

Supplementary lecture: Credit evaluation

Whereas most of the second half of the course has been about issues in equity investment, the growing importance of debt securities markets and of corporate bond finance in particular (Lecture 7) as an investment instrument mean that some awareness of credit risk issues is also appropriate. Accordingly, we present in this annex an overview of methods of credit evaluation both at the micro and macro levels.

What is credit evaluation – micro and macro

Importance of credit evaluation

Bond investors and the seniority of debt
– spread risk as well as default risk

Equity investors

The increasing importance of private
bond investment

Supply side factors

Demand side factors

Bond indentures to protect investors

- Sinking funds
- Subordination of future debt
- Dividend restrictions
- Collateral

Junk bonds

Ambiguities in the concept of firm failure

Recent trends in failures

- aggregate UK and US data
- high yield bond defaults

Information used in credit analysis

Payment record

Financial statements and the problem of timeliness

Financial market information

- share prices
- ratings
- bond spreads-problem of liquidity
- industry, geographic and size characteristics

Empirical approaches to failure prediction

A priori indicators from financial statements

The use of rating agencies

Benefits of use of ratings

- privileged access
- economies of scale
- defensible in court

Recent failures of rating agencies – the Asian crisis

Key indicators:

- Coverage ratios
- Leverage ratio
- Liquidity ratio
- Profitability ratios
- Cash flow to debt ratios

US long term debt ratings and ratios

Three-year (1998 to 2000) medians	AAA	AA	A	BBB	BB	B	CCC
EBIT interest coverage ratio	21.4	10.1	6.1	3.7	2.1	0.8	0.1
EBITDA interest coverage	26.5	12.9	9.1	5.8	3.4	1.8	1.3
Free oper. Cash flow/total debt (%)	84.2	25.2	15.0	8.5	2.6	(3.2)	(12.9)
Funds flow/total debt (%)	128.8	55.4	43.2	30.8	18.8	7.8	1.6
Return on capital (%)	34.9	21.7	19.4	13.6	11.6	6.6	1.0
Operating income/sales (%)	27.0	22.1	18.6	15.4	15.9	11.9	11.9
Long-term debt/capital (%)	13.3	28.2	33.9	42.5	57.2	69.7	68.8
Total debt/capital (incl. short term debt) (%)	22.9	37.7	42.5	48.2	62.6	74.8	87.7
Companies	8	29	136	218	273	281	22

General problems of empirical studies

- The atheoretical nature of empirical studies
- The asymmetry in the cost of Type 1 and Type 2 errors
- Identification of “failed firms”
- Risk of window dressing of popular ratios
- Timeliness and accuracy of accounting data
- Results often sample specific
- Matched samples used

Univariate models

Cash flow as an indicator

Beaver's study of 7 financial ratios

Limitations of univariate approaches

Multivariate approaches

Discriminant analysis – maximization of ability to discriminate between groups (eqs 9.1-9.3)

Need for a subjective cutoff point

Variables in Altman's study

- EBIT/Assets
- Sales/assets
- Market equity/book debt
- Retained earnings/total assets
- Working capital/total assets

More recent work on Z-Scores

Use of conditional probability models

Use of capital market data

Beaver – share price patterns prior to failure

Queen and Roll – capitalization, price, return, size and beta

Market predicts failure well in advance.....but still large negative excess return on day announced

Failure prediction at a macro level (Davis)

A model of business failure

Profits

$$E(\Pi) = E(\rho) F(L) - WL - C\mu(.)$$

Bankruptcy

$$\rho F(L) - WL - qD + S < 0$$

Employment

$$L = L(W, q, D, MV, \rho, \sigma)$$

Combining:

$$\mu(.) = \mu(W, q, D, MV, \rho, \sigma)$$

Estimates for business failure rates using the model

Country by country

	USA ^a	UK ^b	Canada ^c	France ^d	Germany ^e	Japan ^f
Constant	0.48 (1.7)	-0.81 (1.5)	-3.0 (3.8)	6.4 (2.2)	0.01 (0.1)	1.45 (1.8)
Lagged dependent	0.97 (19.2)	0.94 (13.2)	0.55 (6.6)	0.4 (2.1)	0.98 (8.2)	0.8 (7.8)
Log debt/GNP	0.85 (3.0)	0.63 (2.1)	1.1 (2.0)	1.1 (2.8)	1.1 (1.4)	-0.75 (2.1)
Log difference of GNP	-3.3 (4.4)	-7.2 (5.1)	-3.3 (3.7)	-5.6 (3.3)	-3.5 (4.1)	
Log wages/GNP deflator				0.6 (1.8)	-0.5 (2.1)	
Log raw materials price/GNP deflator			1.1 (5.1)	-0.4 (1.5)	—	
Nominal short-term interest rate	0.035 (2.5)	0.07 (7.3)	-0.04 (2.8)		0.05 (4.8)	
Real short-term interest rate		-0.06 (5.5)	0.05 (5.2)	0.028 (2.5)	—	-0.025 (4.1)
Dummy (US bankruptcy law)	0.2 (3.1)					
$\bar{R}^2$	0.98	0.94	0.94	0.97	0.96	0.94
se	0.06	0.09	0.07	0.07	0.08	0.1
LM(1)	6.0	0.5	2.1	4.9	0.6	9.1
N	17	22	24	19	23	23

Pooled data

(1) Cointegrating vector

$$\begin{aligned} \ln BFR = & -6.6 + 1.03 \ln(D/GNP) + 0.8 \ln GNP - 1.02 \ln(W/P) \\ & (1.4) \quad (2.7) \quad (2.2) \quad (2.3) \\ & - 0.04 \ln(PM/P) + 0.028 r + 0.033 q + \text{dummies} \\ & (0.2) \quad (2.0) \quad (3.1) \end{aligned}$$

$$\bar{R}^2 = 0.99 \text{ CRDW} = 0.7 \text{ DF} = -4.9$$

(2) Dynamic equation

$$\begin{aligned} \Delta \ln BFR = & 0.07 - 0.4 \Delta \ln(D/GNP) - 1.51 \Delta \ln GNP + 0.13 \Delta \ln(W/P) \\ & (3.1) \quad (2.9) \quad (3.1) \quad (0.2) \\ & + 0.12 \Delta \ln(PM/P) - 0.01 \Delta r + 0.001 \Delta q - 0.16 \text{RES}_{t-1} + \text{dummies} \\ & ((0.8) \quad 1.0) \quad (0.1) \quad (2.7) \end{aligned}$$

$$\bar{R}^2 = 0.96 \text{ se} = 0.16 \text{ DW} = 1.0 \text{ LM}(1) = 44.0$$

(3) Separate debt ratios (levels) in cointegrating vector

US:	2.5 (2.5)	UK:	0.43 (0.8)	Canada:	4.8 (3.4)
Germany:	-0.5 (0.4)	Japan:	1.3 (1.3)	France:	-1.6 (0.7)

(4) Separate debt ratios (differences) in dynamic equation

US:	1.2 (1.3)	UK:	0.2 (0.4)	Canada:	1.8 (2.1)
Germany:	-0.2 (0.2)	Japan:	-0.8 (1.7)	France:	0.77 (0.6)

Sectoral patterns of failure (Davis)

A “beta-coefficient” analysis

Implications for appropriate spreads on debt

UK bank – new and increased provisions as percent of sectoral lending

	Mean (%)	SD (%)	Max (%)	Beta coefficient ^a	t-value
Agriculture	0.19	0.12	0.45	0.8	(4.6)
Mining and quarrying	0.25	0.36	1.5	−1.4	(2.0)
Construction	0.66	0.55	2.83	0.9	(6.3)
Food, drink, and tobacco	0.20	0.19	0.83	1.1	(4.0)
Chemical and allied	0.23	0.28	1.15	−0.3	(0.1)
Metal manufacture	0.23	0.27	1.29	1.4	(2.2)
Electrical engineering	0.43	0.30	1.11	0.8	(3.5)
Other engineering	0.58	0.60	2.84	1.3	(4.4)
Shipbuilding	0.88	1.2	5.84	0.6	(1.0)
Motor vehicles	0.43	0.50	1.91	−0.4	(0.7)
Textiles, leather, and clothing	0.71	0.52	1.97	1.0	(2.8)
Other manufacturing	0.55	0.44	1.95	0.9	(4.8)
Property companies	0.67	0.8	3.13	1.9	(7.3)
Transport and communication	0.73	1.0	6.10	1.0	(4.6)
Central/local government	0.03	0.09	0.46	—	—
Retail distribution	0.64	0.44	2.04	0.7	(3.3)
Other distribution	0.44	0.31	1.27	0.7	(3.4)
Insurance and pensions	0.09	0.24	1.3	—	—
Other financial	0.42	0.60	2.75	1.9	(2.8)
Professional/scientific/ miscellaneous	0.59	0.43	2.15	0.7	(6.3)
House purchase	0.06	0.06	0.2	0.9	(4.9)
Other personal	0.76	0.64	2.83	0.6	(6.3)
Total excluding financial and personal (TE)	0.54	0.36	1.8	1.1	(25.6)
GRAND TOTAL (GT)	0.49	0.30	1.62	—	

^a Coefficient β in regression: $\Delta \ln (\text{sectoral provisions}) = \alpha + \beta \Delta \ln (\text{total provisions})$