

Capital monitoring and modelling

24 SEPTEMBER 2020



Chairman's Welcome

Fred Vosvenieks

24 September 2020

Agenda



10:30 – 10:35

Chairman's Welcome

Fred Vosvenieks

10.35 – 11.05

Monitoring solvency through a crisis

Russell Ward and Nick Jackson, from Royal London

Questions

11.10 – 11.25

Model Risk

Russell Osman

Questions

11.30 – 11.50

Insurance Capital Standards – just a sideshow?

Philip Simpson and Thomas Bulpitt

Questions and wrap up

Monitoring solvency through a crisis



Russell Ward
Nick Jackson from Royal London



Background and implementation

Key drivers – regulatory

- As part of the ORSA – requiring compliance on a continuous basis with capital requirements¹
- To support notifications to regulators of adverse changes in a firm’s solvency position²

1. Article 45(1b) of the SII Directive

2. Article 136 of the SII Directive

Key drivers – internal management information (MI)

- Highlight and help explain how (and why) the solvency position is evolving between formal valuations -> advance communication of changes avoiding surprises at the next formal valuation.
- Facilitates monitoring of current position vs risk appetite and capital budgets.
- Generation of multiple stress scenarios around the current position to aid understanding of key sensitivities of the capital position -> changes may have implications e.g. for ALM programmes.
- Supports ongoing business decisions via timely MI to senior management -> early warning that action may be needed.

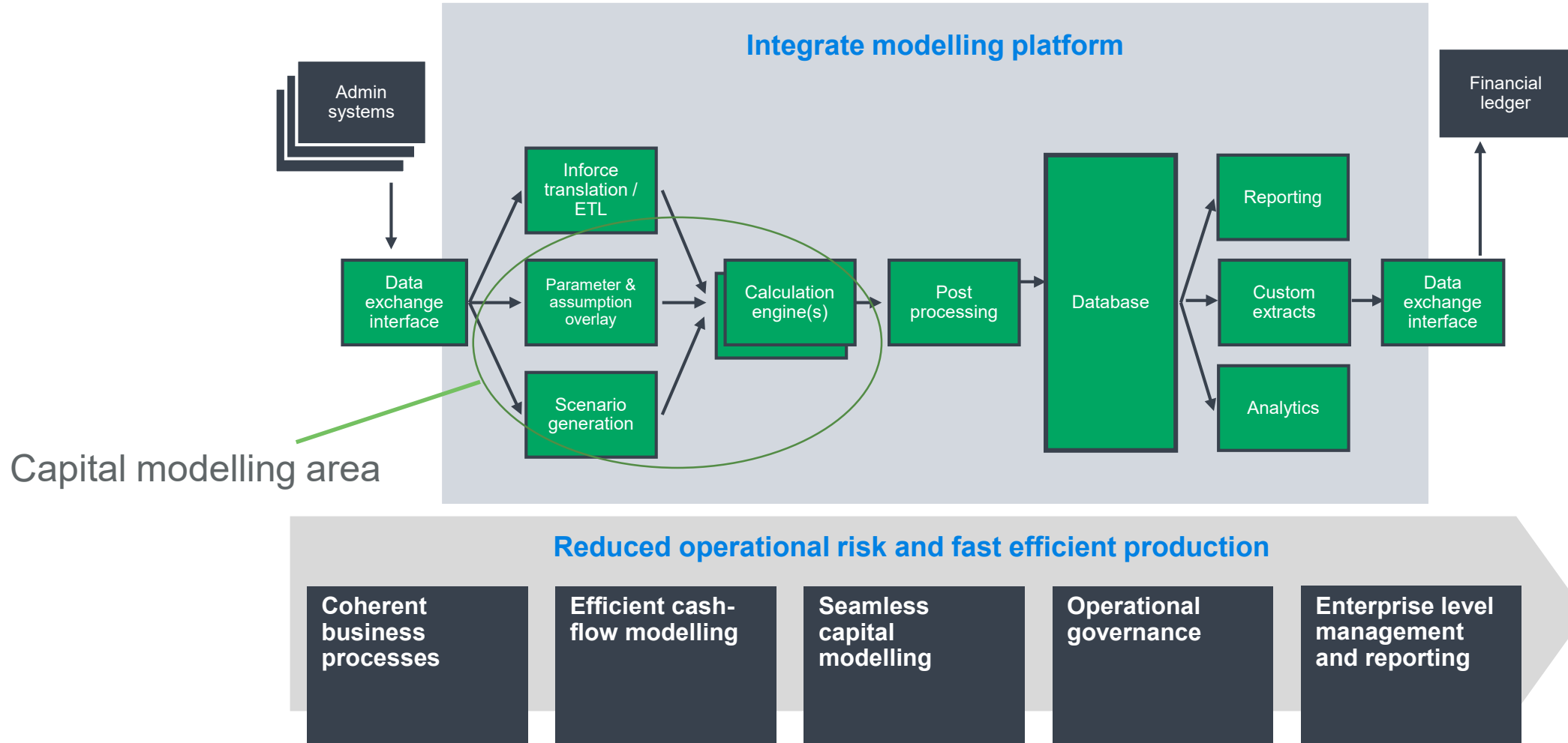
Addressing changes

Our experience

Area considered	Approach
Changes to economic conditions	Automated collection of market data from external vendors, calculation of risk driver impacts and application to shift the risk distribution.
Changes to assumptions	Approach likely to depend on significance: <ul style="list-style-type: none">• Risk driver adjustments may be calculated manually and applied via the system.• Allow via end-piece adjustments e.g. based on cash-flow model sensitivities.
Portfolio run-off / new business	Run-off post calibration addressed via end-piece adjustments to scale results. New business may take a similar approach or may be modelled directly e.g. with its own curve(s).
Other e.g. change to investment strategy	A very broad category – essential to agree a clear and pragmatic process between solvency monitoring team and other areas of the business.

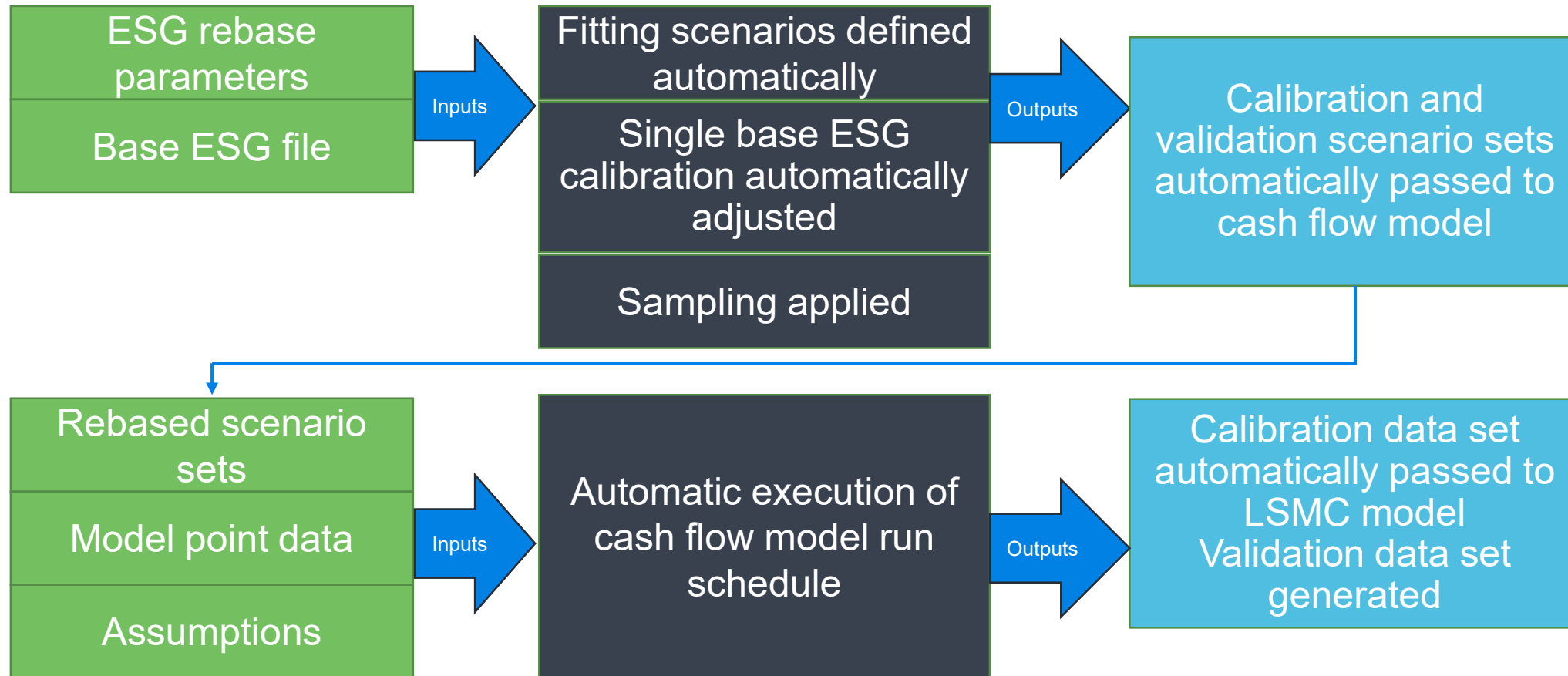
Actuarial modelling platform

An integrated process



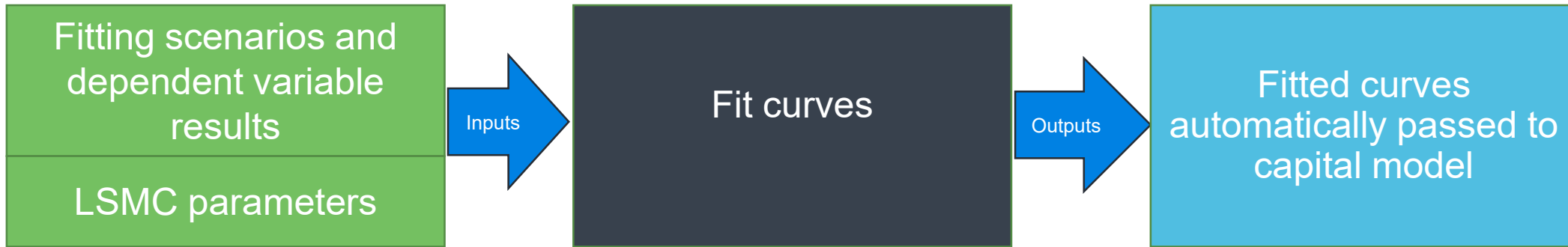
Process overview (1)

Generate the fitting data

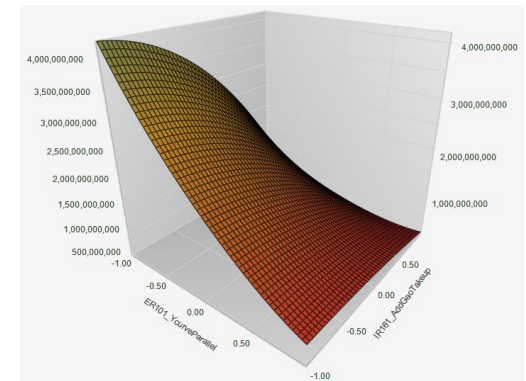
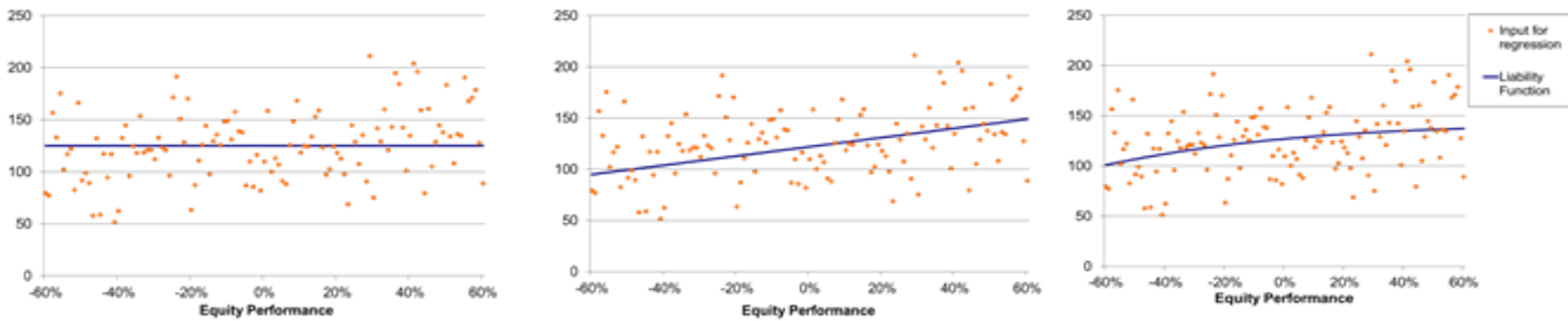


Process overview (2)

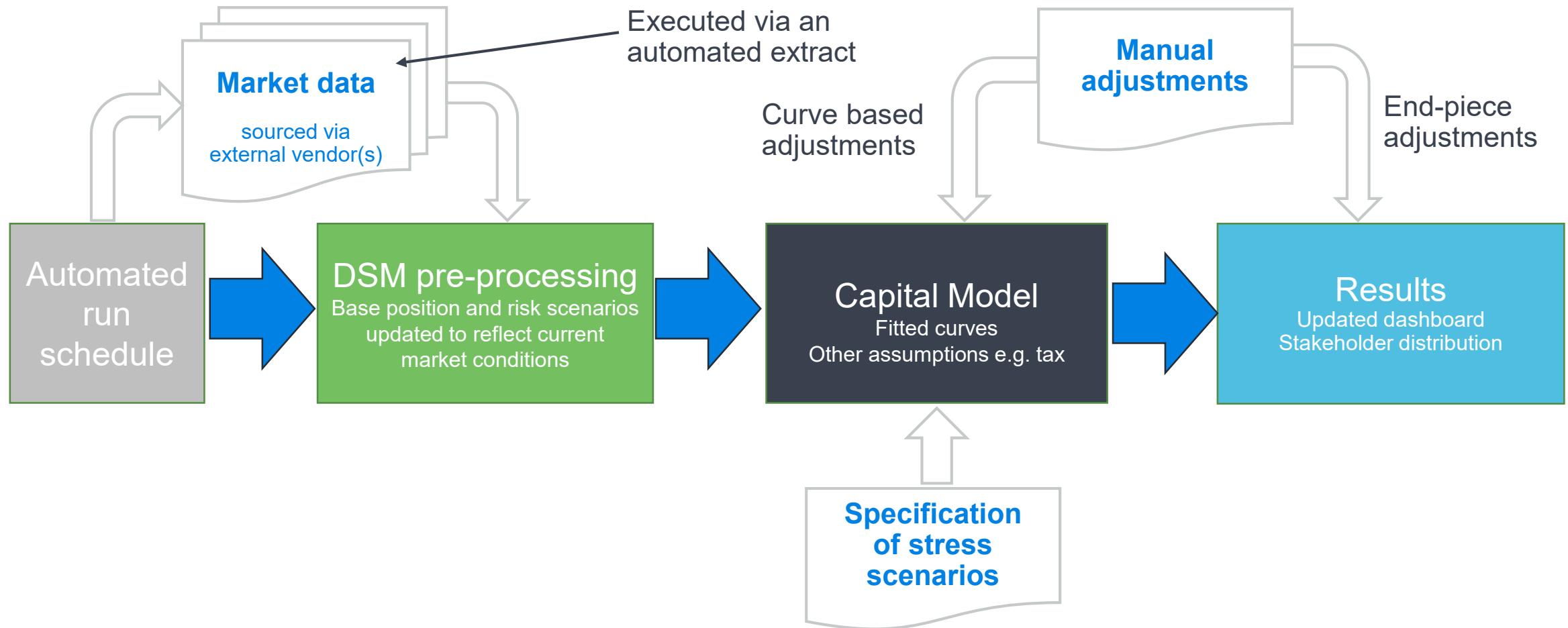
Calibrate the curves using LSMC



Automated model selection & fitting



Process overview - DSM

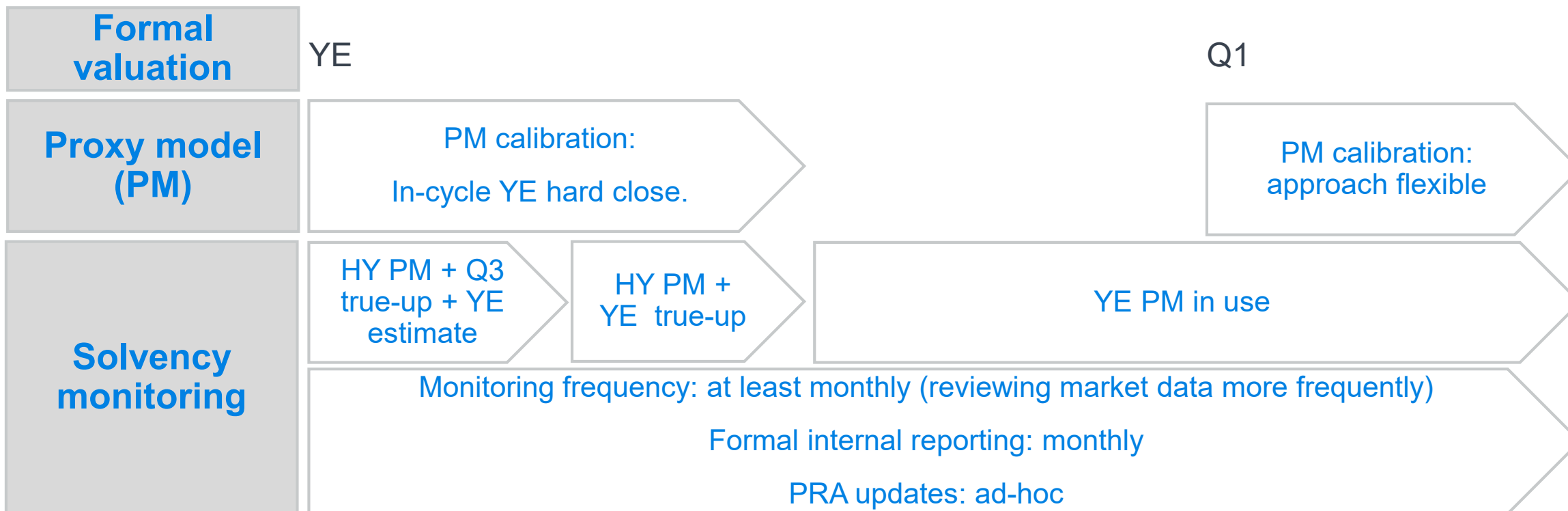


Solvency monitoring in practice during COVID-19

A perspective from Royal London

Solvency monitoring – BAU overview

Royal London's approach in 2019.....



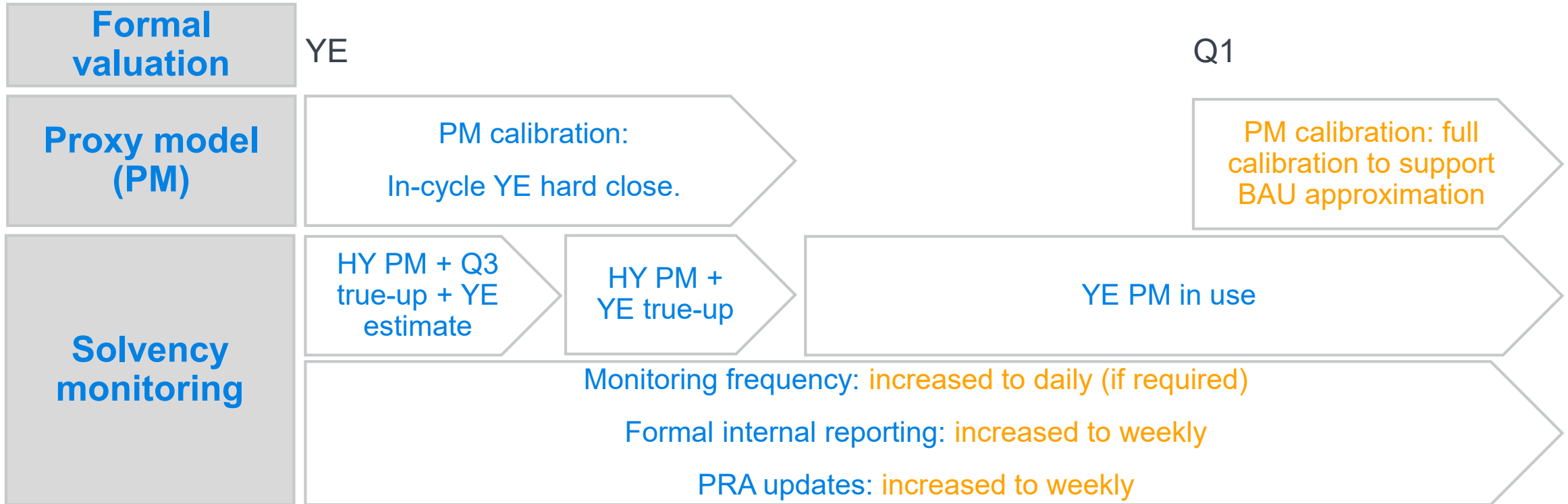
1. YE, HY – full on-cycle calibrations of the proxy model (using LSMC).
2. Q1, Q3 – SCR is calculated without using an on-cycle PM update. The current Solvency Monitoring tool is an input. Model set-up allows a full quarterly recalibration if required.

MI and Communication

- For Royal London, Solvency II is the key capital reporting metric.
- BAU monthly reporting cycle covers updated capital position for each with-profits fund, plus a wide range of sensitivity testing scenarios.
- We consider the “users” of the information in three broad groups:
 - Senior management – core metrics only, focus on narrative.
 - Capital Committee/Actuarial senior management – additional granularity from sensitivity testing provided.
 - Actuarial teams – full granularity available.
- Plus additional ad-hoc Regulatory and Rating Agency requests.
- Established monthly MI packs:
 - Senior Management – one-page “dashboard”. Key Solvency II capital metrics on Pillar 1 and Pillar 2 bases and high-level commentary on results.
 - Capital Committee – more detailed MI pack building on the above one-pager. More detailed analysis fund-by-fund, i.e. sensitivities, risk limits and hedging analyses.
 - Underlying core model output for the Capital Management and Reporting teams.

Responding to a crisis (1)

Royal London's approach in 2020.....



COVID-19 led to significant volatility across a wide range of markets. This led to significantly increased demand for capital updates both internally and externally. Step-change required from the existing BAU process described earlier.

Responding to a crisis (2)



- During height of crisis in late March / April, the frequency of monitoring increased markedly, given the volume of additional requests for updated capital estimates.
- The model runs daily, being run overnight using an automated market data file, with results available to the team next morning. We have cut back scope to focus on core results and key sensitivities, still complemented by the previous month-end full suite of sensitivities.
- Reporting to Senior Management accelerated to weekly, with next day reporting. Similarly able to rapidly respond to PRA request for weekly (and ad-hoc) updates during April – June period.
- Separately, took the decision to update the Proxy Model for a full on-cycle recalibration at Q1.
- This happened whilst we were finalising Q1 reported results within the five week reporting timeline. This recalibrated DSM was available in advance of end-May internal reporting and able to provide a check on end-April results.

Investment in automated systems provides vital capacity to enable the business to “move up a gear” in response to a crisis.

Challenges

- Achieving a high level of automation required a significant effort:
 - The build of the actuarial systems.
 - The build of the daily market data feed.
- Need to manage the balance between proxy model calibration range, accuracy and budget. In addition, it's not feasible/desirable to try to automate everything, as there will always be new features. Retain flexibility to apply end-piece adjustments and be aware of business developments.
- Keep the objective firmly in sight – solvency monitoring aims to provide an early warning of trouble ahead. It should act as a timely complement to the full valuation, providing indicative results and insights into the firm's capital position.
- Ensuring that the model's limitations are well understood, e.g. the greater precision of full cashflow model runs may be needed prior to implementing management actions, rather than relying exclusively on the monitoring results.

Model risk

Russell Osman



Agenda

What is Model Risk?

External Models

End-User Scripting

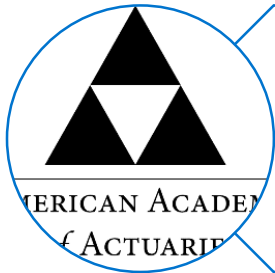
What is Model Risk?

Abridged Definition



The potential for adverse consequences from decisions based on incorrect or misused model outputs and reports

SR 11-07 Guidance on Model Risk Management



The risk of adverse consequences resulting from reliance on a model that does not adequately represent that which is being modeled or that is misused or misinterpreted

Model Governance – Some Considerations for Practicing Life Actuaries



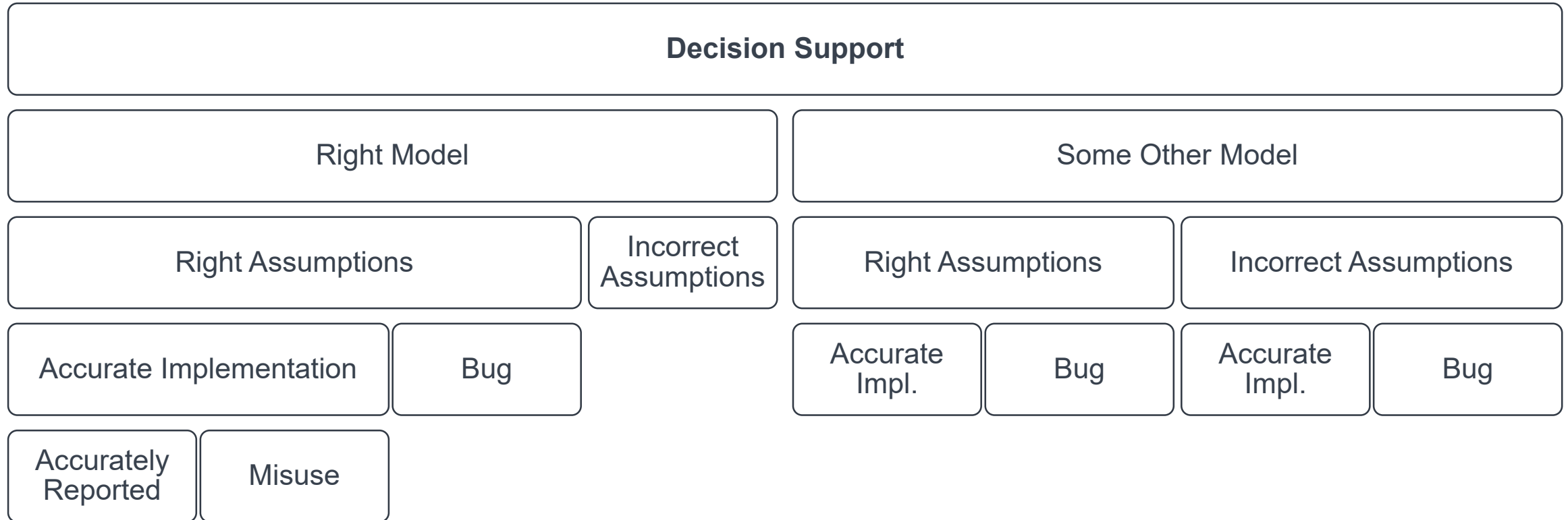
What is of interest in the management of model risk is thus not model error itself, but the materiality of its consequences.

Model Risk Working Party

Risk of a wrong decision being made because an analysis is not what the decision maker thinks it is.

What is Model Risk?

Sources of Model Risk



What is Model Risk?

Managing Model Risk

Model Inventory

- Owner
- Purpose
- Categorisation(s)
 - Risks
 - Products
 - Regulatory context
- Platform
- User(s)
- Documentation location
- ...etc

Useful Processes

- Workflow – Validation
- Queryable
 - Dependencies
 - Theme
- Model risk policy
- Risk scoring + Risk appetite



External Models

Vendor Models



EIOPA-12/136
20 April 2012



VENDOR SUPPORT OF MODEL RISK MANAGEMENT OF VENDOR MODELS

Supported by GARP's U.S. and European
Buy Side Risk Managers Forums

May 28, 2020

Opinion
of the European Insurance and Occupational Pensions
Authority of 2 May 2012 on
External Models and Data

Still need to meet the requirements for internal model approval – including model changes.

Prepared to handle proprietary information.

Summarises the position quite neatly, effectively:

- Vendors need to co-operate in model risk management.
- Clients should understand that such support may be costly to provide.

External Models

Open Source

Governance Challenges

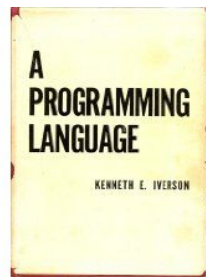
- Narrower use case compared to authors' collective intentions.
- Documentation less likely to be in a form that fits neatly into MRM framework.
- Beware of scope creep and demonstrations entering into production.

Opportunities

- Some test cases and documentation available in public domain.
- No vendor lock-in – may find an ecosystem of consultants who can help.
- Rapid development of proof-of-concepts.

End-User Scripting

Background



- End-user scripting by actuaries is not new.
- The capabilities of libraries that we can invoke with scripting languages now is much greater than when we would be writing glue-steps.
- Questions:
 - Why is Excel so ubiquitous?
 - What end-user computing controls are in place for spreadsheets?
 - How many scripts are out there, how many are important?
 - Is a bad Excel practice because of Excel, or because of bad practice?

End-User Scripting

Suggested governance measures



Lift from department's spreadsheet guidance



A few lines of script can do a lot. Draw out main points for model users and draw out dependencies



Require constraint on what languages and libraries you will allow



Use version control and other paid-for tools



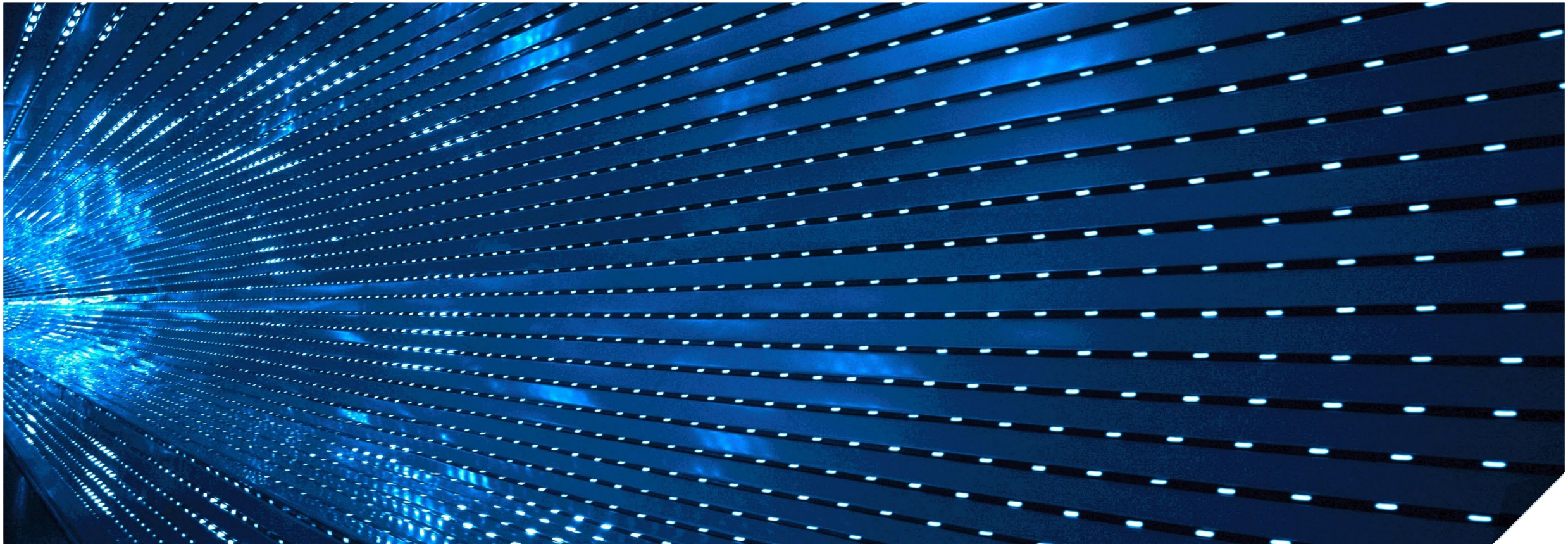
Test sooner rather than later, consider as part of development approach



Culture is essential

Insurance Capital Standards - just a sideshow?

Philip Simpson
Thomas Bulpitt



Why should we care about ICS?

- The shape of post Brexit insurance supervision in the UK remains unclear. If it diverges away from Solvency II then we may look to other international standards as a future template. For example in 2018 the PRA in its response to the Treasury Select Committee's inquiry into Solvency II commented that:

“We agree with the Committee on the importance of having regard to the broader international context of insurance regulation when considering any changes to domestic rules. The PRA will continue to consider the consistency of UK insurance regulation with international capital standards and emerging accounting standards.”

- Both the regulators and industry bodies have recently expressed interest in how some areas of Solvency II might look if a different supervisory regime were followed, for example the risk margin.
- Those working in the industry that may be affected by ICS fall broadly into three groups:
 - Those working for UK based Internationally Active Insurance Groups (IAIG)
 - Those working for the UK subsidiaries or branches of IAIGs
 - Those working for all other insurers in the UK who might one day be regulated in an ICS like regime.

We expect that many viewers of today's forum will be in the last category. So ICS may not just be something that affects only other people.

Known Issues with Solvency II

- The PRA has previously highlighted a number of areas of Solvency II where improvements could be made in its response to the Treasury Select Committee's inquiry into Solvency II. There are also a number of other areas that are known concerns for the insurance industry with respect to Solvency II
- Areas of Solvency II that are known areas of potential improvement by the regulators/industry:
 - Risk Margin
 - Matching Adjustment eligibility criteria
 - Volatility adjustment and in particular use of a Dynamic Volatility Adjustment
 - Lack of an equity volatility stress
 - Insufficient interest rate stresses for negative interest rate environments
 - Regulatory Reporting Burden

The IAIS Global Frameworks for Supervision of IAIGs



The IAIS Global Frameworks for Supervision of IAIGs

- The IAIS has been conducting consultations with stakeholders and field testing of ICS between 2014 and 2019. Many aspects of the ICS have evolved over the course of field testing.
- The ICS were formally adopted at the end of 2019.
- There is a 5 year monitoring period from the start of in 2020. The IAIS does not expect material revisions to standard ICS methodology during the monitoring period.
 - Regulators will collect information on the ICS standard model, internal models, and other alternate measures (e.g., GAAP plus or aggregation method)
- Implementation as a prescribed capital requirement will occur at the end of the monitoring period, starting in 2025. It is possible that the final implementation may include approaches other than the ICS standard model (reference ICS):
 - For example Internal models may be allowed to replace the ICS standard model.
- The ultimate goal of the ICS monitoring period is to achieve a single ICS for an insurer that can be comparable across jurisdictions and meet the needs of the different regulators.

What is an IAIG?

- Insurance-dominated conglomerates, insurance groups and any insurers whose distress or disorderly failure, because of their size, complexity and interconnectedness, would cause significant disruption to the global financial system and economic activity.
- For ICS an IAIG is an insurance group that meets two criteria, related to its international activity and size:
 1. The group's premiums are written in three or more jurisdictions and gross written premiums outside of the home jurisdiction are at least 10% of the group's total gross written premiums.
 2. Total assets of the group are at least USD 50 billion or gross written premiums are at least USD 10 billion (on a rolling three year average basis).
- IAIS expects there to be about 50 IAIGs.
- No definitive list of IAIGs, up to local supervisors to identify them

UK IAIGs

- Bank of England 28 May 2020: We have identified the list of Internationally Active Insurance Groups (IAIGs) headquartered in the UK as follows:



EU IAIGs

- This is the list of IAIGs headquartered in the European Union. The list is based on information from those European group-wide supervisors that have shared with EIOPA their own list as of 18 May 2020, according to the criteria and cases set out in the IAIS Common Framework for the Supervision of IAIGs (ComFrame 23.0.a and 23.0.b).
- The insurance groups identified as of 18 May 2020 as IAIGs headquartered in the EU are:
 - Aegon*
 - Ageas#
 - Allianz#
 - Assicurazioni Generali
 - AXA#
 - BNP Paribas Cardif
 - CNP Assurances
 - COVEA* #
 - Crédit Agricole Assurances
 - GROUPAMA
 - Grupo Mapfre
 - Hannover Re*
 - Munich Re*
 - NN Group
 - SCOR#
 - SOGECAP
 - Vienna Insurance Group

*Group includes a UK presence predominantly in the life insurance market

#Group includes a UK presence predominantly in the non-life insurance market

https://www.eiopa.europa.eu/tools-and-data/registers/list-internationally-active-insurance-groups-iaigs-headquartered-eu_en

Solvency II vs ICS

Solvency II vs. ICS Balance Sheets



Solvency II vs ICS Stresses (Similarities)

RISK	SOLVENCY II STANDARD FORMULA	ICS
Mortality	+15% mortality rates	+10/12.5% (country dependent)
Longevity	-20% mortality rates	-17.5% mortality rates
Lapse Up/Down	+50% long-term rates	+20%/40% (country dependent)
Mass Lapse	-40% retail/-70% non-retail	-30% retail/-50% non-retail
Expense	+10% expenses/+1% inflation	+6-8% expenses/+1-3% inflation (country and time dependent)
Life Catastrophe	+0.15% mortality rates	Terrorism: property, mortality and morbidity impacts Pandemic: 1 per 1000 death increase
Property	-25% property value	-25% property value
Equity	Type 1: -(39% + SA) Type 2: -(49% + SA) Strategic: -22%	Listed shares: -35%/-48% Hybrid debt: stress based on rating Other equity: -49% Volatility increase scenario
Currency	More onerous of +/-25%	More onerous of two defined scenarios based on currency held and long or short position.

Solvency II vs ICS Stresses (Key Differences)

RISK	SOLVENCY II STANDARD FORMULA	ICS
Interest Rate Risk	Most onerous of interest rate up and down stresses	<p>Formula based on 5 scenarios:</p> <ul style="list-style-type: none"> - Mean reversion (MR) - Level Up (LU) - Level Down (LD) - Twist Up-to-Down (TD) - Twist Down-to-Up (TU) <p>} Level/Twist (LT)</p> <p>Combined by: $\max\left(0, \sum_i MR_i + \text{VaR}_{99.5}\left(\sum_i LT_i\right)\right)$</p>
Spread Risk	<p>One directional stress for corporate bonds</p> <p>Dependent on credit quality step (CQS) and duration to maturity</p> <p>Stress covers default and illiquidity risks associated to corporate bonds</p>	<p><u>Non-Default Spread Risk (NDSR)</u></p> <p>Spread Up and Down stresses</p> <p>Flow into market risk correlation as two separate stresses</p> <p>Dependent on the ICS rating category (RC)</p> <p><u>Credit Risk</u></p> <p>One directional stress</p> <p>Different stresses for different asset types</p> <p>Stress factors dependent on the RC and duration to maturity</p>

Modelling Results

Our Model

- Simple annuity model calculating both the Solvency II BEL and ICS CE
- Outputs the interest rate and NDSR/credit capital requirements under both Solvency II and ICS

Assumptions

- Average age 65
- 50:50 Male/Female policyholder split
- Level in-payment annuity liabilities
- Assets assumed to be zero coupon bonds
- Asset portfolio composition based on typical portfolios from EIOPA QRT analysis
- Assets assumed MA eligible

Limitations

- Limited by the data available – IAIS have not published all required data
 - ICS “risk corrections” are estimated based on Solvency II fundamental spreads
 - ICS spread data assumed to be equal to market data
- Illiquidity premia are calculated at key duration points and linearly interpolated

Scenario Results (as at 31 December 2019)

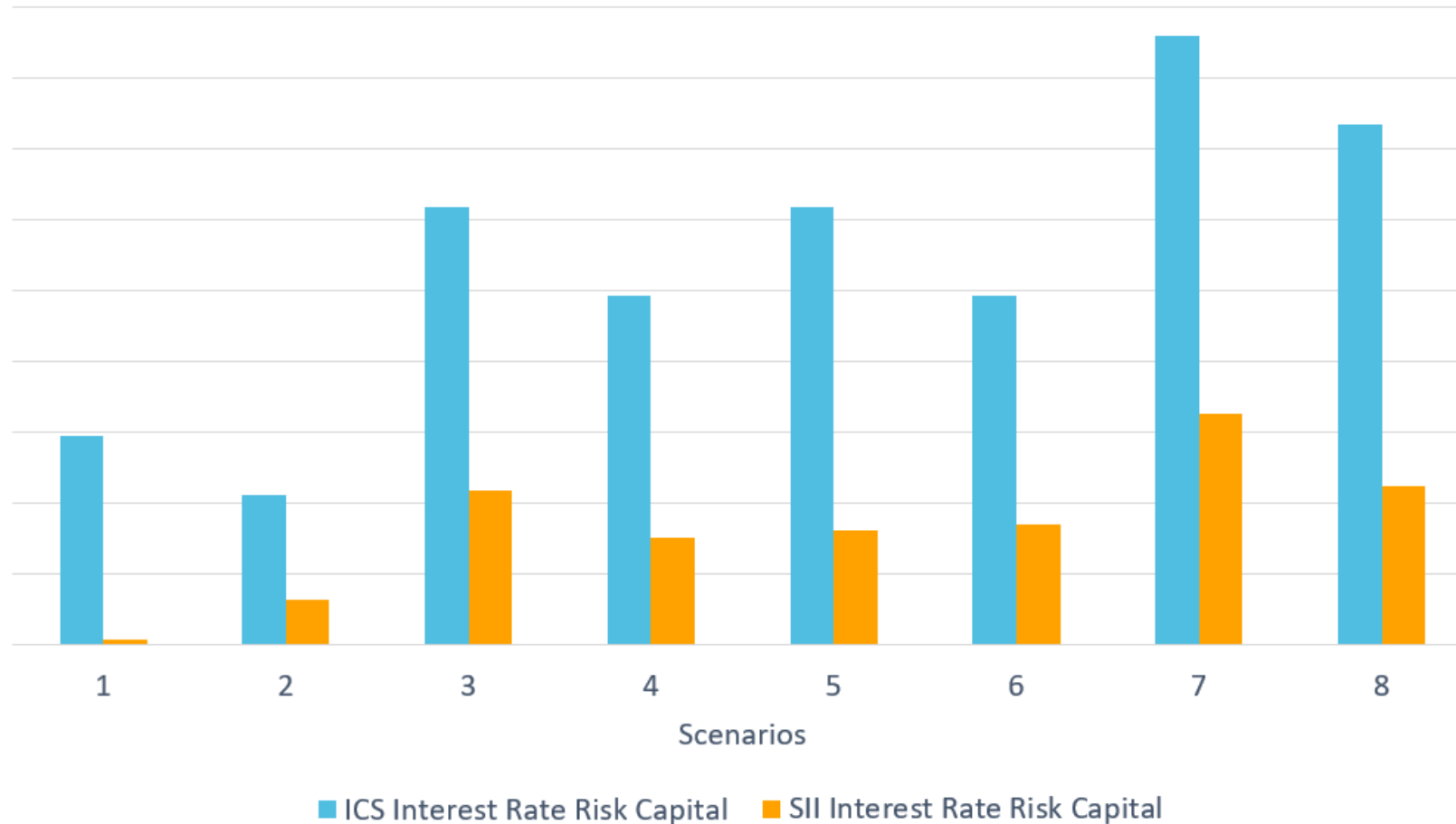
	Asset Dur. Gap	Scenario	ICS Bucket	SII Bucket	SII BEL vs ICS CE
1	+0.50	Closely matched block - MA eligible	Top	MA	SII BEL is 2.2% higher than ICS CE
2	-0.50		Top	MA	SII BEL is 2.2% higher than ICS CE
3	+2.00	Bigger mismatch - VA eligible	General	VA	SII BEL is 2.8% higher than ICS CE
4	-2.00		General	VA	SII BEL is 2.8% higher than ICS CE
5	+2.00	Bigger mismatch - VA ineligible	General	RFR	SII BEL is 4.5% higher than ICS CE
6	-2.00		General	RFR	SII BEL is 4.5% higher than ICS CE
7	+3.00	Even bigger mismatch - VA ineligible	General	RFR	SII BEL is 4.5% higher than ICS CE
8	-3.00		General	RFR	SII BEL is 4.5% higher than ICS CE

Spread Risk



- Solvency II is more onerous across all scenarios.
- Some liquidity pickup for all liabilities – unlike Solvency II
- Desirable as Solvency II may adopt Dynamic VA

Interest Rate Risk



- Assets long => IR up bites => MR stress double hit.
- Assets short => IR down bites
- No floor on the down stress under ICS
- ICS includes twist stresses
- Potential capital volatility

Concluding remarks

- Overall, lower reserves (BEL vs. CE) under ICS than under Solvency II
- ICS MOCE vs. SII Risk Margin is a much more simple calculation that would be less sensitive to interest rates
- Capital requirement stresses comparable under ICS and Solvency II for a number of stresses, however notable differences for spread and interest rate risk stresses.
- Spread risk capital looks to be generally lower under ICS than under Solvency II
- Existence of a mean reversion stress increases capital where rates up bites
- Interest rate stress under ICS could increase capital volatility where biting stress switches between up and down



Thank you

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