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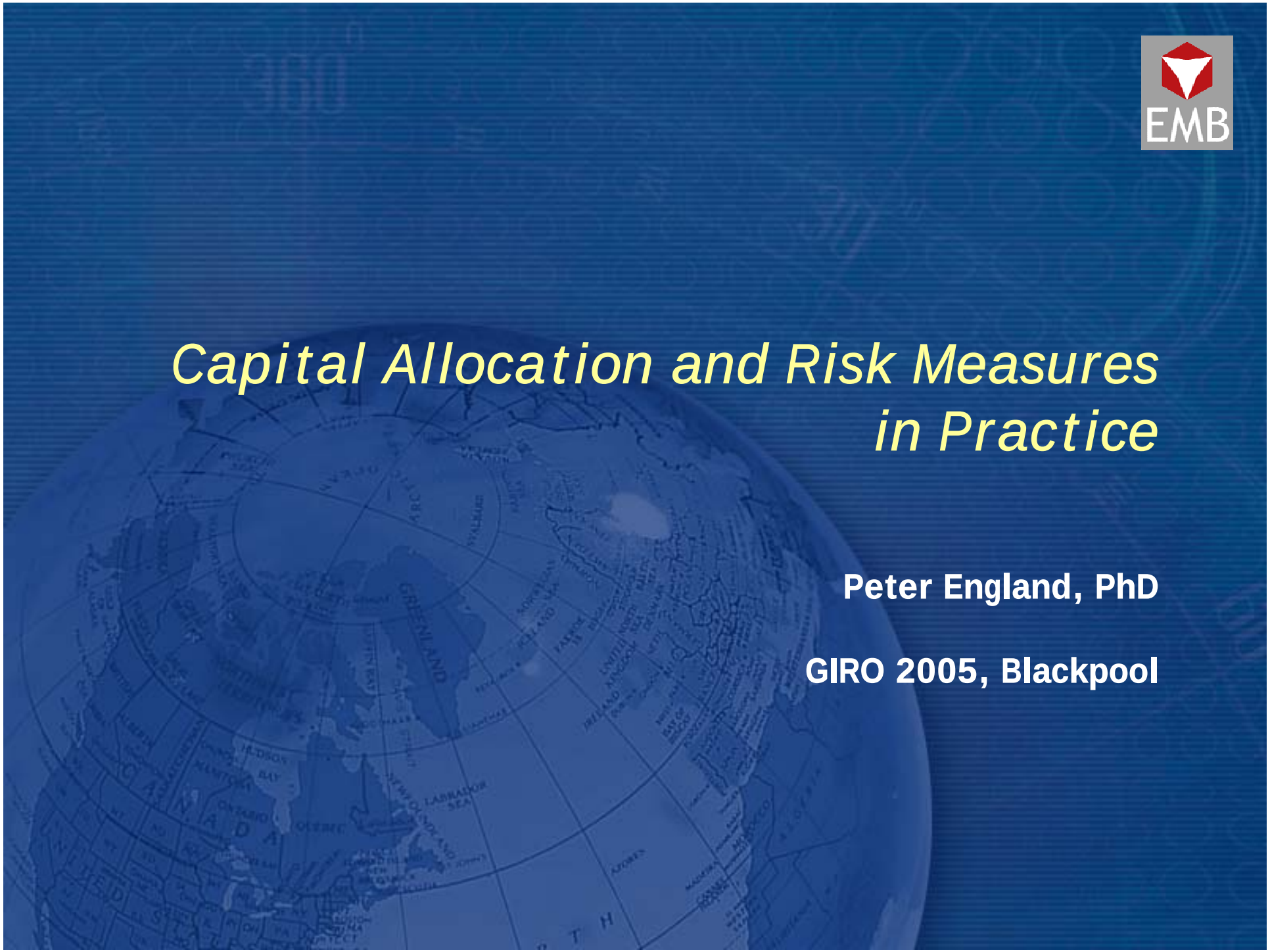

Capital Allocation and Risk Measures in Practice

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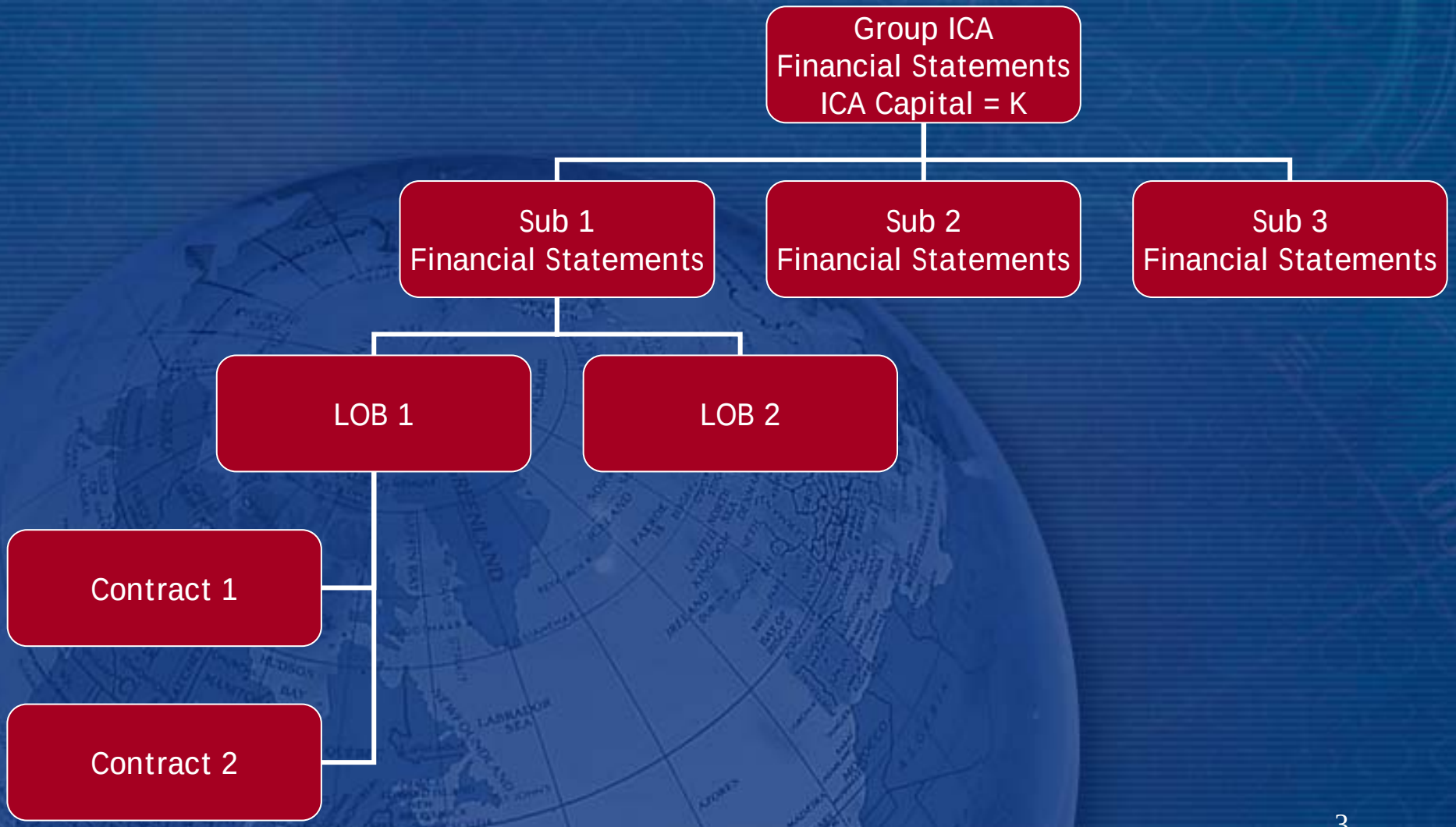
GIRO 2005, Blackpool

So you've got an ICA model…



Why Bother?

- An ICA model is useful for satisfying regulators, but should also be used in running the business
  - Reinsurance "optimisation"
  - Strategic decision making
  - Risk management
  - Performance measurement
  - Pricing
- Capital allocation can help, but…

Capital Allocation Methods

- Myers-Read
- Shapley
- Auman-Shapley
- “Covariance” method
- VaR methods
- Concentration charge
- Expected default methods
- “Coherent” allocation
- Proportional cover
- and so on …

Allocation to what?

- Subsidiaries
- Lines of business
- Distribution channels
- Reinsurance contracts
- Insureds (where cross-subsidies apply)
- Individual contracts
- Underwriting years
- Risk types
  - Market, Insurance (Reserve/Underwriting), Operational, Credit, Liquidity

Capital Allocation Methods

- Which capital allocation method should be used?

- Different capital allocation methods will give different allocations
- Different methodologies will have different characteristics
  - For example, negative allocations?
- Different capital allocation methods might be suitable for different purposes

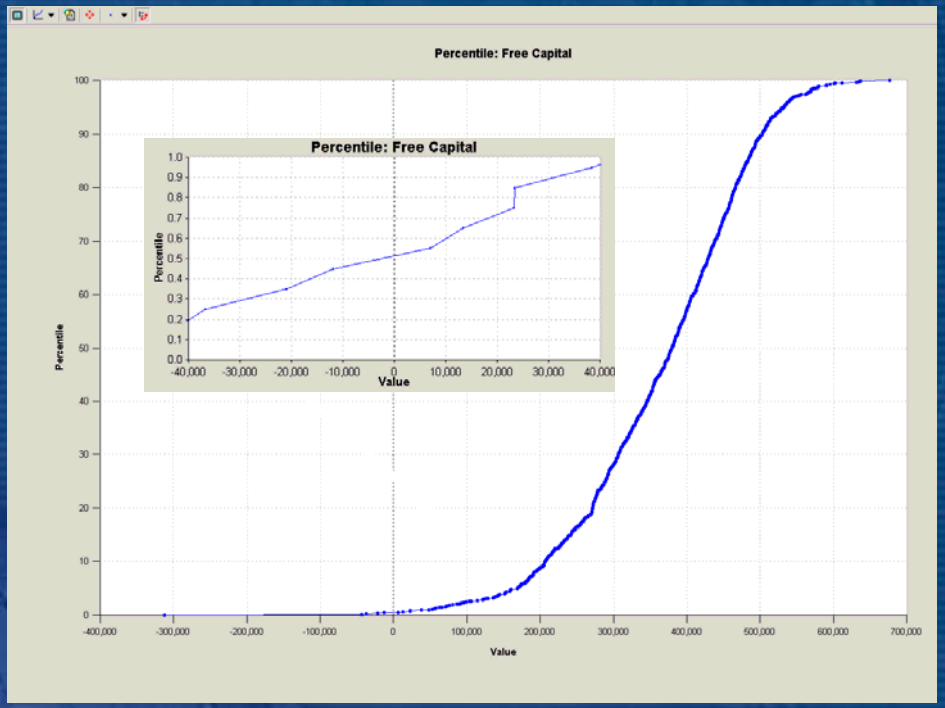
Desirable characteristics?

- Automatically adds up to ICA capital?
  - (or forced to add up to ICA capital?)
- One method for all purposes?
- Stable over time?
- Local allocation unaffected by other regions/business areas?
- Negative allocations?
- Understandable?
- Capable of being communicated?
- Magnitude of diversification benefit can be identified?
- NOT ALL OF THE ABOVE ARE POSSIBLE/MAKE SENSE!

Perspective?

- Policyholder/Regulator
  - Interested in extremes that threaten ability to pay claims
  - Risk management perspective
- Shareholder perspective
  - Interested in return on capital invested (and its stability), hence optimal business plan
  - Potentially not interested in extremes beyond ruin
  - Performance measurement perspective
- Manager perspective
  - Requires a sound basis for risk loading in pricing
  - Interested in his/her bonus and job security
  - Wants to demonstrate excellent expected return on capital
  - Pricing/performance measurement perspectives

ICA Modelling



- Capital setting requires
  - A risk profile
  - A risk measure
  - A risk tolerance criterion
- Examples
  - Distribution of Net Assets at some time horizon *t*
  - Value-at-Risk (Percentile)
  - 99.5% probability of Assets exceeding Liabilities at time *t*
  - Distribution of Ultimate Net Discounted Profit (Loss)
  - Expected Loss Cost per unit premium/reserve
  - 0.000332

Capital Allocation

- Requires local risk profiles
  - Risk profiles by subsidiary, portfolio, contract, risk type etc
- Should be consistent with “global” risk profile if allocation is automatically additive
- That is, local risk profiles should add up to the global risk profile
  - Requires thought with multi-period models
  - Challenging when considering portfolio, contract and risk type allocation
- Usually based on a “loss” profile, that is,
  loss = -profit
- Must not be confused with “claims”

Risk Profile

- If Distribution of Net Assets at *t* is used as a risk profile for setting capital:
  - Net Assets at *t* = Net Assets at *t-1* + Retained Earnings in Period
  - Calculate contribution to Retained Earnings from each "unit"
  - Use cumulative contribution for multi-period models
  - Gives a distribution of "profit" for each unit that is consistent with the ICA basis
- Issues associated with discounting (from *t* to 0), and Economic Net Assets need to be considered

Allocation in Practice

- Aim for consistency in Risk Profile?
  - ICA: Distribution of economic net assets at *t* ?
  - Allocation: "Centred" distribution of ultimate net discounted claims by line of business ?
- Risk measure used for ICA does not have to be used for allocation
  - ICA: VaR at risk tolerance *alpha*
  - Allocation 1: TVaR using "coherent allocation" at risk tolerance *beta*
  - Allocation 2: Standalone TVaR at risk tolerance *beta* such that aggregate capital equals ICA capital
  - (Find *beta* using a search algorithm)

Choice of Risk Measure?

- Many to choose from
- VaR considers a single simulation
- TVaR considers simulations in the tail only
- Some risk measures use all simulations, while still being "coherent"
  - Proportional hazards transform
  - Esscher transform
  - Wang/Valdez transforms
- Given Risk Profile and Risk Measure, allocation is a mechanical process

Capital Allocation

ICA Capital = K

Capital allocated to "unit" $i, j, k = \kappa_{ijk}$

Allocate capital such that $\sum_i \sum_j \sum_k \kappa_{ijk} = K$

The capital allocation method either does this automatically, or a proportional allocation is applied.

For example, if allocation gives $\sum_i \sum_j \sum_k \kappa'_{ijk} = C$

$\kappa_{ijk} = \frac{K}{C} \kappa'_{ijk}$ such that $\sum_i \sum_j \sum_k \kappa_{ijk} = K$

This secondary allocation is usually a bad idea, since anything goes!

Igloo “Generic Model” Demo

Diversification Benefit?

- If ICA is calculated using $\rho_\alpha(S)$ with $S = s_1 + s_2 + \cdots + s_n$
- Find $\rho_\alpha(s_i)$ $\sum_{i=1}^{n} \rho_\alpha(s_i) \neq \rho_\alpha(S)$
- Then apply allocation
  - For example, find beta such that $\sum_{i=1}^{n} \rho_\beta(s_i) = \rho_\alpha(S)$
- Diversification benefit $\rho_\alpha(s_i) - \rho_\beta(s_i)$
  - Standalone capital less allocated capital

Challenges?

- Consistency with an ICA model
- Suitable definition of “risk profile” for allocation to risk type
- Capital allocation with a multi-period model
- Allocating “economic capital”
- Treatment of investment income
- Currency issues

Additional Considerations

Setting Global Performance Targets

- Calculate global capital requirements (ICA) given business plan
- Allocate capital to classes of business to take account of risk
  - Riskier classes require more capital
- Set target Return on Capital requirements
  - Can be the same for all classes
- Manage the business "locally" subject to targets

- Ensures "consistency"?

Setting Global Performance Targets

- Allocation in one class affected by performance/plans in another
- Capital requirements/allocation for new underwriting also affected by reserving risk on prior business
- Requires iteration (global capital and allocation conditional on plan assumptions – plan might need to change given target return)
- Higher global capital requirements in a soft market?
  - This would require higher prices and eliminate the cycle?
- Price setter or price taker?
- Historic performance measurement against target?

Capital Allocation for Pricing

- The problem: pricing consistently for risk in a competitive environment
- Customer has the choice of self-insuring, or transferring the risk to an insurance company
- There is a trade-off between the customer's "capital" and the capital allocated by the insurance company
- The customer's "capital" could be seen as the "standalone" capital – the capital allocated by the insurance company should be less
- Premium = Expected Claims + Expenses + Cost of Capital% * Capital charge
- Premium = Expected Claims + Expenses + Target ROC% * Capital charge
- Capital charge must take account of lifetime of the liabilities
- Market premium also takes account of competitive forces

Capital Allocation for Risk Management

- Need to identify drivers of risk to financial stability
- That is, which business areas cause extreme stress to the Balance Sheet?
- Capital allocation according to “tail” risk can help identify where risk mitigation and transfer will be most effective
- Lines of business that are profitable when the global position is under stress will attract a low (or negative allocation)
- Effective reinsurance contracts would be expected to attract a negative capital allocation (reflecting the trade-off between reinsurance and capital).