Some (hopefully) interesting ideas.

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Typical ERM System
Careful where you apply it

ERM Tools
Melting pot of sciences
Traditional statistical modelling misses causality

- **US Healthcare Death Spiral 1970s**: Stagflation lead to a feedback mechanism of anti-selective lapses, increasing premiums, increasing claims ratios and accelerating losses.

- **London Market Insurance Spiral 1980s**: London market player reinsured risks with each other leading to hidden concentration exposures and losses above those considered possible.

- **Global Banking Crisis of 2008**: Sub-prime losses lead to unexpected mark downs of structured credit. Banks are highly interconnected so losses are amplified and losses rise beyond levels considered possible.

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Using Bayesian Networks to check if Risk Appetite is met

- The Board expects to maintain sufficient capital during normal conditions to retain a AA rating
- Following a 1:25 year event, the Board expects to have sufficient capital to retain at least a BBB rating
- During normal conditions, the planned profit will be delivered
- Following a 1:19 year event, at least 75% of the planned profit will be delivered
- No appetite for regulatory censure or other significant reputational impact

The challenge is to observe the indicators and make regular assessments as to whether the risk appetite is being adhered to.
Using Bayesian Networks to help resource extraction planners

Experts say...
- We think production will be somewhere in the range $X \pm \epsilon$
- We think we can convert that to output of $Y \pm \epsilon$
- Price will probably be $Z \pm \epsilon$

Planners say ...
- Production is $X$
- Output is $Y$
- Price is $Z$

Joining them up...

Planners say... 80% chance profit will be lower.
ERM Tools → Anthropology

Classical View

- Methodological Individualism: Social science is best approached through the study of individuals.
- Methodological Collectivism / Holism: Social science is best approached through the study of groups and organisations.

Market Forces  →  Regulation
Business        →  Government
Individualism  →  Hierarchy
Personal Network  →  Position
P&L Impact Decides  →  Expertise Decides

ERM Tools → Anthropology

Cultural Theory

A good deal of social science looks to dualism between markets and hierarchies.

Leads to the idea that if the market and hierarchy can agree then a workable solution is found.

- Individualist (Profit Maximiser) Rationality
- Hierarchical (Conservator) Rationality
- Egalitarian (Risk Reward Manager) Rationality
- Fatlist (Pragmatist) Rationality

Mary Douglas was for many years the leading UK Social Anthropologist.
She disagreed and developed a Cultural Theory of Risk (now well established in Anthropology) that brings in two more rationalities. Former colleagues Michael Thompson takes this work forward.

Fatalists (passive – accepting of their fate)
Egalitarians (proactive but anti-hierarchy and anti-market).
To make this more concrete, Dave Ingram of the IAA worked with Michael Thompson to rekindle a agent based model based on Culture Theory of Risk. The model explores how different assumptions about the way the world is lead to business cycles and different philosophies dominating in different parts of the economic cycle.

Wilmott, The Surprise Game, Ingram and Thompson

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**ERM Tools → Anthropology**

The Surprise Game - Agent Based Model

<table>
<thead>
<tr>
<th>During the BOOM</th>
<th>During the BUST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes shift towards</td>
<td>Attitudes shift towards</td>
</tr>
<tr>
<td>Maximizer</td>
<td>Conservator</td>
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</tbody>
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<table>
<thead>
<tr>
<th>In UNCERTAIN times</th>
<th>In MODERATE times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes shift towards</td>
<td>Attitudes shift towards</td>
</tr>
<tr>
<td>Pragmatist</td>
<td>Manager</td>
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</tbody>
</table>

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**ERM Tools → Ecology**

Can we learn from the Adaptive Cycle?
ERM Tools → Ecology
Panarchy and the interaction of levels

ERM and the Profession
An Invitation

- ERM R&D Group Broad Church (2 REG Members)
- Lots of exciting things to investigate.
- Non-actuarial science highly applicable.
- New meetings to go to!

Ask not what your country can do for you but what you can do for your country.
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