Economic Capital & Diversification

A practical experience

Be Life Confident
Introduction

First, diversification is not a second order risk

- Correlation impact was under-estimated by practitioners. In practice, probably the main risk driver of an insurance company (see CRO Forum impact of diversification).

Second, diversification is complex

- Obviously complex from a modeling point of view.
- As it's linked also to the chosen risk measure, therefore, not only a modeling issue but also a subject for economic/finance people.
- We will also see that current actuarial practice is not adapted to the challenge of correlation.

A practical approach of the subject: the experience of a large group on the subject

- Brief history of Economic capital & diversification within the AXA Group.
Economic Capital in AXA
Focus has changed with time from modelling to liquidity

First, challenge of **modelling risks**
- How to model risk?
- Investment into understanding complex correlation:
  - asymmetrical copulas between French and German Windstorm
  - Creation of a reinsurer’s default model
  - Modelling assets and theirs correlations

Going Market Consistent
- With our first model, we experienced some inconsistency between our modelling approach and market price (“possibility of martingale”), leading to the need to be **market consistent for the valuation of Best Estimates**.
- But how should we assess the risks that are not traded on the market?

Difficulty with the real insurance risk
- Postulate: insurance risks are risks that can’t be traded on a market.
- Therefore, how to assess them? Cf IFRS.
- How should we estimate illiquidity in a market consistent way? Even more difficult in a regulatory context, how should we take into Financial distress, ie the fact that when things go wrong, they go worse from the market point of view?
The limits of actuarial non-causal posture

- Actuaries have developed statistical approaches based on mathematical evidence with an implicit actuarial posture that their decisions don’t need to be explained (see for instance CAS principles on admissible rating). This approach appeared to be largely inappropriate to calibrate tail risk or tail correlation.

need to develop models (opposed to statistical approach)

- As Economic Capital models should be the basis of discussion with regulators, we have to explain the retained calibration we retain. In a certain sense, it’s the return of “Economists” and their causality models.

Examples:
- Catastrophe models
- Lapse Rate and sensitivity to market conditions.
- Reinsurers’ default modelling
- Market cycle (including correlation with asset)

Need reality check to improve a model

- A model that isn’t used is worthless. Some examples of internal use:
  - Materialise diversification through Group reinsurance. Due to our Group reinsurance, we used our modelling to optimise our reinsurance. Thanks to this experience, we improved the model in studying complex interaction (see asymmetric correlation).
  - Securitisation of motor business, including pan-European transaction: better understanding of correlation.
Example of correlation between countries

For Group solvency (Solvency II) or the securitization on European motor done by AXA, correlation between countries is key: we modeled linear correlation according to yearly results and monthly results.

Historical correlations give insight on extreme correlation but are they sufficient?

We studied the correlation of windstorm between France and Germany.

Two conclusions of the study:

- First, asymmetry of correlation (a severe French storm will hit Germany, not the reverse)
- The second, is the fact that tail correlation is higher than the average correlation.
The example of correlation of reinsurance default

- Default probability of a company is generally modelled though transition matrix. Linear Correlation is considered according to experience.
- Difficulty to integrate more complex interaction (assets, same catastrophe event) in terms of simulation – in that respect, A. Mc Neil’s contribution is really of a great help.

Note from S&P CDO Merlin (Reinsurers’ default):
- “A mix of quantitative and qualitative analysis was used to assess the scale of asset correlation among the various entities in the portfolio. From a quantitative perspective, analysis of default correlations among reinsurers is hampered by the absence of a statistically significant number of data points. We therefore use qualitative judgment about the correlation between business lines within the industry, the interdependence within the industry that stems from the use of reinsurance/retrocession, and the shared exposure to aggregated industry losses (such as those arising from systemic issues or a series of large catastrophes). […] It is therefore assumed that sufficient amounts of tail dependency are required in the analysis of stressed reinsurance default probabilities.
- Since it is assumed that the economic impact of an extreme industry loss is likely to be higher for a smaller, less-diversified reinsurer than for more diversified market participants, correlation assumptions were set as follows:
  - Asset correlation of 0.30 within the smaller, less-diversified reinsurers;
  - Asset correlation of 0.15 within the large diversified reinsurers; and
  - Asset correlation of 0.15 between any small, less-diversified reinsurer and a large one.”

S&P modelling use explicitly qualitative judgement

- The approach of S&P of not over-relying on poor data is appropriate. However, it seems hard to extend it to a regulatory environment, which asks for auditability and not only reputation as for rating agencies.
- Two solutions:
  - Market consistent. For instance, use the implicit correlation of the CDO merlin to calculate the correlation between reinsurers.
  - Academic work and models on the various subjects to bring the required objectivity.
A last example: correlation of equities and bonds

A solvency II assumption of high correlation between equities and bond

- Huge linear correlation in QIS 2: 75%
- Daily correlation extrapolated?

The difficulty is to extrapolate daily return for an annual return

- As yearly returns are not sufficient to estimate the risk, we tend to use the daily information. But correlations in a day are much more important that in a year.
- Even monthly return shows low correlation (35%).

Going Market Consistent

The problem of the horizon of Economic Capital

- The reason to be market consistent for Economic Capital didn’t seem obvious when we launched our process.
- However, as insurance is mainly a borrowing industry, we have to value future cash flows according to when they arise.
- The need to reduce the horizon to one year to check regularly that the model is meaningful, especially in a regulatory environment.

How to reduce projection to one year? Go market consistent!

- If we reduce the projection of all the cash flows to one year, how do we value the cash flows that have not ended?
- The idea is to be market consistent: we project the cash flows and after one year, we try to assess the market value of the residual cash flows.
- Theoretically convincing, practically challenging especially for illiquid assets.

Limits of Market consistent approach: how to measure illiquid assets?

- Some ideas:
  - Make them liquid: Securitisation!
  - Measure Frictional cost: price illiquidity! need to understand financial distress as we should include an additional capital. Ex: Fama-French model instead of CAPM,…
  - Model the way pricing is done (cf Pauline Barrieu)
  - …
At the Group level, the issue is not only to estimate the diversification effect but the issue of its liquidity: A clear debate currently to assess how to insure local regulators of the fact that the diversification asset recognised at the Group level is an asset with sufficient materiality for local regulator.

Financial distress comes from the opacity of insurance for shareholders. Regulatory capital is therefore a signal for shareholders about the financial health of a company. Therefore, companies can’t afford to be close of the regulatory minimum requirement as they will suffer of financial distress (sudden increase of expected return by shareholder) irrespective of the conservativeness of the level of this minimum!

Therefore Regulatory capital should not add additional margin (insurers will add it) but as proposed by Guillaume Plantin and Jean-Charles Rochet, we should study systems with various levels of intervention from the regulator (total autonomy; beginning of control,…).

Long tail risks (either liability or longevity) will be treated as short term risk. However, we see the difficulty of assessing such a risk in a “market consistent” way. Moreover, a too short-sighted view (ie looking at every year risks that are carried forward on a very long term) may lead to an over-estimation of these risks.

Asset risks that are hold in front of these long tail risks suffer from the same risk of myopia, with a volatility of equity calibrated on a one year basis even if they will be carried forward for ten years!

Any idea from the academic research on that topic is welcome!
(Some) pending Issues with academic work

Is there really an independent operational risk in insurance?

- Gary Venter worked to show the operational risk in mispricing and misreserving (and the correlation between the two). Bad management is the first historical reason of default. However, is it possible to assess it in models?
- For banks et especially in trading floor, the operational risk can be isolated from other risk as there is a explicit market price (remaining risk is therefore op. risk).
- But when the very estimation of the risk of insurance lacks of this objectivity, can we separate the operational element from the “pure” insurance risk?