

# Public Natural Catastrophe Losses Funded through Private Capital Markets: The Case of the Mexican Parametric Earthquake Catastrophe Bond

John D. Wilson  
Country Advisor  
Lead Financial Sector Specialist  
World Bank

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## The Mexico Catastrophe Bond

### Origins of Bank / Government Dialogue:

- Country hazard risk exposure and insurance studies (during preparation / impl. of ERL loan).
- Optimizing insurance for public assets with possible bulk pooling to lower premiums.
- Improving risk data for all hazard impacts.
- Hedging federal disaster budget fund using insurance tools, such as catastrophe bonds.

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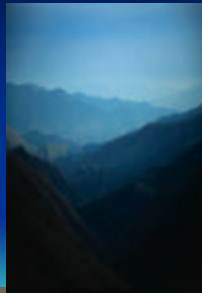
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## Catastrophe Bond Features

- Type of payment trigger:  
(a) indemnity, (b) index or  
(c) parametric.
- Parametric (e.g.: e'quake magnitude 8.0) has least moral hazard or need to verify on-ground losses.
- No loss: investors get above market yield.
- Loss: if Bond defaults.
- Pmt. amount specified.



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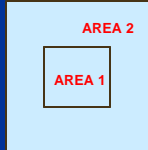
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## Initial Specification of Trigger

Insurance contract versus bond: Payment trigger is Richter magnitude 8.0, Perimeter of epicenter specified, Maximum specified depth, e.g.: 100 km. at epicenter.

Quake Magnitude	7.0	7.5	8.0
% Bond loss Inner grid	40	100	
% Bond loss Outer grid	20	60	100




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## Works as a Market Bond

- Corporate bonds priced based on default probability (e.g. 1%, 2%, 3%), rated by credit rating agencies.
- Catastrophe bond has **hazard** probability (e.g.: earthquake magnitude of Richter 8.0) of 1%. Rated BB / BB- as potential **'default'** by credit rating agency.
- So catastrophe bond should at least pay rate to investors: 5% (risk free rate) + 1% (default probability) + 3% (variance/uncertainty of probability) = **9% rate**. Investors thus fully covered for risk factor.
- If e'quake occurs, investors lose principal, and government keeps proceeds for disaster needs.

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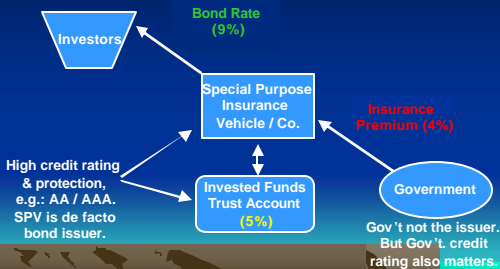
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## Cat Bond Structure




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## Actual Deal Structure



- Insurance vehicle (SPV -like) set up as 'intermediary'.
- Swiss Re acted as underwriter (and guarantor) of bond issuance.
- Bond sold to investors in the private placement market.
- Final spread was 2.36% over LIBOR. Binary: "all/nothing".
- Swiss Re was last resort guarantor of bond purchase.

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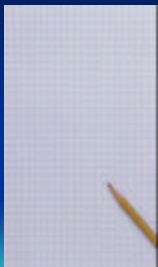
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## Actual Deal Structure, continued



- Two additional earthquake zones covered by Swiss Re under a parametric contract (but with no cat bond).
- Cat bond maturity is 3 years.
- If qualifying earthquake occurs, investors lose principal (not a staggered trigger as previously considered) – kept simple.

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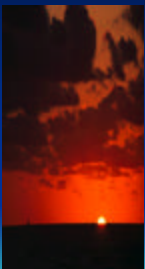
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## Benefits to Parties



- Government pays a premium (similar to pre-amortizing future disaster costs).
- **Capital market absorbs loss if disaster trigger occurs.**
- Bond is attractive: of low probability, and uncorrelated with financial markets.
- **Immediate cash after onset of disaster for first response.**

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## Pre-Requisites

- Inventory of infrastructure and public assets.
- Geographic and topographic locational vulnerability (near faults, mountains, coasts, etc).
- Construction material and its damage potential.
- Valuation of property/infrastructure in \$\$\$.
- Projected frequencies and intensities of hazards.
- Determination of probability distribution of loss \$\$\$ amounts to allow pricing of coverage.
- Cost effectiveness vis -à-vis budget financing.

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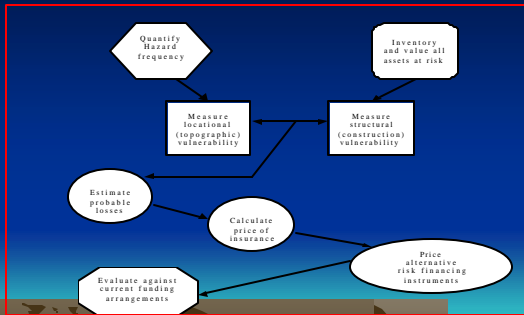
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## Physical/Financial Risk Modeling



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## Operation as Financing Tool

- Mexico has legislated a natural disaster fund. Upon occurrence of disaster, federal and state governments co-share in costs. Fund was pre-budgeted (at time idle funds).
- Instead of building up budget, in future, premium can be financed ex ante. Disaster fund regulations had to be modified to allow insurance.



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## Bank Role / Added Value

- Objective country risk exposure diagnostic and loss potential scenarios.
- Risk management institution building (data).
- Determination of fiscal disruption & situation if large catastrophe occurs.
- Combining insurance, and other financing, for ex ante preparedness.



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