The New Role of PD Models

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PD Models and Their Importance
PD Models

- Why they are important?
- How are they developed?
- What can they tell us about the level of risk in a particular sector?
PD Models are Key in Determining Capital Requirements

- Under Basel II, capital requirements are based on a simple portfolio model that assumes
  - One global factor
  - A very large number of exposures in the portfolio
  - Correlation is determined solely by the size of the exposure and the PD
- The required capital for a given exposure is determined by the 1 in a thousand Value-At-Risk
- The **probability of default** plays a central role in determining required capital
Different PDs yield Different Capital Requirements

<table>
<thead>
<tr>
<th>PD (%)</th>
<th>Risk Weight (%)</th>
<th>Capital Requirements (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.03</td>
<td>14</td>
<td>1.2</td>
</tr>
<tr>
<td>1.30</td>
<td>100</td>
<td>8.0</td>
</tr>
<tr>
<td>10.00</td>
<td>193</td>
<td>15.5</td>
</tr>
</tbody>
</table>

Based on an exposure with 50mm Euros of turnover; maturity, LGD and EAD are 2.5, 45% and 100%, respectively. See for example: page 197 of “A Revised Framework.”
Market Data is Powerful, Where Available

- A structural framework can be used to convert equity prices into default probabilities when equity prices are available.
- A substantial portion of bank debt is to private firms – firms without publicly trade common stock.
Another Approach

Requirements of a statistical PD model include:

- Understood by users
- Variables in the model are a reasonable set of predictors
- Data is representative of the target population to the extent possible
- Calibrated to be consistent with a Basel definition of default
- Documented
- Transparent
Introduction to the RiskCalc Network
RiskCalc Network Since 2000

- Has expanded to cover 22 different countries representing 80% of the world’s GDP
- Includes a model for Private US Banks
- Is actively used by over 200 clients
  - Monitoring of both loans and leases
  - Implementation of risk based pricing
  - Regulatory compliance
  - Transfer pricing
  - Portfolio management
  - Securitization of Small and Medium Size Enterprise (SME) debt into Collateralized Debt Obligations (CDOs)
- Based on data of actual unlisted firms from each country
Greenland is part of the Kingdom of Denmark
Credit Research Database (CRD)

- Began effort in 1997
- Database of borrower financial statements matched to select credit performance data
- Data includes
  - Balance sheets and income statements
  - Default status
  - Internal loan grades
  - LGD information
  - Other obtainable loan information
    - loan rate pricing, origination/maturity dates, etc.
A Few of Our 49 CRD participants...
The Credit Research Database today

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Customers</th>
<th>Defaulted Customers</th>
<th>Number of Fin Stmts</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>106,052</td>
<td>10,496</td>
<td>536,515</td>
</tr>
<tr>
<td>Europe</td>
<td>1,711,990</td>
<td>141,178</td>
<td>9,043,417</td>
</tr>
<tr>
<td>Asia</td>
<td>263,083</td>
<td>15,609</td>
<td>1,219,300</td>
</tr>
<tr>
<td>Australia</td>
<td>31,576</td>
<td>2,715</td>
<td>102,778</td>
</tr>
<tr>
<td>Africa</td>
<td>19,633</td>
<td>415</td>
<td>52,613</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td><strong>2,132,334</strong></td>
<td><strong>170,413</strong></td>
<td><strong>10,954,623</strong></td>
</tr>
</tbody>
</table>
RiskCalc Models

- Seek to maximize the predictive power provided the model is
  - Transparent
  - Intuitive
  - Reasonable
- Extract a risk assessment from the financial statements
  - Localized to the specific accounting practices of the country
- Makes an adjustment for industry differences
- Adjusts for the current state of the credit cycle
RiskCalc Statistically Combines Ratios into a Single PD – an EDF™ Credit Measure

RiskCalc combines several relationships between ratios and default frequencies in a consistent and objective credit risk measure.

Probability of Default: EDF™
Application of the US Banking Model: A Tale of Two Recessions
In the Recent Recession, Bond Defaults Spiked but Not Bank Failures

Speculative Grade Default Rate* and Bank Failures**

*Based on Moody's trailing speculative grade default rate. The value for 1970 is set to missing because the actual rate during this year is highly skewed due to the default of Penn Central Railroad and 25 affiliates.

**Based on FDIC data.

- During the most recent recession, the balance sheets and income statements were much stronger than during the banking crisis of 1987-1991.
- Construction & Commercial real estate asset values were rising dramatically.
- Our model captures both of these outcomes thru several ratios
  - Equity to Assets
  - Net Income to Assets
  - Other Real Estate Owned to Assets
- Even though concentration of Construction, Real Estate and C&I loans is increasing, default risk (as measured by the model) at banks is much lower than in the late 1980s.
In 1986-1991, Insufficient Equity Reflected High Bank Risk

Equity to Assets

Equity to Assets

Period of Banking Crisis

Year


3% 4% 5% 6% 7% 8% 9% 10% 11% 12% 13% 14% 15% 16% 17%

90% 75% 50% 25% 10%

Presents the distribution of this ratio by year for the FDIC insured banks that had not yet failed. The upper and lower whiskers of the blue box plot represent the 90th and 10th percentile of the distribution, respectively. The upper and lower whiskers of the red box plot represent the 75th and 25th percentile of the distribution, respectively. The bar in the middle represents the median of this distribution.
The New Role of PD Models

Net Income to Assets

Presents the distribution of this ratio for the FDIC insured banks that were not yet in default.
And Foreclosed Properties

Other Real Estate Owned to Assets

Period of Banking Crisis

Presents the distribution of this ratio for the FDIC insured banks that were not yet in default.
Nevertheless, Concentration in Risky Assets is Rising

Concentration Risk

Period of Banking Crisis

Year

Concentration Risk

Presents the distribution of this ratio for the FDIC insured banks that were not yet in default. Concentration risk is measured as the sum of Commercial Real Estate, Construction and Commercial & Industrial Loans to Total Assets.
Default Risk, as Measured by RiskCalc Banks, was Much Higher in the 1987-1991 Period

1 Year EDF

Presents the distribution of this 1 year EDF produced by the RiskCalc v3.1 US Banking Model for the FDIC insured banks that were not yet in default.
Conclusion
PD Models are Having a Large Impact on Banking Worldwide

- EDF™ credit measures are used by banks and regulators to manage credit risk
- Play a central role in determining regulatory capital
- Used effectively, they can manage risk and provide early warnings of problems
- EDF measures are currently signaling US Banks appear much safer than in 1987-1991
- Nevertheless, the assets of banks have become increasingly concentrated in risky assets