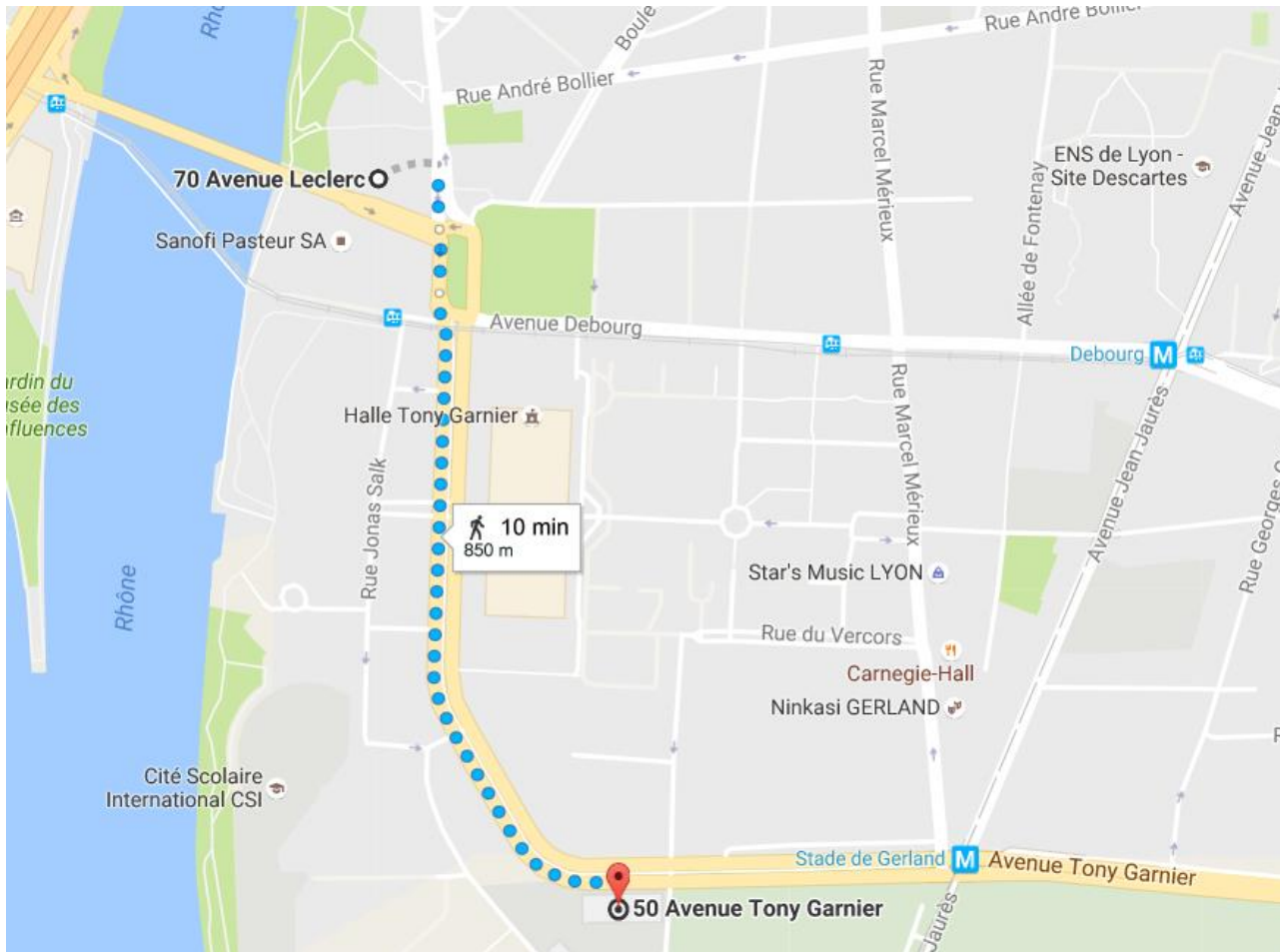


Internal Models: challenges and supervision

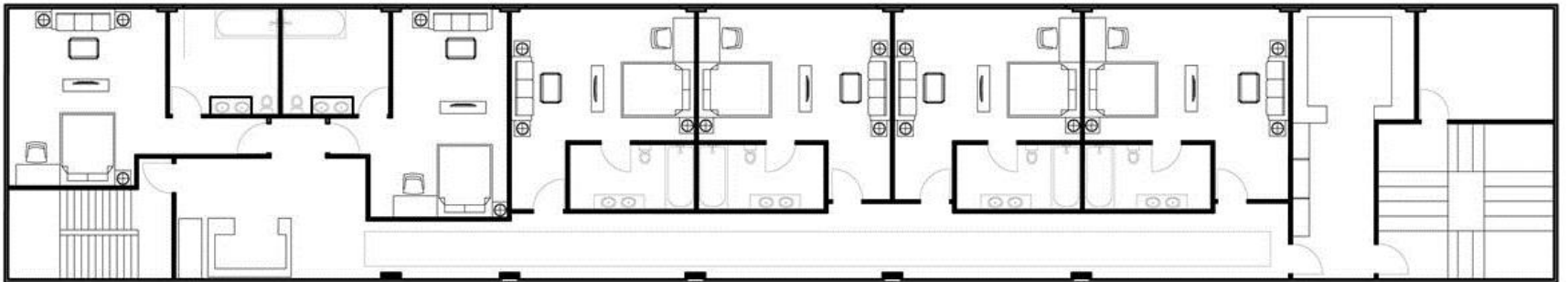
Do we now have a fourth kind of lie?

Andrew Candland
7 September 2016

The map as an analogy to a model



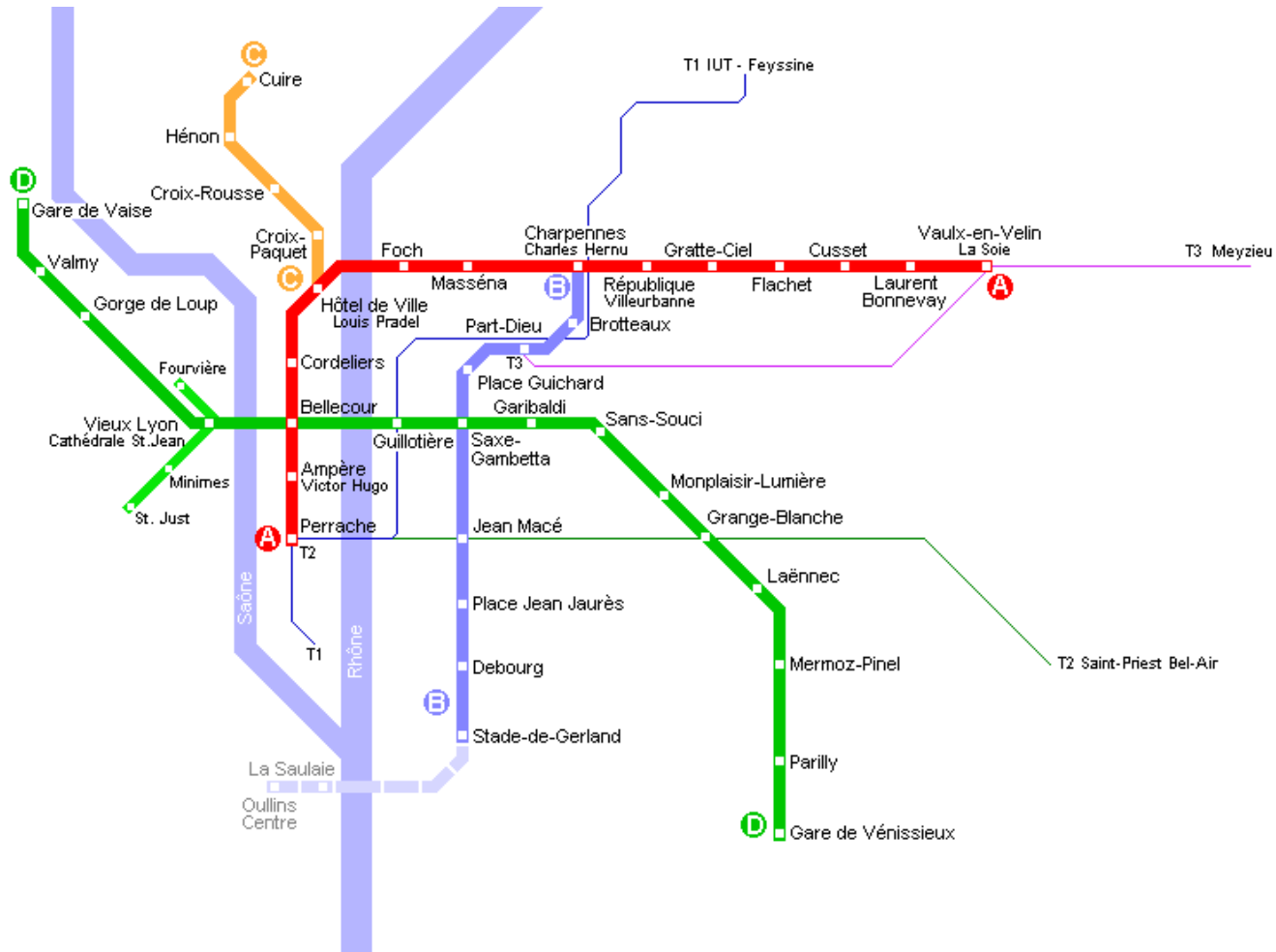
A map can be too detailed



Or not detailed enough.
The map must suit the intended use.



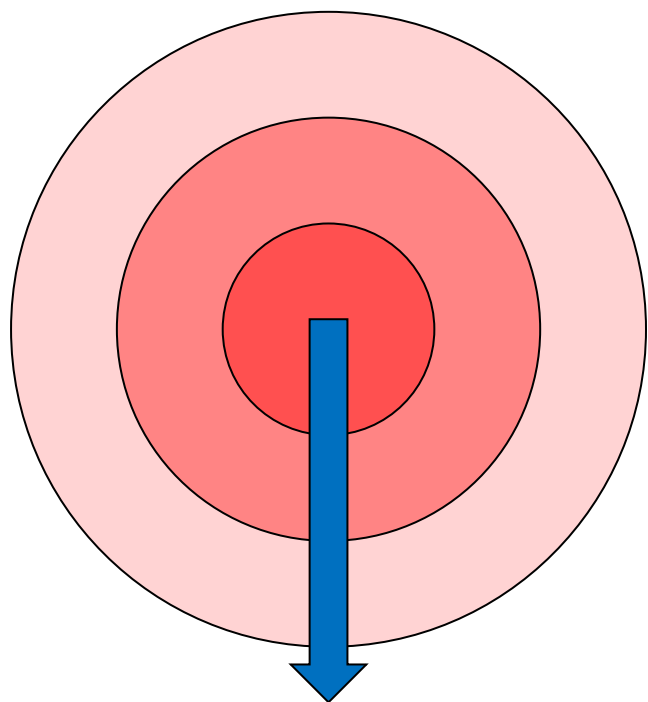
Even an inaccurate map can be useful



t=45 mins

$$\int_{t=NOW}^{t=45 \text{ mins}} \text{formulae on screen}(t) dt \approx 0$$

Circles of simplification/assumption



DECREASING VISIBILITY

Simplifications, grouping
Assumptions set by expert
judgement

Policyholder option not modelled
Use of T-copula

Separate models for market risk
and operational risk
Use of 99.5% one-year VaR

Leaving the world behind?



Quotes about Statistics

**98% OF ALL
STATISTICS
ARE MADE UP**

**STATISTICS IS THE
ART OF LYING BY
MEANS OF FIGURES.**

**FACTS ARE
STUBBORN, BUT
STATISTICS ARE
MORE PLIABLE.**

**THERE ARE TWO
KINDS OF
STATISTICS, THE
KIND YOU LOOK
UP AND THE KIND
YOU MAKE UP**

A fourth kind of lie?

“There are three kinds of lies:
lies, damned lies and statistics.”

“There are **four** kinds of lies:
lies, damned lies, statistics and **models**.”



Tests and Standards for IMs under Solvency II

1. Use Test
2. Statistical Quality Standards
3. Calibration
4. Profit & Loss Attribution
5. Validation
6. Documentation

Articles 120-125 of Solvency II Directive

1. Use Test

“Internal model is widely used in and plays an important role in the system of governance.”

- Used
- Usable e.g. speed
- Understood by Board
- Impacts:
 - model taken seriously
 - better decisions
 - challenge to improve model

2. Statistical Quality Standards

- Heart of building the model
- Choice of methodology:
 - Sophistication – richness of output
 - Proportionality
- Expert judgement – governance
- Full coverage of risks – boundaries
- Data

3. Calibration

- 99.5%, one-year, VaR, basic own funds
- Can vary any of the four parts
- but must demonstrate “equivalent protection”

4. Profit & Loss Attribution

	Net Assets	Technical Provisions	Own Funds
Opening balance sheet (31 Dec 2014)	5,000	4,000	1,000
Opening adjustments			
- model changes		16	(16)
- other restatements	(7)		(7)
New business	493	382	111
Expected return	208	166	42
Experience variances			
- interest rate risk	3	2	1
- mortality risk		28	(28)
Assumption changes			
- interest rate risk	(47)	(36)	(11)
- mortality risk		61	(61)
Dividend	(27)		(27)
Changes to current assets and liabilities	1		1
Currency adjustments	3	2	1
Unexplained amount	2	9	(7)
Closing balance sheet (31 Dec 2015)	5,629	4,630	999

5. Validation

- Not a one-off exercise
- “Convince us how you convinced yourselves”
- Independence
- Four eyes → two brains
- Back testing of new experience
- Stress and scenario testing
- P&L attribution – all six tests linked

6. Documentation

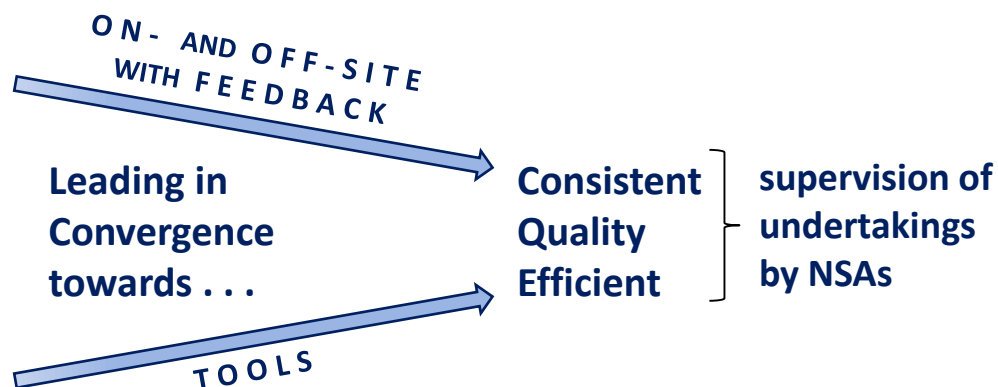
- “Do I have to . . .?”
“Don’t you want to?”
- Tailor to different audiences
- Limitations of model
- Documentation of output file

EIOPA's role in the implementation of Solvency II

EIOPA Strategic Objective 2:

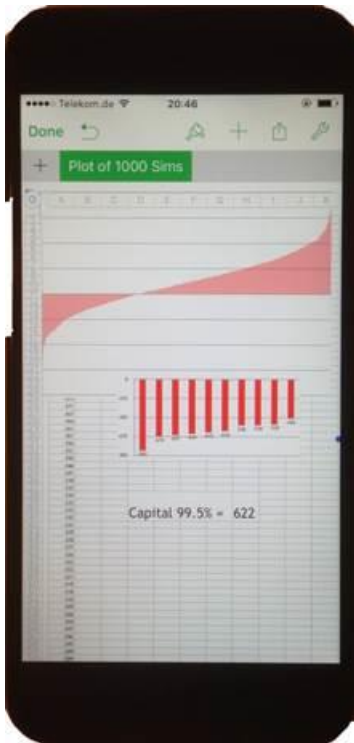
- To improve the functioning of the EU internal market in the field of pensions and insurance . . .
- . . . by leading in convergence to consistent and high-quality supervision.

Oversight Unit's strategic approach to achieve this:



Conclusion

Great possibilities . . .



. . . great dangers



VALIDATION **DOCUMENTATION**
P&L ATTRIBUTION **USE TEST**

Statements made here reflect a personal and private view. They should not be construed to reflect EIOPA's opinion and do not represent official EIOPA statements.