London Market Pricing Framework

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1

London Market Pricing Framework

What we will cover

- Pricing framework

- Overview of pricing methods and where they fit in

- Interaction between main three functions involved:

  - Underwriting

  - Pricing or Analytics

  - Central or Capital modelling team

Title refers to London Market, but similar embedded process for other insurers.

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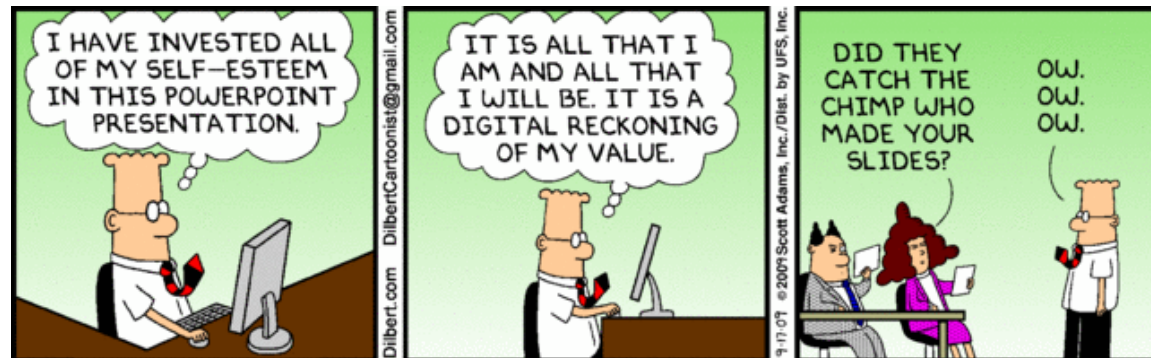
Setting the scene

- **Need for underwriting profit**
  - Financial climate means less investment income
  - Recapitalisation expensive or not easily available
  - Recent insurance results distorted by prior year releases

Setting the scene

- Need for underwriting profit
- **Soft market conditions**
    - Need to know cost of risk to compete profitably
    - Identify profitable segments
    - Walk away

Setting the scene

- Need for underwriting profit
- Soft market conditions
- **Lloyd's franchise directive**
  - Report benchmark rate on per risk basis
  - Regulatory compliance vs value added

Setting the scene

- Need for underwriting profit
- Soft market conditions
- Lloyd's franchise directive
- **Winners curse**
  - Imperfect information leads to loss making business
  - London market exposed due to high level of competition and less than perfect information
  - Party with the better information will outperform

Setting the scene

- Need for underwriting profit
- Soft market conditions
- Lloyd's franchise directive
- Winners curse
- **Embedding capital and pricing**
  - Systematic risk vs. Diversifiable risk
  - Capital allocation reflect risk profile and risk appetite set at company level
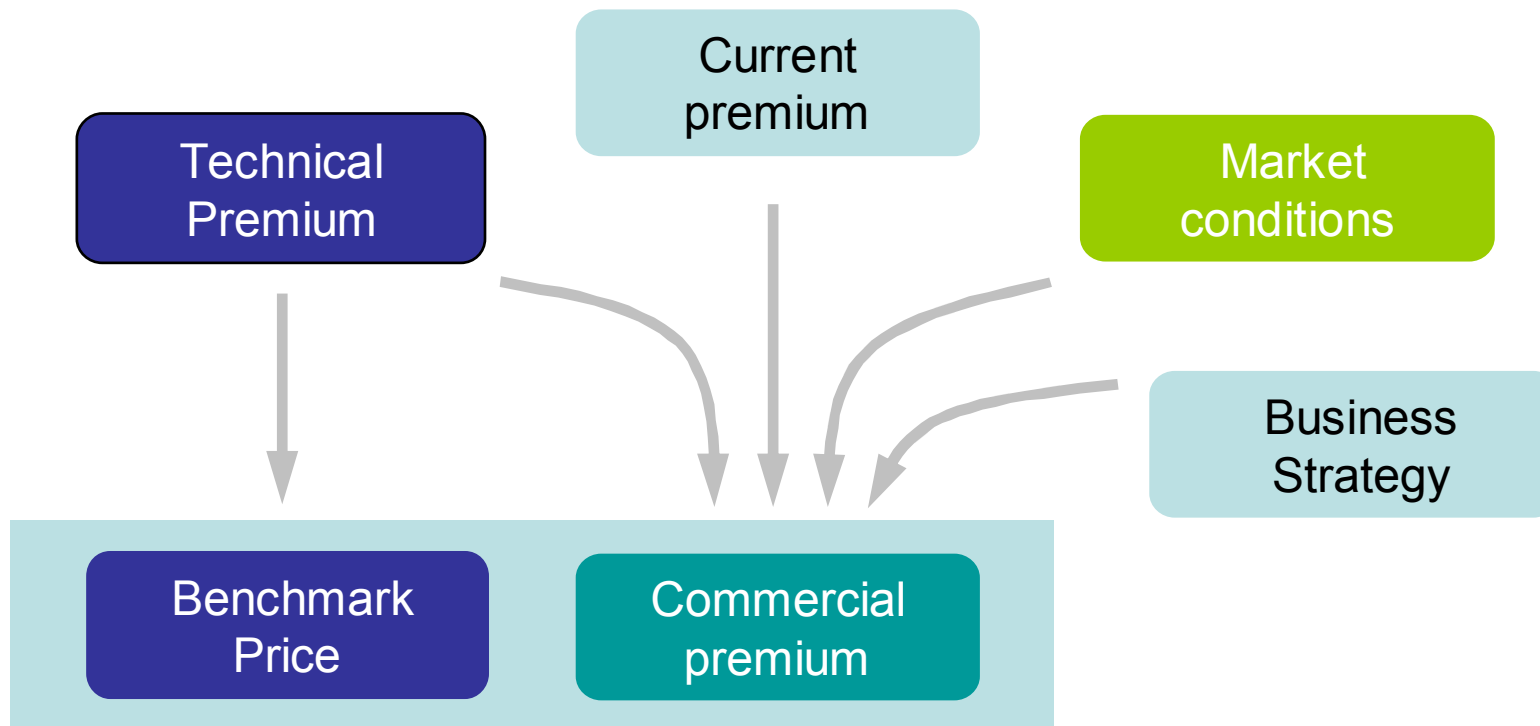
Setting the scene

- Need for underwriting profit
- Soft market conditions
- Lloyd's franchise directive
- Winners curse
- Embedding capital and pricing
- **Solvency II requirements**
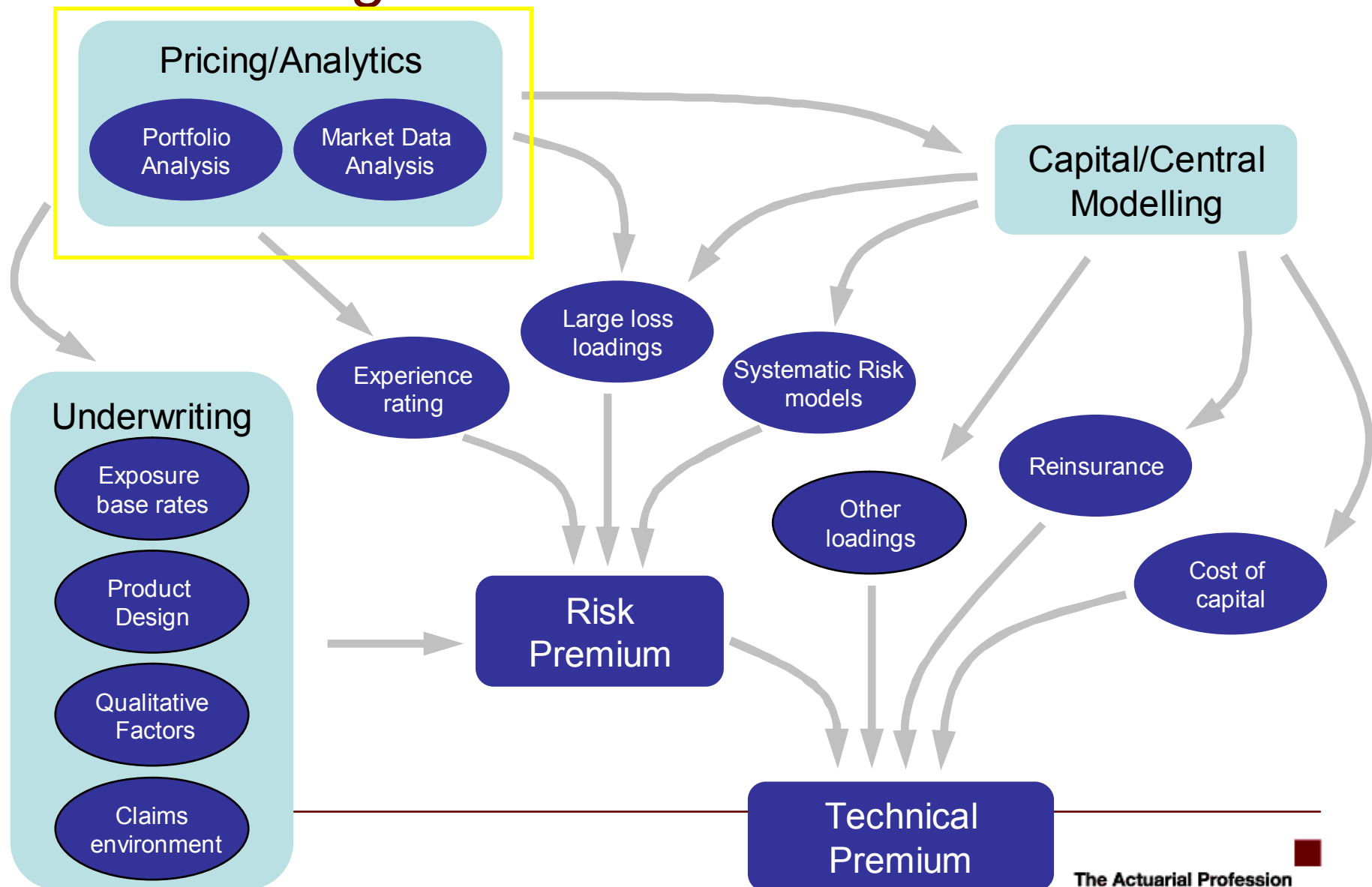 - Actuarial opinion on underwriting function and reinsurance

The Rating Process

The Rating Process

Pricing/Analytics
- Portfolio Analysis
- Market Data Analysis

Capital/Central Modelling

Underwriting
- Exposure base rates
- Product Design
- Qualitative Factors
- Claims environment

Experience rating

Large loss loadings

Systematic Risk models

Other loadings

Reinsurance

Cost of capital

Risk Premium

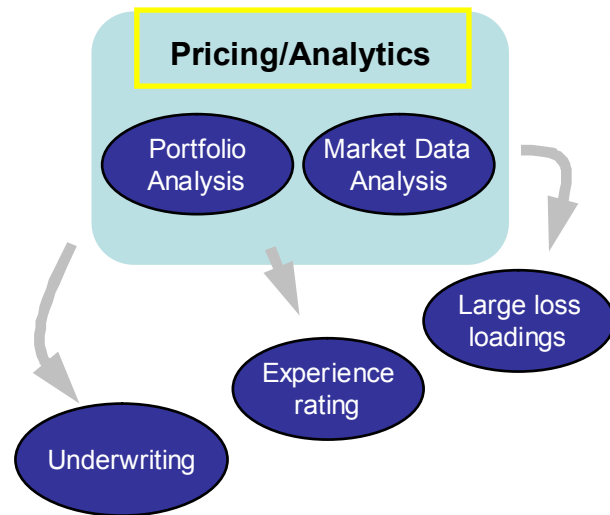**Technical Premium**

The Rating Process

- Analysis of portfolio/market data
  - Predictive modelling
  - Insurance scenario modelling (ISG)
  - Segmentation
- Assisting underwriting
  - Formalise exposure rates
  - Derivation of ILFs
  - Developing rating tools
- Experience rating
  - Burning Cost analysis
  - Frequency and severity fitting
  - Simulating stochastic features
  - Credibility models
- Adjust cost of capital per risk
  - Risk measure – Volatility, Expected Shareholder deficit

Portfolio Analysis

Pricing/Analytics

- Portfolio Analysis
- Market Data Analysis
- Large loss loadings
- Experience rating
- Underwriting
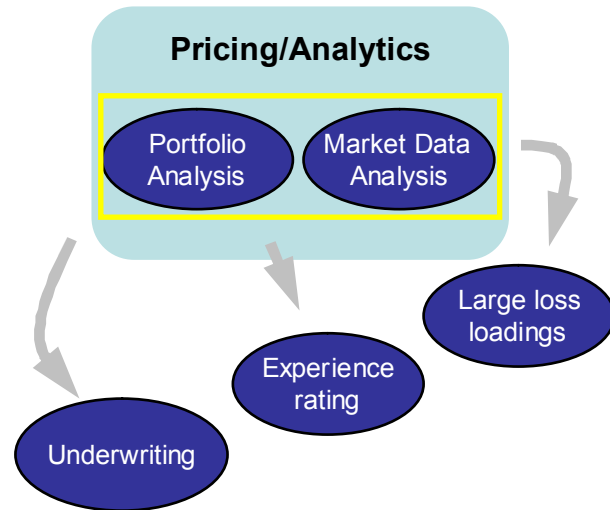
Predictive modelling

- Increasingly used in the London market
- Major limitations to date:
    - Current data systems not set up to capture
    - Heterogeneity
- Systems and awareness increasing
- Some of the classes where it is currently used:

Marine	Aviation
Employers Liability	Public Liability
Energy	Yacht
Motor Fleet	D&O
Professional Indemnity	

Predictive modelling- example

- With a "reasonable" amount of credible portfolio or market data:
  - Derivation of base rates and rating differentials
  - Probability models used to model attrition and large separately
  - Simulate large loss and deductible discount curves by rating groups
  - Predict profitability for change in business mix
  - Monitor A v E (lift curves) for claims and portfolio mix

Marine Liability Example

Objective

Age

Flag

Vessel

Model

Tonnage

Excess

NCD

Expected cost of claims
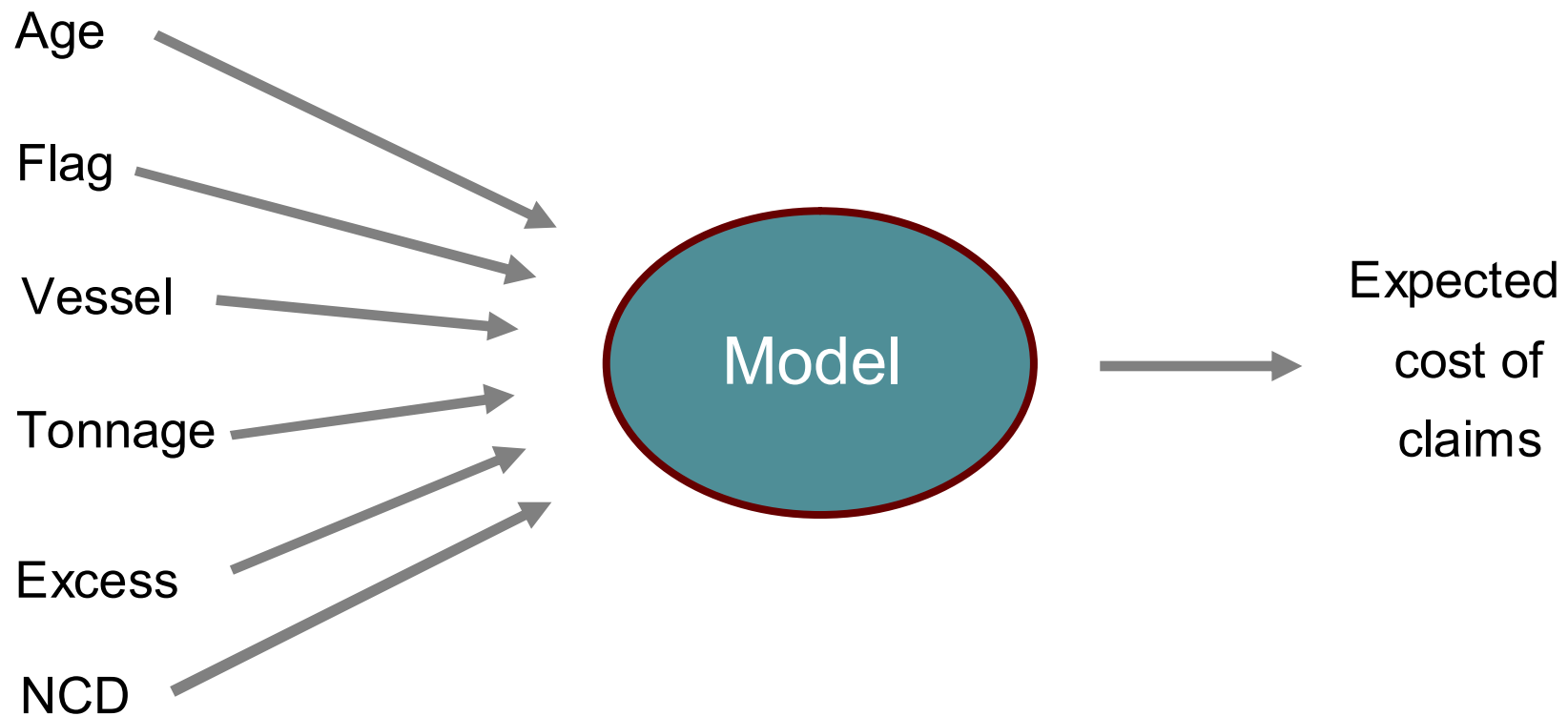
Marine Liability Example

Modelling the cost of claims

	Freq		Amt	
Car	Freq	x	Amt	= Cost 1
Col	Freq	x	Amt	= Cost 2
Pax	Freq	x	Amt	= Cost 3
Pol	Freq	x	Amt	= Cost 4
Oth	Freq	x	Amt	= Cost 5

Marine Examples
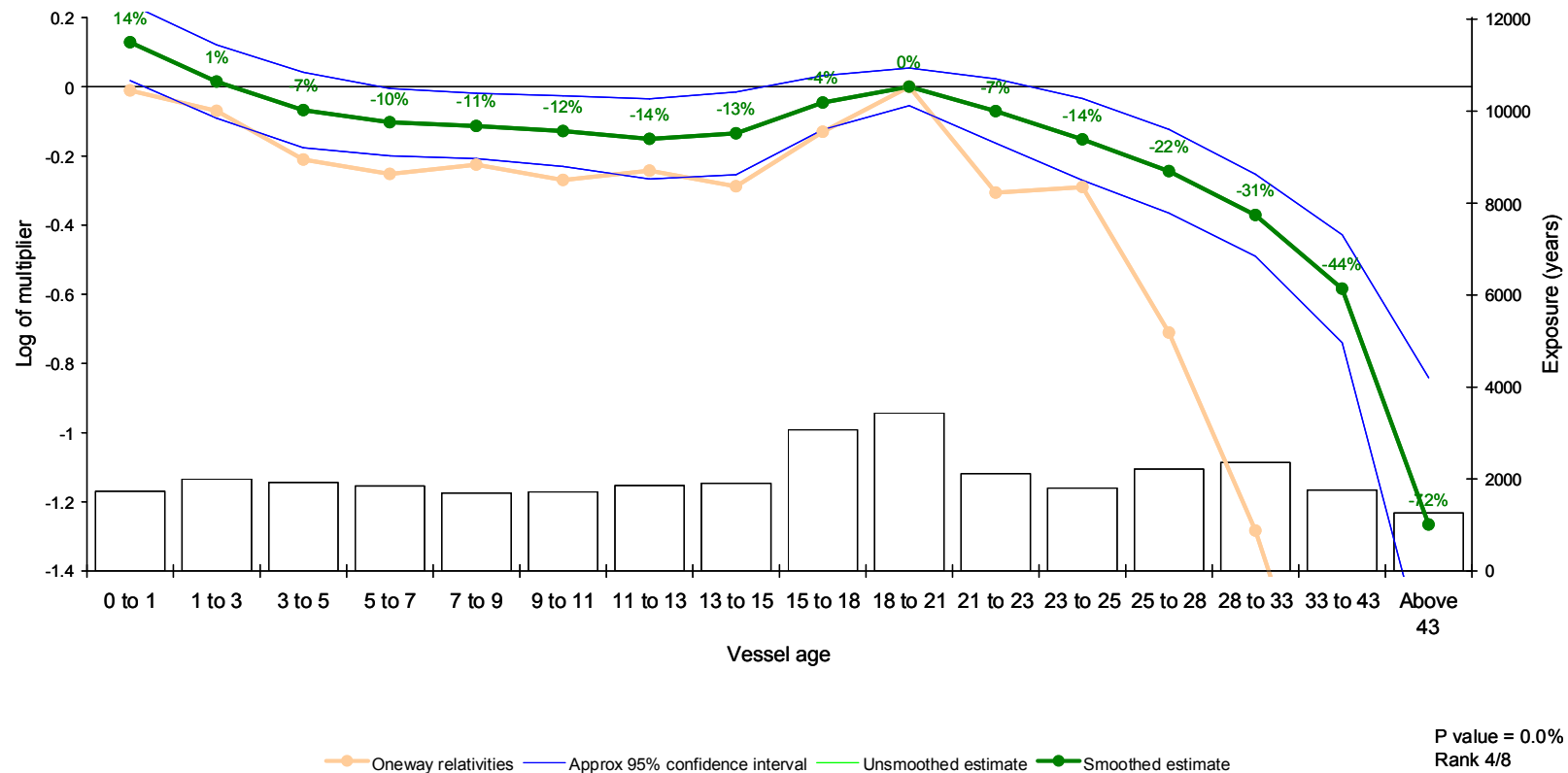
Marine – Cargo numbers model

Marine Examples

Marine – Cargo numbers model

Japan: -51%, Sweden: 5%, Greece: -10%, England: -16%, Norway: 28%, Cuba: 25%, Denmark: 10%, Germany: -19%, Others: 0%, China: -12%, Liberia: 7%, Panama: 6%, Cyprus: 20%, Bahamas: 41%, Korea: 28%

— Approx 95% confidence interval — Unsmoothed estimate —●— Smoothed estimate

P value = 0.0%
Rank 3/4

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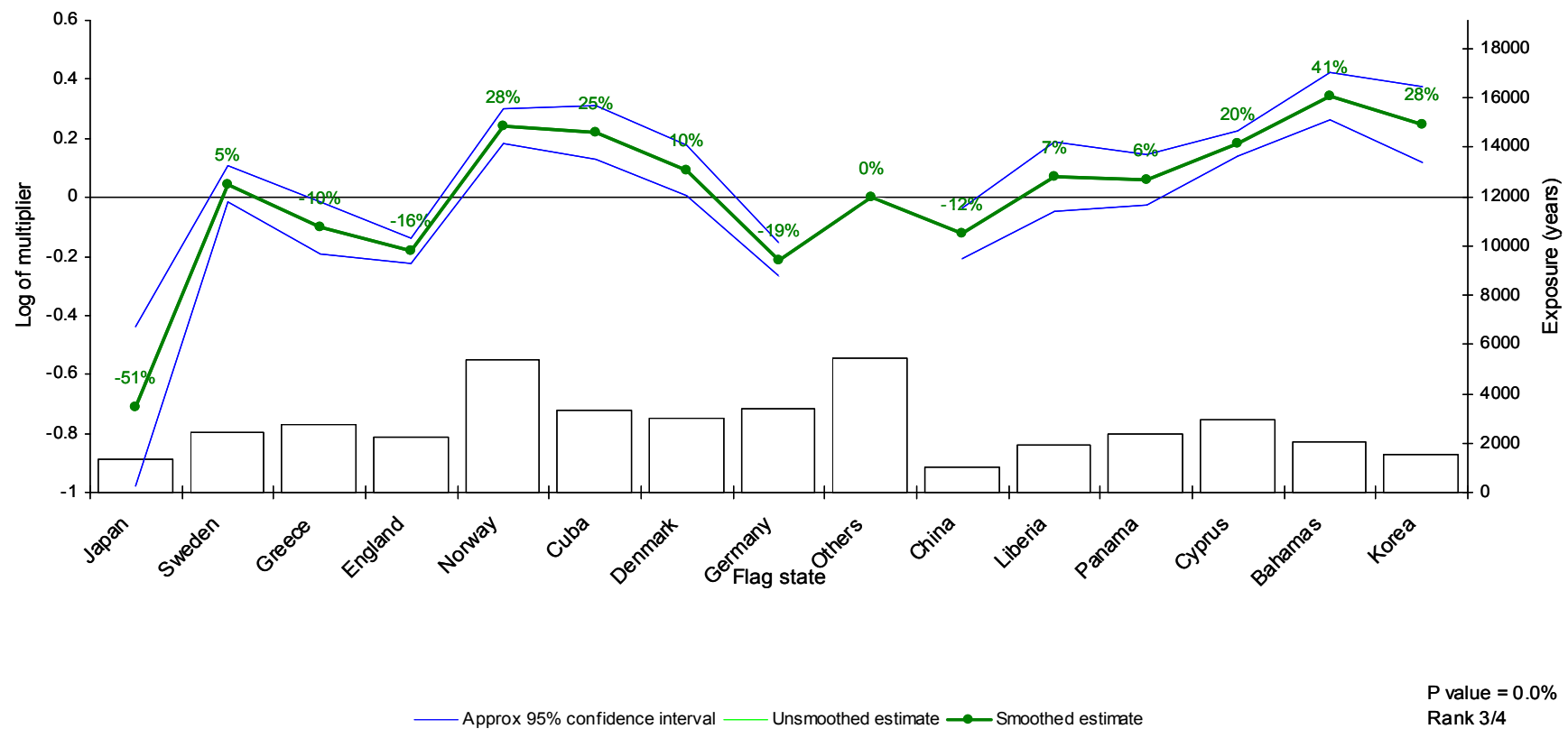
Marine Liability Case Study

Dealing with large claims

Freq X Prob X Amt

Freq X Amt
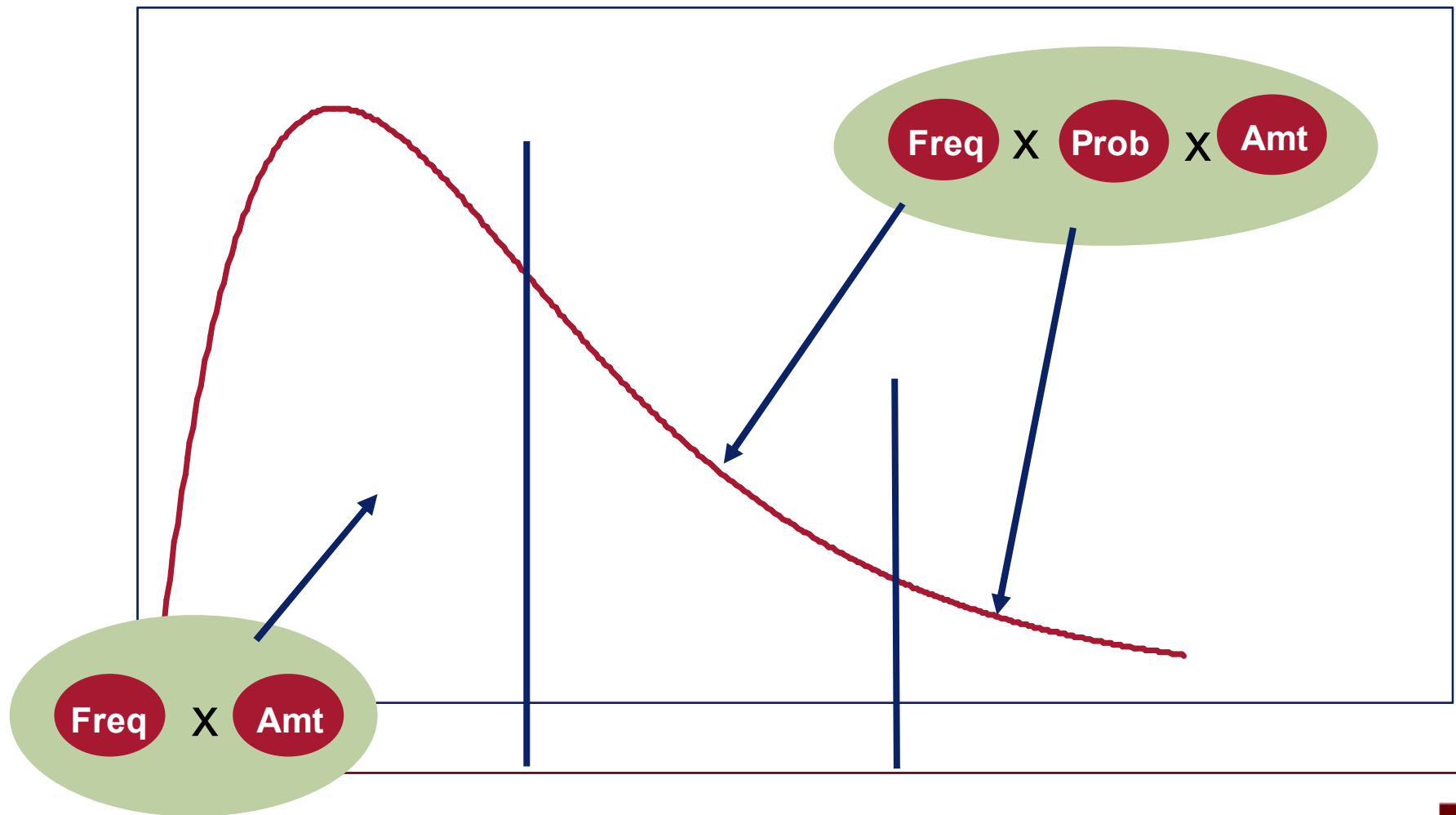
More Marine Examples

Marine – Probability of large cargo model

P value = 0.0%
Rank 1/4

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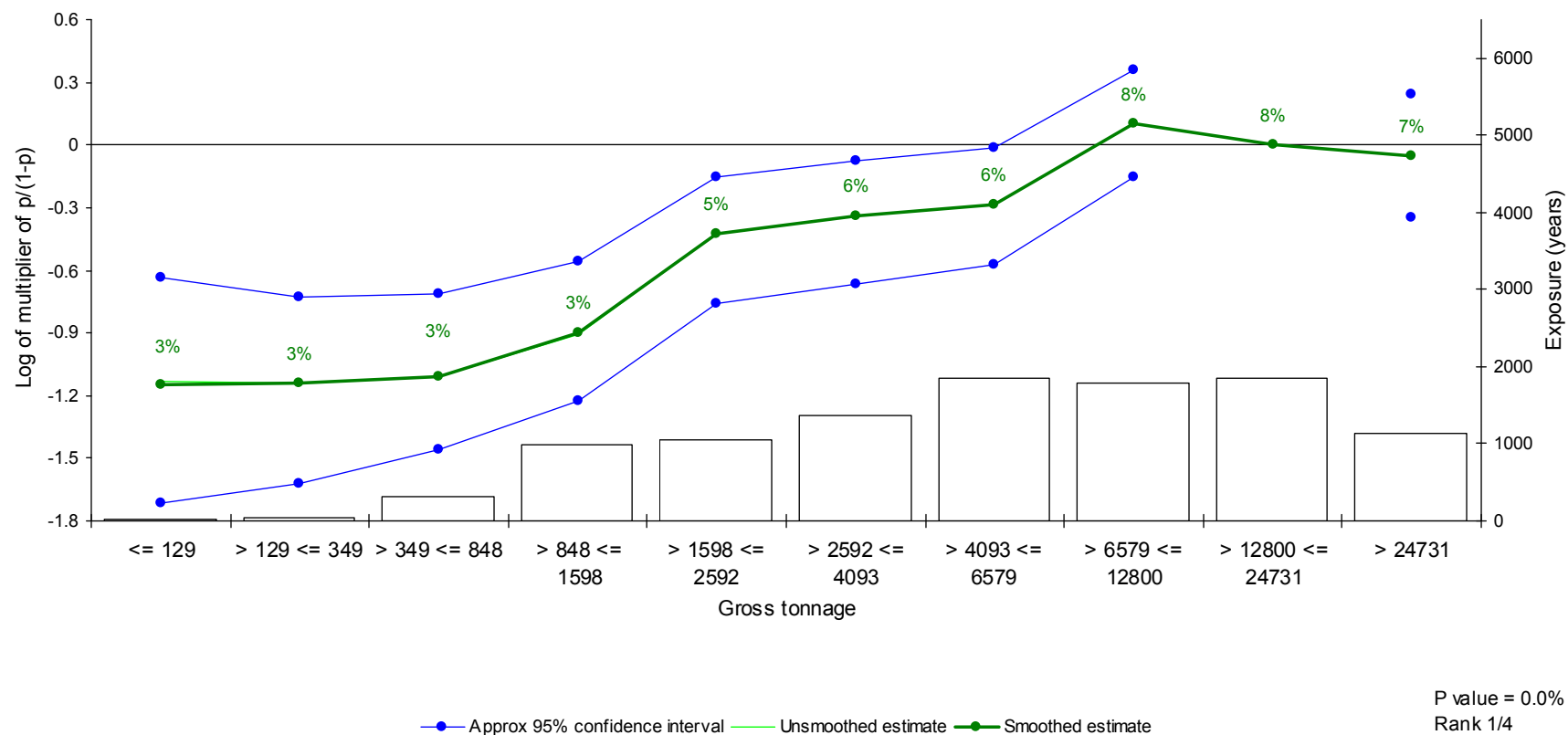
Predictive power of models

Predictive power analysis
Actual versus expected claim frequency (all claim types) on 2007 and 2008 year data

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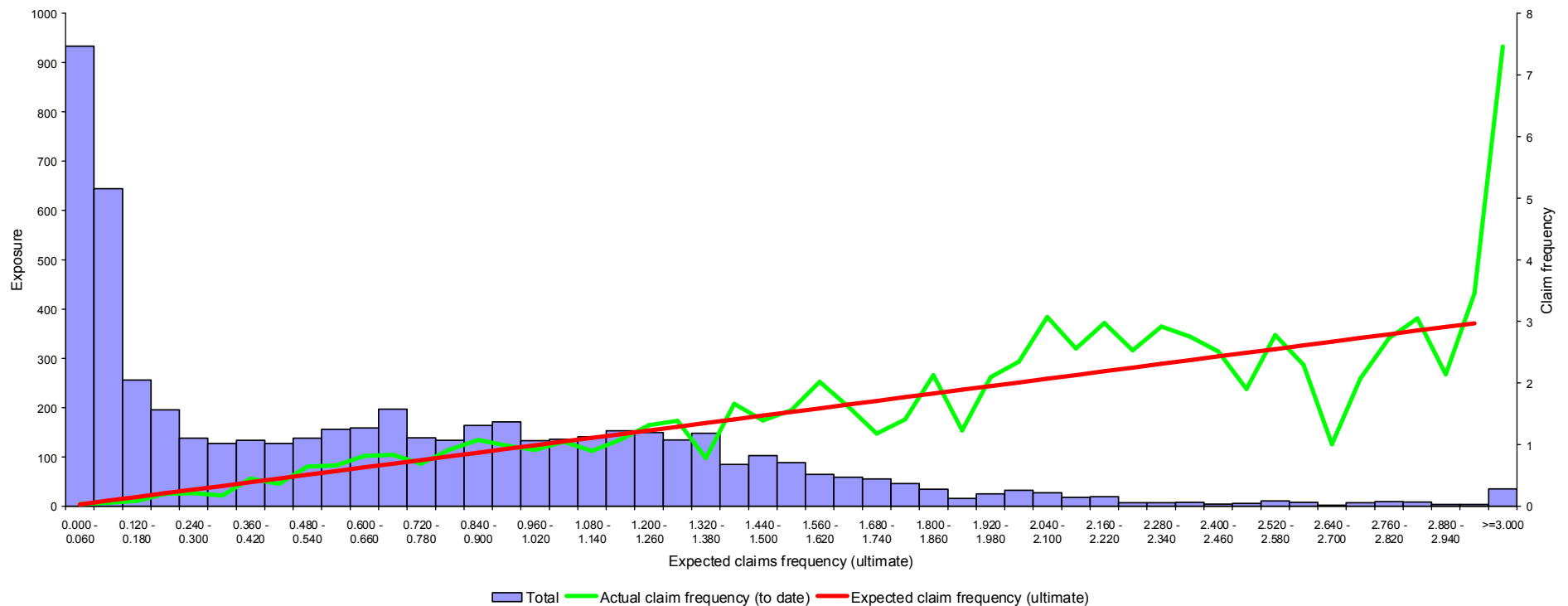
Predictive power of models

Predictive power analysis

Actual versus expected burning cost (all claim types) on 2007 and 2008 year data

Legend: Exposure — Actual burning cost (to date) — Expected burning cost (ultimate)

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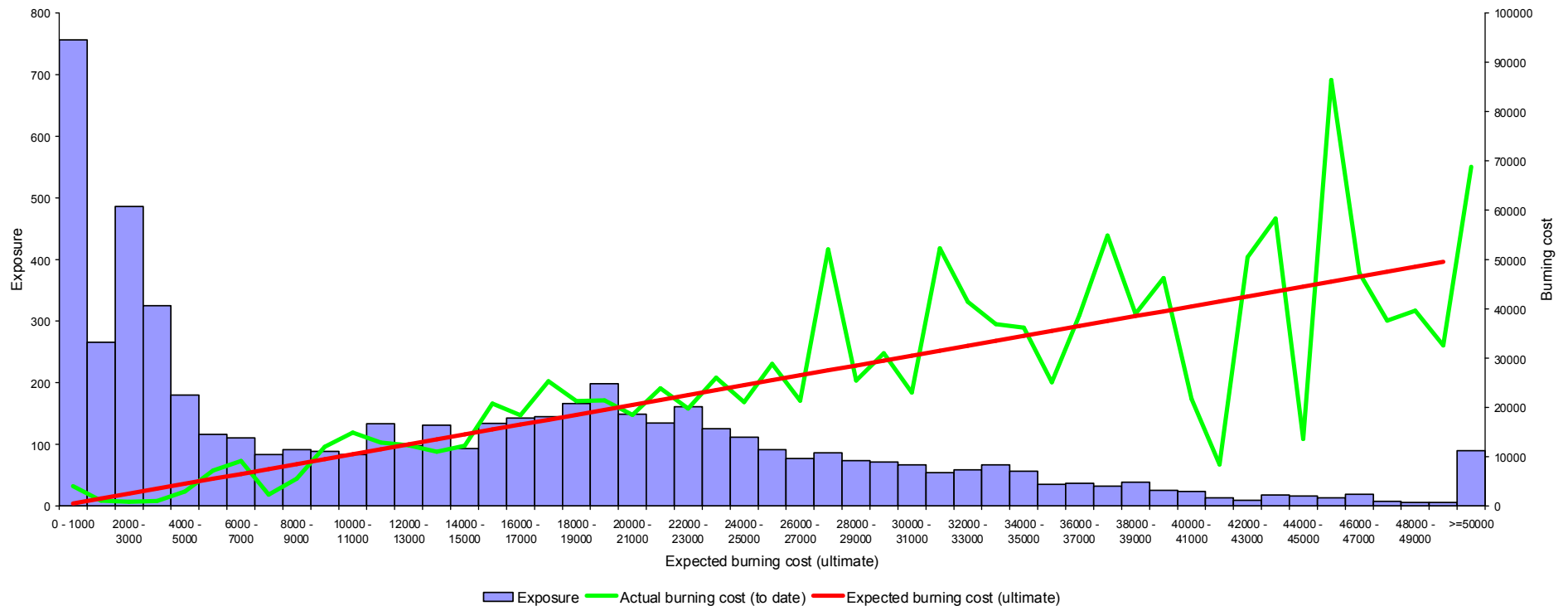
To simulate large loss curve from GLM

- Fit average cost per large claim distribution using traditional approach
- Select portfolio / subset for which total large claims cost distribution is to be generated
- for each policy record, determine expected number of claims and expected large claim probability from earlier fitted GLM
- For each policy record, simulate the number of claims
- For to each simulated claim, simulate a random number
- If the random number is less than or equal to probability of a large claim then simulate a large claim severity from a fitted distribution, otherwise use GLM severity for policy rating levels.
- Apply deductibles / coverage structure
- Cumulate large costs over the simulated claims over all policy records in each rating group
- Run sufficient simulations to obtain average cost for specified deductible
- Repeat for different deductibles to generate a loss curve

Portfolio analysis with less data

- Set framework in place for capturing exposure and claims data
- Supplement with market data
- Capture underwriting judgement as constraints in model and monitor emerging experience with subjective rates
- Start with simple one-way analysis and increase complexity
- Clustering of risks to more homogeneous rating groups
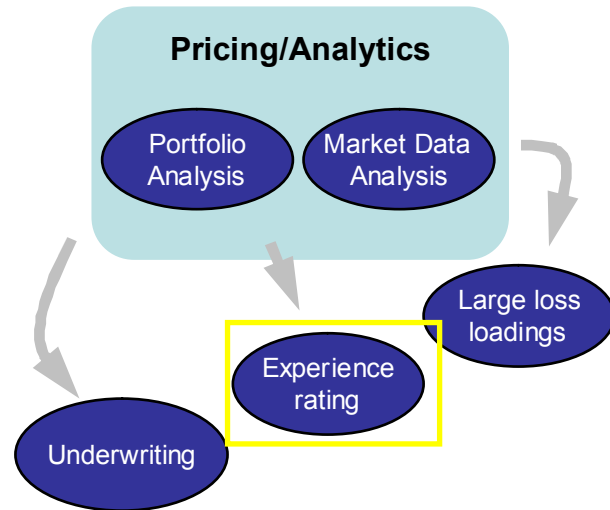
Experience rating
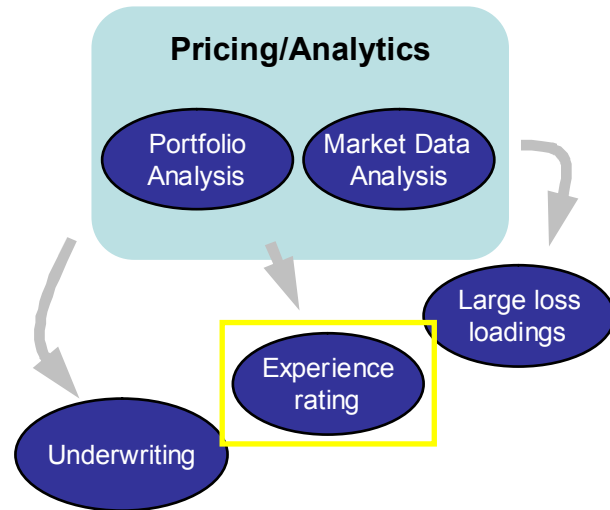
- Individual account pricing needs sufficient historic exposure and claims data
  - EL, PL, Motor, Marine, PI, Cash-in-Transit and the list goes on
- Limited information - can still use techniques, but use credibility approach to adjust portfolio rates:
  - Burning cost or Frequency/Severity
  - Capped burning cost
  - Loss loading or discount scale

Experience rating

Pricing/Analytics

Portfolio Analysis

Market Data Analysis

Large loss loadings

Experience rating

Underwriting

- If you cap or exclude unusual experience, such as large claim, need to make a "normal" allowance:
    - Portfolio analysis
    - Catastrophe models
    - ISG output/contingency models
- Select a claims rate to apply to expected future exposure
- Blend with view of other premiums
- Credibility approach to blend with portfolio view of premium based on:
    - Number of years data, number of claims, incurred amounts
    - Volatility of annual rates for risk compared to risks in overall portfolio

Experience rating – Burning cost example

UY	Exposure	Incurred	Inflated	Developed	Capped	Rate
2000	100	523	663	663	663	6.63
2001	103	514	632	632	632	6.14
2002	106	1212	1447	1447	847	7.99
2003	109	611	708	722	722	6.61
2004	113	450	506	532	532	4.73
2005	116	655	716	787	687	5.93
2006	119	525	557	668	668	5.60
2007	123	400	412	577	577	4.69
2008	**125**				**755**	**6.04**
Large loss allowance					88	0.70
Systematic Risk/Portfolio loadings					25	0.20
Projected Claims Cost for 2008					867	6.94

Portfolio (GLM) risk premium					813	6.50
Credibility Premium Factor (Z)					853	74%

Experience rating

Frequency Severity modelling

- Inflate and trend historic claims and exposure to consistent basis
- Allow for future movement in case estimates (IBNER) and new reported (IBNR) claims separately [Workshop]
- Fit statistical distributions to the frequency and severity of claims
- London market policy features can be modelled by simulation
    - Multiline or multiyear programmes
    - Captive involvement with stop loss features
    - Non proportional reinsurance and deductibles
    - Aggregate limits and deductibles
    - Bespoke features such as round-the-clock, multi-trigger
- Use simulations to adjust capital allocation to each component
    - Volatility of each layer
    - Var, TVar or ESD

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- Product Design
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- Other loadings
- Reinsurance
- Cost of capital

Risk Premium

Technical Premium
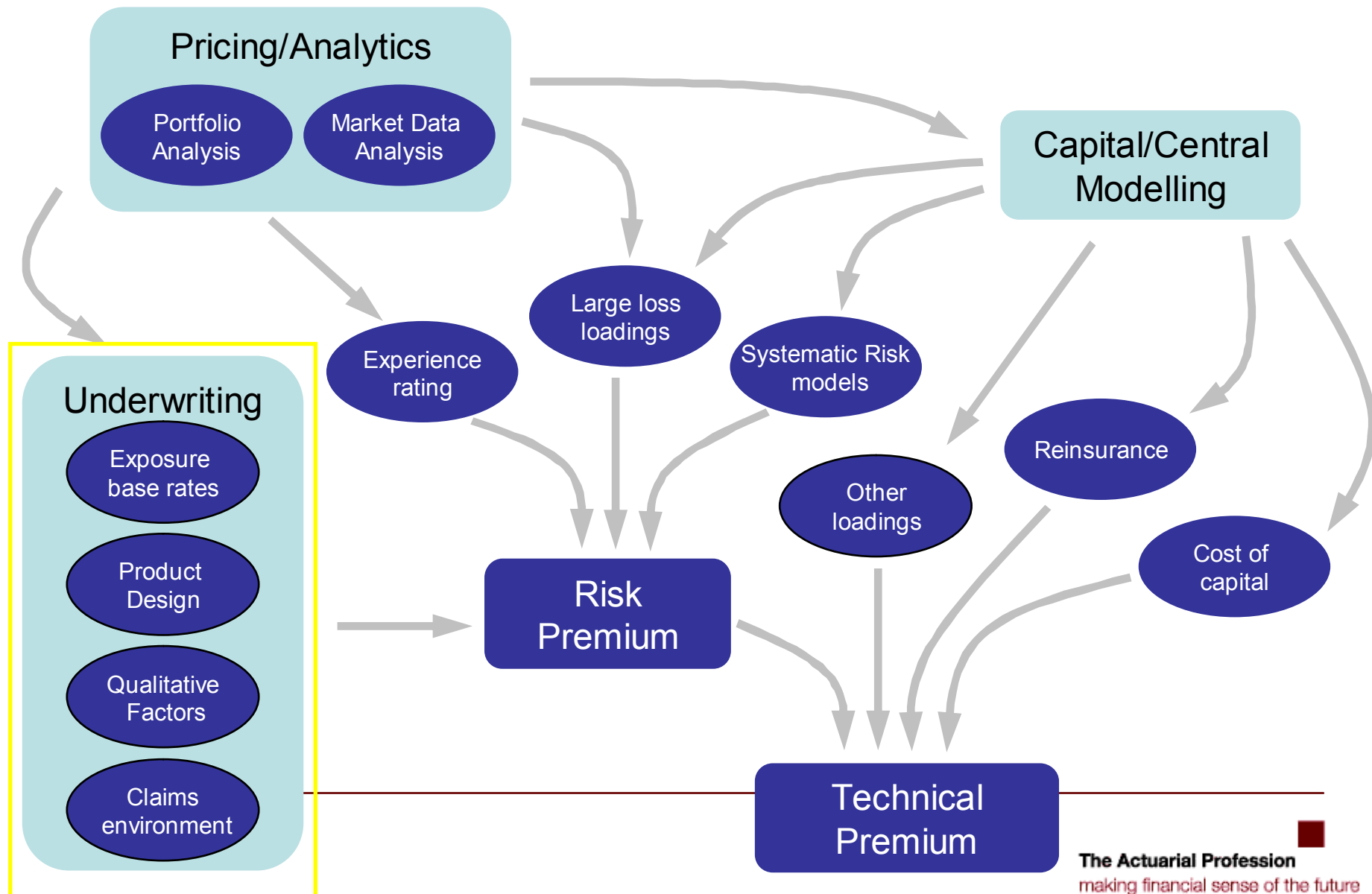
Underwriting

- Underwriting process not only about price
    - Product design and wording
    - Risk assessment can be more valuable than pricing
    - Claims environment adjustments
    - Balanced Portfolio
        - Underwriting/pricing models
            - Expert opinion based on experience
            - Base rates for standard level of cover
            - ILF curves to price higher layers
            - Gross rates allowing for cost of risk, expenses, profit, reinsurance etc.
        - Commonly used underwriting methods
            - Return period (rate on line)
            - Exposure curves set by loss elimination ratios
            - Market loss Market share approaches

Underwriting

- Exposure base rates
- Product Design
- Qualitative Factors
- Claims environment

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Underwriting

- Actuaries can add value even for portfolios with minimal data:
  - Quantifying and formalising this judgement
  - Break assumptions into different components
  - Validating assumptions against claims experience and market losses
  - Ensure risk premium change with policy design, portfolio mix and market trends
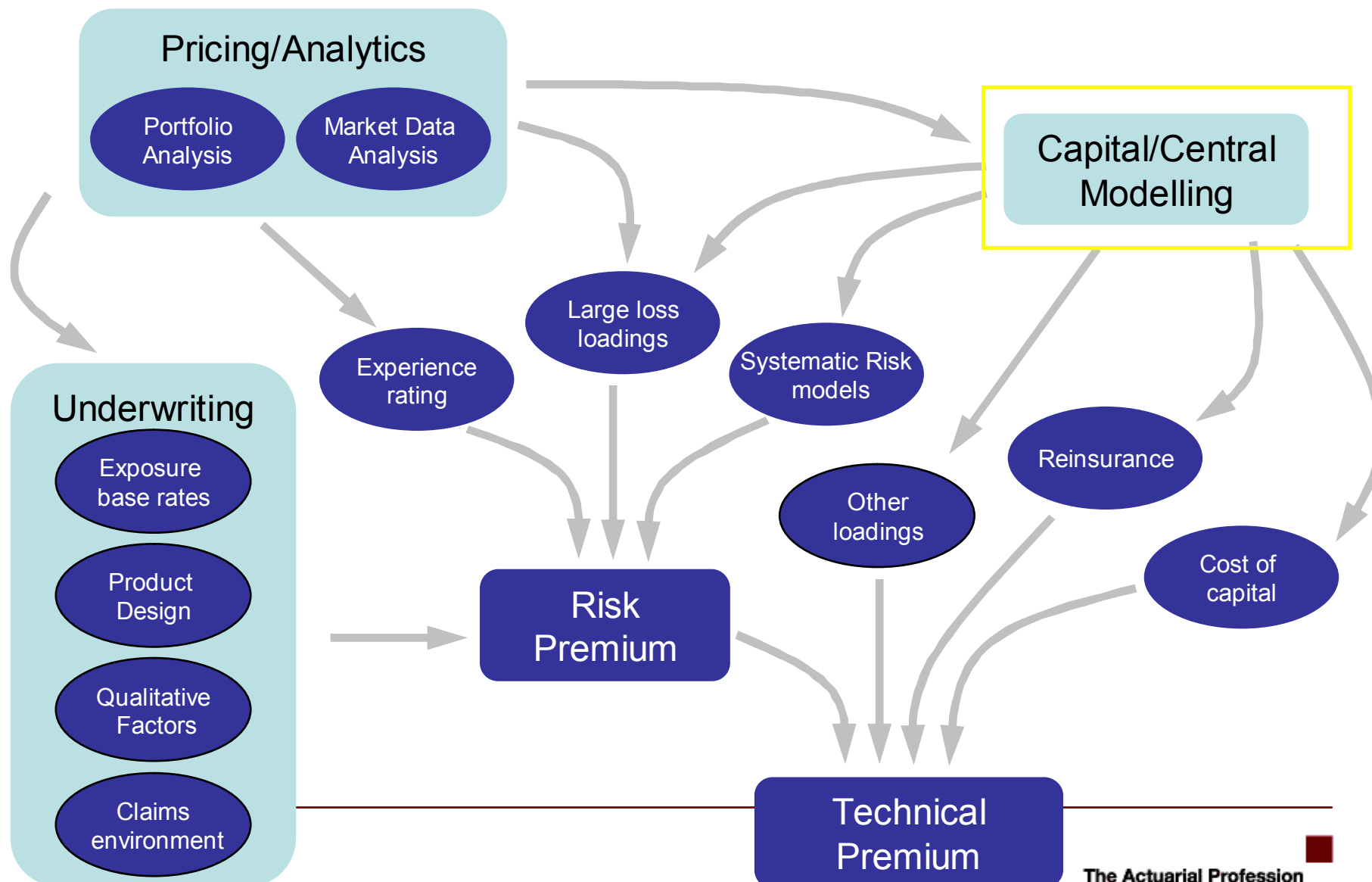 - Design data capture tools
  - Feed Benchmark rate

Underwriting

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Risk Premium

Technical Premium

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Capital/Central modelling

- Embed Capital modelling and pricing
- Assumptions consistent within pricing:
    - expense allocations consistent with volumes
    - Investment income consistent with expected returns
- Reinsurance cost and benefit allocated per policy
- Insurance Scenario Generators
    - Catastrophes
    - Economic claim influences
    - Financial strength
    - Latent claim models
    - Global or market trend models
- Diversification of multi-line business
- Capital allocation and return on capital
    - Reflect risk appetite and profit requirements
    - Use capital model simulation to allocate capital to line of business
    - Pricing team can adjust these to reflect individual risks compared to portfolio
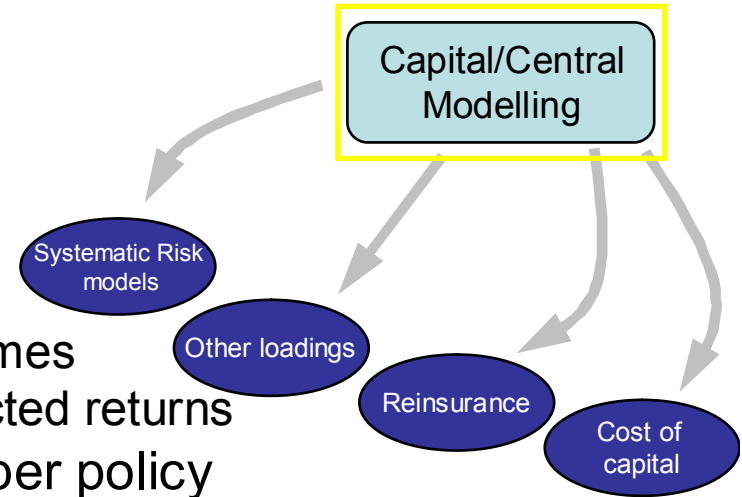
Integrated process

- Interaction between three functions:

| **Underwriting**	**Pricing or Analytics**	**Central or Capital modelling team**
- Ensure portfolio is balanced - Underlying risk changes	- Base rates and large loss factors - Experience rating and credibility	- Systematic risk models (ISG) - Large portfolio losses and reinsurance

- All three parties play significant role…
    - and can bring valuable information to the table.
    - build on strengths of each other

Conclusion – Stating the obvious

- Imperfect information always a challenge, but can mitigate by having better information than peers
- Will never have data unless it is captured: "It will take 3-5 years to capture sufficient data"
- It will also in 3-5 years time!
- Value in modelling found in thought process and formalising the problem, not only in number crunching

Questions?
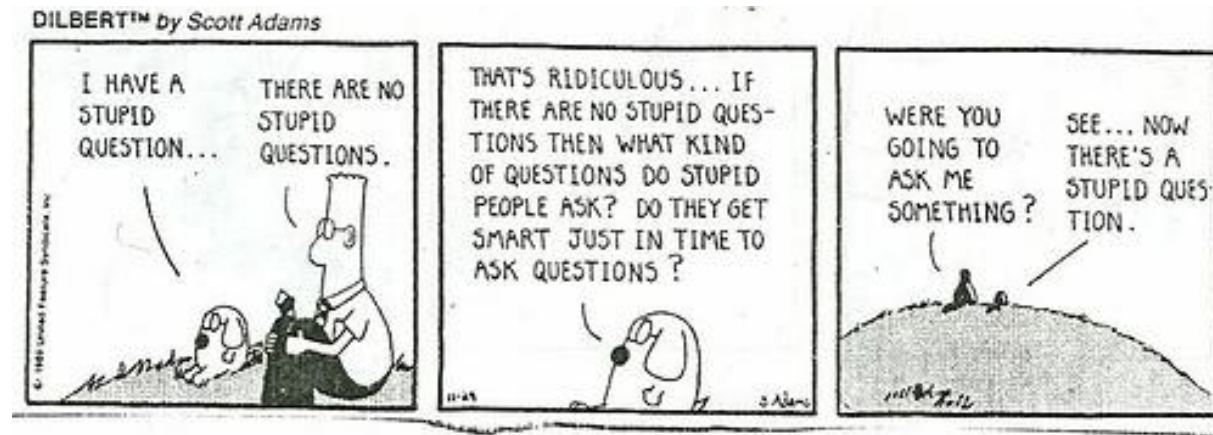
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