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Developing a Commercial Credit Risk Rating Model:

Case Study of a Petrochemical Company

Credit Scoring and Credit Control XI conference

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Agenda

- **Problem Statement**
- **Model Development**
  - Current models
  - Considerations for model selection/development
  - Steps for developing the new model
- **Results**
- **Limitations**

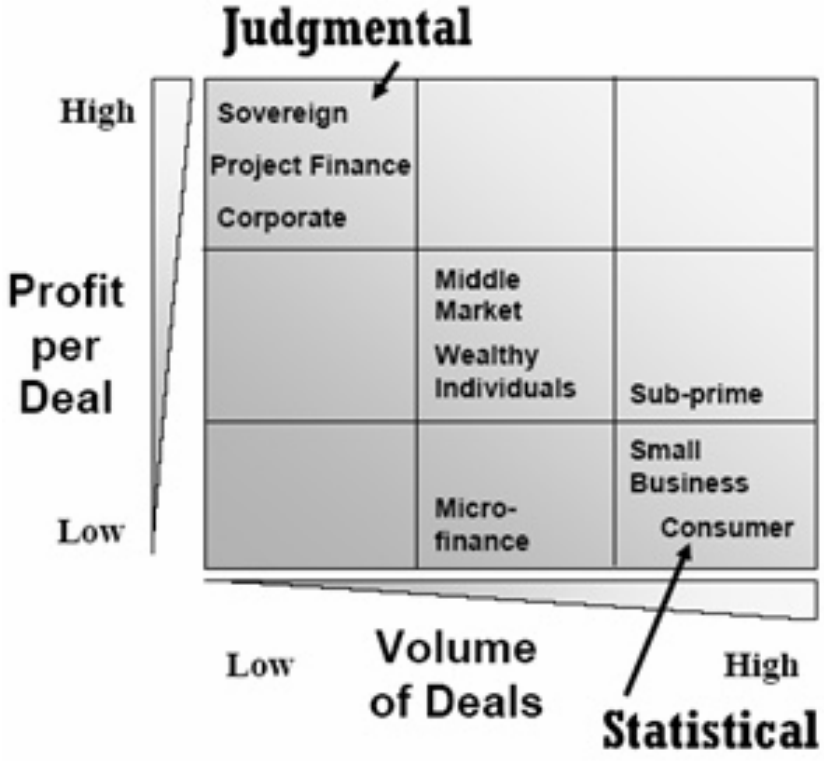
Problem Statement:

- **a model for credit risk assessment in the petrochemical industry:**
  - Improving the credit risk model of a major petrochemical company by combining a financial model (Altman's Z-Score) with a non-financial model (A-Score)

Current Models:

- Accounting-Based Credit Scoring models
- CreditMetrics (by JP Morgan)
- KMV Model (by Moody's KMV)
- CreditRisk+ (by Credit Suisse)
- CreditPortfolio View (by McKinsey)
- Credit Rating Methods by the CRAs (e.g. Standard & Poor's)

Considerations for Model Selection/Development:



Source: Anderson, 2007

Considerations for Model Selection/Development:

Company Size	Market prices	Judgmental inputs	Environment Inputs	Financial statements	Payment history	Principal assessment
Very Large	✓	✓	✓	✓		
Large		✓	✓	✓		
Middle		✓	✓	✓	✓	
Small				✓	✓	✓
Very Small					✓	✓

Source: Anderson, 2007

Considerations for Model Selection/Development:

- **Sample of customers:**
  - 42 customers with the largest exposures
  - All in Chemicals & Intermediate industry
  - Credit exposure ranging from half a million to 150 million Euro
  - All medium and large companies, with a few being very large
  - 14 customers rated by one or more of the major CRAs
  - 25 customers are publicly-listed

Considerations for Model Selection/Development:

- **Available sources of data for the sample:**
  - Judgmental input
  - Environmental inputs
  - Financial statements
  - Payment history

Steps for developing the new model

- The New Model:

$$Z_{Adjusted} = Z_{Score} * A_{Score}$$

Financial assessment

Non-Financial assessment

Steps for developing the new model:

- Developing a list of potential factors
- Assessing the importance and measurability of each factor
- Selecting the most important factors
- Weighting the selected factors using the Analytic Hierarchy Process (AHP)
- Calculating the A-Score and the adjusted Z-score

Steps for developing the new model:

- Developing the list of potential factors:
  - Reviewing the literature
  - Ten interviews with credit analysts and marketing & sales staff members
  - Reviewing the rating methodology of the three Rating Agencies
  - Reviewing the rating system of a commercial bank
  - 34 potential factors were listed

Steps for developing the new model:

- Assessing the importance and measurability of each factor:
  - six persons were selected for the interview
  - two dimensions were measured by the respondents: Importance & Measurability
  - Each factor was measured using a scale of 0 to 5

Steps for developing the new model:

- Assessing the importance and measurability of each factor:

Factor	Importance Score	Measurability Score
Payment behaviour	5.0	4.8
Quality of the financial information	4.5	3.7
Type of transaction with Company	4.5	4.8
Exposure to event risks	4.0	2.7
Operational diversity	3.8	4.0
Stability of purchase from Company	3.8	4.5
Legal form	3.8	4.7
Company's share in customer's supply	3.8	3.7
Level of integration of the business	3.7	4.0
Industry risk	3.7	4.3

Steps for developing the new model:

- Selecting the most important factors:
  - For the final selection of the variables, a group meeting was set with three credit analysts and two senior risk managers

Steps for developing the new model:

- Final list:
  - Payment behaviour
  - Industry risk
  - Country risk
  - Type of transaction with Company
  - Operational Diversity
  - Level of integration of the business
  - Exposure to event risks
  - Legal form

Steps for developing the new model:

- Weighting the selected factors using the Analytic Hierarchy Process (AHP):
  - AHP is a methodology for systematic evaluation of the relative importance of qualitative criteria
  - In a meeting with three credit analysts and one senior manager, the AHP method was used
  - In order to verify the consistency of the factor weights, the Consistency Ratio was calculated

Steps for developing the new model:

- Weighting the selected factors using the Analytic Hierarchy Process (AHP):

Factor	Weight
Payment behaviour	36.4%
Industry risk	19.0%
Country risk	16.0%
Type of transaction with Company	12.0%
Operational Diversity	7.2%
Level of integration of the business	4.8%
Exposure to event risks	2.5%
Legal form	2.2%

Steps for developing the new model:

- Calculating the A-Score and the adjusted Z-score:

A=0.364*P+0.190*I+0.160*C+0.120*T+0.072*O+0.048*L+0.025*E+0.022*F

Results:

- The major credit analyst rated customers' riskiness with a scale of 1 to 3
- 1 representing the highest and 3 representing the lowest risk for that customer

Results:

- Customers were categorized in two categories; 1 was labeled as High-Risk and 2 or 3 were categorized as Low-Risk customers
- customers with the combined score of less than 1.8 were categorized as High-Risk
- In 37 cases out of the 42, the model accurately categorized the customers (88% of the cases)

Results:

- As a second test, the Adjusted Z-Score for each customer were compared to the expert's rating of the customer.

- In 36 cases out of 42, the deviation of the Z-score and expert rating was reduced when A-score was included. (86% of the cases)

Limitations:

- Lack of historical data on long-term payment behavior of the customers
- Few companies with financial distress in our sample
- The subjective judgment involved both in factor selection and factor weighting by AHP can cause imprecision in the model

Thank You!