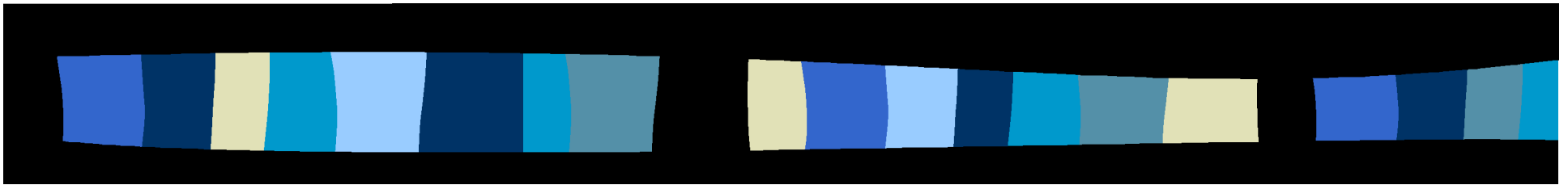# The Concentration Charge: Reflecting Catastrophe Exposure Accumulation in Rates
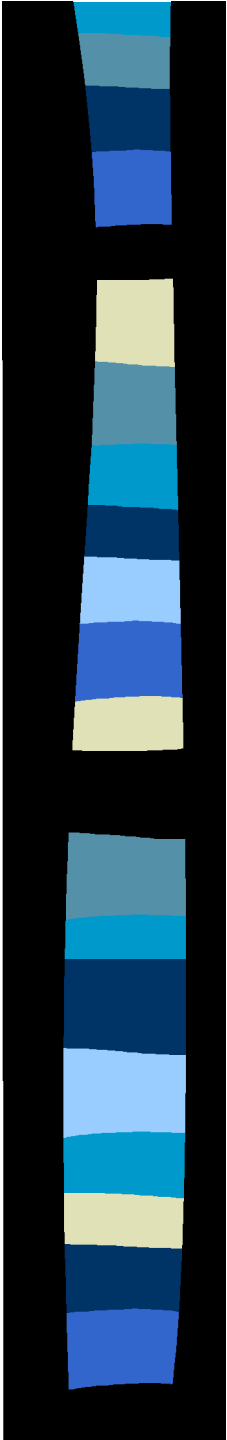
Session CPP-54 March 12, 1998

CAS Ratemaking Seminar

Donald Mango

Zurich Centre Group L.L.C.

Why Have a Concentration Charge?

Answer: Exposure Balancing

- *In theory* Capital Market would diversify away exposure concentration
- True *in theory,* unsettled *in practice*
- Current measures inefficient, apply *after* policies are written:
  - Catastrophe Reinsurance
  - Exposure Indices and Exchanges
- What about exposure balancing at point of sale using insurance pricing structure?
  - would require *Portfolio-State Dependent pricing*

Portfolio State-Independent Pricing

- Filed Loss Cost / LCM approach is *portfolio state-independent* (**PSI**)

- Manual Rate =
    loss cost +
    "state-independent" expenses
    (*LAE, Commission, Taxes, Overhead)*

- Quoted rate the same no matter if new policy is first or one hundred thousand and first such insured in their area

- Independent of the policies in-force when new policy is quoted -- the "state" of the portfolio

Portfolio State-Dependent Pricing

- No need, since loss costs and most expenses are **PSI**

- Exposure accumulation threatens solvency *which is a cost*

- How much it threatens solvency depends on exposure "state" of portfolio (policies in-force)

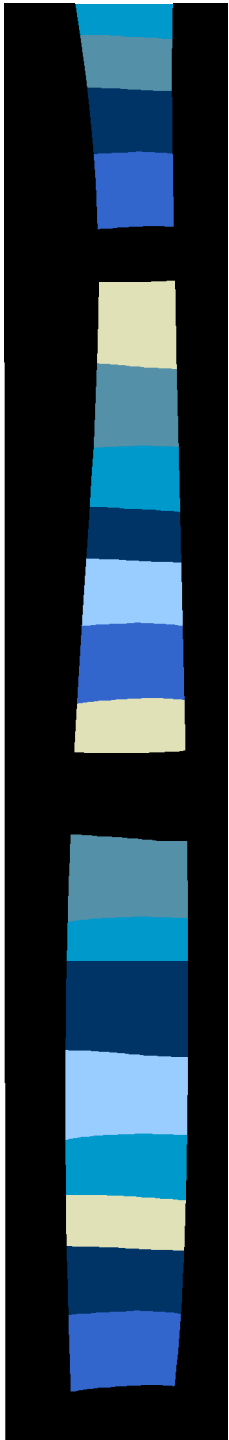- **Portfolio State** *Dependent*

Barriers to Implementation

- No place to put the Concentration Charge in a filed loss cost/LCM structure

- Computationally Intensive

- Unfair Discrimination
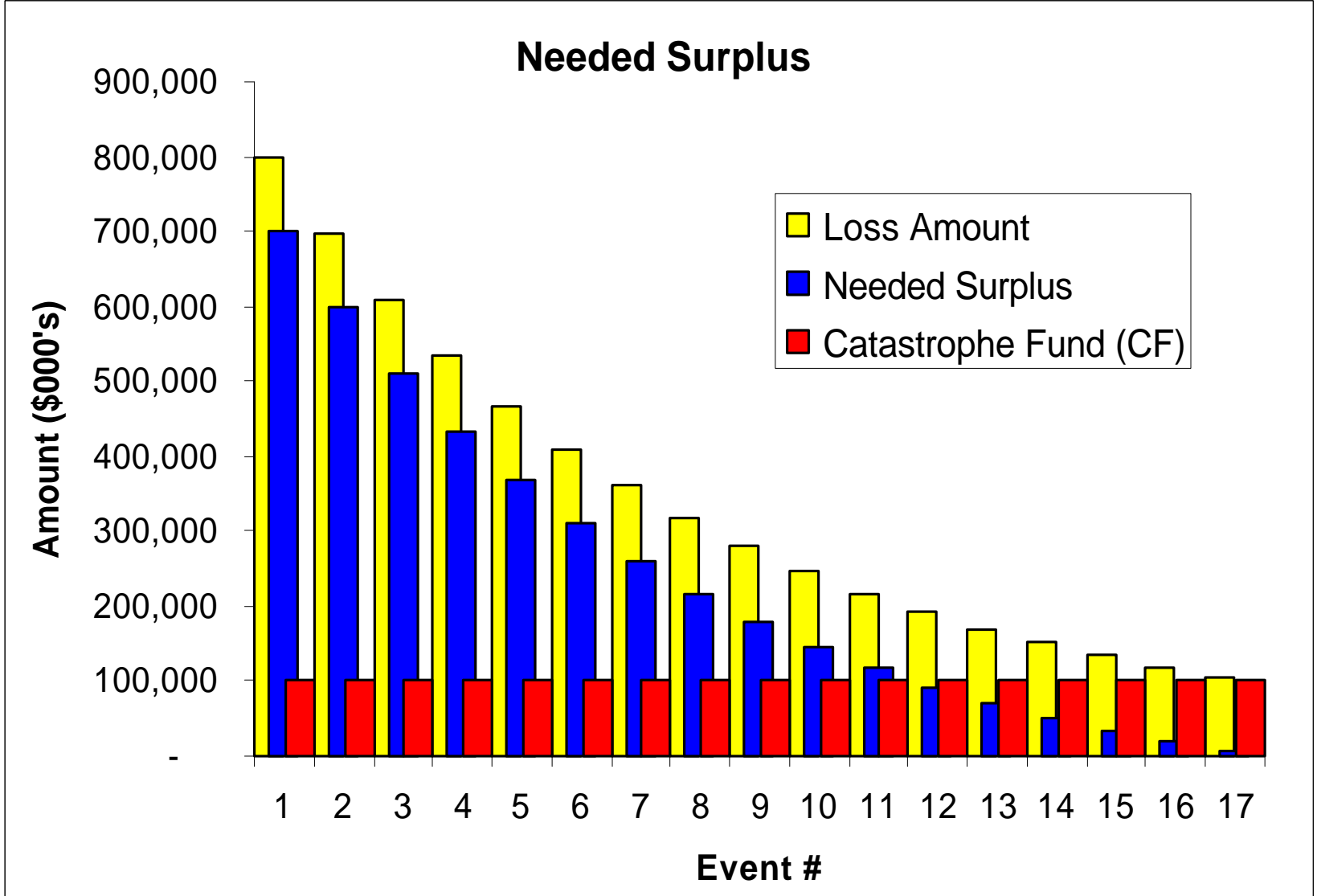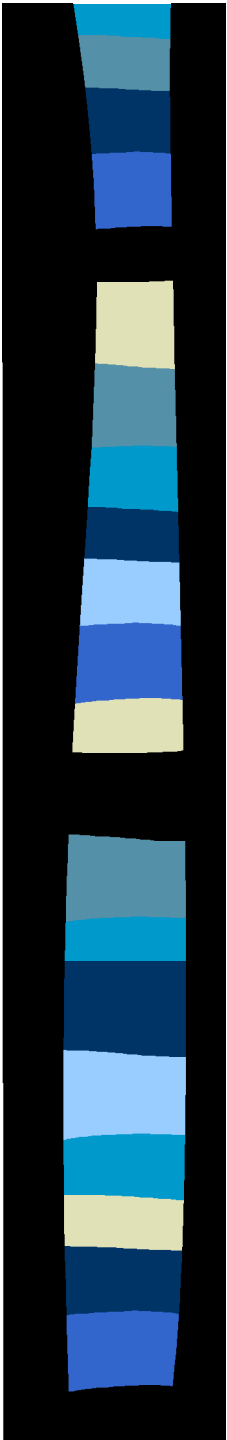
Components of New Approach

- Needed Surplus Distribution
- Surplus Tiers
- Surplus Replenishment Period

Needed Surplus Distribution

- Catastrophe Fund (**CF**) = Funds on hand to pay cat losses
- Needed Surplus for event i = **NS(i)**
  - NS(i) = MAX [Event i Loss - CF, 0]
  - Amount of *Surplus funds* needed to pay loss
- Can be expressed as a percentage of total available surplus
  - range from 0% to more than 100%

Needed Surplus

Legend:
- Loss Amount
- Needed Surplus
- Catastrophe Fund (CF)

Y-axis: Amount ($000's) — 900,000; 800,000; 700,000; 600,000; 500,000; 400,000; 300,000; 200,000; 100,000; -

X-axis: Event # — 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Surplus Tiers

- Economic impact of losing *d%* of surplus more severe as surplus decreases

  - e.g. Going from 100% --> 90% of surplus not as bad as going from 90% --> 80%

- Identify percentiles of surplus where "operational status" ("DEFCON") of firm changes

- Percentiles demarcate ***SURPLUS TIERS***
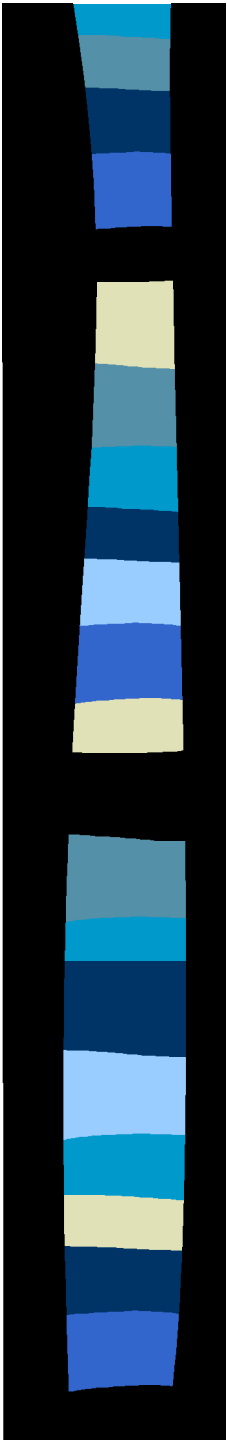
Sample Surplus Tiers

Surplus Tier	Percent of Surplus Consumed	Impact
1	0-10%	None – Acceptable Variation
2	10-20%	Regulatory and Rating Watch
3	20-30%	Regulatory Oversight, Ratings Downgrade
4	30-50%	Regulatory Intervention
5	>50%	Reorganization, Runoff or Insolvency

Note the convention that higher numbered tiers represent deeper shocks and more severe impairment to the company.
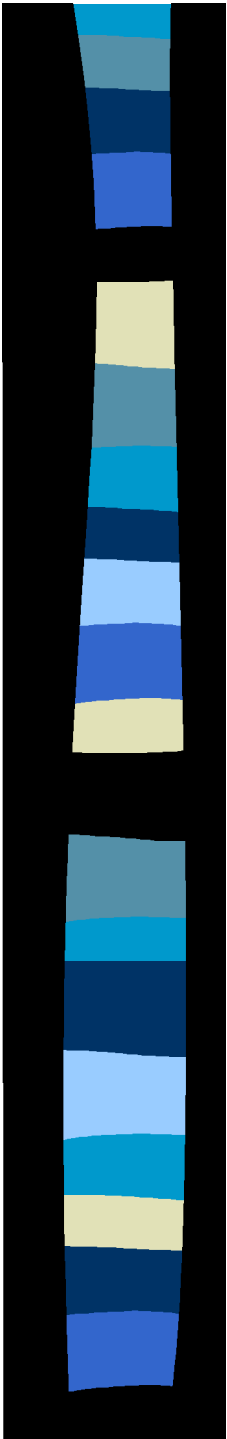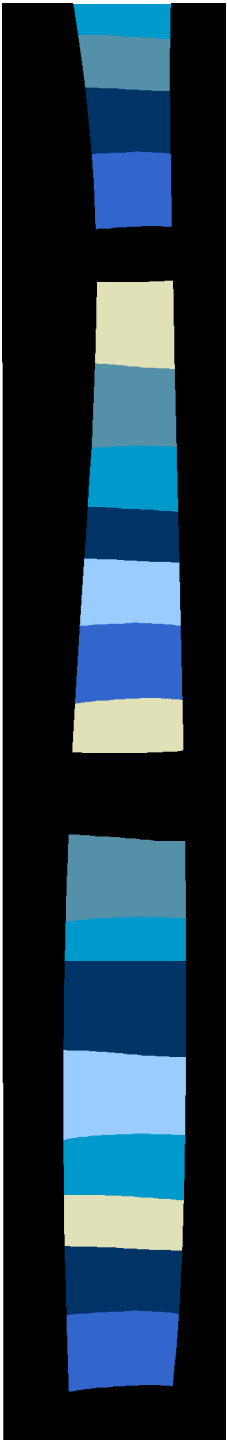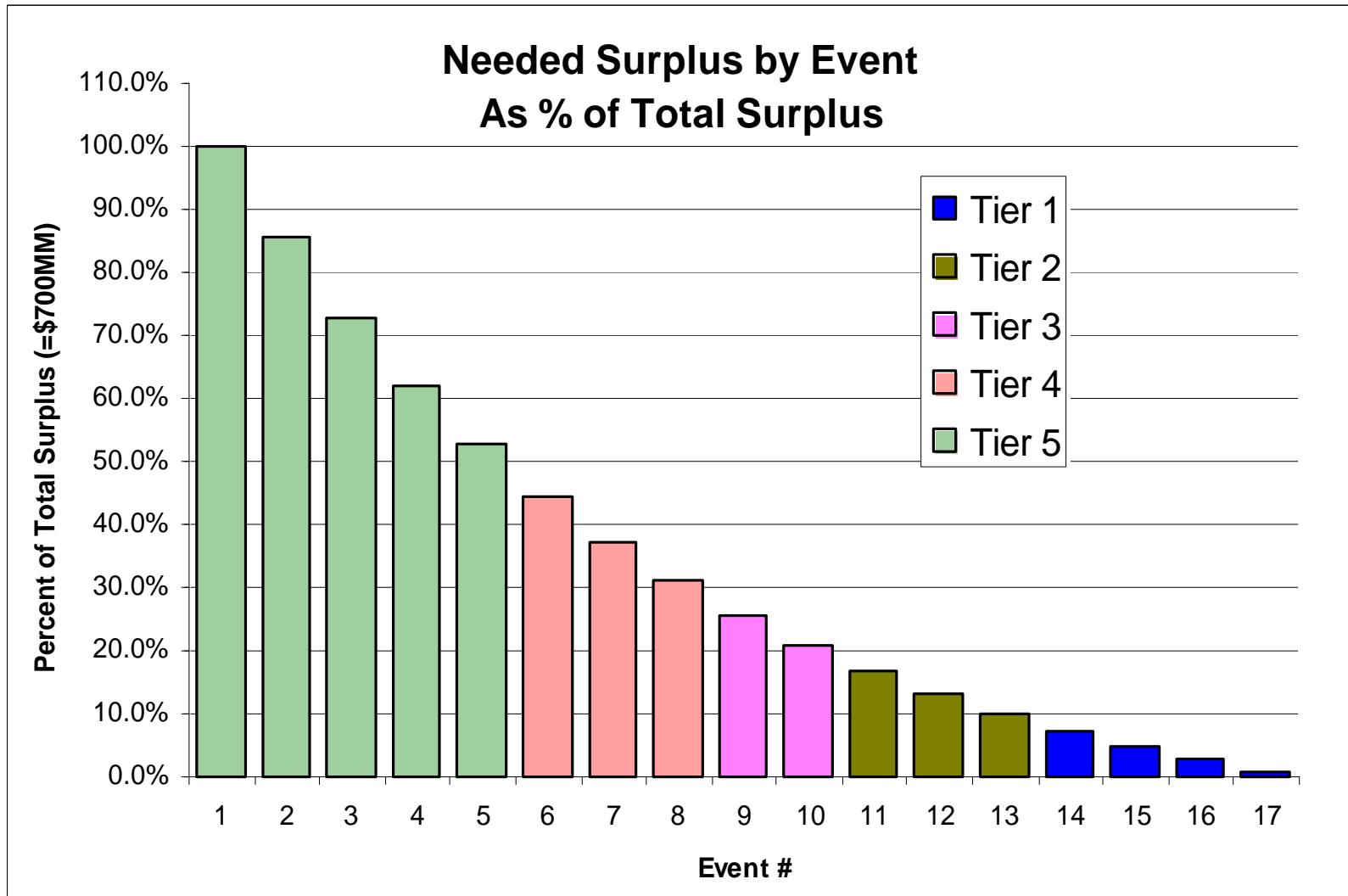
Event Tiers

- Needed Surplus distribution associates events with % of total surplus consumed

- Tiers demarcated by % of total surplus consumed

- Each event has an associated Tier
  - "Tier 4" event consumes between 30% and 50% of surplus

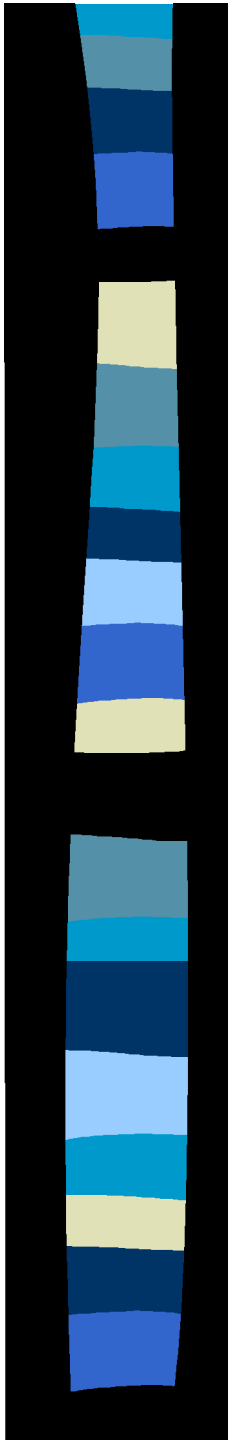# Event Tiers Graph

**Needed Surplus by Event
As % of Total Surplus**
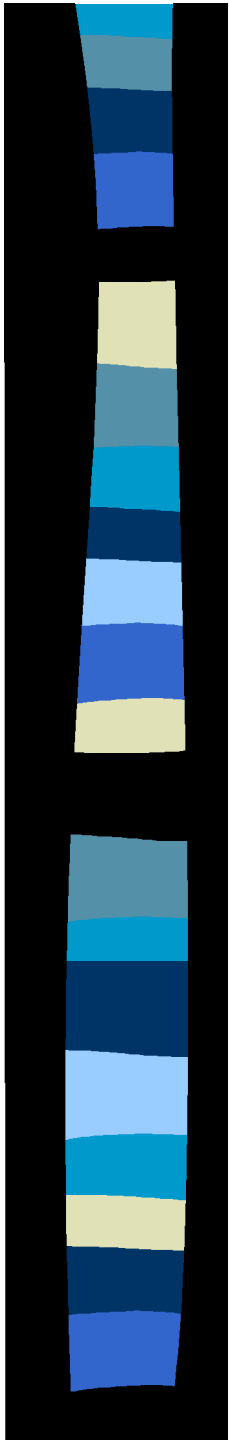
The Concentration Charge

- Charge for a new policy added to a highly exposed area

- Depends upon to which Tier the new policy adds losses

- Propose using REPLENISHMENT OF DEPLETED SURPLUS as criteria for developing charge

Replenishment Periods

- Each tier is assigned a replenishment period
  - Higher tiers need to be replenished sooner
- Each additional $1 of loss to that event exposes a dollar of surplus which must be replenished within that replenishment period
- Annual surplus replenishment load equal to inverse of replenishment period (in years)
 - e.g. To pay back $1 in five years, collect 20 cents per year
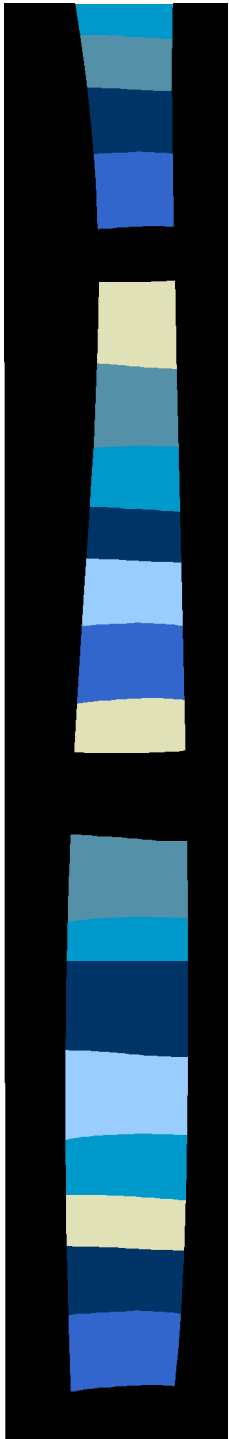
Replenishment Periods (cont'd)

Surplus Tier	Percent of Surplus Consumed	Replenishment Period	Concentration Charge (CC)
1	0-10%	-	-
2	10-20%	5 Years	1/5 = 20%
3	20-30%	3 Years	1/3 = 33%
4	30-50%	2 Years	1/2 = 50%
5	>50%	1 Year	1/1 = 100%

The story so far...

- Needed surplus distribution by modeled event expressed as a percentage of total surplus

- Surplus tiers are percentile ranges of surplus within which a company's operational status is constant, but between which material changes occur

- Each tier has a replenishment period associated with it

- Each event has a tier and therefore a replenishment period

- Concentration charge = 1 / replenishment period
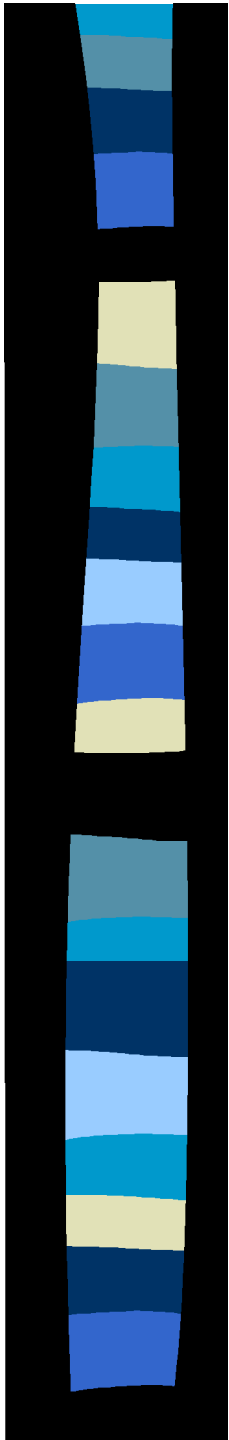
Pricing a New Account

- New account loss for event i = n_i

- Concentration Charge dollars by event
  $$CC\$_i = CC_i * n_i$$

- Expected CC$ over all events
  $$CC\$ = \Sigma_i [CC\$_i * p_i]$$

- Concentration Charge (CC) = expense provision to be applied to the catastrophe loss cost
  $$CC = CC\$ / \Sigma_i [n_i * p_i]$$
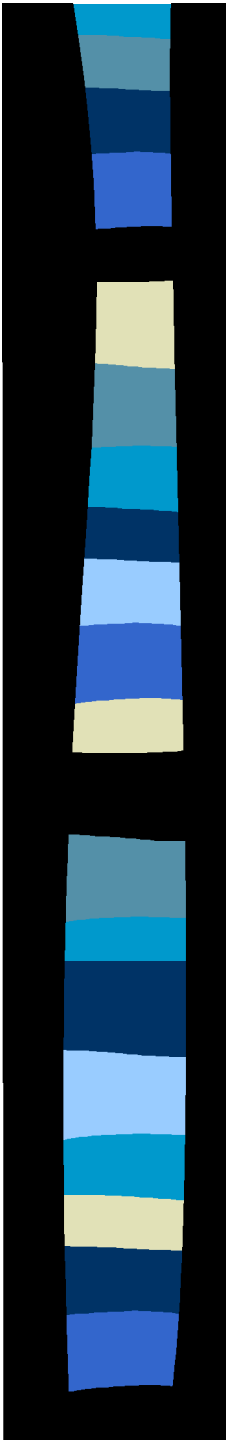
Example: Homeowners

- Detailed approach = "continuous" PSD pricing

- More "discrete" approach for HO

- Territorial Loss Cost Multipliers
  - Concentration charge developed by territory
  - Loss-based expense included in LCM

Example: Homeowners

Expense Item		Terr. Y	Terr. Z
(1)	Premium-Based Expense Load	31%	31%
(2)	Concentration Charge	15%	30%
(3)	Loss Cost Multiplier = [1 + (2)] / [1 − (1)]	1.667	1.884

Assumes the concentration charge is included as part of premium for determination of taxes, commission, and other variable expense provisions.

Example: Large Commercial Account

|	Item	Identifier	LOW Account	HIGH Account
(1)	Expected Loss	$\sum_i [\, n_i * p_i \,]$	$151.78	$151.78
(2)	Expected Concentration Charge $	CC$	$9.73	$33.38
(3)	Concentration Charge = (2)/(1)	CC	6.41%	21.99%

Portfolio State Dependent Pricing and the CAS Ratemaking Principles

Ratemaking Principles

- *…important that proper actuarial procedures be employed to derive rates that protect the insurance system's financial soundness and promote equity and availability to insurance consumers*

PSD Pricing

- Produces rates which directly reflect threats to financial soundness due to exposure accumulation
- Equitable among policyholders covered under different lines of business and/or different states, the collectibility of whose insurance is threatened by exposure accumulation
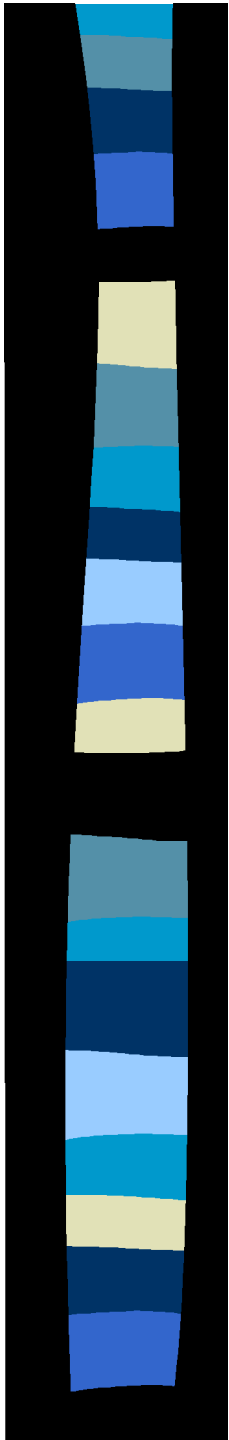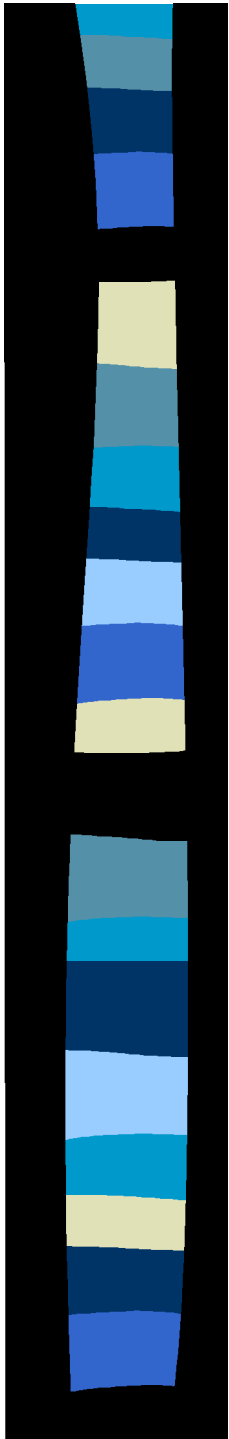
Portfolio State Dependent Pricing and the CAS Ratemaking Principles (cont'd)

Ratemaking Principles

- *…important that proper actuarial procedures be employed to derive rates that protect the insurance system's financial soundness and promote equity and availability to insurance consumers*

PSD Pricing

- Portfolio state *independent* pricing represents an implicit subsidy among cat-exposed policyholders, policyholders in other states and/or lines and/or companies.
- Excessive exposure accumulation threatens the availability of insurance
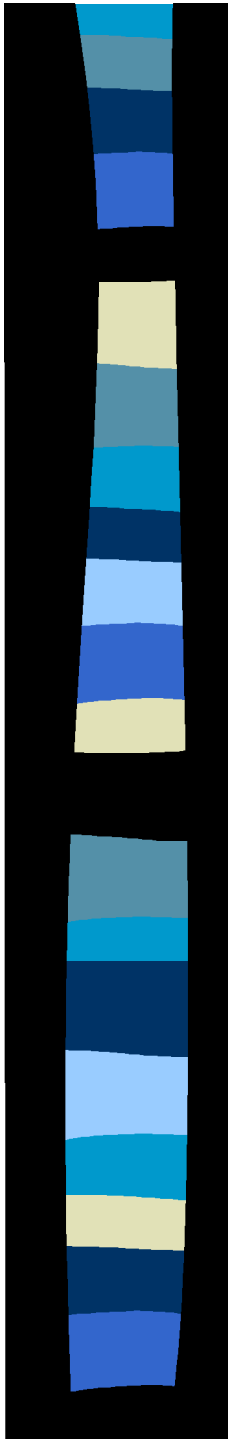- Exposure balancing via PSD pricing could lead to *more* availability

Portfolio State Dependent Pricing and the CAS Ratemaking Principles (cont'd)

Ratemaking Principles

- *Principle 1: A rate is an estimate of the expected value of future costs.*
- *Principle 2: A rate provides for all costs associated with the transfer of risk.*
- *Principle 3: A rate provides for the costs associated with an individual risk transfer.*

PSD Pricing

- PSD pricing is based on the view that the cost of an individual risk transfer -- writing a cat policy -- depends on the exposure levels already in force within the portfolio
- Insolvency is a potential future cost

Portfolio State Dependent Pricing and the CAS Ratemaking Principles (cont'd)

Ratemaking Principles

- *Principle 4: A rate is reasonable and not excessive, inadequate, or unfairly discriminatory if it is [based on Principles 1-3].*

PSD Pricing

- A PSD pricing process can be as objective and fair as the current paradigm, if it is
  - Systematic
  - Based on sound economic principles
  - Objectively applied
  - Auditable
  - Not subject to distortion or fraud
- Not *by definition* unfairly discriminatory, instead reflecting consumption of a limited resource
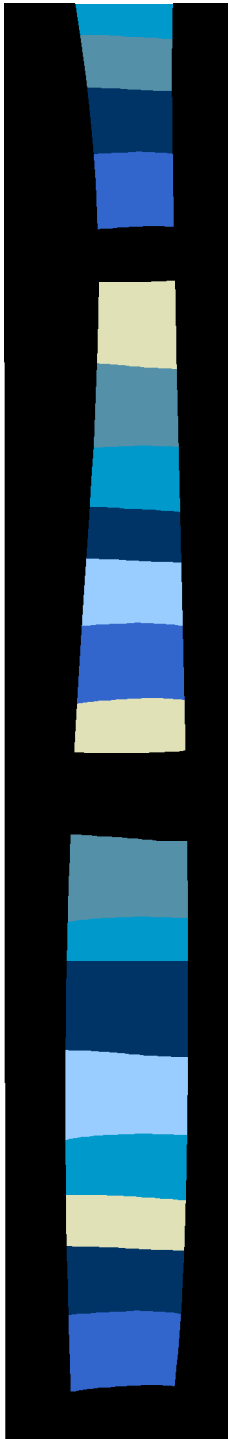
Conclusions

- Provides a connection between current portfolio exposure levels, modeled losses, utility of surplus

- Requires a paradigm shift to PSD pricing
  - Regulatory and social issues to work through
  - Fairness
  - Order dependency

- Meant to be forward looking