The Value of Reinsuring Parameter Risk

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HOLBORN

Parametizing Models:
Volatility Measures

- The bad news: It's hard
- The good news: It's impossible

The Value of Volatility

An integrated and dynamic view of the volatility of transactions would be a powerful insight:

- Overall capital needs, real time
- Relative capital usage of transactions
- Marginal cost pricing

Unfortunately, data is a poor source for the volatility of the next period. "Past performance is not a promise of future returns."

In real world situations, what we don't know that we don't know can have more cost (and value) than what we do know.

"It's hard."

Value of a Contract (Assuming No Parameter Risk)

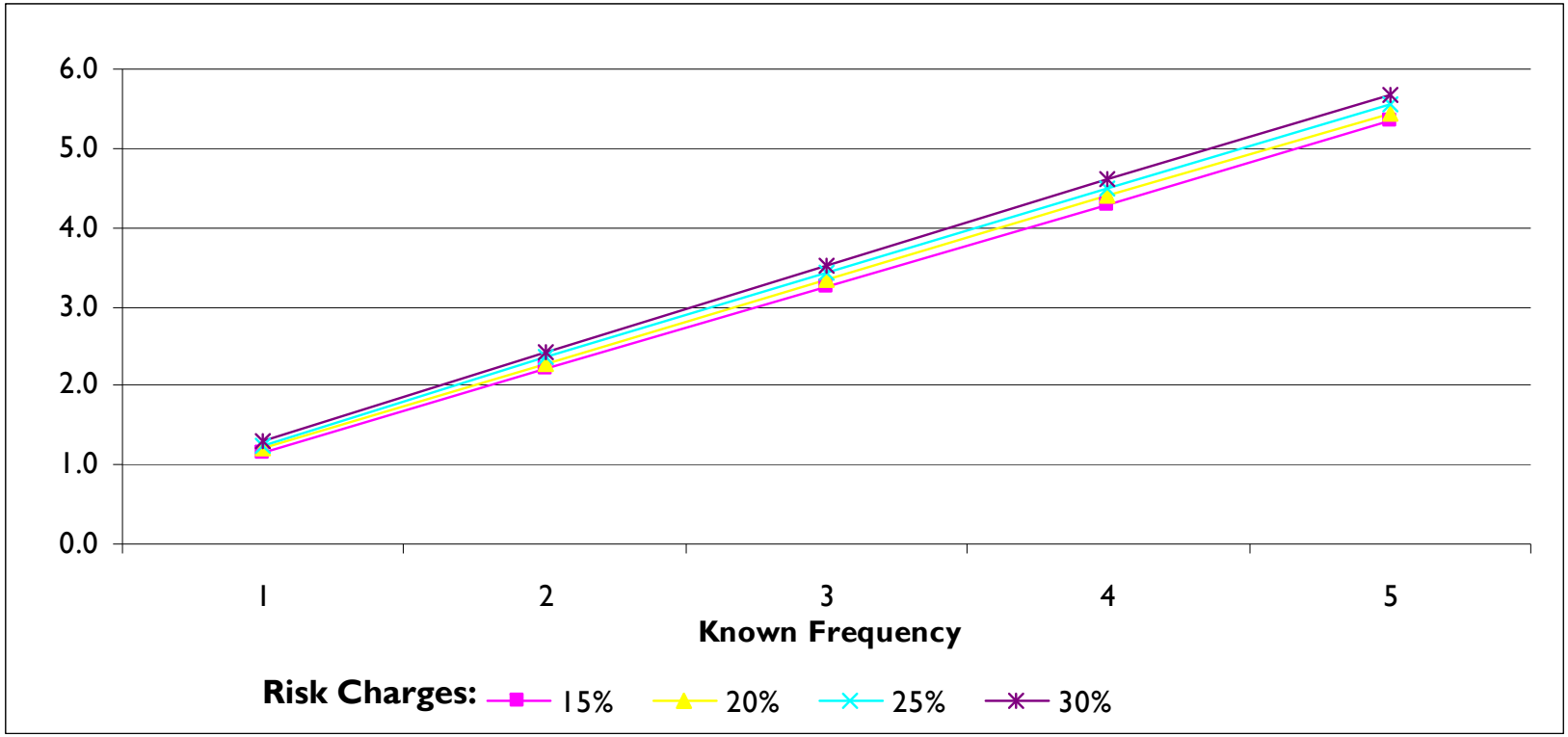
A simple model:

- Define a loss process so that it is a Poisson (counting) function: frequency, not severity.
- Look at a history and estimate the Poisson mean.
- Project the distribution of counts next year.
- Measure the value as E(X) + R x SD(X)

	Risk Charge Factor			
Known Frequency	**0.15**	**0.20**	**0.25**	**0.30**
1	1.150	1.200	1.250	1.300
2	2.212	2.283	2.354	2.424
3	3.260	3.346	3.433	3.520
4	4.300	4.400	4.500	4.600
5	5.335	5.447	5.559	5.671
10	10.474	10.632	10.791	10.949
50	51.061	51.414	51.768	52.121

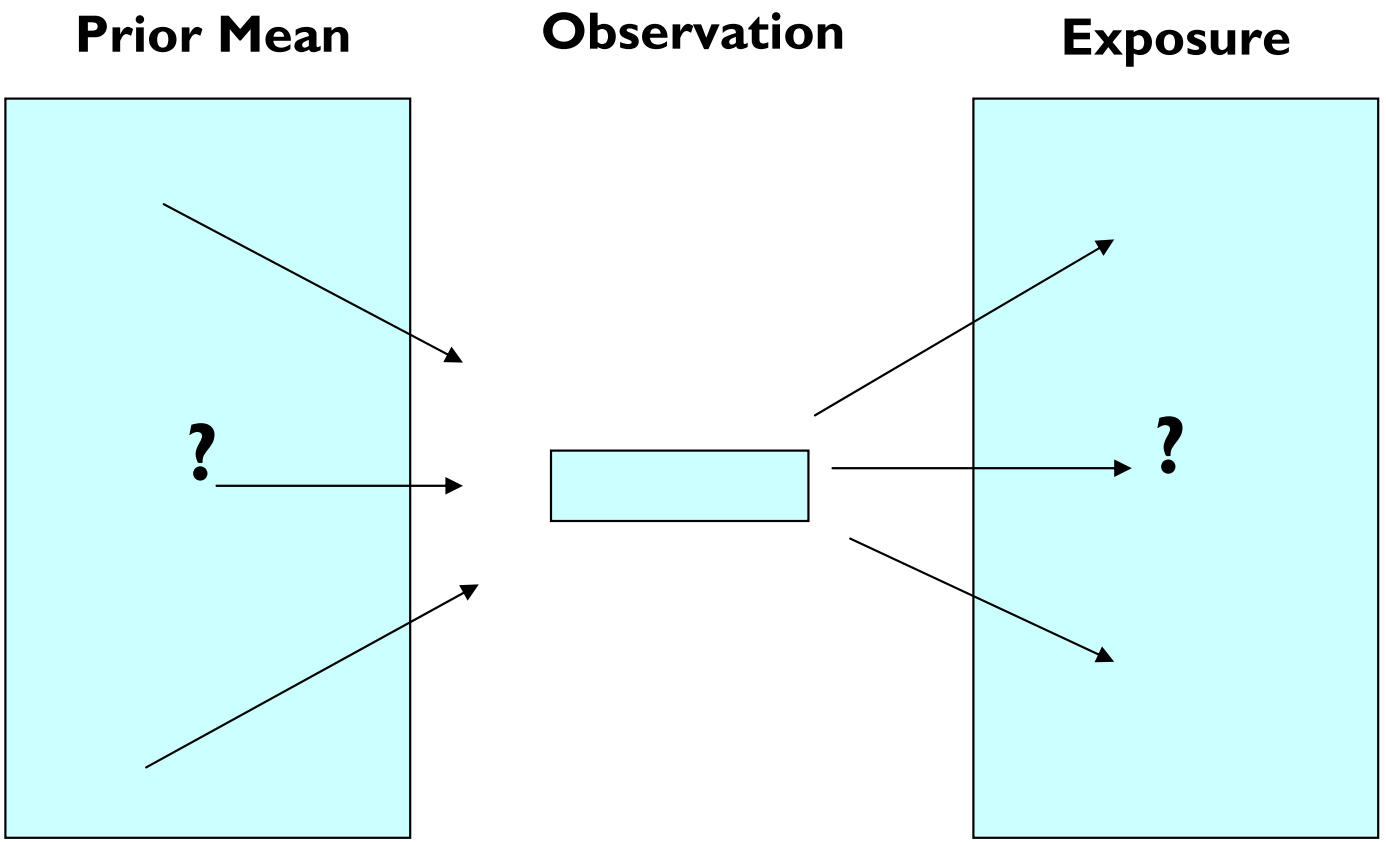
No Parameter Risk

Contract Value



Now, Add Parameter Risk

Acknowledge that the data from last year is only a sample from a distribution that we can never know.



Simple Model of Parameter Uncertainty

- Process is Poisson, with unknown mean
- Distribution of prior mean is Gamma

A little algebra gives us:

- Distribution of mean after seeing an observation is still a Gamma (very easy)
- Distribution of final observations is a Negative Binomial (pretty easy)
- …With parameters directly related to the original Gamma's parameters and the observed data (do-able)

Increase in Value from Parameter Risk

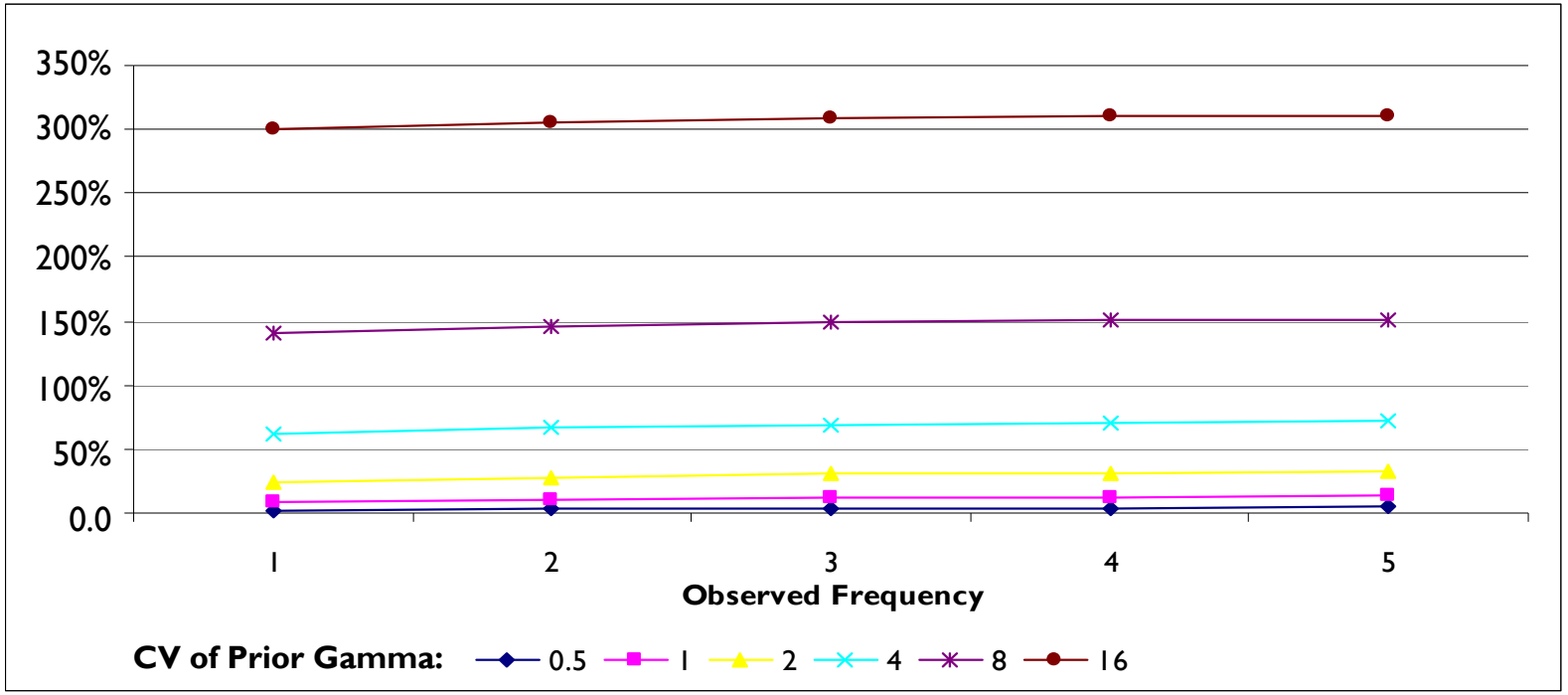
The value of parameter risk is proportional to:

- C.V. of uncertainty around prior mean
- Square root of annual observed claims
- Correlation between this risk and overall market
- Market risk premium charges
- Square root of 1 / experience period (in years)

	Prior Gamma's Coefficient of Variation					
Observed Frequency	**0.50**	**1.00**	**2.00**	**4.00**	**8.00**	**16.00**
1	0.024	0.083	0.247	0.625	1.412	3.006
2	0.032	0.104	0.283	0.671	1.465	3.062
3	0.037	0.115	0.301	0.693	1.489	3.087
4	0.041	0.124	0.312	0.706	1.503	3.102
5	0.045	0.130	0.320	0.716	1.513	3.112
10	0.055	0.147	0.342	0.739	1.538	3.137
50	0.076	0.174	0.373	0.772	1.572	3.172

Result is shown relative to expected losses

Relative Increase in Value
(Value of Parameter Risk/Expected Loss)



It's Hard!

Required Reading:
"The Black Swan" by Nassim Taleb

In many areas, the next data observations can be so discontinuous that it invalidates the form of distribution you would have chosen.

For the population of CARe Meeting attendees, would you bet on the relative increase in the overall average size following the next arrival, based on:

- Height?
- Career experience?
- Journal citations?
- Net worth?

Black Swans

- Maximum swing to average from next observation:

Observation	Swing to Average
Kevin Garnett (6'11" Forward for Celtics)	< 1/20 inch part of six feet, <0.1%
Charles Hewitt (FCAS, 1951)	< 1 month part of 20 years, 0.4%
Paul Samuelson (MIT Nobelist)	> 500 part of < 5, 100x
Bill Gates (Harvard Drop-out)	> $500Mn part of < $1Mn, 500x

- Fields of analysis exposed to black swans cannot be approximated assuming small, unbiased, normal errors.
- **"It's impossible"**

P&C Industry "Black Swans"

WHAT?	WHEN?	WHY A SURPRISE?
Katrina in New Orleans	2005	Levee failure in a windstorm
Hurricane frequency cycles	2000s, 1960s, 1930s	Short memories
Enron/Andersen, etc.	2003	Clash of D&O and E&O; Clash across firms
9/11 Attacks	2001	Foreign Terror in U.S.; Clash of Property, Liability, Life, WC and Aviation
Soft Casualty market	1998 – 2001	Cycles effect coverage, reserving and price monitoring; not just rates
Tobacco Liability settlements	Late 1990s	Government warning does not pre-empt manufacturers' duties
Northridge earthquake	1994	Unmapped fault
Mold	1990s	Excluded physical damage collected as "water damage" or BI liability
LMX spiral	Early 1990s	Higher layers exposed when same amount counted again
Construction defects	1980s – 1990s	"Damage to own work" exclusion bypassed

P&C Industry "Black Swans" *(cont'd)*

WHAT?	WHEN?	WHY A SURPRISE?
Piper Alpha	1988	Multiple insureds and multiple limits at one rig
Widespread reinsurance uncollectibles	1980s	Not Cat driven
Repetitive stress injuries in WC	1980s	Neither accident nor illness
European windstorms	1987	Short memories
Superfund	Early 1980s	First party clean up costs covered as third party liability
Tenerife runway crash	1977	Collision causes clash of limits
Products coverage for asbestos	1970s (BI), 1990s (PD)	Workers not covered as WC; Clean up costs as liability
Pharmaceutical class actions	1960s	Expansion of "batch clause" concept

Tools Invalidated by Black Swans:
Volatility Measures

Sharpe ratio	Kreps pricing
CAPM	Mango Rhum ordering
APM	RBC
Black Scholes	BCAR
Duration immunization	DFA
VAR	Chain ladder confidence intervals
TVAR	Experience rating credibility

Alternatives to Estimating Volatility

- Scenario testing (MFL's)
- Maxi min (When am I the best off if the worst happens?)
- Contract aggregate management
- Natural hedging (Go short on what you are long of)

For Comments or Questions

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