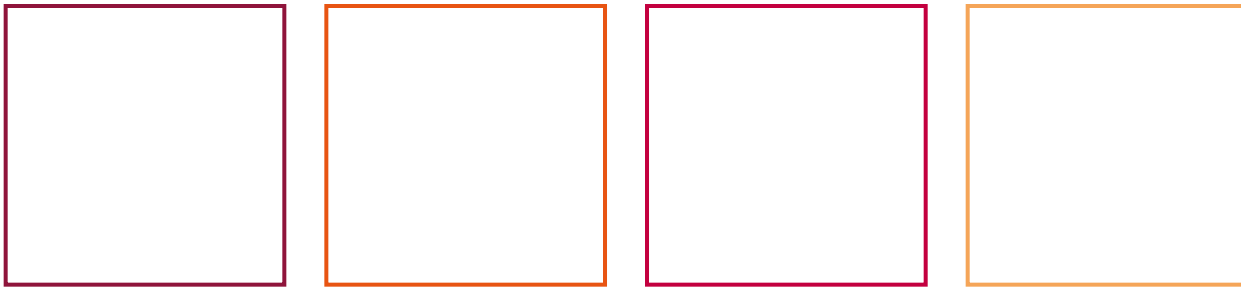


Cracking the Kernel

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Today's agenda

- How can Internal Audit provide Solvency II programme assurance taking into considering the technical aspects being implemented?
- Review of the specialist areas
- Interdependencies between Validation and Assurance
- Different approaches to validating the model
- How to evidence data quality attainment
- Questions for the Group

Technical understanding

- Most of the tests and standards are specialist and require extensive technical knowledge
 - What is a probability distribution forecast?
 - Article 121 - Statistical quality standards
 - Article 122 - Calibration standards
 - Article 123 - Profit and loss attribution
- Solvency II introduces new terminology
 - Technical provisions, risk margin, SCR v MCR
- The Internal Model calls upon advanced mathematics to estimate the capital which must be held for the following year
 - Simplifying assumptions / approximations are used in the model
 - Actuarial and Statistical techniques
 - Log normal v negative binomial - which is the most appropriate?
- It is important to have a level of understanding but you need not be an expert

Validation compared to Assurance

- **Validation** – to confirm and establish the soundness of the model
 - The model meets all of the tests and standards required for model approval (some are technical others are not)
- **Assurance** – a declaration of confidence in the Internal Model
 - The design and operation of the model can be trusted

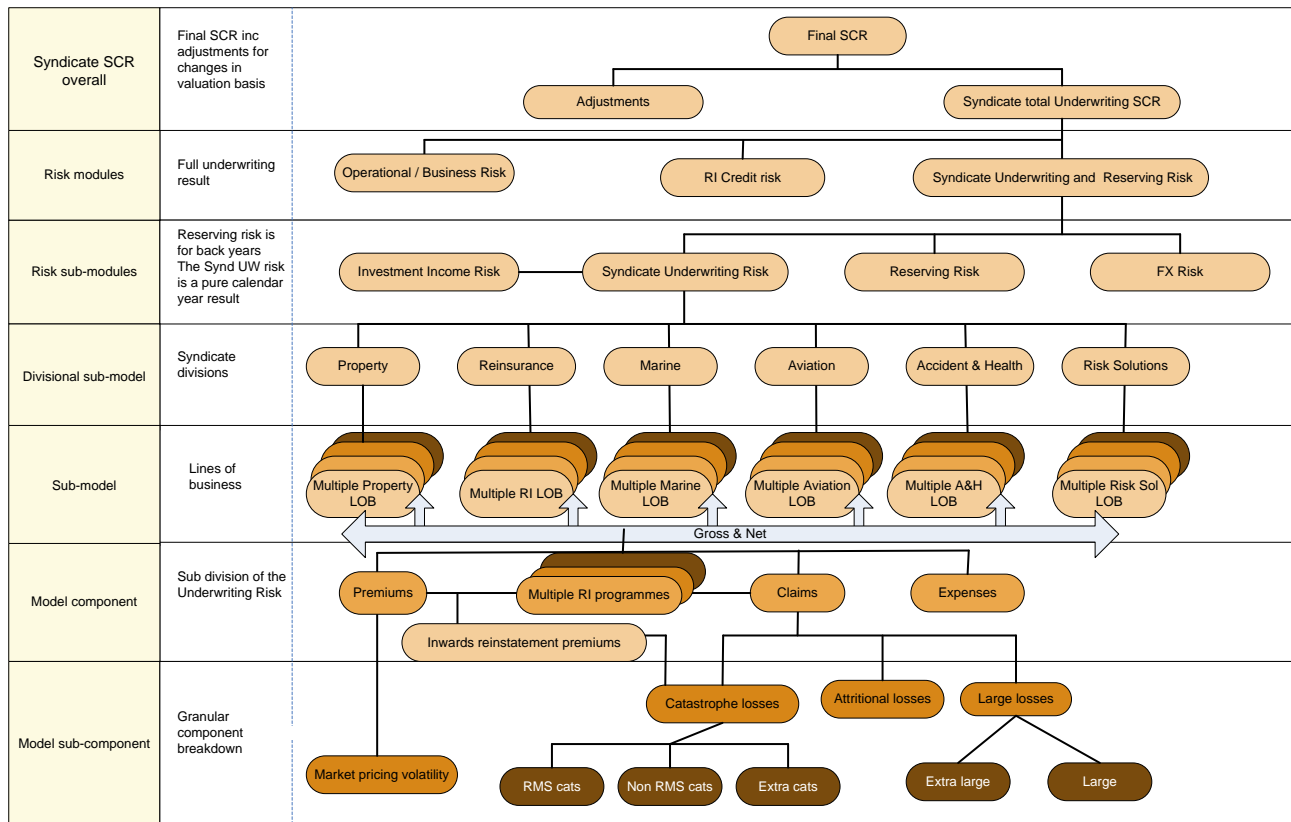
Both play a very important role

Different people – different skill sets – different perspective

How can Internal Audit assist?

- Common sense approach
 - Complements a technical review
 - Raise questions which take a macro view
- Objective
 - Disciplined approach
- Well planned & executed analysis of the model
 - Structured approach throughout the year
 - Not just a one off audit – each year / quarter there is more to learn
- Detailed documentation of the model identifying key controls
 - Use of schematics
 - Must convey meaning
 - Enable non technical people to get an insight into the model
 - Flow charts and diagrams

Model structure schematic



Model validation approaches

- There is not one solution but a range of possibilities to suit the individual needs of every Company
- Which department should lead the validation of the Model
 - Risk Management?
 - Internal Audit?
 - A combination of both?
 - Recognise the strengths within your Company
 - Who is best to validate Article 125 – documentation standards?

Co-ordination is key to understand who is doing what and when

Internal v external approach

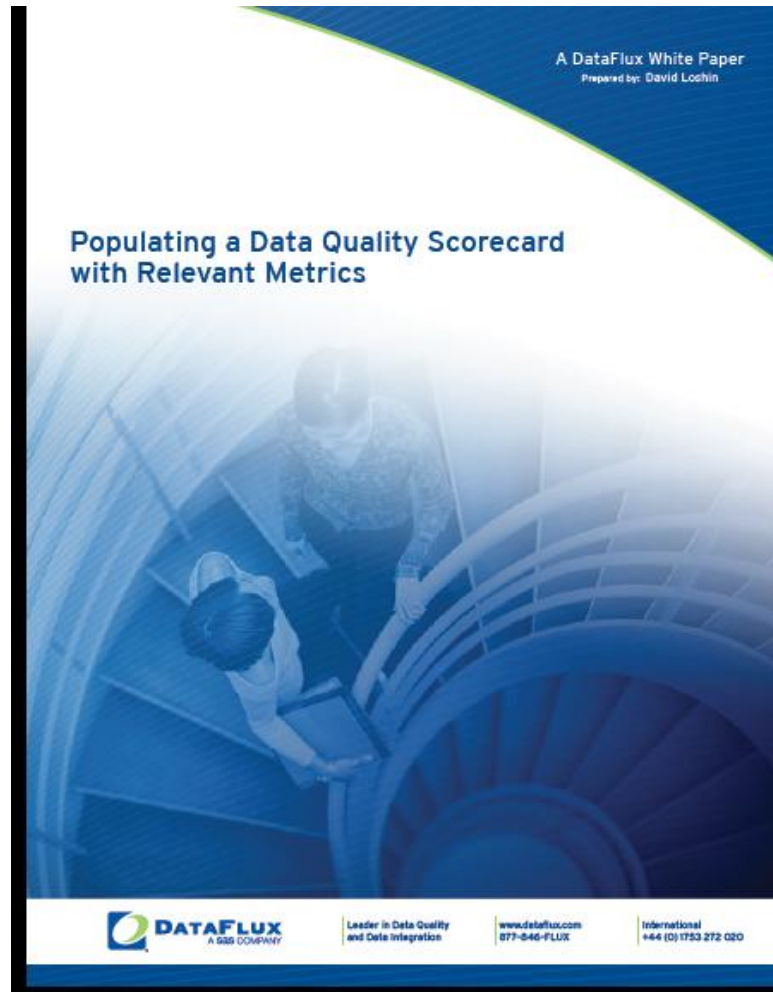
- Once again there is not one solution but a range of possibilities to suit the individual needs of every Company
- Whichever solution is chosen it is essential for independence to be made
- Internal resourcing
 - Dedicated department
 - Use of a Group function
 - Different locations validating each other
 - Different functions validating each other
- External resourcing
- Combination of Internal and External
- External in the 1st year with transition to Internal over time

Co-ordination is key to understand who is doing what and when

Evidencing Data Quality attainment

- Do not try to re-invent the wheel!
- Data quality controls will be performed in most departments already
 - Formal controls, automated system checks
 - Informal controls, reviews within departments
- Build upon the existing controls and share best practice
- Consolidate the pre-existing checks and use them as comparisons against each other
 - What one department may believe is a quality issue may not be material for another
- Best practice for data quality has already been outlined – it is the insurance industry who are using this for the first time so benefit from the experiences of other industries.

Review best practice



1st Data quality assessment

- Establish data quality metrics qualitative and quantitative
- Involve many departments to receive their feedback
- Define levels of acceptable standards
- Understand the materiality of each data set to the SCR
- Perform the assessment at a data set level to avoid granularity issues of looking at individual data fields
- Who will conduct the assessment?
 - Technicians who operate the model / internal audit / risk management?
- Be prepared for surprises in the results – minor unresolved issues can cause major problems to downstream data quality
- Try to implement best practice through the use of data quality scorecards and data quality dash boards
- Recognise the 1st assessment is a test of the process which will be improved

Data quality scorecard

Data Set	Source	Materiality	Data Quality Standard	Data Quality Rating	DATA QUALITY CRITERIA (out of 5)									
					ACCURATE				COMPLETE			APPROPRIATE		
					Error Free	Current	Confidence	Controlled	Comprehensive	Inclusive	Historic	Granular	Relevant	Consistent
Cat data - rate and loss tables	Cat Modelling	High	3.5	3.5	3	4	3	3	3	3	4	4	4	4
Cat data - premium based on	Cat Modelling	High	3.5	4.0	3	4	3	3	4	4	4	5	5	5
Cat data - loss summary	Cat Modelling	High	3.5	3.2	3	3	3	3	3	3	3	3	4	4
Business plan	Dept of UW	High	3.5	3.2	2	2	2	2	4	4	4	4	4	4
Historic claim data at claim level	Eclipse	High	3.5	3.9	3	4	3	4	5	4	3	5	4	4
Historic premiums and claims data	Eclipse/Forecasting	High	3.5	3.9	3	4	3	4	5	4	3	5	4	4
Earnings rates	Finance	High	3.5	4.2	4	4	4	4	5	5	5	5	3	3
FX rates	Lloyd's	High	3.5	5.0	5	5	5	5	5	5	5	5	5	5
Detailed RI resume	OWRI	High	3.5	4.1	4	4	4	4	3	4	5	4	5	4
Distilled RI resume	OWRI	High	3.5	3.8	4	4	4	4	3	4	5	4	3	3
Historic claims data	Reserving	High	3.5	3.9	4	4	4	3	4	4	5	3	4	4
Current reserve amounts	Reserving	High	3.5	3.8	4	4	4	3	4	4	3	3	5	4
Latest year-end reserve projections	Reserving	High	3.5	3.7	3	3	3	3	4	4	5	3	5	4
Operational risk register	Risk Management	High	3.5	4.0	4	4	4	5	4	4	4	3	4	4
Operational risk definitions	Risk Management	High	3.5	4.3	5	5	5	5	4	4	4	3	4	4
Reinsurance failure rates	AM Best Report	Medium	2.8	4.9	5	4	5	5	5	5	5	5	5	5
RDS scenario data	Dept of UW	Medium	2.8	3.7	4	4	4	4	4	4	5	3	3	2
Historic actual PRI	Dept of UW	Medium	2.8	3.4	4	4	4	4	3	4	2	3	3	3
Historic line size	Eclipse	Medium	2.8	3.3	3	4	3	3	4	3	3	4	3	3
Projected amount of assets	Finance	Medium	2.8	3.0	3	3	3	3	3	3	3	3	3	3
Projected investment return	Finance/Dept of UW	Medium	2.8	4.1	5	3	4	5	4	4	4	4	4	4
Projected expenses	Finance/Dept of UW	Medium	2.8	4.1	5	3	4	5	4	4	4	4	4	4
Current reinsurer ratings	Lloyd's RI dept/OWRI	Medium	2.8	4.3	4	4	4	4	4	4	4	5	5	5
Current reinsurance balance by RI	OWRI	Medium	2.8	4.0	4	4	4	4	4	4	4	4	4	4
Syndicate weightings	Risk Management	Medium	2.8	3.8	4	4	4	3	4	4	4	4	4	3
Department exclusions by syndicate	Risk Management	Medium	2.8	3.9	4	4	4	3	4	4	4	4	4	4
Cat data - industry loss tables	Cat Modelling	Low	2.0	3.7	4	2	4	4	5	5	4	3	3	3
Proportion of business by currency	Dept of UW	Low	2.0	4.7	5	2	5	5	5	5	5	5	5	5
Historic planned PRI	Dept of UW	Low	2.0	4.4	4	3	4	4	5	5	5	5	5	4
Historic monthly FX data	Internet	Low	2.0	4.6	5	5	5	4	5	5	5	4	4	4
Volatility as a percentage of assets	Finance	NA	NA	0.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Payment patterns	Reserving	NA	NA	0.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Data quality scorecard

Overall data quality %		71%	14%	15%	
Break down by Syndicate					
	Synd 1	Synd 2	Synd 3	Synd 4	Synd 5
Data quality scorecard (Capital Modelling Team CMT)	25	25	25	20	10
	2	2	2	5	3
	1	1	1	0	7
Kiln data quality review (non CMT)	6	13	14	15	13
	8	3	2	2	4
	7	5	5	4	4

Questions for the Group

- If you have a nat cat model does it fall within the scope of your Internal Model?
- How do you propose to validate / provide assurance for Article 126 'external models and data'
 - Nat Cat models - RMS, AIR, EQE
 - Very technical
 - What is your approach?