
Loss Given Default: The Link Between Default and Recovery Rates, Recovery Ratings and Recent Empirical Evidence

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Dr. Edward Altman
NYU Stern School of Business

Outline

- Loss Given Default – It's importance in today's environment
- Recovery ratings from the rating agencies
- Default and recovery rates: previous research
- An empirical test of DR/RR correlation
- Some recent empirical evidence

Loss Given Default – It's importance in today's environment

- Basel II – Procyclicality
- Credit Default Swap Market
- Is the link between default and recovery rates still relevant in today's environment?

Recovery Ratings from the Rating Agencies

<i>Agency</i>	Moody's	Standard & Poor's	Fitch
<i>Ratings Type</i>	Loss Given Default Ratings	Recovery Ratings	Recovery Ratings
<i>Ratings Scale</i>	LGD1 0-9% LGD2 10-29% LGD3 30-49% LGD4 50-69% LGD5 70-89% LGD6 90-100%	1+ 100% 1 100% 2 80-100% 3 50-80% 4 25-50% 5 0-25%	RR1 91-100% RR2 71-90% RR3 51-70% RR4 31-50% RR5 11-30% RR6 0-10%
<i>Assets Rated</i>	Non-financial corporate speculative-grade issuers in the US	US and Canadian secured bank loans to which it assigns bank loan ratings, to senior secured loans in Europe, and to any secured bonds issued along with rated bank loans	All corporate, financial institutions and sovereign issuers rated in the single B category and below

Recovery Ratings from the Rating Agencies Continued..

Agency	Moody's	Standard & Poor's	Fitch
<p><i>Methodology</i></p>	<ol style="list-style-type: none"> 1. Establish priority of claim <ol style="list-style-type: none"> a. Jr bonds are subordinated to Sr bonds, but may or may not be subordinated to other unsecured obligations b. Prioritize claims across affiliates 2. Assume a beta probability distribution for potential Enterprise Value (EV) outcomes <ol style="list-style-type: none"> a. For most issuers, assume a beta distribution of EV relative to total liabilities b. Corporate LGD distribution will have 50% mean and 26% standard deviation 3. For each EV outcome, calculate LGDs for each security class implied by absolute priority 4. Expected LGD equals the probability-weighted averages of LGDs across EV outcomes 	<ol style="list-style-type: none"> 1. Review transaction structure 2. Review borrower's projections 3. Establish simulated path to default 4. Forecast borrower's free cash flow at default based on our simulated default scenario and default proxy 5. Determine valuation 6. Identify priority debt claims and value 7. Determine collateral value available to lenders 8. Assign recovery rating 9. Convey the recovery analytics to the issuer and investment community 	<ol style="list-style-type: none"> 1. Estimate the enterprise value (EV) <ol style="list-style-type: none"> a. Establish the level of cash flow upon which it is most appropriate to base the valuation b. Apply a multiple reflecting a company's relative position within a sector based on actual or expected market and/or distressed multiples 2. Estimate the creditor mass, ie identify existing claims <ol style="list-style-type: none"> a. Claims taken on as a company's fortunes deteriorate b. Claims necessary to the reorganization process c. Claims that have priority in the relevant bankruptcy code 3. Distributing the EV <ol style="list-style-type: none"> a. The resulting value is allocated to creditors according to jurisdictional practice

Previous research works/1: credit pricing models

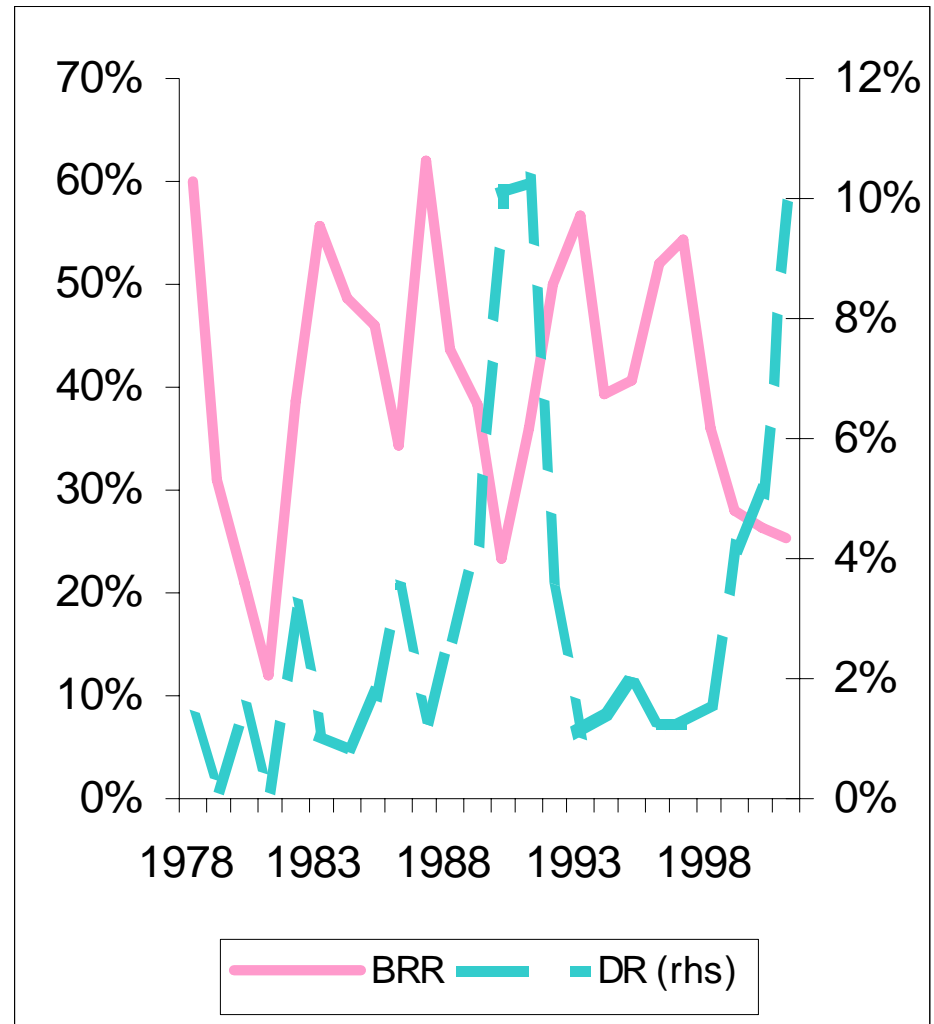
	<i>Main contributions</i>	<i>RR is treated as:</i>	<i>Relationship between PD and RR</i>
1st generation structural form models	Merton '74, Black-Cox '76, Geske '77, Vasicek '84, Crouhy-Galai '94, Mason Rosenfeld '84	Endogenous: depends on structural characteristics of the defaulted firm	PD and RR are inversely related
2nd generation structural form models	Kim et al. '93, Nielsen et al., Santa Clara '93, Hull-White '95, Longstaff-Schwarz '95	Exogenous and independent of the firm's asset value	PD and RR are independent
Reduced form models	Litterman-Iben '91, Madan-Unal '95, JT '95, JLT '97, Duffie-Singleton '99	Exogenous (constant or stochastic)	PD and RR are independent

Previous research works/2: credit VaR models and beyond

	<i>Main contributions</i>	<i>RR is treated as:</i>	<i>Relationship between PD and RR</i>
<i>Credit VaR models</i>	Gupton et al. '97, Wilson '97, CSFP '97, McQuown '97, Crosbie '99	Constant (CSFP) or stochastic	PD and RR are independent
<i>Some Latest contributions</i>	Frye '00 and '01, Jarrow '01, Carey-Gordy '01, Altman-Brady '01, Jokivouille-Peura '01, Hu and Perraudin, '02	Stochastic, depending on some macro or supply factor	PD and RR are correlated, usually in a negative way
<i>Explaining LGD for Individual Defaults</i>	Keisman '99, Acharya et al. '05, Altman & Kalotay '06	Combining Micro and Macro data	Industry is critical Debt Cushion is critical Recent Empirical Results

Structure of the sample

- About 1,000 bonds (NYU Salomon Center database) defaulted between 1978 and 2001
- Define BRR as weighted average price of defaulted bonds as close to default date as possible

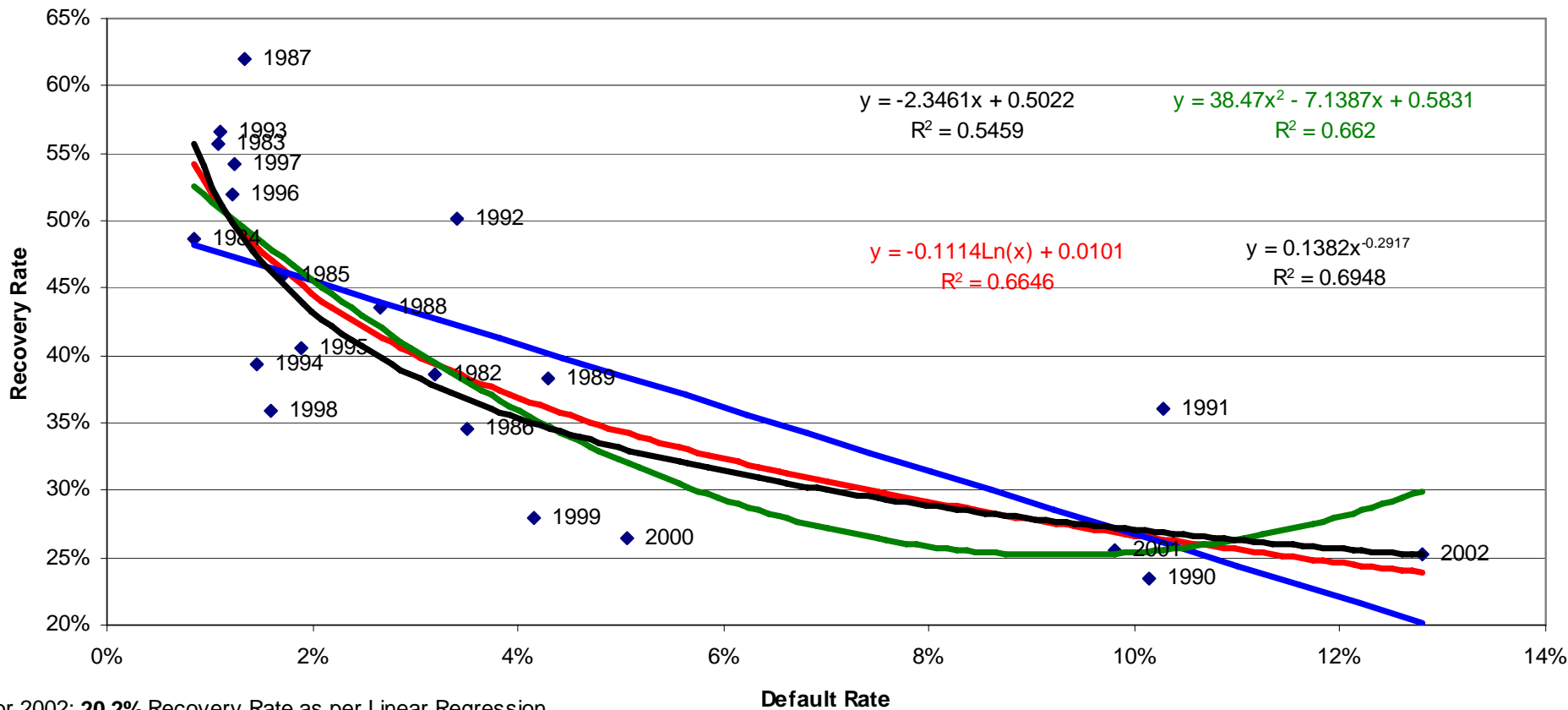


The univariate picture

RECOVERY RATE/DEFAULT RATE ASSOCIATION

Altman Defaulted Bonds Data Set (1982-2002)

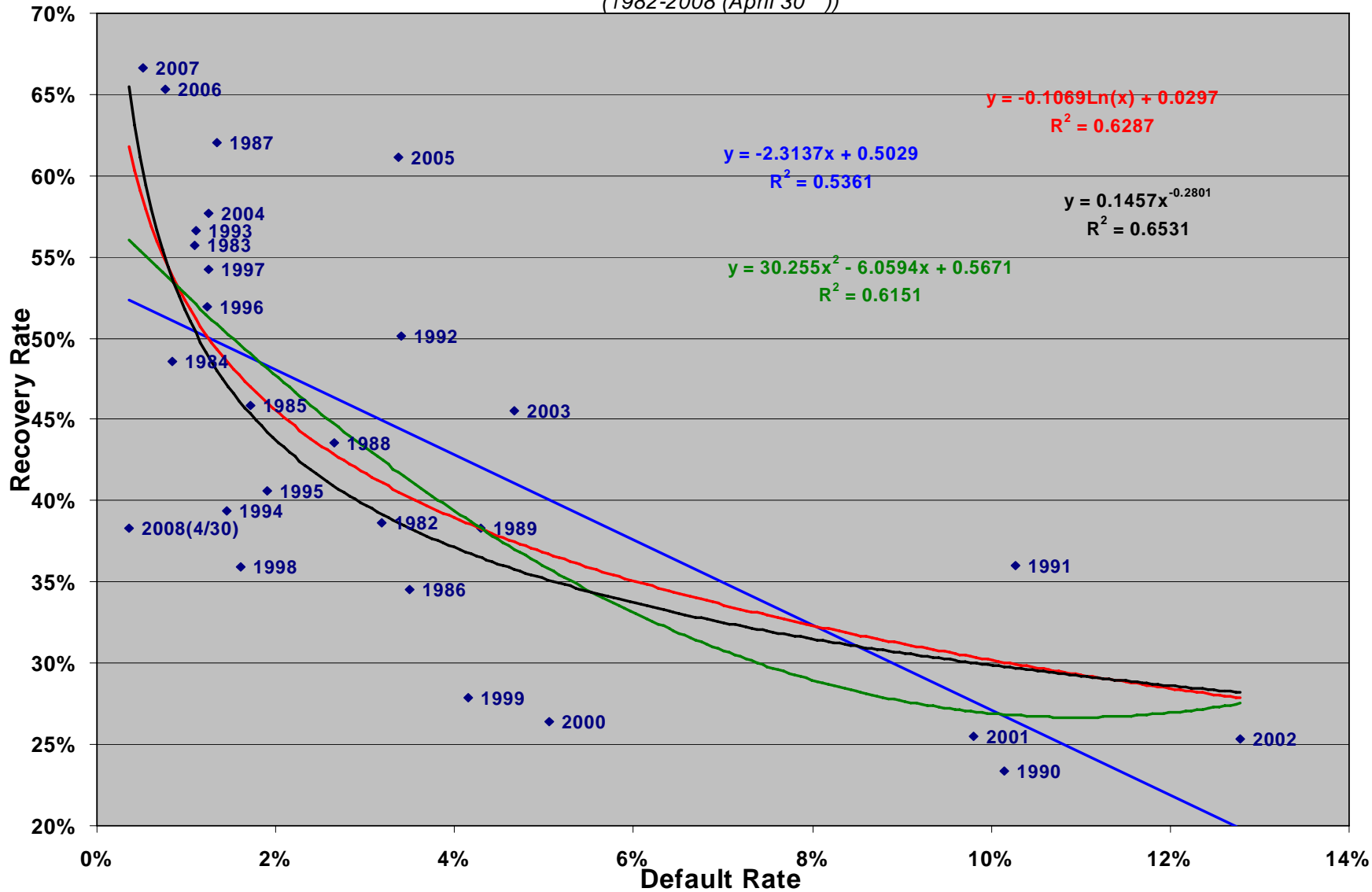
Dollar Weighted Average Recovery Rates to Dollar Weighted Average Default Rates



Recovery Rate/Default Rate Association

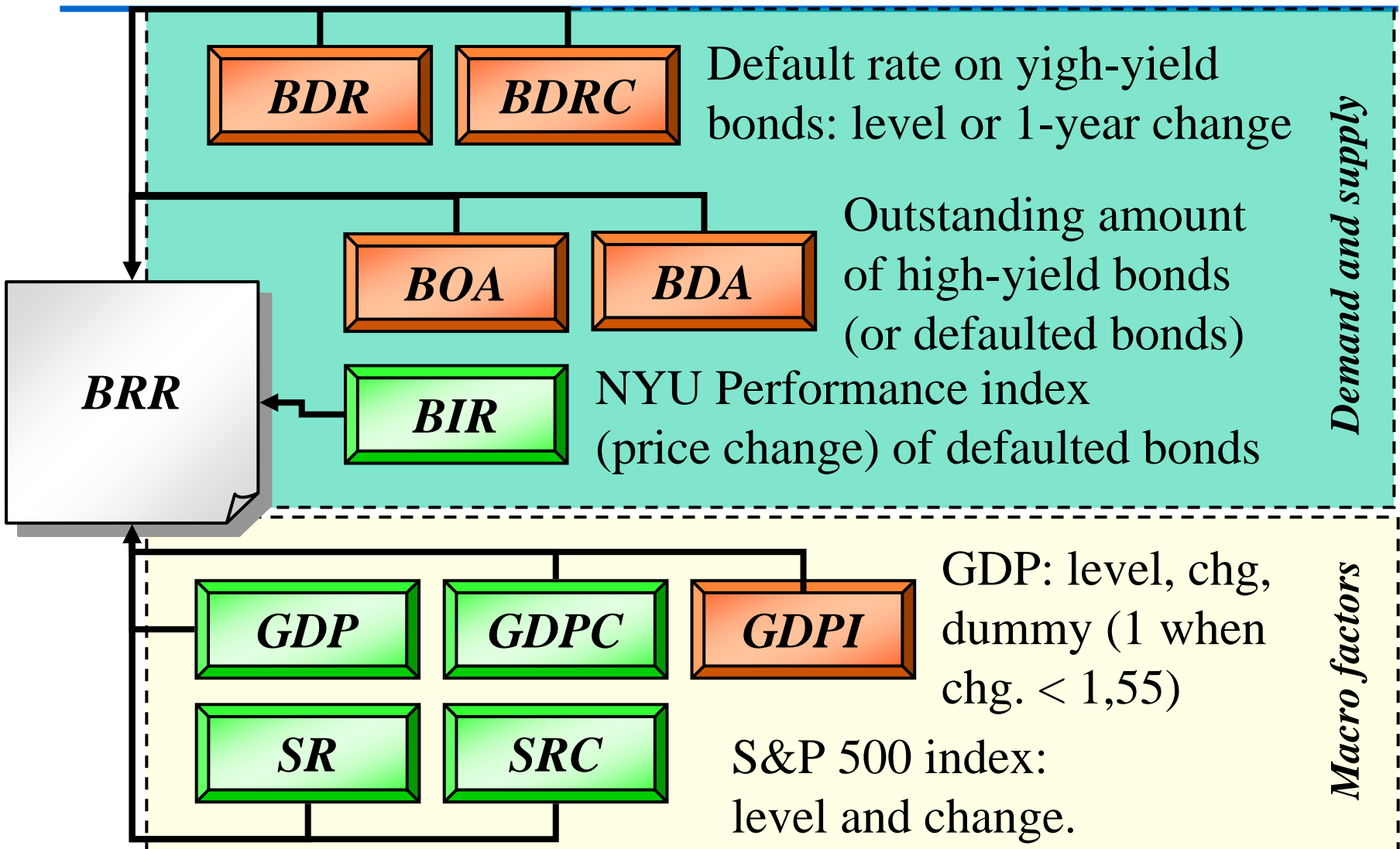
Dollar Weighted Average Recovery Rates to Dollar Weighted Average Default Rates

(1982-2008 (April 30th))



Source: E. Altman, et. al., "The Link Between Default and Recovery Rates", NYU Salomon Center, S-03-4.

Multivariate models: explanatory variables



Some multivariate results

Dependent var.: BRR (log)			
	Model I	Model II	Model III
Constant	-1.55 (-9.27)	-1.29 (-4.51)	-1.02 (-6.36)
BDR (log)	-0.22 (-5.18)	-0.13 (-1.96)	
BDRC	-3.51 (-2.82)	-3.45 (-2.45)	-4.85 (-2.55)
BOA	-0.59 (-2.60)		-0.85 (-2.18)
BDA		-10.60 (-1.84)	
BIR	0.20 (1.28)	0.33 (2.14)	0.43 (1.63)
GDP			0.33 (2.14)
R-square	91%	89%	68%

Supply and demand variables explain about 90% of BRR total variance

Macro factors are less significant: GDP is “crowded out” by BDR because of a strong (-67%) univariate correlation

Recovery at Default* on Public Corporate Bonds (1978-2007) and Bank Loans (1989- 2007)

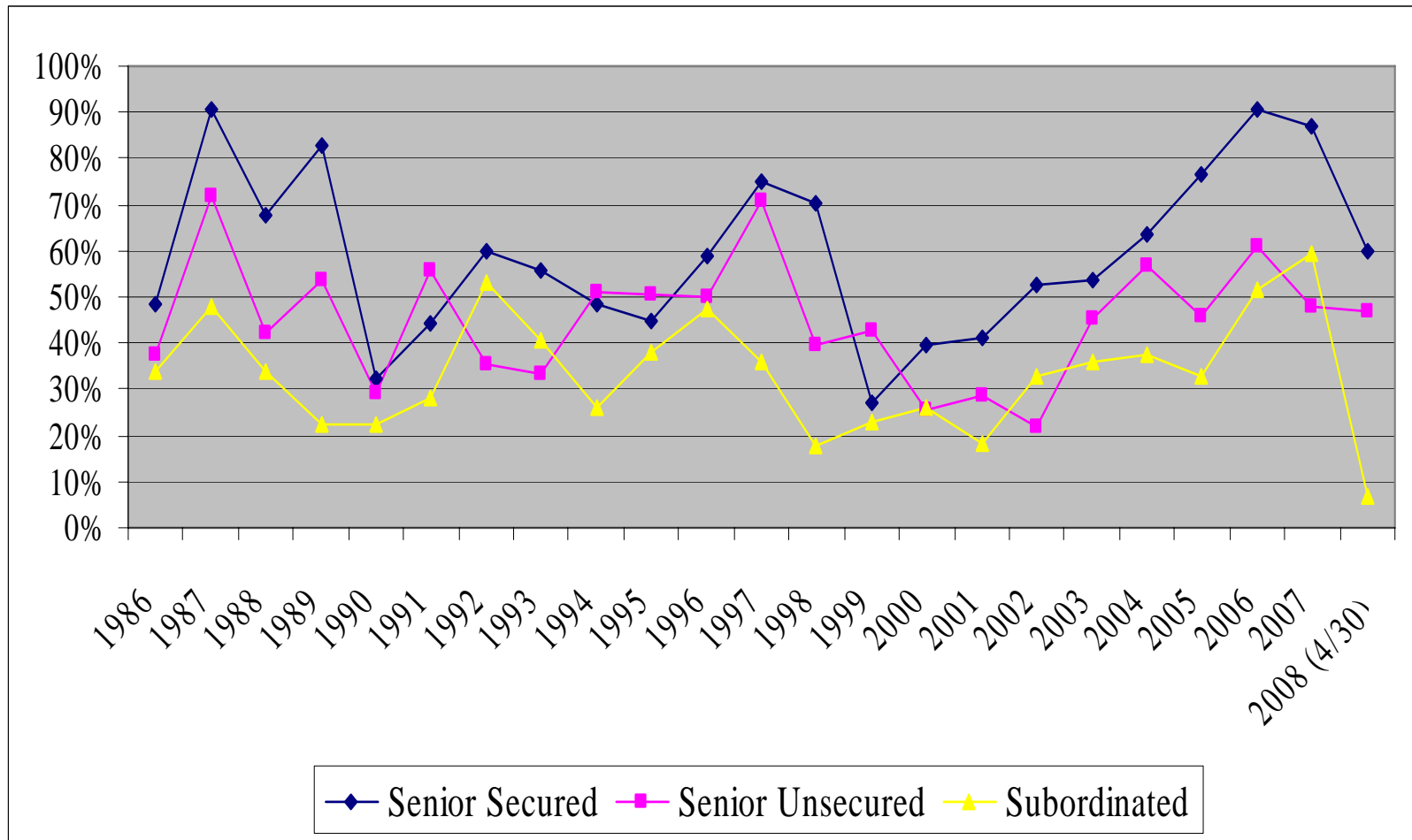
Loan/Bond Seniority	Number of Issues	Median	Mean %	Standard Deviation
Senior Secured Loans	432	71.50	68.71	25.46
Senior Unsecured Loans	63	45.00	50.39	27.16
Senior Secured Bonds	342	59.47	60.45	17.69
Senior Unsecured Bonds	1027	45.64	36.95	13.72
Senior Subordinated Bonds	420	34.00	31.08	14.47
Subordinated Bonds	251	31.96	31.30	17.78
Discount Bonds	156	19.41	25.98	20.70
Total Sample Bonds	2196	41.77	37.54	14.28

**Based on prices just after default on bonds and 30 days after default on loans. Loan prices are tranche levels.*

Source: Moody's (K.Emery, 2008) (Bank Loans) and Altman & Karlin, 2008 (Bonds).

Recovery Rate by Seniority

(1986 – 2008 (April 30th))



Source: E. Altman & B. Karlin, NYU Salomon Center (2008).

Investment Grade vs. Non-Investment Grade (Original Rating) Prices at Default on Public Bonds (1978 - 2007)

Bond Seniority	Number of Issues	Median Price %	Average Price %	Weighted Price %	Standard Deviation %
Senior Secured					
Investment Grade	137	50.50	55.61	60.58	25.77
Non-Investment Grade	276	38.00	43.24	42.57	29.29
Senior Unsecured					
Investment Grade	325	43.50	45.33	35.07*	25.44
Non-Investment Grade	593	31.50	35.79	34.40	23.31
Senior Subordinated					
Investment Grade	15	28.00	38.91	36.36	27.44
Non-Investment Grade	407	28.00	33.16	30.02	24.22
Subordinated					
Investment Grade	11	35.50	37.59	25.99	31.30
Non-Investment Grade	215	28.83	32.23	28.75	22.53
Discount					
Investment Grade	1	13.63	13.63	13.63	---
Non-investment Grade	122	18.00	27.68	27.66	25.45
Total Sample	2102	33.50	38.52	35.69	25.91

Non-rated issues were considered as non-investment grade

Source: E. Altman & B. Karlin, NYU Salomon Center (2008).

Ultimate Recovery Rates on Bank Loan and Bond Defaults (Discounted Values, 1988 - 2006)

	Observations	Ultimate Discounted Recovery	Standard Deviation	Ultimate Nominal Recovery
All Bank Debt	1188			
<i>Revolving Loans</i>	621	80.8%	29.4%	90.76%
<i>Term Loans</i>	567	71.7%	34.0%	81.13%
Senior Secured Bonds	403	55.6%	33.4%	66.68%
Senior Unsecured Bonds	897	43.3%	35.9%	52.78%
Senior Subordinated Bonds	369	25.4%	29.7%	30.25%
Subordinated Bonds	366	23.0%	30.7%	26.73%

Source: Moody's Database, 3492 defaulted loans and bond issues that defaulted between Dec. 1987-Dec. 2006. Recoveries are discounted at each instruments' pre-default interest rate.

Recovery Rates for Telecommunications and E-Commerce Industries*

1998 – 2004

YEAR	NUMBER OF ISSUES	AVERAGE RECOVERY PRICE	WEIGHTED AVERAGE
1998	8	\$20.81	\$18.84
1999	16	\$23.47	\$25.58
2000	18	\$24.50	\$24.69
2001	118	\$18.69	\$16.07
2002	88	\$19.38	\$16.56
2003	26	\$40.31	\$38.03
2004	14	\$52.57	\$58.04
	288	\$23.19	\$21.39

* Includes Wireless Equipment and Satellite Telecommunication companies in addition to Telecommunication Service companies.

Source: Authors' compilation from Various Dealer Quotes.

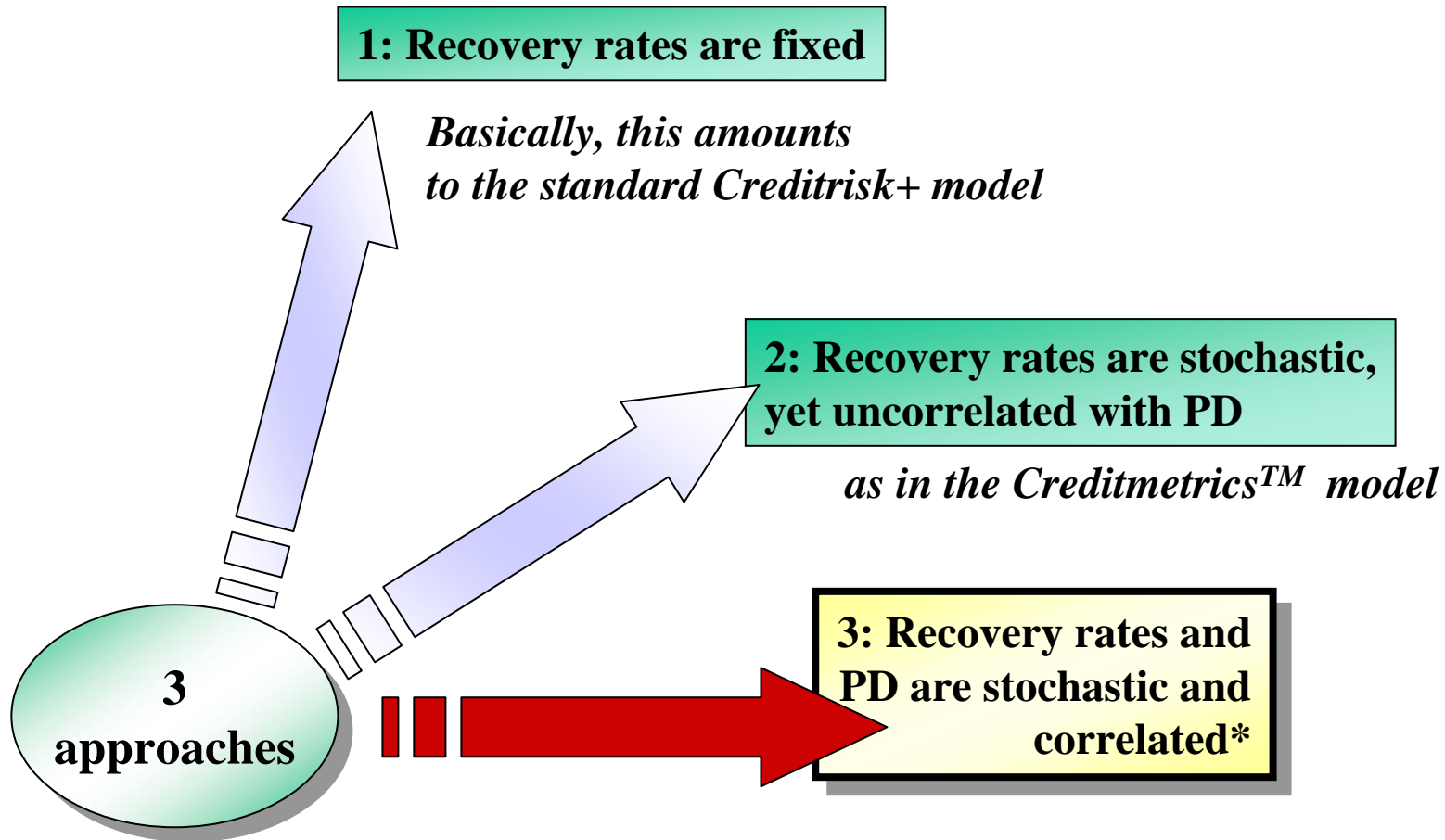
Default Recovery Rates for the Financial Service Sector

1975 – 2007

Financial Sector	Number of Issuers	Number of Issues	Average Recovery Rate (%) (Issues)	Weighted Average Recovery Rate (%)
Banks	7	20	26.91	19.87
Mortgage Bankers	7	17	44.97	37.75
Accident, Health & Life Insurance	7	19	26.95	19.79
Fire, Marine & Casualty Insurance	9	15	26.05	21.31
Savings Institutions	4	9	13.28	18.67
Investors	3	4	24.00	23.51
Security Brokers & Dealers	2	8	43.59	42.30
Miscellaneous Credit Institutions*	7	31	70.17	68.52
All Financial Sectors*	46	123	39.61	40.90

*Removing FINOVA defaults from calculations (19 issues, Recovery Rate = 86% for all issues) results in an Average Recovery of 38.97% and a Weighted Average Recovery of 30.69% in the Miscellaneous Credit Institutions Sector as well as an Average Recovery of 31.13% and Weighted Average Recovery of 26.38% in all Sectors.

Detail: three approaches to recovery rates



***High values for the macro factor (i.e., recession scenarios) bring in RRs close to 10%, while low values in the macro factor are associated with RRs of about 90%**

Simulation results

		RR modeled according to approach:			Delta
		1	2	3	(3-1)/1
Expected loss		46.26	45.81	59.85	+29.4%
Standard errors		98.17	97.84	127.16	+29.5%
VaR	95	190	188	245	+28.9%
	99	435	437	564	+29.6%
	99.5	549	546	710	+29.3%
	99.9	809	815	1,053	+30.1%

...both unexpected and **expected** losses
are **severely underestimated**

Moreover, **cyclical swings may be stronger than expected**

The procyclicality issue

- As the economic **cycle worsens**, so do ratings.
 - This means that, under the new rating-based Basel rules, a bank would have to raise more capital or to **reduce its loan book**
 - The latter would **make economic slowdowns even worse...**
- In the “advanced” internal rating-based approach proposed by the BCBS, banks are allowed to use their own **estimates of recovery rates**
 - **What if these estimates are reduced as the economy slows, when the supply of defaulted assets increases?**