The Research Corner:

Buying Reinsurance in an Inefficient Market

HOLBORN

Paul Kneuer

CARe Meeting

Philadelphia

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How to Buy Reinsurance In an Efficient Market

Welcome to the CAPM World

- Evaluate each alternative reinsurance contract's expected net margin, by weighing the protection it provides against only the risk factors in the overall equity market.
- Buy any reinsurance contracts that cost less than the value of their reduction in equity market risk. (Buy the best one; Buy the best $X worth; or, Buy all better than your "hurdle" rate, if you use RAROC.)
- The analysis results in efficient-market margins that do not depend on the type of product: Cat, Risk, Agg or Pro Rata.
- It works both ways, and risk margins are theoretically efficient across different markets: Direct, Fac or Treaty. So, sell any direct contracts that are priced above the value of their increase in investment market risk factors.
- No arbitrage is possible. **(Separate checks at lunch.)**

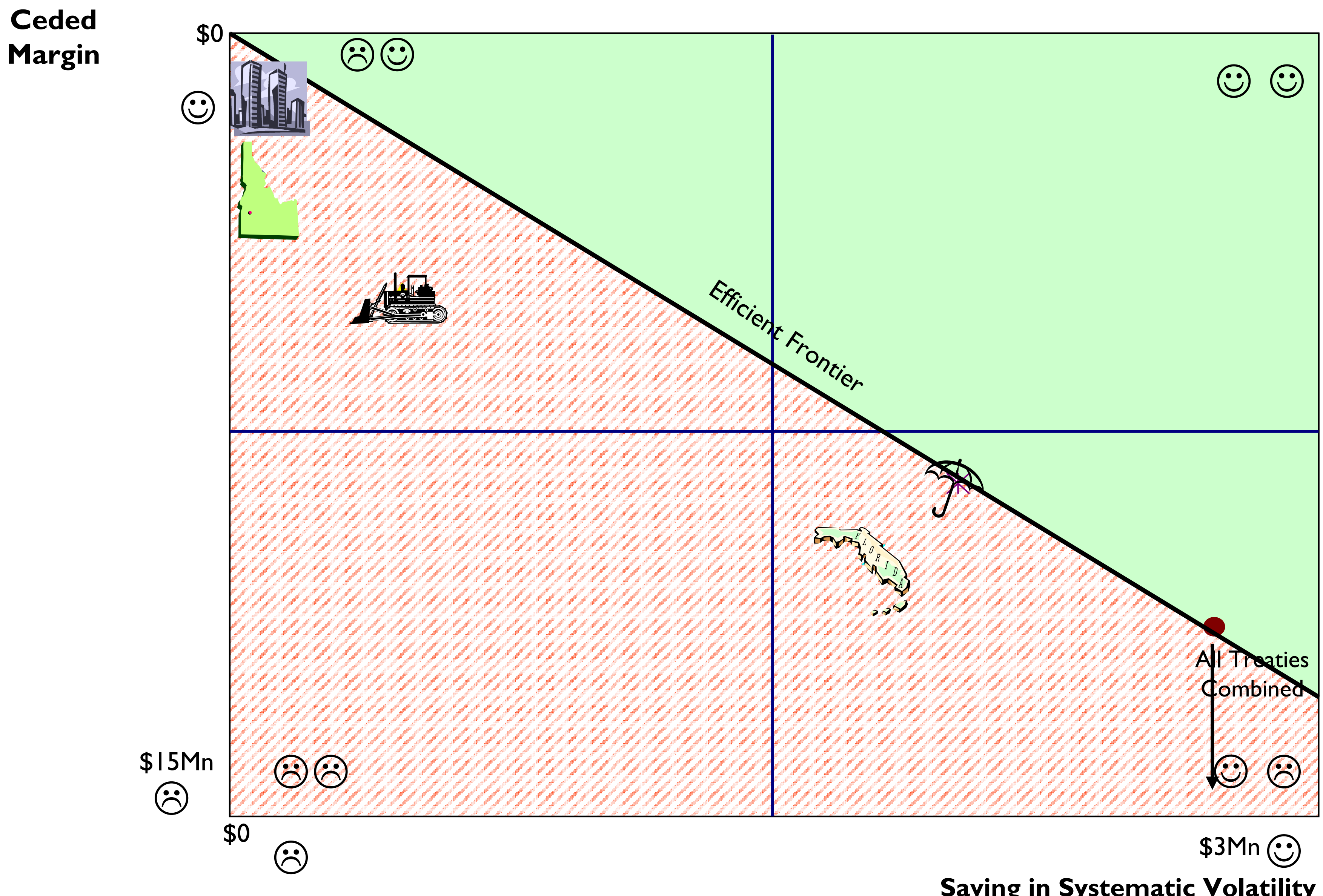
The CAPM World (Circa 1980)

Alternative Treaty	Occurrence Treaty Limit	Treaty Premium	Layer AAL	Layer SD	Correl. w/ Overall Equity Markets	Savings in Cedants' Systematic Volatility	Ceded Margin	Ceded ROE
Florida Cat XL	$100Mn	$25Mn	$10Mn	$30Mn	5%	$1.5Mn	$15Mn	250%
Idaho Cat XL	$100Mn	$6Mn	$3Mn	$1.6Mn	0%	$0Mn	$3Mn	Undefined
Per Risk XL	$100Mn	$5Mn	$4Mn	$2Mn	0%	$0Mn	$1Mn	Undefined
Working Property	$10Mn	$30Mn	$25Mn	$15Mn	5%	$0.75Mn	$5Mn	833%
Umbrella QS	$5Mn	$25Mn	$15Mn	$8Mn	20%	$1.6Mn	$10Mn	156%
Total Ceded	**Approx. $200Mn**	**$91Mn**	**$57Mn**	**$34.6Mn**	**7%**	**$2.48Mn**	**$34.0Mn**	**343%**

Which Should You Buy?

Best one ⇨ Umbrella QS, only
Best $20Mn worth ⇨ Umbrella and 67% of Florida Cat
ROE better than pre-tax hurdle ⇨Buy nothing: **Cancel the CARe meeting!**

Reinsurance Buying in a CAPM World
Circa 1980



CAPM Axioms

- All buyers and sellers have the same, finite, time perspective.
- All buyers measure risk the same way, are risk averse and are fully diversified.
- Leverage is free, and unlimited.
- Contracts are fully divisible, long or short.
- Market risk and price information is available to all uniformly.

When these axioms apply, prices for all assets have risk charges that only reflect the non-diversifiable exposure to the overall market, which is measured as the assets' betas.

CAPM Buyers in Action
Circa 1980

CAPM Doesn't Apply to Insurance Risks

- These concepts do not apply well to insurers, because of licenses, ratings, reputation, staff and producer relations that are expensive and slow to build.
- Insurers' overall risk is not well correlated with investment market risks, so equity market betas are not significant amounts for most insurance risks.
- However, because of the "stickiness" of insurer capital, response to catastrophe risk requires considering Cat as a systematic risk ***within*** insurers, and they often use CAPM-like tools internally. Exposure to catastrophes is evaluated as a systematic, non-diversifiable risk both within individual insurers and across the insurance and reinsurance markets.

How to Buy Reinsurance in a CAPM-like World
(Cat Risk is Non-Diversifiable)

- *Evaluate each alternative reinsurance contract's expected net margin by weighing the protection it provides against only the ceding company's catastrophe PML events.*
- *Buy any reinsurance contracts that costs less than the value of the reduction in Cat PML. (Buy the best one; Buy the best $X worth; or, Buy all better than hurdle.)*
- *Sell any direct contracts that charge more than the value of their increase in PML.*
- *Sort of works both ways. Same margins for Cat, ILW, Side-car. All insurance contracts outside of peak Cat zones are good writes.*
- Arbitrage is common: I-Bankers pick up lunch for all!
- **Never buy Per Risk or Fac.**

A CAPM-like World (Cat Risk is Non-Diversifiable)

Circa 2000

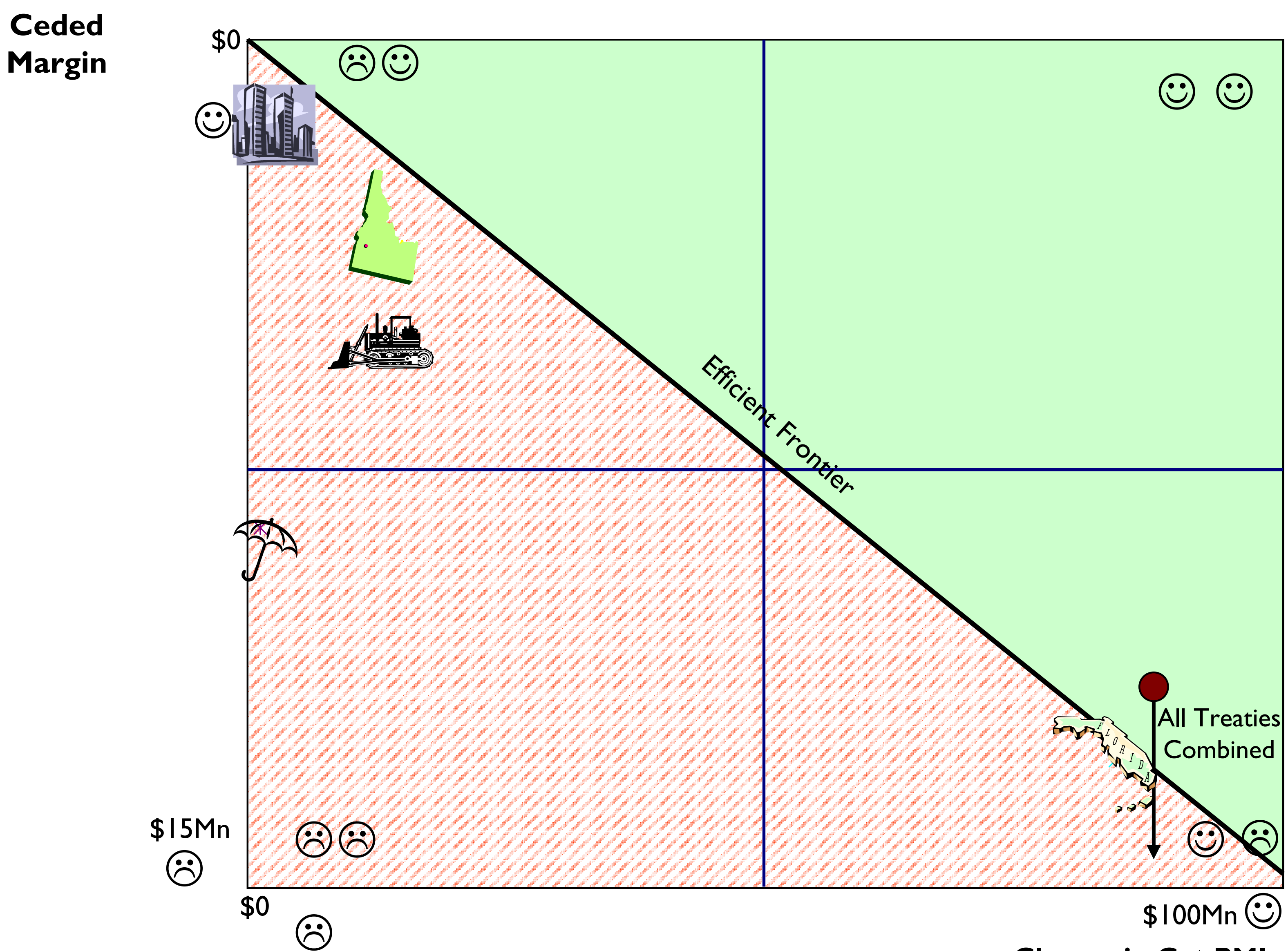
Alternative Treaty	Occurrence Treaty Limit	Treaty Premium	Layer AAL	Layer SD	Correl. w/ Cedant Cat Exposure	Change in Cedant PML	Ceded Margin	Ceded ROE
Florida Cat XL	$100Mn	$25Mn	$10Mn	$30Mn	60%	$90Mn	$15Mn	16.7%
Idaho Cat XL	$100Mn	$6Mn	$3Mn	$17.1Mn	15%	$12.8Mn	$3Mn	23.4%
Per Risk XL	$100Mn	$5Mn	$4Mn	$2.0Mn	2%	$0.2Mn	$1Mn	50.0%
Working Property	$10Mn	$30Mn	$25Mn	$15.8Mn	10%	$8.0Mn	$5Mn	62.5%
Umbrella QS	$5Mn	$25Mn	$15Mn	$8.7Mn	0%	$0Mn	$10Mn	Undefined
Total Ceded	**Approx. $200Mn**	**$91Mn**	**$57Mn**	**$34.1Mn**	**52%**	**$90.3Mn**	**$34.0Mn**	**37.6%**

Which Should You Buy?

Best one ⇨ Florida Cat, only
Best $20Mn worth ⇨ Florida, Idaho, Risk XL and 20% of Working Property
ROE better than pre-tax hurdle ⇨ Florida, Idaho only

Buying Reinsurance in a CAPM-like World

Cat Risk is Non-Diversifiable



Reaction of the Commercial Lines Underwriting Manager

Real Value in Per Policy Protections

- Long-term costs of low-frequency claims to use in short-term performance assessments (product, class, territory, producer)
- Objective charges for compensation systems, including producer profit share
- Objective expense factors for rate filings
- Price validation for low credibility books
- Validation of contract forms, risk selection, producer management and growth strategies
- Access to broader technical experience base for Claims, Loss Control, Actuarial (both staff and data)

Buying Reinsurance Circa 1960

How to Use the Individual Policy Perspective

- Evaluate each alternative reinsurance contract's expected net margin by weighing the price for the direct volatility as it is sold in the direct insurance market, totaled over all subject policies. (Total ceded exposed policy premiums may be an easier proxy for ceded volatility.)
- Buy any reinsurance contracts that cost less than the value of the risk in the exposed limits ceded.
- Sell any direct contracts that charge more than the cost of their reinsurance protection.
- The "individual policy" view is not comparable to the Catastrophe PML view, because the denominators are different and because they are in different markets, i.e. insurance and reinsurance, that do not cross-trade efficiently. Arbitrage is natural and expected: **Brokers buy lunch!**
- Investment bankers frequently associate this technique with GEICO.

I-Bankers' Understanding of Insurance Policy Markets

The Policy Volatility World (Circa 1960)

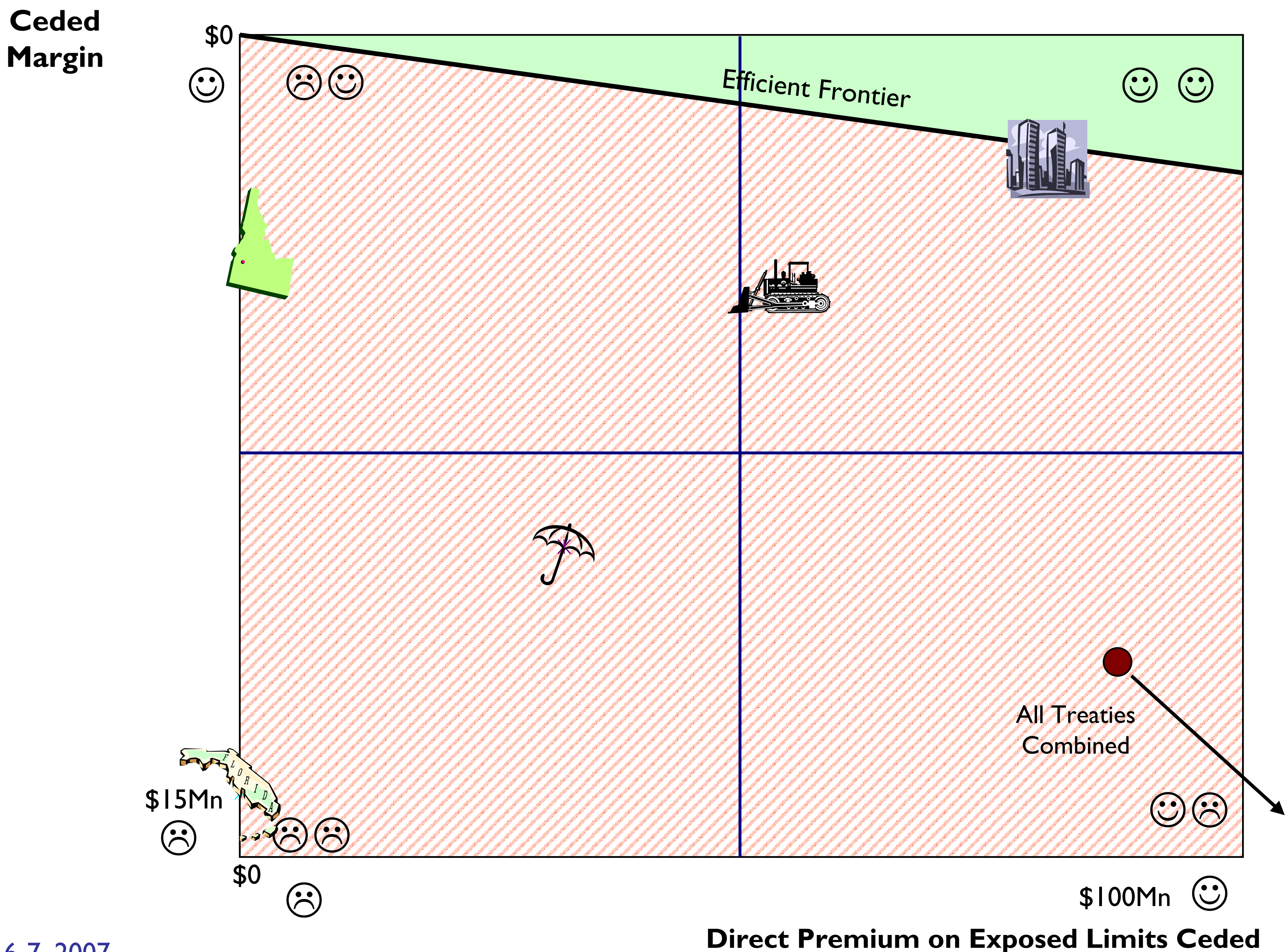
Alternative Treaty	Occurrence Treaty Limit	Treaty Premium	Layer AAL	Layer SD	Aggregate of Subject Policy Within-Layer SD's	Net Exposed Policy Limits Ceded	Direct Premiums on Exposed Limits Ceded	Ceded Margin
Florida Cat XL	$100Mn	$25Mn	$10Mn	$30Mn	$0	$0	$0	$15Mn
Idaho Cat XL	$100Mn	$6Mn	$3Mn	$1.6Mn	$0	$0	$0	$3Mn
Per Risk XL	$100Mn	$5Mn	$4Mn	$2Mn	$2.4Bn	$15Bn	$75Mn	$1Mn
Working Property	$10Mn	$30Mn	$25Mn	$15Mn	$2.2Bn	$20Bn	$50Mn	$5Mn
Umbrella QS	$5Mn	$25Mn	$15Mn	$8Mn	$1.4Bn	$25Bn	$25Mn	$10Mn
Total Ceded	**Approx. $200Mn**	**$91Mn**	**$57Mn**	**$33.7Mn**	**$6.0Bn**	**$60Bn**	**$150Mn**	**$34Mn**

Which Should You Buy?

Best one ⇨ Per Risk only
Best $20Mn worth ⇨ All except Cat XL's
ROE better than pre-tax hurdle ⇨ Not defined

Buying Reinsurance in the Policy Volatility World

Circa 1960



Buying Reinsurance Circa 1960
The Individual Policy Perspective (cont'd)

- Some reinsurances protect against both individual-policy volatility and peak-event Cat PML, for example, high level Per Risk excess coverage in Florida. Assess these alternatives on an either/or basis, and buy them if they add value to either the diversified or undiversified perspective. Or, build an internal "shadow cost" system that lets you trade off the value of their systematic and individual-policy riskiness.
- In assessing individual policy volatility, we do not take partial steps to look at regions, channels or LOBs within the ceding company. These perspectives do not have an external value reference. There are benefits to managers of regions, production channels, products and LOBs from having an external cost gauge for the volatility they sell. But the price of volatility is only directly measurable on their individual policies.

Multiple Perspectives Needed

"My dear Wormwood,

Humans are amphibians, half spirit and half animal. As spirits they belong to the eternal *[NAIC]* world, but as animals they inhabit *[daytrader]* time"

- C.S. Lewis

The Screwtape Letters

Buying Reinsurance Circa 2008

- Most insurers have (at least) two separate risk protection budgets:
  - *Overall exposure to peak events, and*
  - *Protection of individually risky policies.*
- They have to choose how to allocate reinsurance spending to those two budgets. In the simple CAPM-like world, we have implicitly assumed a 100% - 0% split. Is there a reason to think that is optimal?
- Considerations in choosing between the approaches can include:
  - *Ratio of policy limits to surplus*
  - *Design of compensation and underwriting authority systems*
  - *Value of market intelligence*
  - *Strategies of competitors and rating peers*
- **CAPM axioms don't apply to the second budget, so CAPM-like approaches cannot be used to allocate between the two budgets.**

Buying Reinsurance Circa 2008

Create a "Shadow Price" Between Two Perspectives

- ***Example:*** Evaluate each alternative reinsurance contract's expected margin by comparing it to:
  - *80% of the reduction in Catastrophe PML,* ***plus***
  - *20% of the price of the direct volatility sold to the market.*
- Specific scales and weights must be subjective judgments for each ceding company, based on its capital, risk, product knowledge, competition and internal processes.

Buying Reinsurance Circa 2008

Create a "Shadow Price" Between Two Perspectives (cont'd)

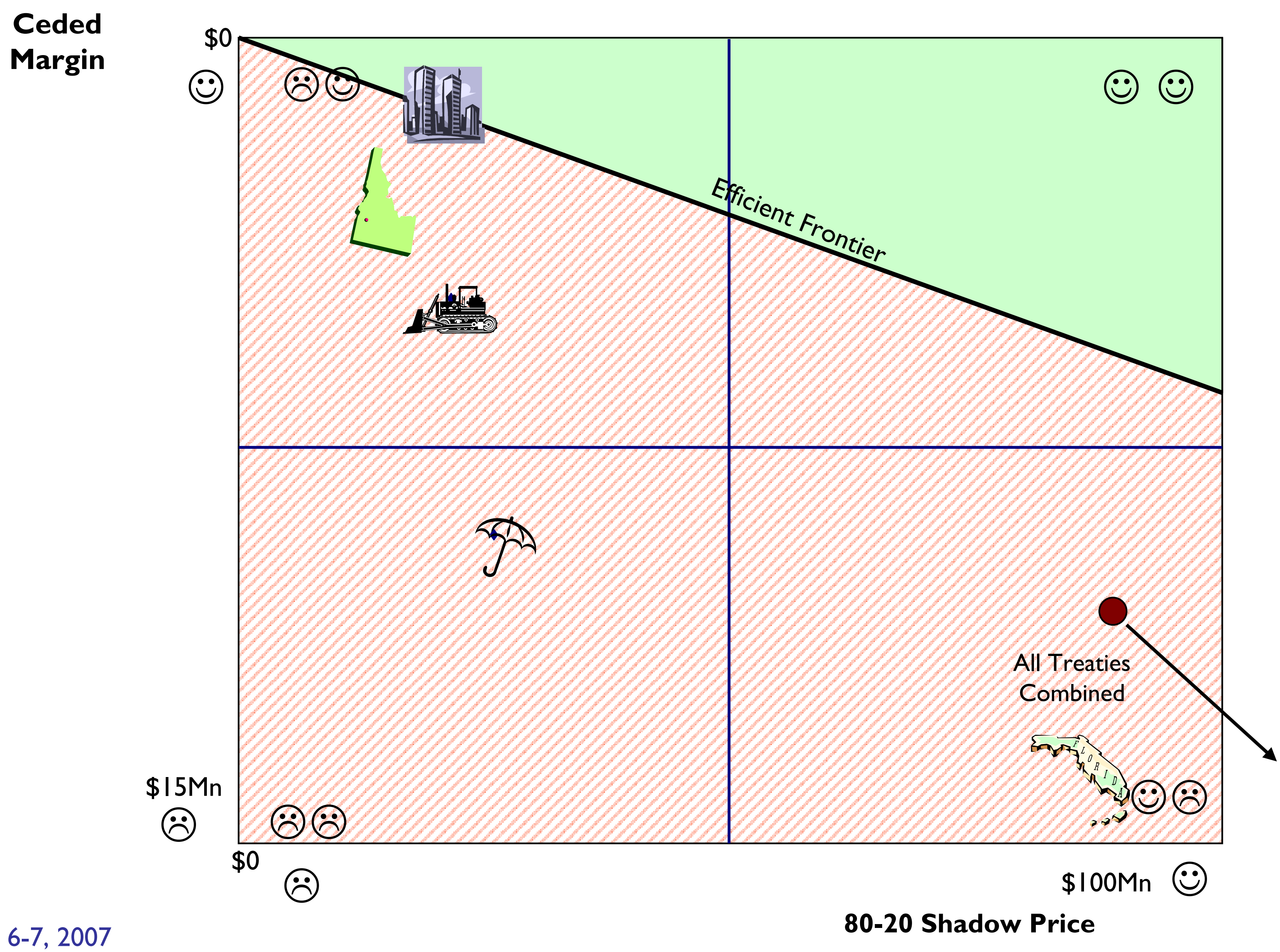
Alternative Treaty	Occurrence Treaty Limit	Treaty Premium	Change in Cedant PML	Direct Premiums on Exposed Limits Ceded	80% - 20% Shadow Price	Ceded Margin	Ceded ROE
Florida Cat XL	$100Mn	$25Mn	$90Mn	$0	$72.0Mn	$15Mn	20.8%
Idaho Cat XL	$100Mn	$6Mn	$12.8Mn	$0	$10.2Mn	$3Mn	29.2%
Per Risk XL	$100Mn	$5Mn	$0.2Mn	$75Mn	$15.2Mn	$1Mn	6.6%
Working Property	$10Mn	$30Mn	$8.0Mn	$50Mn	$16.4Mn	$5Mn	30.4%
Umbrella QS	$5Mn	$25Mn	$0Mn	$25Mn	$20.0Mn	$10Mn	50.0%
Total Ceded	**Approx. $200Mn**	**$91Mn**	**$90.3Mn**	**$150Mn**	**$102.2Mn**	**$34Mn**	**32.2%**

Which Should You Buy?

Buy the best one ⇨ Per Risk XL only
Buy the best $20Mn ⇨ Per Risk, Florida Cat, Idaho Cat and 20% of Working, only
ROE better than pre-tax hurdle ⇨ Florida Cat, Per Risk only

Buying Reinsurance Circa 2008

Create a "Shadow Price" Between Two Perspectives (cont'd)



Comments or Questions?

Paul Kneuer
212-797-2285
paulk@holborn.com

Holborn