A faint world map is visible in the background of the slide, rendered in a darker shade of red against the main red background.

Assessing the use of indeterminates for scorecard model development

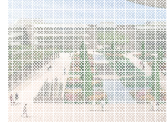
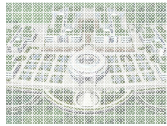
James Tebboth & Manoel Gadi
Santander Analytics

Credit Scoring and Credit Control XI
University of Edinburgh
27 August 2009

A faint world map is visible in the background of the slide, rendered in a darker shade of red against the lighter red background. The map shows the continents of North America, South America, Europe, Africa, and Asia.

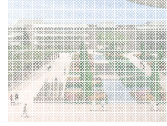
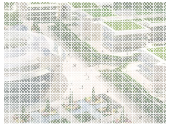
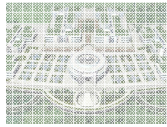
Just use goods and
bads – don't use
indeterminates!

Assessing the use of indeterminates



- 1. Organisational context**
- 2. Use of indeterminates in scorecards**
- 3. Empirical assessment**
- 4. Findings and application**

Assessing the use of indeterminates



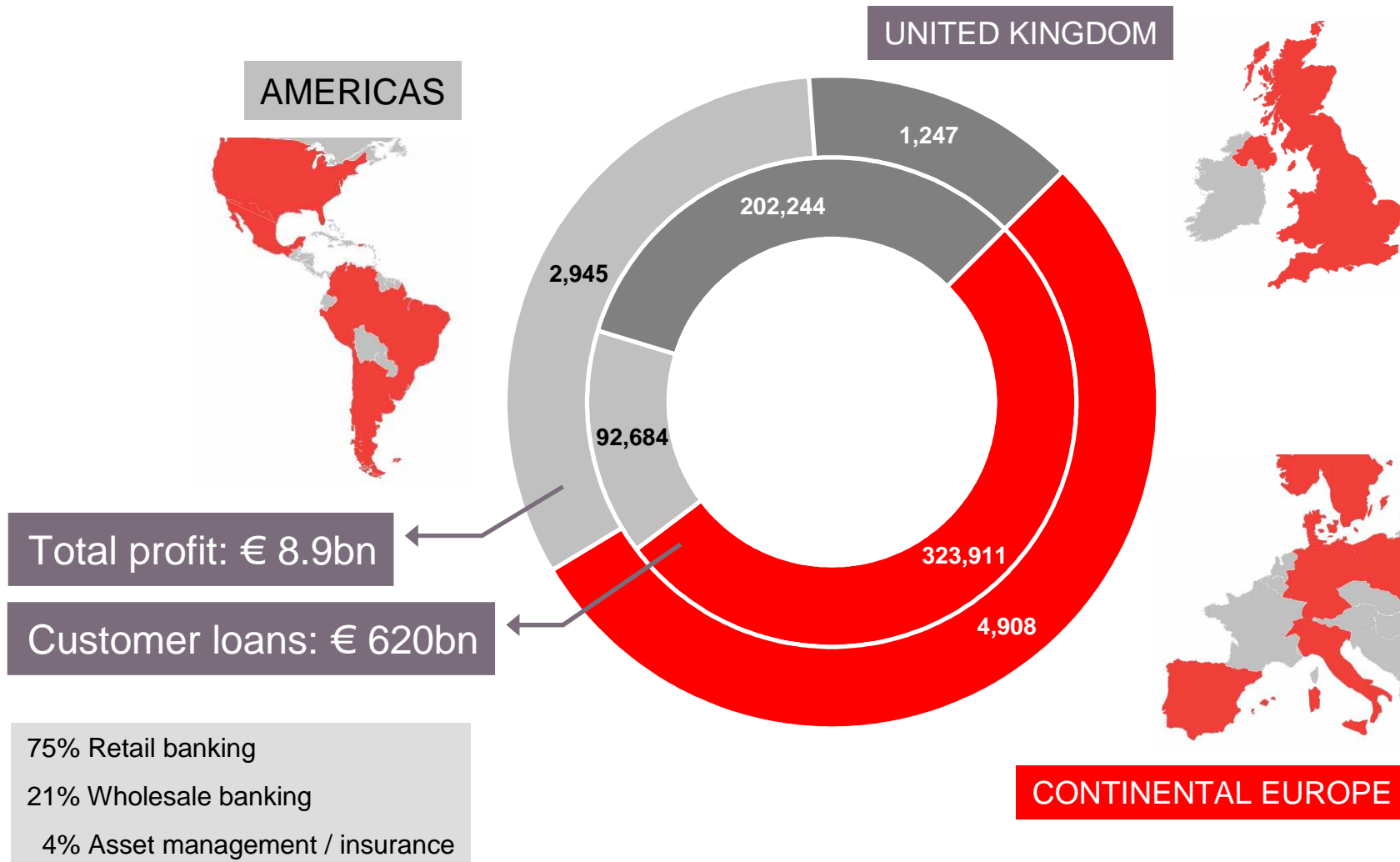
1. Organisational context

2. Use of indeterminates in scorecards

3. Empirical assessment

4. Findings and application

Banco Santander



Santander Analytics



- In 2007, the retail bank covered eleven countries, but only three had the capability to develop models
- Santander Analytics was created in 2007 as a group function for the management and development of credit risk scorecards
- The three existing units were combined to cover the entire retail bank of Santander

To contribute to achieving the best lending decisions for Santander through the development and monitoring of decision models, and ensuring the most effective use of analytical resources available worldwide

Scorecard development and management

- One of our objectives was to:

develop and implement a corporate methodology and process to develop and manage decision models

- to ensure a consistent approach
- to establish best practice
- to be dynamic: a focus for learning, capturing and building on the experience throughout the group

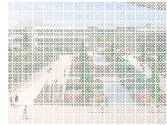
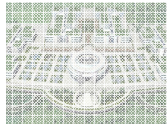
Scorecard development and management

Gap analysis

- Three corporate centres discussed and compared approaches

- Found subtle but significant differences in the three approaches:
 - reject inference
 - use of indeterminates
 - model formulation
 - involvement of internal stakeholders
 - statistics used to assess model performance
 - reports used for monitoring models
 - methods used to manage and revise models
 - ...

Assessing the use of indeterminates



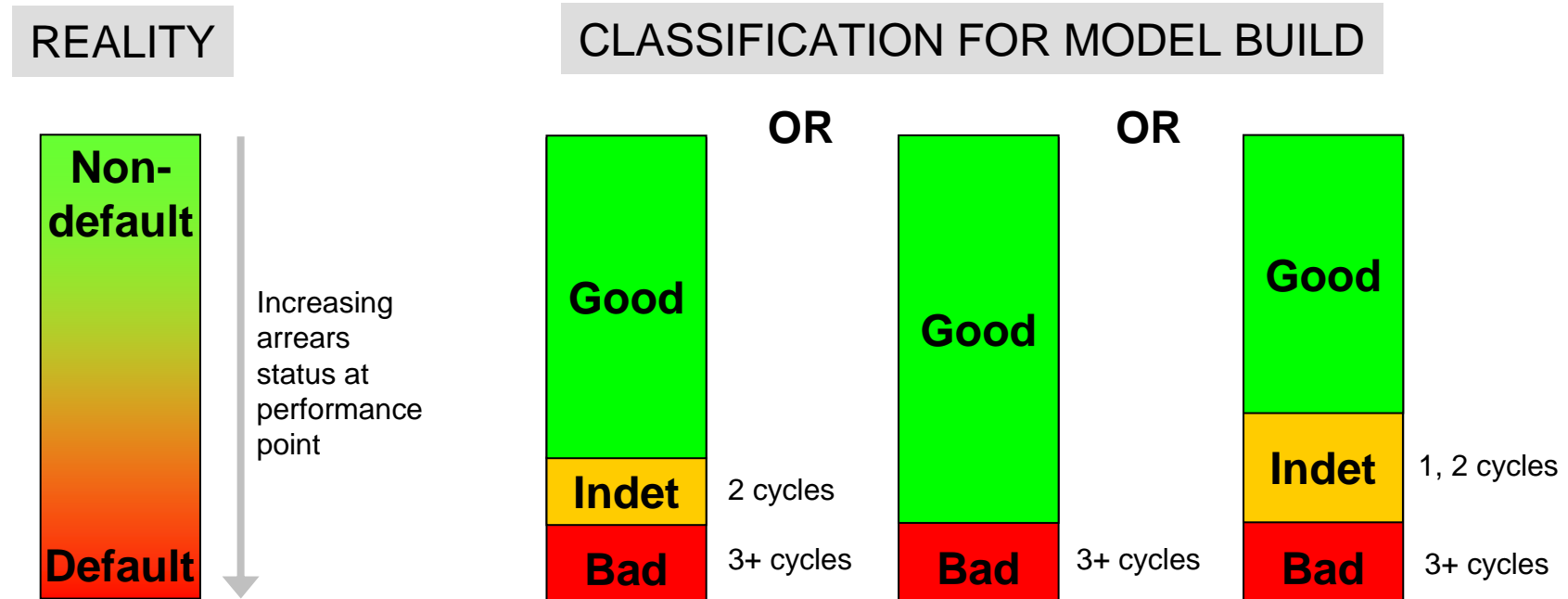
1. Organisational context

2. Use of indeterminates in scorecards

3. Empirical assessment

4. Findings and application

What are indeterminates?



- Model built on goods and bads only – indeterminates, if present, excluded from model build
- Considering indeterminates here as “intermediates”

Industry context

Historical background

- Account for mistakes and inconsistencies in manual calculations of arrears
- Allow for judgemental treatment in collections
- With limited computing power, focus model build on small samples of clear-cut goods and bads

Diverse industry views...

- Anderson, 2007: Logic for indeterminate range is that (i) seemingly bad behaviour may be the result of technical arrears, or company strategies; and (ii) good and bad are more clear cut, which should hopefully aid identification of truly problematic accounts
- Scallan, 2008: Avoid indeterminates if at all possible: (i) extra discrimination is spurious; (ii) makes models less sensitive to borderline cases; (iii) statistical estimation more complex; (iv) complicates strategy setting
- Hand, 2003: Proper way to handle indeterminates, intermediate between other classes, is as a three class problem

R Anderson, 2007: The credit scoring toolkit: Theory and practice for retail credit risk management and decision automation

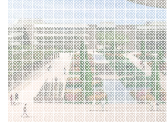
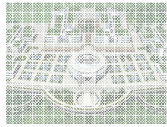
G Scallan, 2008: Building Better Scorecards

D J Hand, 2003: Good practice in retail credit scorecard assessment

| What are we trying to predict?

- Identify accounts that default ... at some point
- Want recent development samples, so use proxy definition, such as three payments in arrears after 12 months
- Choose proxy definition to maximise correlation with default
- So purpose of scorecard is to identify “bads”, and want to distinguish bads from not-bads

Assessing the use of indeterminates



1. Organisational context
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Evaluation framework

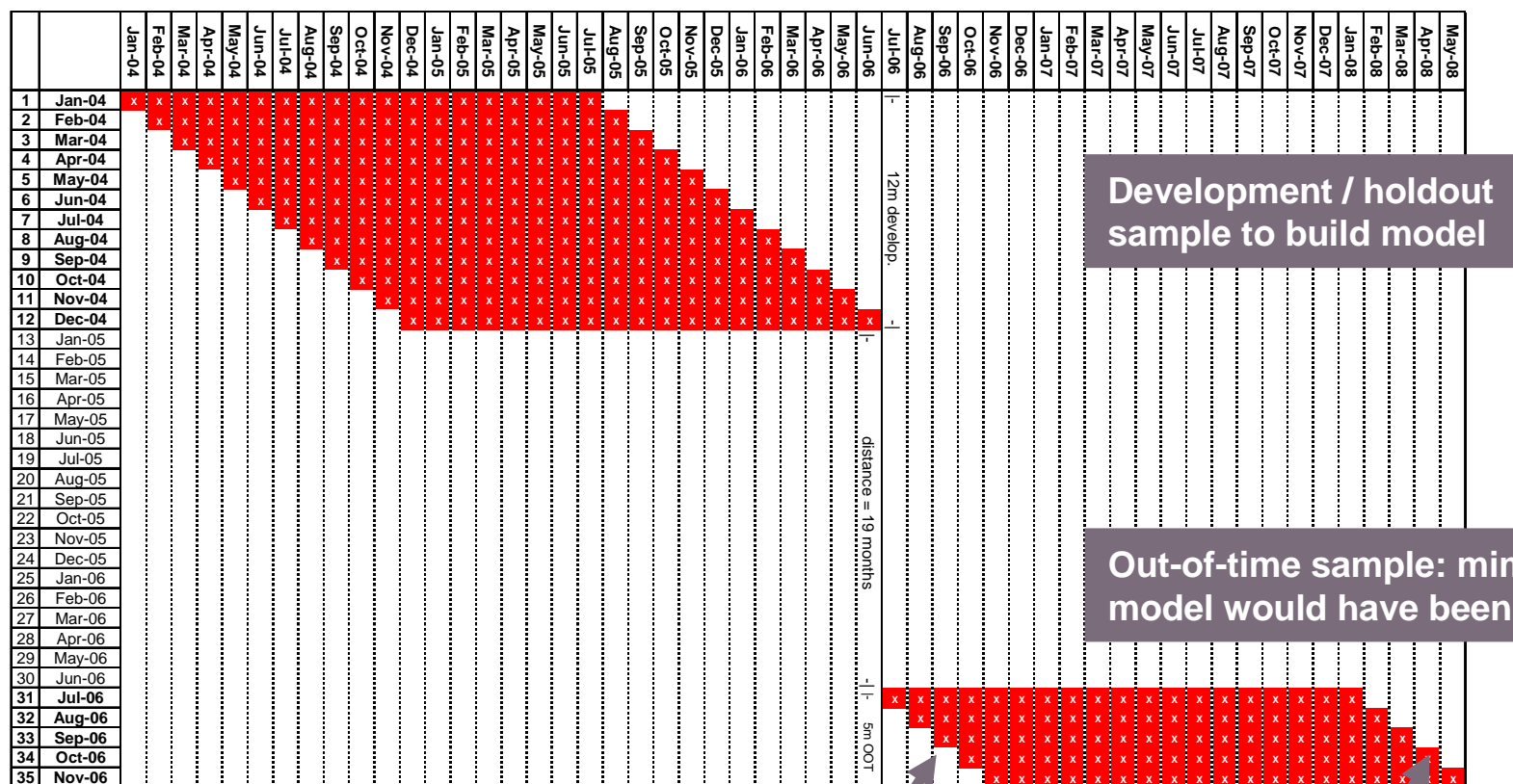
- For each test case, two models built: one using a G/B definition; another using a G/I/B definition
- Models built and validated in consistent way
- Results assessed using Gini and K-S statistics
- In order to compare results, we'll measure and assess performance using a consistent G/B definition

Evaluation data

Three data sets used

- Use existing data sets, from previous model developments
- Brazil, Spain, UK
- Auto-loans, customer score, unsecured personal loan
- Four comparisons tested, representing four G/B or G/I/B definitions used in practice over the three data sets
- Volume of observations: 15,700 32,500 169,100
- Number of independent variables: 124 216 257
- Impossible to cover all variants, but aim for diverse samples to increase robustness of results

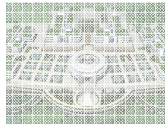
Performance evaluation



Observation
(scoring) point

Performance
point

Assessing the use of indeterminates



1. Organisational context
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4. Findings and application

Results

	Table 1		Table 2
	Dev Sample	OOT Sample	OOT Sample
Test 1	G/B	G/B	-2.7%
Test 2	G/B	G/B	-1.4%
Test 3	G/B	G/B	-5.0%
Test 4	G/B	G/B	-0.4%

- Table 1: better performing model, out of G/B and G/I/B models
- Table 2: relative drop in Gini, G/I/B model relative to G/B model
 - all results assessed using G/B definition

Conclusions

Results clearly show that indeterminates do not add power to models

Recommend building models on G/B definition, ie, good = not bad

- Results apply to indeterminates as *intermediates*
- In certain situations may still be relevant to exclude observations where performance genuinely *indeterminate*
 - eg where genuine customer performance unavailable or compromised
 - better thought of as *exclusions*

Convincing the stakeholders

A significant amount of discussion with stakeholders followed!

- Evaluation framework had been agreed prior to work
- Results and conclusions circulated
- Many questions from stakeholders from all three centres followed
 - how the models were built
 - why the performance statistics varied as they did
 - had the model taken account of this or that particular detail in the data
- While no test can ever be perfect or comprehensive, the test framework used and the robustness of the results obtained meant that the conclusions were adopted
- Conclusions also follow principle of not introducing complexity unless warranted
 - and also avoids complexity in other areas, eg, reject inference

Implementation

- End result was an agreed approach to build models on a G/B definition
- Incorporated into corporate methodology
- Methodology implemented through model building code, to help give consistency and efficiency

Further work

- Address all issues raised by gap analysis
- ... but not all through empirical testing!
- Incorporate scorecard areas and techniques from recently acquired companies
 - Banco Real
 - Alliance & Leicester
 - Sovereign
- Primary objective remains helping the bank to make the best decisions through the best models
- Recognise that standard techniques are not suitable for all situations
- So plenty of opportunities to continue learning

A world map is faintly visible in the background of the slide, rendered in a dark red color against the lighter red background. A vertical white line is positioned to the left of the text.

Thank you for your attention

Any questions?