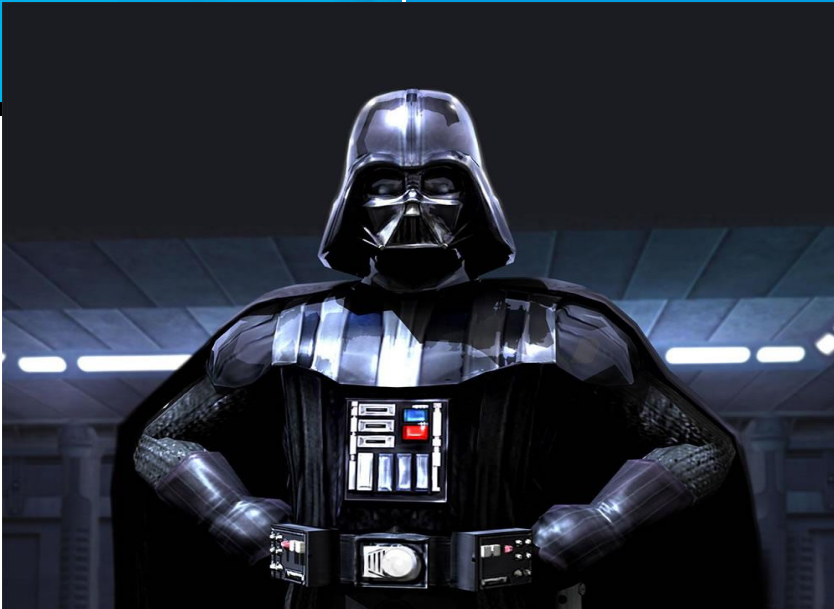


Looking into the Future with Scenarios



Brian Heale

Senior Director

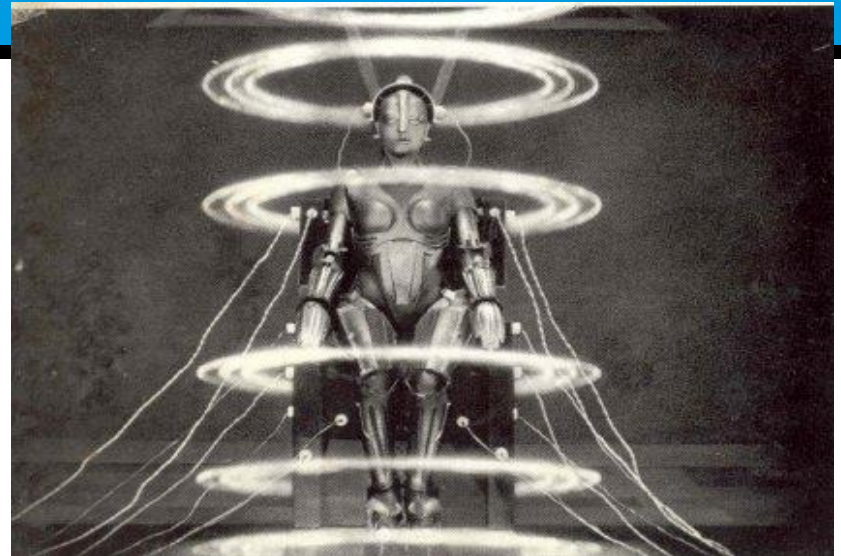
MOODY'S ANALYTICS

Agenda

1	What are Scenarios?
2	Scenario Generation
3	Uses of Scenarios including ORSA
4	Summary
5	Questions

1

What are Scenarios?



Why do we need Scenarios?

Financial decision making and enterprise risk management involves managing risk and return in an increasingly uncertain future. Scenario and stress analysis are powerful techniques that help us to understand this uncertainty by generating a large number of future possible evolutions of key financial, insurance and economic risk variables. Today I will focus on *Economic Scenarios*

Business Needs

- Valuation of Insurance Policies
- Strategic Planning
- Forecasting
- Management Actions

Regulatory Needs

- EIOPA
- Local Regulator

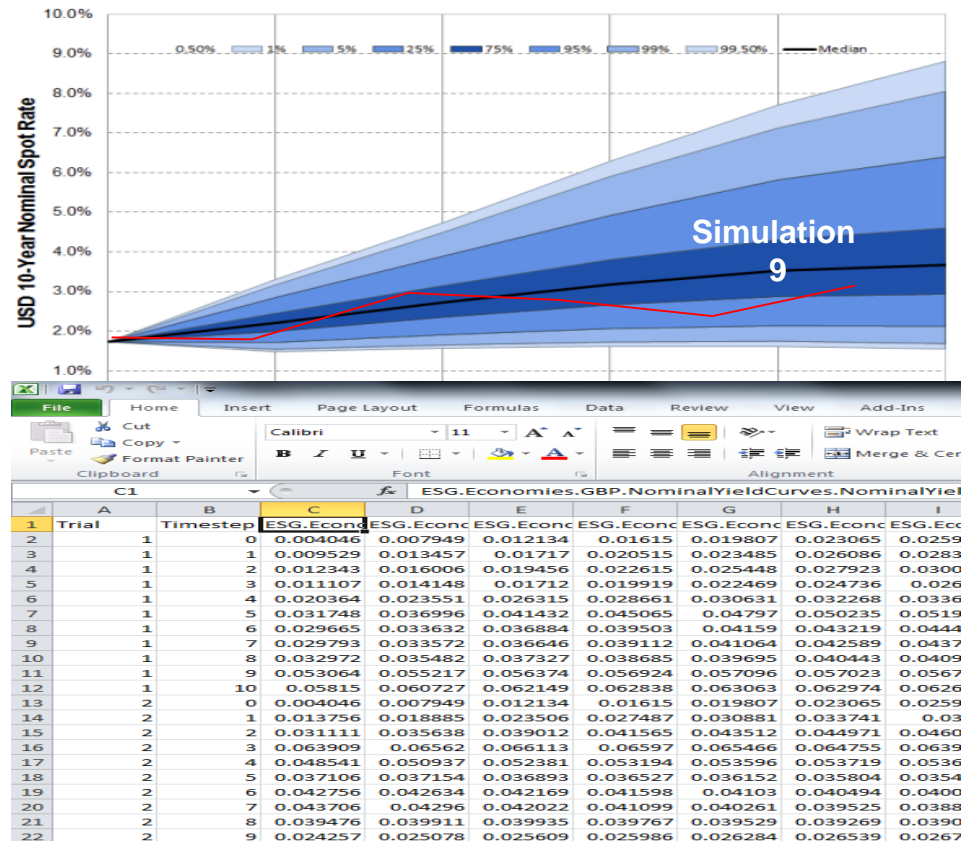
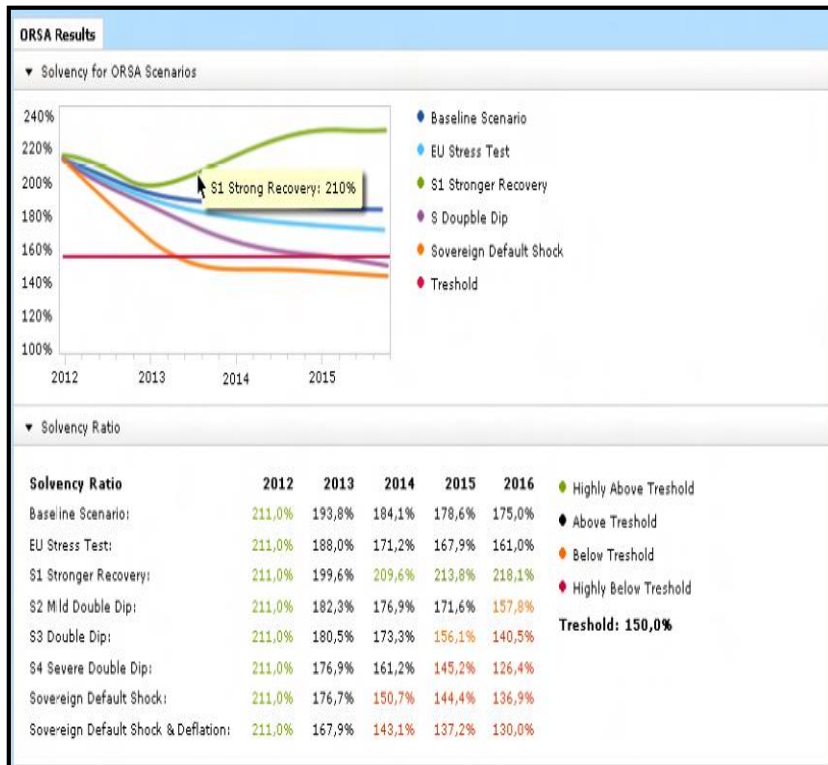
ORSA

What is a Scenario?

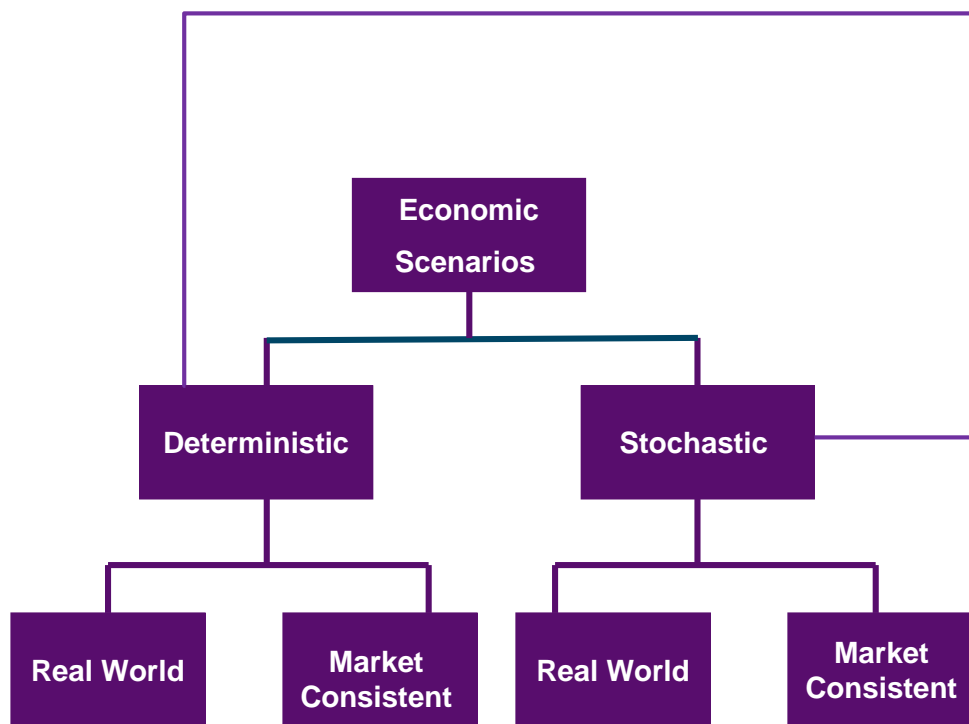
A scenario is a **forward** looking view which describes a possible future state of the world from an insurer's perspective (in reality a best guess!) . It can be wide ranging – e.g. looking at the global economy from a **multiple risk factor** perspective (“Macro”) or alternatively focus on **one specific risk factor** such as interest rates or yield curve.

Macro

Single Factor



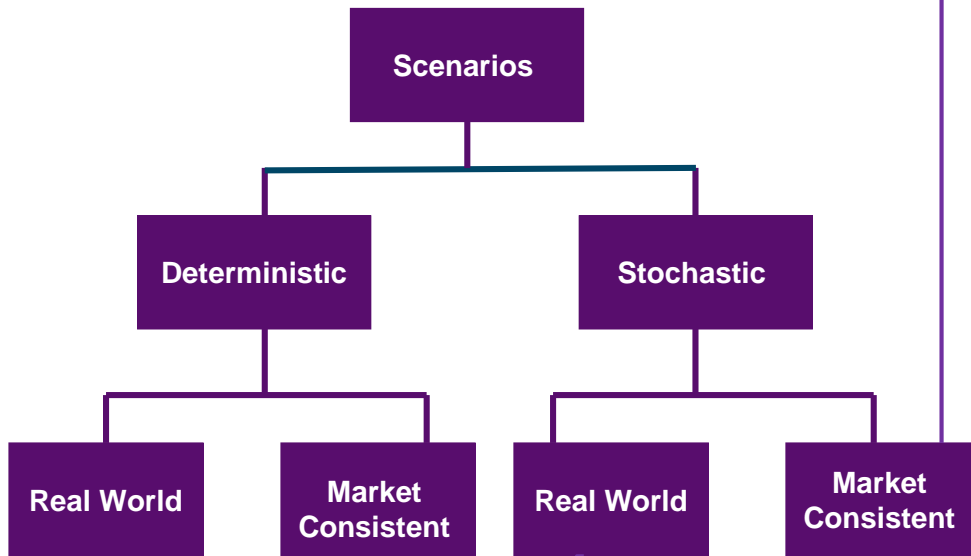
Types of Economic Scenario



A deterministic scenario is single scenario that outlines a view of the world based on a certain event, such as a double-dip recession, oil price crisis, mild recovery for example – often referred to as **Macroeconomic Scenarios**. Often used in strategic planning where their descriptive nature enables senior management to understand the impact of adverse factor on the performance of the company and to plan appropriate sets of management actions.

Stochastic scenarios are multiple scenarios generated by simulating variables from probability distributions using a random number generator. The purpose of stochastic scenarios is to capture the randomness or unpredictability of real-world events and their impact.

Types of Economic Scenario (2)

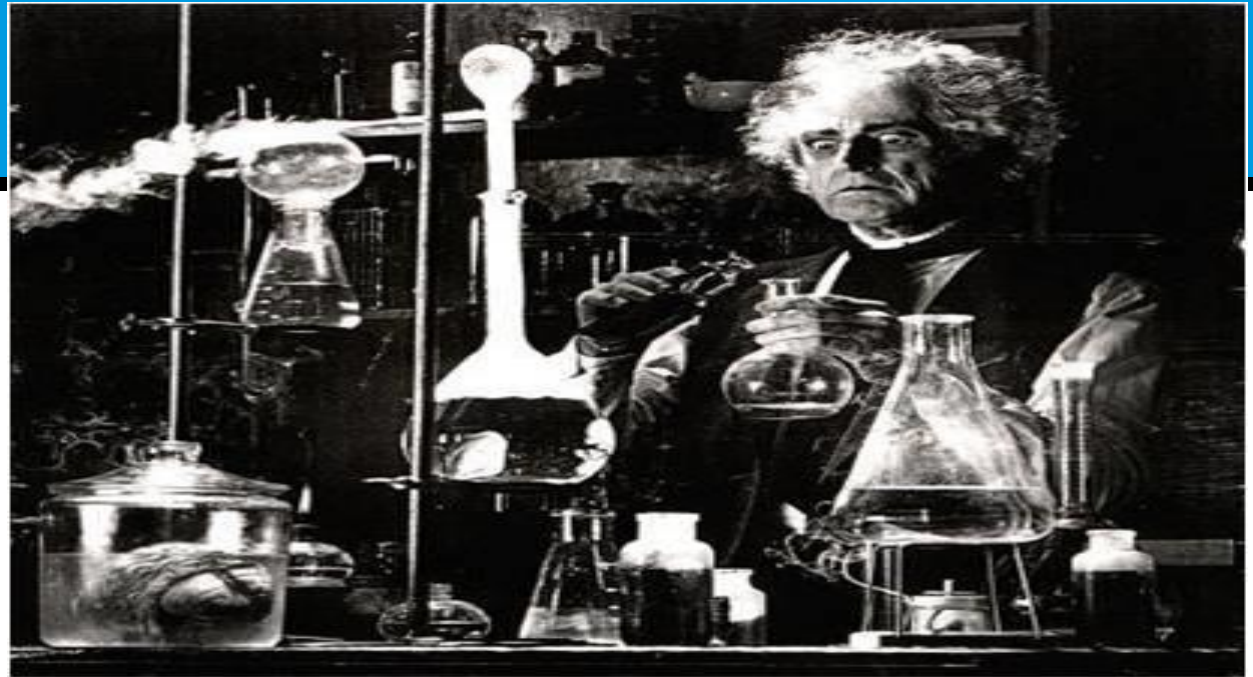


Market Consistent scenarios are parameterized such that if we used the scenario generator and Monte Carlo simulation to price an instrument, we would calculate the same price at which the instrument is traded in the market..

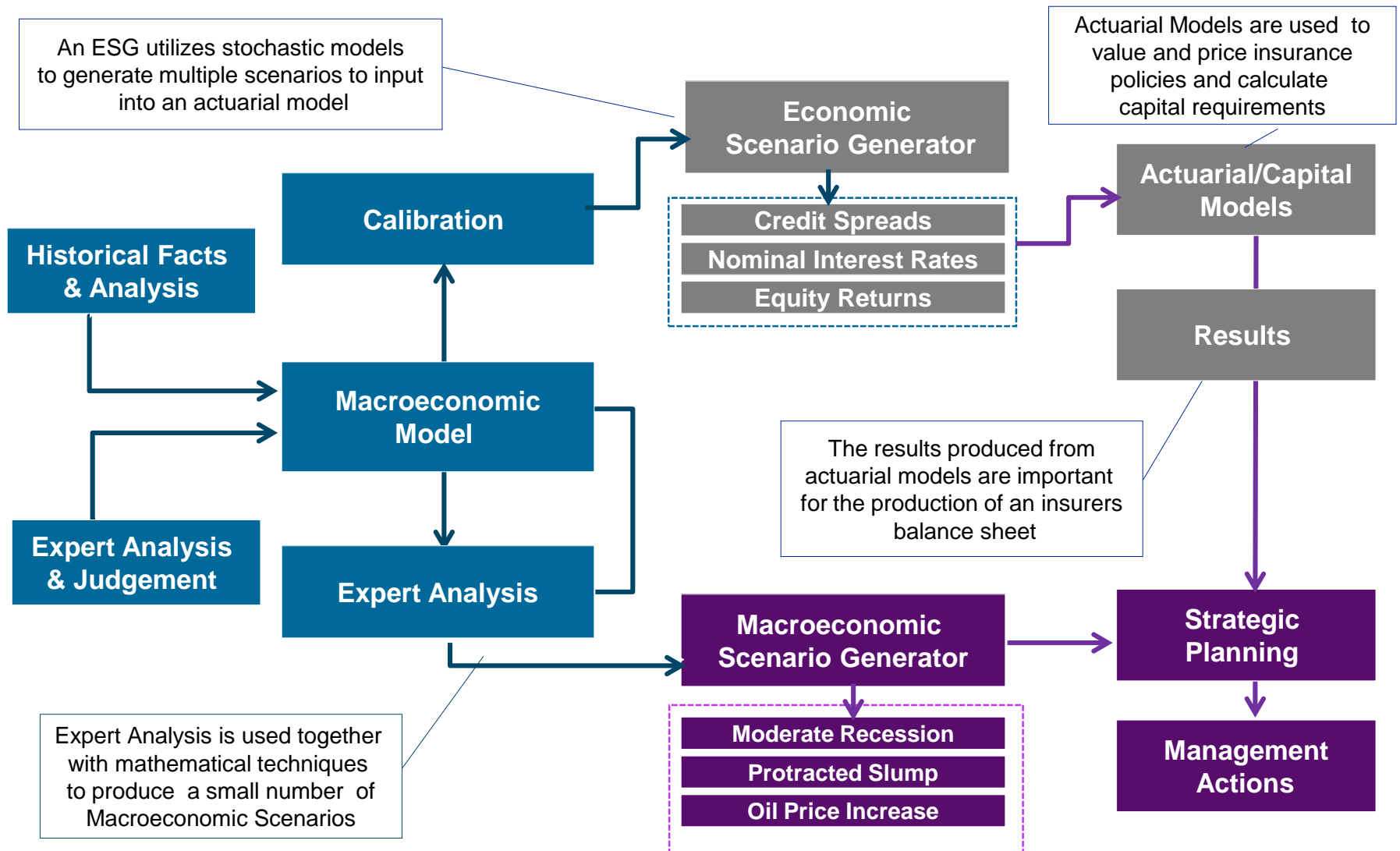
Real World scenarios are configured to produce a realistic distribution of economic scenarios that reflect the way the world is expected to evolve according to its user, for example an insurer or a regulatory authority. The underlying models can be very similar to the models in a market consistent ESG, but they differ in the way they are calibrated.

2

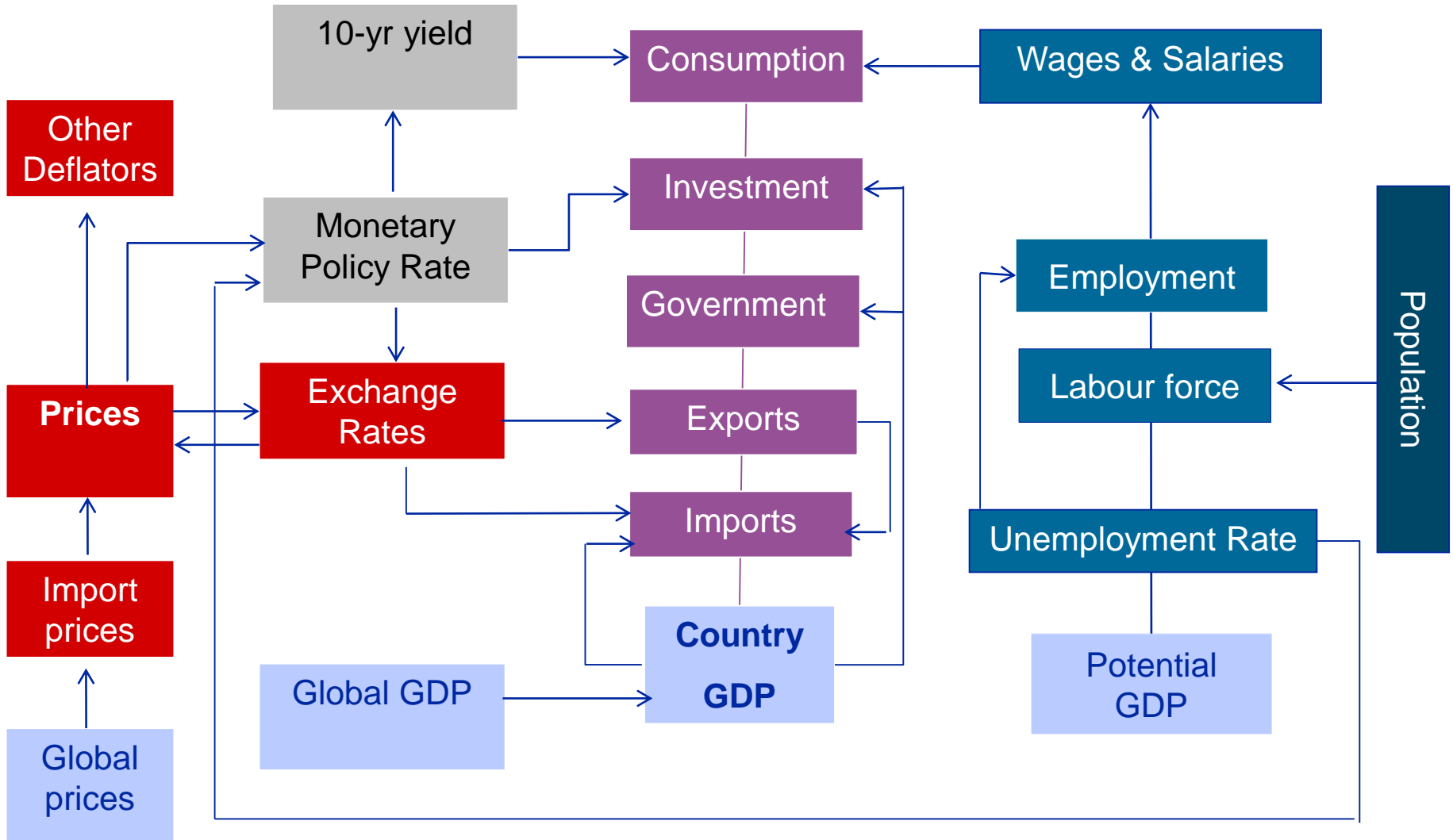
Scenario Generation



Scenarios are generated by an Economic Scenario Generator



Based on a underlying Macroeconomic Model



3

How are Scenarios Used ?



Uses of Scenarios

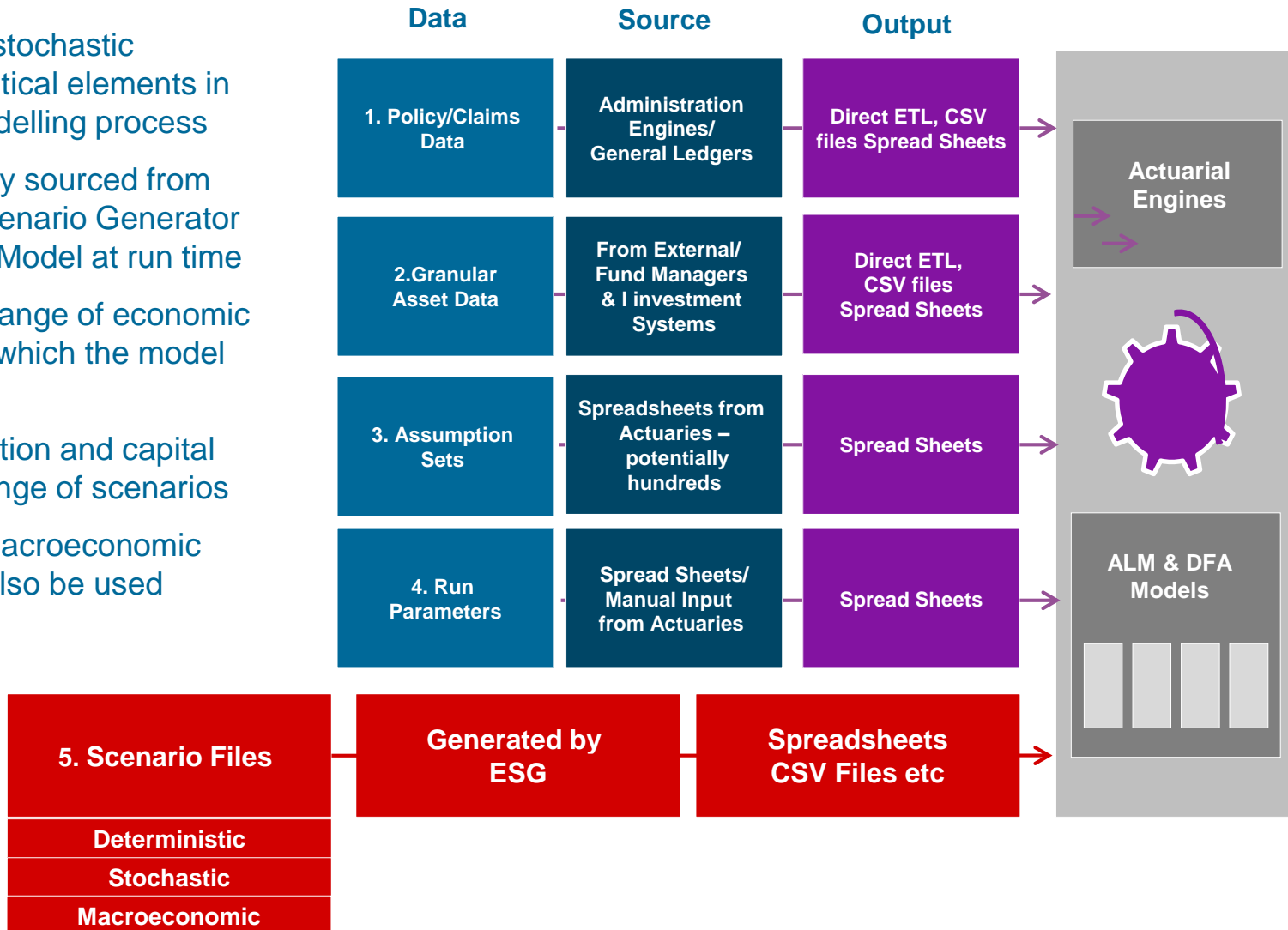
1. Valuation of Insurance Policies	<ul style="list-style-type: none">Multiple Scenarios primary used as an input to an insurers actuarial cash flow projection, pricing and valuation models<ul style="list-style-type: none">Deterministic Scenarios to value simple insurance products without guarantees – e.g. unit-linkedStochastic Scenarios to value complex products with guarantees – e.g. with-profits endowments
2. Stress Testing	<ul style="list-style-type: none">Regulatory Requirements (EIOPA Stress Tests)Balance Sheet SensitivitiesDetermine killer or worst case scenarios of the insurerReverse Stress Tests
3. Strategic Planning	<ul style="list-style-type: none">Macroeconomic scenarios largely used for strategic planning due to their story board nature and ease of understandingExcellent way to communicate to non-actuaries the potential future risks to the business, their probability of happening and the possible impactsEssential element in the forward projection of an insurers economic balance sheet over a 3-5 year time horizon as required in the ORSA
4. Management Actions	<ul style="list-style-type: none">Help evaluate the effectiveness of various options available to the insurer or indeed develop a series of predetermined management actionsFor specific risk events a range of scenarios can be analyzed to quantify an insurer's exposure to those risks. The insurer can then “walk through with the regulator their advanced planning to deal with adverse scenarios



ORSA

1.Valuation and Pricing of Insurance Policies

- Deterministic & stochastic scenarios are critical elements in the actuarial modelling process
- They are typically sourced from an Economic Scenario Generator and fed into the Model at run time
- They provide a range of economic variables within which the model is run
- All pricing, valuation and capital models use a range of scenarios
- Wider ranging Macroeconomic scenarios may also be used



2. Stress Testing

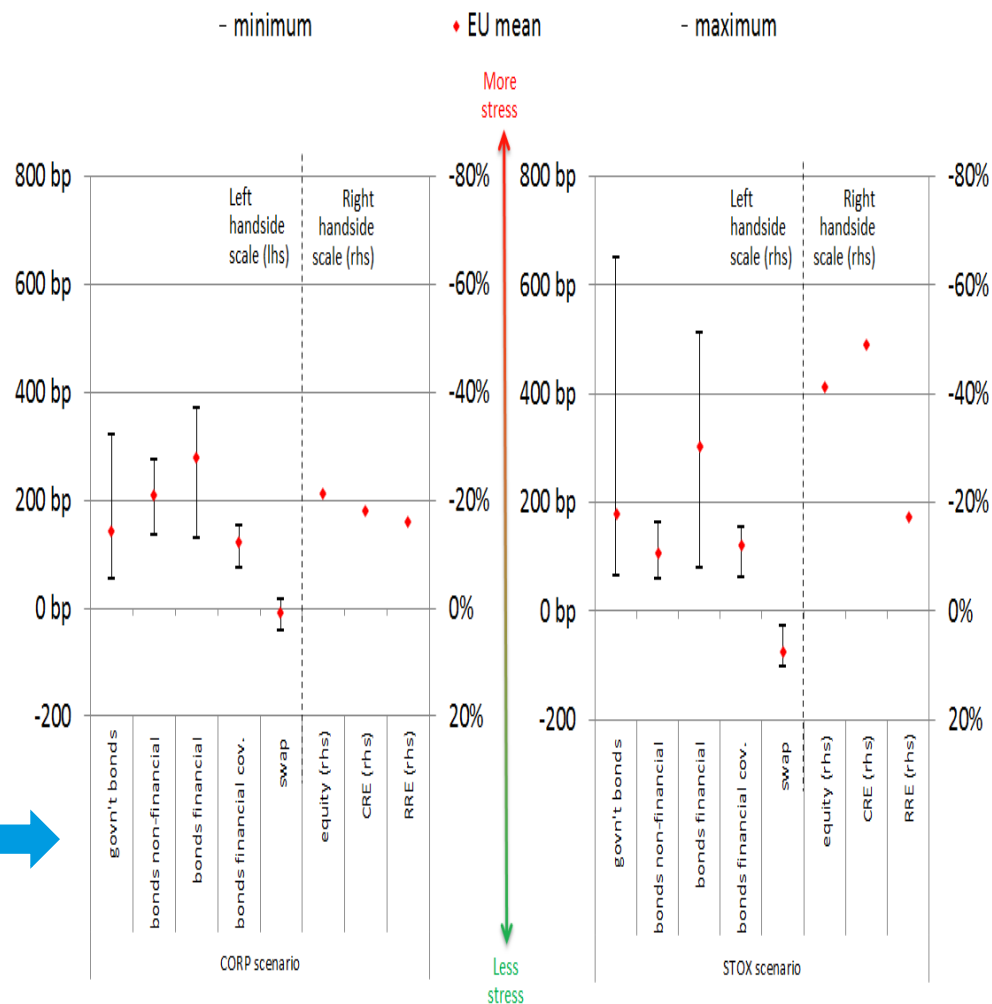
1. Stresses are effectively single (or multiple) factor scenarios designed to “shock” models or the balance sheet; stresses can be for :

- **Regulatory Purposes** – The regulator wants to test the robustness of the balance sheet and capital through a range of prescribed stresses and scenarios.
- **Business Planning** – Management wants to assess the sensitivity of the balance sheet over the business planning horizon.

2. There are 20+ shocks prescribed by in the EIOPA SCR Calculation e.g. Interest Rate Shock - *Upward: 25% - 70% by maturity year, Downward: 30% - 75% by maturity year, Instantaneous upward or downward shock on the term structure of interest rate*

3. EIOPA Stress Test Exercise for 2014 based on for example:

- Adverse Market Stress scenarios based on European Equity Market and non-financial corporate bond market
- A Japanese Scenario featuring a vey low sloping yield curve



All's Well That Ends Well

Consider a shock: Oil prices rise by \$150 a barrel

Oil Importers

- Oil prices rise => consumption falls => GDP falls
- Less to spend on life insurance

Oil Exporters

- Oil prices rise => government revenue rises => GDP rises
- More to spend on Life Insurance

	Importing countries			Exporting countries		
	CHINA	FRANCE	JAPAN	MEXICO	NORWAY	RUSSIA
% change in GDP (4 qtr after shock)	-0.2286	-0.3801	-0.7085	0.9886	1.2778	2.4437

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
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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

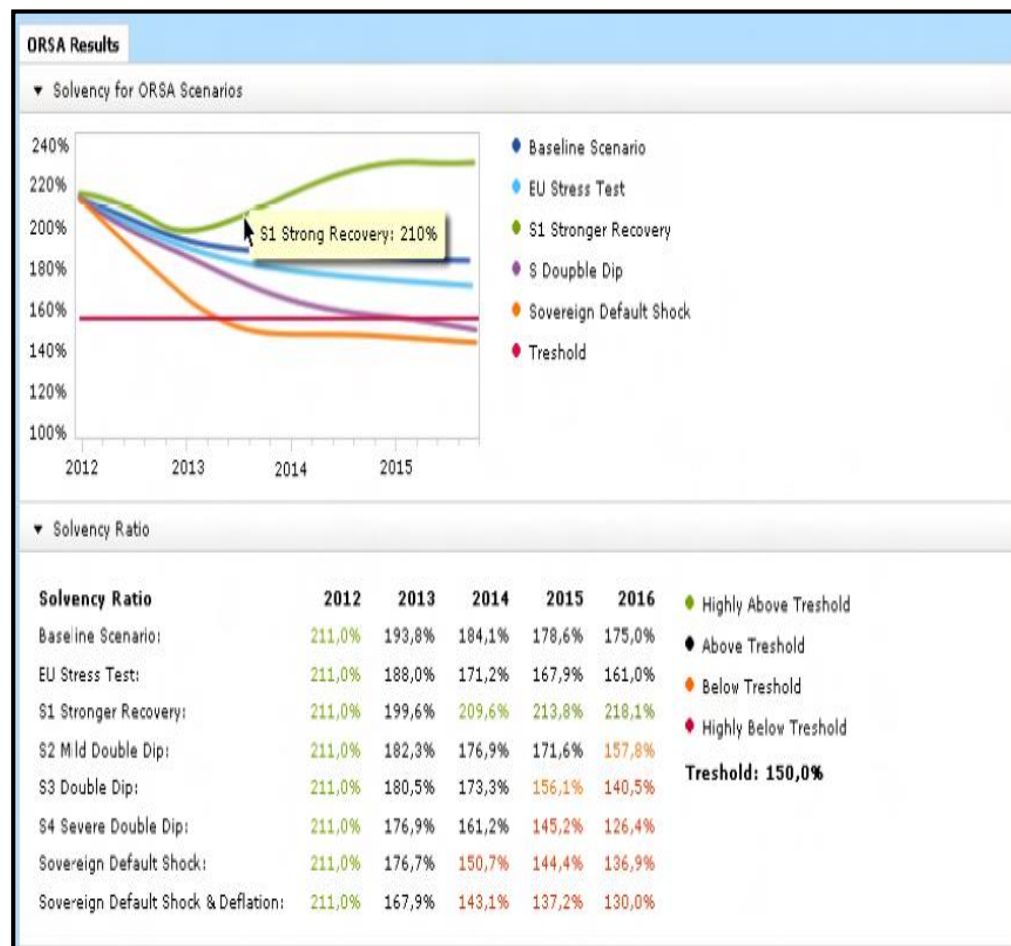
Diversification
Benefits

Stress Tests

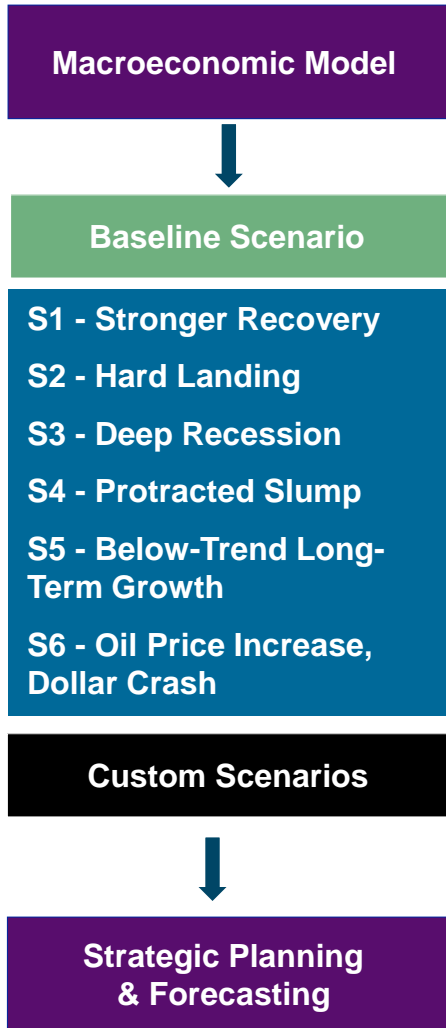
ORSA – Potential Output

ORSA requires:

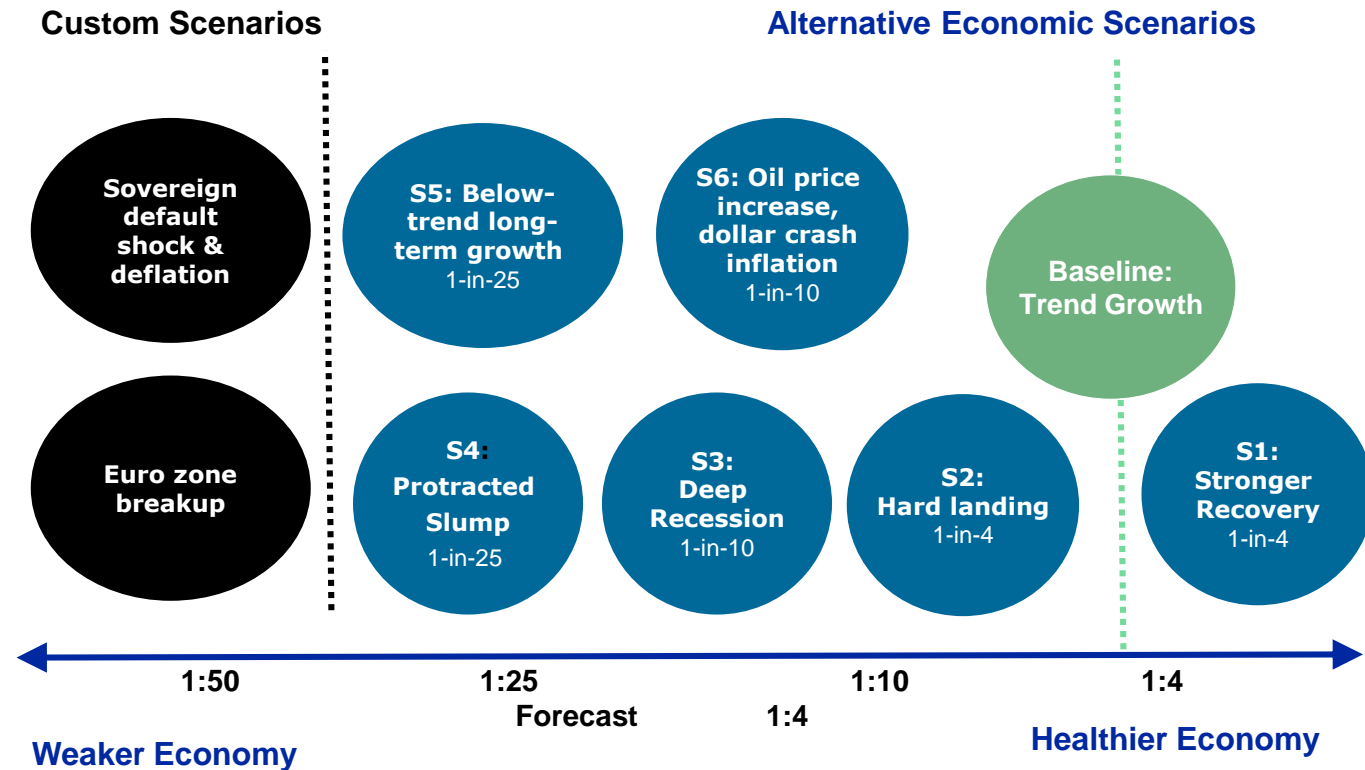
- A **Stressed Balance Sheet** project forward for a three to five year period based on a number of macroeconomic scenarios
- A **Reverse Stress Test** scenario which tests the point and event which might cause an insurer to breach of their risk capital appetite. The reverse stress test can also be used 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



3. Strategic Planning Macroeconomic Scenarios



- 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



Descriptive Nature - Stronger Near-Term Recovery (“S1”)

This above-baseline scenario is designed so there is a 10% probability the economy will perform better than in this scenario, broadly speaking, and a 90% probability it will perform worse.

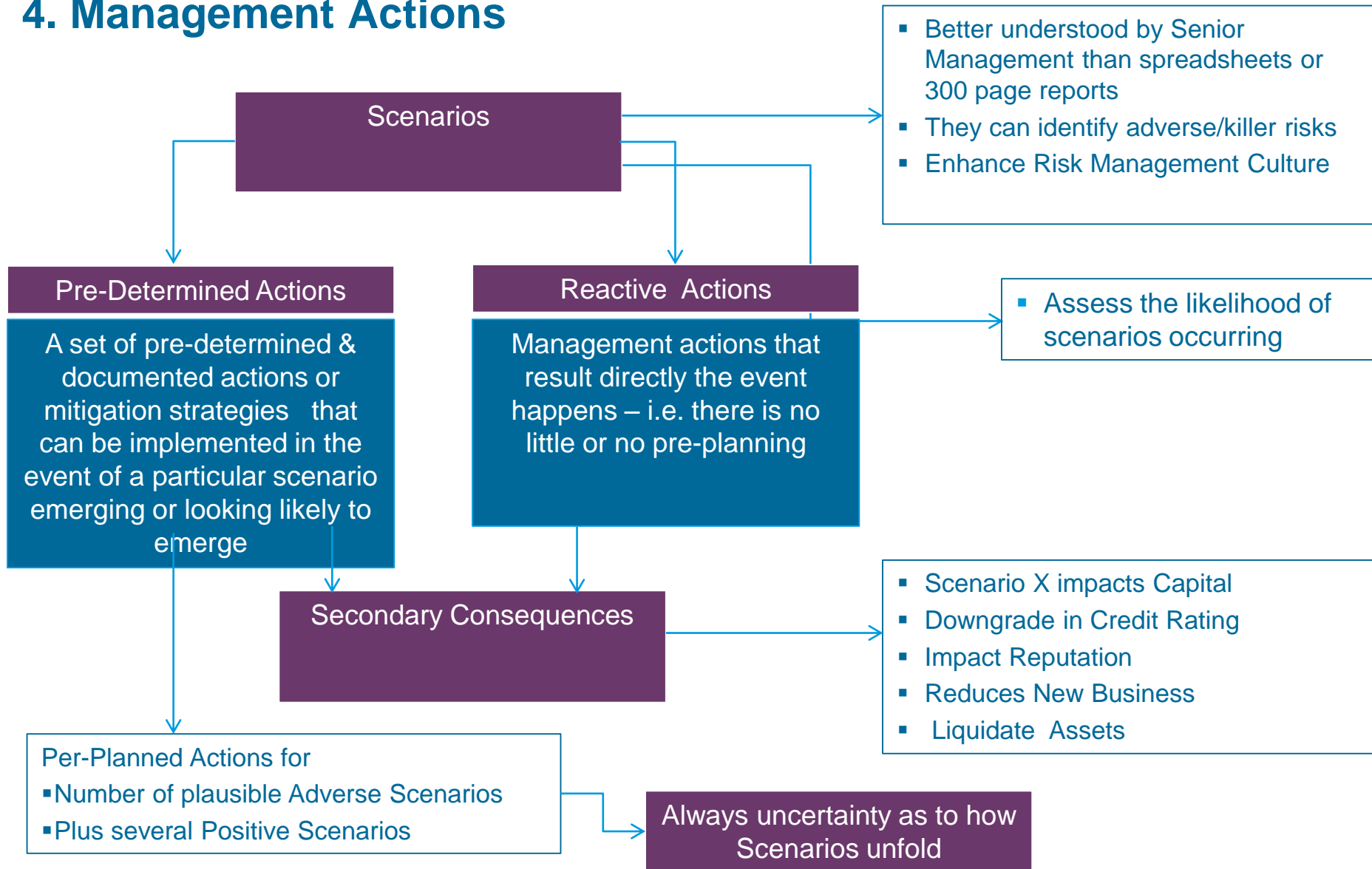
The upside scenario, “Stronger Near-Term Recovery” is based on the assumption of better than expected progress by the European Central Bank and euro zone governments in resolving the sovereign debt crisis. Irish government bond yields tick lower, enabling the country to meet fiscal targets marginally earlier than planned.

Further stabilisation in the euro zone in 2014 raises business confidence around Europe, causing a faster pace of expansion in fixed investment and an improvement in the labour market. The trade-oriented Irish economy benefits from the improvement in demand both in Europe and in the global economy. Easing tension about the euro zone debt crisis improves consumer sentiment and business investment in the world’s largest economy more strongly than in the baseline. The better performance of the U.S. helps to lift global financial markets and demand. Ireland notably benefits because around a quarter of Irish exports are destined for the U.S. and the U.S. is the key foreign investor in the country.

Stronger exports are the key boost behind stronger GDP growth for Ireland than in the baseline. Domestic demand is also somewhat stronger than in the baseline. Retail sales, the property market, and the labour market show stronger activity through 2014. In response to the stronger than anticipated recovery and rising inflation pressures, the ECB starts to raise its key policy rate earlier than in the baseline. Therefore, restrictive credit conditions remain a brake to even stronger

IRELAND MACRO S1 SCENARIO—FORECAST SUMMARY										
	Units	13Q3	13Q4	14Q1	14Q2	2013	2014	2015	2016	2017
Real GDP	10 € bil, SAAR	164.34	165.02	165.11	166.93	162.89	167.17	172.08	176.18	179.35
<i>Change</i>	%YA	1.67	1.86	3.02	3.10	0.04	2.63	2.94	2.38	1.80
Total Employment	Mil, SA	1.89	1.89	1.90	1.91	1.88	1.92	1.94	1.96	1.97
<i>Change</i>	%YA	3.16	2.64	2.58	2.23	2.21	2.00	1.36	0.89	0.41
Unemployment Rate	%, SA	12.80	12.50	12.10	11.80	13.18	11.62	10.62	10.12	9.90
Consumer Price Index	%YA	0.36	0.20	0.71	1.83	0.50	2.33	2.69	1.53	1.99
Official Refinancing Rate, ECB	%	0.50	0.25	0.25	0.25	0.50	0.44	1.38	2.38	3.38
10-yr Government Bond Yield	%	3.98	4.12	4.15	4.20	3.98	4.25	4.41	4.75	5.26
Exchange Rate	€/ \$	1.33	1.36	1.38	1.37	1.33	1.37	1.32	1.24	1.21
BCI All Share General Index	Index	4,165.77	4,399.25	4,567.00	4,894.53	4,042.90	5,021.00	5,685.30	5,967.49	6,297.74
<i>Change</i>	%YA	30.02	33.64	24.43	24.35	26.95	24.19	13.23	4.96	5.53
House Price Index	2005=100, SA	67.09	67.33	68.00	69.24	66.08	69.72	72.81	74.18	75.66
<i>Change</i>	%YA	2.91	2.63	5.03	6.26	0.54	5.51	4.43	1.88	2.00

4. Management Actions



Management Actions – Examples

1. An economic scenario featuring increasing interest rates and a declining equities market might be used to refine an insurer's investment strategy
2. A low interest rate scenario might have an impact on the annuity market resulting reduced sales which might mean a change in product mix

Scenarios for Management Actions should be:

- Intuitive, Plausible & Tangible
- Forward-looking
- Creates dialogue with board and senior management

4

Summary



Benefits of Scenarios

1	Enable more “accurate” actuarial and capital modelling and essential for ORSA
2	Help evaluate the effectiveness of various options available to the insurer or indeed develop a series of predetermined management actions and mitigation strategies
3	Highlight potential weak points in an insurers business plan based on their current risk appetite and exposures. This in turn promotes insurer to think about risk-mitigations and management actions to be set in advance. In many instances these weak-points and risks may be material to the business and thus it is important to have a robust stress and scenario testing framework in place to stress the balance sheet and the overall insurance book.
4	Help evaluate the effectiveness of various options available to the insurer or indeed develop a series of predetermined management actions and mitigation strategies
5	For specific risk events a range of scenarios can be analyzed to quantify an insurer’s exposure to those risks. The insurer can then “walk through with the regulator their advanced planning to deal with adverse scenarios

Scenarios Should

- 1 Cover all key risks an insurer is exposed to, including financial and insurance risks
- 2 Be dynamic and look to the future and compare historical results with forward looking views
- 3 Encompass different events and degrees of severity, including what are considered to be severe but plausible events – not always that easy when considering catastrophe and terrorist risk!
- 4 The time horizon should reflect the characteristics of the business
- 5 Examine full range of relevant variables – wider than key financial indicators including strategic goals and idiosyncratic factors
- 6 Consider if a scenario is one that would have a materially larger impact on the you than your peer companies
- 7 Incorporating “Real World” events and not just financial risks
- 8 Generate clear outputs which are used to inform and support decision making and senior management discussion of results
- 9 Comprise a range of qualitative and quantitative factors which could materially impact an insurer. Which strike a sensible balance between sophistication/complexity and tractability for senior management

5

Questions

