Dynamic Effects of Basel II Implementation

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Credit Risk Systems
1. Motivation

2. Risk Adjusted Pricing and Rating Accuracy

3. The Model

4. Results and Conclusion
Motivation

Basel II will have a significant impact on the banking industry.

- **Strategic effects**
  - Risk-sensitive capital requirements
  - Focus on advanced risk management systems
  - Growing importance of active portfolio management
  - Risk transfer (securitization vs. credit derivatives)
  - Change in bank valuations, RoC

- **Project costs** estimated at around 5 bps so that a typical mid-market bank will invest around **25 MM** over several years prior to adoption*
  - 89% of CEOs consider Basel II as high priority and are involved personally*

- **Banks that look beyond compliance will benefit most from Basel II**
  - What are the **dynamic** effects of Basel given the institution’s portfolio structure and size
  - How will the decisions of other market **players** influence its competitiveness
  - How can the bank position itself **strategically** well and allocate the scarce resources where they contribute most
    (effects, profit vs. cost contributions, internal vs. vended models)
The paper relates to several different areas of research.

• Theoretical models of bank competition.

• Empirical analysis of rating models’ profitability effects

• Empirical estimations of Basel II effects.
  Basel Committee for Banking Supervision (Quantitative Impact Studies)
  Local Regulatory Authorities
Banks will experience both positive and negative effects from the implementation of the New Accord.

- **Positive effects.**
  - Improved risk management processes
  - Regulatory capital incentives
  - Optimization of loan loss provisioning
  - Active portfolio management

- **Negative effects.**
  - High implementation costs
  - Credit crunch
  - Adverse selection
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Risk Adjusted Pricing

The estimated risk parameters should determine the pricing of credits in a straightforward manner.

**Fair Market Price**

- **Creditworthiness**
  - Equity costs
  - Standard risk costs
  - Unit costs
    - Market rate ("purchase" price of the credit)

- **Collateral**
  - Maturity
  - Market term structure
  - Fixed vs. variable rates
Risk Adjusted Pricing in the Model

The estimated risk parameters should determine the pricing of credits in a straightforward manner.

- **Standard risk costs**
  \[ StdR = \frac{r^f + PD * LGD}{1 - PD} \]

- **With certain assumptions the following approximation can be used**
  \[ StdR = PD * LGD \]

- **Equity costs**
  \[ K = [LGD * N\left((1 - R)^{-0.5} G(PD) + (R / (1 - R))^0.5 G(0.999)\right) - PD * LGD] * (1 - 1.5 * b)^{-1} * (1 + (M - 2.5) * b) \]

- **Risk-adjusted prices in the model**
  \[ Price_{i,j} = PD_{i,j} * LGD + Margin + Underwriting Fees \]
The performance of a rating system is characterized through its discriminatory power.

- **Accuracy Ratio (AR)**

\[
AR = \frac{B}{A + B}
\]

- **PD Derivation**

\[
PD(Score) \approx \frac{defaults}{total} \cdot \frac{\Delta y(Score)}{\Delta x(Score)}
\]
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Simulation Setup

Numerical simulations allow for the estimation of the profitability effects related to improvement in the rating methodology.

- **Obligor population**  
  \[ P \subset \{t_1(p_1, q_1), t_2(p_2, q_2), \ldots, t_n(p_n, q_n)\} \]

- **Discriminatory Power**  
  \[ PD_{t=i,j} = p_i + \xi_{i,j} \quad \xi_{i,j} \sim N(0, \sigma_{i,j}) \]

**Accuracy Ratio**  
\[ f(\sigma_1, \sigma_2, \ldots, \sigma_n) \]
Model

A number of different market setups are simulated.

- No uncertainty
  - less advanced bank, grading bucket „k“:
    \[ Q_k = \sum_{i=1}^{k} q_i \quad P_k = \frac{\sum_{i=1}^{n} p_i \cdot q_i}{\sum_{i=1}^{n} q_i} \]
  - IRB bank:
    \[ PD_{IRB,j} = p_i \]
  - Customer decision
    \[ p_i < \frac{\sum_{i=1}^{n} p_i \cdot q_i}{\sum_{i=1}^{n} q_i} \Rightarrow Price_{IRB,j} < Price_{STD,j} \]
  - Profit
    \[ \pi_j = Exposure_j \cdot Price_j \quad \text{if the customer survives (non-default)} \]
    \[ \pi_j = -Exposure_j \cdot (LGD + \text{workout fees}) \quad \text{otherwise} \]

- Uncertainty
  \[ PD_{IRB,j} = p_i + \xi_{IRB,j} \text{, where } \xi_{IRB,j} \sim N(0, \sigma_{IRB,j}) \text{ and} \]
  \[ PD_{STD,good} = P_k + \xi_{STD,good} \text{, where } \xi_{STD,good} \sim N(0, \sigma_{STD,good}). \]
Numerical simulations allow for the estimation of the profitability effects related to Basel II adoption.

- $T=0$
  - define customer structure and competition setup
  - banks rate borrowers and offer risk-adjusted prices
  - borrowers choose bank with lowest rate

- $T=1$
  - borrowers default randomly with their "true" unconditional PD
  - accuracy ratios and profitability differentials are calculated
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Results

A number of different market setups were simulated.

- Single Bank acting as a price-taker
  - conservative case (no uncertainty)

<table>
<thead>
<tr>
<th>Number of risk grades</th>
<th>Absolute profit in % of originated amount</th>
<th>Profitability relative to an IRB Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0,77%</td>
<td>-56%</td>
</tr>
<tr>
<td>3</td>
<td>1,26%</td>
<td>-28%</td>
</tr>
<tr>
<td>5</td>
<td>1,39%</td>
<td>-21%</td>
</tr>
</tbody>
</table>

- Competing banks
  - on average one more percentage point in accuracy brings about €1,9 MM in additional profit

<table>
<thead>
<tr>
<th>Ex-Ante PDs (16 types)</th>
<th>Standardized Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,01%</td>
<td>1 Grade 0,07%</td>
</tr>
<tr>
<td>0,02%</td>
<td>3 Grades 0,07%</td>
</tr>
<tr>
<td>0,03%</td>
<td>5 Grades 0,07%</td>
</tr>
<tr>
<td>0,04%</td>
<td>0,02%</td>
</tr>
<tr>
<td>0,05%</td>
<td>0,05%</td>
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<tr>
<td>0,07%</td>
<td>0,05%</td>
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<tr>
<td>0,11%</td>
<td>0,15%</td>
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<td>0,20%</td>
<td>0,20%</td>
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<tr>
<td>0,35%</td>
<td>0,20%</td>
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<tr>
<td>0,60%</td>
<td>0,20%</td>
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<tr>
<td>1,05%</td>
<td>0,20%</td>
</tr>
<tr>
<td>1,85%</td>
<td>0,20%</td>
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<tr>
<td>3,25%</td>
<td>0,20%</td>
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<tr>
<td>5,70%</td>
<td>0,20%</td>
</tr>
<tr>
<td>10,00%</td>
<td>0,20%</td>
</tr>
<tr>
<td>17,50%</td>
<td>0,20%</td>
</tr>
</tbody>
</table>

- Calibration
  - a bank is much better off by erring on the down side
Conclusion

IRB implementation will be characterized by a large first mover advantage and thus differing adoption dates for the different players.

- Large national-scale banks
  - will strive IRB adoption
  - in position to cherry pick Standardized banks’ portfolios
  - should carefully consider their implementation strategies (improve fundamentals vs. compliance)

- Smaller banks
  - will continue to emphasize their close relationship with the customer
  - will adopt IRB as more and cheaper products appear on the market
  - should invest in know-how formation to make better use of spillovers and react to the developments