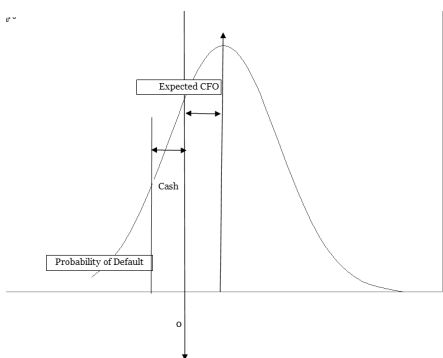


18 Measures of Risk for Debt and Distress

Accounting based Measures of Risk

1



3

Earnings Variability

What causes bankruptcy?
 CFO is too LOW or negative
 And
 Cash is LOW

What is the probability of that happening
 Standardized value =
 $[(\text{Cash} + \text{Expected CFO}) / \text{Std Deviation of CFO}]$
 Is LOW

2

Accounting based measures of risk

Categories of risk

1. Risk of financial failure or bankruptcy
2. Firm's bond ratings or yield rate
3. Equity Risk (Beta)

$$Y = w(0) + w(1) X(1) + w(2) X(2) + \dots$$

Y = Dependent Variable

X(i) = Financial statement based measures of risk (ratios ?)

W(i) = Weights

Question:

Which ratios and what are the weights

4

Independent variables used in Bankruptcy and Bond Rating Prediction

- Activity: Sales to assets
- Liquidity: Current ratio, Quick Ratio, Working Capital to assets,
- Leverage & Solvency: Liabilities to assets, Fixed Charge Coverage, Equity to capital, Debt to assets, CFO / Liabilities, Times Interest earned,
- Profitability: ROA, Retained Earnings to assets,
- Earnings Variability: Standard error of ROA,
- Size: Total Assets

5

Bankruptcy Prediction

		Actual Outcome	
		Bankrupt	Non-bankrupt
Predicted Outcome	Bankrupt	Correct	Error: Type II
	Nonbankrupt	Error: Type I	Correct

Cost large? (points to Error: Type I)

Opportunity Cost - small? (points to Error: Type II)

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Which model/ratios are best 1

2000 firms

Predicted Outcome	Actual Outcome	
	Bankrupt 100, 5%	Non-bankrupt 1900, 95%
Bankrupt	78, 78%	95, 5%
Nonbankrupt	22, 22%	1805, 95%

Accuracy $[78 + 1,805] \div 2,000 = 94.15\%$

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Which model/ratios are best 2

2000 firms

Predicted Outcome	Actual Outcome	
	Bankrupt 100 5%	Non-bankrupt 1900 95%
Bankrupt	0	0
Nonbankrupt	100 100%	1900 100%

Accuracy $[1,900] \div 2,000 = 95\%$

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Which model/ratios are best 3

2000 firms

Cost	Type 1 -\$20	Type 2 -\$1	Total Cost
Model 1	22	95	-535
Model 2	100	0	-2,000

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Univariate Models

Use one variable to predict bankruptcy

If a Ratio $<>$ A Cutoff Value

then predict that the firm will be bankrupt

- Tough to predict many years before bankruptcy
- With Cash Flow / Total Liabilities as bankruptcy predictor:

Years before bankruptcy	1	2	3	4
Type I error rate	22	34	37	47

Check: Credit/Moodys rating process

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Univariate Models - 2

What is the most discriminatory ratio ?

Look at paper Altman Paper:

ZETA TM ANALYSIS

A new model to identify bankruptcy risk of corporations

Page 54

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Multivariate Models

Altman

$$Z\text{-score} = 1.2 \times [\text{Working capital/Total Assets}] + 1.4 \times [\text{Retained Earnings /Total Assets}] + 3.3 \times [\text{EBIT/Total Assets}] + 0.6 \times [\text{Market value of Equity /Book Value of debt}] + 1.0 \times [\text{Sales / Total Assets}]$$

Z-score $>$ 2.675 Solvency

Z-score $<$ 2.675 Bankruptcy

1.81 $<$ Z-score $<$ 2.99 gray area

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Multivariate Models

Variable Means and Test Significance

Look at paper Altman Paper:

Altman-Predicting-Financial-Distress-Of-Companies

Page 54

Adjustments:

S&P

Zeta:

Altman-Predicting-Financial-Distress-Of-Companies

page 32

Results 41

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Tough to predict many years before bankruptcy

With Cash Flow / Total Liabilities as predictor

Years before bankruptcy	1	2	3	4
-------------------------	---	---	---	---

Type I error rate

Model

Univariate	22	34	37	47
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Z-Model	6	28	52	71
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ZETA©	4	15	25	32
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ZETA©: Adds operating leases as debt and assets.

Affiliates consolidated with parent company.

Capitalize research and development etc.

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The Prediction of Debt Risk - Bond Ratings

Standard & Poor's	AAA	AA	A	BBB	BB
Moody's	Aaa	Aa	A	Baa	Ba

Who cares about ratings?

Ratings affect interest rates

Standard & Poor's	AAA	AA	A	BBB	BB
Interest rate %(1997)					
Spread (over T-Bond)	.28	.39	.57	.83	1.53

Check:

[actg516rtr/Readings/Credit/Credit-Spreads.pdf](http://www.federalreserve.gov/releases/h15/actg516rtr/Readings/Credit/Credit-Spreads.pdf)

<http://www.federalreserve.gov/releases/h15/>

Some institutions are restricted to invest only in bonds with a minimum rating.

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S&P Long-Term Issuer Credit Ratings 1

AAA: An obligor rated 'AAA' has EXTREMELY STRONG capacity to meet its financial commitments. 'AAA' is the highest Issuer Credit Rating assigned by Standard & Poor's.

AA: An obligor rated 'AA' has VERY STRONG capacity to meet its financial commitments. It differs from the highest rated obligors only in small degree.

A: An obligor rated 'A' has STRONG capacity to meet its financial commitments but is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.

BBB: An obligor rated 'BBB' has ADEQUATE capacity to meet its financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.

Obligors rated 'BB', 'B', 'CCC', and 'CC' are regarded as having significant speculative characteristics. 'BB' indicates the least degree of speculation and 'CC' the highest. While such obligors will likely have some quality and protective characteristics, these may be outweighed by large uncertainties or major exposures to adverse conditions.

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S&P Long-Term Issuer Credit Ratings 2

BB An obligor rated 'BB' is LESS VULNERABLE in the near term than other lower-rated obligors. However, it faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to the obligor's inadequate capacity to meet its financial commitments. B An obligor rated 'B' is MORE VULNERABLE than the obligors rated 'BB', but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.

B An obligation rated 'B' is more vulnerable to nonpayment than obligations rated 'BB', but the obligor currently has the capacity to meet its financial commitment on the obligation. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitment on the obligation.

CCC An obligor rated 'CCC' is CURRENTLY VULNERABLE, and is dependent upon favorable business, financial, and economic conditions to meet its financial commitments.

CC An obligor rated 'CC' is CURRENTLY HIGHLY-VULNERABLE.

Plus (+) or minus(-) The ratings from 'AA' to 'CCC' may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories.

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Why bother with prediction of ratings

Some offering not rated

Predict ratings changes

Useful before undertaking large projects.

Explanatory variables could be improved.

Identify ratings/explanatory variables mispricing.

18

What ratios predict Bond Ratings

Similar to Bankruptcy Prediction
 New factor: Subordination
 Z"-Score also predicts Bond Ratings

Intercept adjusted Z" score

$$\begin{aligned}
 Z''\text{-Score} = & 6.56 \times [\text{Working capital/Total Assets}] \\
 & + 3.26 \times [\text{Retained Earnings/Total Assets}] \\
 & + 6.72 \times [\text{EBIT/Total Assets}] \\
 & + 1.05 \times [\text{Book value of Equity/Book Value of debt}] \\
 & + 3.25
 \end{aligned}$$

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Ratings and ratios

Standard & Poor's	AAA	AA	A	BBB	BB
Z-score	8.15	7.30	6.65	5.85	4.95
Free operating cash flow / Debt	84.2	25.2	15.0	8.5	2.6

Table 18-5

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The Prediction of Interest Rate

Accounting variables

Accounting variables

Prediction Model
 Bankruptcy

Prediction Model
 Bond rating
 Prediction Model
 Interest Rate

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