Increasing Earthquake Insurance Coverage in California Via Parametric Hedges

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Tuesday, June 26 – Friday, June 29
What is Parametric Insurance?

Earthquake  
Damage  
Adjustment  
Insurance  
Recovery

INDEMNITY

Parametric

Good sensors exist today

Good sensors will exist soon

Days

Seconds  
Weeks  
Months  
Months/Years

PARAMETRIC
The Convergence Market

The convergence market has driven demand for parametric transactions.

Reliance on physical measurements obtained from a variety of sensors, on a near-real-time basis, fosters transparency and efficiency.

The payment of insurance claims will progressively rely, more and more, on parametric indices and triggers.
Parametric vs Indemnity – Building & Property Losses

Accuracy (lack of basis risk)

Indemnity

In Indemnity

In Indemnity

Parametric

Parametric

Affordability

Speed

Transparency

In Indemnity

In Indemnity

Parametric

Parametric

In Indemnity

Parametric

Parametric

Indemnity CAN BE superior

Parametric is far superior

Parametric is far superior

Parametric is far superior

Parametric is far superior

Indemnity

Indemnity

Parametric

Parametric
Parametric vs Indemnity – Business Interruption Losses

- **Accuracy** (lack of basis risk)
  - Indemnity CAN BE somewhat superior
  - Parametric is even more superior

- **Transparency**
  - Parametric
  - Indemnity

- **Affordability**
  - Parametric
  - Indemnity

- **Speed**
Construction of Simple “First Generation Cat-in-a-Box Triggers”

Smoothing Process

Areas around Fault B have HIGH thresholds

Areas around Fault A have LOW thresholds
Optimization Objective is to Maximize Risk Transfer (Could be Others)

- M = 7
- L = $1M
- P = 0.01
- R = $10k
- L = $100k
- P = 0.01
- R = $1k

- P = 0.01 ➞ 100 years RP
- P = 0.02 ➞ 50 years RP

Trigger 1

Trigger 2
The Problem Reframed as an Optimization Process

Find \( \{M_k\} \) to maximize
\[
\sum_{k=1}^{K} \sum_{i \in V_k} r_i \times l_i \times H(m_i - M_k)
\]
\[
\sum_{k=1}^{K} \sum_{i \in V_k} r_i \times H(m_i - M_k) < R
\]

Find the magnitude threshold map that \text{MAXMIZES} risk transfer at a given budget
Solutions on Efficient Frontier Provide Optimal Risk Transfer at Given Budget

- More Expensive / More Risk Transfer
- Cheaper / Less Risk Transfer

It may be that a “sub-optimal” solution is of interest to satisfy other constraints.

Each point on the Front is an “optimal” trigger solution.
Example: FONDEN 2017 (not actual transaction map shown)

M8.1 – 100km SW of Pijijiapan, Mexico (9/8/2017)

73 Days

$150M
Example: An Insured in Los Angeles with a budget of $300

- **Attachment Probability**: 2%
- **Limit**: $15,000
- **Pure Premium**: $300
- **Captured Risk**: 21.6% of the Total Risk
Conclusions

1. The affluence of NEW capital has driven demand for TRANSPARENT and SPEEDY insurance
2. PARAMETRIC insurance solutions have been enabled by SENSORS
3. As more SENSORS appear, PARAMETRIC solutions will be better and more in number
4. PARAMETRIC solutions can be customized through an optimization process
5. INDUSTRIALIZATION of customized PARAMETRIC solutions has the potential to increase cover
6. Although TEMPTING, lots of barriers exist for RETAIL PARAMETRIC usage
7. CORPORATES and the PUBLIC SECTOR are natural users
8. These SYSTEMS will contribute to increase RESILIENCE in California... and India, China, etc.