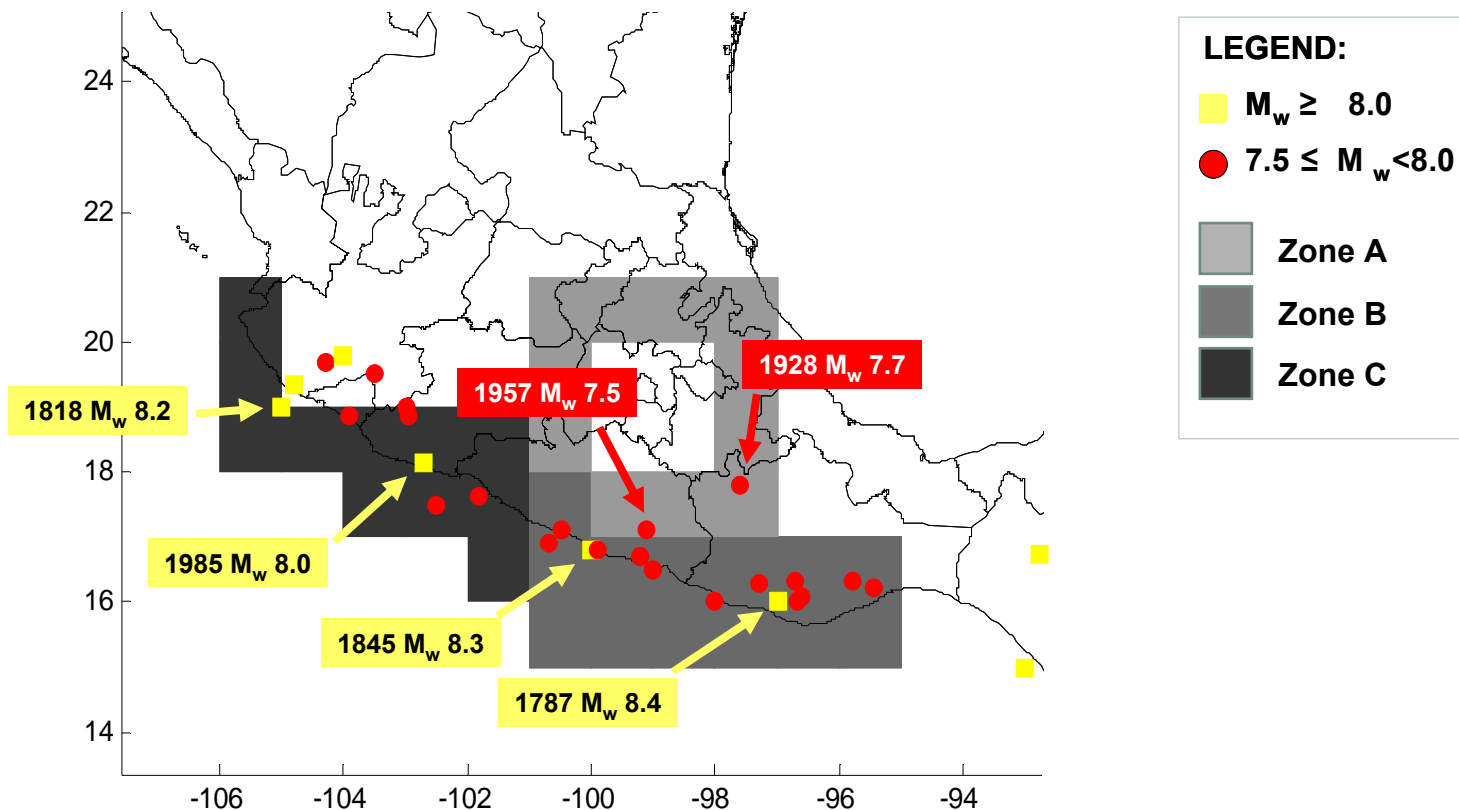
- The Mexican Government hired Applied Insurance Research Worldwide Corporation (AIR) one of the top modeling agencies of the financial and insurance sector. **AIR modeled the Mexican earthquake risk, supported by the Engineering Institute of Mexican National University.**

## Plate Boundaries in Mexico





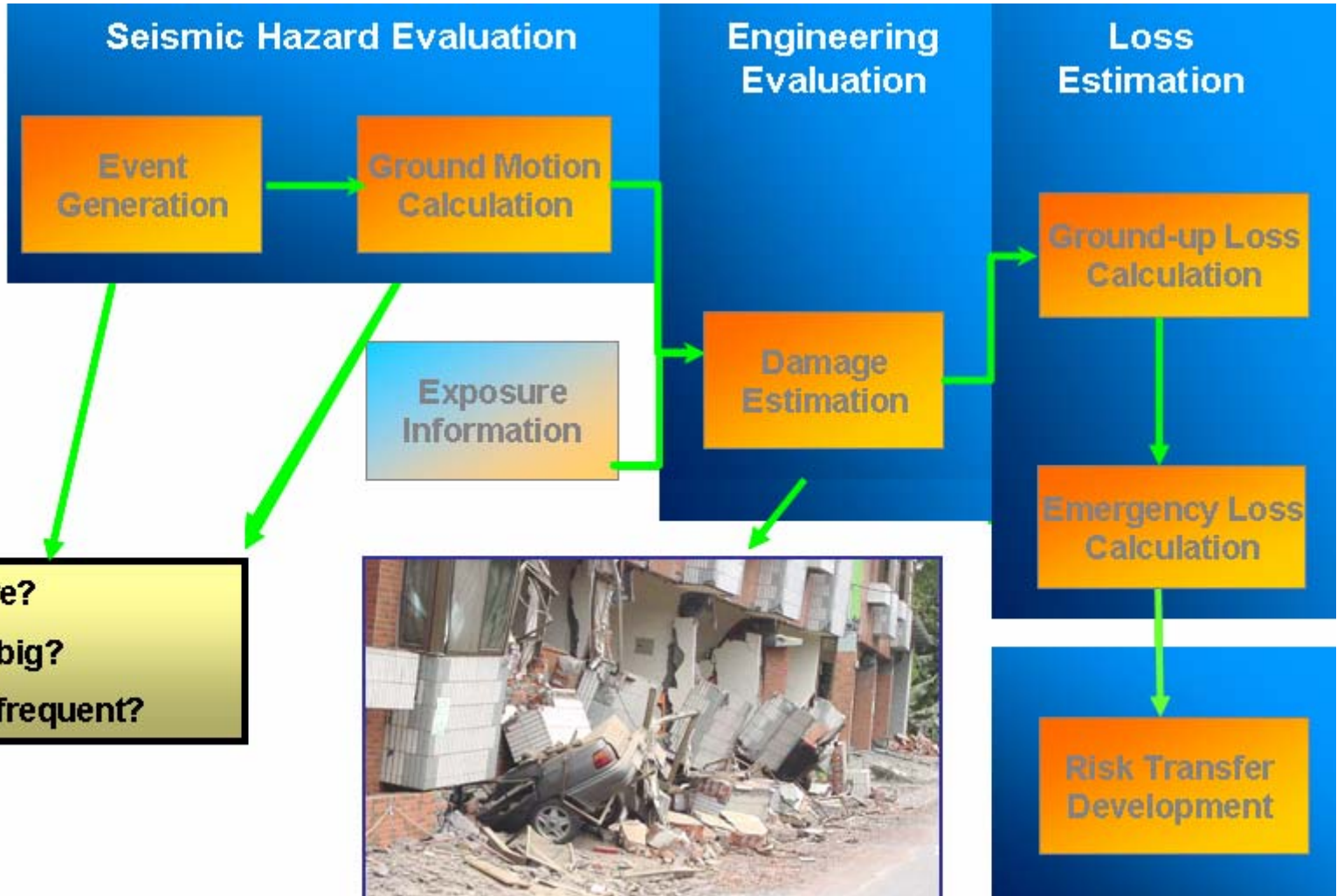
# AIR emphasized its analysis in three major zones, as main sources of earthquakes





# Components of AIR's Earthquake Risk Model

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# AIR's Final output

Annual Expected Loss Probabilities		
Zone A	Zone B	Zone C
0.63%	0.96%	0.30%





# Risk management

Annual Expected Loss Probabilities		
Zone A	Zone B	Zone C
0.63%	0.96%	0.30%



**Pricing Model**



**Premium Expected=Cost Expected**





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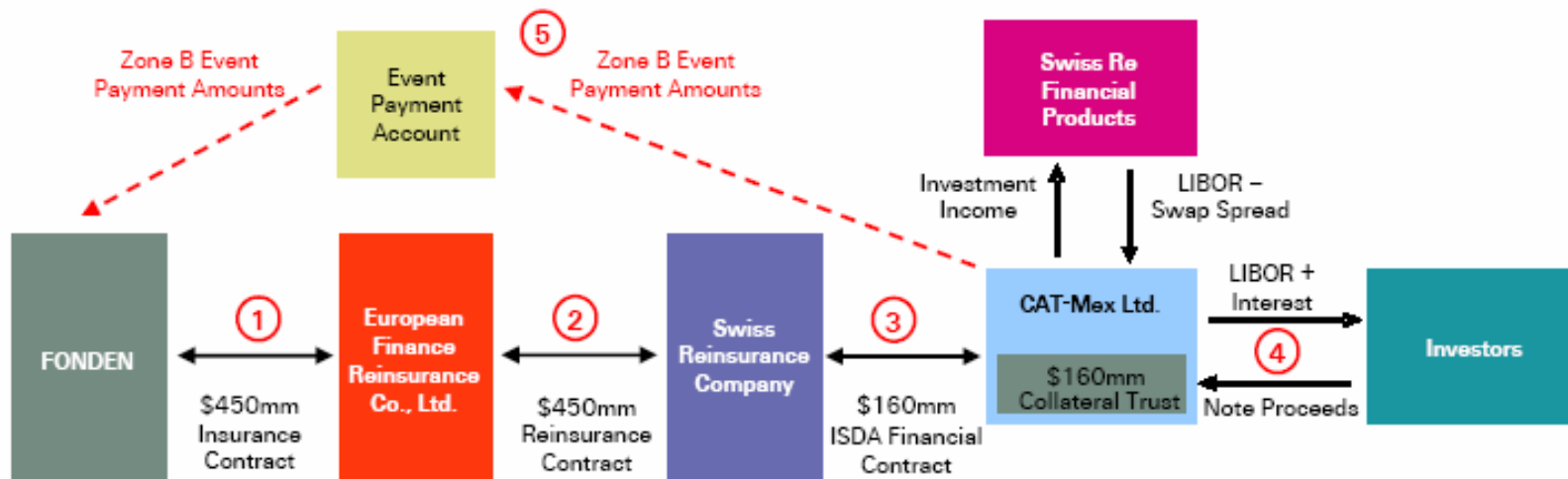
# Main risk transferring components

- The Natural Disaster Fund (FONDEN) through a international public bid, hired Swiss Re Capital Markets (SRCM), Swiss Reinsurance Company (SRC) and Deutsche Bank Securities.
- SRCM designed, according to the terms of reference, a financial structure where FONDEN transferred the risk to European Finance Reinsurance (EFR), an indirect, wholly-owned subsidiary of SRC.
- EFR transferred 100% of the risk to SRC.
- The risk transferring and retaining was made it according to the following breakdown:
  - Zone A (EFR transferred to SRC, SRC retain 100%)
  - Zone B (EFR transferred to SRC, SRC transferred to CAT-Mex Ltd, and CAT-Mex to the Capital markets)
  - Zone C (EFR transferred to SRC, SRC retain 100%)





# Illustration of the entire structure



1. FONDEN entered into the Insurance Agreement with European Finance Reinsurance Company Ltd. ("EFR"), an indirect wholly-owned subsidiary of Swiss Reinsurance Company.
2. EFR transferred 100% of the risk to Swiss Reinsurance Company in Zurich via the Reinsurance Agreement.
3. Swiss Reinsurance Company entered into a financial contract with CAT-Mex Ltd., a Cayman Islands special purpose company.
4. CAT-Mex Ltd. issued floating rate notes (catastrophe bonds) to capital markets investors to hedge its obligation to Swiss Reinsurance Company under the financial contract.
5. A separate Event Payment Account was established with the Bank of New York providing FONDEN the ability to receive loss payments directly from CAT-Mex Ltd., subject to the terms and conditions of the Insurance Agreement.





# Summary of Notes

## Class A Notes

Notional:	\$150,000,000
Covered Territory:	Zone B
Annualized Expected Loss <sup>(a)</sup> :	0.96%
Principal Reduction Mechanism:	Binary
Expected Rating (S&P):	BB+
Investor Spread:	LIBOR + [235]

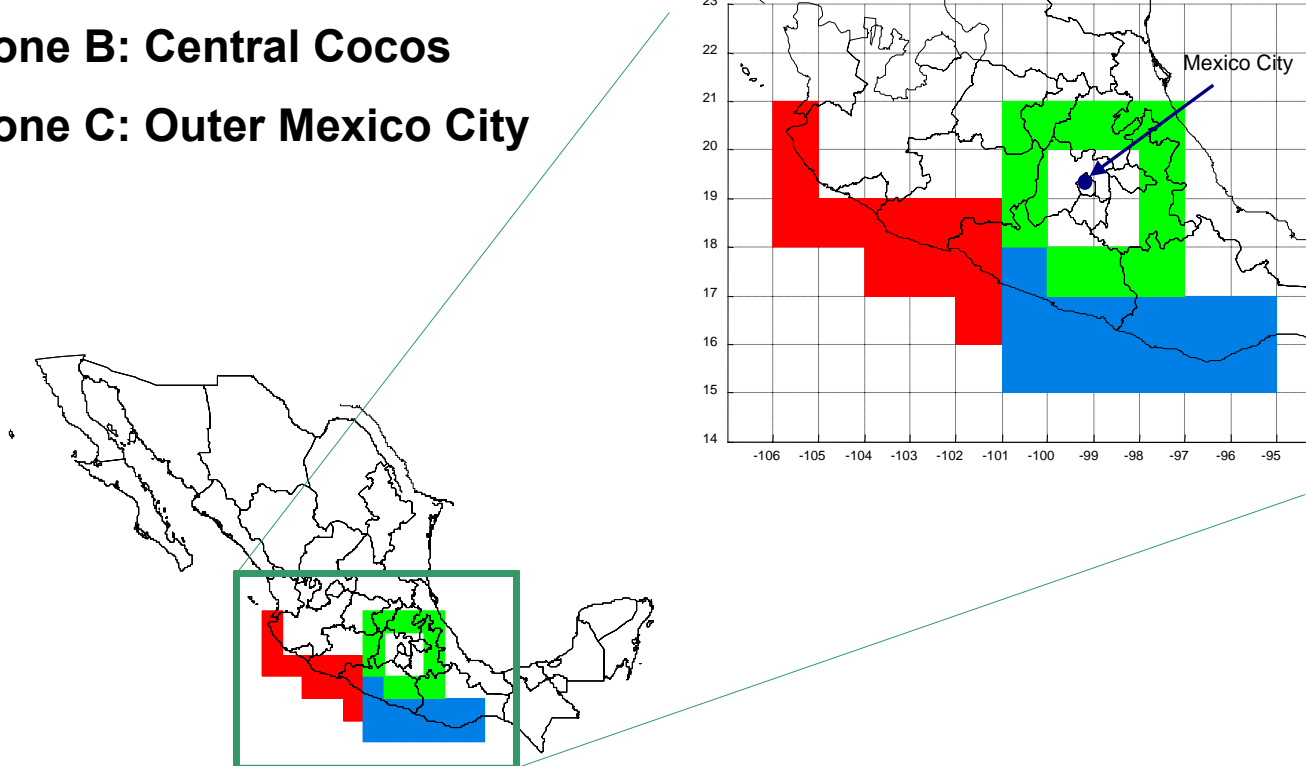
(a) As estimated by AIR





# Trigger Zones

- **Zone A: Northwest Cocos**
- **Zone B: Central Cocos**
- **Zone C: Outer Mexico City**





# Trigger Event Conditions

- Binary parametric trigger, 100% principal reduction if trigger conditions are met
- Payment of losses requires verification by Event Verification Agent (AIR) of Trigger Event Conditions as reported by United States Geological Survey (USGS)
- Trigger Event Conditions:
  - i. A state of emergency declaration issued by the Secretaria de Gobernacion (Ministry of the Interior of Mexico) and published in the Mexican Official Gazette,
  - ii. Epicenter location in or on the boundary of a Zone, and
  - iii. the following magnitude and depth requirements:

	<b>Zone A</b>	<b>Zone B</b>	<b>Zone C</b>
Magnitude ( $M_w$ )	8.0	8.0	7.5
Max. Focal Depth (km)	200	200	150





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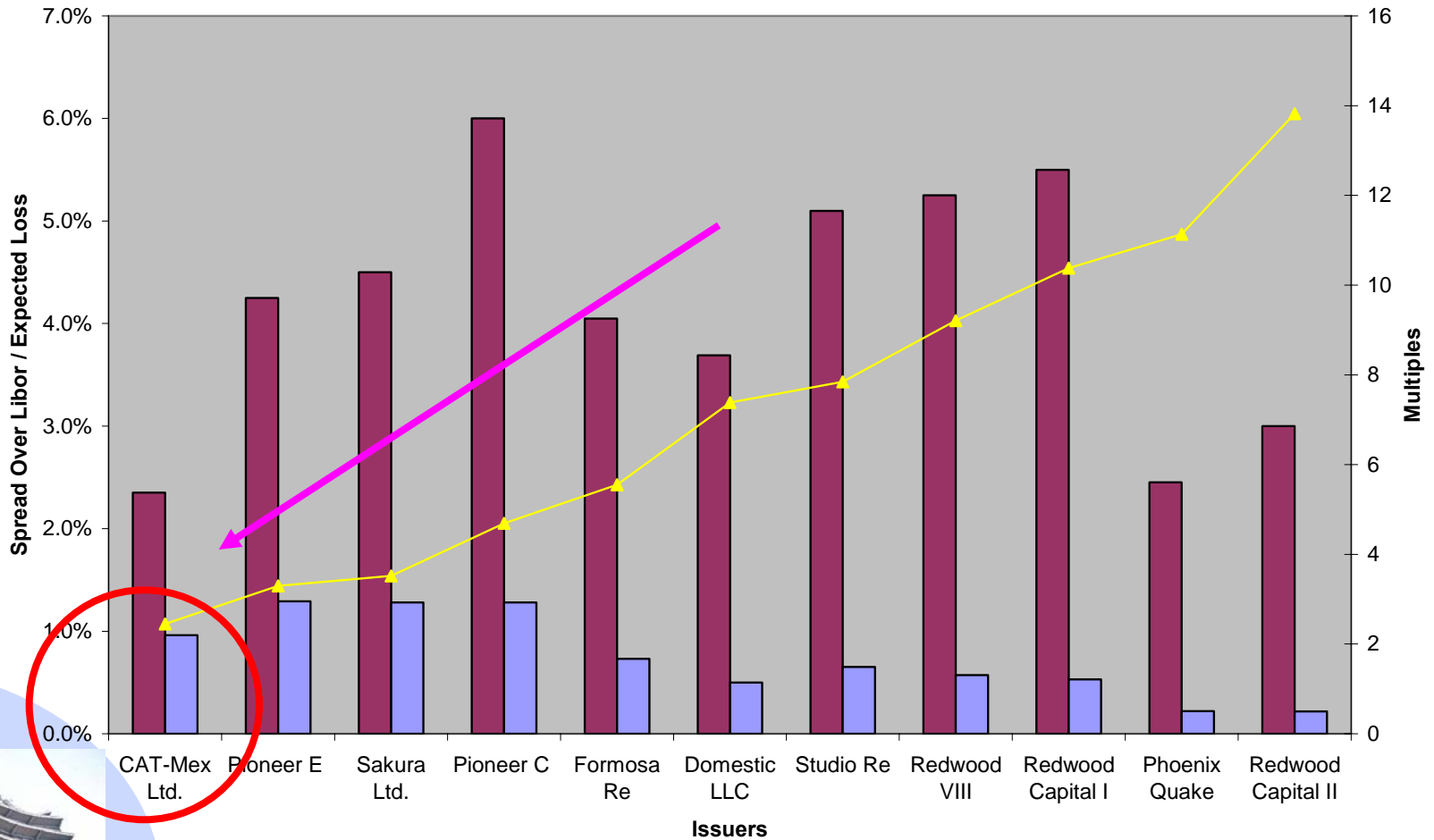




# The Mexican transaction had an outstanding reception in the capital markets

Multiple= (Spread Over Libor / Expected Loss)  
Issuances selected: only multiples non duplicated  
Spread over Libor / Expected Loss

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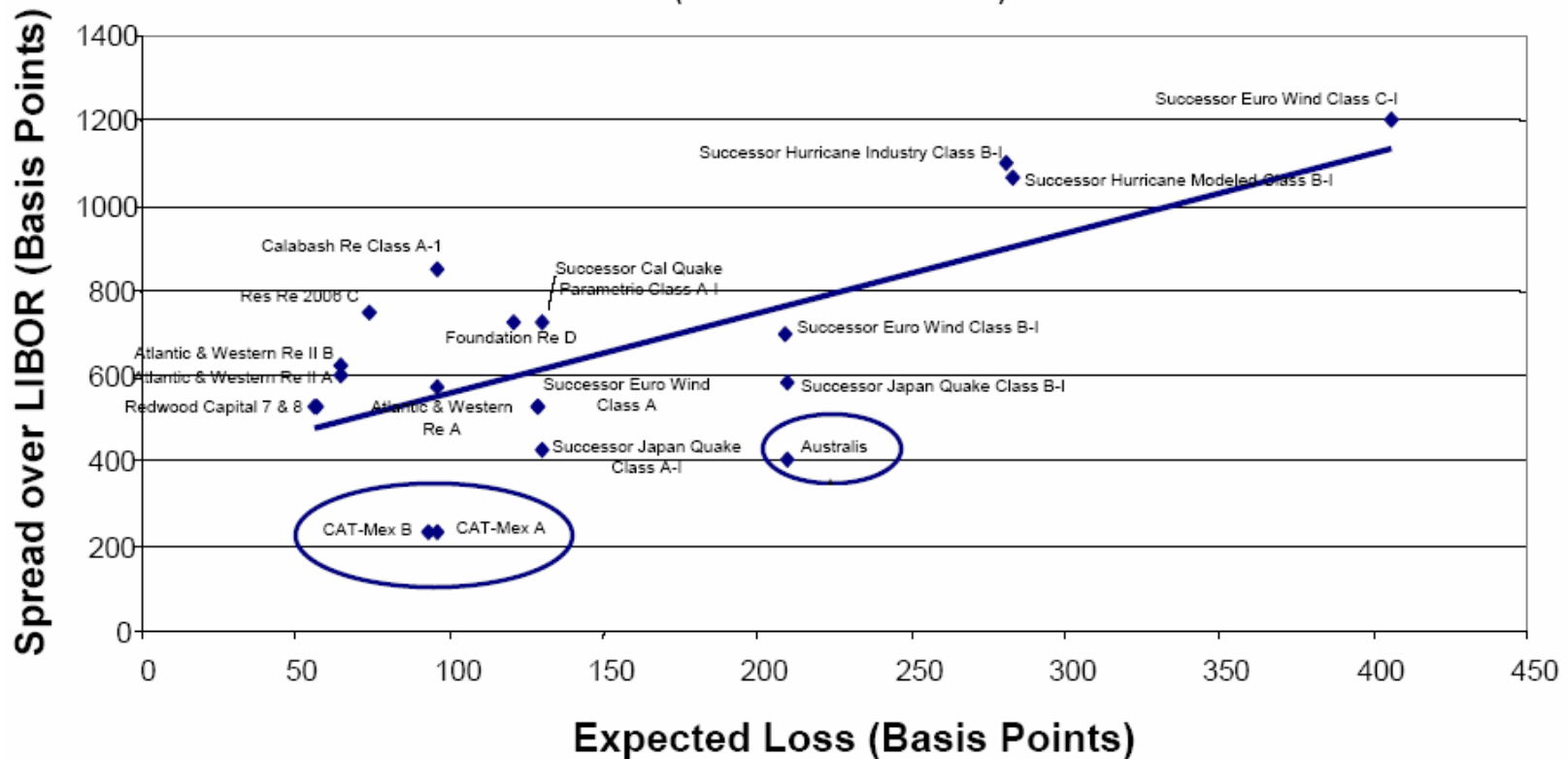




# Comparative analysis with last transactions

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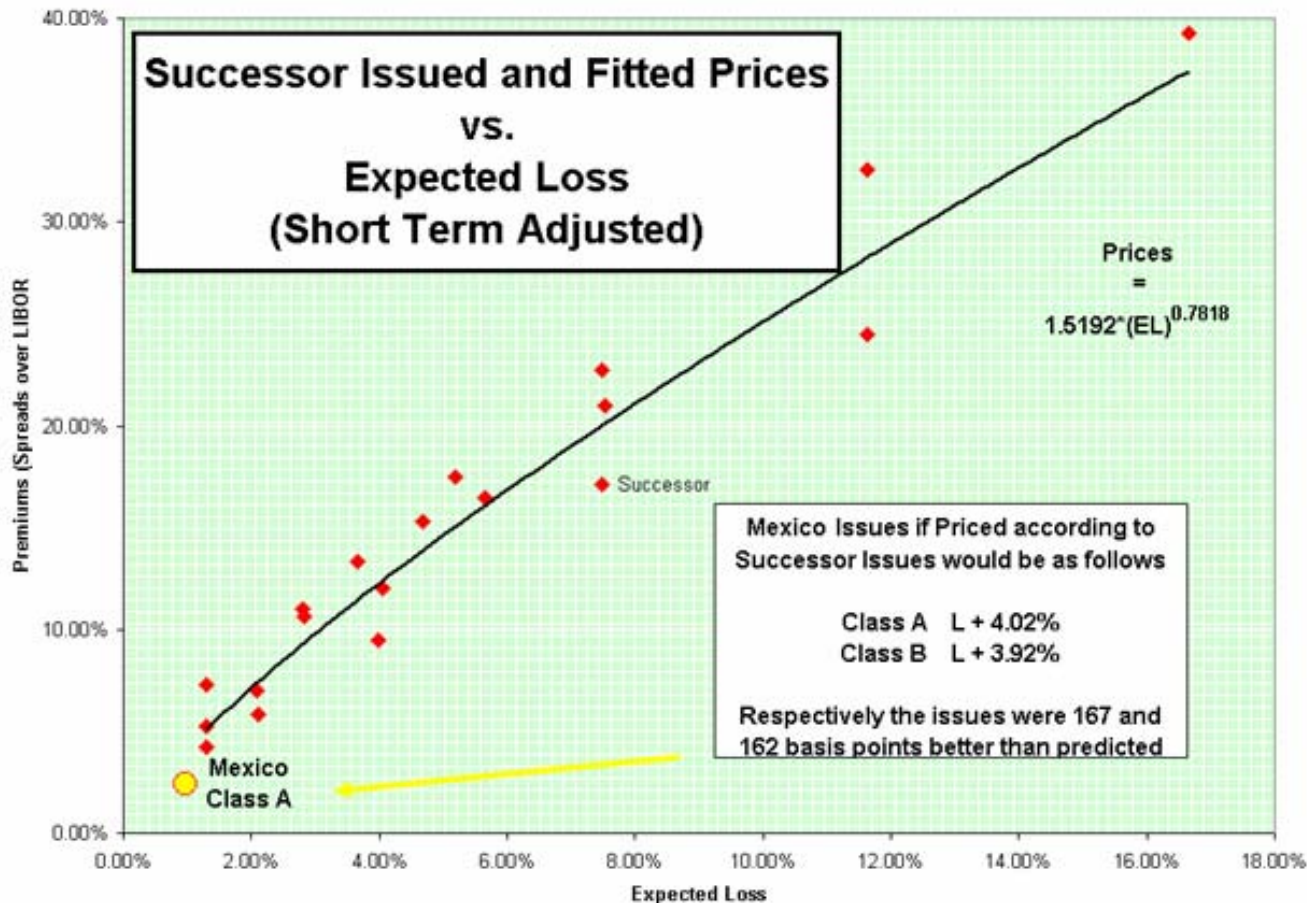
New Issuance Pricing as of June 6, 2006  
(Rated BB- to BB+)





# Particularly, relative to other big issuances, the Mexican transaction got a better price

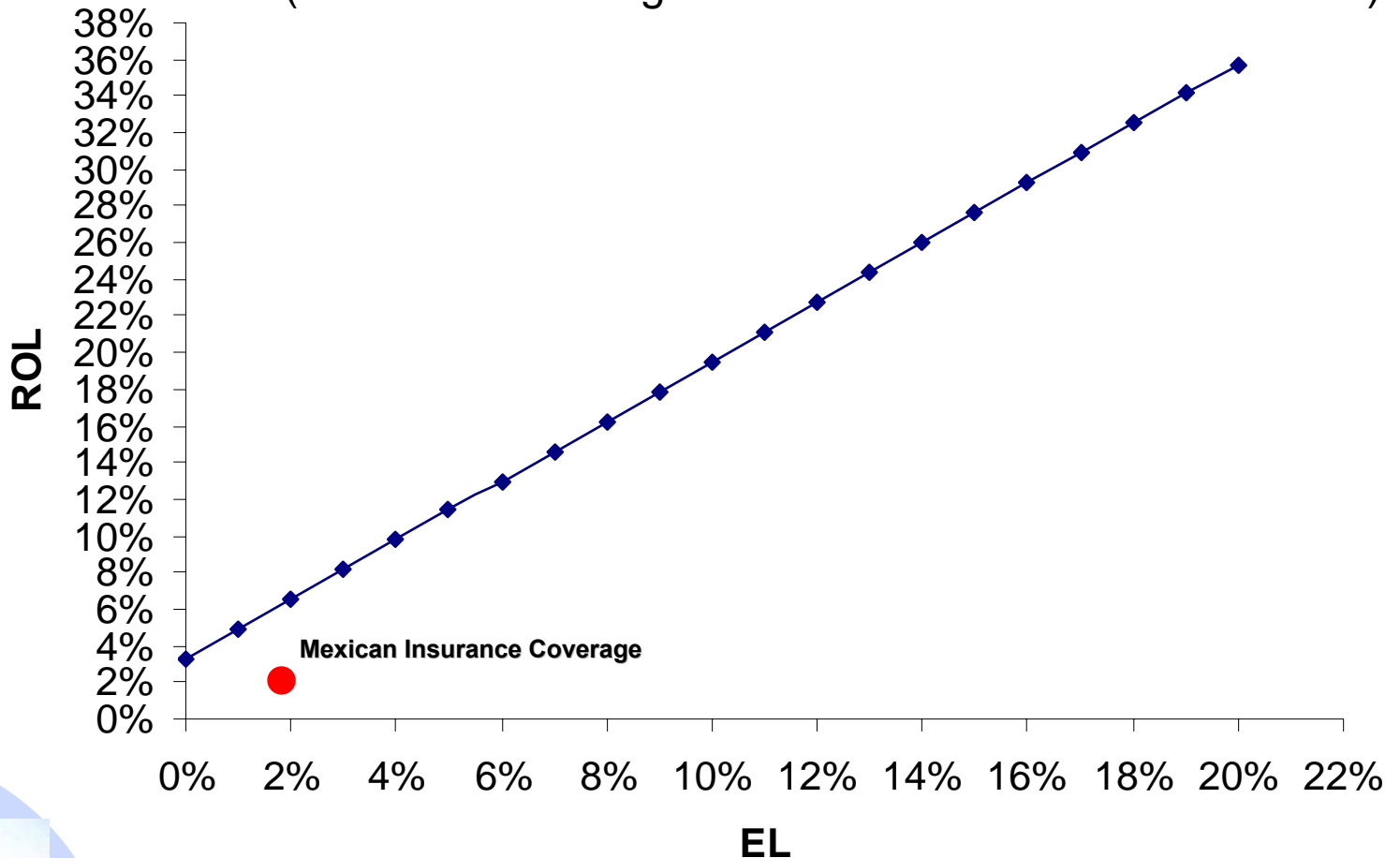
- Successor Program was sponsored by Swiss Re, making a comparative analysis, the Mexican transactions got a better pricing.





# Not only a cat bond was a good deal, the entire transaction was too...

## Rate-On-Line (ROL) per Expected Loss (EL) (Estimation for England Insurance Market after Katrina)



Source: Guy Carpenter with Author estimations





# The Mexican transaction inaugurated a new risk zone in the worldwide capital market

## Averages of all Earthquake-Only Issues by Zone of Coverage

	Amount Issued	Issue Spread over Libor	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





# Some final thoughts: international media press comments



**The New York Times**  
nytimes.com

“The Mexican government has tapped international markets to issue a special catastrophe bond to finance rescue and rebuilding in case of a disastrous earthquake...”

## Reactions

www.reactionsnet.com

“The Mexican government has issued a \$160m catastrophe bond to cover it against losses from a severe earthquake. It is the first time a sovereign country has securitised natural catastrophe risk in this way....”

### THE WALL STREET JOURNAL

“In the first attempt by a developing country to tap the world's capital markets in the event of a natural disaster, ... The Mexican earthquake bond, which has been sold to institutional investors in the U.S. and Europe, will act like an insurance policy for the Mexican government....”





**Thank you!**

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