LLOYD'S

SOLVENCY II: MODEL VALIDATION

Workshop 6

14 & 15 MAY 2013

AGENDA

- Quick SII update
- Validation: lessons learned
- Three steps to improving the Validation Report
- Questions
- Changes to the LCR for 2014 capital setting
- What's new for 2014 ?
- Questions

DELAY REQUIRES MODIFIED APPROACH - TO BE IN LINE WITH THE INTERIM MEASURES

- Assume at this stage that Solvency II rules will ultimately apply
  - with an assumed a 1 Jan 2016 start date
- Options discussed internally as well as with the LMA and PRA
  - "Full Stop" and "Full Steam Ahead" considered and dismissed
- **"Soft Landing"** deemed appropriate approach to take
- Phased implementation - least painful and most efficient
  - avoids full burden of Solvency II compliance in advance of go live
  - does not lose good work already done
- Quantitative requirements apply immediately to support use of Solvency II models
- Qualitative requirements phased in over 2013 to 2016

SOFT LANDING IN 2013 DOES NOT REQUIRE FULL COMPLIANCE WITH ALL TESTS AND STANDARDS

- Agents to continue to run and embed processes as per operating model
- Quantitative submissions using Solvency II internal models to meet ICAS+
- Key supporting qualitative processes live and evidenced:
  - ORSA
  - **Model Validation**
  - Model Change governance and reporting
  - Documentation controls and updates
  - Actuarial Function Report
- Lloyd's will continue to provide and follow up on feedback
- Maintain compliance with principles AND close gaps to tests and standards
- Board declaration and confirmation of status required in October 2013

CURRENT AGENT STATUS ON VALIDATION

Measured against Principles of Tests & Standards

Measured against Full Tests & Standards

Does meet the standards

Pending further assessment by Lloyd's

Does not meet the standards

COMMON ISSUES DRIVING "FAILS" ON PRINCIPLES

AREA/PRINCIPLE	ISSUES OUTSTANDING
ORSA	
Validation	• Evidence of feedback loop and follow up/tracking of validation failures • Validation report does not provide sufficient evidence of validation work performed and conclusions
Model Change	
Use Test	
Documentation	

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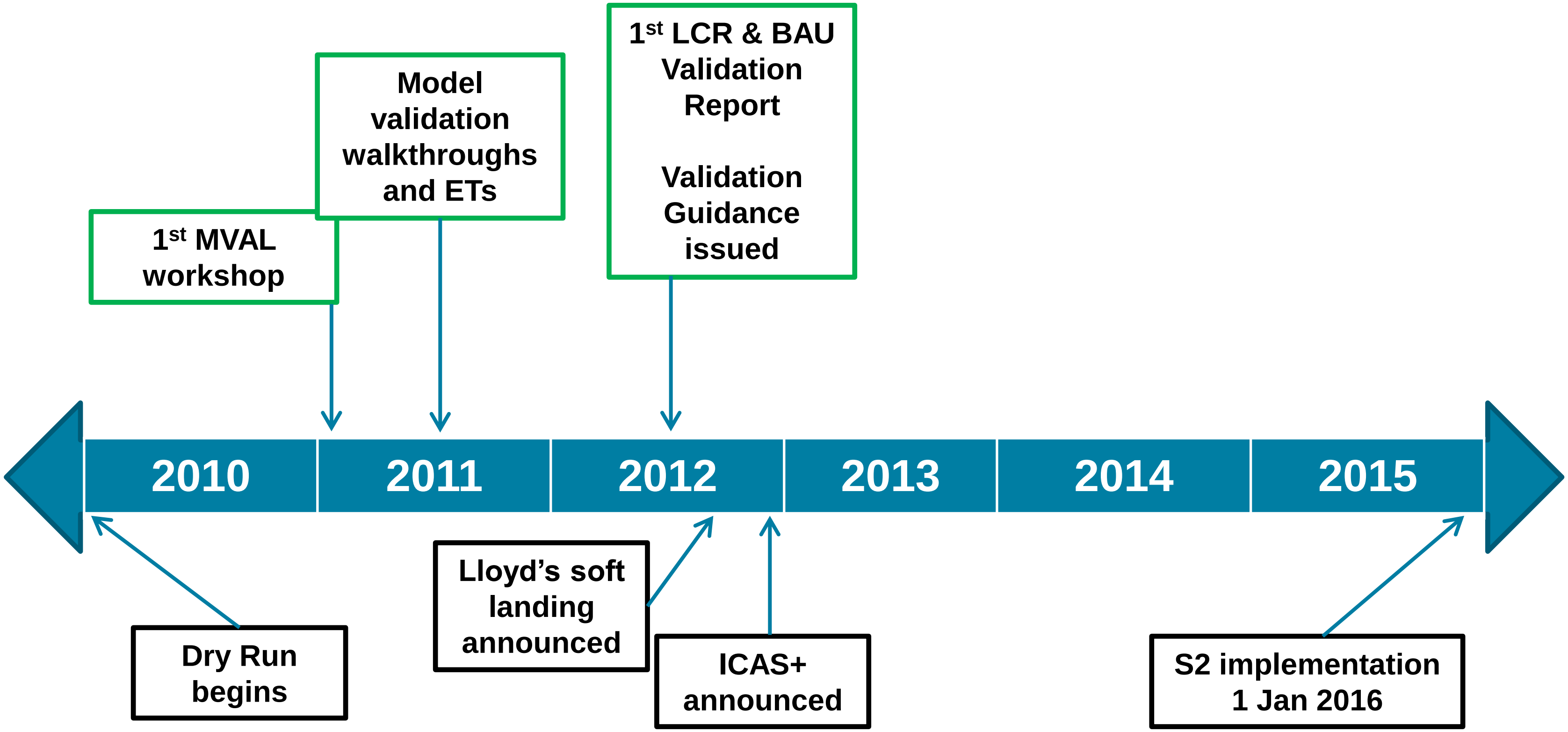
SO HOW ARE WE DOING?



We have come a long way since 1 Jan 2010…..

Now is a good time to take stock

TOP 3 ACHIEVEMENTS ON VALIDATION

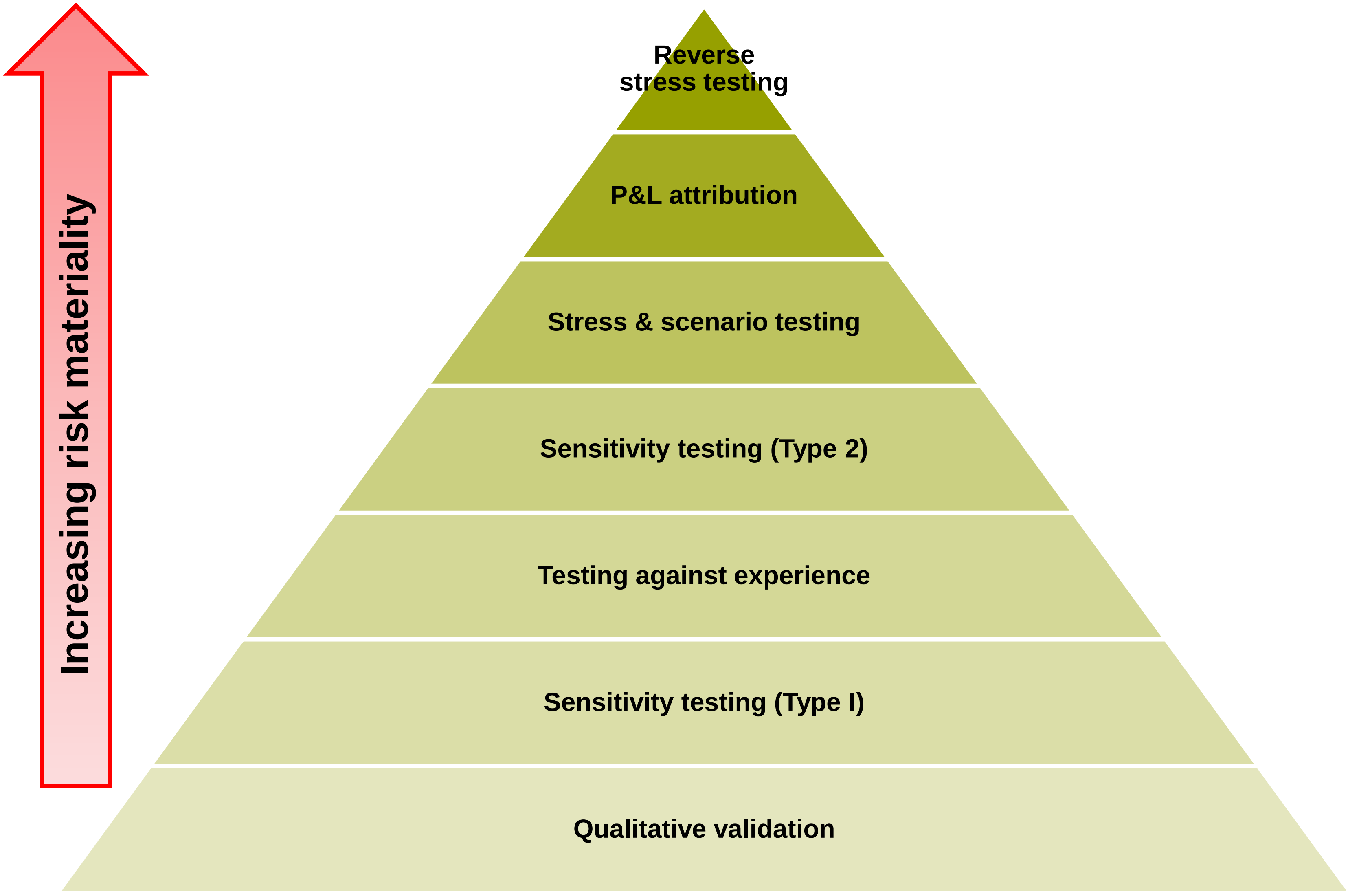
1. A structured validation process has been implemented and governs model change
2. Model assumptions and methodologies have become more robust (and there is a deeper understanding of external models)
3. Validation results are communicated to the board, management and the wider organisation

…in other words, validation is being embedded across the market

TOP 3 AREAS FOR IMPROVEMENT

1. The operation of the validation cycle needs to be clarified – what constitutes an unacceptable result, and what happens when one occurs?
2. Communication (including the Validation Report) should use risk-based as well as statistical language
3. Validation tools applied should be applied in proportion to the materiality of the risk – more (sophisticated) tests for larger risks

VALIDATION TESTS AND MATERIALITY: SUGGESTED HIERARCHY



SO SOLVENCY II IS DELAYED…DOES VALIDATION STILL MATTER?

- There is still a regulatory capital requirement (ICAS+)
- SCRs must have objective support
- Key stakeholders (the board, RI buyers, rating agencies, capital providers, etc.) must have confidence in the model
- It's good business sense

So yes…validation matters!

And must be completed to suitably high standards…

FAQ: SHOULD VALIDATION PERFORMED BY AN ACTUARY BE TAS COMPLIANT?

- Para C.1.8 of the Insurance TAS indicates that "providing actuarial information to support the insurer's assessment of the amount of regulatory capital it requires" must be TAS compliant

- Also BAS issued specific FAQ (6.3) for SII models:

  Q. Does validation work on an internal model used to calculate the Solvency Capital Requirement (SCR) in accordance with Solvency II fall within the scope of the TASs?

  A. Yes, normally…

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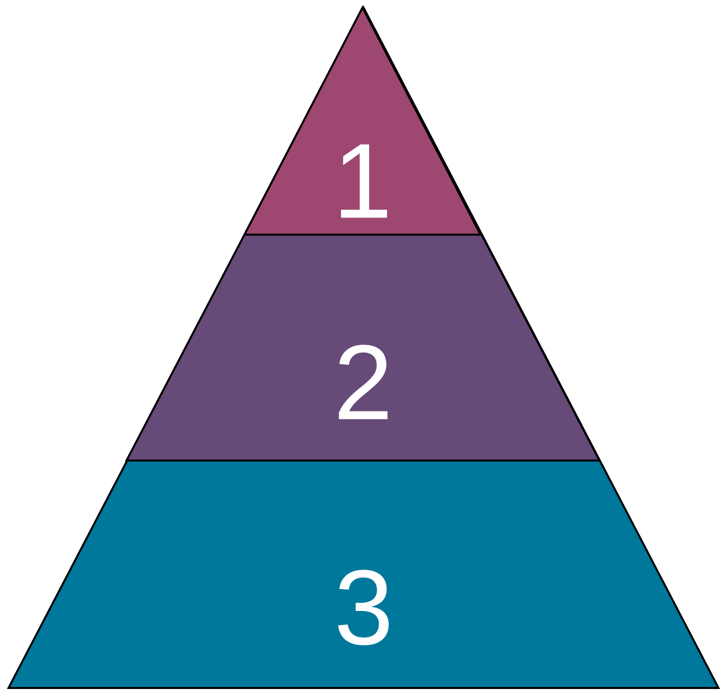
DOCUMENTATION OVERVIEW: RE-CAP FROM 2011 WORKSHOP

Submission to Lloyd's
- **Validation Report**
- Completed Evidence Templates (ETs)
- Validation proformas - technical specialist documentation



Maintained by agents
- Executive summary and board documentation
- Technical Detail
- Specialist level

SOME BROAD DISTINCTIONS

	Validation Report (Level 1)	Technical specialist (Level 3)
Audience	Board/management	Modeller/actuarial
Language	Risk-reward	Statistical
Viewpoint	Top down	Bottom up
Outputs vs. inputs	Model outputs and why they reflect the business	Model inputs/parameters and their appropriateness
Validation tests	Emphasis on comparisons to experience, scenarios, P&L attribution	Emphasis on sensitivity testing, g.o.f., qualitative tests
Validation process	Independent & robust – in accord with the Policy	Status update – in red/amber/green
Length	30-40 pages plus 5-10 pages of appendices	75+ pages plus 200+ pages of appendices
Challenge	Writing it	Reading it

SOME USEFUL COMPARISONS

- **Language**: RI programme analysis for financial language
  - Risk-reward comparison of programs, AEPs, net benefit of RI
  - P/L metric + volatility measure (**essential** for risk appetite decisions)
  - CoVs and other input parameters not informative
- **Viewpoint**: Reserve reports for top-down perspective
  - Start with syndicate level movements then drill down to sources
  - Address the materiality of classes/policy groups to overall result
  - Tail factors, BF ULRs stay in appendices
- **Validation tests:** Reserve reports (somewhat) for back-tests and scenarios
  - Actual vs. expected analyses
  - Scenarios that underlie the uncertainty in the best estimate

BY EXTENSION…3 STEPS TO A BETTER REPORT

For each major risk type, and the syndicate as a whole…

1. Start with a description of the drivers of that risk type in **your** syndicate. Emphasise the top 1-3 drivers. Be specific. Use £££ with probabilities.
2. Explain the validation **outcomes** (including failures). Link to past experience and/or scenarios is essential – even if not part of a formal validation test.
3. Discuss the **limitations** of the model. Quantify with 1-2 sensitivity tests.

Let's go through a few (partial) straw men*…

* See also the **Illustration for Reserving Risk** on lloyds.com.

RESERVE RISK (STEP 1): DESCRIPTION OF THE DRIVERS

"…Reserve risk is the second largest risk for the syndicate…**reserve deteriorations above the 1-in-50 year return period are driven primarily by two classes**.

► **US medical malpractice. Large claims relating to the obstetricians' policies written in 2007-2011** remain a significant driver of uncertainty. There are currently 8 claims reserved above £250,000, all in litigation. The maximum net deterioration on these claims is £18.1m.

► **UK motor liability. The frequency of large claims above £250,000** arising from the Green Light young drivers' policies sold beginning in 2008 is nearly twice the frequency as the remainder of the book."

RESERVE RISK (STEP 1): DESCRIPTION OF THE DRIVERS

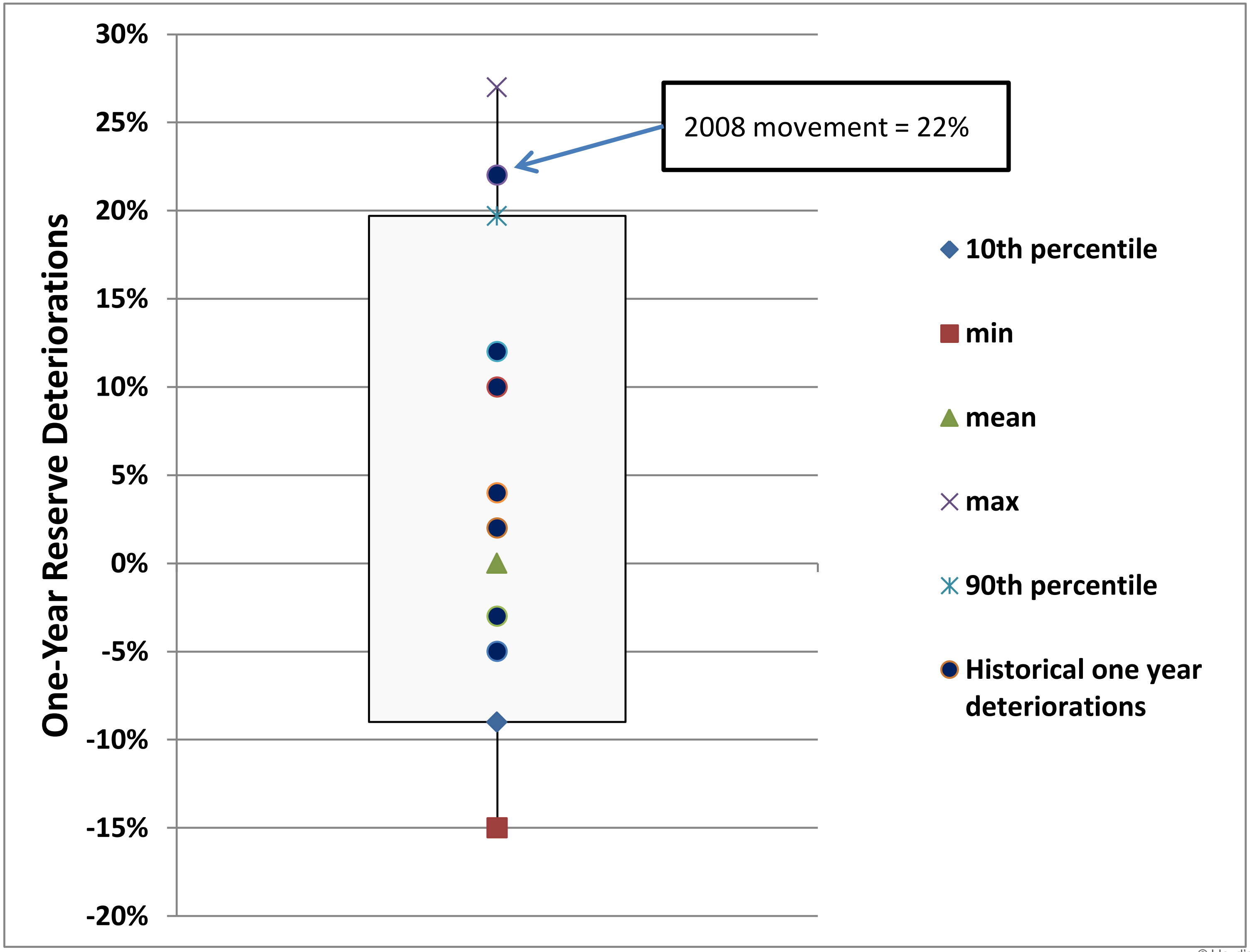
Contribution to total reserve deterioration from riskiest classes (£m)				
	Mean	**50 year**	**100 year**	**200 year**
Reserves – total	120.0	58.4	66.2	73.3
US med mal	30.7	20.3	24.0	27.6
UK motor	39.8	19.5	22.0	24.2
All other	49.5	18.6	20.2	21.4

Example: *The 1-in-100 year return period (99th percentile) for reserve risk is a 66.2m deterioration on the best estimate of 120m. US med mal would contribute 24m to the 66.2m, and so on.*

RESERVE RISK (STEP 2): VALIDATION OUTCOMES

"…**We compared 7 historical one-year reserve movements as a percentage of opening reserves to the simulated model output.** The largest historical movement is the 2008 deterioration of 22%, which was driven by adverse experience on US med mal and UK motor. The smallest was a reserve release of 5%. **The test against experience required at least 5 of the 7 years to fall within the 10th and 90th percentiles of model output**. The following graph demonstrates that this validation test was passed, but that the 2008 movement exceeds the 90th percentile. We have assessed the potential impact of this outlier as part of our pessimistic scenario covered in the section on model limitations…"

RESERVE RISK (STEP 2): VALIDATION OUTCOMES



RESERVE RISK (STEP 3): MODEL LIMITATIONS

"…**Two of the most significant limitations in the reserving model include the reliance on expert judgement** for the following assumptions:

- ► **IBNER volatility in US med mal** obstetrician large claims
- ► **large claim frequency on UK motor** liability

We have carried out sensitivity tests on these two assumptions in order to assess their impact on reserve risk. **We obtained "pessimistic" and "optimistic" assumptions** in consultation with the claims team and reserving actuaries. These alternatives are intended to be plausible upper/lower bounds for each assumption. In particular, **the pessimistic assumption was chosen to ensure that all historical movements fall within the 10th and 90th model reserve risk outputs**."

RESERVE RISK (STEP 3): MODEL LIMITATIONS

Assumption/ output	Best estimate	Selected 99.5th	Pessimistic 99.5th	Optimistic 99.5th
US med mal: IBNER obstetrician claims (£m)	0	15.5	17.8	14.0
UK motor: No. claims > £250k	5	8	10	7
Total reserve risk (£m)	0	73.3	84.3	66.0

Example: *The pessimistic 99.5th percentile for US med mal IBNER is 17.8m and the pessimistic assumption for UK motor large claims frequency is 10. These two assumptions result in a reserve risk 99.5th percentile of 84.3m.*

DEPENDENCIES (STEP 1): DESCRIPTION OF THE DRIVERS

"…**The largest driver of dependency at the syndicate level is the underwriting cycle** and its impact on the proposed and recent prior underwriting years, particularly for longer-tailed casualty classes. The cycle drives dependencies between premium and reserving risk…The following table measures the strength of this dependency by **quantifying the probability of different reserve deteriorations conditional on a 1-in-200 result on underwriting risk** (the largest risk for the syndicate)."

DEPENDENCIES (STEP 1): DESCRIPTION OF THE DRIVERS

How much worse can it get? Probabilities of exceeding selected reserve deteriorations Given a 1-in-200 underwriting loss of £139m or higher		
Deterioration (£m)	**Deterioration RP (years)**	**Probability of deterioration or more**
(0.7)	2	55%
58.4	50	38%
66.2	100	21%
73.3	200	4%

Example: *If the underwriting loss is 139m or higher, the modelled probability of a reserve deterioration of 66.2m or more is 21%. If there were no dependency between underwriting and reserve risk, then the probability of reserves deteriorating by 66.2m or more would be 1% (1-in-100).*

DEPENDENCIES (STEP 2): VALIDATION OUTCOMES

“…We have validated our dependency assumptions against scenarios and causal explanations based on expert judgement…We have used scenarios to assess the plausibility of modelled outcomes at key return periods…

We specified scenarios that were plausible but unlikely to occur during a 40 year period. **The model indicated a much higher return period of 135 years for one of these scenarios (see table below). This was deemed an unacceptable result and led to a strengthening of the dependency assumptions. The resulting return period is 38 years (validation pass)**.”

DEPENDENCIES (STEP 2): VALIDATION OUTCOMES

Scenario	Description	Insurance risk outcome	Modelled return periods	
			Initial (validation fail)	Revised (validation pass)
UK motor large claims 40 year scenario	Green Light 80% higher than expected frequency of large claims on both earned and unearned business	Loss of £183m	132 years	38 years
Etc.				

DEPENDENCIES (STEP 3): MODEL LIMITATIONS

"…**The most significant model limitation relating to dependencies is the reliance on expert judgement** on the strength of the tail dependency between premium and reserving risk.

We have obtained **alternative pessimistic and optimistic assumptions on the strength of the tail dependency** in consultation with claims and underwriting. These are based on high/low views of the key drivers of the dependency, including the underwriting cycle and the proportion of business renewed from prior years…"

DEPENDENCIES (STEP 3): MODEL LIMITATIONS

Impact on SCR of changing probability of both premium and reserve risk exceeding a 1-in-200 outcome			
Assumption/ output	Selected	Pessimistic	Optimistic
Joint probability of exceedance	0.200%	0.350%	0.050%
SCR (£m)	198.1	211.7	168.4

Example*: The pessimistic assumption is that there is a 0.35% probability of a 1-in-200 or worse outcome on both premium risk and reserving risk. This assumption results in an SCR of 211.7m vs. 198.1m using the selected assumption of a 0.20% probability.*

VALIDATION REPORT: FAQ (I)

- How long?
  - “*As a rough guide, Lloyd’s would expect the Validation Report to be between 20 and 30 pages*.” **Guidance** (June 2011)
  - A bit optimistic perhaps?
  - **Illustration for Reserving Risk** (Nov 2011): 5 pages of content, including generic stuff at beginning
  - 5 pages/risk x 7 risks + 5 pages (appendices) = 40 ballpark
- How much detail?
  - A common feedback point was lack of detail on validation outcomes
  - Follow the “3 steps” described above
  - Issue is materiality (£) and operation of validation cycle – not lack of technical specialist detail

VALIDATION REPORT: FAQ (II)

- Independence?
  - See 2.36-2.38 of the **SCR 2014 Guidance** for an update
  - Full independence of validation (as per S2) will not be mandated in 2013
  - Validation report must include evidence of objective challenge
  - Tests should be set and reviewed by someone independent from build and operation of model
  - Tests can be carried out by modeller
  - External opinion NOT mandatory

VALIDATION REPORT: FAQ (III)

- How much of last year's validation do I need to repeat this year?
  - Validation is an on-going process not a one-off
  - FSA/PRA have emphasised demonstrating action on prior validation issues
  - Short answer: validation must be sufficient to show that the model is appropriate for the <u>current</u> risk profile
  - Limited/no validation should be justified by demonstration that risk is of limited/no materiality (or has not changed since last year)
  - See July 2011 Model Validation Workshop for discussion on risk indicators of materiality

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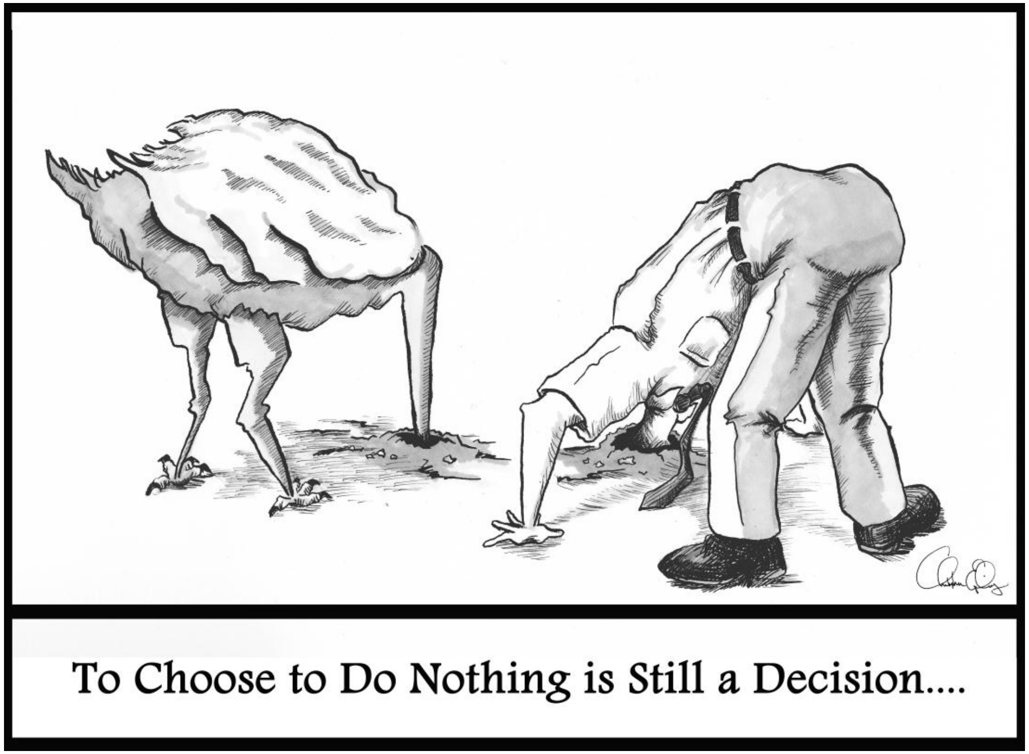
LCR GROUND RULES…

- Submit via Core Market Returns and by 1pm on deadline day
- All syndicates must complete all forms
- Attachments via Form 990, including:
  - methodology documents (July) & analysis of change (Sept)
  - the supplementary questionnaire
  - any additional evidence
- Numbers are in £m to one decimal place, i.e. £100.1m
- Unsure of format / requirements…
  - ask in June NOT 12.59pm 4th July
  - Contact Kevin Barnes

I DON' T LIKE CHANGE!



- There have been no changes made to the following forms:
  - LCR Form 309 – LCR Summary
  - LCR Form 312 – Projected Solvency II Technical Provisions at Time Zero

UNFORTUNATELY CHANGE IS INEVITABLE: LCR FORMS 310 & 311

		Percentiles			
		Mean	99th	99.5th	99.8th
		A	F	G	H
1	Distribution of balance sheet position on One-Year basis (Note 310.1)	-ve w: if +ve	+ve w: if -ve v: if F1 < E1	Pre-populated = form 309 headline (One-Year)	
2	Distribution of balance sheet position on Ultimate basis (Note 310.2)	-ve w: if +ve	+ve w: if -ve v: if F2 < E2	Pre-populated = form 309 headline (Ultimate)	+ve w: if -ve v: if H2 < G2

- Forms 310 & 311 now include the Ultimate 50th to 99th percentiles and the 99.8th percentile (net basis only on form 311)
- Purpose to calibrate / validate LIM
  - using mean and intervening distributions up to 99.8th both on a one-year and ultimate basis

LCR FORM 313: FINANCIAL INFORMATION

		Net Mean	Net 99.5th
		H	I
Catastrophe Claims total:	1	Sum: H2 + H3	w: if I1 = (I2 + I3)
split: Catastrophe Losses – LCM Region-Perils & Classes Only	2	+ve w: if -ve	+ve w: if -ve
split: Catastrophe Losses – All Non-LCM	3	+ve w: if -ve	+ve w: if -ve
Premium Risk Claims - Excluding Catastrophe	4	+ve w: if -ve	+ve w: if -ve
Reserving Risk Claims	5	+ve w: if -ve	+ve w: if -ve
TOTAL	6	Sum: H1 + H4 + H5	Sum: I1 + I4 + I5
Diversification Credit - Between Risk Categories	7	w: if <> 0	-ve v: if +ve
DIVERSIFIED TOTAL	8	Sum: H6 + H7 v: if <> Form 311 A3	Sum: I6 + I7 v: if <> Form 311 G3

- The Catastrophe Risk Summary table has been amended to include a split between LCM and non-LCM related claims
- Adding back Premium & Reserving claims to review to form 311
- Lloyd's review the CAT exposures and their affect on the SCR

NEW FORM 314: ADDITIONAL QUANTITATIVE ANALYSIS

				Mean Outcome	Stress	1:200 Confidence
				A	B	C
Insurance Risk	total:		1	Sum: A2 + A3	+ve w: if -ve w: if B1 <> A1 + C1	Pre-populated = form 309 E1
	split:	Premium Risk	2	-ve w: if +ve	Sum: C2 - A2	Pre-populated = form 309 E2
	split:	Reserve Risk	3	-ve v: if +ve w: if <> form 312 P total	Sum: C3 - A3	Pre-populated = form 309 E3
Investment Return & Risk			4	-ve w: if +ve	Sum: C4 - A4	+ve w: if -ve
All Other			5		Sum: C5 - A5	Pre-populated = form 309 E4 + form 309 E8
TOTAL EXPECTED RETURN			6	Sum: A1 + A4 + A5 w: if <> form 310 A2		

- Table One – Mean and Stress by Risk Category (ultimate basis)
- What – submit the mean outcome, the stress and the 1in200 confidence for insurance risk
- Why – To establish the mean expected return per syndicate and to aid the Lloyd’s review of the total expected return submitted on form 310

NEW FORM 314:
ADDITIONAL QUANTITATIVE ANALYSIS…

		Mean Outcome	Stress	1:200 Confidence
		D	E	F
Interest Rate Risk (including interest rate risk on liabilities)	1	-ve w: if +ve	Sum: F1 - D1	+ve w: if -ve
Credit Risk (on assets only)	2	-ve w: if +ve	Sum: F2 - D2	+ve w: if -ve
Equity and Other Asset Risk (on assets only)	3	-ve w: if +ve	Sum: F3 - D3	+ve w: if -ve
Liquidity Risk	4	-ve w: if +ve	Sum: F4 - D4	+ve w: if -ve
Foreign Exchange Risk (including fx risk on liabilities)	5	-ve w: if +ve	Sum: F5 - D5	+ve w: if -ve
Other Risks	6	+ve w: if -ve	Sum: F6 - D6	+ve w: if -ve
TOTAL	7	Sum: D1 : D6	Sum: E1 : E6	Sum: F1 : F6
Diversification Credit	8		Sum: F8	-ve v: if +ve
DIVERSIFIED TOTAL	9	Sum: D7	Sum: E7 + E8	Sum: F7 + F8 v: if <> form 309 E7

- Table Two – Market Risk
- What – submit the mean outcome and the 1in200 confidence for the pre defined components of Market risk
- Why – To provide the review team with greater detail on the inputs to market risk

NEW FORM 314: ADDITIONAL QUANTITATIVE ANALYSIS…

		Mean Outcome	Stress	1:200 Confidence
		G	H	I
One-Year SCR	1	v: if <> form 310 A1	Sum: I1 - G1	+ve w: if -ve v: if <> form 309 A11
Removal of PY+1 Unincepted Contracts	2	+ve w: if -ve		Sum: G2
Additional PY & Prior Years Binder Business	3	-ve w: if +ve	Sum: 13 - G3	+ve w: if -ve
Change in Risk Margin from T0 to T1	4			Sum: G4
Run Down Opening Risk Margin from B/S at T0 to Nil at Ultimate	5	-ve v: if +ve w: if <> form 312 P1 total		Sum: G5
Unexpired Business on PY & Prior Years	6		Sum: I6	+ve w: if -ve
Ultimate Volatilities Less One-Year Volatilities	7		Sum: I7	+ve w: if -ve
Other	8		Sum: 18 - G8	
TOTAL	9	Sum: All	Sum: All	Sum: All
One-Year Diversification Credit less Ultimate Diversification Credit	#			-ve w: if +ve
DIVERSIFIED TOTAL	#			Sum: I9 + I10 w: if <> form 309 E11

- Table Three – SCR Reconciliation
- What – submit the mean outcome and the 1in200 confidence for the pre defined components that move from the one-year mean to the diversified ultimate SCR
- Why – to provide the review team with greater detail on the deterioration between the mean and the 99.5th percentile

WHAT'S NEXT?

- 17 May
  - LCR released in CMR UAT
  - The new excel specification document will be available
- 7 June -
  - Go live, LCR available in CMR production
  - FAQs will be updated
  - Release of an excel template to aid form completion
- 4 July - Initial submission
- 12 / 19 September - Final Submission

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KEY DATES

Submission	Deadline
1st LCR	4 July
SCR Methodology Document	4 July
Interim Validation Report (optional)	4 July
Feedback on July submission	16 August (at latest)
Half-year 2013 QMC	5 September
Final LCR (non-aligned syndicates)	12 September
Final LCR (aligned syndicates)	19 September
Validation Report	26 September
Final sign-off (non-aligned)	18 October
Final sign-off (aligned)	Late October

Key: Red = Market Black = Lloyd's

WHAT'S NEW FOR 2014 ?

- Changes to the LCR (already discussed by Kevin)
- Supplementary questionnaire
  - primary purpose: facilitate early feedback in 2013
    - a key goal of the reviews this year following feedback
  - submit with LCR (July **and** September submissions) via CMR
  - please review draft now if you haven't already!
    - positive feedback received to date
    - we recognise it is some extra work to complete - it is information that should be readily to hand
  - final Excel version to be posted on lloyds.com by end of month

WHAT'S NEW FOR 2014 ? (CONTINUED)

- Validation Report
  - option to submit interim report with 4 July LCR
  - feedback will be aligned with 4 July LCR feedback
  - new Lloyd's review & feedback categories (only apply to 26 September submission):
    - Urgent action required and resubmission
    - Action required for next submission
    - Action recommended for next submission

WE HAVE MERGED THE CAPITAL AND BUSINESS PLANNING PROCESSES

- The new Capital and Planning Group (CPG) has formed
- Jointly sponsored by the Director, Performance Management and Director, Finance and Operations
- CPG has the authority:
  - to approve Syndicate Business Plans including any Franchise Guideline dispensations
  - to approve Syndicate Capital Requirements on both a one year and ultimate basis before economic uplift
  - to communicate decisions made by the group to key stakeholders within Lloyd's and to Managing Agents
- Reviews will use "virtual teams"
  - MRC are the virtual team for capital purposes

WHAT HAPPENS NEXT?

- Slides will be posted on lloyds.com after workshops
- Call us, maybe…or email us if you have further questions
- For specific queries on the LCR please contact **Kevin Barnes** kevin.barnes@lloyds.com
- For queries on validation please contact **Eric Pizarro** eric.pizarro@lloyds.com
- If you have specific queries on your SCR please contact your MRC analyst during "reviews season" (i.e. June – October)
  - we will let you know who your assigned analyst is shortly
  - do you have a point person for the technical capital side?
  - in the meantime contact either **Eric** or **Jerome**

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