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The Financial Crisis –

Risk Transfer, Insurance Layers, and (no?) Reinsurance Culture

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Two worlds apart?

- The markets for credit derivatives and reinsurance have much in common, however, there are essential differences.
- The reinsurance industry has survived for many decades, having learned some (partly very expensive) lessions.
- Some old-fashioned insurance rules could now experience a revival in other areas.
- Some problems are yet to be addressed in both worlds.

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Overview

- Risk Pools
- Risk Transfer Chains
- Skewness and Scarce Data
- The Human Factor
- Investments

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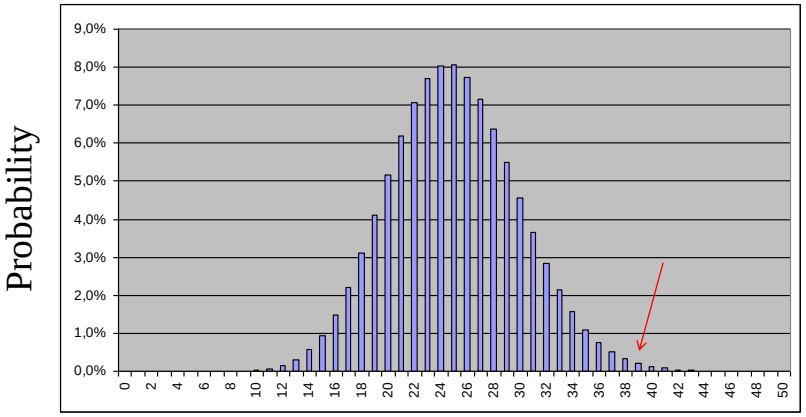
Distribution of losses in a risk pool



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The quest for certainty

Ever rising risk awareness:

Basel III, Solvency II, Risk Based Capital, …

Even if you are a big company,
low frequency / high severity events are **bad**
(i.e. require more capital to be held).

Consequence: Try to get rid of such events

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Idea

Determine the maximum tolerable loss and transfer losses exceeding it to someone else:

You pay a fee – they take the excess risk.

This is called: **non-proportional risk transfer**

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Examples of NP risk transfer

- Homeowner's risk: fire policy with a very high deductible
- Individual health risk: health insurance with a deductible of say 5000 Euro
- Insurance portfolio: non-proportional reinsurance, e.g. Stop Loss treaty
- Credit portfolio: Collateralized Debt Obligation

Trend: increasingly complex variants

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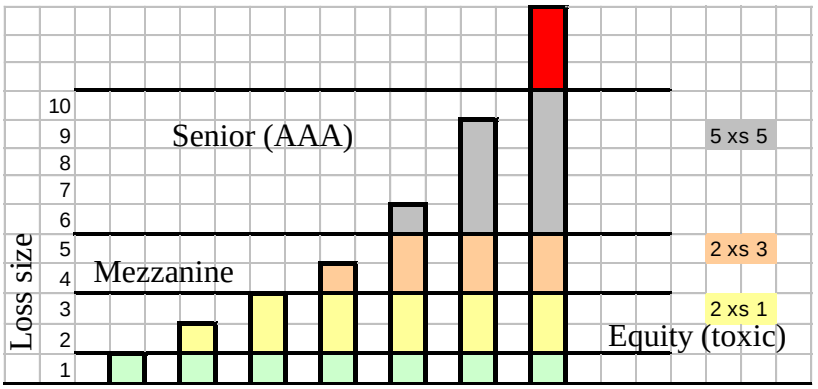
Layering

- Tail is split into pieces called layers (tranches).
- Different layers are placed with different “insurers”.



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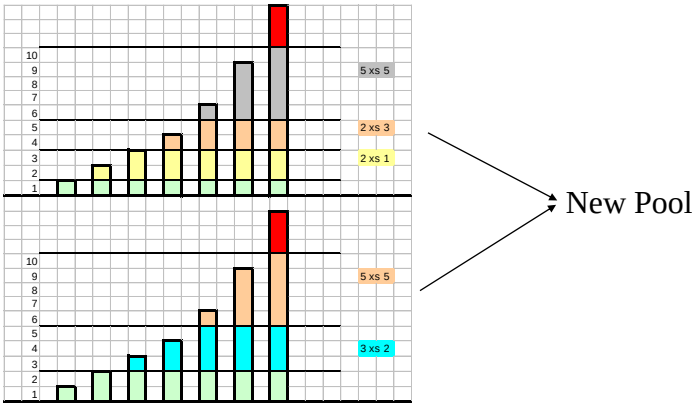
Modern risk pooling

- Layers from different businesses are pooled – and protected by other layers, and so on …



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Design

Basic idea:

- diversify by pooling
- reduce probabilities by layering

Insurance:

Property ➔ Insurer ➔ Reinsurer ➔ Retrocessionaire ➔ 2nd Retrocessionaire ➔ ...

Banking:

Mortgage ➔ ABS ➔ CDO ➔ CDO^2 ➔ CDO^3 ➔ ...

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Contagion

X ➔ X ➔ X ➔ X ➔ X ➔ X ➔ X ➔ X ➔ X ➔ ...

What if that one goes bankrupt?

Insurance chain: Losses threaten from the left, defaults from the right ➔ both the taking and the cession of risks require caution ➔ solid and short chains

Credit derivative chain: Complete risk transfer ➔ (at least) the cession of risks requires no caution ➔ unstable chains

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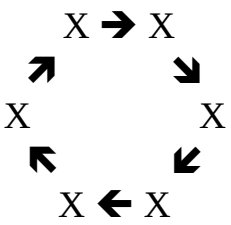
Spirals

This problem was well known (in theory).

The first big one of its kind was called **LMX spiral**



Very short spiral:

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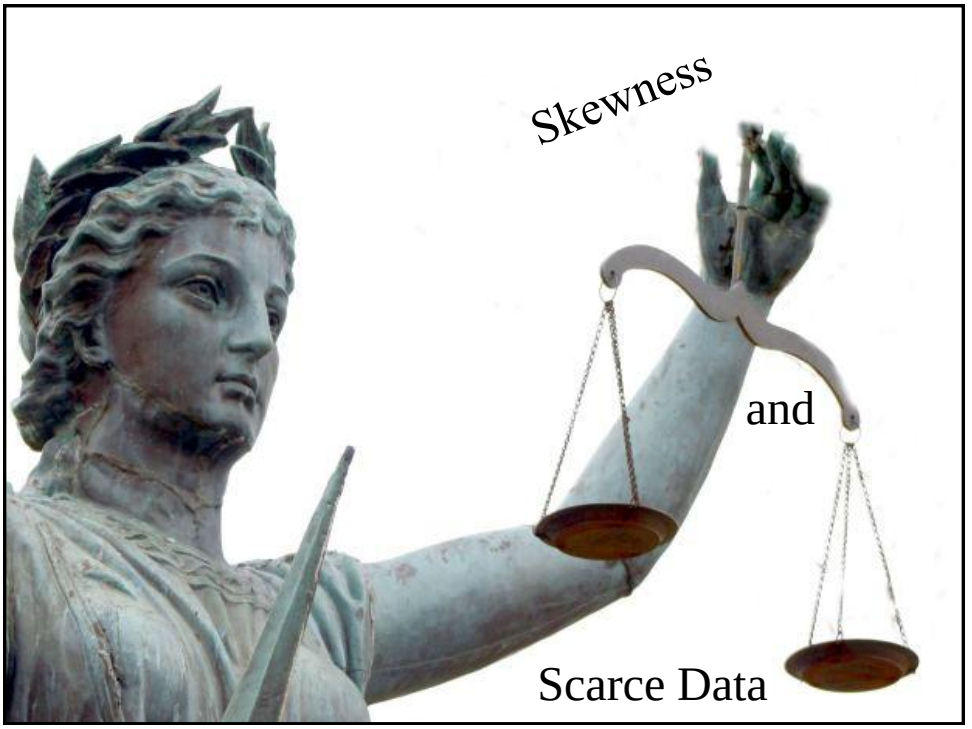

Skewed distributions: management challenge

Once in 50 years you have a very bad year.

- If you choose among two strategies to reduce your risk, bear in mind that the **better strategy will be more expensive in 49 out of 50 years**.
- Risk managment means to think in **extremely long time horizons** – luckily this is an integral part of reinsurance culture.

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Skewed distributions: interpretation challenge

Once in 50 years you have a very bad year, but you only have data from ten years available.

- If the bad year is not in your data, everyone claims the data is representative.
- If the bad year is in your data, everyone claims it was a 500-year-event.

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Scarce data: calibration challenge

You only have data from ten years available, but you need to calculate the 100-year event.

You start your powerful statistics software.

Tool output: best fit Weibull, VaR = 100 million $

You get new data (some run-off).

Tool output: best fit LogNor, VaR = 50 million $

You get new data (correction of a typing error).

Tool output: best fit Pareto, VaR = 150 million $

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Consequences

- A lot of new ways to transfer risk,
- a lot of new analyses to be done,
- a lot of new calculations to be done,
- a lot of new jobs for quants,
- ...

- a lot of things that can go wrong.

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Problem

- If you have a model the calculation is easy
  (for your computer, not for you)

- Very complex models required
  - Risks are not similar
  - Risks are not independent
  - Parameters change over time
- Results depend strongly on uncertain parameters
- Partly counterintuitive results

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The big dilemma

- If you use simple models they might give you an **illusion** of certainty – rather than describing reality.
- If you use complex models to cater for all uncertainties data will be insufficient for robust parameter estimation.

To reduce the volatility of your inference process you will need to employ exogeneous information, e.g. expert judgement.

This means you rely on a kind of **rating** – hopefully with some skepticism.

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Consequences

XL on XL is dangerous, due to the geometry of loss distributions:

- Reduction of loss probabilities might be small
- Model uncertainty: huge estimation errors possible – and far more likely than 25σ events

How reinsurers deal with excess business:

- Standard exclusion in reinsurance layers
- If included, total transparency required (bordereau)

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The usual game:
How certain uncertain deals come about

For a very uncertain deal there is always …

- not enough time to do it well,
- hectic activism,
- a market player (inadvertently) offering it at a too cheap price,
- others who hope that he/she is right and take a share in the deal.

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The main problem
... is human, not mathematical

- People go with the crowd.
- Admitting uncertainty is uncool.
- If you take it into account this may affect your bonus or, even worse, the bonus of your boss / your colleagues.
- If you don't take it into account everyone around you will be happy.

You almost certainly will get away with being very optimistic – if bad things occur everyone will agree it was unforeseeable.

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How prevent gambling?

Old insurance rule:

- The insurance only pays if you can prove an **insurable interest**, i.e. you have suffered a loss.
- Transfer to capital market possible? (maybe for Credit Default Swaps)

Risk transfer in reinsurance: almost never 100% (not even 100% of the tail risk)

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And the quants (and their management) …

- … have to learn statistics anew, need to develop intuition far beyond normally distributed i.i.d. risks,
- … need to learn from history,
- … need more and better data,
- … must always quantify the impact of uncertain assumptions (sensitivity),
- … should acknowledge that this world is far more uncertain than we (want to) believe.

And **all of us** should learn to live happily in spite of all these uncertainties around.

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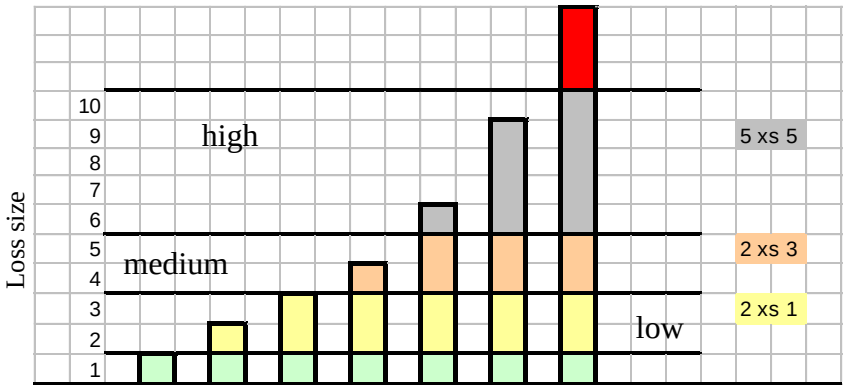
Cash-flow of layers

- Premium flows every year.
- A heavy loss takes away many annual premiums.



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Comparison with investments

Analogy between bonds and insurance layers:
yearly-income / total-loss ratio (spread vs. Rate on Line)

- high layer ≈ investment-grade bond
- low layer ≈ junk bond

Which class is riskier?

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Investments in insurers' language

Common rule for respectable financial institutions:

- You may only write high layers.
- As soon as such a layer is rated riskier you have to buy yourself out of this liability (whatever the cost).
- The rating of layers is to be outsourced to a few named institutions.

Is that convenient?

Is it safe?

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Further questions:

- If ratings and prices are correct, does it really materially matter whether you invest in AAA or in junk?
- If not, which market has the higher risk of error / change? AAA or junk?
- Which market has the higher accumulation (systemic) risk? AAA or junk?

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The End

Thanks for joining this talk.

Feedback welcome.

Paper about the topic (see Parallel Session 2):

http://www.actuaries.org/ASTIN/Colloquia/Madrid/programme.htm

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