Moody's
INVESTORS SERVICE

MA/ERS Market Drivers & Decision Kaking

Brian Heale – Senior Director – Business Development
Lenka Szonyiova - Account Director

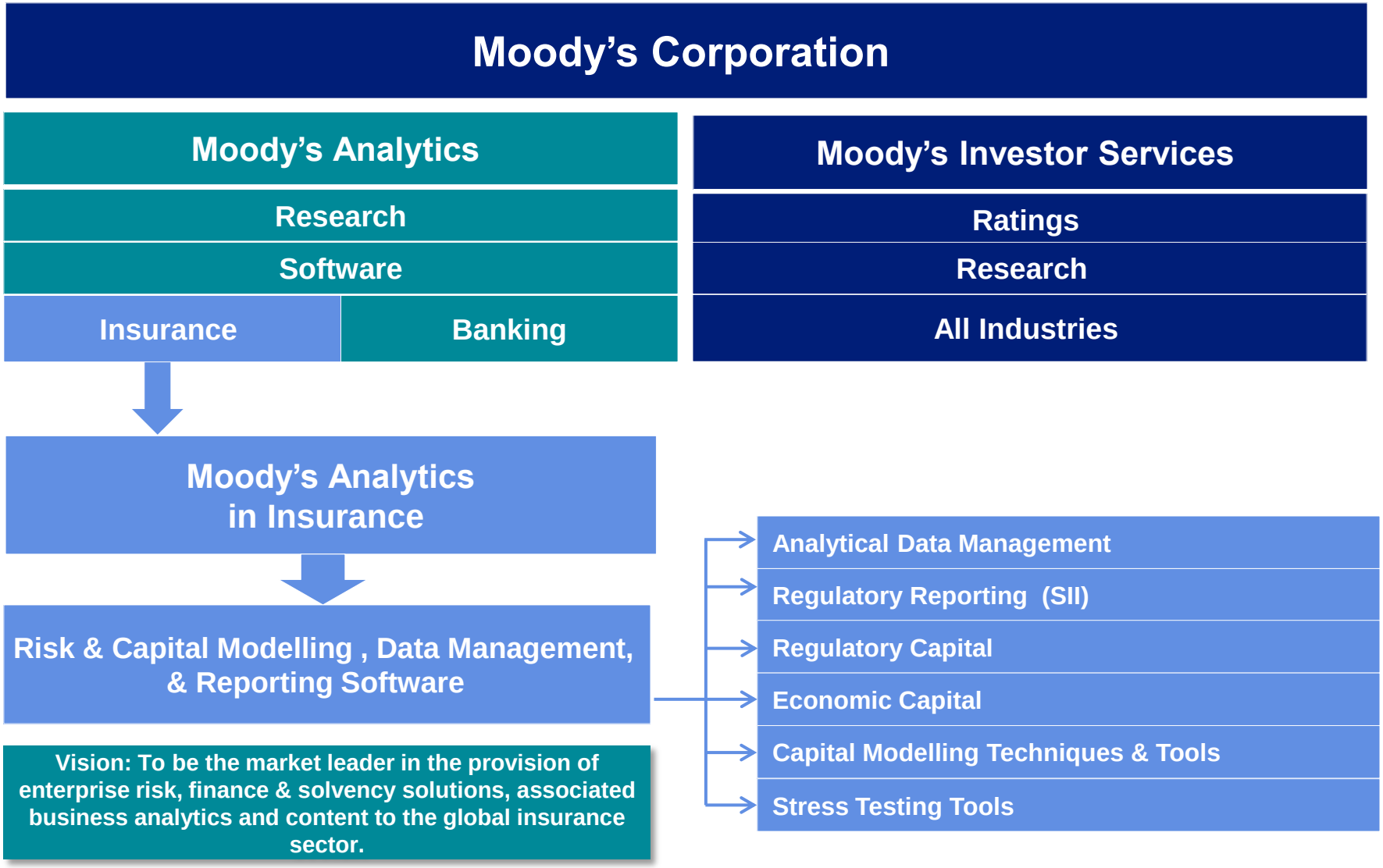
Session I

Moody's Analytics

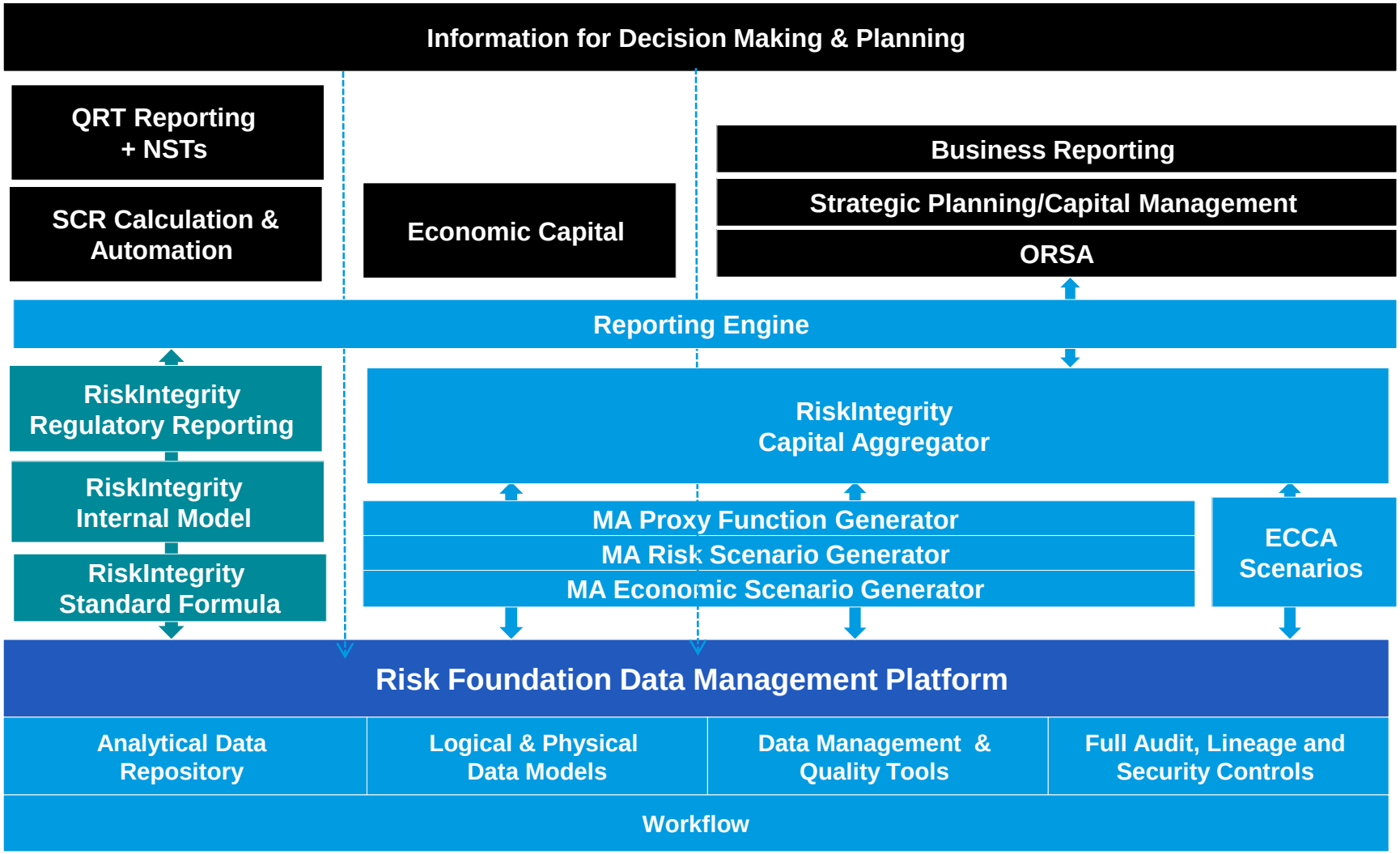
Enterprise Risk Solutions

Research and client-led Risk Management Solutions

Moody's Analytics in Insurance



Moody's Analytics – Overall Insurance Solution Set



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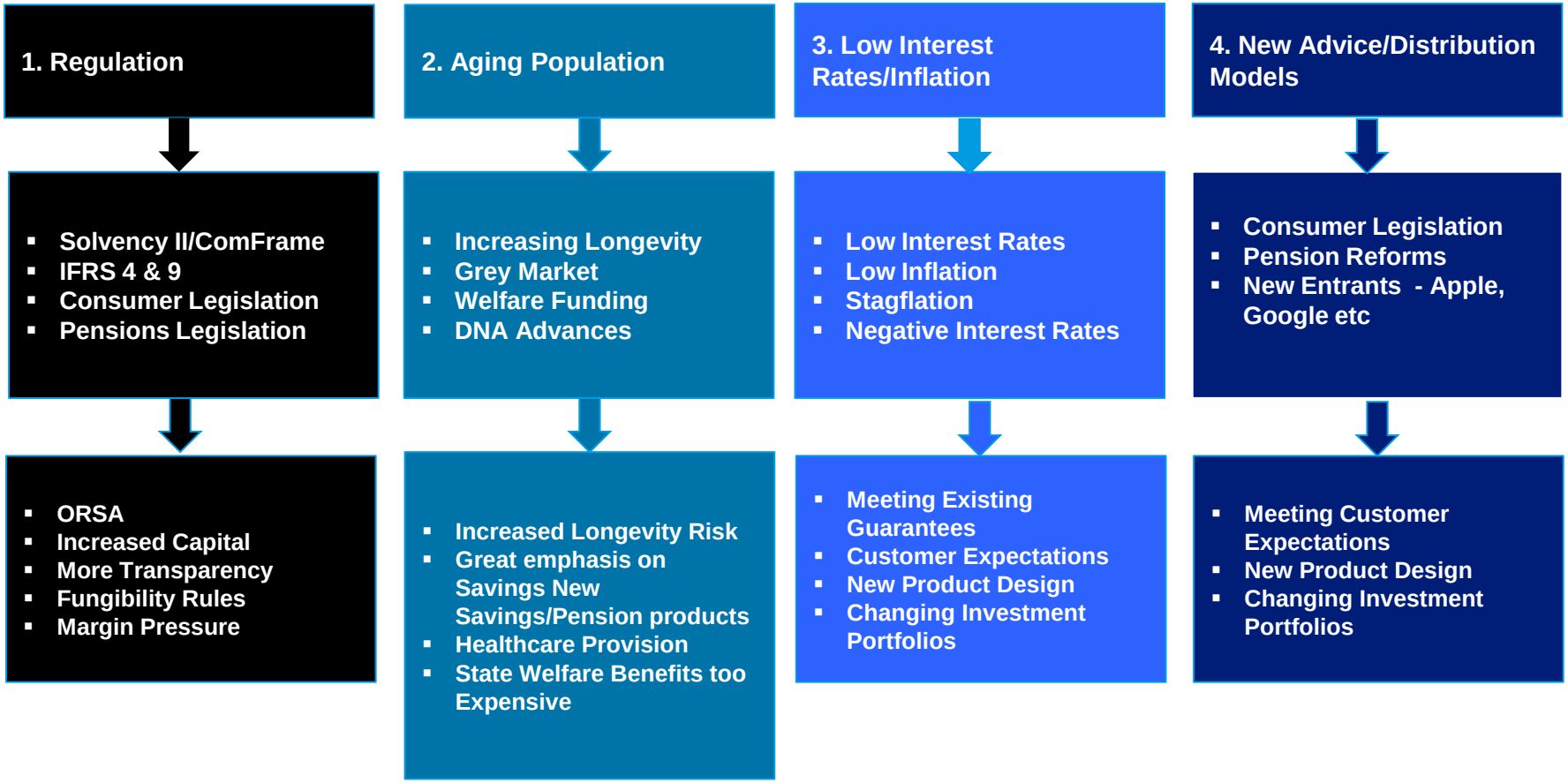
Market Drivers in Europe

Drivers

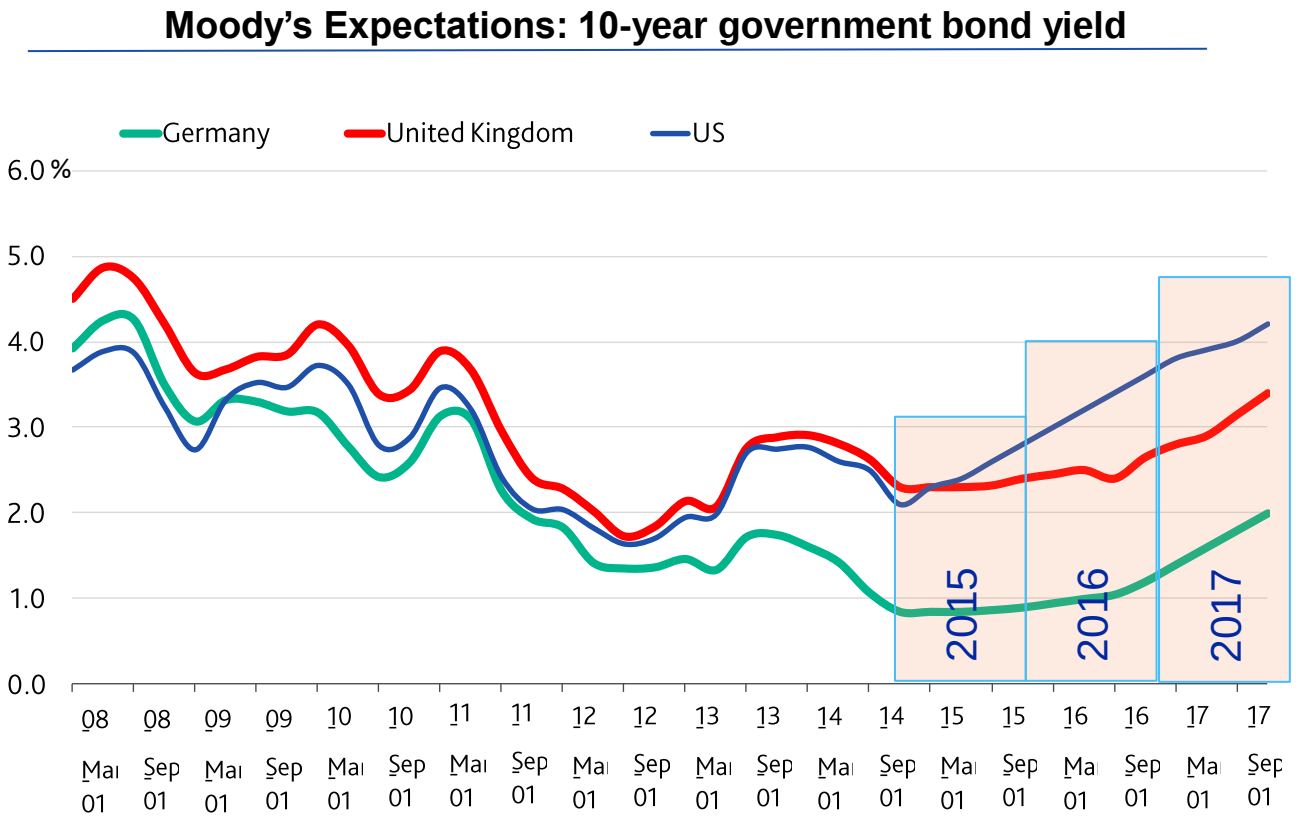
A combination of four factors is causing insurers to review and change their existing business models



Market Demands – What's Hot?

1. Solvency II - Automation of Processes – Hard Close
2. ORSA – Balance Sheet Projection
3. Continuous Solvency Monitoring
4. Stress/Scenario Testing – Business Decision Making (What-If Analyses)
5. Gap Analyses – IFRS 4/9 Projects

Interest Rates: Low and Expected to Rise only Slowly in Europe

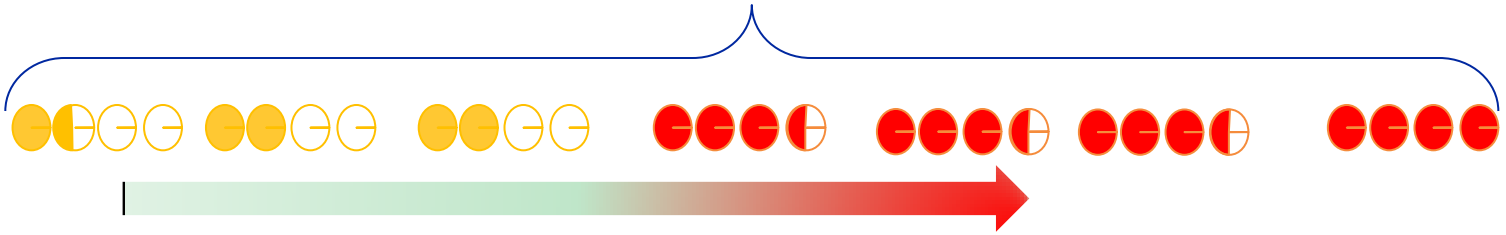


Interest Rates Will Remain Low by Historical Standards, and Expected to Rise Only Gradually in 2015-2016 in Europe, with Signs of Divergence by Geography

Sources: U.S. Board of Governors of the Federal Reserve System (FRB); International Monetary Fund (IMF); Bank of England (BoE), Moody's Analytics Forecast; Moody's Investors Service

European Insurers Are Not Equally Exposed to Low Interest Rates

Life	UK	France	Italy	Switzerland	Germany	Norway [4]	Netherlands
Guaranteed products as % technical reserves [1]	~32%	~84%	~77%	~94%	~92%	~75%	~63%
Average portfolio guarantee rate [2]	~0% [3]	~1%	~2 - 3%	~2 - 3%	~3 - 4%	~3 - 4%	~3 - 4%
Average new business guarantee rate	~0% [3]	~0%	~1.5%	1.5%	~1.25% (in 2015)	~2%	~0-2.5%
Moody's view on the ability to share losses	Very High	High	Medium - High	Medium	Medium	Medium	Low
Overall risk of guaranteed products							



Source: Moody's

[1] Figures for all countries are year-end 2012 non-linked gross technical provisions as a percent of total technical provisions. The exception is Switzerland, for which figures are a percent of total gross mathematical provisions. Sources: EIOPA Statistics, Finma and Moody's calculcations

[2] Aegon, Axa, Assicurazioni Generali, Munich Reinsurance Company, Unipol Gruppo Finanziario S.p.A., Zurich Insurance Company Limited, Gernd, European Insurance and Occupational Pensions Authority, Associazione Nazionale fra le Imprese Assicuratrici, De NederLandsche Bank and Moody's.

[3] In relation to with-profits savings products

[4] In relation to defined benefit products only

Detailed assessment of interest rate exposure by market

	COUNTRY	REGION	WEIGHT	2013 PREMIUMS (USD MILLIONS)	GUARANTEED PRODUCTS *as % reserves*	AVERAGE GUARANTEED RATE	ABILITY TO REDUCE CREDITED RATES	DURATION GAP
VERY HIGH RISK TO PROFITABILITY	GERMANY	Europe	4%	$114,349	> 80%	3-3.5%	low to medium	> 10 yrs
	NETHERLANDS	Europe	1%	$26,005	60-80%	3.5-4%	low	5-8 yrs
	NORWAY	Europe	1%	$13,909	60-80%	3-3.5%	medium	> 10 yrs
	TAIWAN	Asia	3%	$75,013	> 80%	4-5%	low	5-8 yrs
HIGH RISK TO PROFITABILITY	JAPAN	Asia	16%	$422,733	60-80%	2-3%	low to medium	2-5 yrs
	SOUTH KOREA	Asia	3%	$91,204	> 80%	5-6%	low to medium	0-2 yrs
	SWEDEN	Europe	1%	$30,865	40-60%	3-3.5%*	low to medium	> 10 yrs
	SWITZERLAND	Europe	1%	$34,227	> 80%	1.5-2.5%	low	0-2 yrs
MODERATE RISK TO PROFITABILITY	CANADA	N. America	2%	$52,334	60-80%	2-4%	medium	1-3 yrs
	FRANCE	Europe	6%	$160,156	> 80%	0-1%	medium to high	2-5 yrs
	HONG KONG	Asia	1%	$32,059	60-80%	2.5-3.5%	medium	N/A
	ITALY	Europe	5%	$117,978	60-80%	2-3%	medium	0-2 yrs
	US	N. America	20%	$532,858	60-80%	2-4%	low to medium	< 1 yrs
LOW RISK TO PROFITABILITY	CHINA	Asia	6%	$152,121	> 80%	2-3%	high	N/A
	SOUTH AFRICA	Africa	2%	$44,556	60-80%	N/A	high	N/A
	SPAIN	Europe	1%	$33,862	> 80%	3.5-4%	low	0-2 yrs
VERY LOW RISK TO PROFITABILITY	AUSTRALIA	Pacific	2%	$45,641	< 20%	0-1%	high	N/A
	BRAZIL	LatAm	2%	$49,417	< 20%	N/A	N/A	N/A
	IRELAND	Europe	2%	$46,929	< 20%	1-2%	high	< 0 yrs
	MEXICO	LatAm	0%	$12,470	< 20%	N/A	N/A	N/A
	UK	Europe	9%	$222,893	20-40%	0-1%	high	< 0 yrs

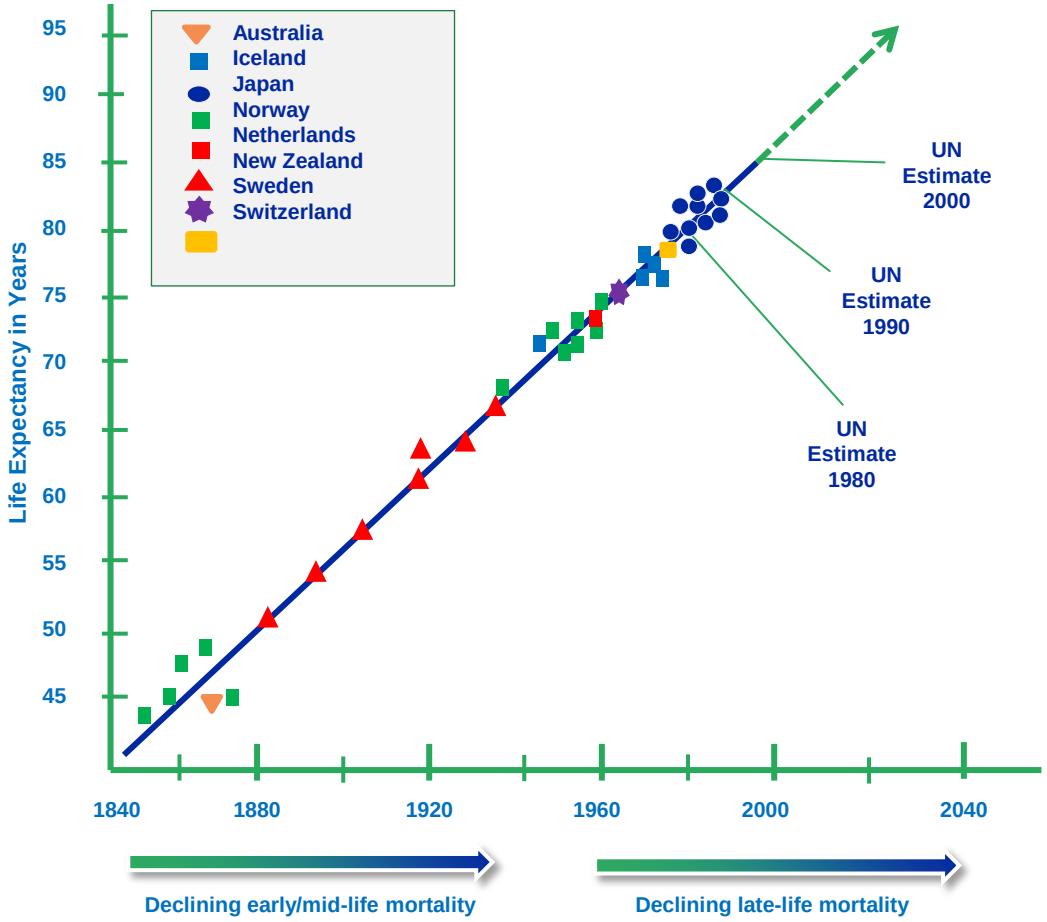
This assessment is made at the country level and mostly focuses on the direct impact of low interest rates on profitability generated by in-force policies. However, not all insurers in each country face the same level of risk. Moody's insurance financial strength ratings reflect the specificities of each individual insurer. Please refer to moodys.com for research on Moody's-rated insurers.

Additional notes:
- "Weight" refers to the weight of the market in the worldwide life insurance market in 2013 (total life insurance premiums: USD2.6 trillion)
- "Guaranteed products" also include long-term non-savings products with interest-rate assumptions embedded in their pricing; some data are Moody's estimates
- "Average guaranteed rate": an asterisk (*) means that guarantees are mostly at policy maturity; some data are Moody's estimates
- "Duration gap": a positive number means assets are shorter than liabilities; the higher the duration gap, the higher the reinvestment risk and the higher the risk in a prolonged period of low interest rates; some data are Moody's estimates

Source: Moody's Investors Service

Life Expectancy

- **If the past decade is representative then life expectancy (*ignoring* future improvements) is predicted to hit 95 by 2050**
- **Actual life expectancy by 2050 (*including* future improvements in healthcare) increases the figure to at least 95 and possibly go as high a 115!**
- **Cambridge University geneticist Aubrey de Grey believes life expectancy will soon extend dramatically to 1,000. He quotes –** *"Ageing is a physical phenomenon happening to our bodies, so at some point in the future, as medicine becomes more and more powerful, we will inevitably be able to address ageing just as effectively as we address many diseases today"*



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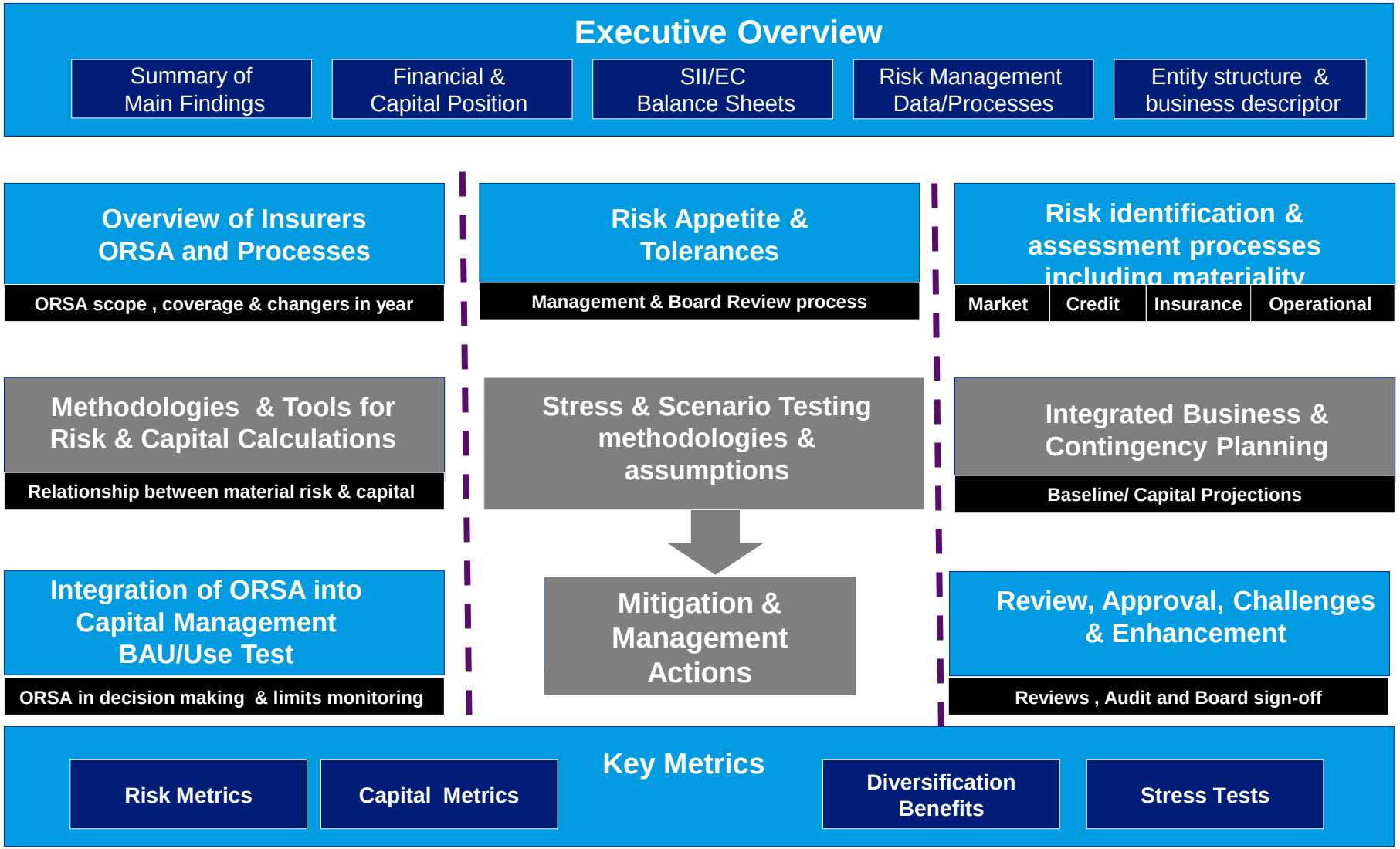
ORSA/Stress Testing Platform

ORSA

1. Capital Position
2. Balance Sheet Protection
3. Continuous Solvency Monitoring
4. Stress Testing

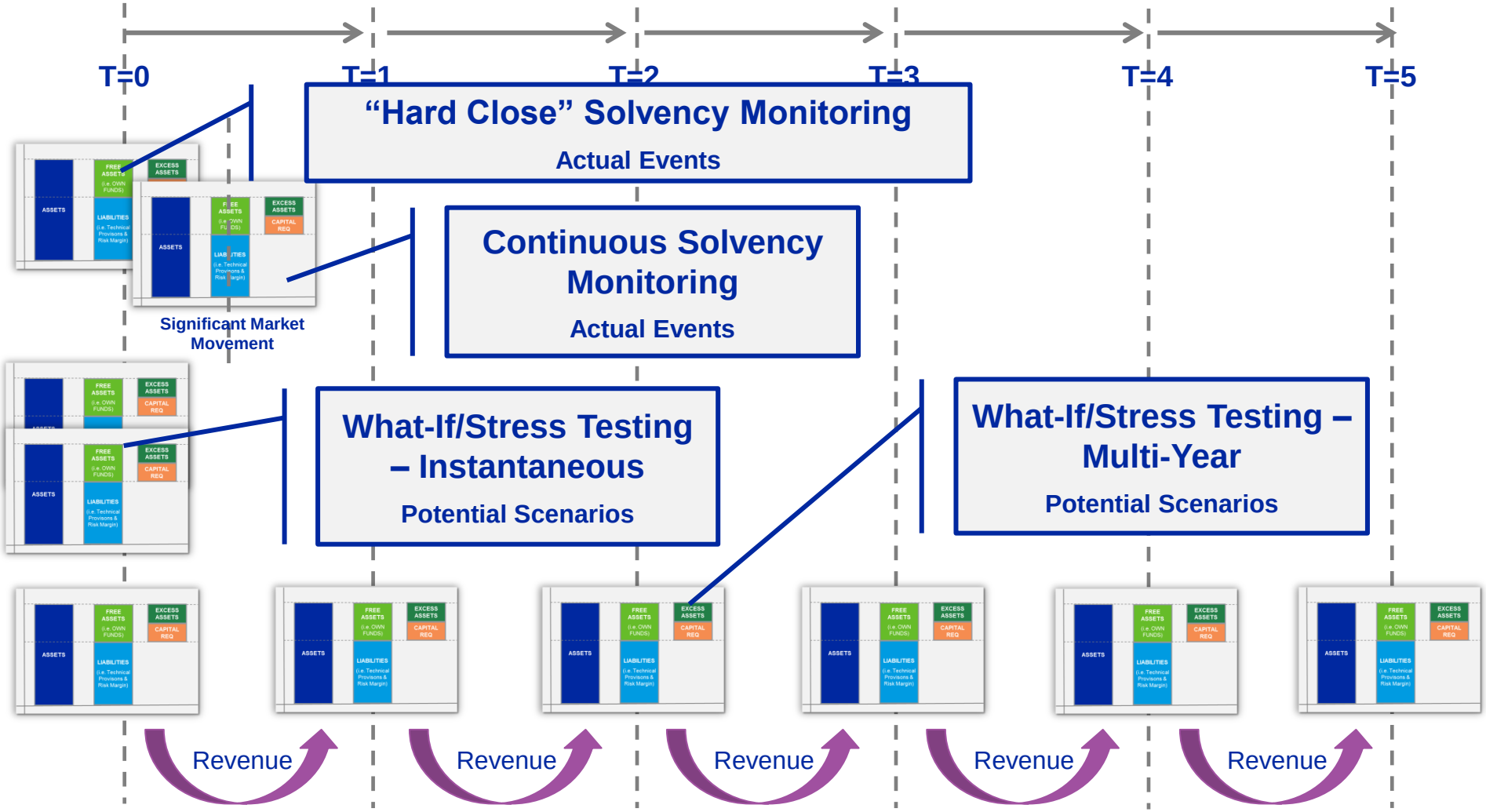
Better Business and Capital Planning

ORSA


Executive Overview
Summary of Main Findings
Financial & Capital Position
SII/EC Balance Sheets
Risk Management Data/Processes
Entity structure & business descriptor
Overview of Insurers ORSA and Processes
ORSA scope , coverage & changers in year
Risk Appetite & Tolerances
Management & Board Review process
Risk identification & assessment processes including materiality
Market
Credit
Insurance
Operational
Methodologies & Tools for Risk & Capital Calculations
Relationship between material risk & capital
Stress & Scenario Testing methodologies & assumptions
Integrated Business & Contingency Planning
Baseline/ Capital Projections
Integration of ORSA into Capital Management BAU/Use Test
ORSA in decision making & limits monitoring
Mitigation & Management Actions
Review, Approval, Challenges & Enhancement
Reviews , Audit and Board sign-off
Key Metrics
Risk Metrics
Capital Metrics
Diversification Benefits
Stress Tests

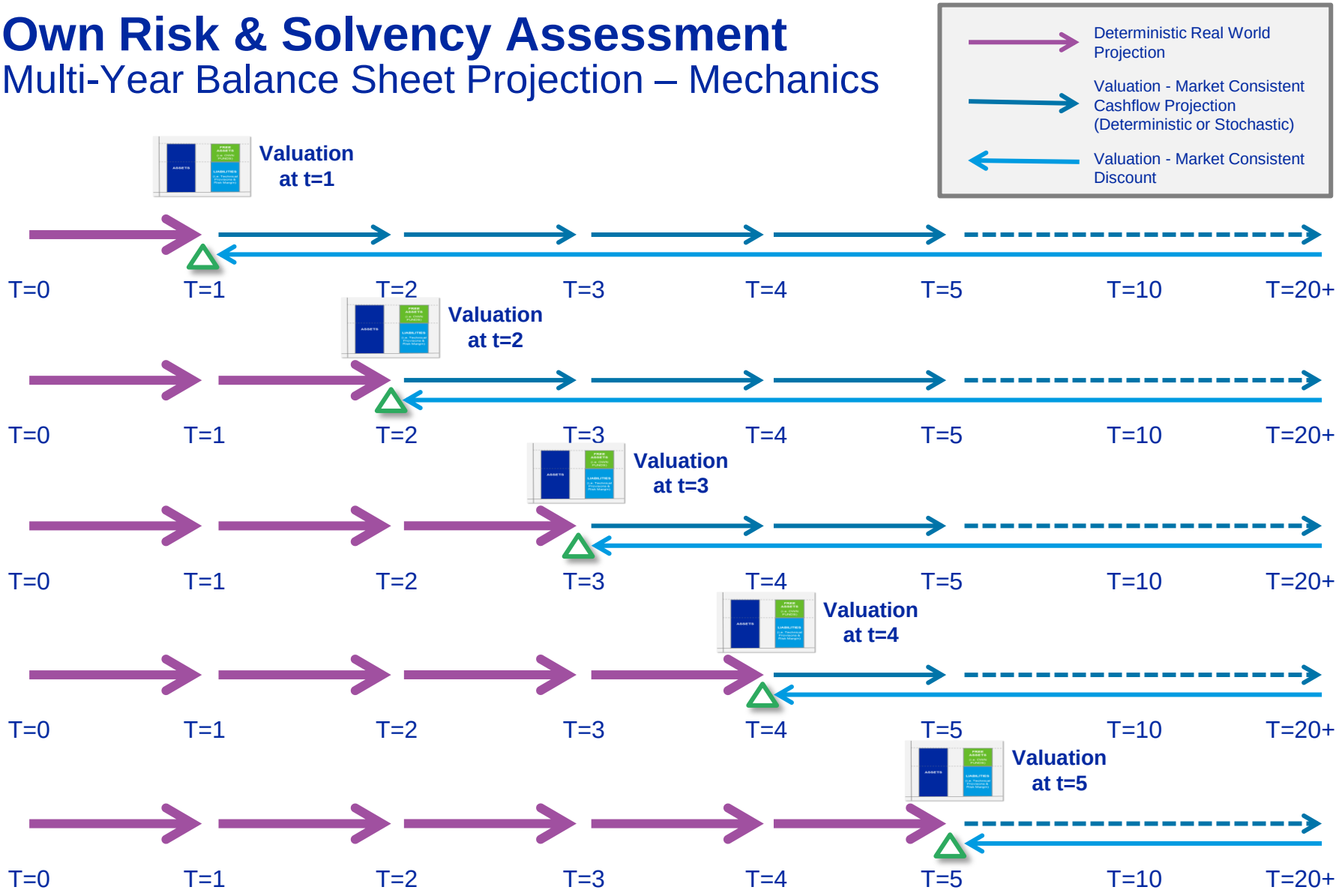
Own Risk & Solvency Assessment

Key Modelling Requirements



Own Risk & Solvency Assessment

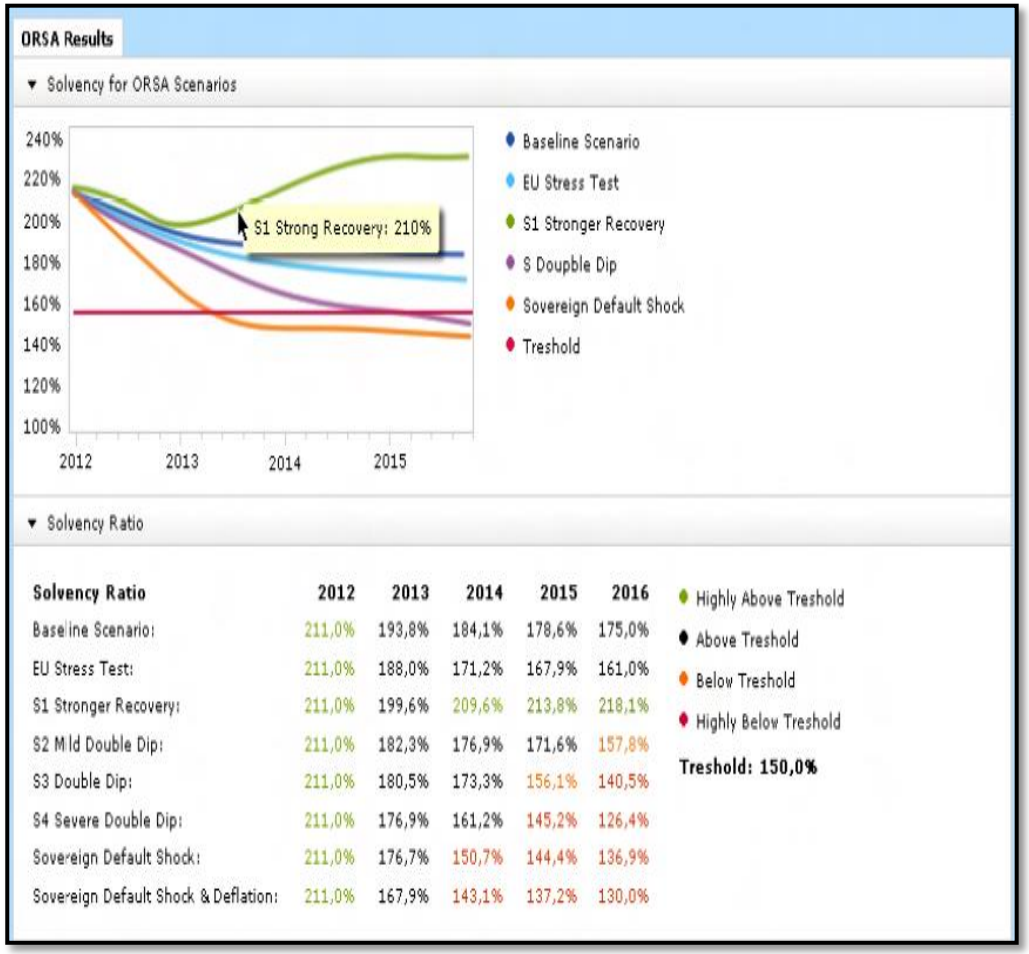
Multi-Year Balance Sheet Projection – Mechanics



ORSA – Potential Output

ORSA requires:

- A Stressed Balance Sheet projected forward for a three to five year period based on a number of macroeconomic scenarios
- A Reverse Stress Test scenario which tests the point and event which might cause an insurer to breach of their risk capital appetite. The reverse stress test can also be used to identify the point which the insurer becomes economically insolvent or that the market loses confidence in an insurer.
- In developing the stresses the insurer may consider different forms of scenario such as:
  - "Top-down" macro-economic capturing systematic exposure to economic and financial market outcomes
  - "Bottom-up" scenarios that reflect firm-specific risk exposures arising from firm's strategy and operational profile
  - Systematic insurance risk scenarios such as longevity and underwriting risks



Solvency Ratio	2012	2013	2014	2015	2016
Baseline Scenario:	211,0%	193,8%	184,1%	178,6%	175,0%
EU Stress Test:	211,0%	188,0%	171,2%	167,9%	161,0%
S1 Stronger Recovery:	211,0%	199,6%	209,6%	213,8%	218,1%
S2 Mld Double Dip:	211,0%	182,3%	176,9%	171,6%	157,8%
S3 Double Dip:	211,0%	180,5%	173,3%	156,1%	140,5%
S4 Severe Double Dip:	211,0%	176,9%	161,2%	145,2%	126,4%
Sovereign Default Shock:	211,0%	176,7%	150,7%	144,4%	136,9%
Sovereign Default Shock & Deflation:	211,0%	167,9%	143,1%	137,2%	130,0%

Own Risk & Solvency Assessment

Multi-Year Balance Sheet Projection – Mechanics

Deterministic Real World Projection

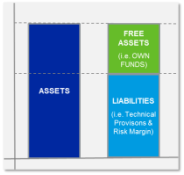
Valuation - Market Consistent Cashflow Projection (**Deterministic** or **Stochastic**)

Valuation - Market Consistent Discount

STEP 1: Deterministic Real World Projection

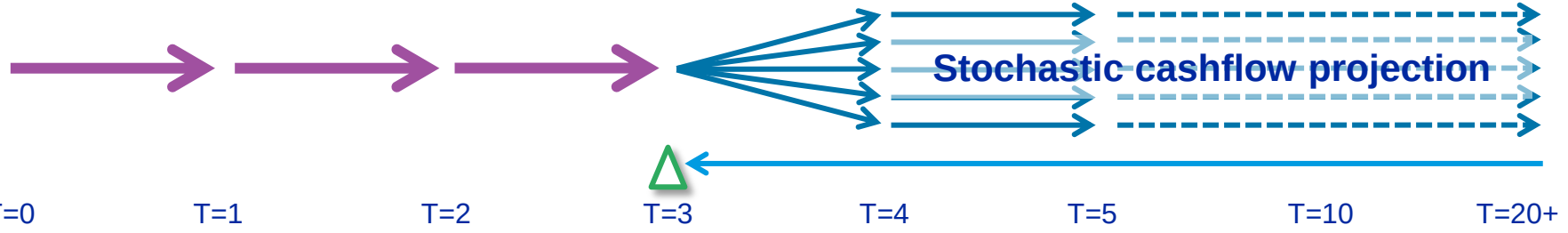
- **Single narrative scenario describing changes in economic environment over the projection period (and possibly insurance events).**
- **Portfolio of policies from t=0 will be rolled forward with assumptions for premiums received, claims made etc. over projection time horizon (i.e. to year 3 in this case)**
- **These revenue items will interact with the roll forward of the assets based on the narrative scenario (e.g. equity index performance).**
- **At the end of the roll-forward we will know the Assets part of the balance sheet and will have the inputs to enable the valuation of the liabilities to be carried out (see steps 2 and 3).**

Valuation at t=3



STEP 2: Valuation – Market Consistent Cashflow Projection

- **Deterministic projection of expected premiums, expenses and claims for the portfolio over valuation time horizon (i.e. year 3 to 40+).**
- ***Except* where projected claims are dependent on the performance of assets. Then require ESG to stochastically project assets and thus associated claims.**
- **Calculate net cashflow at each time period (monthly or annual)**



STEP 3: Valuation – Market Consistent Discount

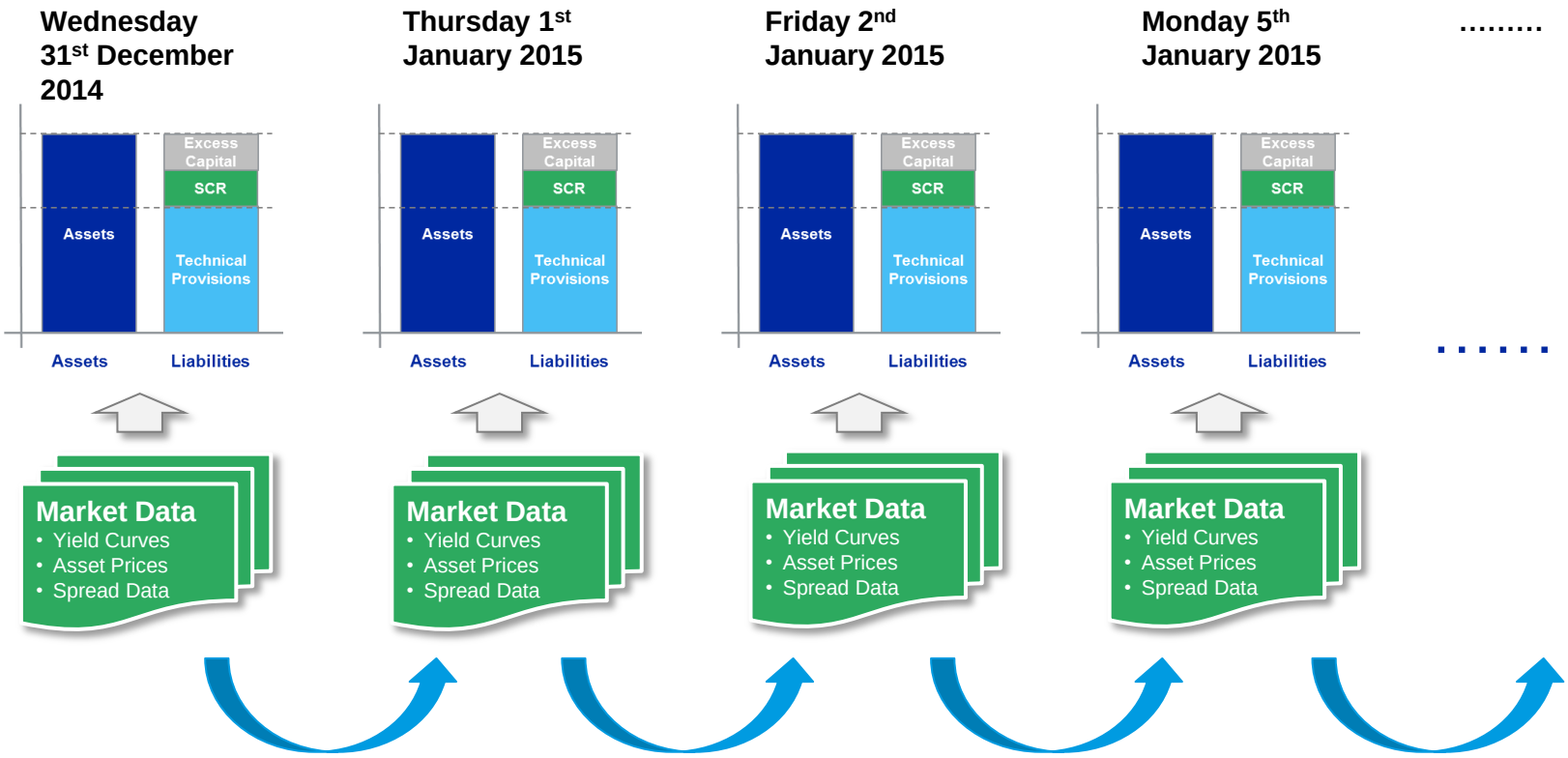
- **Discounting of net cashflows (whether generated deterministically or stochastically) using market consistent yield curve.**

4

Continuous Solvency Monitoring

Continuous Solvency Monitoring
Ambition - Daily Capability

Senior management want a view of how the balance sheet and associated capital requirement is evolving on a “continuous” basis. There may not be a requirement to monitor on a daily basis but the ability to **re-calculate on a particular day** when needed.



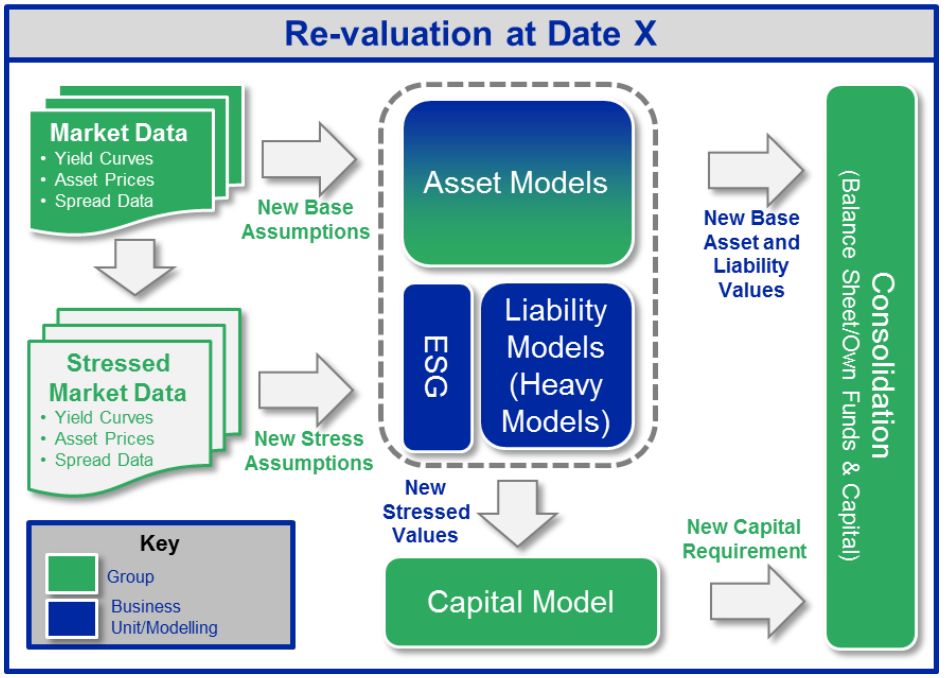
Continuous Solvency Monitoring
Why challenging?

Time-consuming to run

- Liability cashflow models are complex and can be time consuming to run.
- Particularly for liabilities with options and guarantees that require stochastic modelling.

Too many hand-offs

- Typically there are too many hand-offs between functional areas across the end-to-end process.
- e.g. ALM models run by business units rather than centrally.



Many hand-offs typically required for liability modelling.

ESG Re-calibration

- Need to re-calibrate the ESG for complex liability valuation.

Continuous Solvency Monitoring
Functional Overview

MA Solution Modules

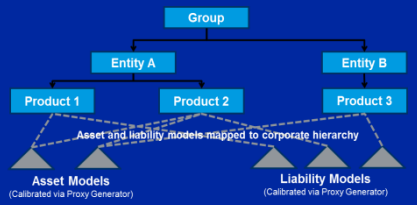
Deterministic Scenarios (What-If & CSM)

Scen	RF	RF	RF	RF	RF
CSM1	…	…	…	…	…
CSM2	…	…	…	…	…
CSM3	…	…	…	…	…
CSM4	…	…	…	…	…
CSM5	…	…	…	…	…
WhatIf 1	…	…	…	…	…
WhatIf 2	…	…	…	…	…
WhatIf 3	…	…	…	…	…
WhatIf 4	…	…	…	…	…

Balance Sheet Valuation and Solvency Assessment

Balance Sheet/Capital requirements & Associated Analytics

Capital Aggregator
(Capital Aggregation and Attribution)



Stress & Correlate/ Monte Carlo

Asset & Liability Proxy Functions f(x,y..)

Proxy Model Calibration

Proxy Generator
(w/ embedded ESG)

Fitting and Validation Scenarios

Fitting and Validation Results

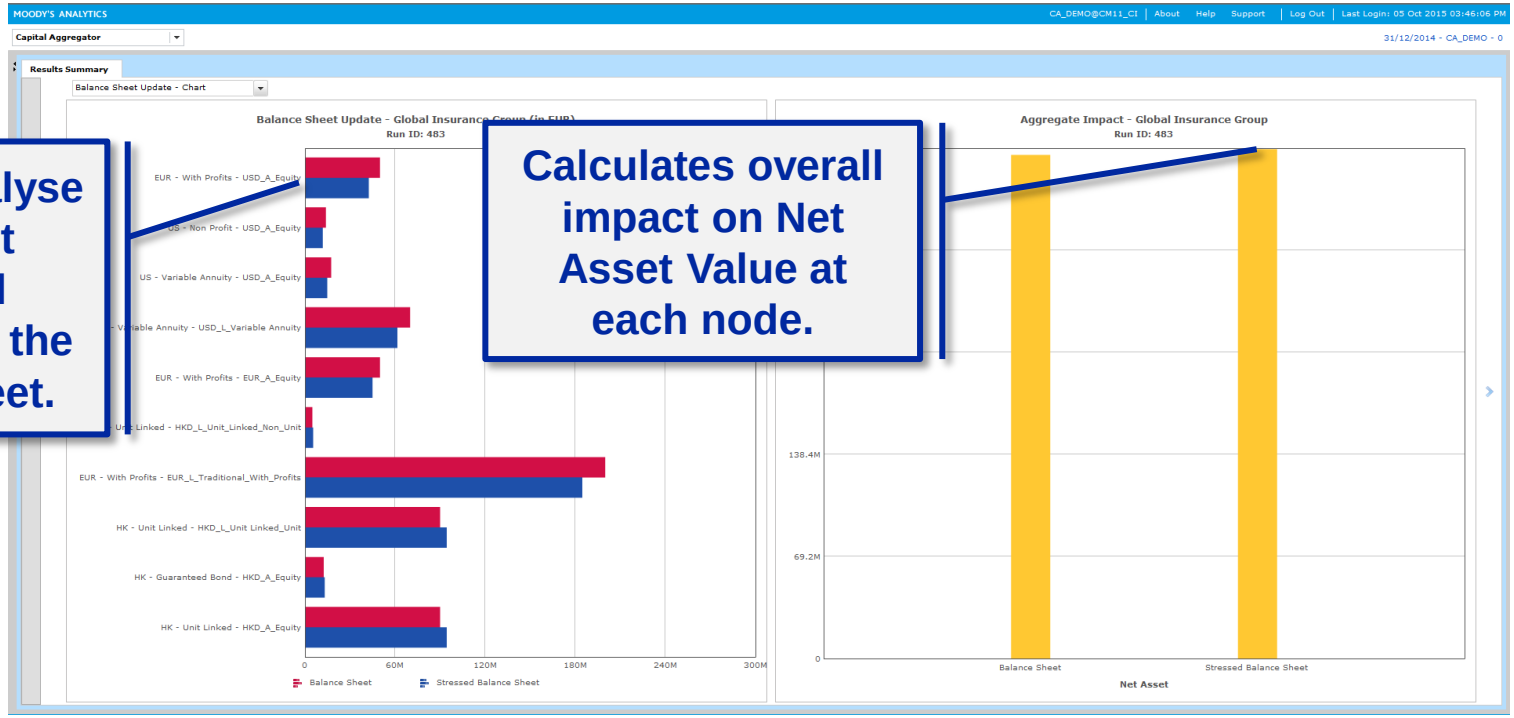
Asset Models

Liability Models

Continuous Solvency Monitoring
RiskIntegrity Capital Aggregator v2.0

RiskIntegrity Capital Aggregator v2.0 will have the ability to re-value the balance sheet and calculate the associated capital required under a deterministic scenario for the purposes of continuous solvency monitoring.

Ability to analyse the impact across all positions on the balance sheet.



Calculates overall impact on Net Asset Value at each node.

Analytics from Capital Aggregator V2.0 – due for release 2016

5

Stress Testing Platform

Stress Testing - Regulatory Trends

Stress testing is increasingly becoming a part of the regulator toolkit. Multi-year stress testing has had a major impact on banks over the last few years and is already impacting some insurers.

Global Trends (Banking & Insurance)

- **Systemically Important Financial Institutions** – Enhanced supervision
- Financial Stability Board (Global)
  - 9 G-SIIs (Globally Systemically Important Insurers)
- US Federal Reserve
  - Comprehensive Capital Analysis and Review (CCAR)
  - Primarily Banks but also insurers
  - **Multi-year stress tests under 3 scenarios**
- European Central Bank

Insurance in Europe

- Solvency II **ORSA** – Forward looking assessment
- **EIOPA** Stress Testing

Multi-year Stress Testing - Banking Challenges

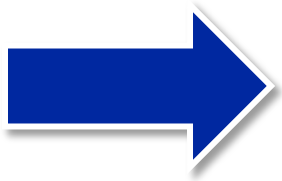
- Existing infrastructure not designed for Stress Testing
- Increasing Frequency & Granularity
- No Single Data Source
- Conflicting Priorities
- Organisation & Governance

ORSA/Stress Testing – Business Needs

- Financial decision making and enterprise risk management involves managing risk and return in an increasingly uncertain future.
- **Scenario analysis and stress testing** are powerful techniques that help insurers to understand this uncertainty.
- Informs risk-based decision-making by generating future possible evolutions of key financial, insurance and economic risk variables.

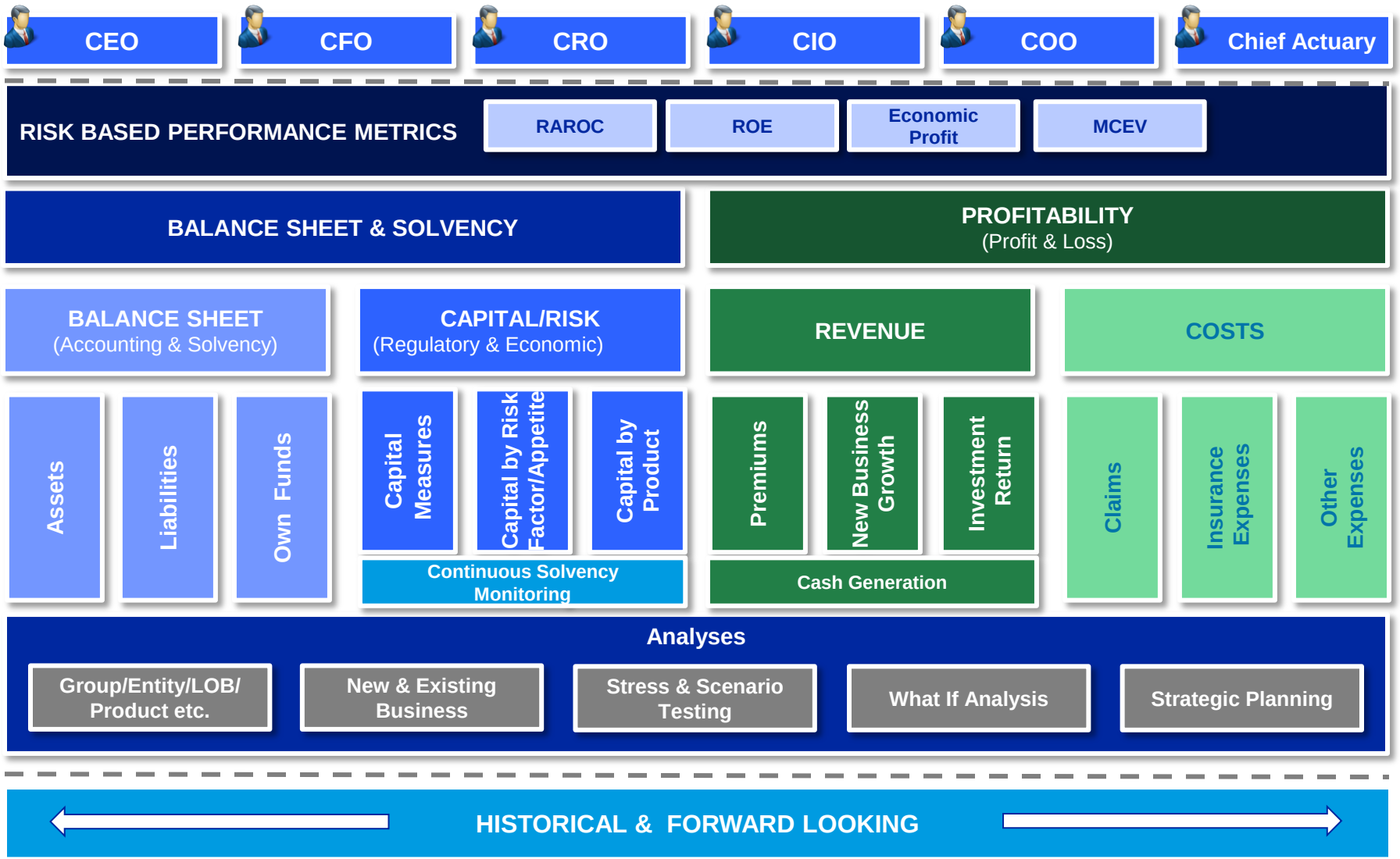
Business Needs

- What-If Analysis
- Strategic Planning & Forecasting
- Risk-based decision making
- Validating Internal Models



Information you need to run the business better

ORSA - What Information?



Scenario and Stress testing

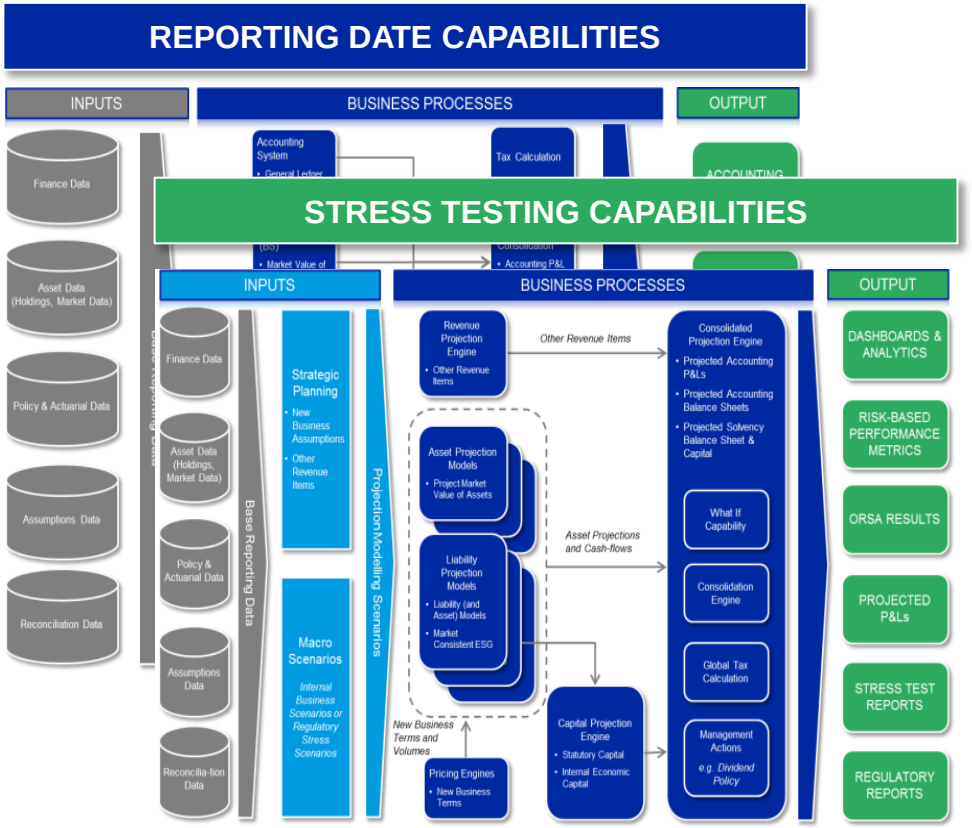
A business decision tool

- Forward looking assessment of balance sheet and solvency position
- Performed at least annually over the business plan horizon and different stress scenarios
- Should incorporate strategic planning assumptions
- Should be performed when taking new strategic decisions
- Should incorporate reverse stress testing
- Results should be discussed with the board

Scenario /Stress Testing Framework

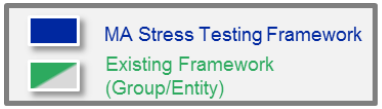
Scenario/Stress Testing Framework needs to be aligned with regulatory and business planning – Support both T0 and Tx worlds

- Current reporting date capabilities (T zero world) do not map well to stress testing capabilities due to the need for a **Multi-Time Step** projection capability (Tx world)
- Scenario Stress Testing Framework (SSFT) should be aligned with the capability to support forward looking **Business Planning** capability.
- The SSFT must leverage existing liability modelling, capital & finance engines ***but also*** needs the capability to project forward and consolidate assets, other revenue line items and capital over the business planning horizon



MA Stress & Scenario Testing Framework

Solution adapted to clients



Modular design leveraging existing infrastructure to provide an integrated capability and support phased delivery.

BUSINESS INPUTS

- Strategy & Risk Appetite
- New Business Assumptions
- "Narrative" Deterministic Scenarios
  Regulatory & Internal
- Other Input Data

SCENARIO MANAGEMENT

- Macro Scenarios (What-If multi-year/instantaneous & continuous solvency monitoring)
- Modelling Scenarios

MODELLING

GROUP | LIFE | P&C | OTHER

ACCOUNTING
- Asset Models
- Tax Models
- Finance Models
- Liability Models
- Pricing Models

SOLVENCY
- Asset Models
- CAT Models
- Other Risk Models
- Liability Models
- Credit Models
- Own Funds
- Proxy Models
- Pricing Models
- Capital Models

CONSOLIDATION

Consolidation & Projection
- "What-If" Capability
- Consolidation
  - Organisational Structure
  - Results mapping
  - Consolidation rules
- Projection
  BS, P&L, Capital, Tax, Dividends etc

ANALYTICS

- DASHBOARDS & ANALYTICS
- SCENARIO COMPARISON
- RISK-BASED PERFORMANCE METRICS
- ORSA RESULTS
- PROJECTED P&Ls
- STRESS TEST REPORTS
- REGULATORY REPORTS

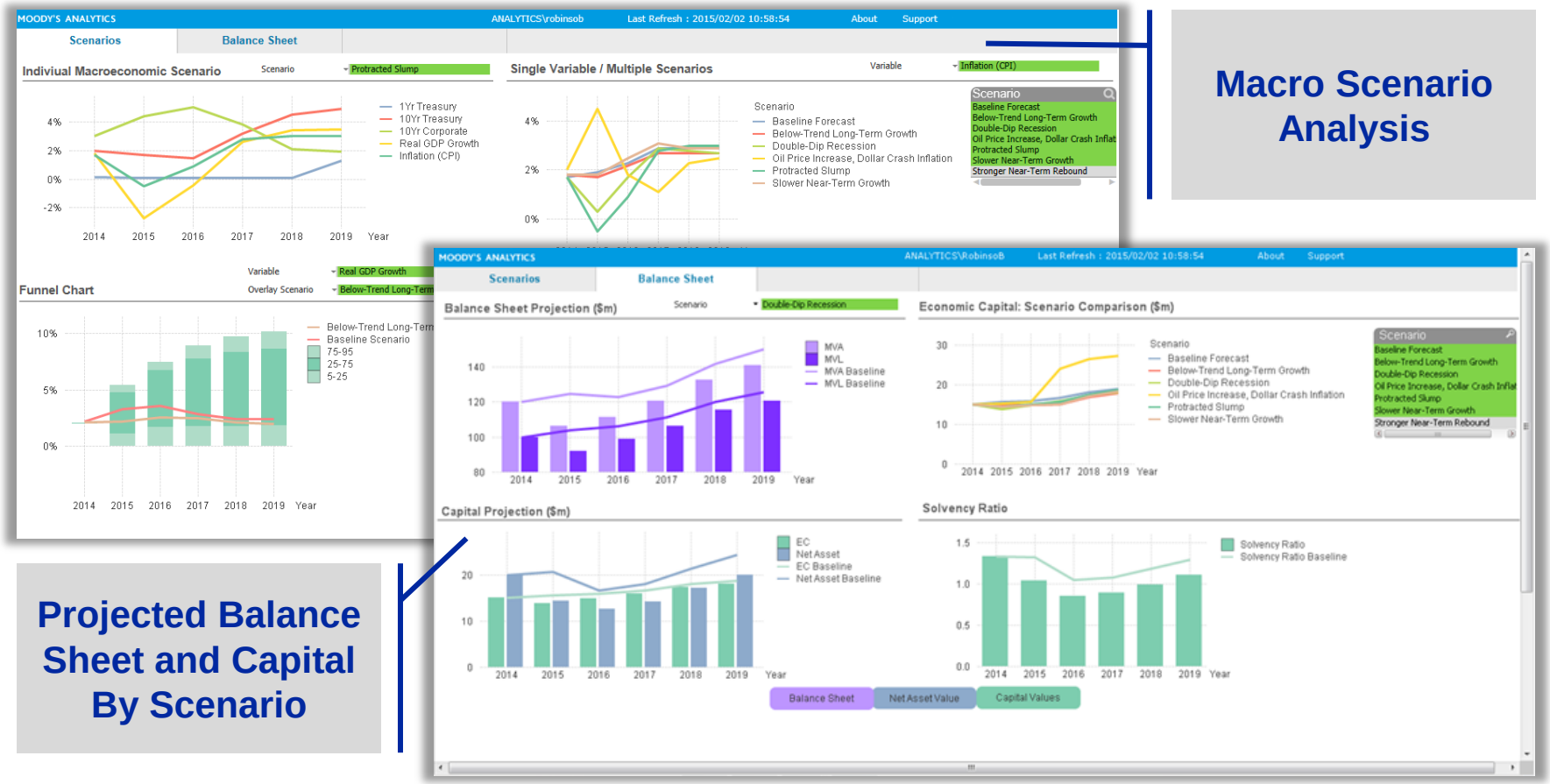
ANALYTICAL DATA REPOSITORY

GOVERNANCE & WORKFLOW

Stress & Scenario Testing Solution

Prototype End-In-Mind

This is the end in mind, the information required to support strategic business planning and risk-based decision-making.



Macro Scenario Analysis

Projected Balance Sheet and Capital By Scenario

Strategic Planning Macroeconomic Scenarios

Macroeconomic Model

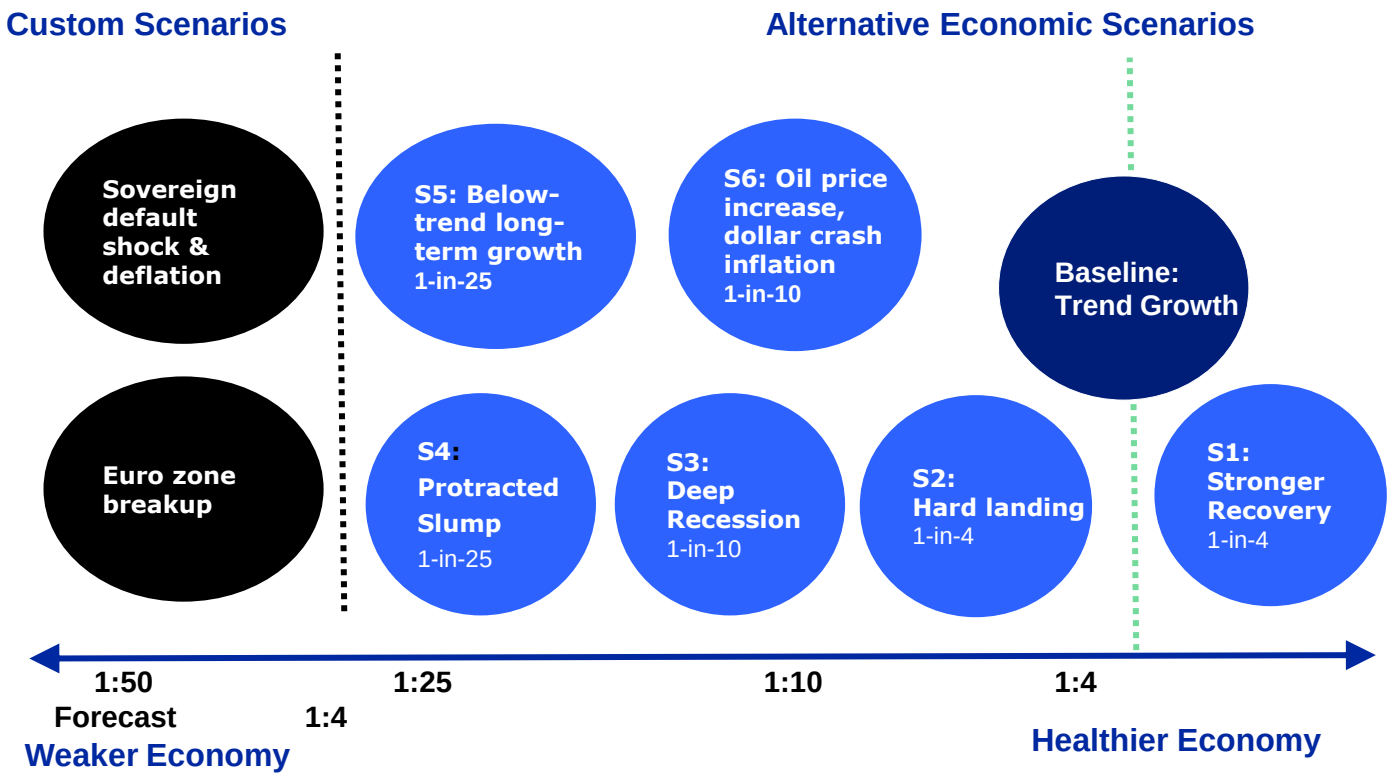
Baseline Scenario

S1 - Stronger Recovery
S2 - Hard Landing
S3 - Deep Recession
S4 - Protracted Slump
S5 - Below-Trend Long-Term Growth
S6 - Oil Price Increase, Dollar Crash

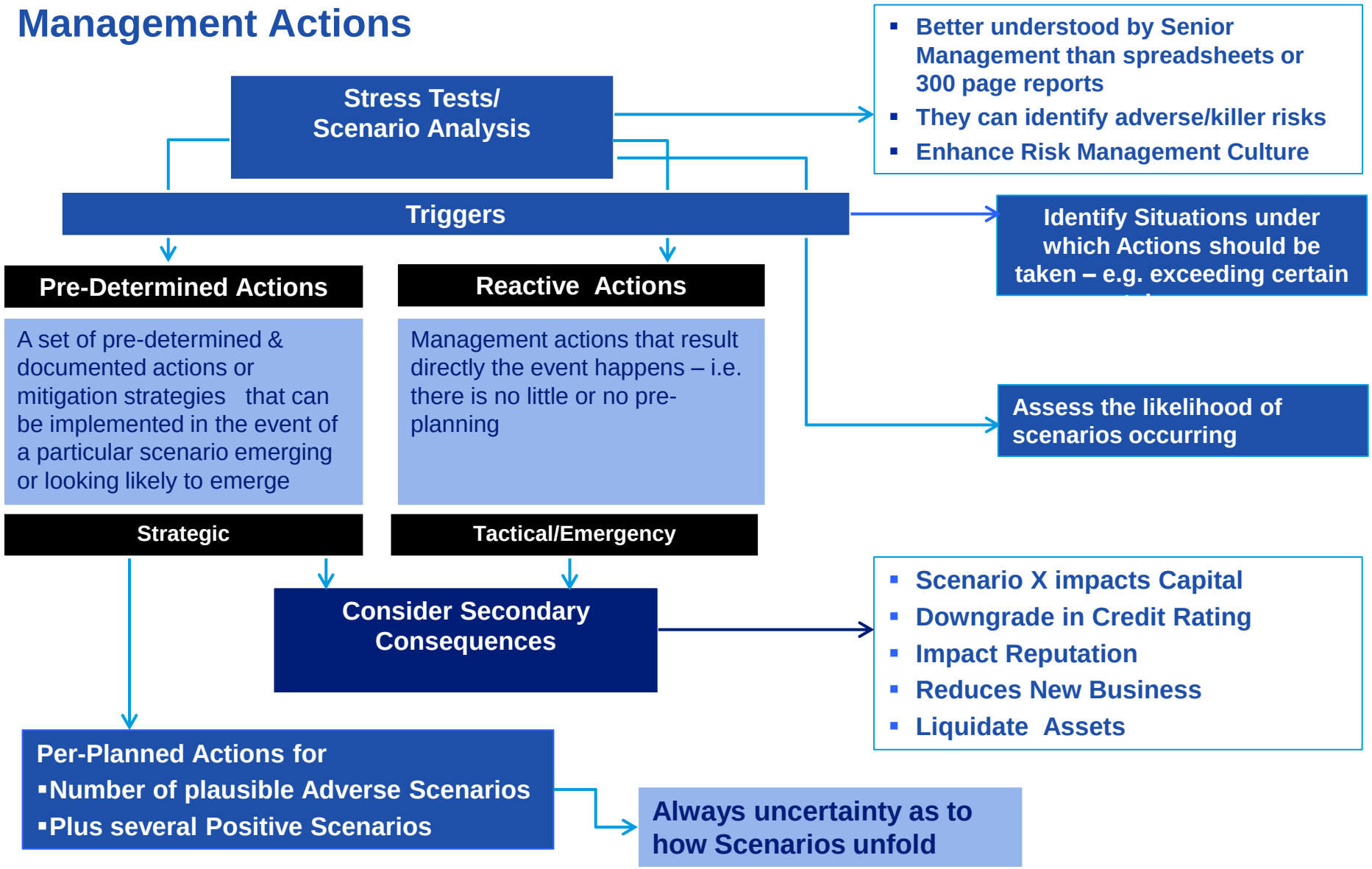
Custom Scenarios

Strategic Planning & Forecasting

- Six standard scenarios updated on a monthly basis: **deviations from baseline**
- **Ad hoc custom macro scenarios: targeted to model specific risk events; for example, sovereign event, euro zone breakup**
- Whilst the focus of risk management is tail distribution positive scenarios should also be considered



Management Actions



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