Choosing modelling options and transfer criteria for IFRS 9: from theory to practice

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Modelling principles and challenges
MAIN IMPLEMENTATION CHALLENGES – IFRS 9 Phase 2

- A complex principle-based requirement
  - New concepts and principles in the accounting framework
  - A larger scope, that includes all exposures evaluated at the amortized cost
  - An accurate evaluation of risks based on modelling

- Global issues across the bank: processes, IT, reporting
  - Substantial evolution of accounting and management systems across the Group
  - Data collection since granting on a line by line basis
  - Reporting / Disclosure: new requirements (transfers between buckets, evolution of provisions) and additional disclosures.
  - Production issues (coordination Corep / Finrep)
  - SG is specific because of its diversity (entity sizes, geography, business lines)

- Modelling options (norm compliance, existing processes, market practices)
  - Data requirements
  - Modelling and impact studies
  - Calculator and calibration tool design
  - Normative modelling documentation
MAIN PRINCIPLES – IFRS 9 phase 2

- Risk management based
  - Build upon the existing frameworks (monitoring, regulatory, …)
  - Accounting should not change the risk management and monitoring practices, but should improve them
  - Manage the interplay between accounting, regulatory and risk management processes

- Simplicity
  - Avoid black box effects
  - Leverage business knowledge
  - Avoid full automatic framework, preference for auditability and understanding of the provision variations
  - Make sure that the framework will be displayed and will evolve conveniently

- Materiality, proportionality
  - A reference method displayed on the most significant entities in terms of exposure or credit risk
  - A simplified approach for less significant entity which data collection and qualification is not the same level

- Comparability / benchmarking with peers
  - Working groups are now structured across boarders
  - Audit firms are starting to settle their standards
MODELLING CHALLENGES FOR NON RETAIL EXPOSURES

- A market standard has emerged
  - Use of internal ratings for the transfer criteria
  - Methodologies based on the Basel 2 framework
  - PDs calibrated from observed migrations instead of observed defaults only
  - Forward-looking estimations based on the stress testing framework

- Main modelling challenges / still to be done
  - Calibration of the transfer criteria
  - Identification of the risk drivers (segmentation and forward looking)
  - Lifetime PDs backtesting
MODELLING CHALLENGES FOR RETAIL EXPOSURES

- The market standard has not emerged yet
  - Risk indicator for the transfer criteria (score, risk class, 1Y or lifetime PD, current or past payments in arrear)
  - Tolerance on the initial recognition date (granting vs. first behavioral score)
  - Lifetime PD measurement

- Lifetime PD measurement
  - Data sources
    - Observed default
    - Observed risk class migrations
    - Roll rates
  - STEP 1: estimate TTC parameters
    - Either risk class migration matrices or TTC PD curves
    - At a one year horizon, mind the gap with Basel 2 PDs!
  - STEP 2: adjust for current conditions and forward-looking
    - Cycle effects should be included to take macro economics factors into account
    - Additional adjustments for trends or other effects
POSSIBLE APPROACHES FOR RETAIL EXPOSURES (1/2)

<table>
<thead>
<tr>
<th>Observed migrations</th>
<th>Observed defaults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cohort</strong></td>
<td><strong>Vintage model</strong></td>
</tr>
<tr>
<td>• Matrix approach</td>
<td>• Risk class</td>
</tr>
<tr>
<td>• Risk class (rating matrix)</td>
<td></td>
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<tr>
<td>• Days-past-due buckets (roll-rate matrix)</td>
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<tr>
<td><strong>Duration</strong></td>
<td><strong>Cox model: estimation of the default rate based on</strong></td>
</tr>
<tr>
<td>• Matrix approach taking into account</td>
<td>time spent within risk segment before default</td>
</tr>
<tr>
<td>time spent within risk segment</td>
<td></td>
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<tr>
<td>(risk class, days-past-due bucket, etc.)</td>
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</tbody>
</table>

Contracts:

- A: R1
- B: R3, R2
- C: R2
- D: R3
- E: R1, R3, R2
- F: R2

Legend:
- Red circle: Exit of portfolio
- Star: Default
- R1, R2, R3: Risk class of the contract
- Triangle: Transition to a new risk class

Data used in the duration approach (all the historical data available is used)

Data used in the cohort approach
### POSSIBLE APPROACHES FOR RETAIL EXPOSURES (2/2)

<table>
<thead>
<tr>
<th>Observed migrations</th>
<th>Observed defaults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pros</strong></td>
<td><strong>Cons</strong></td>
</tr>
<tr>
<td><strong>Cohort</strong></td>
<td></td>
</tr>
<tr>
<td>Adapted for low default portfolios (especially the duration approach: use of all historical data available)</td>
<td>Does not cope with path-dependence</td>
</tr>
<tr>
<td>Same mathematical framework as the mainstream corporate framework</td>
<td>Complex to include maturation effects</td>
</tr>
<tr>
<td>Easy to estimate lifetime PDs</td>
<td>Backtests not relevant (significant gaps between historical and calibrated PDs on horizons higher than 1Y)</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A lot of parameters to estimate (non homogeneous matrix model)</td>
</tr>
</tbody>
</table>

- **Among the panorama of Retail PD approaches, several are considered not relevant:**
  - Duration models seem unduly complex for retail exposures (very high default portfolios)
  - The structure of observed migrations is highly complex due to path-dependence

- **Default rate with a cohort vision seems to be the most appropriate approach to build lifetime PD curves for Retail portfolios**
Assessing the performance of IFRS 9 models

http://ssrn.com/abstract=2606080
TRANSFER CRITERIA STAGE 1 – STAGE 2

- The emerging consensus is that transfer criteria are based on Basel risk measures
  - Retail: scores or measures derived from the score (risk class, PD)
  - Non retail: internal rating

- Transfer criteria are still an open field of research for the whole industry
  - Relative vs. absolute
  - How do we set the thresholds?
  - What is the impact on the provision itself?

- An optimal transfer criterion leads at setting some targets in terms of thresholds and discriminatory power
  - Absolute risk criterion is a good proxy whenever the bank originates loans above a given cut-off threshold
  - The discriminatory power of the transfer criterion is assessed for a 1 year period of time

- The target hit rate associated with the transfer criterion depends on the average risk of the portfolio and on the accuracy ratio
  - It is a driver of the stage 2 portfolio size
  - It is a driver of the provision
Receiving Operating Characteristic (ROC) curve

- The ROC curve plots the Hit rate as a function of the False Alarm Rate
  - Random model: hit rate = false alarm rate
  - Perfect model: hit rate = 100%

- Statisticians usually fit the ROC curve with regular functions
  - Binormal fit
  - Exponential fit (Van Der Burgt’s fit of the CAP curve)

\[ AR_2 = \alpha - R^{-1}(\alpha) \]
OPTIMAL TRANSFER CRITERION

- The optimal transfer criterion maximizes the area under the 2 stages ROC curve

\[ R'(R^{-1}(\alpha^*)) = 1 \]
Stage 2 Portfolio Size

$$AR_2(1 - p) = \alpha - B_2$$
The hit rate is the driver of the stage 2 portfolio size and of the total provision as a consequence

\[ P = p.LGD.\left[(1 - \alpha)D_1 + \alpha D_2\right] \]

- The stage 2 portfolio size depends on both the risk parameters and discriminatory power of the transfer criterion
- The provision proxy formula is helpful as a benchmark formula for advanced methodologies and could be used as a simplified approach for less advanced banks or entities

Risk sensitivity is a requirement of the IFRS 9 framework. We see that the provision is sensitive to the quality of the models as well

- It is not certain that the provision decreases when we increase the quality of the classification between stage 1 and stage 2 (likely to generate negative misclassification costs)
CONCLUSION

- Complexity is a threat for IFRS 9 frameworks, on models and on other aspects as well.
- The goal in designing the framework is to set norms
- The framework must deliver the correct information to the market
  - For instance: the description of anticipated defaults should not be biased: stage 2 portfolios should catch a significant proportion of defaults and should not generate too high false alarm rates)
- Not sure that we need a consensus on method details on any segment of business or portfolio
- However, trade-offs are necessary for fitting pratice to theory
  - Coherent frameworks
  - Set targets