Institute and Faculty of Actuaries

What does internal model validation mean for the business?

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In the next 40 minutes we will share …

5 valuable things you get from validation

5 things you can do tomorrow

3 things on the validation wish list

Emerging themes from Lloyd's

5 valuable things you get from validation

- Model implementation
- How results are used
- Upping the game

- Hard work, but really valuable if “signal to noise” is right
- Reduces arm-waving

5 valuable things you get from validation

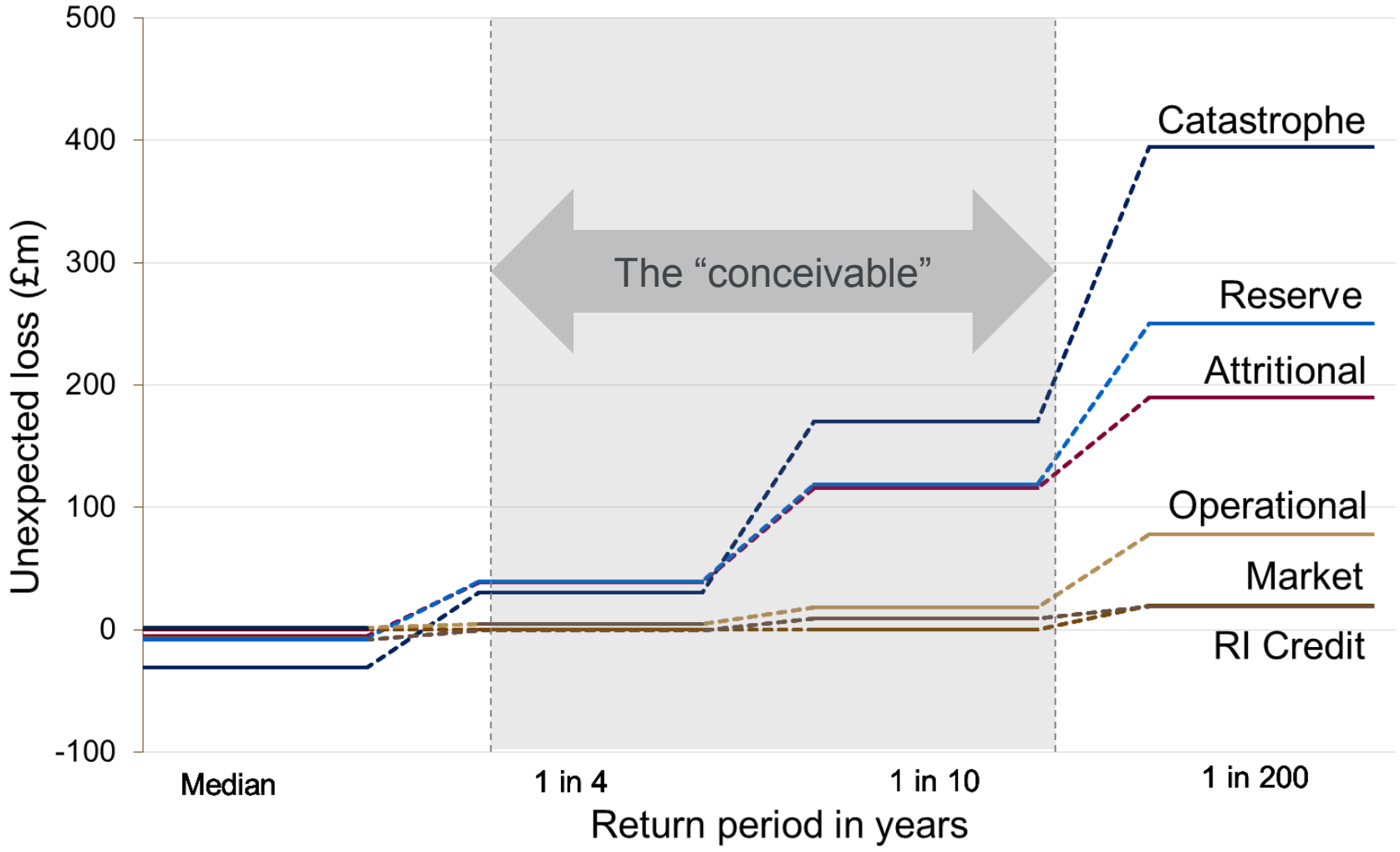
- Writing down the “why”
- Modellers working alone is no longer good enough
- Audit framework

- Optimise model approval
- Demonstrate effective model risk management
- Build trust

5 valuable things you get from validation

- Wider audience
- Break down silos
- Training “for free”

How to communicate results effectively



Views from over half Lloyd's market

Source: LCP internal model validation survey 2013/14

Views from over half Lloyd's market

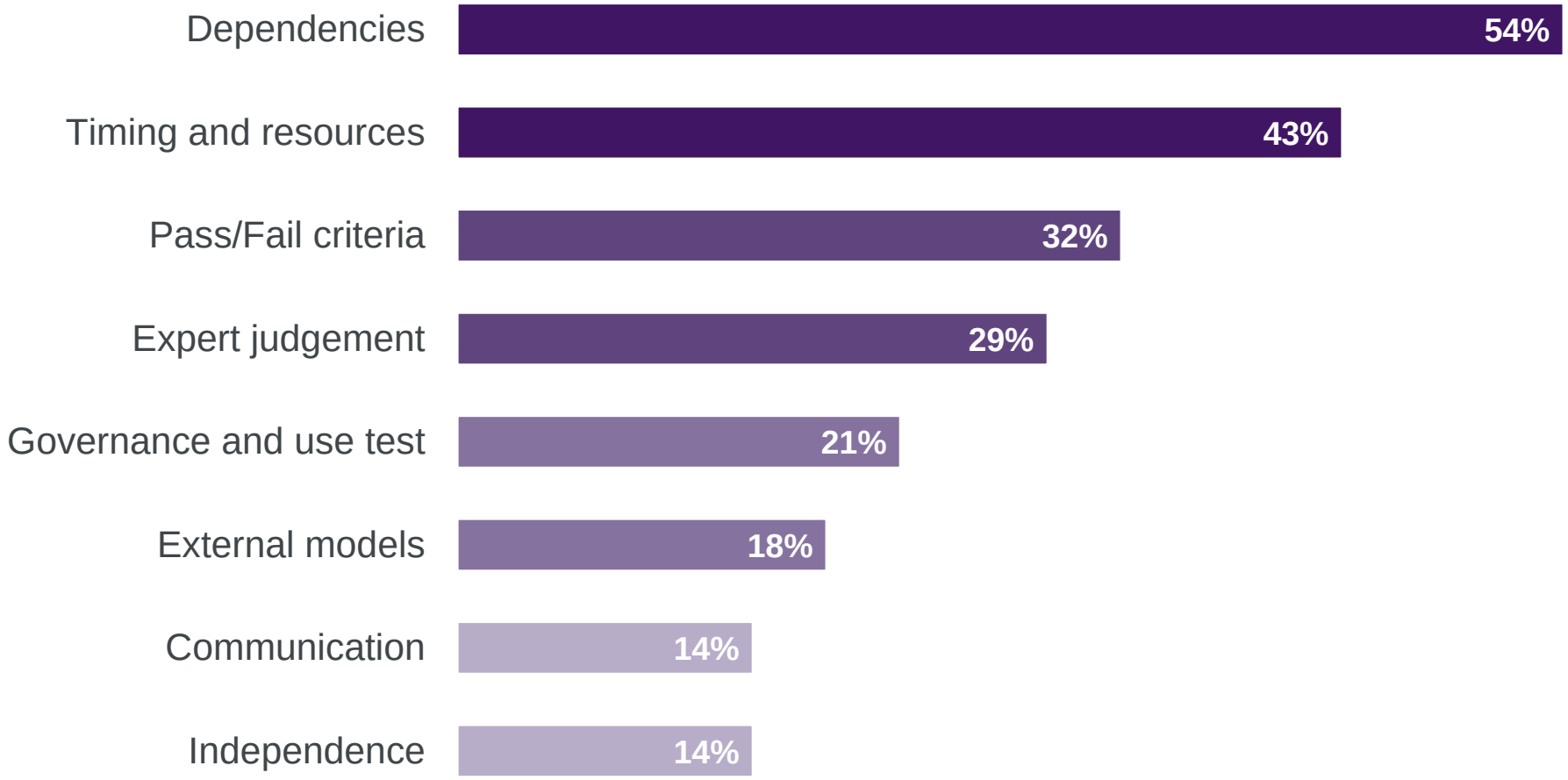
"Business drives the model; the model does not drive the business"

"Engagement in model use is engagement in validation"

"Validation should be collaborative rather than confrontational"

Source: LCP internal model validation survey 2013/14

What are the key validation challenges?



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5 things you can do tomorrow

(aka the validation utility belt)

The validation utility belt

1. Testing framework “laser”

- Eradicates unnecessary work
- Focus on interpretation of results
- Consistency between tests

Difficulty rating: 

Standardised test schedules

XYZ Managing Agents - Syndicate 000
Internal Model Calculation Kernel Validation

Model Component:	Catastrophe Risk
Model version:	v4.5 (released 6 July 2012)
Parameterisation date:	31 December 2012
Validation Cycle:	August 2012 (cycle 3)
Test ID:	CR2
Test category:	Benchmarking
Test prepared by:	Anne Actuary - Head of Capital Modelling
Peer Reviewer:	John Smith - Deputy Underwriter
Independent Reviewer:	Andrew Jones - Senior Underwriter
Purpose:	To test whether the calculation Kernel is producing a distribution of catastrophe losses that is sufficiently extreme when benchmarked against Lloyds Realistic Disaster Scenarios (RDSs).
Description:	For a selection of RDSs, calculate the implied percentiles from the simulated catastrophe loss distribution, and corresponding return periods.
Pass criteria:	The RDSs should not be more extreme than the modelled distribution. Specifically: • Single event RDSs should have a return period of no more than 1 in 75 years; • Double event RDSs should have a return period of no more than 1 in 100 years;
Result of test: Anne Actuary Head of Capital Modelling	PASS - the RDSs are not more extreme than the modelled distribution All single event RDSs have a return period of less than 1 in 60 years. All double event RDSs have a return period of less than 1 in 90 years.
Result of peer review: John Smith Deputy Underwriting	PASS - I agree with the test result
Result of independent review: Andrew Jones Senior Underwriter	Independent review not required, as peer reviewer agrees with the test result
Improvements for next validation cycle:	Include comparison against a larger range of RDS scenarios Consider refining the pass criteria to increase the strength of the test

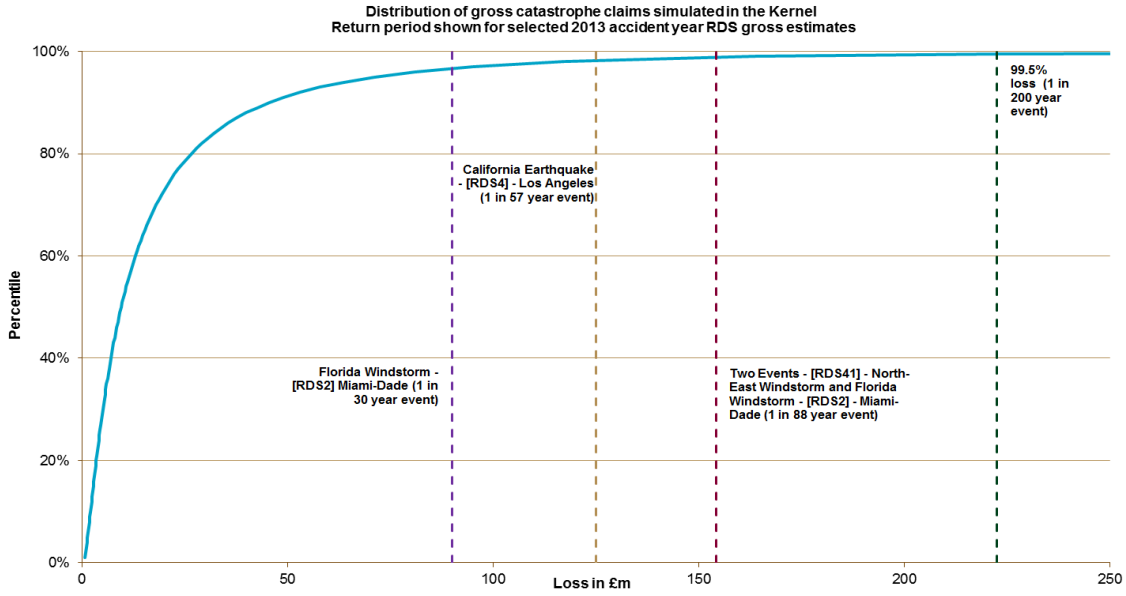
Internal Model Calculation Kernel Validation
Catastrophe Risk CR2

The simulated distribution of catastrophe claims is based modelled catastrophes during 2013 (accident date between time 0 and time 1)
The return periods set out below refer to the modelled distribution of aggregate catastrophes, not the return period for each specific named event
The RDS data used are the gross estimates for 2013 accident year

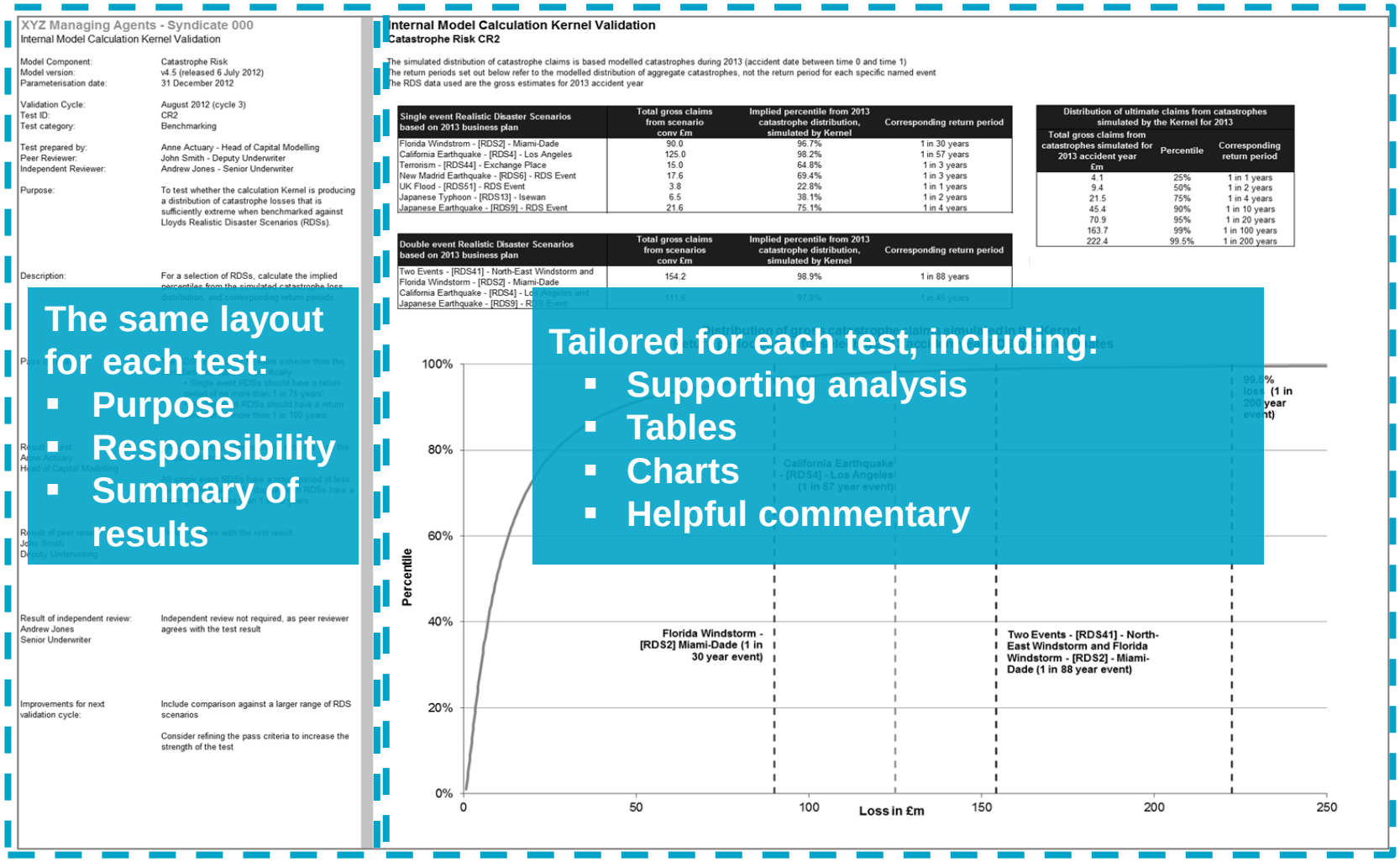
Single event Realistic Disaster Scenarios based on 2013 business plan	Total gross claims from scenario conv £m	Implied percentile from 2013 catastrophe distribution, simulated by Kernel	Corresponding return period
Florida Windstrom - [RDS2] - Miami-Dade	90.0	96.7%	1 in 30 years
California Earthquake - [RDS4] - Los Angeles	125.0	98.2%	1 in 57 years
Terrorism - [RDS44] - Exchange Place	15.0	64.8%	1 in 3 years
New Madrid Earthquake - [RDS6] - RDS Event	17.6	69.4%	1 in 3 years
UK Flood - [RDS51] - RDS Event	3.8	22.8%	1 in 1 years
Japanese Typhoon - [RDS13] - Isewan	6.5	38.1%	1 in 2 years
Japanese Earthquake - [RDS9] - RDS Event	21.6	75.1%	1 in 4 years

Double event Realistic Disaster Scenarios based on 2013 business plan	Total gross claims from scenarios conv £m	Implied percentile from 2013 catastrophe distribution, simulated by Kernel	Corresponding return period
Two Events - [RDS41] - North-East Windstorm and Florida Windstorm - [RDS2] - Miami-Dade	154.2	98.9%	1 in 88 years
California Earthquake - [RDS4] - Los Angeles and Japanese Earthquake - [RDS9] - RDS Event	111.6	97.8%	1 in 45 years

Distribution of ultimate claims from catastrophes simulated by the Kernel for 2013		
Total gross claims from catastrophes simulated for 2013 accident year £m	Percentile	Corresponding return period
4.1	25%	1 in 1 years
9.4	50%	1 in 2 years
21.5	75%	1 in 4 years
45.4	90%	1 in 10 years
70.9	95%	1 in 20 years
163.7	99%	1 in 100 years
222.4	99.5%	1 in 200 years



Standardised test schedules



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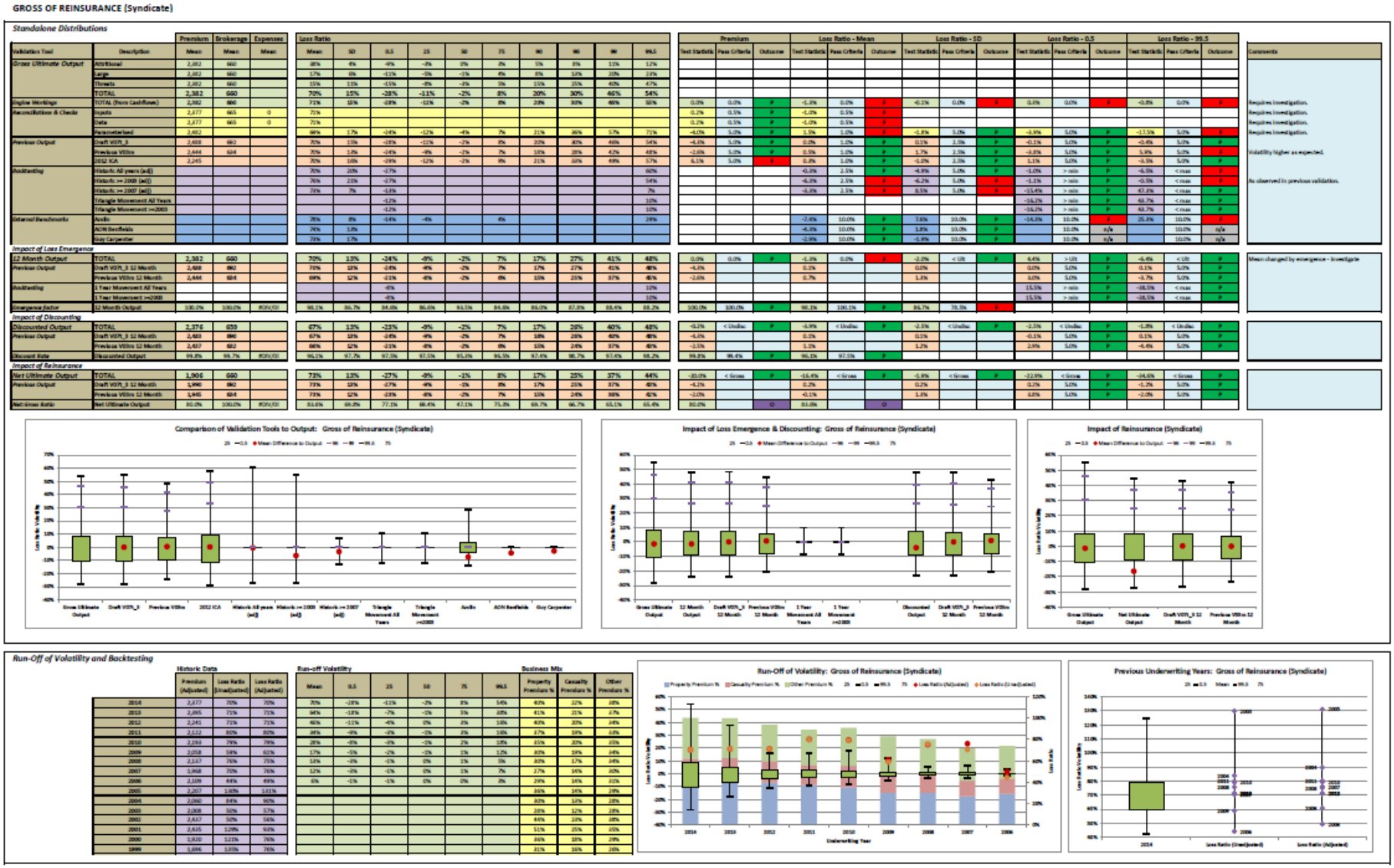
The same layout for each test:

- Purpose
- Responsibility
- Summary of results

Tailored for each test, including:

- Supporting analysis
- Tables
- Charts
- Helpful commentary

Technical validation dashboard



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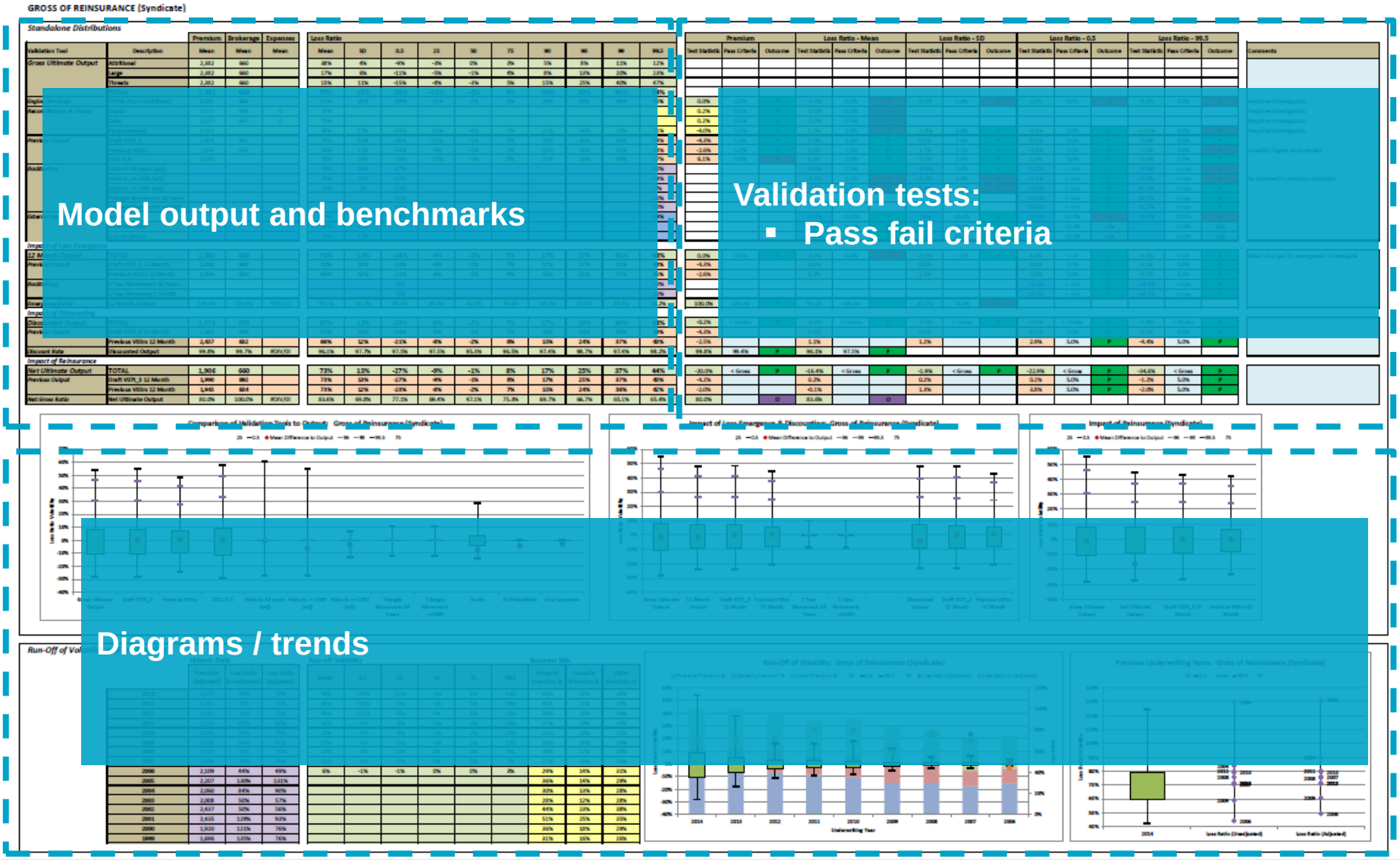


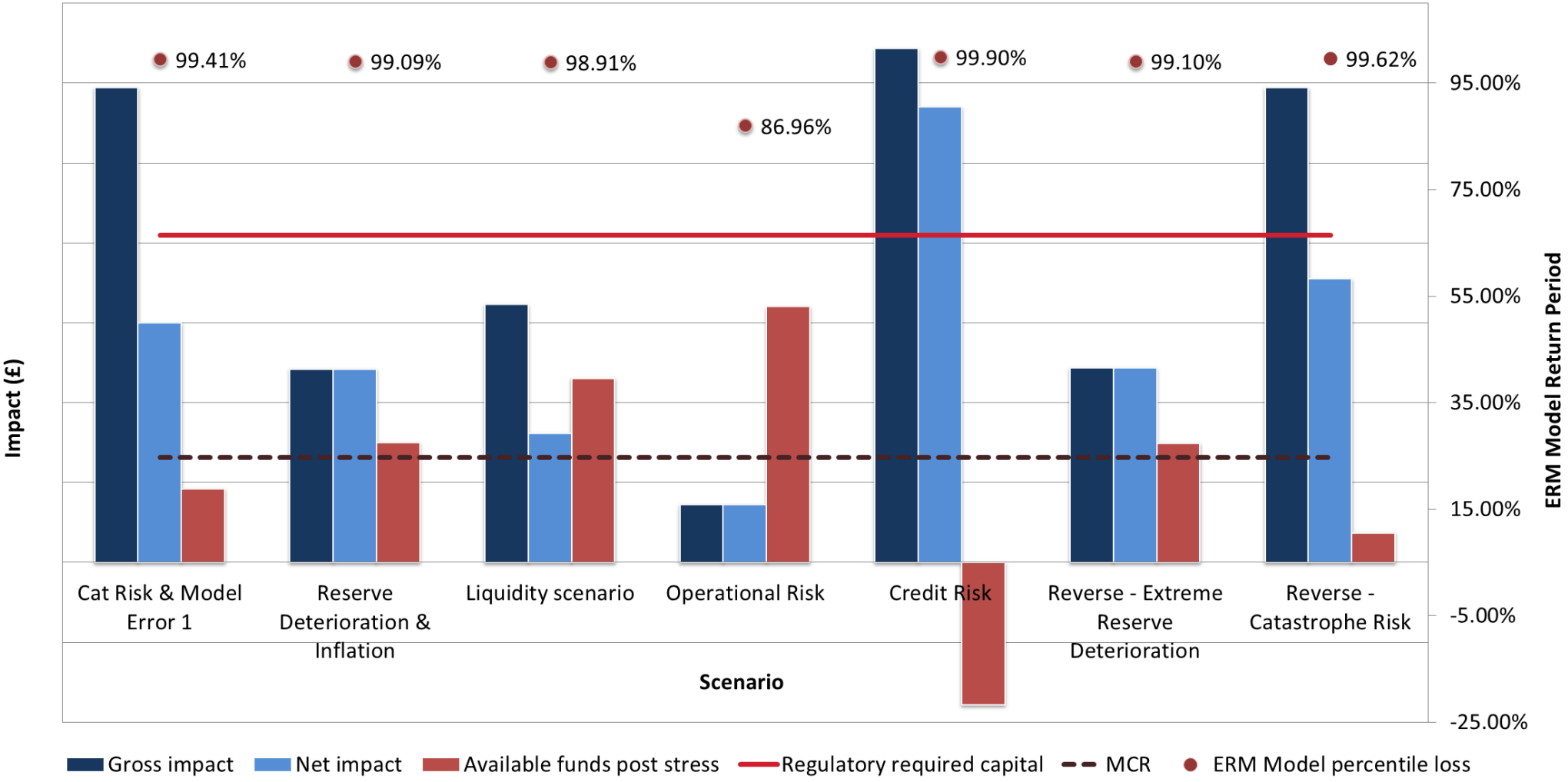
The validation utility belt

2. Scenario testing “grapple gun”

- Makes output tangible and meaningful
- Provides a common language
- Align to risk management

Difficulty rating: 

Scenario testing



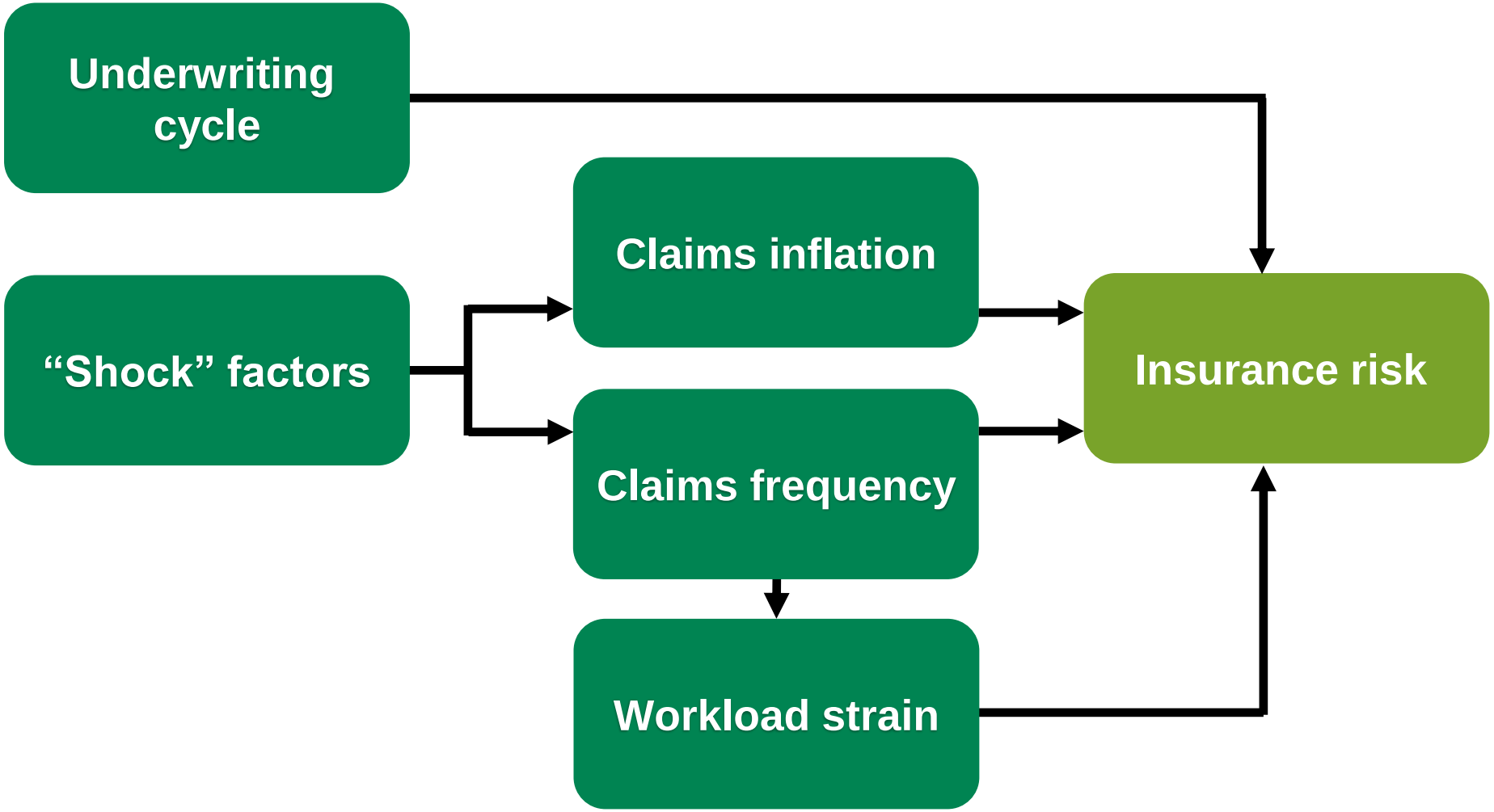
The validation utility belt

3. Dependencies “shark repellent”

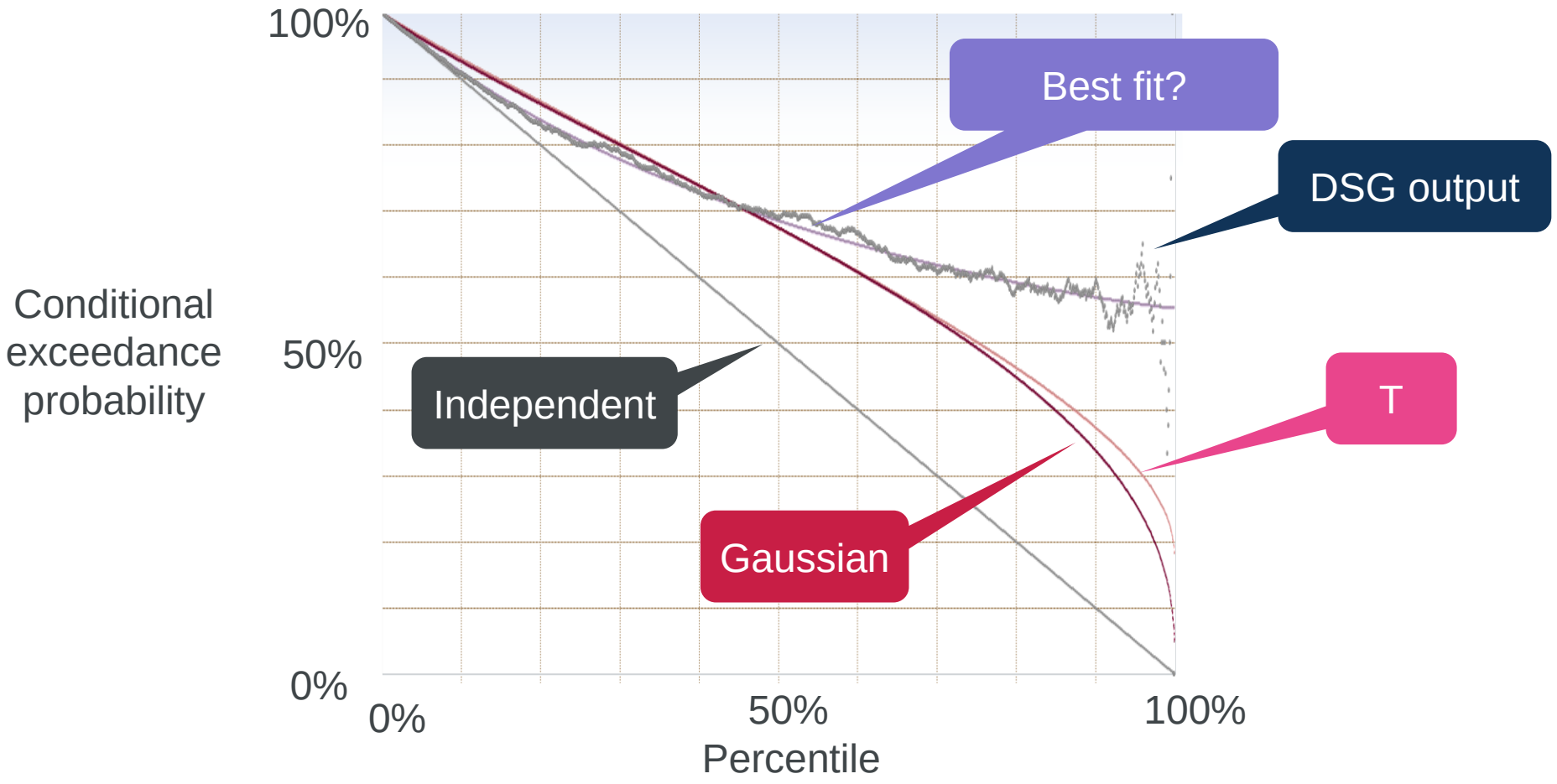
- Understanding the drivers
- Deters the vicious cycle of expert judgement

Difficulty rating: 

Validating dependencies using key drivers



Dependency scenario generator vs. copulas



The validation utility belt

4. The “bat line reel” line check

- Simple but easily overlooked
- Helps locate errors quickly

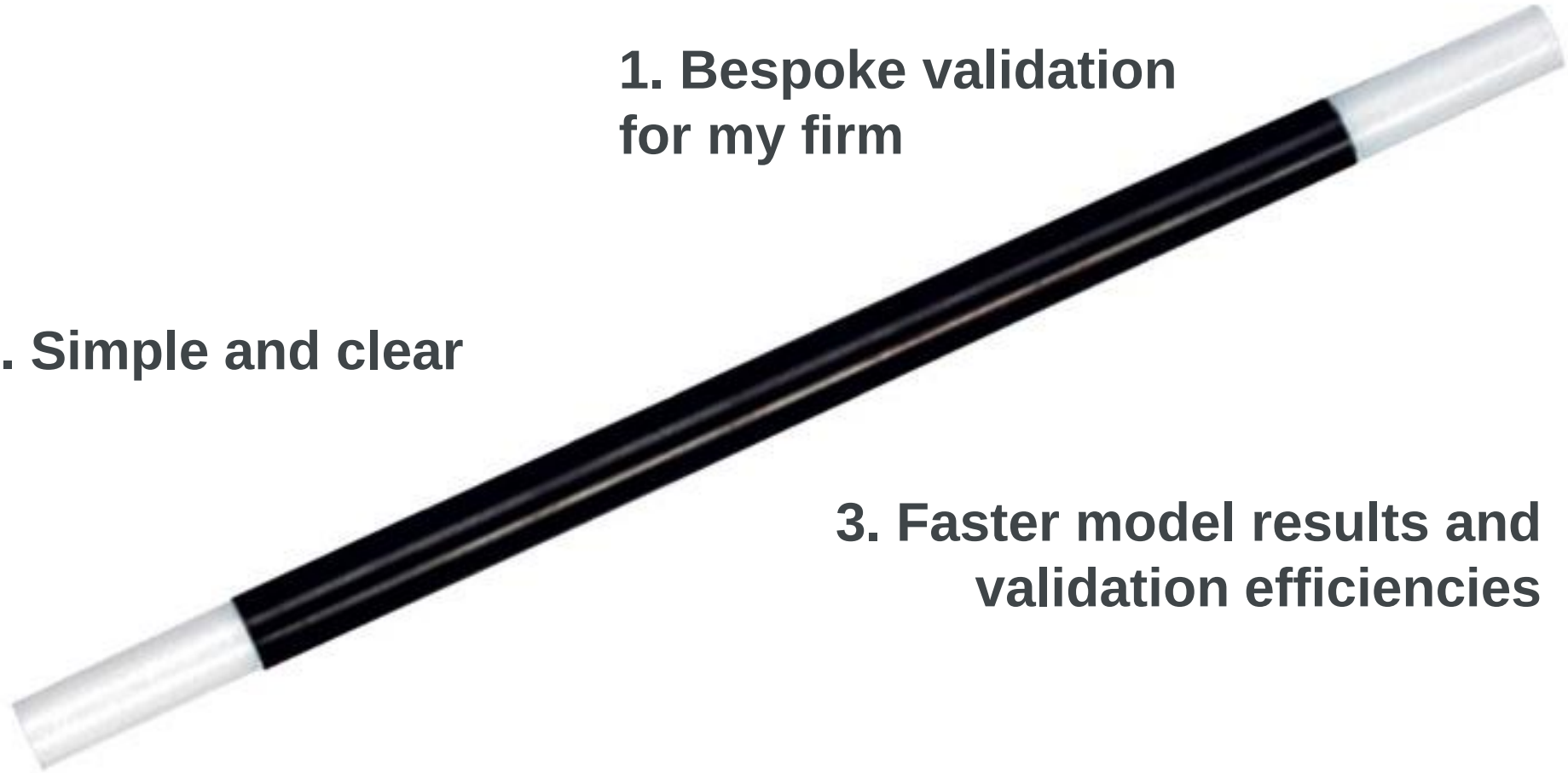
Difficulty rating:

5. Validation “eye goggles”

- Applies the techniques to all business critical models
- Quality validation throughout

Difficulty rating:

3 things on the wish list



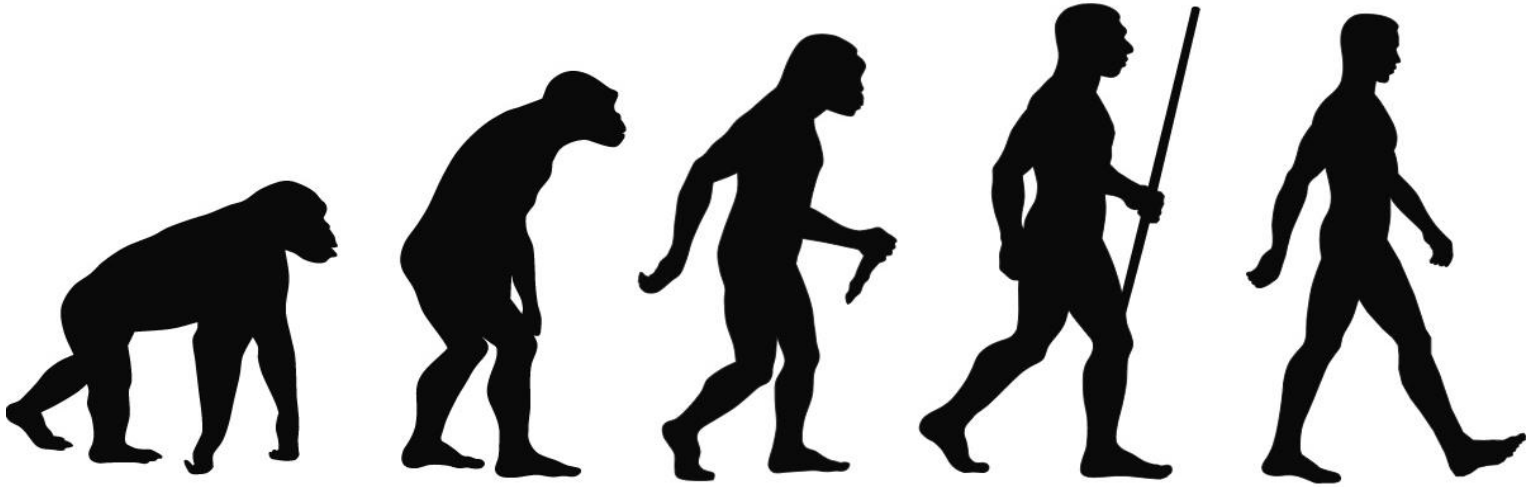
1. Bespoke validation for my firm

2. Simple and clear

3. Faster model results and validation efficiencies

Where are your eureka moments?

Early stages	Developing	Developed
Input/output Reasonableness Goodness-of-fit	Analysis of change Risk ranking Sensitivity tests Benchmarking	Back testing Scenario testing P&L attribution Qualitative tests Risk coverage



Source of table: LCP internal model validation survey 2013/14

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenters.