

## Infoline General Insurance Summit

### Practical Issues in deploying a Marginal Capital approach

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Opinions expressed here are my own and  
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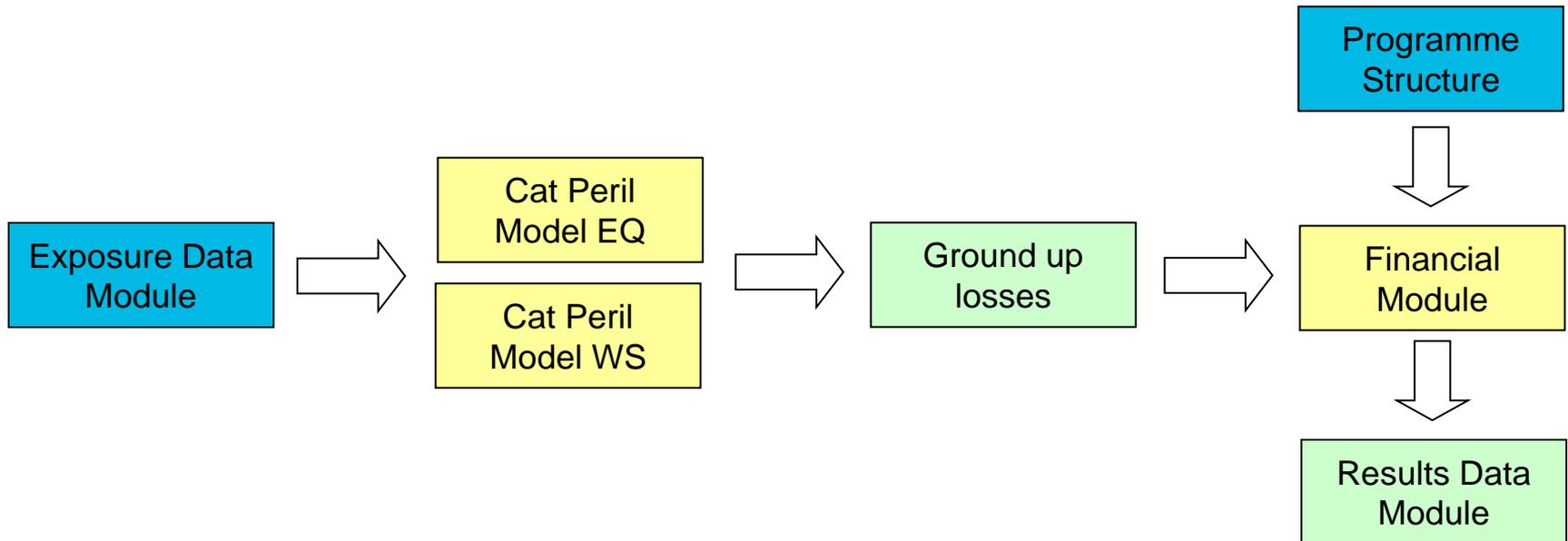
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# Agenda

- What is marginal pricing and why go to the trouble?
- What has this got to do with Solvency II?
- Practical Issues
- Concluding remarks: Benefits and Limitations
- Any questions?

# Background on Catastrophe Models

- The context of this presentation is catastrophe risk
- A simplified diagram of the catastrophe modelling process is shown below



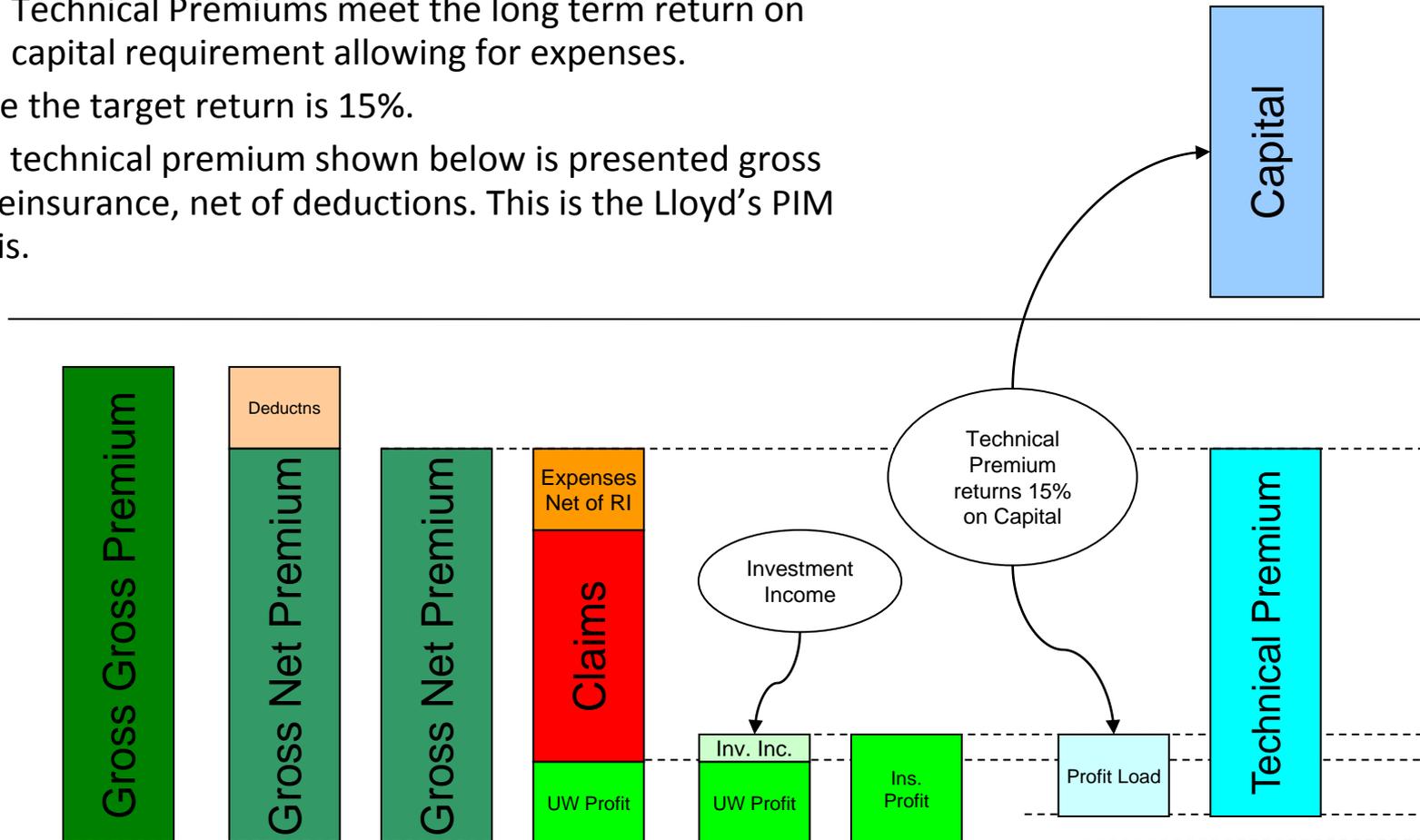
- The power of the approach lies in the ability to aggregate results across the portfolio, giving us an indication of how heavy total losses could be and a link to regulatory capital.

# What is marginal pricing?

- Marginal pricing considers the *marginal* impact on an insurer's capital requirement of writing a specific risk
  - It's not practical to re-run the internal model for each new risk, so instead we use catastrophe model claims output. This is a good proxy for capital as it is a large component for cat-dominated insurers.
  - We analyse the entire portfolio with and without the risk to see the impact on the 1 in 200 loss. Adding in the new risk is easy because we can add-up the losses from each event.
  - The 1 in 200 Value at Risk is equivalent to the regulatory basis.
  - A constant return on capital can be used to generate a technical premium.
- By considering the marginal impact on capital, an allowance can be made for the degree to which a risk clashes with or diversifies against the portfolio
  - Risks which clash - are correlated - with the current portfolio add more marginal capital
  - Diversifying risks add less marginal capital so can be written with a *higher loss ratio* while still delivering the *same return on capital*.

# Background on Technical Premiums

- Various definitions are used for Technical Premiums.
- This presentation uses the following definition\*:
  - Technical Premiums meet the long term return on capital requirement allowing for expenses.
- Here the target return is 15%.
- The technical premium shown below is presented gross of reinsurance, net of deductions. This is the Lloyd's PIM basis.



\*The above definition is one of the three premium bases discussed in Will Forster's pricing presentation:

<http://www.actuaries.org.uk/research-and-resources/documents/c02-target-technical-and-walk-away-pricing-london-market>

# Why go to the trouble?

- Aggregate monitoring is difficult enough already:
  - “The software is expensive”
  - “Staff/teams are expensive”
  - “Modelling slows down the underwriting process”
  - “Models are unreliable anyway”
- Model output has well-understood limitations but still:
  - It exposes clashes within portfolios
    - Through the use of achieved versus technical premium metrics underwriters can be encouraged to diversify their books
  - Clashes across classes/entities are exposed – important for groups
    - Seeing more demanding loss ratios come out, underwriters are *directly* informed that “we have a lot there already”
  - Market inefficiencies or opportunities can be more readily exploited
    - Underwriters can see immediately where we can increase exposure profitably
  - Capital Efficiency is improved.

# What has this got to do with Solvency II?

- Solvency II gets a lot of coverage in actuarial presentations, consumes a lot of resources and management time. It can distract insurers from the day job of underwriting.
- In theory, the capital buffer held under Solvency II will prevent our going insolvent any more frequently than once every 200 years.
- The *Use Test* demands that the internal model is *used* by the business. But...
  - Are models really good enough to be used?
  - Are model inputs reliable enough to inform strategy?
  - Do models really capture what goes on in underwriting?
  - Do senior managers really understand model outputs and their limitations?
- Marginal Pricing is not dressed up as *Use Test* fodder here but still represents the best kind of model use (in the opinion of your presenter):
  - *Marginal Pricing takes model output and uses it to directly inform underwriting decisions at the coalface.* This brings the internal model - in part at least - directly to underwriting.
  - ***The best protection against insolvency is through better risk selection in the first place.***

# Practical Issues in allocating marginal capital: *Introduction & Basis and Return Period*

- This section of the presentation focuses on technical complexities to be resolved in deployment
- Complexities glossed over in the earlier slides are addressed in turn
  - Selection of basis and return period
  - Notional versus rolling portfolio
  - Relation to regulatory capital
  - Treatment of non-correlating classes
- Selection of basis for allocating capital and return period
  - We can choose various bases:
    - Value at Risk (VaR) gives the expected loss at a certain return period – this is closest to the regulatory measure
    - Tail Value at Risk (TVaR) gives the average loss of all possible events beyond a certain return period
    - Simpler metrics like standard deviation could be used
  - The return period could be moved away from the regulatory 1 in 200 level. For example, S&P ratings are based on a 1 in 250 loss.

# Practical Issues in allocating marginal capital: *Notional versus Rolling Portfolio*

- We need a portfolio to add our new risk to before we can see the marginal impact
  - Do we use the rolling in-force portfolio?
  - Do we use a notional portfolio?
- A rolling in-force portfolio
  - This more closely resembles the reality of transacting business – we write risks in a specific order
  - However, the approach leads to inconsistencies in the treatment of risks depending on the order they bind
    - Risks written early on get no diversification benefit. Is it fair to make them pay more? In a busy 1.1. renewals spike underwriters may view the order as arbitrary.
- A notional portfolio
  - By considering a notional portfolio of risks that resembles the business plan we avoid the problem of ordering
  - However, the notional portfolio may be inaccurate. Do we refresh it? Then we reintroduce ordering problems.

# Practical Issues in allocating marginal capital:

## *Relation to regulatory capital*

- Relation to regulatory or indeed whatever capital basis is used to define long term target.
- We have discussed allocating capital to risks on the basis of marginal 1 in 200 claims costs, a simpler basis that is merely one component of internal model capital.
  - How to allocate other elements?
    - Investment, Operational, Credit Risk
  - And what about the marginal effect?
    - If we add up all the marginal capital amounts using a notional portfolio we don't get the total. This is because rather too much diversification benefit is attributed. To maintain the link to regulatory capital we need some sort of adjustment.
    - Note the marginal effect problem does not apply if using a rolling in-force portfolio. There, early risks get charged more as they have less of a portfolio to diversify against.
- Allocating internal model capital on a pro rata basis is suggested as a practical solution.

## Practical Issues in allocating marginal capital: *Treatment of non-correlating classes*

- Non-correlating classes may need to be handled carefully if extending marginal pricing beyond cat
- With no material correlations between risks or classes in, say, airline hull, each new risk adds very little to a cat-dominated total capital requirement
  - US quake or windstorm exposure will dominate the 1 in 200 for many Lloyd's syndicates.
  - What are the chances of a plane crash in France the same year as another Katrina?
  - The events are not correlated so the marginal impact on the 1 in 200 year loss is little more than the average annual aviation loss cost. This average amount, however, is already covered by the reserves.
  - Larger than average aviation claims would help push years into the 1 in 200 range but the effect is likely to be small for cat-dominated London Market participants because of relative exposures.
- With low levels of capital allocated it's like saying: *we've got all this capital just in case there's an earthquake in California so we may as well write aviation even if it's only marginally profitable. It'll still enhance returns on barely-increased capital.*
- This example exposes an important limitation in the framework
  - The basis may not be appropriate for managing non-correlating classes
  - Can we be so precise as to write just marginally profitable business?
  - Is it safe to write marginally profitable business given the limitations in allocating internal model capital? Operational risk, say?

# Concluding remarks and questions

- Marginal Pricing Benefits
  - Avoid clashes and concentrations
  - Exploit opportunities
  - The best sort of *Use Test*: directly connect the model to underwriting.
  - Practical Issues not insurmountable.
- Limitations
  - Cat model error
  - Exposure data errors
  - Allocation of actual internal model capital using 1 in 200 loss
  - Difficulties in treatment of non-correlating classes.
- Any questions or comments?