4th Webinar on Life Insurance
Institute of Actuaries of India
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ALM Modeling – Global View

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Agenda

1. Why ALM
2. What is ALM
3. ALM use cases

Deterministic Modelling

- Characteristics
  - Single set of assumptions → single cash flow (reserve) calculation
  - Good for where liabilities are not sensitive to assumptions
  - For example, fixed benefit products such as term assurance

- Benefits
  - Quick to run
  - Easy to understand

- Limitation
  - Sensitivity to assumptions is unknown

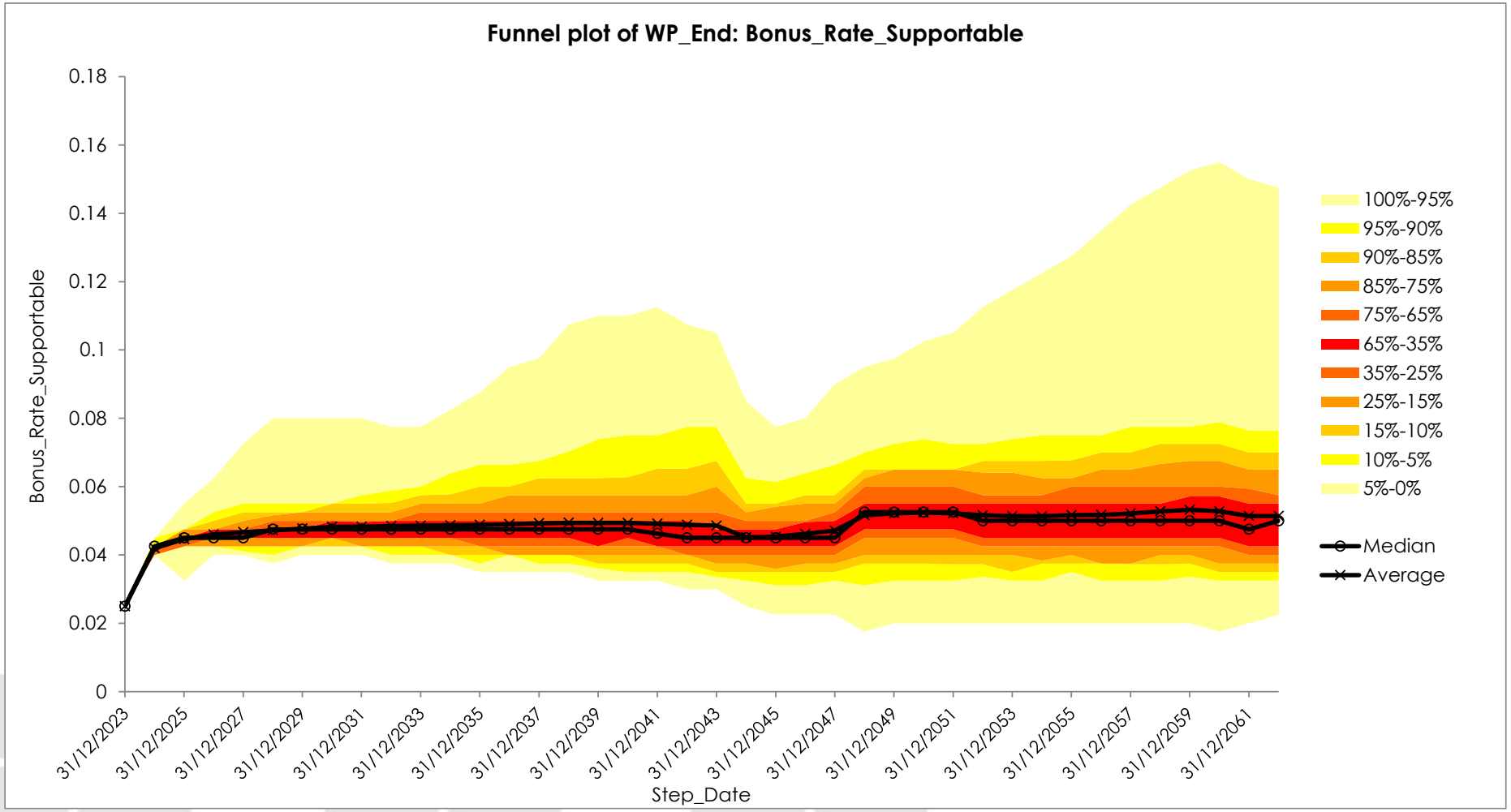
Stochastic Modelling

- Characteristics
  - Multiple definitions of some assumptions → multiple cash flow calculations
  - Stochastic assumptions are usually investment related but can be demographic
  - Good for where liabilities are sensitive to assumptions
  - For example, products with profit sharing benefits or investment links, and especially so if product also has guarantees
  - Model result is usually *average* of results by scenario, but may also use VaR, etc

- Benefits
  - Captures distribution of outcomes
  - Calculates cost of options and guarantees not possible with deterministic calc

- Limitation
  - Slow to run, hardware demands
  - Need to create stochastic scenarios
  - Tendency for spurious accuracy

Example Distribution Output



Terminology

Scenarios	Sensitivities
Or 'Path' Variations of assumptions within a stochastic run.	Changes to assumptions to investigate the *sensitivity* of model result to that assumption (or assumptions).
For example, a base (best estimate run) may use 1000 *scenarios* for discount rate.	For example, if inflation rate increased by 5%.
Note that all scenarios would be 'calibrated' to the base position	Stochastic model would still include scenarios, but all scenarios would now be calibrated to this sensitivity position

- Be careful - the definitions of these terms are often swapped
- In particular use of 'scenario' to refer to 'scenario analysis' i.e. 'sensitivities'

Why ALM: Guarantees

- Example product
  - Product with min death benefit of 1000
  - Product with account value linked to investment return

- Expected guarantee cost
  - Account value at t0 = 1050
  - At t1:

Investment Return	Account Value	Guarantee Cost
-5.00%	997.50	2.50
0.00%	1050.00	0.00
5.00%	1102.50	0.00

- **Costs are asymmetric**

Why ALM: Profit Sharing Bonuses

- Example product
  - Product with initial guaranteed benefit of 1000
  - Guaranteed benefit increased by discretionary bonus rate r% each year

- To project benefits, must determine r_t% for each future t
- Logically r% must be linked to investment returns and company profits
- So need to model the assets → calculate investment return → determine (supportable bonus rate) r_t%
- Project liabilities using supportable rates r_t% and discount
- **Highly sensitive to investment returns so must be done stochastically**

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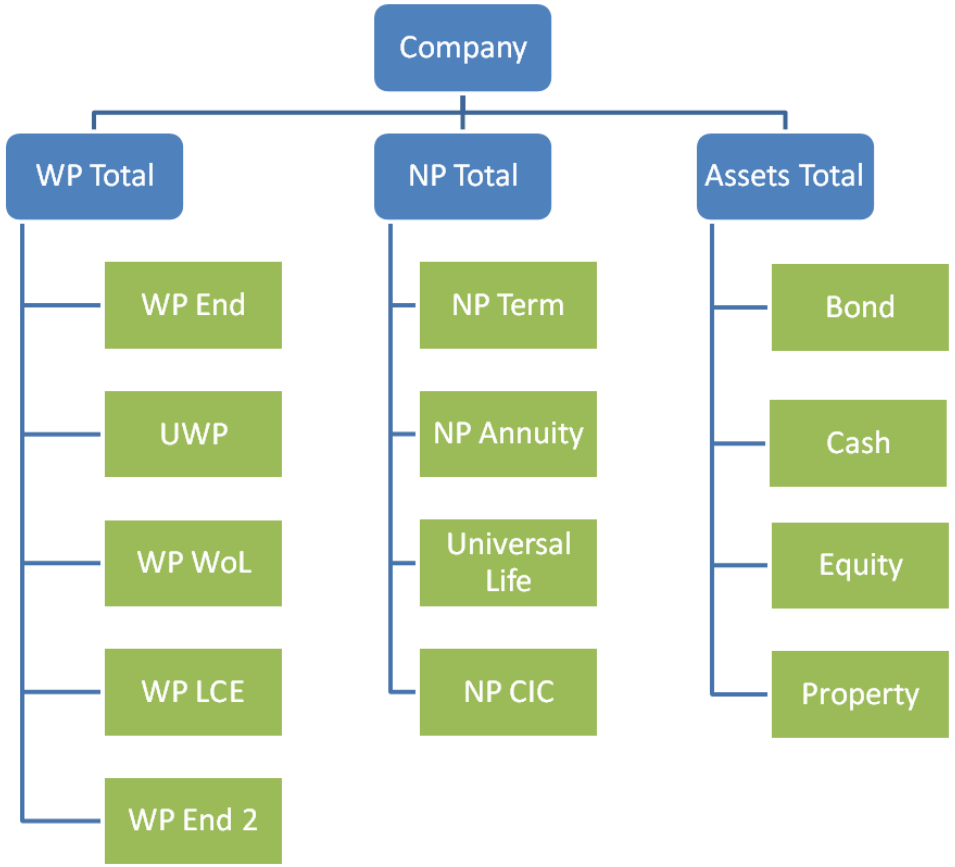
What is ALM

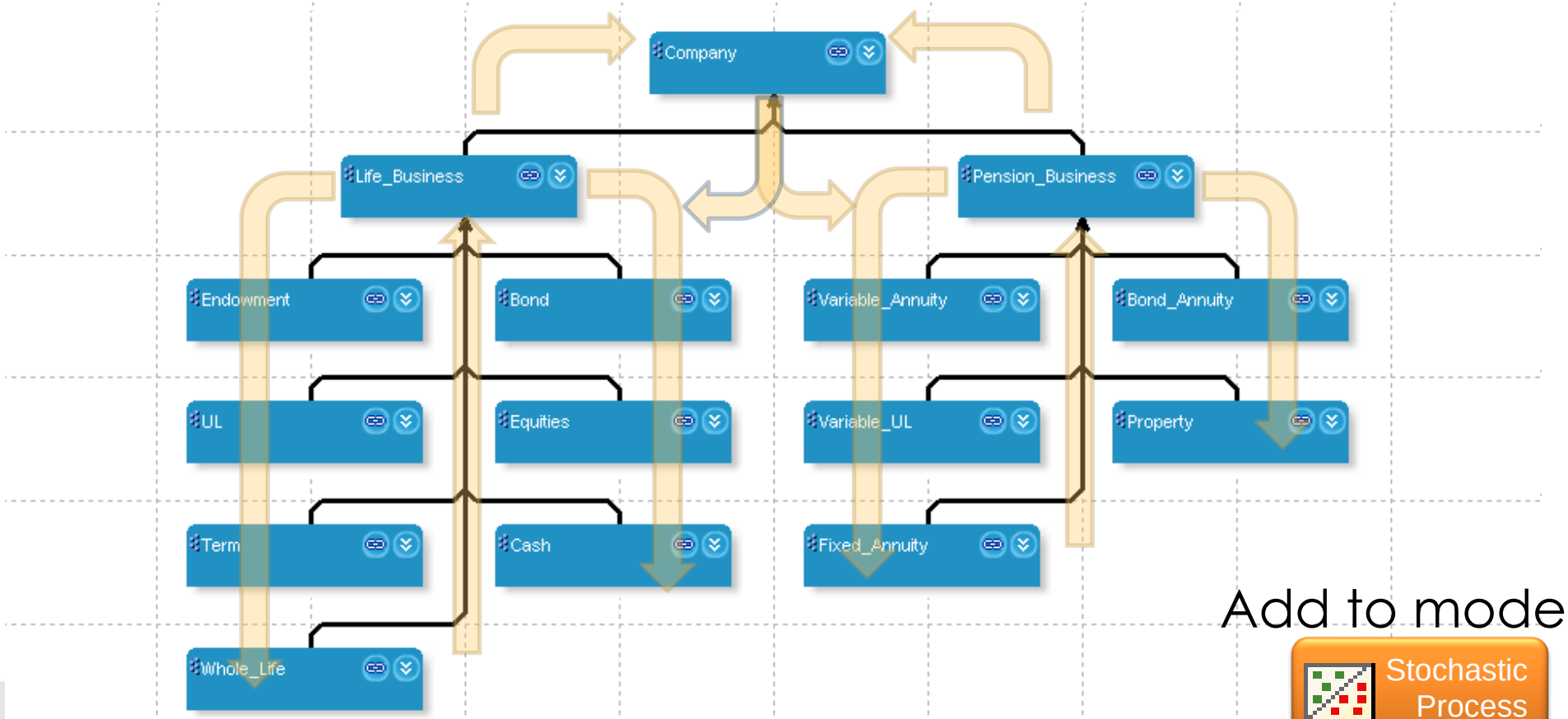


- Company has profit sharing (WP) and fixed benefit (NP) products
- Profit sharing products require stochastic modelling
- Side-by-side project the assets and liabilities
- Aggregate results to perform ‘management actions’
- Repeat for each projection step
- Repeat this whole projection across hundreds / thousands / tens-thousand of scenarios

What is ALM: Management Actions

- Calculations that make model dynamic – path dependent
- Reflect ‘real life’ actions of the company (or policy holders)
- For example:
  - **Supportable bonus rates**
    - As previously covered
  - **Policyholder lapse rates**
    - Awareness of their guarantees moneyness and timing
  - **Asset investments**
    - May be simple or complex
    - Simple: order to invest/disinvest net cash flow over each step
    - Complex: in scenarios where solvency is good invest in riskier assets, conversely when solvency is less good invest in more conservative assets

ALM Process In R³S Modeler



Add to model:

Stochastic Process

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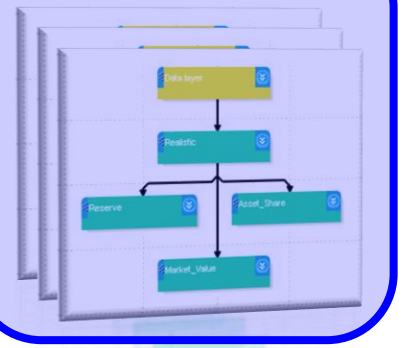
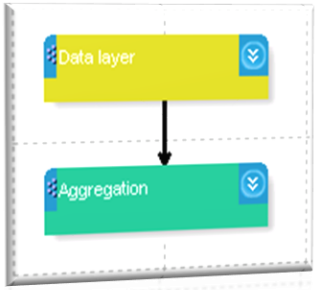
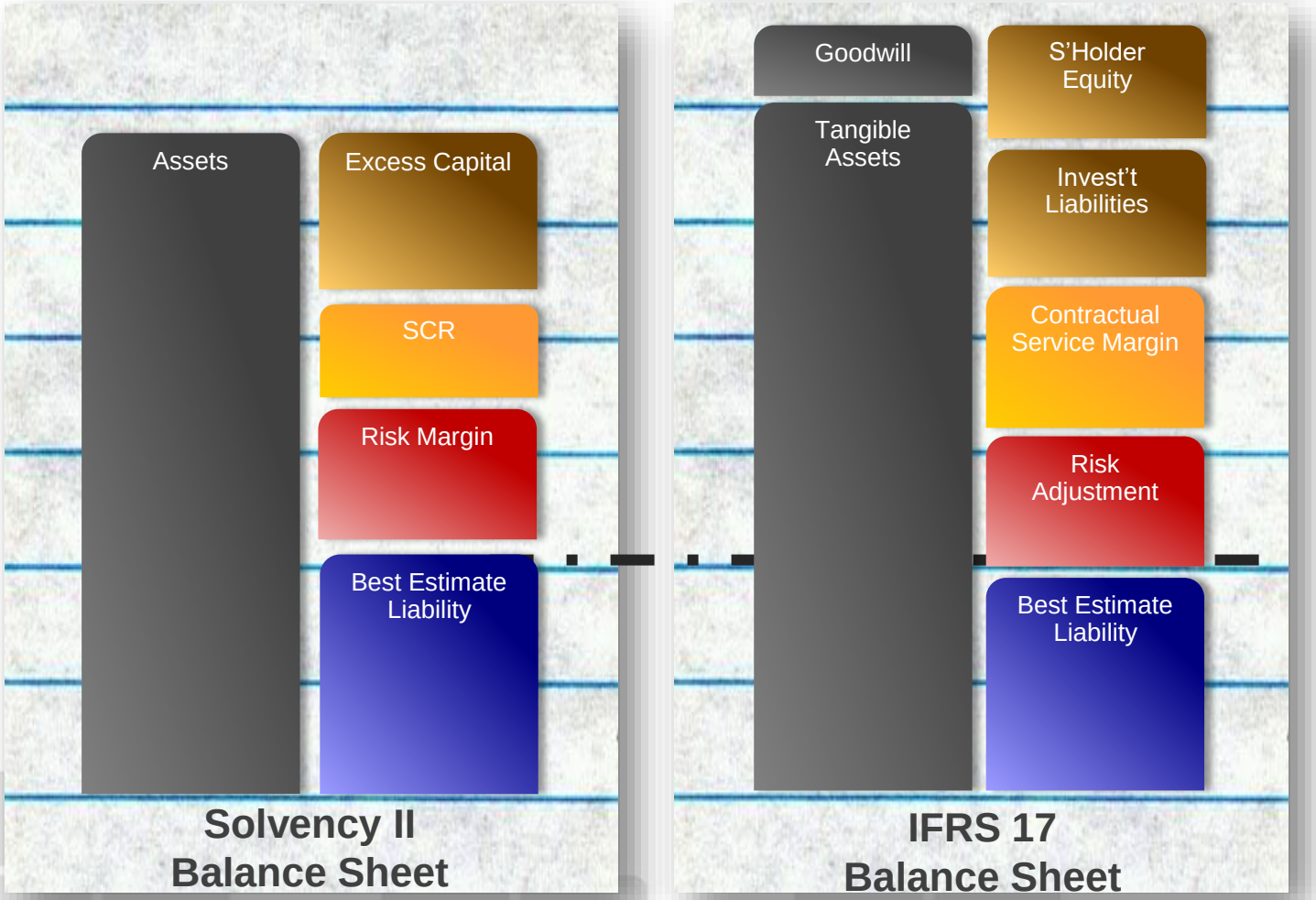
ALM use cases

- Regulatory
  - Realistic / best-estimate reporting
  - Solvency II / ICS
  - IFRS 17
- Internal management information
  - Solvency information
  - Testing different asset investment strategies
  - Balance sheet projections
  - VaR, proxy models

SII Standard Formula Model - Process

1	2	3	4
Input Data	**Company Batch**	**R³S SII Aggregation Model**	**Output Reports**
Liabilities			SII QRT Reports
Assets	• Companies Liabilities • Companies Assets • Stochastic ALM • Decision Rules	• Data input via ODBC • R³S Workspaces/ other tools	
Finance	• Batched Stressed Runs	• NAV & δNAV Calc • Correlation Matrixes • Op Risk & Adjustment	Business Reporting
Sales	• Results Workspaces	• BSCR & SCR • MCR & Risk Margin	
Assumptions			
ESG			

IFRS 17 vs Solvency II Balance Sheet

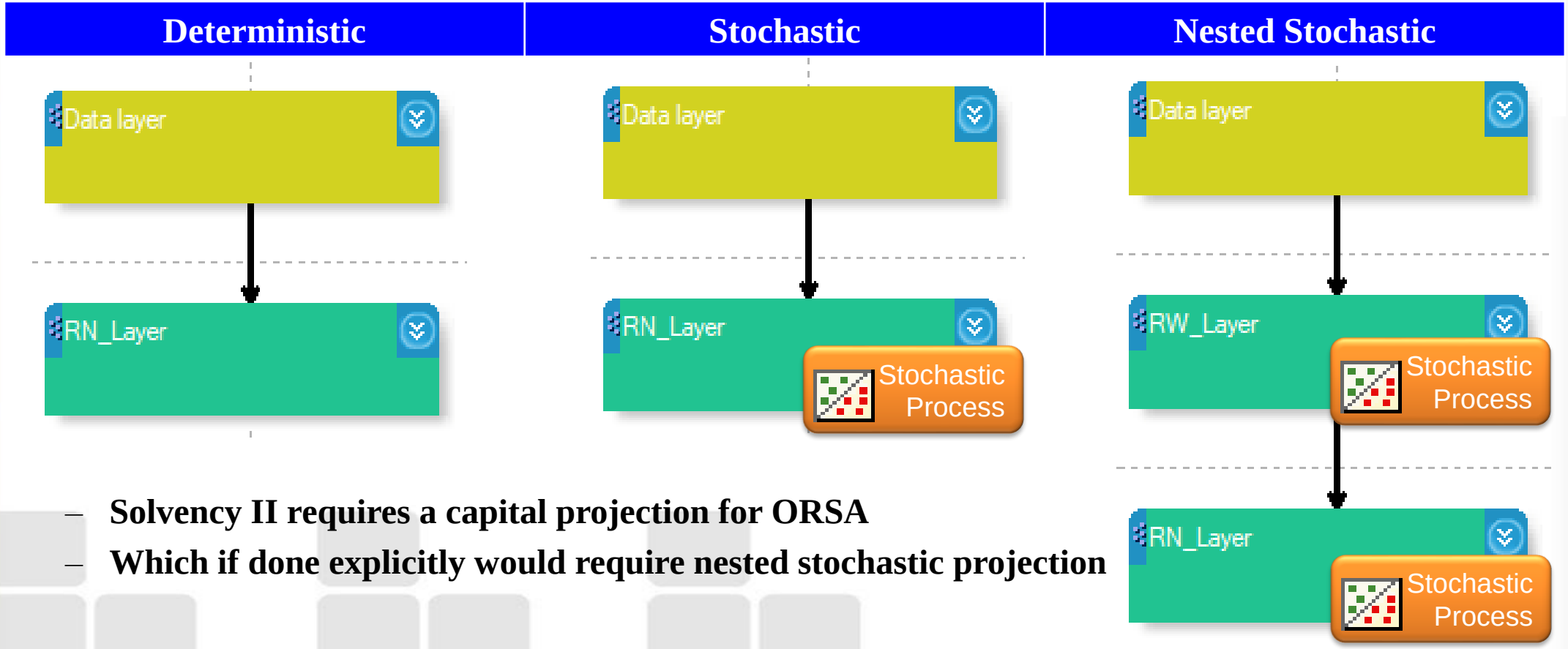


NB: IFRS 17 only applies to insurance contracts, not investment

Best estimate liability not necessarily the same (not least because IFRS 17 excludes investment contracts) but also different definitions of risk free rate → different economic scenarios

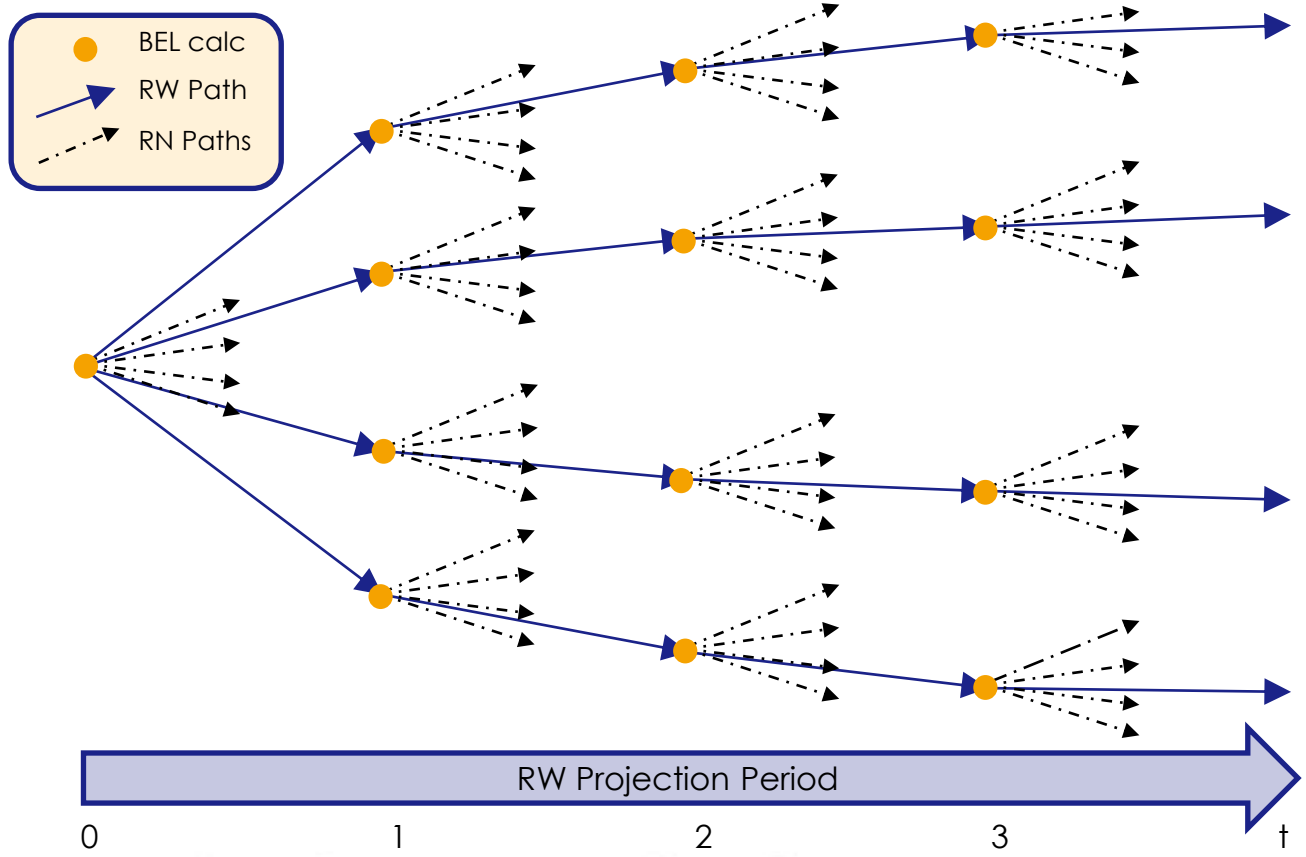
Further Use Cases

- Deterministic → Stochastic → Nested Stochastic



  - **Solvency II requires a capital projection for ORSA**
  - **Which if done explicitly would require nested stochastic projection**

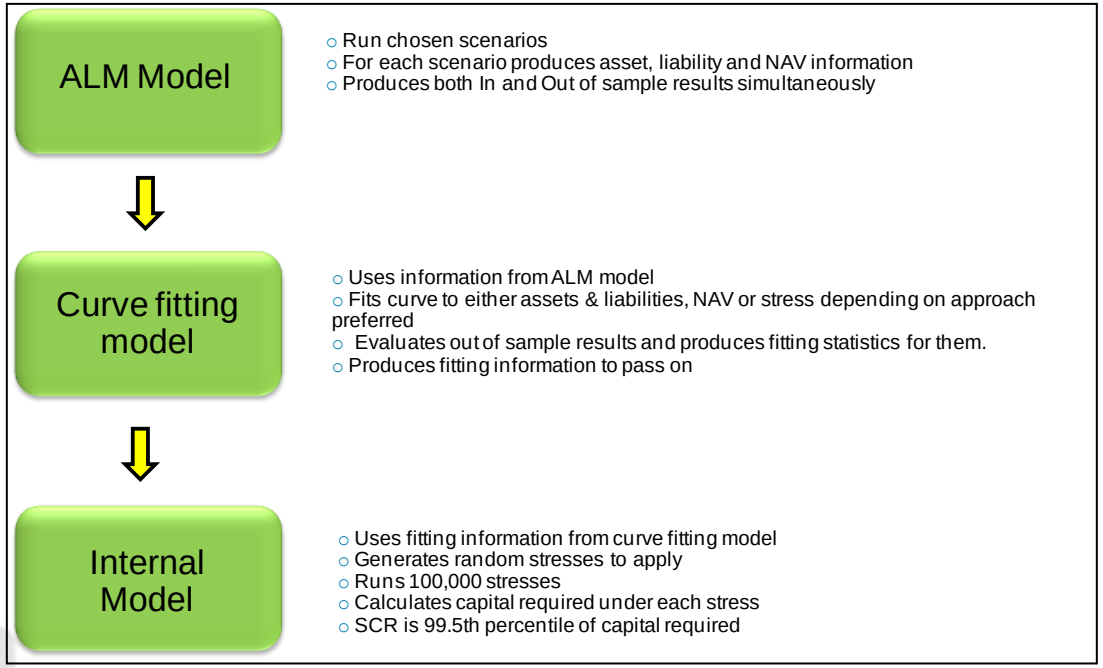
Nested Stochastic Projection



Proxy / Lite Models

- Quick to run proxies, for regular updates of solvency etc
- For example:
  - Curve fitting
  - Least Squares Monte Carlo fitting
  - Driver based
- Calibrated to stochastic or nested stochastic model result

- Curve fitting example process in R³S Modeler for Solvency II



Thank You