Measures of Security-Level Loss Given Default

Greg M. Gupton
(212) 553-1493
Greg.Gupton@moodys.com

Topics

- **Overview**
- Data
- Methodology
- Validation and Testing
- Performance Over Time
- Web-based Delivery
- Recent Findings

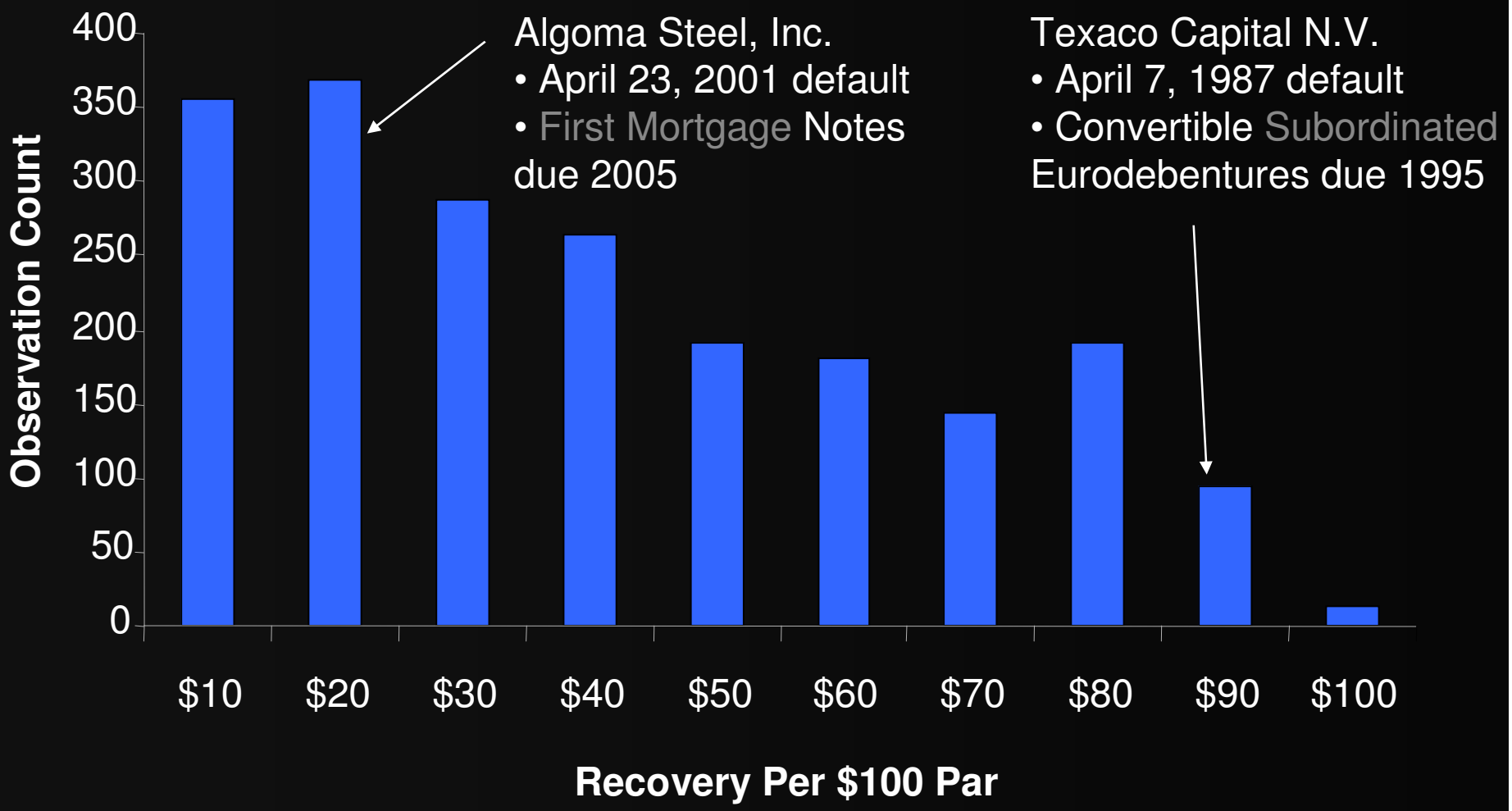
Credit Risk Depends Critically on Loss Given Default...

Both expected and "unexpected" losses vary with and impact:

- pricing
- provisioning
- capital calculation and allocation
- credit risk measurement & management

Note: LGD, Loss in the Event of Default (LIED), Default severity, 1-Recovery Rate are all equivalent

… And LGD Varies Dramatically



Topics

- Overview
- **Data**
- Methodology
- Validation and Testing
- Performance Over Time
- Web-based Delivery
- Recent Findings

Two ways to measure LGD

(Method 1)

Secondary Market Quotes on Defaulted Debt:

- Larger firms
- Syndicated loans
- Corporate bonds
- Preferred Stock

(Method 2)

Realized Net Present Value of Funds Recovered:

- Middle mkt. firms
- Mid-tier lending
- Mostly of loans
- Few (if any) bonds, etc.

Post-Default Market Prices

- Market prices are efficient estimates of ultimate recovery
- Allows use of largest database of prices
  - taken from dealer quotes, data vendors, exchanges, and other sources
  - consistent with Moody's published studies
  - thousands of observations
  - includes bonds, loans, & preferred stock
- Prices taken 15 to 60 days after default

Data Set

We chose 1981-2001 data:

- Better address today's market
  - Example: **Pre-packaged Chapter 11 filings**
- Extensive data: **1,800+ observations** from more than 900 defaults, (*as of Feb-2002*)
- Includes **two full credit cycles**

• Composition:

- Public (**50%**) and private (**50%**) firms
- Rated (**60%**) and unrated (**40%**) instruments
- **Firm size** (assets): $5 million to $38 billion
- **Obligation size**: $680,000 to $2 billion

Topics

- Overview
- Data
- **Methodology**
- Validation and Testing
- Performance Over Time
- Web-based Delivery
- Recent Findings

Prevailing Market Practice: Look-up Table of Historical Averages

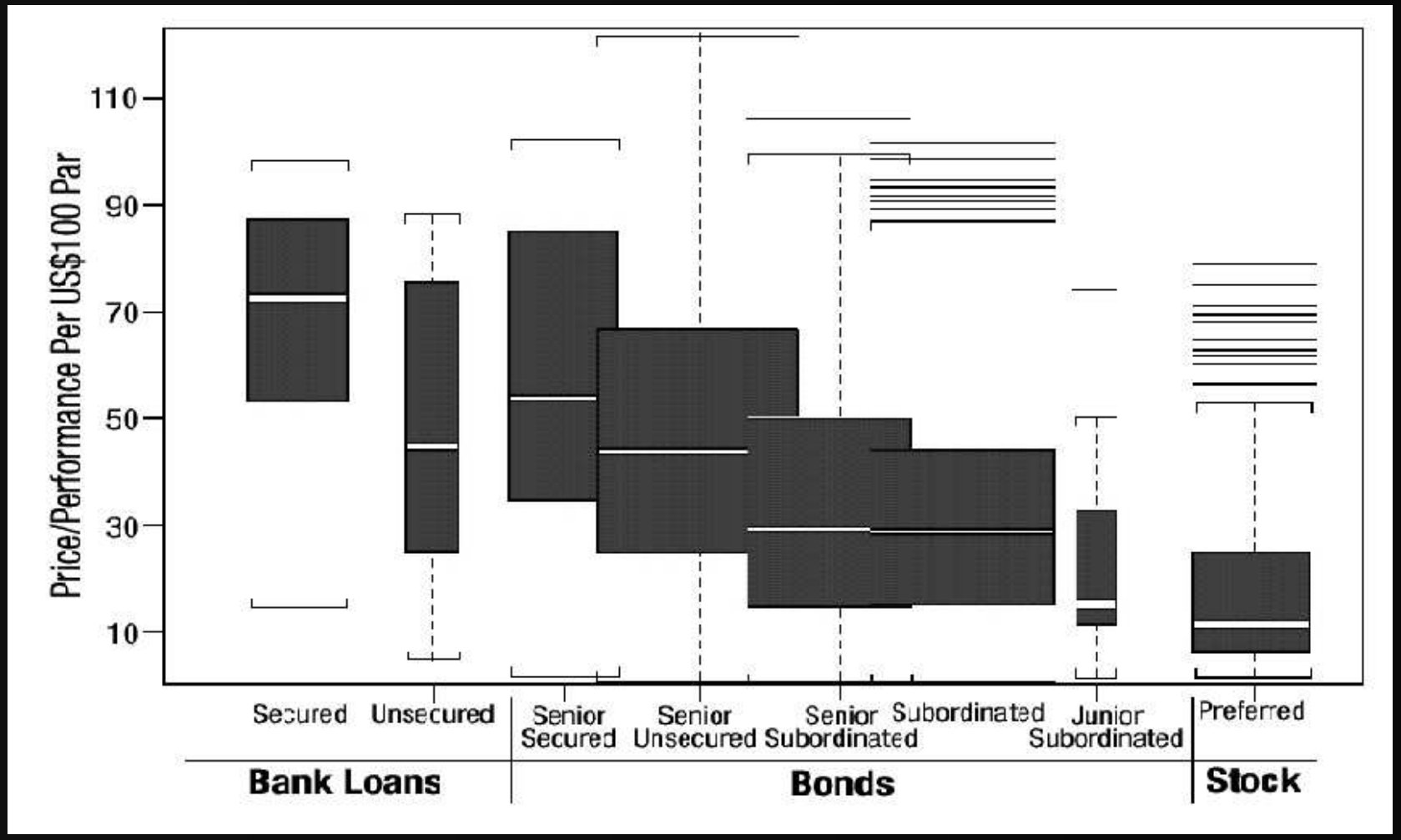
Exhibit 6

Descriptive Statistics for the Time to Defa

Bank Loans	Count	Average
Sr. Secured	119	$69.5
Sr. Unsecured	33	$52.1
Long Term Public Debt (of these same Bank Loan Borro		
Sr. Secured	6	$59.1
Sr. Unsecured	51	$45.1
Sr. Sub	55	$29.4
Sub	32	$29.1
Jr. Sub	5	$10.8

Source: Gupton, G., "Bank Loan Loss Given Default," Moody's Special Comment, November 2000

Recovery Distributions by Debt-type & Seniority-Class



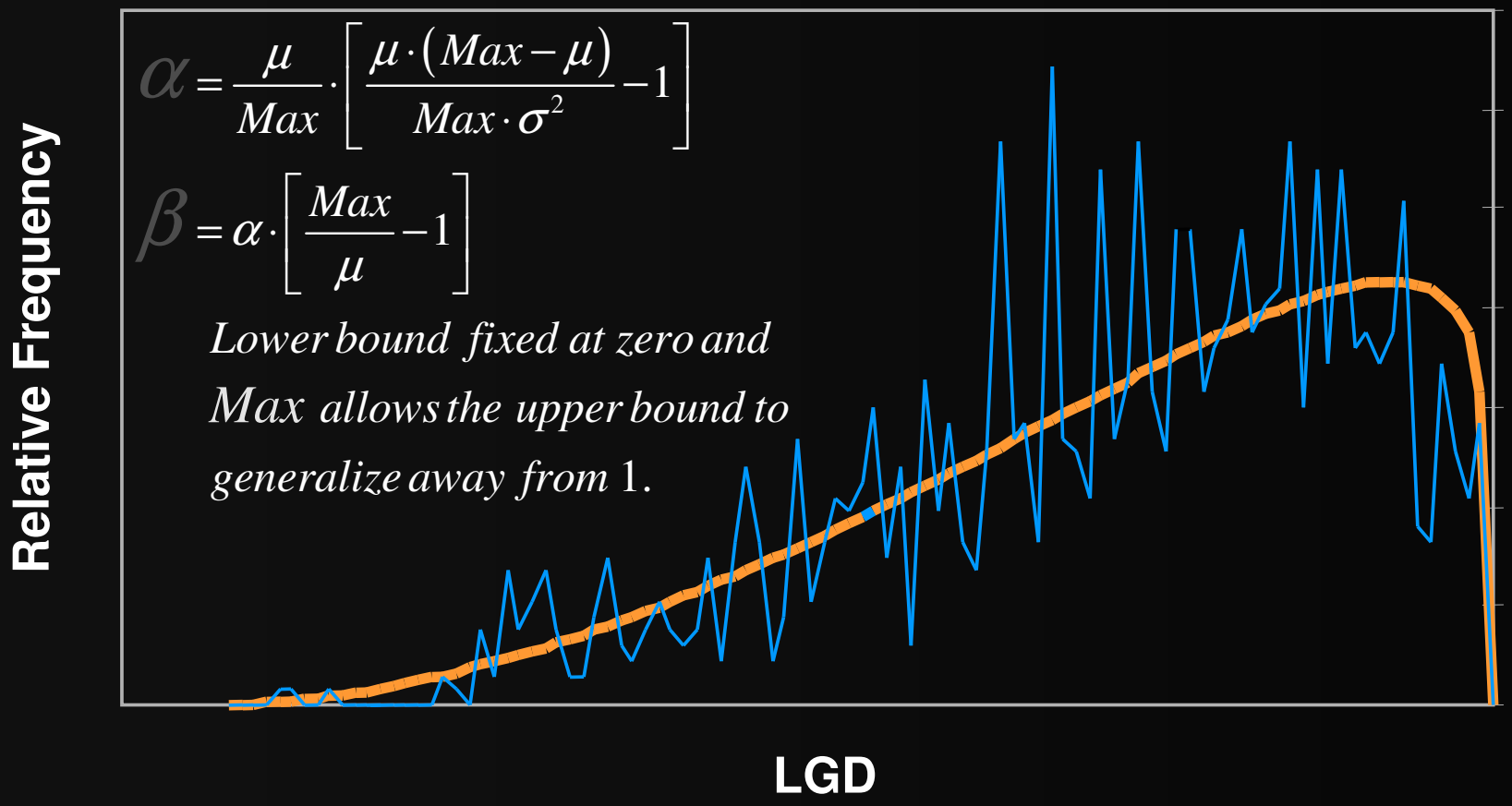
Normalize LGD via Transformation

Beta Distribution Fit to LGD

$$\alpha = \frac{\mu}{Max} \cdot \left[\frac{\mu \cdot (Max - \mu)}{Max \cdot \sigma^2} - 1 \right]$$

$$\beta = \alpha \cdot \left[\frac{Max}{\mu} - 1 \right]$$

Lower bound fixed at zero and Max allows the upper bound to generalize away from 1.



The LossCalc Predictors

Traditional debt type/seniority lookup:

1) Average recoveries by Debt+Seniority

Firm-specific capital structure:

2) Is there more senior debt above?
3) Leverage ratio: *(Total Assets / Total Liabilities)*

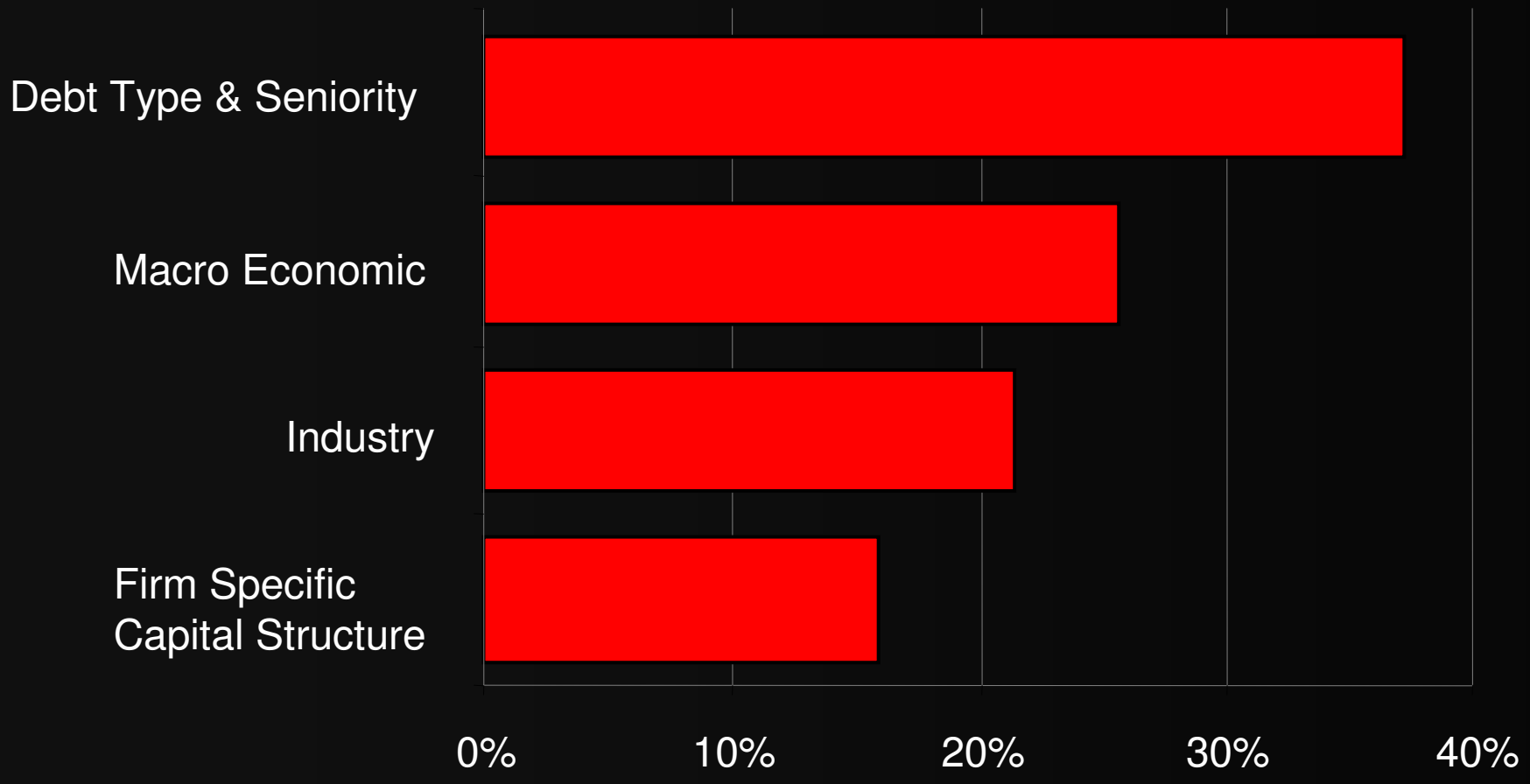
Industry:

4) LGD index by industry
5) Industry indicator for banking (Low)

Macro economic:

6) RiskCalc PD Index (North American Population)*
7) Leading economic indicators
8) Moody's Bankrupt Bond Index (MBBI)
9) Trailing speculative-grade default rates

LossCalc Factors Strengths

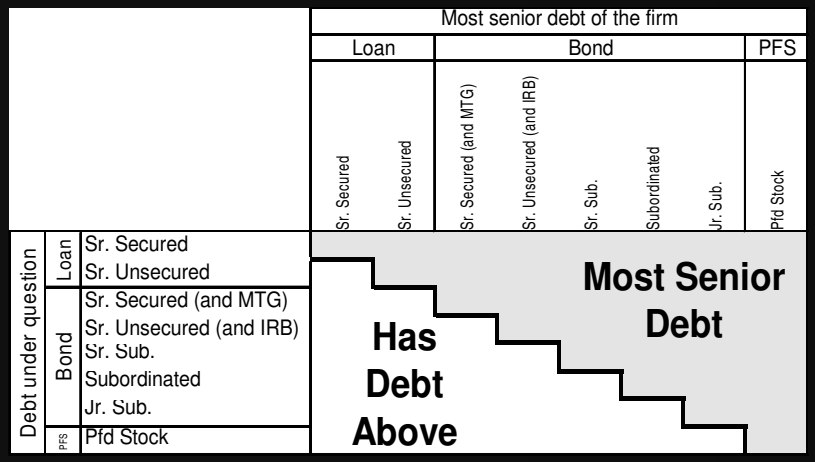


Relative Debt Seniority

	Sr. Sec.	Sr. Unsec.	Sr. Sub.	Sub.	Jr. Sub.	Pfd Stock
Sr. Secured	100.0%					
Sr. Unsecured	76.3%	100.0%				
Sr. Subordinated	49.7%	58.2%	100.0%			
Subordinated	30.7%	45.9%	56.6%	100.0%		
Jr. Subordinated	26.8%	34.7%	53.9%	63.5%	100.0%	
Preferred Stock	13.2%	10.9%	24.1%	20.2%	37.2%	100.0%

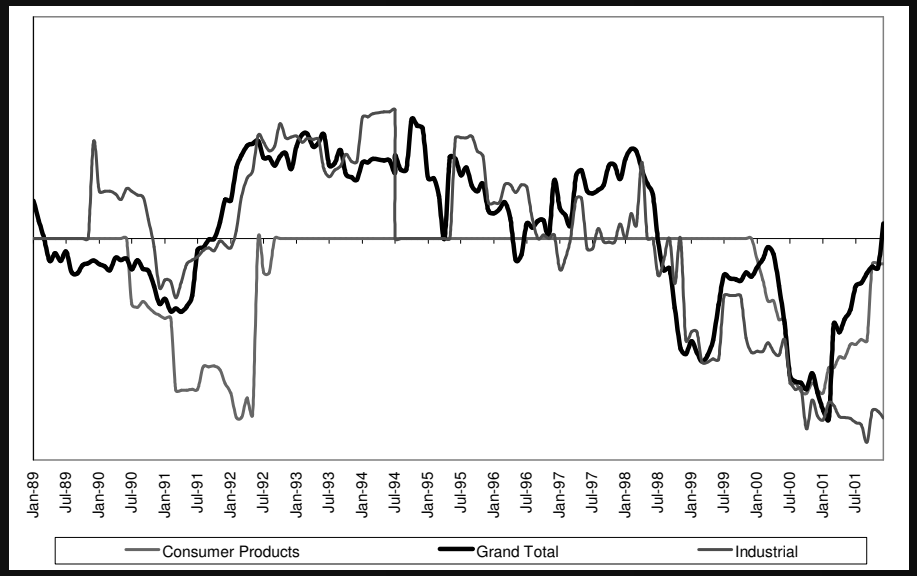
Source: Hamilton & Carty, June-1999, "Debt Recoveries for Corporate Bankruptcies", Exhibit 13

Rule for Assigning 'Capital Structure'



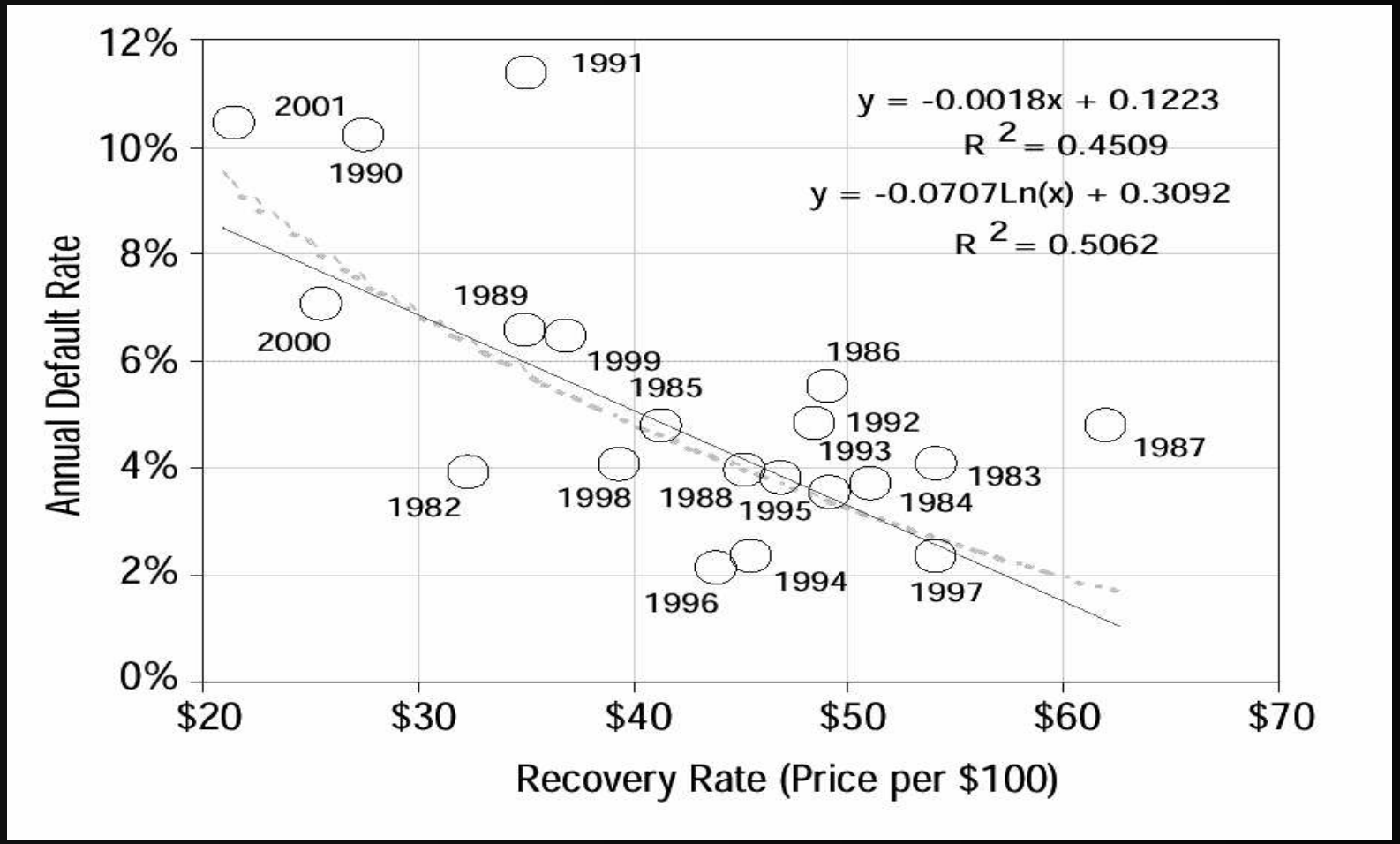
- **Example:** If the security in question is any type of Bond and there exists even a small Loan (any type) within the defaulted firm, then the bond "Has Debt Above".
- Note that all **secured** debt classes are not themselves influenced by this factor, but they have an influence on the other seniority classes.

Industries Behave Differently

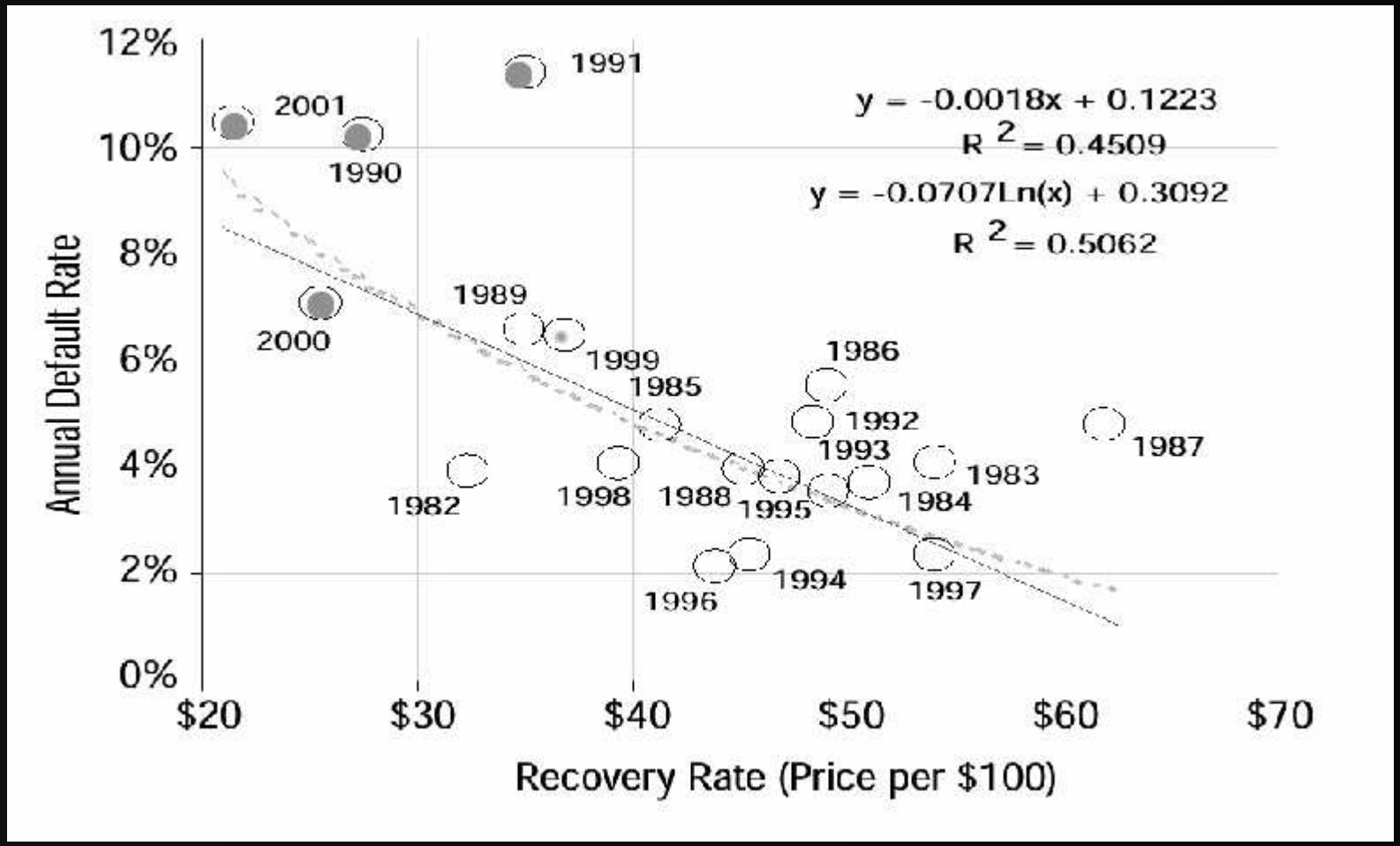


- Industries enter and exit recessions at different points and with different intensities.
- 'Consumer Products' enters/exits downturns differently than 'Industrial' and doesn't have the same *upside*.

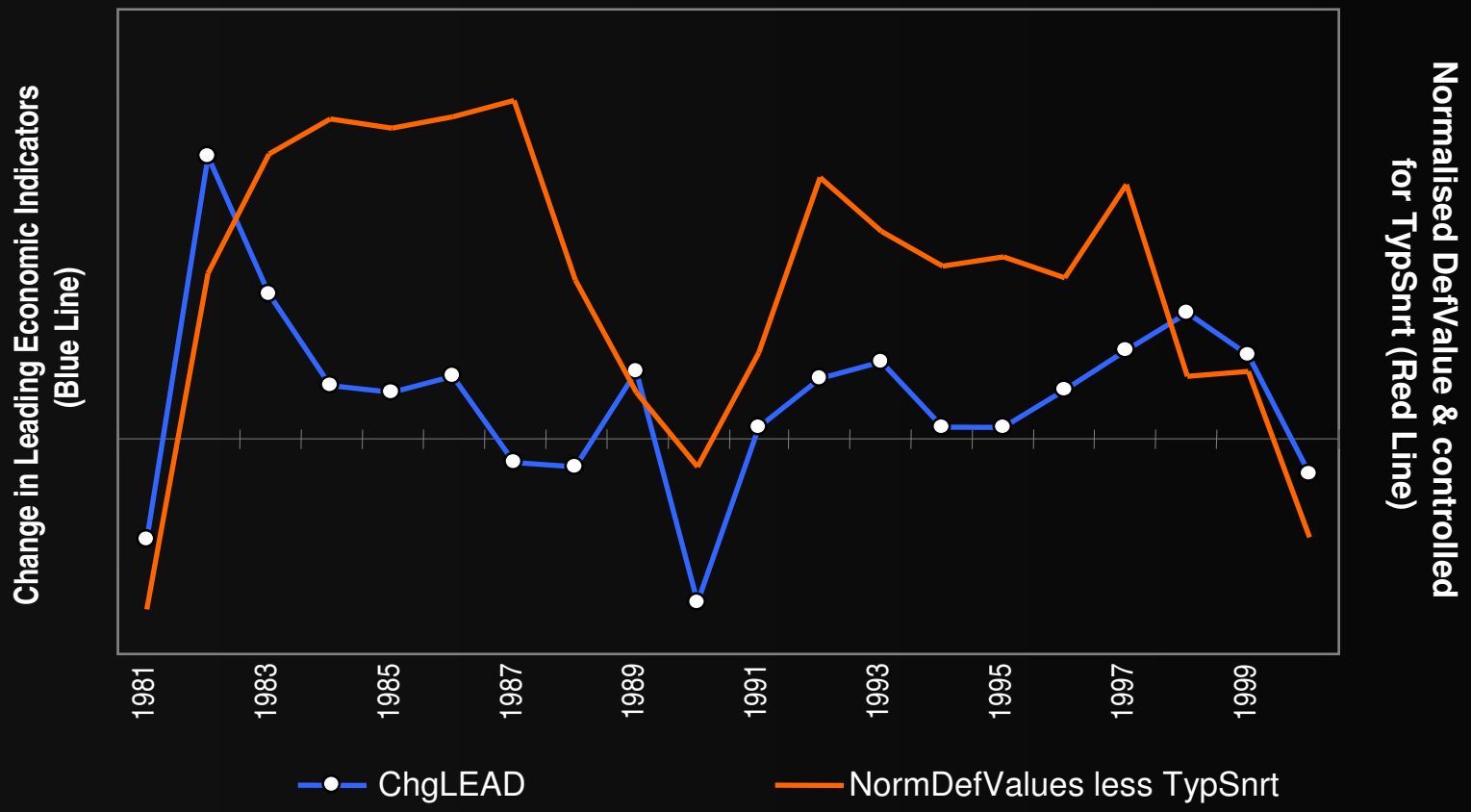
LGD vs. Default Rates



LGD vs. Default Rates



LossCalc & the General Economy



Topics

- Overview
- Data
- Methodology
- **Validation and Testing**
- Performance Over Time
- Web-based Deliver
- Recent Findings

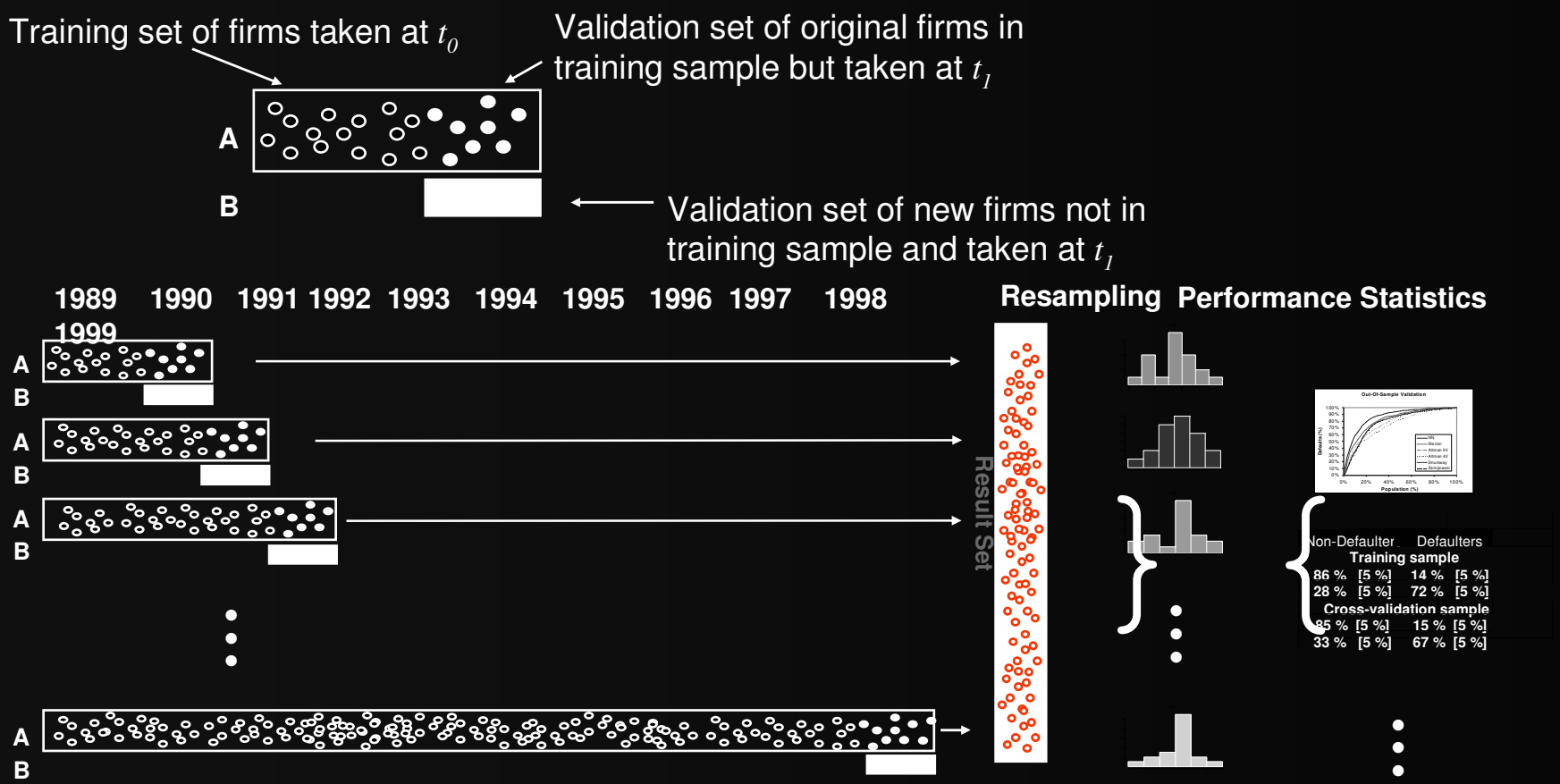
Performance Testing

What we Measured:

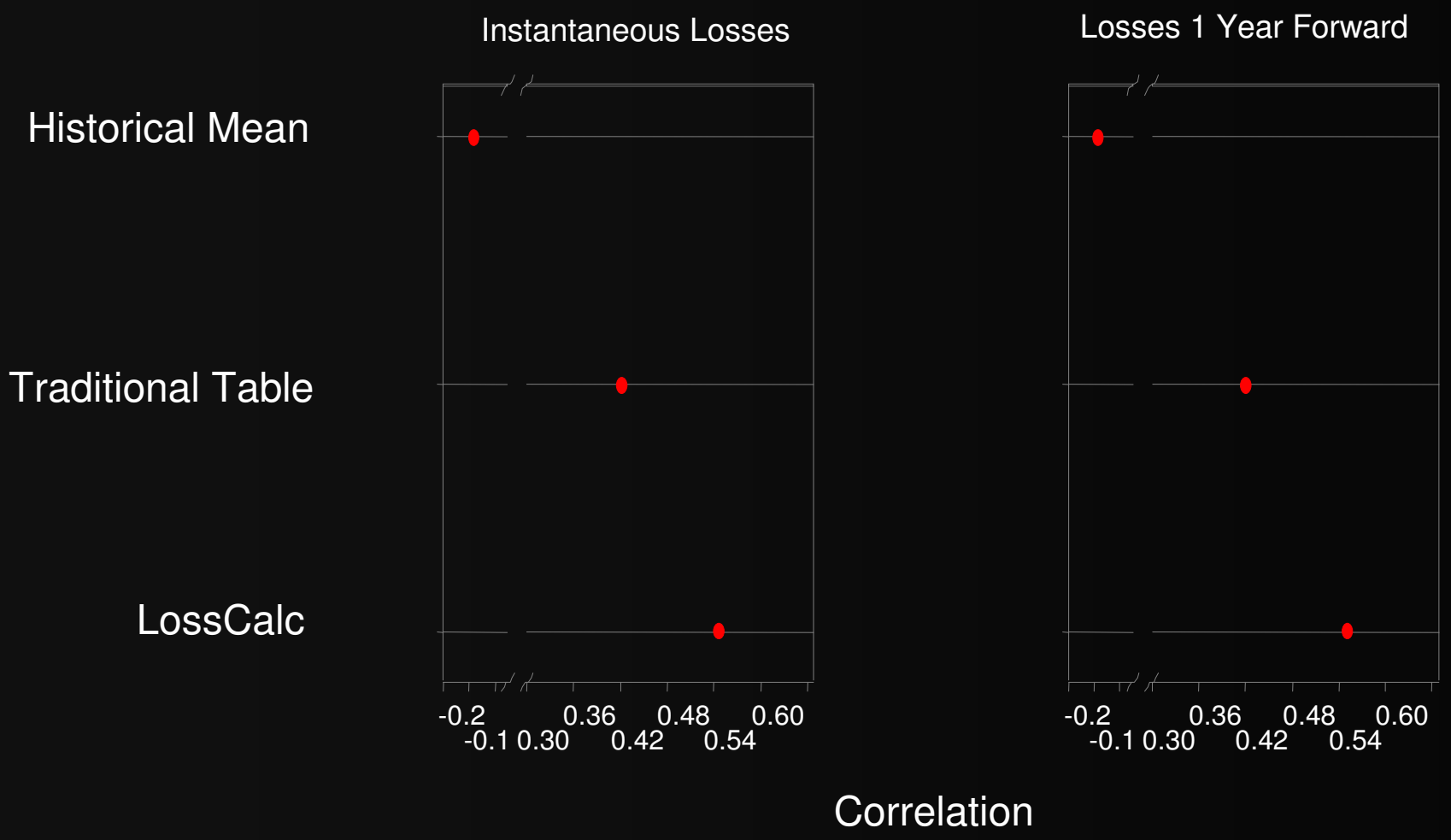
- Prediction *mean squared error*
  - Differences between predicted vs. actual losses?
- The *correlation* of predictions with actual losses
  - i.e., did LossCalc rank predictions in the right order?
- Ability of model to *predict larger than expected losses*

» All taken *out of sample*

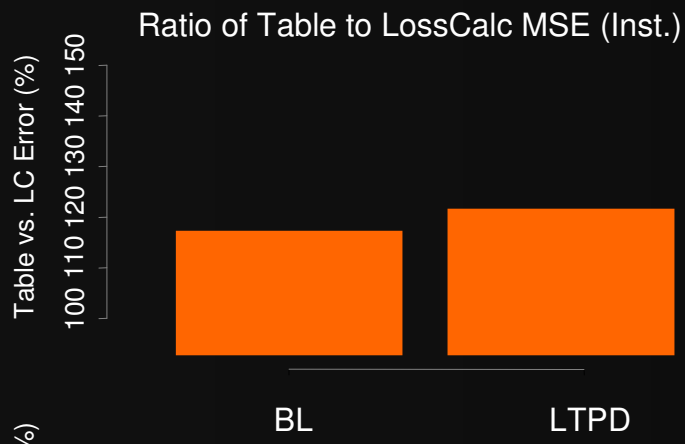
Walk-Forward Testing

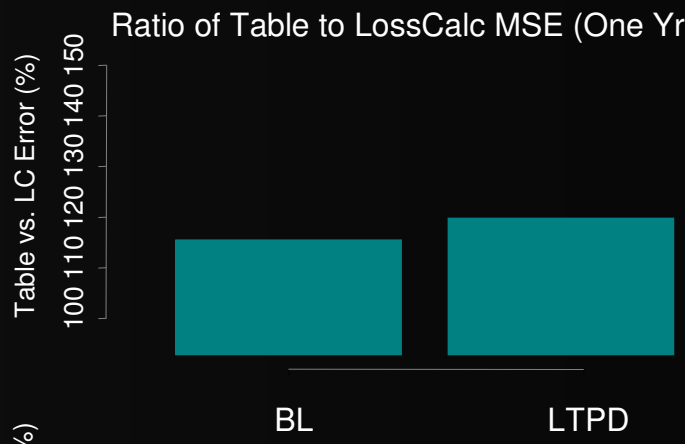


Higher Correlation



Better Discrimination Within Debt Types

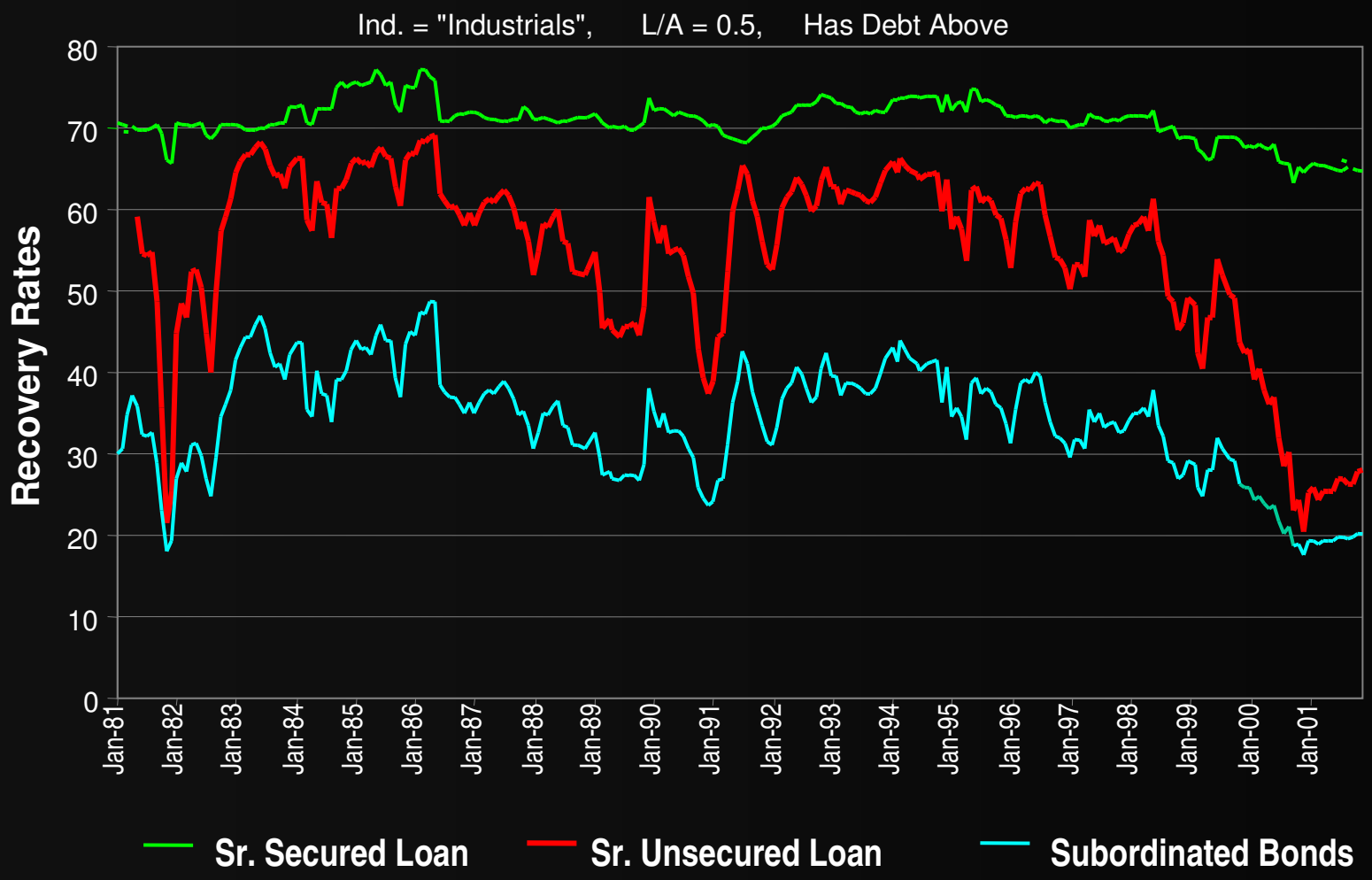




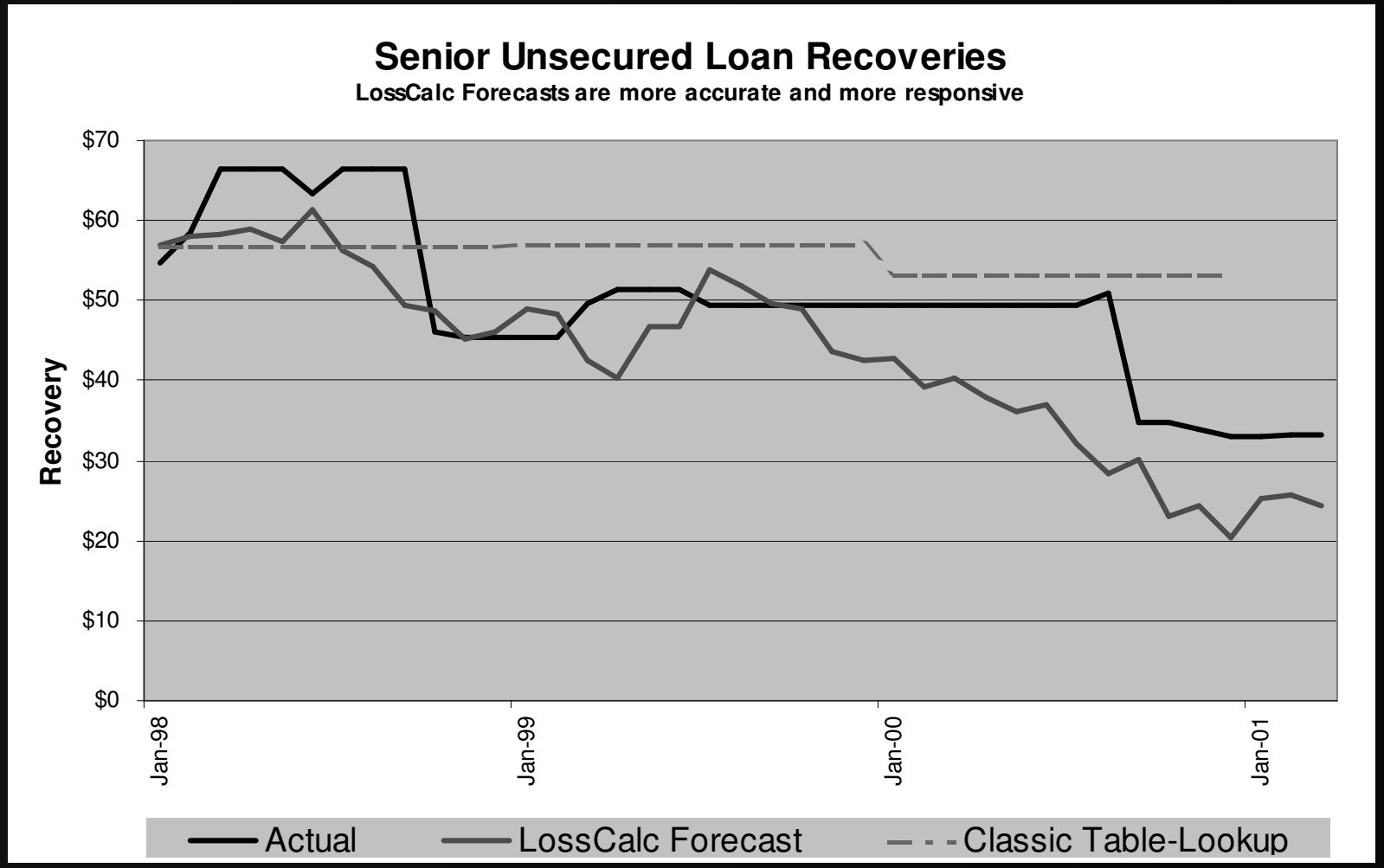
Topics

- Overview
- Data
- Methodology
- Validation and Testing
- **Performance Over Time**
- Web-based Delivery
- Recent Findings

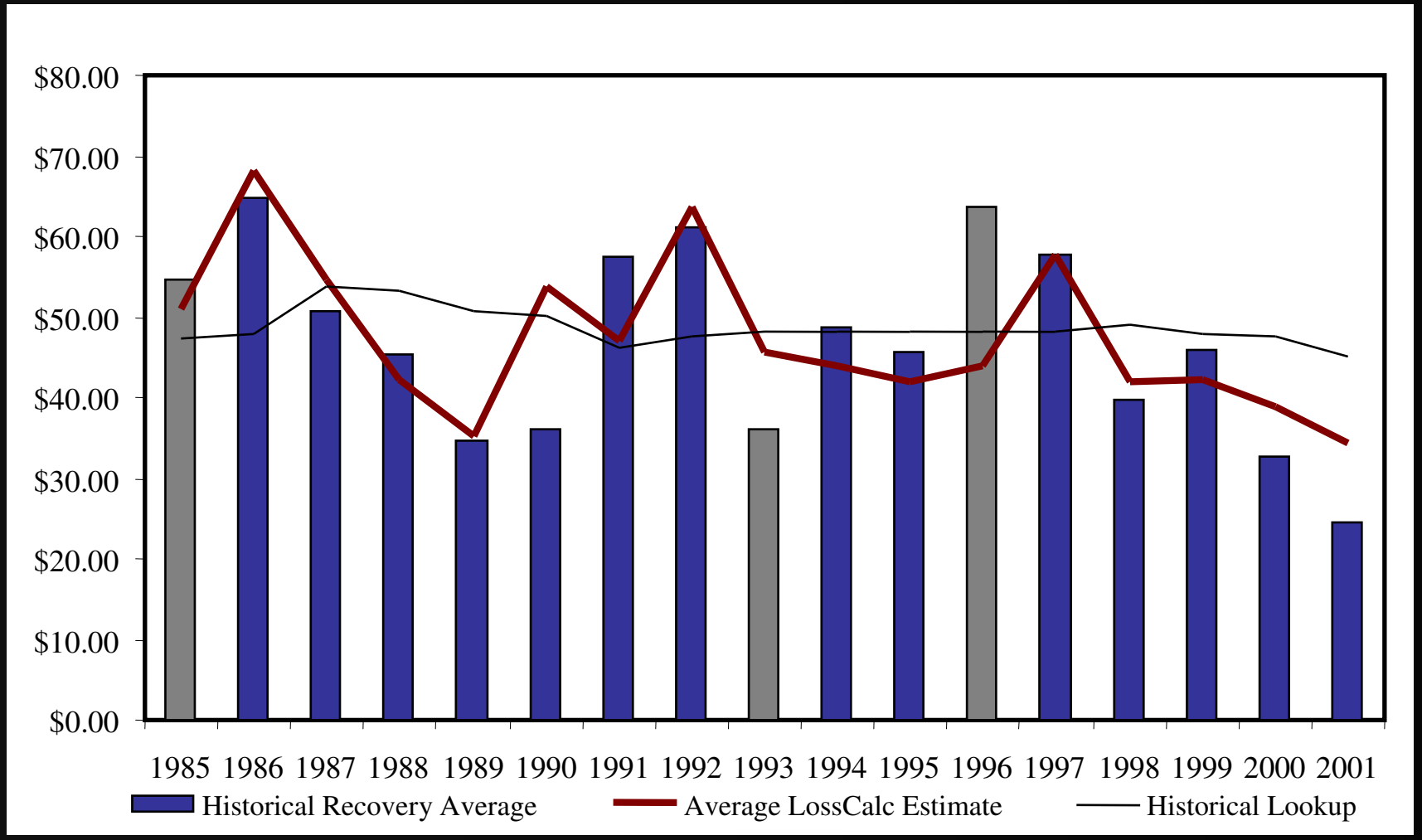
LossCalc Estimates Over Time



Forecast vs. Actual



Responding to the Economy



Topics

- Overview
- Data
- Methodology
- Validation and Testing
- Performance Over Time
- **Web-based Delivery**
- Recent Findings

Moody's Quantitative Risk Analytics - LossCalc - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss

Links Customize Links Free Hotmail Windows Address

Total Assets (us$)*	100000
Total Liabilities (us$)*	75000

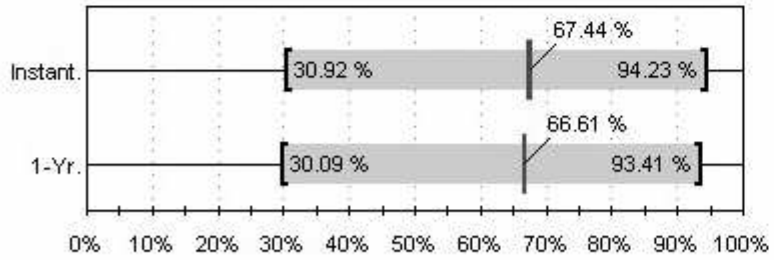
Get LGD

* Values should be entered in thousands.

Date of Evaluation:	Jan. 2002
Debt / Seniority:	Loan / Sr. Unsecured
Capital Structure:	Most Senior Debt
Industry:	Utilities
Total Assets (us$):	$ 100,000,000.00
Total Liabilities (us$):	$ 75,000,000.00

	Instantaneous	1-Year
Recovery Rate:	67.44 %	66.61 %
Lower, Upper 80%-Confidence Level:	[30.92 %, 94.23 %]	[30.09 %, 93.41 %]
"Classic" Recovery Rate:	52.57 %	52.57 %
LGD (1 - Recovery Rate):	32.56 %	33.39 %

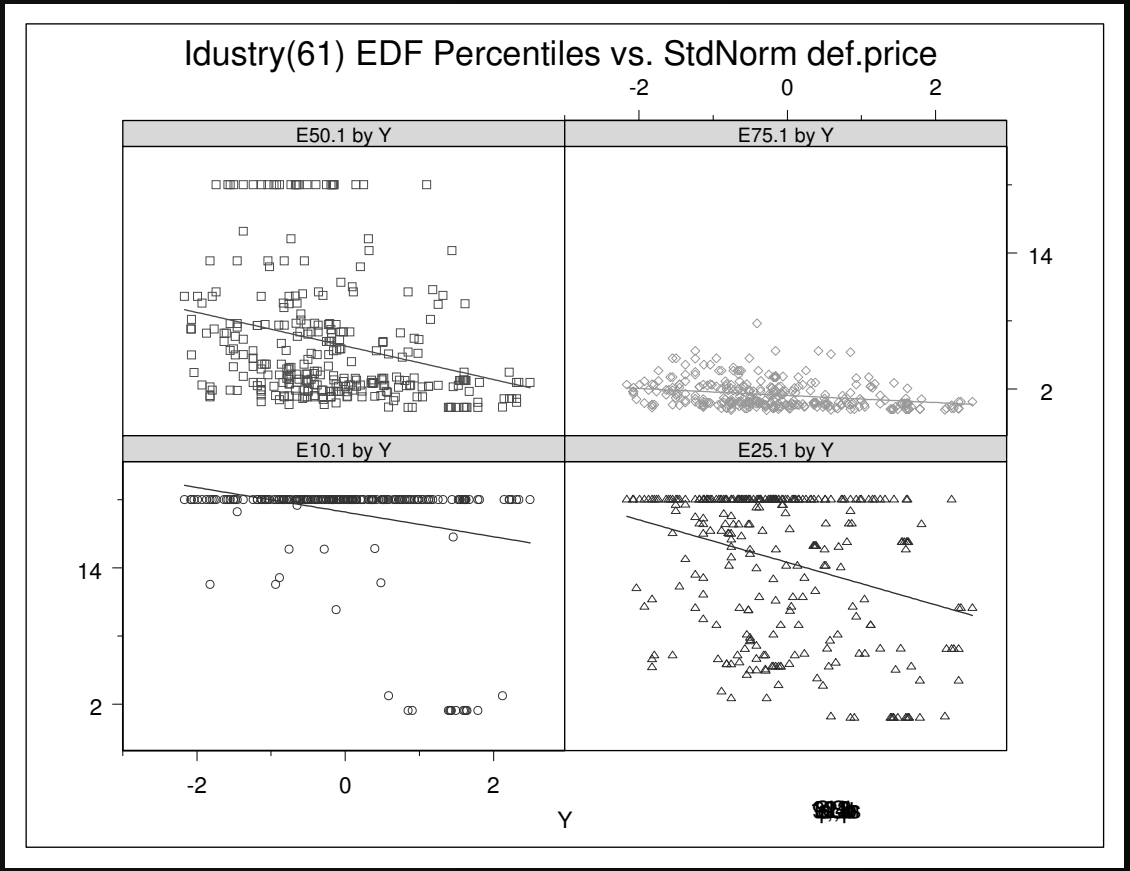
Recovery Rates (blue) and 80%-Confidence Levels (gray)



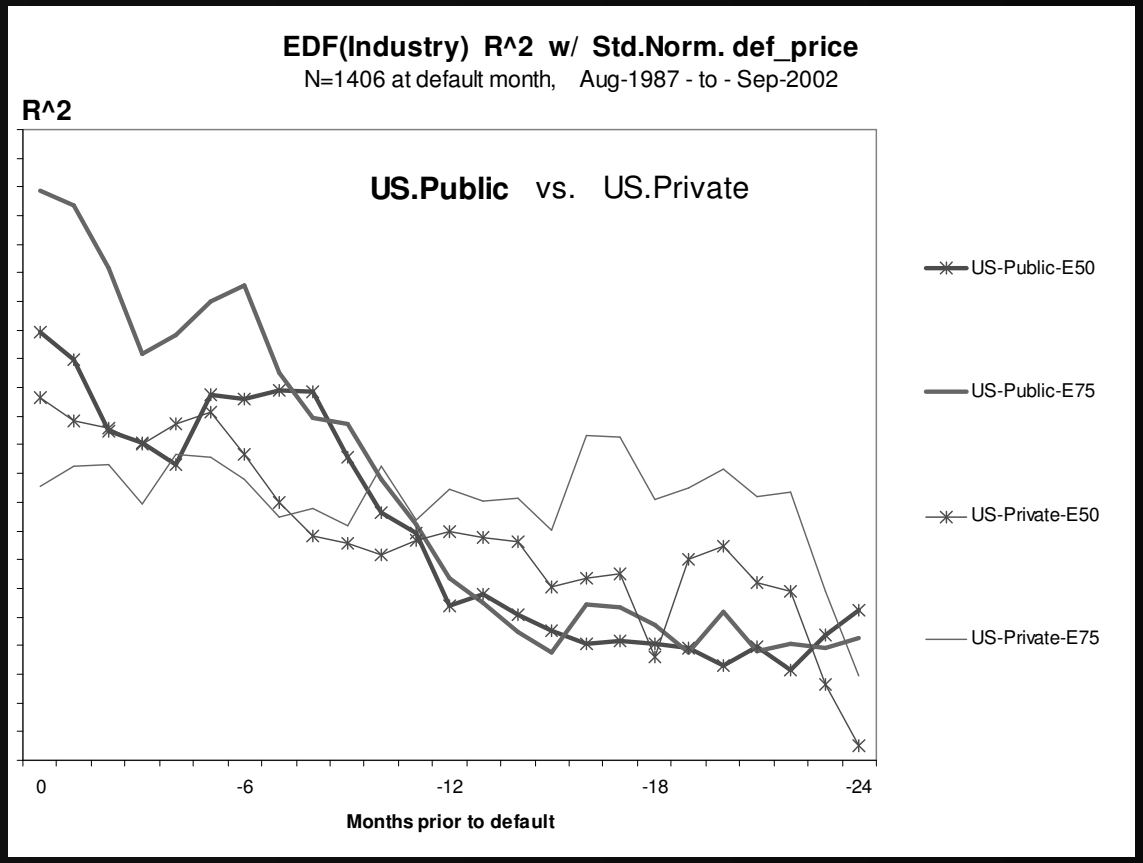
Topics

- Overview
- Data
- Methodology
- Validation and Testing
- Performance Over Time
- Web-based Delivery
- **Recent Findings**

EDFs are Correlated with LGD



EDFs Predictive: Public & Private



EDFs Predictive: US & Non-US