

# Technical Pricing

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# Traditional approach

## Fleet records (loss rating):

- **Data:** 3-5 year loss ratio
- **Application:** Decrease premium if LR is low, increase if high

## Fleet schedule (exposure rating):

- **Data:** Vessel details
- **Application:** Rules of thumb i.r.o. USD/DWT & risk factors or (good) models developed a long time ago

# Fleet Record's Shortcomings

- Statistically irrelevant
- Businesswise absurd
- Contributes to premium cycles
- **Underestimates the risk**
  - Skewed distribution (heavy tail)
  - IBNR and CBNI (long tail)
- **Introduces risk assessment bias**
  - Myopic focus on “causes” for the good/bad records

# Suggested approach

- **Step 1 – Risk Assessment**  
Semi-automatic risk assessment to check if the risk is within the scope of the company's statistical experience and UW-guidelines
- **Step 2 – Technical Pricing**  
Automatic calculation of expected claims cost based on various risk factors, sum insured and deductible
- **Step 3 – Quotation**  
Manual assessment of market price – guided by estimates based on previous written risks and the technical price

# The Beauty of Hull Risk & Data

- Abundance of vessel specific data from third parties:  
Technical details, affiliation, operations
- Increasing regulation implies more homogeneous risk  
within a given trade and vessel type
- Severity controlled by sum insured
- Short tail and limited accumulation risk

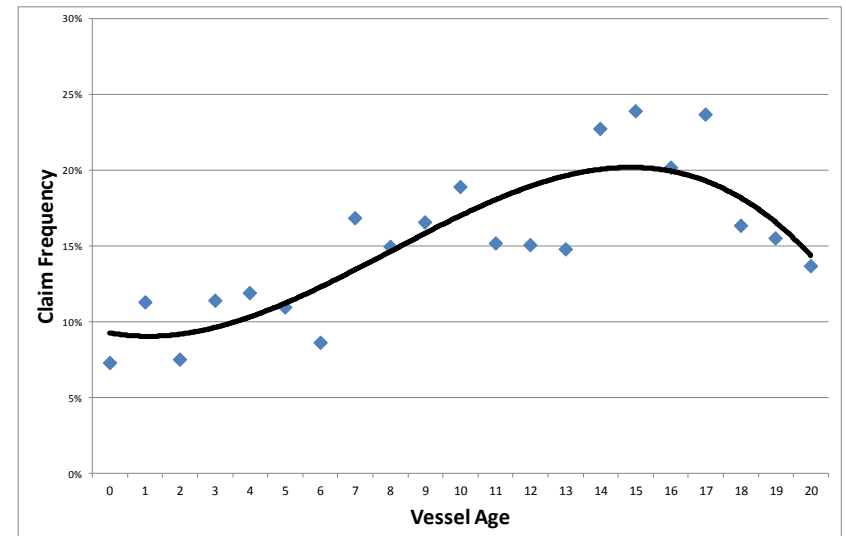
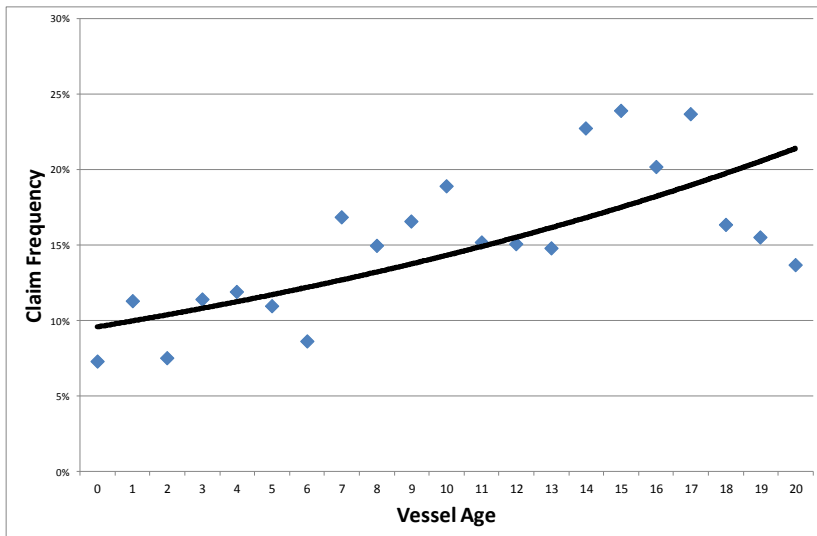
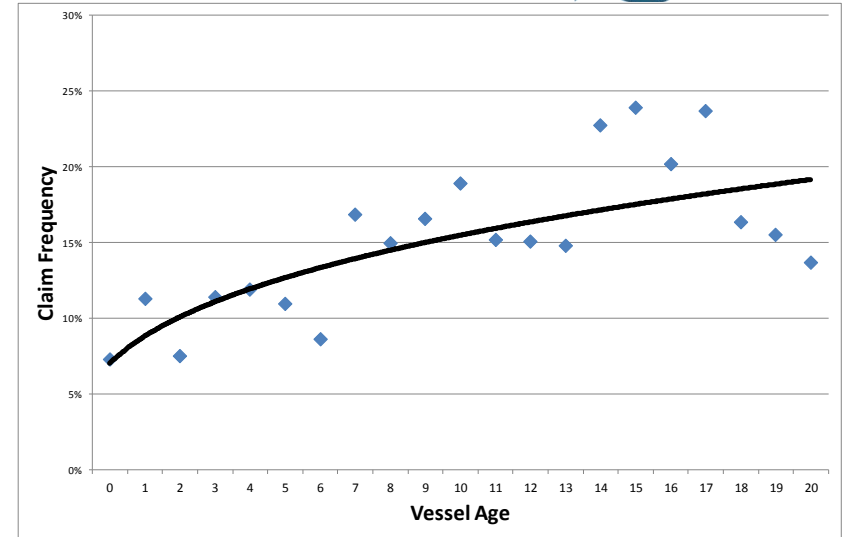
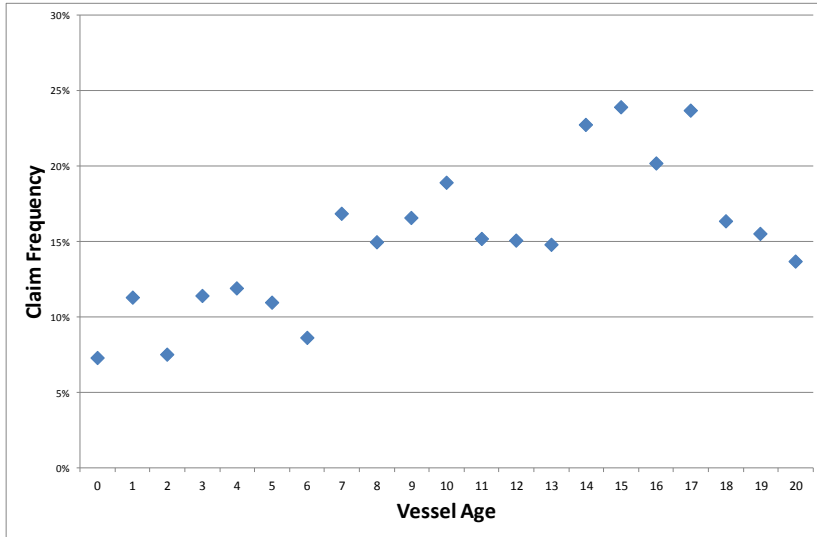
# Technical Pricing

- **Data:** 5-10 years of portfolio (or market) claims and exposure data including relevant risk factors
- **Application:** Frequency –Severity regression models

$$\begin{aligned}
 \text{Premium} &= \text{Frequency} * \text{Severity} \\
 &= \lambda \mu \\
 &= \lambda_0 \lambda_1^{x_1} \lambda_2^{x_2} \dots \mu_0 \mu_1^{y_1} \mu_2^{y_2} \dots
 \end{aligned}$$

- **Caveat:** Deductibles should be included in the modelling to improve precision and applications

# Claim frequency vs. Vessel Age



# Segmentation, risk factors, structure

- Mathematics = The noble art of simplification  
A pricing model is only one of many possible representations of the claim experience
- The more differentiation, the better historic fit  
...the less predictive
- Possible approach: Build simple separate PA models in several homogeneous risk groups and TLO / semi-TLO models at a more aggregate level
- The more modelling experience, the harder it gets!
- A non-causal risk factor can be better than a causal risk factor, but implications must be understood by users!



# Age a causal risk factor?

1. Well maintained steel lasts for much more than 20 years
2. Old = Old design & technology (IMO conventions etc.)  
→ Building year more relevant?
3. Old = Wear and tear → Mileage more relevant?
4. Old = Lower value = Higher CTL risk (lower PA risk)  
→ Value per GT more relevant?
5. Old = Higher risk of over insurance = Moral hazard  
→ Value vs Market value more relevant?
6. Old = Bad owners, crew, trade, cargo, charterers and maintenance → Are these the actual risk factors?

Is age causally irrelevant...  
but a (good?) proxy for real risk factors?

# Seeing the forest rather than the trees

- All models are wrong – some models are useful!
- A model can't predict next year's claims for a fleet, but should be able to predict the next few years' claims of vessel segments (especially segments of expected profitability)
- Underwriters need portfolio reporting tools to believe in, understand, use and improve models efficiently
- The model doesn't have to be perfect, but should be better than the competitors' models!
- A bad model is a good source of improvement: Fixing a consistent model is easier than fixing an inconsistent gut-feeling!

# Technical Pricing Models

## Value adding applications

- Minimum price
- Line size
- BWMD\* (AAD, PC, NCB, CC etc.) calculations
- Portfolio Monitoring
- **Solvency II reserving:**  
The expected profit will be reflected in the accounts!
- Risk management through analytic or simulation based risk assessment

## Potential danger zones

- Client advice, due to non-causal risk factors
- Growth outside portfolio experience as a model is not based on a random sample of the world fleet (and non-causal risk factors)
- Market pricing (“winner’s curse”)
- A changing world

\*BWMD=Brokers’ weapons of mass destruction

# Technical Pricing in Competition

Winner's Curse

[http://en.wikipedia.org/wiki/Winner's\\_curse](http://en.wikipedia.org/wiki/Winner's_curse)

# Example

- The world hull market split randomly 50/50 on two competitors writing 100% shares.
- Each company calculates a technical premium based on their past 5 year's claims experience
- The next 5 years they compete using their technical premium (i.e. aiming for a 100% loss ratio).
- The above can be simulated by splitting a large portfolio in two portfolios at random – and repeating several times.
- Let the games begin!

# Case 1

- Both companies quote a fixed premium on all vessels equal to their past 5 years' claim per vessel
- The company with the lowest premium (i.e. lowest past 5 years' claims) wins the total market
- Although aiming for a 100% loss ratio the winner's loss ratio is on average 105%

## Case 2

- Both companies quote a fixed premium on all vessels within a vessel type group equal to their past 5 years' claim per vessel within that group.
- The company with the lowest premium wins the total market within a vessel group (tankers, bulkers etc.)
- Although aiming for a 100% loss ratio the winner's loss ratio is on average 115%

# Results – Company A and B Competing for 500 years

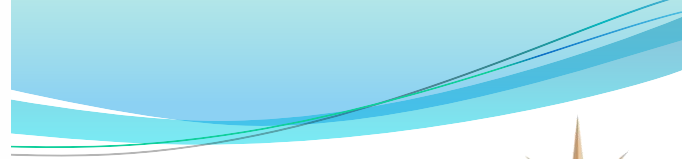
Case	Risk Factor	Loss Ratio Minimum Premium		
		A	B	Total
Simplistic vs Simplistic	None	105 %	105 %	105 %
<b>Simple vs Simple</b>	<b>Vessel type group</b>	<b>115 %</b>	<b>115 %</b>	<b>115 %</b>
"Clever" vs "Clever"	Vessel type	124 %	124 %	124 %
Stupid vs Stupid	Imo last digit	116 %	116 %	116 %
Stupid vs Simple	Imo vs Vgroup	132 %	109 %	121 %
"Clever" vs Simple	Vtype vs Vgroup	126 %	122 %	124 %

The examples illustrate academic theory and should not be considered representative for pricing approaches, market practice or the real effect of competition



# Lessons Learned

- Model weaknesses are exacerbated by competition
- Model weaknesses can be softened by competitors with even worse models
- The quality of the model depends on the quality of the competitors' models, the use of the model and to what extent your portfolio changes

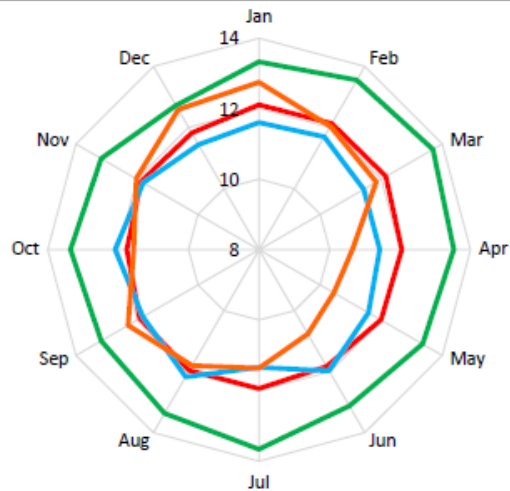


# What will happen in the next 10 years (or as we speak)?

- **Risk** can be measured through statistical analysis  
**Uncertainty** is statistically indeterminable
- Today's **uncertainty** might be tomorrow's **risk**?
- Machine Learning
  - SIRI...
  - Decision trees/jungles, Naïve Bayes, Random Forests
- New sources of data
  - AIS data...

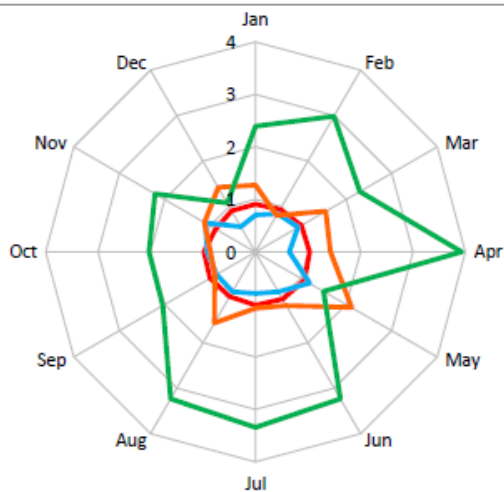
# Tanker Operational KPI's: Tanker Pools v.s. Owners

Operational performance metrics are often hard to quantify due to data availability and fleet heterogeneity. We take a unique approach by utilizing our existing vessel database along with our AIS based analytics to build a comprehensive picture to analyse Key Performance Indicators (KPI's) for VLCC operators and pool operators. We select three prominent owners and benchmark four KPI's with the global fleet average over 12 months. Frontline and Maran tankers metrics are almost indistinguishable from each other and from the global benchmark however Vela with its comparative advantage are quite prominent in the comparison. The efficiency with which operators are able to optimize their laden times and slow steam are also apparent.



Average Laden Speed

- VLCC fleet
- Frontline LTD
- Maran Tankers
- Vela International



Laden Underway / Total time

- VLCC fleet
- Frontline LTD
- Maran Tankers
- Vela International



Trondheim

Vestfjorden

Vestfjord Valley

Bodø

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# Past presentations/publications

- 2004 IUMI Singapore  
*“The failure of current market pricing”*
- 2006 Lloyd’s List  
*“Why good statistics are just a myth”*
- 2008 Insurance Day  
*“Why bad statistics are not a myth”*
- 2010 IUMI Zurich: *“Actuaries and Underwriters  
- a Rose War?”* - *webcast*