# Materials Prepared For:

## CAS 2013 Seminar on Reinsurance

*CS-13: A Tale of Two Triggers: Analyzing the Basis Risk / Reward Tradeoff Under Index and Parametric Triggers*

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# WHAT IS AN INDEX TRIGGER?

■ **An index trigger links loss payments to a predefined index**

■ **Contracts use different indices**

- Industry-index: based on an industry-wide loss index (e.g., PERILS / PCS)

    - For example, an industry loss warranty or "ILW"

- Parametric-index: based on a custom index of catastrophe parameters

    - E.g., could be linked to an index of county-weighted industry losses

- Other – there is still room for innovation…

$$\mathbf{M}_1^e = \int_{-1}^{1} \left[ \mathbf{H}_{\bar{\mathbf{V}}}^{e\,T} \, \bar{\mathbb{I}} \, \mathbf{H}_{\bar{\mathbf{V}}}^e + \mathbf{H}_{\bar{\mathbf{F}}}^{e\,T} \, \bar{\mathbb{S}}^{-1} \, \mathbf{H}_{\bar{\mathbf{F}}}^e \right] J \, dt$$

# WHY ARE INDEX TRIGGERS USED?

*They offer investors and sponsors several benefits*

**1**   *They help investors and reinsurers understand insurance risk*

- *Easy to structure and document with minimal subjectivity*

- *Minimizes potential for moral hazard (important from an investor perspective)*

**2**   *Well designed triggers can minimize negative basis risk for a sponsor*
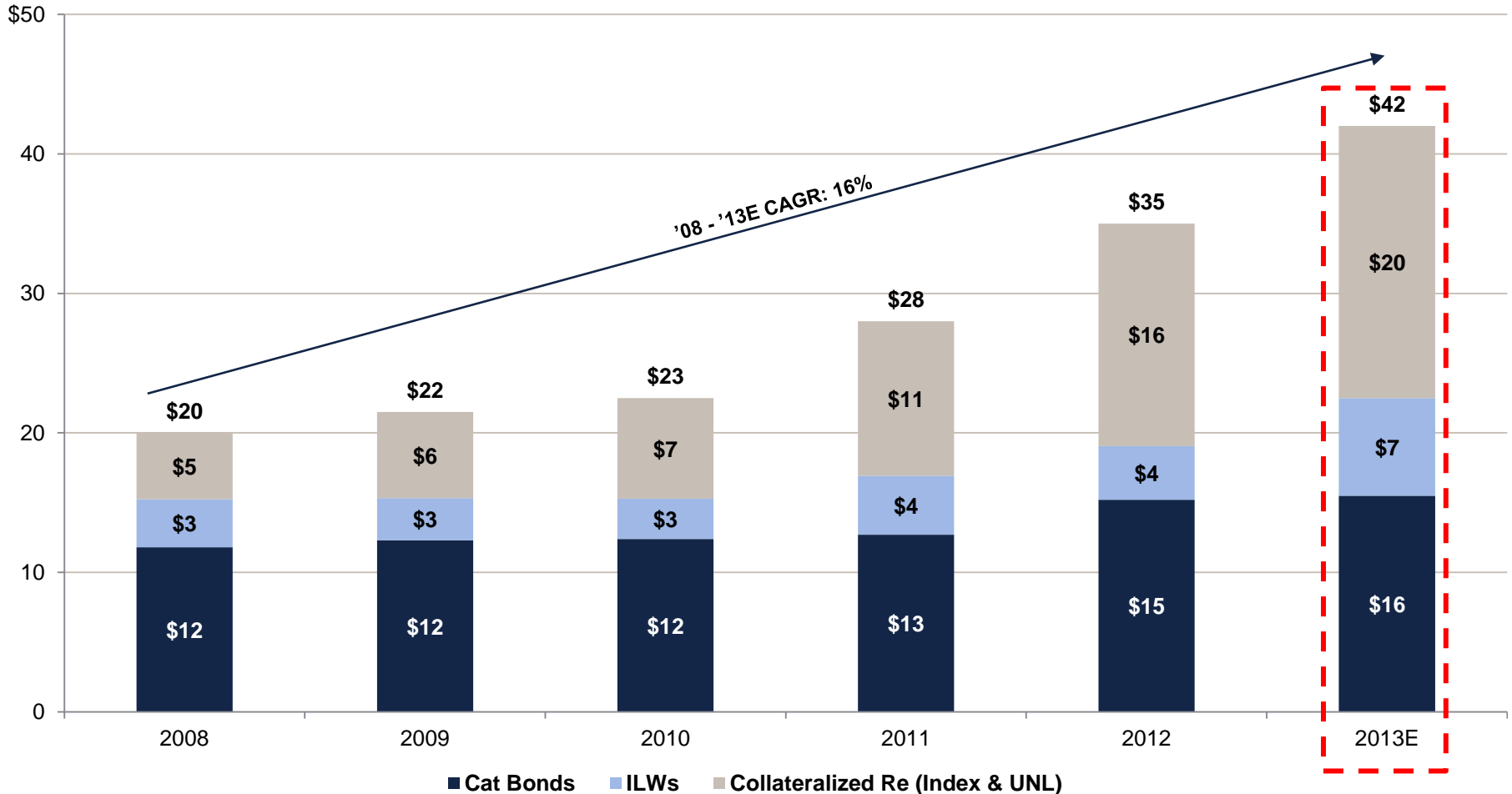
**3**   *Highly transparent*

# INDEX TRIGGERS HELP UNLOCK CAPACITY

## *The ILS market is expected to continue its rapid expansion*

*($ in billions)*

### Collateralized Re & Cat Bonds Outstanding at Year End



'08 - '13E CAGR: 16%

| Year | Cat Bonds | ILWs | Collateralized Re (Index & UNL) | Total |
|------|-----------|------|--------------------------------|-------|
| 2008 | $12 | $3 | $5 | $20 |
| 2009 | $12 | $3 | $6 | $22 |
| 2010 | $12 | $3 | $7 | $23 |
| 2011 | $13 | $4 | $11 | $28 |
| 2012 | $15 | $4 | $16 | $35 |
| 2013E | $16 | $7 | $20 | $42 |

■ Cat Bonds  ■ ILWs  ■ Collateralized Re (Index & UNL)

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# STRUCTURAL TRANSPARENCY VS. BASIS RISK

*There is a trade-off between structural transparency and basis risk*
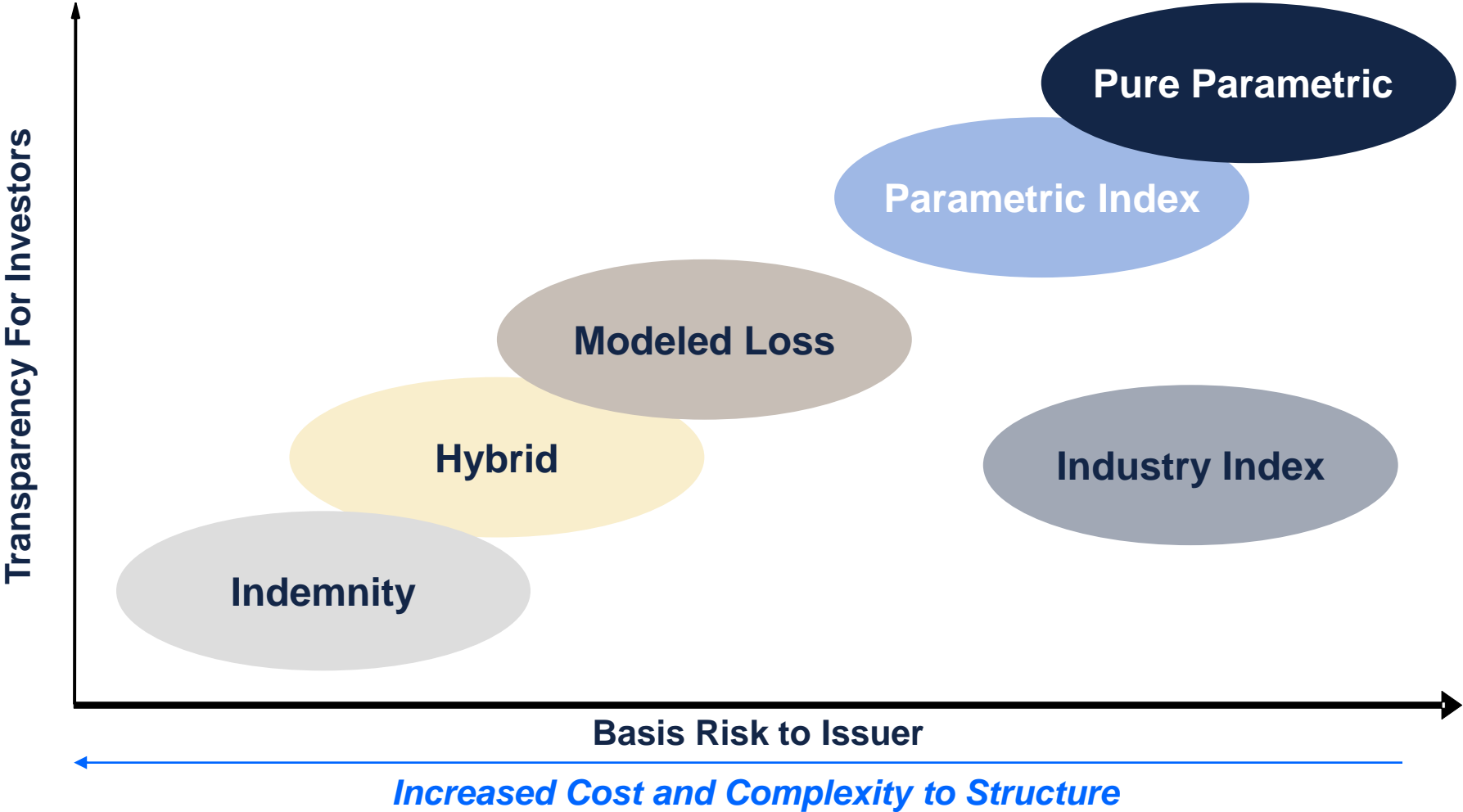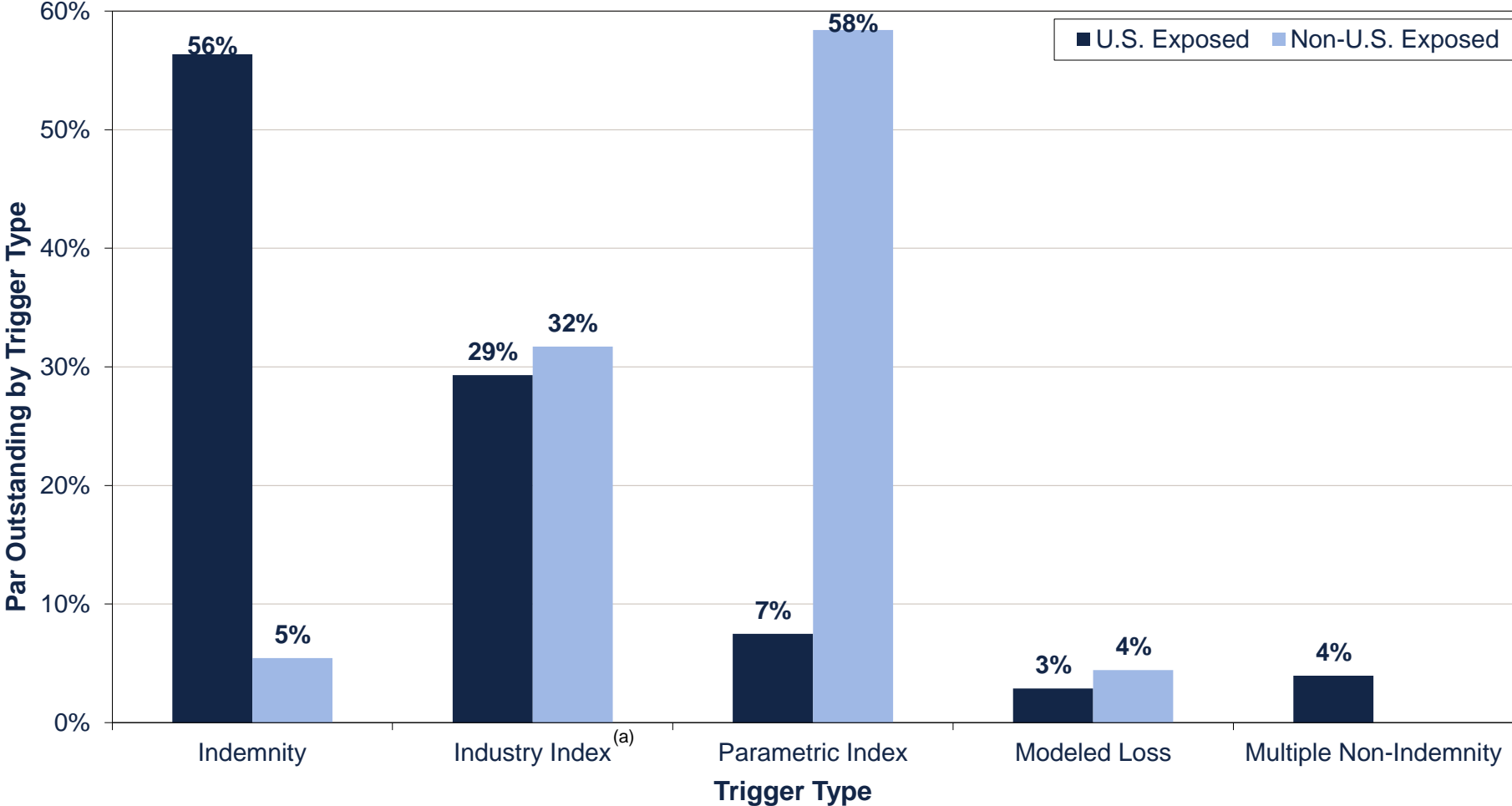
# INDEX TRIGGER TYPES

- **Indemnity:** based on the actual losses of the sponsor (i.e. ultimate net loss)

- **Industry Index:** based on an industry-wide loss index
  - *E.g., PCS in U.S., PERILS in Europe*

- **Modeled Loss:** losses determined by inputting actual physical parameters into cat model and running through escrowed portfolio

- **Pure Parametric / Parametric Index:** based on actual reported physical event parameters
  - *E.g., wind speeds or earthquake magnitude*

- **Hybrid:** mixes elements of various triggers (e.g., MITT, ZWIL, CWIL)

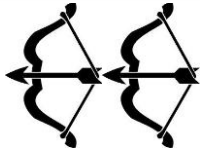**Note: Non-cat index triggers are also possible**

# CATASTROPHE BOND ISSUANCE BY TRIGGER

*Index based triggers are utilized extensively in non-US exposed structures*



Source: WCMA transaction database and offering circulars.
(a) Industry index includes hybrid triggers.
Note: YTD data as of 5/25/2013.

# DOUBLE TRIGGERS WITH AN INDEX



| Double Trigger Structure | Derivative Structure |
|---|---|

**Double Trigger Structure**

- *Index trigger a condition of recovery*

- *Reinsured then indemnified for actual loss once actual condition met*

- *Reinsurance accounting typical*

- *Examples:*
  - *ILW's*
  - *ZWIL, CWIL contracts*
  - *Most "index" bonds*

**Derivative Structure**

- *Index trigger sole determinant of loss*

- *Reinsurance accounting less likely*

- *Examples*
  - *Industry index exchange traded contract*

Note: WCMA does not provide any tax, legal, or accounting advice

# GOLDEN STATE RE SERIES 2011-1 OVERVIEW

## *Golden State Re utilized a modelled loss trigger for workers' comp. risks*

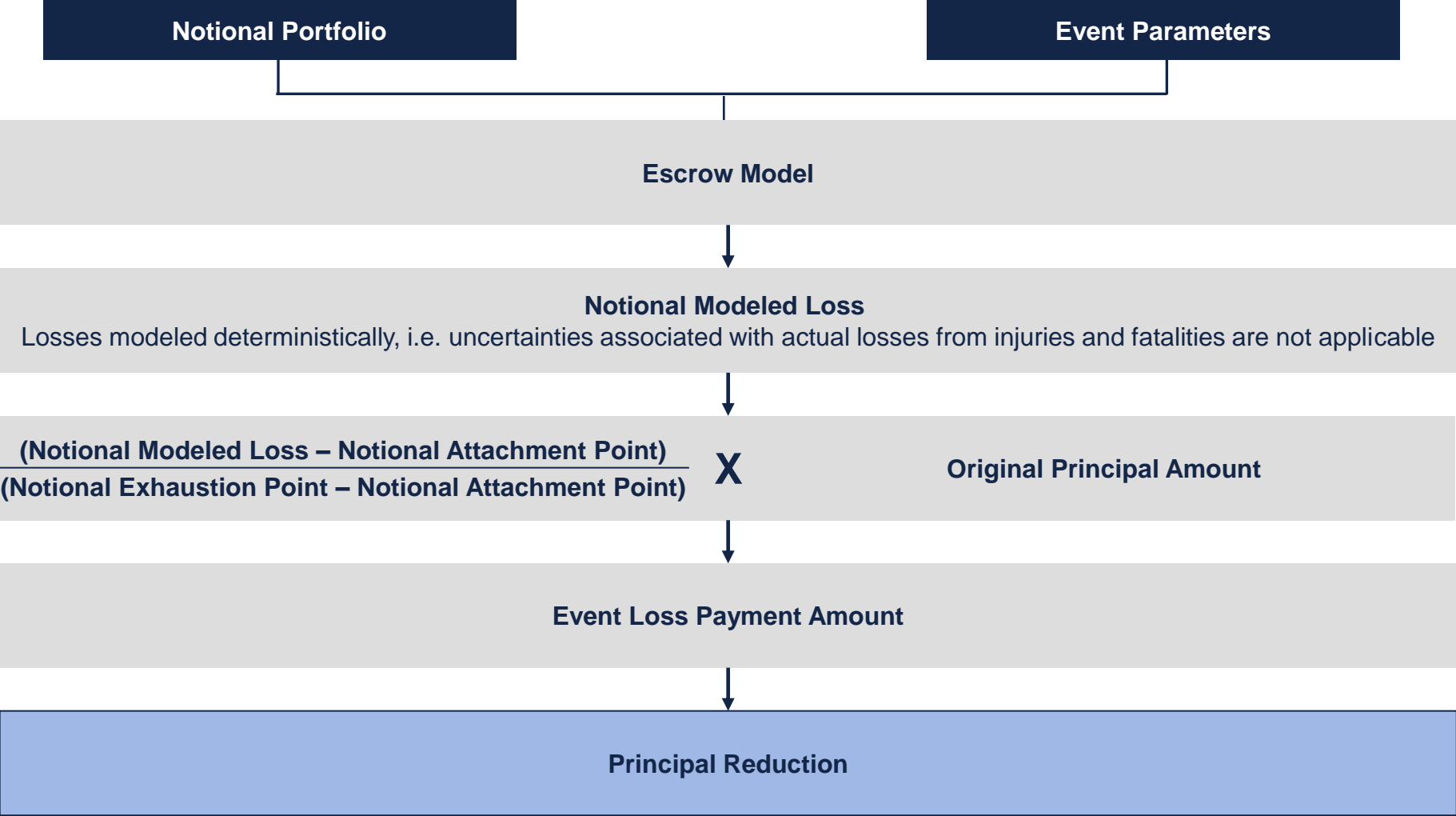| Summary | |
|---|---|
| **Issuer:** | Golden State Re Ltd. |
| **Ceding Insurer:** | State Compensation Insurance Fund |
| **Structuring Agent & Bookrunner** | Willis Capital Markets & Advisory |
| **Issuance Date:** | December 8, 2011 |
| **Scheduled Redemption:** | January 8, 2015 |
| **Original Principal:** | $200 million |
| **Stated Coupon:** | TMMF Yield + 375 bps |
| **Expected Loss:** | 0.36% |
| **Rating (S&P):** | BB+ sf |
| **Perils / Index:** | U.S. Earthquake (Shake Only) |
| **Trigger(s):** | Modeled Loss, Per Occurrence |
| **Extension Period:** | 1 Month Increments (6 month max) |
| **Collateral:** | Treasury Money Market Funds |
| **Model:** | RMS U.S. Earthquake Casualty Model |

### Commentary

- **Sponsored by the State Compensation Insurance Fund ("SCIF")**
  - Largest provider of monoline workers' compensation in California
  - First time SCIF has sponsored a catastrophe bond
- **Multi-year protection against comp. claims resulting from U.S. EQ**
  - Covers losses from ground shaking activity only
  - Modeled loss trigger allows for rapid post-event payout
- **99.99% of exposures are in California**
  - Majority of exposures are concentrated in southern counties
    - LA, San Bernandino, Ventura and Orange County
- **~90% of modeled contribution to EL are from EQ's of 6.6 – 8.0 Mw**

**Illustrative Modeled Contribution by Time of Day for Weekdays**
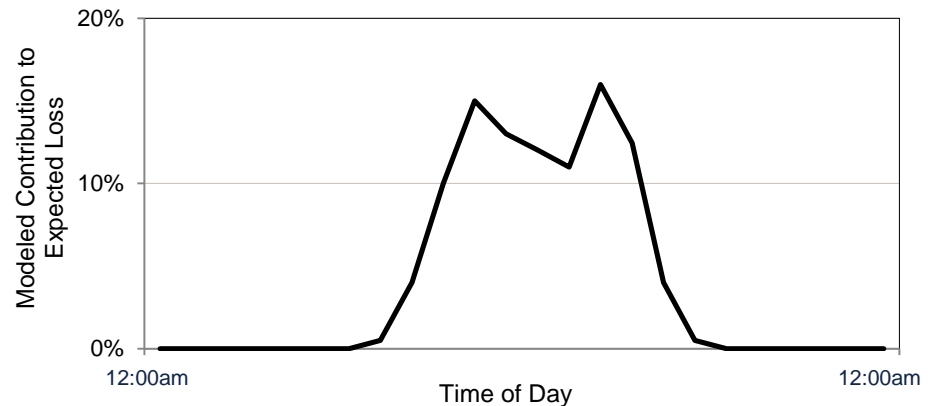


*The modeled contribution to expected loss for weekend days is 0%*

# ILLUSTRATIVE MODELED LOSS DETERMINATION

| Notional Portfolio | Event Parameters |
|---|---|

**Escrow Model**

**Notional Modeled Loss**
Losses modeled deterministically, i.e. uncertainties associated with actual losses from injuries and fatalities are not applicable

$$\frac{(\text{Notional Modeled Loss} - \text{Notional Attachment Point})}{(\text{Notional Exhaustion Point} - \text{Notional Attachment Point})} \times \text{Original Principal Amount}$$

**Event Loss Payment Amount**

**Principal Reduction**

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# BASIS RISK OVERVIEW

*Basis Risk – the risk that offsetting hedges will not perform as intended*

■ *In (re)insurance, we understand basis risk to be the risk that actual losses will deviate from the expected recovery*

# ILLUSTRATIVE MATHEMATICAL EXAMPLE

## *Trigger optimization depends on a risk manager's view of basis risk*

*($ in millions)*

| Basics | |
|---|---|
| Layer EL | 2.00% |
| Layer | $200 xs $500 |
| Layer Exhaustion | 700 |
| 100 Year Loss | 1,000 |
| 250 Year Loss | 2,000 |

*($ in millions)*

| Scenario | Status Quo | Index in Layer | Index Below Layer |
|---|---|---|---|
| **Contract Type** | **UNL in Layer** | **Hybrid Index** | |
| ROL | 15.00% | 12.00% | 13.50% |
| Hedge Efficiency in Layer | 100.00% | 75.00% | 82.50% |
| Hedge Efficiency at 100 Year Loss | 100.00% | 90.00% | 95.00% |
| Hedge Efficiency at 250 Year Loss | 100.00% | 95.00% | 96.00% |
| Limit | $200 | $200 | $200 |
| Cost | 30 | 24 | 27 |
| Reinstatement | 1 | 0 | 0 |
| Net Retention at 700M Loss | 560 | 549 | **547** |
| Net Retention at 100 Year Loss | 860 | 839 | **835** |
| Net Retention at 250 Year Loss | 1,860 | **1,832** | 1,834 |

# TRIGGER DESIGN AND BASIS RISK

*Basis risk must be carefully considered when deciding on trigger design*

- *Trigger design and basis risk analysis is an interactive process*

- *Criteria in selecting trigger include:*

  - *Maximizing rating agency credit*

  - *Evaluating and minimizing **actual** basis risk*

  - *Maintaining flexibility to deal with portfolio changes*

  - *Optimize fit within the broader program*

  - *Enhancing transparency to attract investors*

*Actual Basis Risk: How will the hedge actually perform.*

# OPTIMIZING INDEX TRIGGERS

*Structural optimization could offer significant risk benefits to sponsors*

**1**    *Optimizing the hedge efficiency of the trigger*

**2**    *Create a bias towards over-recovery*

**3**    *Have the index inure to the benefit of other covers which effectively absorb basis risk*

**4**    *Redefine risk tolerance from a "gaps and overlaps" perspective to a net retention view*