Counterparty Credit Risk for Insurance and Reinsurance Firms

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Outline

- What is counterparty credit risk
- Relevance of counterparty credit risk
- Typology of credit risk models for reinsurers
- Comparative features of model types

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What is Counterparty Credit Risk

- Certain types of events relating to a borrower or trade counterparty, such as
  - Non-fulfillment of monetary obligations (Default)
  - Non-fulfillment of other than monetary obligations, (Covenant Violation) including
  - Downward migration of credit quality (Downgrade)

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Relevance of Counterparty Credit Risk

- Previous presentation by Luyang Fu outlines reinsurance pricing
- Paper suggests other inputs to reinsurance decision, e.g., p. 205 (emphases added):

> "… The reinsurance purchase decision is seldom, if ever, guided solely by the dry mechanics of pricing a layer …
>
> … An aspect of the transaction that goes beyond the mechanical factors deals with **"who" the prospective reinsurer is**.
>
> … **The size of the reinsurer, the size of its surplus, the financial rating of the reinsurer, the length and quality of the relationship with the reinsurer, how much of the reinsurance is retained for its own account**, and so forth form important intangibles …
>
> … these factors do operate and they can influence the final decision."

~ Fu, Luyang and C.K. "Stan" Khury, "Optimal Layers for Catastrophe Reinsurance", *Variance*, Volume 4, Issue 2, pp 191-208

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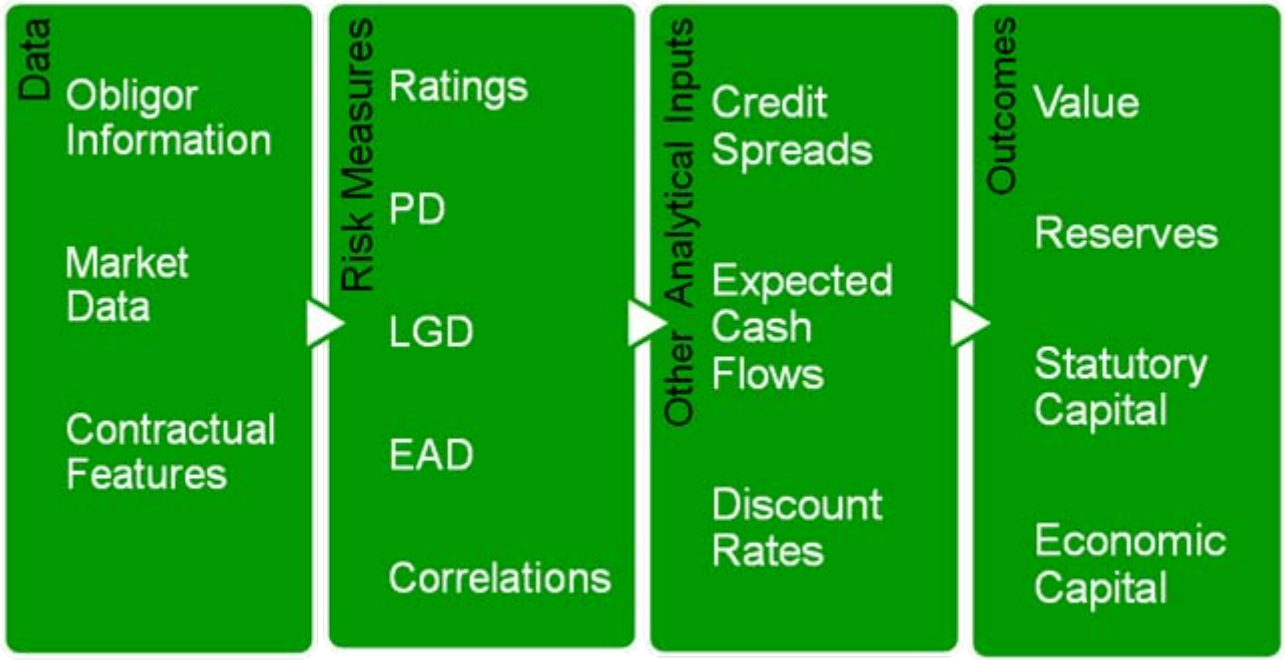
Relevance of Counterparty Credit Risk (2)

Credit Risk: A Typical Process



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Counterparty Credit Risk: EAD vs. PD

- For some types of short-term exposures, industry practice is to measure counterparty credit risk with EAD
  - Commercial banking guidance outlines key approaches
  - These methodologies focus purely on the amount of exposure left over after collateralization, margining, and netting agreements
  - They do not account for creditworthiness of the entities themselves
- Firms with very different credit profiles, but with identical transactions, would have identical counterparty credit risk
  - If those two firms were, say, Lehman and Metlife, would you want to differentiate between them?
- How might we differentiate between such counterparties?

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Credit Models: A Typology

Credit models can be classified according to their

- Outputs
  - Absolute risk measures (PD, LGD, EAD) vs. relative risk measures (score, rating)
  - Single-name risk measures (PD, EL) vs. portfolio measures (risk capital)
- Methodologies or methodological frameworks
  - Structural vs. Reduced Form models
  - Ordinary Least Squares Regression vs. Logistic Regression models
  - Monte Carlo Simulation vs. Analytic models

Credit Models: A Typology (2)

Credit models can be classified according to their

- Applications
  - Assess effect on value from changes to credit risk
  - Provide early warning of excessive risk
  - Estimate loss reserves
  - Assess risk-adjusted performance
- Providers
  - Rating agencies
  - Vendors
  - Internal development

Illustrative Approaches: Altman's Z-Score

- $Z = 1.2\ X_1 + 1.4\ X_2 + 3.3\ X_3 + 0.6\ X_4 + 0.999\ X_5$
  - X_1 = (Current Assets – Current Liabilities) / Total Assets
  - X_2 = Retained Earnings / Total Assets
  - X_3 = EBIT / Total Assets
  - X_4 = Market Value of Liabilities / Total Liabilities
  - X_5 = Sales / Total Assets
- Interpretation: Higher Z is better
  - $Z > 2.99$ "Safe" Zone
  - $1.8 < Z < 2.99$ "Grey" Zone
  - $Z < 1.80$ "Distress" Zone
- Variants
  - Private firms
  - Manufacturers, non-manufacturer industrials, & emerging market credits

A Rating Agency's Reinsurer Model

Rating Summary Profile							
Financial Strength Rating Scorecard (weights)	Aaa	Aa	A	Baa	< Baa	Score	Adjusted Score
Business Profile							
Market Position, Brand and Distribution (20%)							
Business and Geographic Diversification (15%)							
Financial Profile							
Asset Quality (10%)							
Capital Adequacy (20%)							
Profitability (10%)							
Reserve Adequacy (10%)							
Financial Flexibility (15%)							
Aggregate Profile							
Total Scorecard Rating -- Value							

High Risk Assets / Invested Assets

Reinsurance Recoverable and Goodwill / Equity

Source: Moody's Global Rating Methodology for Reinsurers, July 2008

www.moodys.com

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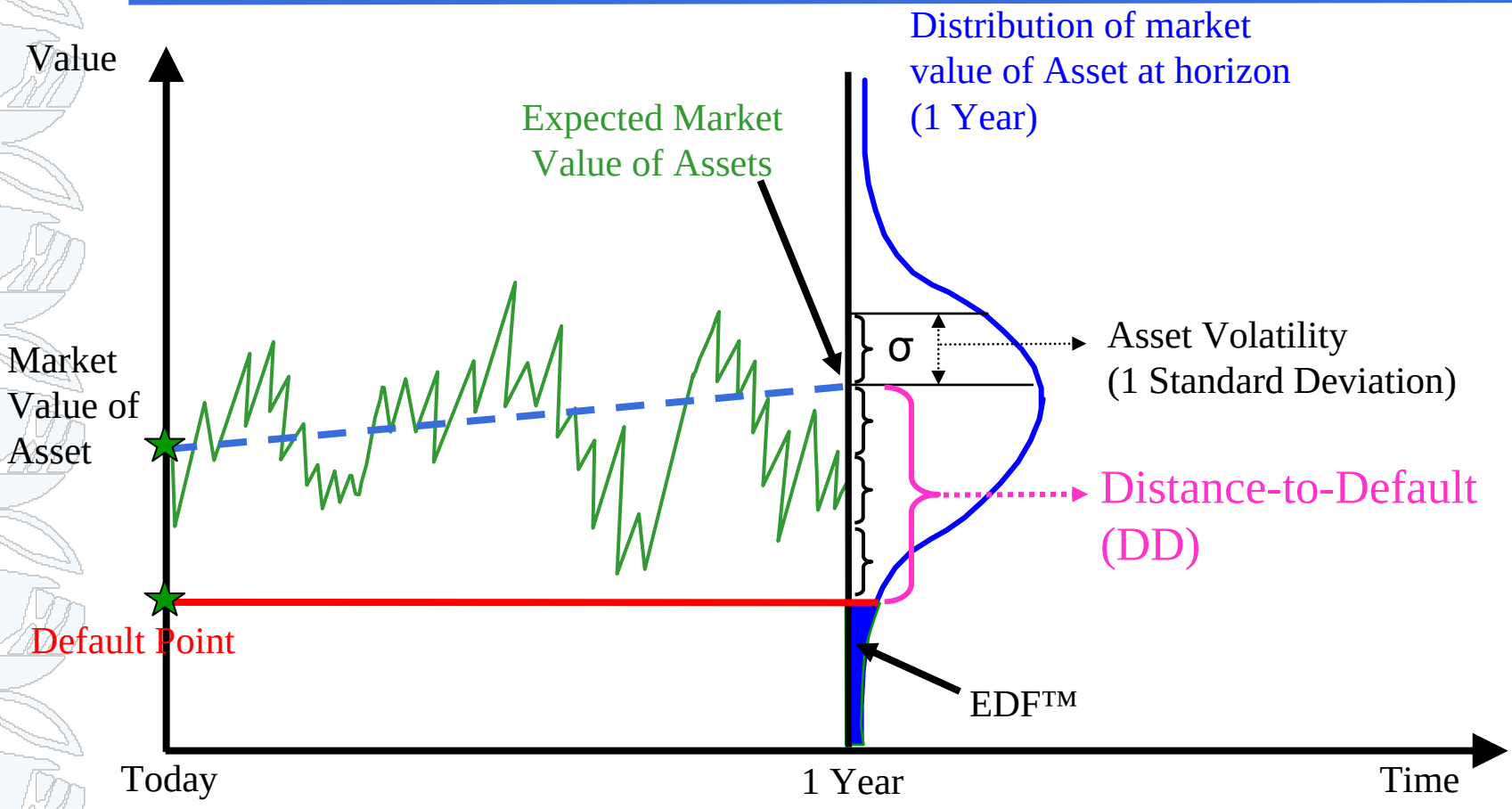
Agency vs. Vendor/Internal Models

- Agencies typically apply a “scorecard”-type methodology
  - A. M. Best
  - Moody’s
  - Standard & Poor’s
  - Fitch
- May combine default and severity effects
- Ratings output is intentionally slow to change
- Agency ratings drive regulatory compliance – investment constraints, capital rules

A Popular Vendor Model

- Merton's approach: Equity is a call option on the firm's assets
  - Struck at the value of the firm's liabilities
- Distribution of asset value at time of interest (1 year in picture) is source of "EDF", expected default frequency
- Distance-to-Default (DD) ≈ The number of Standard Deviations the Market Value of Assets is away from the Default Point

A Popular Vendor Model (2)



Source: Modeling Default Risk, Peter Crosbie and Jeff Bohn, 2003
www.moodyskmv.com

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Agency vs. Vendor/Internal Models (2)

Vendor/Internal Models

- Outcomes are typically more volatile
- Can be more risk-sensitive
- Can have clearer separation of default and severity effects
- More feasible to test statistically
  - Not limited to agency rated universe
- Can be customized to desired aggregations, e.g.
  - Geographic regions
  - Industry sectors
  - Size

Vendor vs. Internal Models

Vendor:

- Model maintenance is typically contracted
  - Data
  - Recalibration
  - Methodology review and updates
- May have resources not internally available, e.g., more data

Internal:

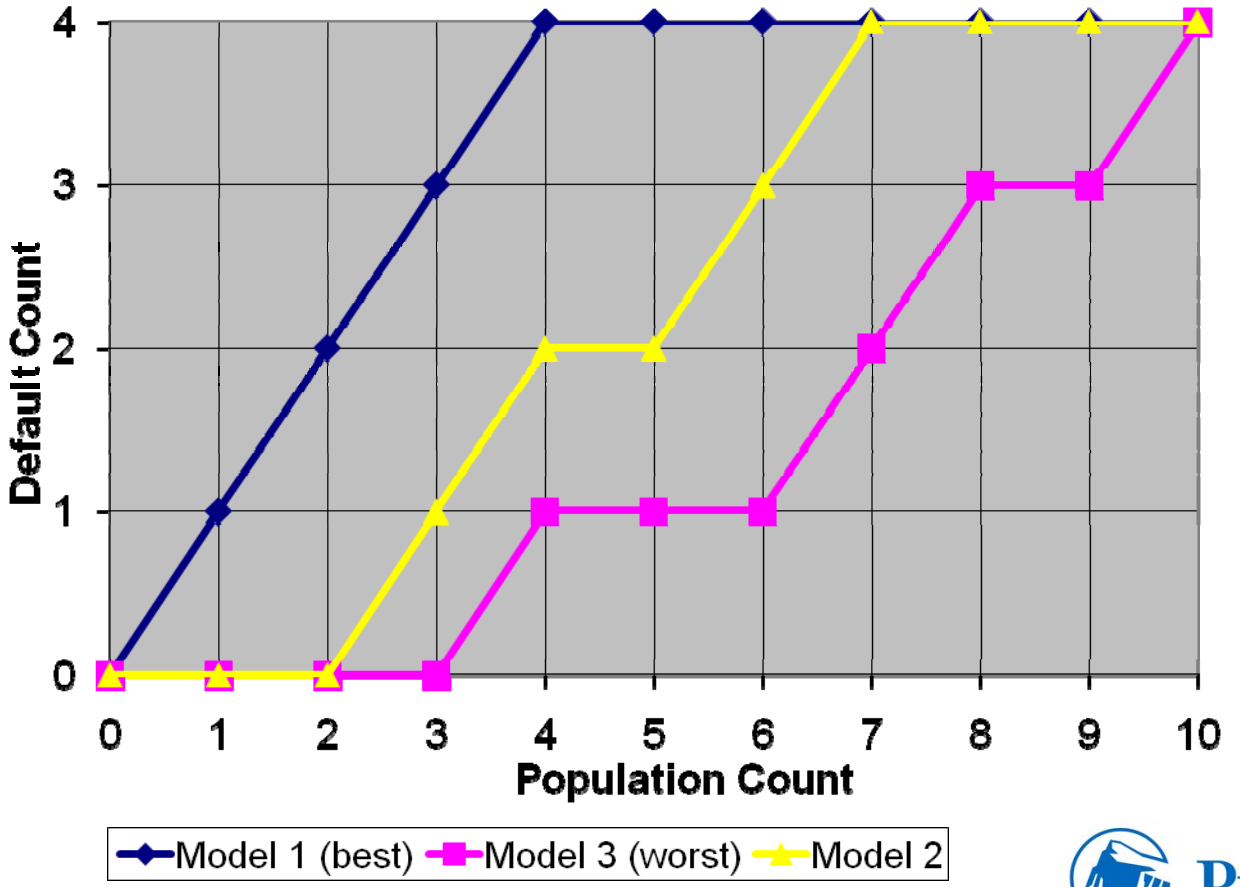
- Desired stratification is more feasible
- Usually restricted to own or purchased data
- You are responsible for model updates

Summary: Agency, Vendor, and Internal Models

Features	Agency	Vendor	Internal
Key advantages	Common language; facilitates compliance	Statistical rigor	Desired rating scale; requirement for some institutions
Approach	Scorecard	- Merton model - Logistic regression	- Scorecard - Logistic regression
Sensitivity	Typically combines default and loss effects; intended slow to change	Usually default models; can be built to be more sensitive	Separate default and loss assessment required by some regulators
Calibration sample	Rated universe	Often multi-organizational data	Usually internal data
Maintenance	By agency	By vendor	Internal

Credit Model Quality: Accuracy Ratio

A power curve measures how effectively a factor, or model, discriminates between defaults and non-defaults



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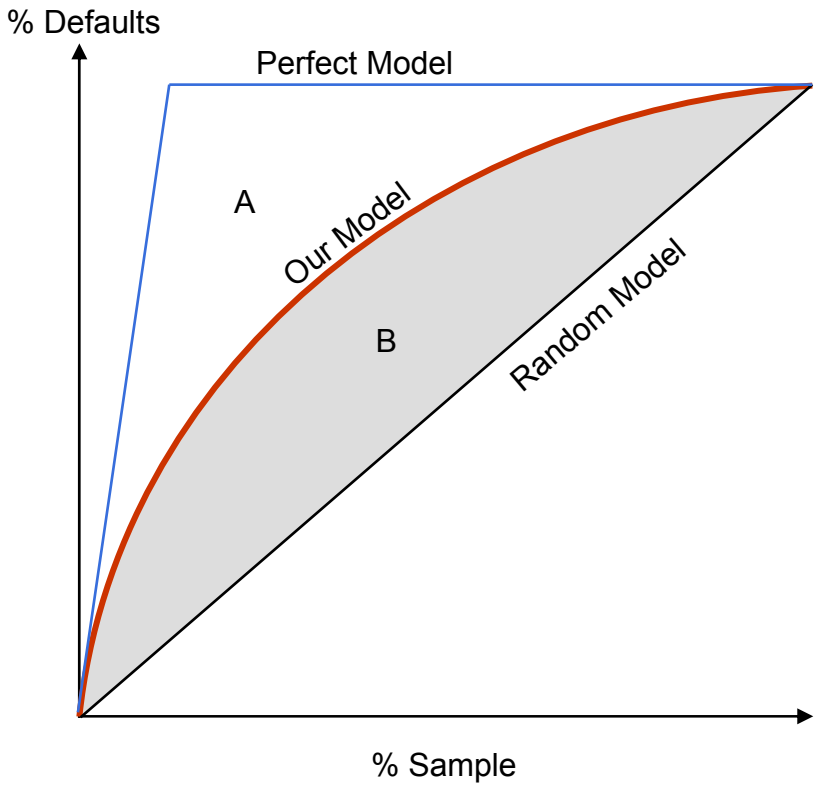
Accuracy Ratio (2)

$$\text{Accuracy Ratio} = \frac{B}{A+B}$$



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An Example

Stuart Hayes will now describe a specific approach to assessing reinsurance firm counterparty credit risk

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Appendix: Glossary

- PD: Probability of Default, typically over a 1-year horizon
  - A characteristic of the borrower (obligor) reflecting how likely that entity is to default on its credit obligation during the period of interest
- LGD: Loss Given Default; also Severity, Loss in the Event of Default
  - A characteristic of the facility, or credit exposure
  - Depends upon the structure of the credit, its collateral, seniority, etc.
- EAD: Exposure at Default, the credit exposure amount at risk, should default occur during the period of interest
- EL: Expected Loss on a credit-risky asset
- Economic Capital: An equity or cash reserve buffer to be set aside with intent to protect the holder against unexpected losses
- Ratings, Internal: A financial institution's system of classifying the credit quality of borrowers (obligor rating) or facility (facility rating)
- Ratings, Agency: Credit quality classification system by rating agencies such as A.M. Best, Standard & Poor's, Moody's, etc.