What is DFA?

“A process for analysing the financial condition of an insurance enterprise, by calculating a company’s risk profile through introducing the uncertainties of the real world into the management process”

- *investigating risk using simulation*
Traditional Approach to Planning

- Looks at point estimates
- Scenario based only
- Tends not to be holistic in nature

Why Use DFA?

- DFA is a methodology which introduces the uncertainties of the real world into the management process
- DFA recognises the fact that in any given scenario a range of outcomes is possible
- Dynamic in sense of
  - Stochastic view of experience
  - Dynamic view of strategy

Output From a DFA Model

- Varies with nature of the problem
- For a particular business plan obtain a loss profile
- Need concept of risk (VAR or TVAR?)
- Risk – return measure (e.g. Efficient frontier)
- Optimal strategies based on risk measure
Efficient Frontier Analysis

- Classical efficient frontier techniques can be used
- Definition of risk needs to be determined
- Can assist in deciding business mix
- Every point is a strategy

How to Build a DFA Model: The Basic Building Block

Input
Marginal distributions
Correlation / Dependency structure
Deterministic inputs

Output
Simulated output variables with dependency structure

Example Underwriting Module

- Each module does not necessarily have only one output
- Enables accurate modelling of marginal distributions
- Dependencies between modules modelled in the higher module
- List of submodules is not necessarily complete
- Each module may represent a segment
Business Unit Example

- Modular approach enables replacement of modules as and when necessary
- All variables from within a module/sub-module may be made available to model dependency structures

High Level Models

- Global DFA Model
- Commercial Lines DFA Model
- Personal Lines DFA Model
- Other Business area DFA Model

Business Considerations in Model Design

- Business Volumes
  - Expenses
  - Operational infrastructure
  - Solvency and capital requirements
- Premium Income Levels
  - Competition
  - Insurance cycle
  - Pricing strategy
  - Business volume
- Extreme Events
  - Impacts losses
  - Operational infrastructure
  - Impacts prices
Business Considerations in Model Design

• Lines of Business
  - Behave differently
  - Different cycles
  - Different returns
  - Different risks

• Economic Factors
  - State of the economy
  - Inflation
  - Interest Rates
  - Stock Market
  - Litigiousness

Financial Management of your Business

• How do you decide which line of business to grow?
• How to you determine the optimal pricing strategy?
• How do you measure which strategy is best?
• How do you allow for uncertainty?
• How do you allow for correlations and dependencies?

The Insurance Cycle Building Block
Can the Cycle Be Predicted?

- Lines of business behave differently
- Competition and consolidation
- Information
- Technology
- Barriers to entry
Can the Cycle Be Predicted?

• Possibly over short term but uncertain
• Some lines more stable
• Impact of extreme events
• A range of future scenarios
• Could assign probabilities to scenarios

Building a Model to Manage Uncertainty

A Simple Example

• How does your future view of the cycle affect your capital requirements and the probability of ruin?

• How do you choose which line of business to grow?

Model Assumptions

• 2 classes: Motor and Property
• 1000 policies in each class initially
• Initial ave loss £1200 for Motor, £1800 for Property
• Claims frequency 20% for Motor, 15% for Property
• Ave loss ratio 99% for Motor, 98% for Property
• Property more volatile
Model Assumptions

- Initial premium approx £500,000 split — 50:50 motor/household
- Initial Capital £1,000,000
- Capitalised such that if growth is 5% per annum, the Board is happy with the level of risk
- Company follows premium levels set by the market
- Assume the company can meet its growth targets
- Simulate over two complete cycles
### Results from Different Growth Scenarios

<table>
<thead>
<tr>
<th>Motor Growth</th>
<th>Property Growth</th>
<th>Expected Profit</th>
<th>Extra Capital Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>5%</td>
<td>10%</td>
<td>£0.4m</td>
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<tr>
<td>10%</td>
<td>10%</td>
<td>35%</td>
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<tr>
<td>20%</td>
<td>0%</td>
<td>0%</td>
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</tr>
<tr>
<td>0%</td>
<td>20%</td>
<td>50%</td>
<td></td>
</tr>
</tbody>
</table>

* to maintain risk level

### Business Planning Model