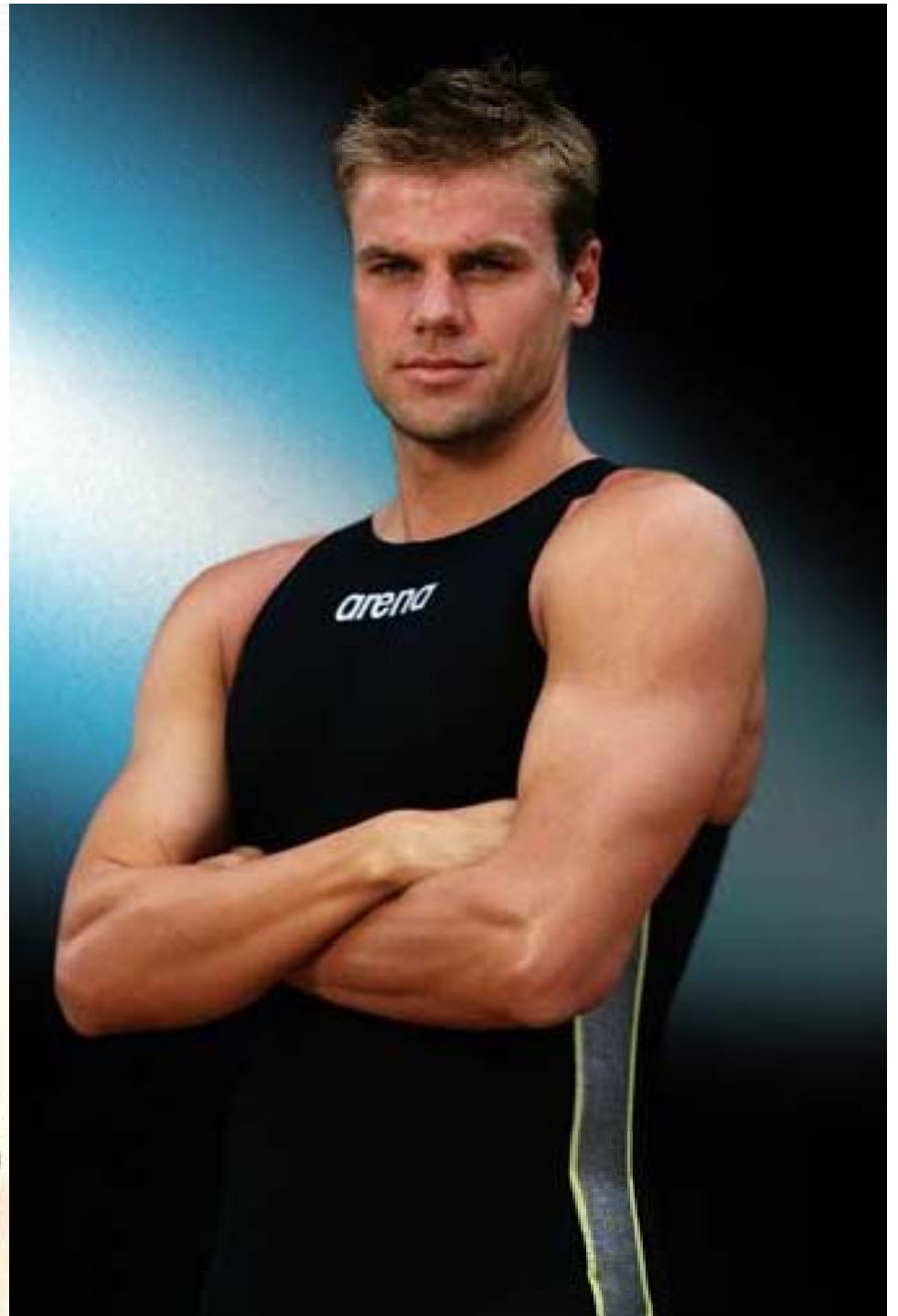# Internal Models – FSB feedback on on-site visits

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Financial Services Board

Agenda

1. Background

2. General features

3. Risks included

4. Use of models

5. Difficulties and problems identified

6. Lessons learnt

Agenda

7. Possible pitfalls

8. Differences between ST and LT

9. Requirements for a good model

10. Principles for approval

11. Way forward

Background

- On-site visits took place between August 2008 and February 2009

- On-site visit lasted (on average) one day – therefore only high-level "assessments" done

- Visited 9 insurers (Life: 3; Short-term: 4; Reinsurer: 2)

- All developing their model in-house

- Did not focus on results of model (i.e. is result higher/lower than current statutory requirement)

- This presentation focuses on life insurance, but some information on short-term insurance also included

General features

- Use commercially available software as basis

- Data

  - Model points
  - Grouped in a way that makes sense for the insurer

- Time horison – 1 year

- Risk measure – Var (although most test tVar also)

- Level of sufficiency – 99.5% (although some calculate other (higher) levels also)

- Risk appetite approved by Board - differs

General features

- Development started as far back as 2003

- Economic capital calculated typically twice a year

- All use SWAP curve for discounting

- Two insurers take account of new business (for differing time periods)

- Test model for sensitivity to different assumptions

- Stress testing done

- Allowance for management action

General features

- Time taken to produce results differ

- Generally 5000 simulations done

- Correlation still difficult (must be correlations in the tail)

  - Mostly correlation matrix

  - Based on historical data

  - Adjusted where necessary

- Generally more than one "model" exists which is then combined to get the final answer

Risks included

- Risk classification differs

- Nobody allows for liquidity risk, strategic risk and reputational risk in the model

- Operational risk not part of model but added in an approximate way

  - Risk register

  - Quantify scenarios

  - How to allow for correlation with other risks still difficult

Risks included

- Market risk (similarities)

  - Economic Scenario Generator: Same model used

  - Interest rate risk

  - Equity & property risks

  - Implied volatilities

- Market risk (differences)

  - Currency

  - Derivatives

  - Concentration

  - Inflation

Risks included

- Credit risk
    - Assets and reinsurance exposure
    - Credit spread
    - Default risk
    - Migration risk

- Insurance risk
    - Underwriting (mortality, morbidity etc)
   - Persistency
    - Expenses
    - Catastrophe events

Models currently used for

- Determining economic capital requirement

- Allocating capital to class of business / business units

- Determining investment / hedging strategy

- Remuneration / incentives

- Monitoring financial risk appetite

- Setting new business limits

- Determining expected return on capital per product

- Reinsurance programme (and pricing of reinsurance)

Difficulties identified

- Calculation complexity / nested stochastic runs

- Run-time and capacity (take practicality into account)

- Not enough data for long-term products (e.g. how to determine a yield curve for long durations)

- Tax – credit for losses incurred? (to what extent will losses be able to be offset against future profits?)

- Tax – reserves could decrease whilst capital increases, resulting in a large tax liability

- How to spread some of the risks (e.g. operational) or diversification effects back to business units?

1982
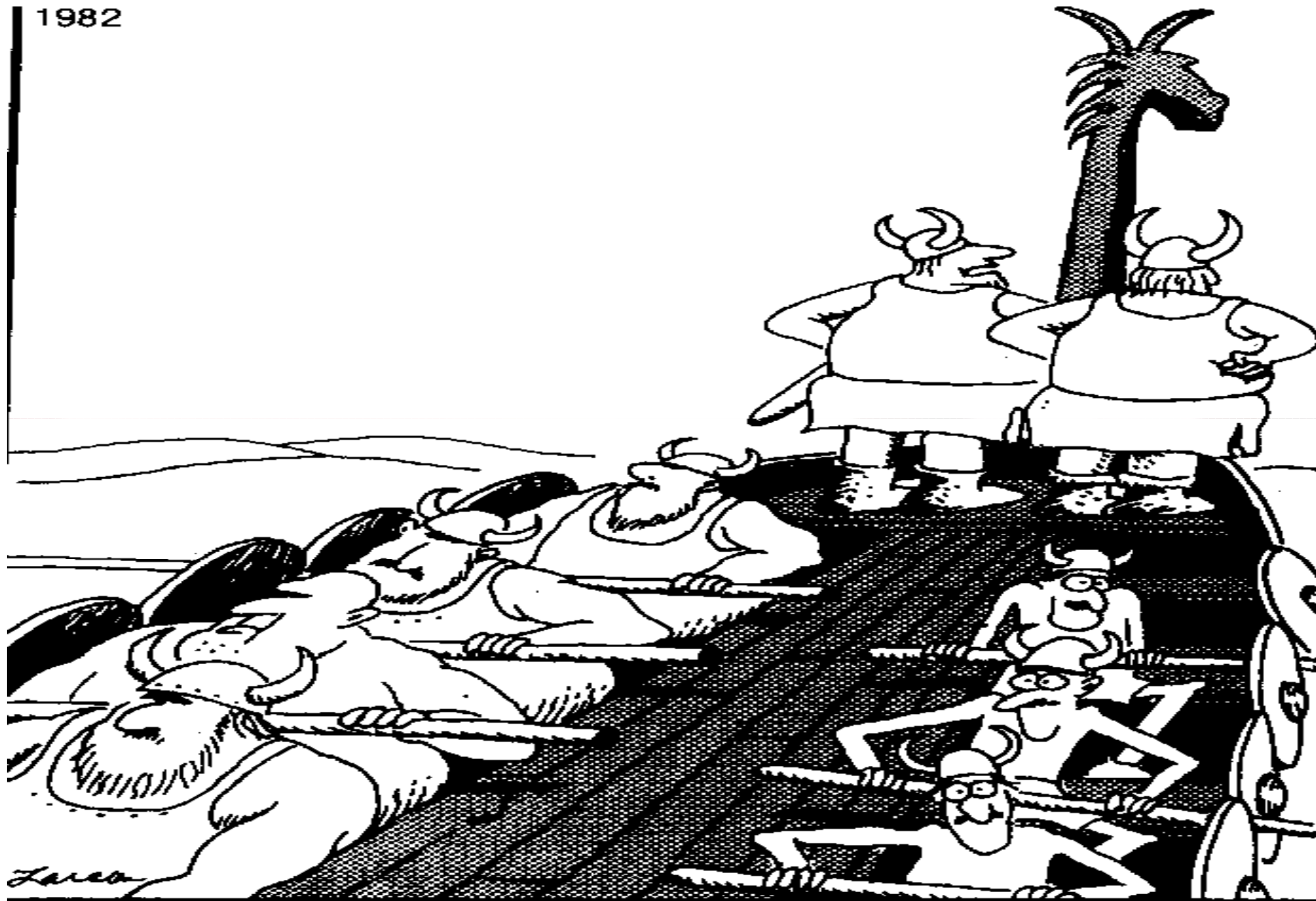
"I've got it, too, Omar. . . . a strange feeling like we've just been going in circles."

Difficulties identified

- Assume another shock after experiencing one?

- Risk event difficult to conceptualize

- Lack of suitable experience data / benchmark data

- Increased resource requirements

- Back-testing

Problems identified (FSB)

- Documentation

- Reliance on key people

- Some technical issues will need actuarial guidance

Lessons Learnt
(from the horses' mouths…)

- Buy-in from the executive management is crucial for the ultimate success of the model

- It takes a number of years' development before one is comfortable with the model and prepared to use it to take major decisions

- Need to have very good data

- The toughest parts were to gather the data, develop processes and communication

- Need to consult widely in the organisation

- Need dedicated resources and constant investigation

Lessons Learnt
(from the horses' mouths…)

- The mathematical side is relatively simple and well established, the actual day-to-day operation of the model is more difficult

- It may not be necessary to be able to do the calculations quickly – it is more important what you do to manage the risks (once you know what they are) in both normal and stressed circumstances

- Need to adjust "off-the-shelf products" for individual circumstances

Lessons Learnt
(from the horses' mouths…)

- The model must be based on sound assumptions that can be easily verified. The process to determine the assumptions must be sound

- The model must be used at the top level of the company (the Board and Exco must understand the model and its results) therefore constant communication in an understandable form is necessary

- Need to use judgement (common sense) as well, and not only use the results blindly

Quote of the day
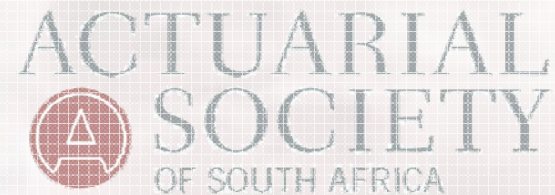
"One of the key lessons that the insurance industry can draw from the banking crisis is that having sophisticated tools to measure risk is not the same as managing it.

It is essential to understand that the measurement and management of risk are two different things and that they need to be done together.

It is all very well to have a fancy model that calculates value-at-risk using sophisticated techniques, but if you don't understand the risks underlying those numbers and don't think about the unthinkable – the market conditions that could kill your business – then it is a purely regulatory exercise."

Quoted from Life & Pensions (March 2009) page 32

Possible Pitfalls
(again, from the horses' mouths…)

- Trying to rush the model's development

- Trying to be too complicated initially – rather start simple and add additional functionality later on

- Using an immature model to make important decisions

- Lack of data

- Lack of skills

- Over-confidence of skills / Intellectual arrogance

- Lack of testing (need to make sure that the results make sense)

Differences between LT and ST

- ST determines insurance risk stochastically, whilst determining market risk (often) and operational risk (mostly) using other methods

- LT determines market risk stochastically whilst determining other risks using other methods (stress testing, deterministic formulae etc)

- Reinsurance and catastrophe cover much more important for ST than for LT (with associated credit risk on reinsurance)

Requirements for a good model

- Relevance

- Accuracy

- Completeness

- Reliability

- Robustness

- Sound assumptions

Principles for approval

- Use test

- Statistical quality test

- Calibration test

- Independent review

- Quality of data used

- Audit trail of changes / Analysis of change

- Inclusion of all risks

Are we there yet?

Way forward

- Feedback document with more detailed comparison

- Updated guidance on internal models (FSB)

- Continued liaison with insurers developing models

- Develop approval process

- Project to develop new solvency requirements for long-term insurers to start in 2009

- Project to research requirements on corporate governance to start in 2009

- Process to re-write both Long-term and Short-term Insurance Acts will start in 2010

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