DEBT SECURITIES

Topic 6: Credit analysis

LA TROBE UNIVERSITY Faculty of Law and Management

Presented by:
Darren Henry
Associate Professor of Finance
Department of Finance, La Trobe Business School

References

> **Fabozzi F. J. (2007).** *Fixed Income Analysis*. John Wiley & Sons Inc. New Jersey. Chapter 15.

Student learning objectives

6.1 Distinguish among default risk, credit spread risk and downgrade risk;

6.2 Illustrate how credit analysis encompasses assessing the borrower's character (including the quality of management) and capacity to repay (including sources of liquidity), and the issue's underlying collateral and covenants;

6.3 Calculate the key ratios used by credit analysts to assess the ability of a company to satisfy its debt obligations, and explain the limitations of these ratios;

6.4 Analyse why and how cash flow from operations is used to assess the ability of an issuer to service its debt obligations and to assess the financial flexibility of a company;

Objective 6.1

Credit risk of a bond

> The credit risk of a bond includes:
  - **Default risk:** The risk that the issuer will default on its obligations
  - **Credit spread risk:** The risk that the bond's price will decline as a result of the market requiring a wider spread due to a perceived increase in the risk that the issuer will default
  - **Downgrade risk:** The risk that the bond's price will decline as a result of the company being assigned a lower credit rating
> There are four general approaches to determining credit risk:
  - Credit ratings
  - Traditional credit analysis
  - Credit scoring models
  - Credit risk models

Student learning objectives

6.5 Explain the typical elements of the debt structure of a high-yield issuer, the interrelationships among these elements, and the impact of these elements on the risk position of the lender;

6.6 Discuss the factors considered by rating agencies in rating asset-backed securities (i.e. collateral credit quality, seller/servicer quality, cash flow stress and payment structure, and legal structure);

6.7 Explain why two sovereign ratings are assigned to each national government and discuss the key factors emphasised by Standard & Poor's in determining each rating;

6.8 Describe the various credit score models and other quantitative techniques used to assess credit risk.

Objective 6.1

Credit ratings

> A **credit rating** is a formal opinion given by a specialised company of the default risk faced by investing in a particular issue of debt
> A **credit watch** is an announcement that the rating of an issue is being reviewed with the potential for an upgrade or a downgrade
> A **rating outlook** is a projection of whether an issue in the long term is likely to be upgraded or downgraded
> There are three U.S. ratings agencies:
  - Moody's Investors Service
  - Standard & Poor's
  - Fitch Ratings

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Objective 6.1

Credit ratings

> The ratings given by each of the agencies, and the description of each rating, are as follows:

Moody's	S & P	Fitch	Summary Description
Investment grade – High credit worthiness			
Aaa	AAA	AAA	Gilt edge, prime, maximum safety
Aa1	AA+	AA+	High grade, high credit quality
Aa2	AA	AA	
Aa3	AA –	AA –	
A1	A +	A +	Upper-medium grade
A2	A	A	
A3	A –	A –	
Baa1	BBB +	BBB +	Lower-medium grade
Baa2	BBB	BBB	
Baa3	BBB –	BBB –	

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Objective 6.1

Credit ratings

> The ratings given by each of the agencies, and the description of each rating, are as follows:

Moody's	S & P	Fitch	Summary Description
Speculative – Lower credit worthiness			
Ba1	BB +	BB +	Low grade, speculative
Ba2	BB	BB	
Ba3	BB –	BB –	
B1	B	B +	Highly speculative
B2		B	
B3		B –	

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Objective 6.1

Credit ratings

> The ratings given by each of the agencies, and the description of each rating, are as follows:

Moody's	S & P	Fitch	Summary Description
Predominately Speculative, Substantial Risks, or in Default			
Caa	CCC +	CCC +	Substantial risk, in poor standing
	CCC	CCC	
Ca	CC	CC	May be in default, very speculative
C	C	C	Extremely speculative
	CI		Income bonds – no interest being paid
	D	DDD	Default
		DD	
		D	

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Objective 6.1

Credit ratings

> A credit rating is a forward-looking assessment of (1) the probability of default, and (2) the relative magnitude of a loss should a default occur

> Periodic studies by ratings companies provide information about default rates and default loss rates for each rating
  - The default rate measures the percentage of bonds of a given rating that have defaulted during a specified period
  - Default loss rate is a measure of the magnitude of loss where default occurs

Rating	Watch up	Positive	Stable	Negative	Watch down
Baa1	NA	0.20%	0.60%	1.25%	2.26%
B1	NA	0.98%	2.52%	5.07%	12.03%
Caa1	3.7%	3.82%	8.43%	14.93%	42.21%

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Objective 6.1

Credit ratings

> Moody's Investors Service makes the following suggestion as to how an analyst can combine the information in rating watches and outlook rating status to adjust the rating of a corporate bond:

For ratings on:	*Suggestion:*
Downgrade watch	reduce current rating by two rating notches
Upgrade watch	increase current rating by two rating notches
Negative outlook	reduce current rating by one rating notch
Stable outlook	keep current rating
Positive outlook	increase current rating by one rating notch

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Objective 6.1

Credit ratings and downgrade risk

> A popular tool used by managers to gauge the prospects of an issue being downgraded or upgraded is a **ratings transition matrix**

> This is a table that shows the percentage of issues that were downgraded or upgraded in a given time period

Rating at start of year	Rating at end of year								Total
	AAA	AA	A	BBB	BB	B	CCC	D	
AAA	93.20	6.00	0.60	0.08	0.00	0.00	0.00	0.00	100
AA	1.60	92.75	5.07	0.36	0.11	0.07	0.03	0.01	100
A	0.18	2.65	91.91	4.80	0.37	0.02	0.02	0.05	100
BBB	0.04	0.30	5.20	87.70	5.70	0.70	0.16	0.20	100
BB	0.03	0.11	0.61	6.80	81.65	7.10	2.60	1.10	100
B	0.01	0.09	0.55	0.88	7.90	75.67	8.70	6.20	100
CCC	0.00	0.01	0.31	0.84	2.30	8.10	62.54	25.90	100

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Objective 6.2

Traditional credit analysis

- In traditional credit analysis, the analyst considers the four C's of credit
  - **Capacity:** the ability of an issuer to repay its obligations
  - **Collateral:** the quality and value of pledged and unpledged assets of an issuer and their ability to generate the cash flow to service the debt
  - **Covenants:** terms and conditions of the lending agreements, which help to prevent the transfer of wealth from debt holders to equity holders
  - **Character:** the ethical reputation, business qualifications and operating record of the board, management and executives of an issuer

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Objective 6.2

Capacity to pay

- In assessing an issuer's capacity to repay its obligations, an analyst at Moody's will analyse:
  - Industry trends – vulnerability to economics cycles, barriers to entry, exposure to technological changes
  - Regulatory environment – proposed changes in regulations must be analysed
  - Basic operating and competitive position – e.g. diversification of the product line and the cost structure, future investment projects and funding required
  - Financial position (using profitability ratios and debt and coverage ratios) and sources of liquidity – e.g. backup credit facilities, lines of credit, securitisation
  - Company structure
  - Parent company existence and/or support
  - Special event risk

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Objective 6.3

Debt and coverage ratios

- Short-term coverage ratios are used to judge the adequacy of liquid assets to meet short-term obligations as and when they fall due
  - Current ratio
  - Acid-test ratio
- Financial leverage (or capitalisation) ratios are used to assess the extent to which a firm is using financial leverage (i.e. debt)
  - Long-term debt to capitalisation
  - Total debt to capitalisation
- Coverage ratios are used to test the adequacy of cash flows generated through earnings for meeting debt obligations
  - EBIT interest coverage ratio (EBIT / annual interest expense)
  - EBITDA interest coverage ratio (EBITDA / annual interest expense)
  - Funds from operations/total debt ratio
  - Free operating cash flow/total debt ratio

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Objective 6.3

Profitability ratios

- **Profitability ratios** are utilised to explore the underlying causes of change in a company's net income by assessing the underlying factors driving the company's net income
- A common application is to use the DuPont formula to assess the determinants of a company's operating performance:
  - Return on stockholders' equity
  - Return on total assets
  - Profit margin
  - Asset turnover
  - Leverage ratio
- These ratios have been covered in detail in other subjects, such as Financial Statement Analysis (FIN5FSA)

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Objective 6.3

Other ratios

- Other specific ratios may be relevant in assessing the activity, efficiency or performance of companies from particular industries:
- Retail companies:
  - Accounts receivable and inventory turnover, gross profit margin
- Banking companies:
  - Net interest margin, non-performing loan percentage, loan prepayment speeds
- Mining and resources companies
  - Operating efficiency, asset turnover, cost management
- Manufacturing companies
  - Labour productivity, operating capacity, accounts payable turnover

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Objective 6.4

Cash flow measures

- Standard & Poor's suggest that cash flow is the single most critical aspect of all credit rating decisions
- Standard & Poor's uses the following definitions of cash flow:
  - **Funds from operations:** net income adjusted for depreciation and other non-cash debts and credits
  - **Operating cash flow:** funds from operations less net increase in working capital
  - **Free operating cash flow:** operating cash flow less capital expenditures
  - **Discretionary cash flow:** free operating cash flow less dividends paid
  - **Pre-financing cash flow:** discretionary cash flow less discretionary expenditures and revenues from investment activities

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Objective 6.3

Cash flow ratios

- Standard & Poor's uses the following cash flow ratios, based on its definitions of cash flow:
  - $\frac{\text{Funds from operations}}{\text{Total debt (adjusted for off - balance sheet liabilitie s)}}$
  - $\frac{\text{Free operating cash flow + Interest}}{\text{Interest}}$
  - $\frac{\text{Free operating cash flow + Interest}}{\text{Interest + Annual principal repayment obligations}}$
  - $\frac{\text{Total debt}}{\text{Discretionary cash flow}}$
  - $\frac{\text{Funds from operations}}{\text{Capital spending requirements}}$

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Objective 6.4

Cash flow from operations

- A firm that generates cash flows only by selling off its assets or by issuing more securities cannot keep that up for very long
- For future prosperity and the ability to meet its obligations, the firm must be able to generate cash flows from its operations
- By analysing cash flow from operations an analyst can examine:
  - The source of financing for business operations
  - The ability of the company to meet debt obligations
  - The ability of the company to finance expansion
  - The ability of the company to pay dividends
  - The flexibility the business has in financing its operations

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Objective 6.2

Collateral

- Corporate debt can be either secured or unsecured
- In the case of a bankruptcy, the proceeds from liquidation are distributed to creditors based on the absolute priority rule; however, in the case of a reorganisation, the absolute priority rule almost never holds in the U.S.
- The final distribution in the case of a reorganisation depends on the bargaining ability of the parties and, although secured creditors should have a stronger bargaining position, some analysts place less emphasis on collateral compared to the other factors of credit analysis

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Objective 6.2

Covenants

- Some covenants are common to all debentures, such as:
  - To pay interest, principal and premium, if any, on a timely basis
  - To pay all taxes and other claims when due unless contested in good faith
  - To maintain all properties used and useful in the borrower's business in good condition and working order
  - To submit periodic certificates to the trustee stating whether the debtor is in compliance with the loan agreement
- These covenants are called **affirmative (or positive) covenants** since they call upon the debtor to make promises to do certain things

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Objective 6.2

Covenants

- **Negative covenants** are those that require the borrower not to take certain actions
- There are an infinite variety of restrictions that can be placed on borrowers, depending on the type of debt issue, the economics of the industry, the nature of the business, and the lenders' desires
- Some of the more common restrictive covenants include:
  - Various limitations on the company's ability to incur debt
  - For example, debt might be limited to no more than a certain percentage of the total capitalisation of the company
  - Various limitations on a company's interest or fixed charge coverage ratios
  - Restrictions on dividend distributions to ensure that sufficient cash is maintained within the firm

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Objective 6.2

Character

- Moody's notes the following in regard to the quality of management:

  "Although difficult to quantify, management quality is one of the most important factors supporting an issuer's credit strength. When the unexpected occurs, it is a manage-ment's ability to react appropriately that will sustain the company's performance."
- In assessing management quality, the analysts at Moody's consider:
  - Corporate governance
  - Strategic direction
  - Financial philosophy
  - Conservatism
  - Track record
  - Succession planning
  - Control systems

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Objective 6.5

Credit analysis of high-yield issues

- The analysis of high-yielding issues should consider the effect of the overall indebtedness and debt structure of the issuer on its ability to meet its obligations on the higher-yielding debt
- The debt structure of high-yield issuers can include:
  - Bank debt
  - Broker loans
  - Reset notes
  - Senior debt
  - Senior or junior subordinated debt
  - Payment in kind (PIK) bonds

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Objective 6.5

Credit analysis of high-yield issues

- If the debt structure includes:
  - Bank debt
    - It is likely that the issuer of higher-yielding debt will rely more heavily on bank debt, due to a lack of alternatives
    - Bank debt holders have precedence over other holders of debt on the firm's assets
    - Bank debt is typically short-term
    - Bank debt is usually at floating rates, which can impose cash flow problems if interest rates rise and which raises a refunding problem in the short term
  - Reset notes
    - Reset notes can impose cash flow problems if interest rates rise
    - To meet the requirements resulting from higher interest rates, assets might have to be sold, which may lead to problems with generating future cash flow from operations

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Objective 6.5

Credit analysis of high-yield issues

- If the debt structure includes:
  - Senior bonds
    - Note that this term is misleading in the presence of bank loans, because the latter are senior to bonds
    - Senior bonds are often deferred coupon bonds, which means that the interest burden is placed on future cash flows to meet the interest obligations
    - This may impair the ability of an issuer to improve its credit quality in future years
  - Payment in kind (PIK) bonds
    - These allow the issuer to pay interest with equivalent new bonds, with the same coupon payment, instead of with cash
    - If the new bonds are senior bonds, this will significantly increase the proportion of senior debt to subordinated debt in the debt structure over time
    - PIK bonds may place an even greater burden on future cash flows to service increased future interest payments

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Objective 6.6

Credit analysis of non-corporate bonds

- A slightly different approach is sometimes required when conducting credit analysis of the following types of non-corporate bonds:
  - Asset-backed and non-agency mortgage-backed securities
  - Municipal bonds
  - Sovereign bonds
- In analysing the credit risk of asset-backed securities and non-agency mortgage-backed securities, the ratings companies focus on:
  - Credit quality of the collateral
  - Quality of the seller/servicer
  - Cash flow stress and payment structure
  - Legal structure

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Objective 6.6

Asset-backed and mortgage-backed securities

- When conducting credit analysis of corporate bonds, it is important to note that:
  - Management must undertake the necessary activities that will produce the cash flow required to service the debt
  - The cash flows are subject to all the business risks of the manager/issuer
  - In evaluating credit risk an analyst will focus on the four C's
- In the case of asset-backed and mortgage-backed securities:
  - There are assets (consisting of loans and receivables) resulting in cash flows that must be collected and distributed to investors in the security
  - There is no business risk associated with collection of the cash flows
  - There is no active management with respect to the collateral
  - It is the quality of the collateral that is of key concern

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Objective 6.6

Municipal bonds

- When conducting credit analysis on municipal bonds, a distinction must be made between tax-backed debt and revenue bonds
- Factors to be considered with tax-backed debt include:
  - The issuer's debt structure, to determine the overall debt burden
  - The issuer's ability and political discipline to maintain sound budgetary policy (i.e. balanced budgets)
  - Specific local taxes and intergovernmental revenues available to the issuer, as well as historical tax collection rates
  - The issuer's overall socioeconomic environment

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Objective 6.6

Municipal bonds

- The key concern with revenue bonds is whether the project being financed will generate sufficient cash flows to satisfy the obligations due to bond holders
- In this sense, revenue bonds are similar to corporate bonds, and their analysis involves the same factors (i.e. the four C's)
- Factors to be considered by credit analysts include:
  - The limits of the basic security
  - The flow of funds structure
  - The rate or user-charge covenant
  - The priority-of-revenue claims
  - The additional-bonds tests
  - Other relevant covenants

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Objective 6.7

Sovereign bonds

- **Sovereign ratings** are ratings given by ratings companies on the debt of national governments other than the U.S. government
- There are two ratings, because historically the default rate differs by the currency denomination of the debt
- Foreign denominated debt is more likely to be subject to a higher default rate
- The two ratings given are:
  - Local currency debt rating
  - Foreign currency debt rating
- Australia, for instance, has AAA country ratings for both local currency and foreign currency debt

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Objective 6.7

Sovereign bonds

- Factors considered by analysts in relation to local currency debt:
  - The stability of political institutions and the degree of popular participation in the political process
  - Income and economic structure
  - Fiscal policy and budgetary flexibility
  - Monetary policy and inflation pressures
  - Public debt burden and debt service track record
- Factors considered by analysts in relation to foreign currency debt:
  - The country's balance of payments
  - The structure of the country's external balance sheet, including net public debt, total net external debt and net external liabilities

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Objective 6.8

Credit scoring and bankruptcy prediction models

- Beaver (1966) model
- Altman (1968) Z score models
- Springate (1978) model
- Lincoln (1984) model – Australian application
- Fulmer et al. (1984) model
- Logit analysis – Ohlson (1980) model
- Zmijewski (1984) model
- Ratings model
- Distance to default or insolvency measures

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Objective 6.8

Beaver (1966) model

- Beaver's early work reviewed single ratios as important indicators of failure
  - Used t-tests to identify differences in ratio values between bankrupt and non-bankrupt samples of firms
- He identified three key ratios:
  - Operating free cash flow / Total debt
  - Net income / Total debt
  - Total debt / Total assets
- Limitations of the model:
  - Single ratios vary according their explanatory power; hence the signals may be confused

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Objective 6.8

Altman (1968) Z score model

- Altman's Z score weights five ratios by predetermined factor or coefficient values calculated using the discriminant analysis technique
- The five ratios are:
  - X1 = Working capital / Total assets
  - X2 = Retained earnings / Total assets
  - X3 = Earnings before interest and taxes (EBIT) / Total assets
  - X4 = Market value of equity / Total liabilities
  - X5 = Sales / Total assets

$$Z = 1.2(X1) + 1.4(X2) + 3.3(X3) + 0.6(X4) + 1.0(X5)$$

- A Z score < 1.80 indicates a firm with serious credit problems, while a Z score > 3.00 indicates a healthy firm

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Objective 6.8

Altman (1968) Z score model

- Limitations of the model
  - It does not eliminate all the problems associated with accounting ratios, such as:
    - Privately held companies have no readily quoted market value
    - The Sales / Total assets ratio varies significantly from industry to industry
  - The model assumes the sample data to be normally distributed
  - Beyond two years it has poorer predictive power than a random chance model
  - It is based on small samples of 33 surviving and 33 failed firms and, therefore, may not be representative of the wider corporate sector
  - It is based on US industrial (manufacturing) companies, so it is not necessarily applicable to other industry or country environments
  - Difficulty in interpreting the status of companies with Z scores between 1.80 and 3.00

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Objective 6.8

Altman Z score model (privately-held firms)

- Privately-held firms do not have a quoted market value
- Hence, Altman recalibrated the Z score measure based on using the book value of equity to define variable X4
  - Criteria for the model is Healthy firms (Z > 2.90) and Distressed firms (Z < 1.23)
- The five ratios are:
  - X1 = Working capital / Total assets
  - X2 = Retained earnings / Total assets
  - X3 = Earnings before interest and taxes / Total assets
  - X4 = Book value of equity / Total liabilities
  - X5 = Sales / Total assets

$$Z = 0.717(X1) + 0.847(X2) + 3.107(X3) + 0.420(X4) + 0.998(X5)$$

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Objective 6.8

Altman Z score model (merchandising and service firms)

- The Sales to Total Assets (X5) variable is suggested as varying significantly from industry to industry
- Altman, therefore, recalibrated the Z score to exclude this variable
  - Criteria for the model is Healthy firms (Z > 2.60) and Distressed firms (Z < 1.10)
- The four ratios are:
  - X1 = Working capital / Total assets
  - X2 = Retained earnings / Total assets
  - X3 = Earnings before interest and taxes / Total assets
  - X4 = Book value of equity / Total liabilities

$$Z = 6.56(X1) + 3.26(X2) + 6.72(X3) + 1.06(X4)$$

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Objective 6.8

Springate (1978) model

- Springate (1978) built on the work of Altman to define four ratios which were weighted according to the following model
- The four ratios are:
  - X1 = Working capital / Total assets
  - X2 = EBIT / Total assets
  - X3 = Pre-tax profits / Current liabilities
  - X4 = Sales / Total assets

$$Z = 1.03(X1) + 3.07(X2) + 0.66(X3) + 0.4(X4)$$

- If a firm has a score of Z < 0.862 this indicates that the firm has failed or is likely to fail

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Objective 6.8

Lincoln (1984) model

- Lincoln (1984) developed a discriminant analysis insolvency risk prediction model using Australian firm data
- The ratios included in his best performing model were:
  - Cash flow before tax / Current liabilities
  - Current assets / Total assets
  - Quick assets / Current assets
  - Current liabilities / Total liabilities
  - Quick liabilities (current liabilities – bank overdraft) / Current liabilities
  - Retained profits / Total assets
  - Total liabilities / Total assets
- Based on identifying the two main characteristics of firms with high insolvency risk (close to the limit of its borrowing capacity and lacking accumulated profits)
- Unfortunately, ratio weights were not provided in the published paper

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Objective 6.8

Fulmer, Moon, Gavin and Erwin (1984) model

- Fulmer et al. (1984) developed a discriminant analysis bankruptcy prediction model for small firms which included nine variables. The model is:
- H = 5.528(V1) + 0.212(V2) + 0.073(V3) + 1.270(V4) – 0.120(V5) + 2.335(V6) + 0.575(V7) + 1.083(V8) + 0.894(V9) – 6.075
- where:
  - V1 = Retained earnings / Total assets
  - V2 = Sales / Total assets
  - V3 = Earnings before tax (EBT) / Shareholders' equity
  - V4 = Cash flow / Total debt
  - V5 = Debt / Total assets
  - V6 = Current liabilities / Total assets
  - V7 = Log of tangible total assets
  - V8 = Working capital / Total debt
  - V9 = Log of EBIT / Interest
- If H < 0, then the firm is classified as 'failed' or 'expected to fail'

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Logit analysis

- The Logit model approach uses a regression estimation process based on a probability distribution to obtain a specific probability of failure / bankruptcy measure
  - Does not assume that variables and data are normally distributed, and can be applied to a diverse sample of companies from different industries
- There are four steps in applying the model:
  - Calculate the nine financial ratios or other variable specifications
  - Multiply each ratio by a unique coefficient
  - Sum the weighted ratios together to calculate y
  - Calculate the probability of bankruptcy as $1 / (1 + e^{-y})$, where $e \approx 2.71828$
- The most well-known logit distress prediction model was developed by James Ohlson in 1980

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Objective 6.8

Logit analysis

- The Ohlson (1980) model equation is:

$$y = -1.320 - 0.407(Y_1) + 6.030(Y_2) - 1.430(Y_3) + 0.076(Y_4) - 2.370(Y_5) - 1.830(Y_6) + 0.285(Y_7) - 1.720(Y_8) - 0.521(Y_9)$$

- where:
  - Y_1 = Log (Total assets / GNP price-level index)
  - Y_2 = Total liabilities / Total assets
  - Y_3 = Working capital / Total assets
  - Y_4 = Current liabilities / Current assets
  - Y_5 = Net income (NI) / Total assets
  - Y_6 = Funds provided by operations / Total liabilities
  - Y_7 = 1 if Net income < 0 for the last two years, 0 otherwise
  - Y_8 = 1 if Total liabilities > Total assets, 0 otherwise
  - $Y_9 = (NI_t - NI_{t-1}) / (|NI_t| + |NI_{t-1}|)$

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Objective 6.8

Zmijewski (1984) Model

- Zmijewski (1984) estimated a bankruptcy prediction model using probit analysis for a sample of 40 failed firms and 800 non-failed firms (although a range of sample mixes were tried)
- The model is:

$$X = -4.336 - 4.513(X_1) + 5.679(X_2) - 0.004(X_3)$$

- where:
  - X_1 = Net income / Total assets
  - X_2 = Total debt / Total assets
  - X_3 = Current assets / Current liabilities
- A probability of default is then determined by referring the X score obtained from the probit model to a cumulative normal distribution table
- Focus on three aspects – profitability, financial leverage and liquidity

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Ratings model

- The Ratings model is based on a comparison of a series of financial ratios with median ratios for similar (peer or comparable) firms
- There are eight ratios used by Standard and Poor's in conducting their form of ratings model analysis:
  - EBIT cover (EBIT / Interest expense)
  - EBITDA cover (EBITDA / Interest expense)
  - Free operating cash flow / Total debt
  - Funds from operations / Total debt
  - Pre-tax return on capital (EBIT / Total capital)
  - Operating income / Sales
  - Long-term debt / Capitalisation
  - Total debt / Capitalisation

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Objective 6.8

Ratings model

- Example of a median ratings table (published by Standard and Poor's)

	AAA	AA	A	BBB	BB	B	CCC
EBIT cover	21.4	10.1	6.1	3.7	2.1	0.8	0.1
EBITDA cover	26.5	12.9	9.1	5.8	3.4	1.8	1.3
FOCF / TD	84.2%	25.2%	15.0%	8.5%	2.6%	-3.2%	-12.9%
FFO / TD	128.8%	55.4%	43.2%	30.8%	18.8%	7.8%	1.6%
ROC	34.9%	21.7%	19.4%	13.6%	11.6%	6.6%	1.0%
Op Income / Sales	27.0%	22.1%	18.6%	15.9%	15.4%	11.9%	11.9%
LT Debt / Capital	13.3%	28.2%	33.9%	42.5%	57.2%	69.7%	68.8%
Tot Debt / Capital	22.9%	37.7%	42.5%	48.2%	62.6%	74.8%	87.7%

LA TROBE UNIVERSITY Credit analysis

Objective 6.8

Ratings model

- The steps required in order apply this model are as follows:
  - Calculate the eight ratios for a period of interest (e.g. historical results, forecast results). Note that alternative company- or industry-specific variables could be substituted
  - Match the value of each ratio to the relevant column in the grid of median ratios
  - If the value is "worse than" any given median ratio, it is classified as the next worst debt rating
  - Find the average debt rating for all ratios, and then determine an overall average
  - Repeat for each period of interest
- Limitations of the model
  - Beware of industry differences, cyclical effects and cross-border effects that might exist in the median scores
  - Requires updating as median ratio levels will likely change over time

LA TROBE UNIVERSITY Credit analysis

Objective 6.8

Distance to default or insolvency measures

- More advanced credit risk models use option pricing principles to measure credit risk
- A relatively simple form of such models is distance to default (DTD):

$$DTD = \frac{[MV\ of\ Assets] - [Default\ point]}{[MV\ of\ Assets][Asset\ volatility]}$$

- where:
  - MV of Assets = present value of the future free cash flows produced by the firm's assets, discounted at the appropriate discount rate
  - Default point = Book value of liabilities (firm will default when its asset value falls below the value of its contractual liabilities)
  - Asset volatility = standard deviation of the annual percentage change in asset value
- A default probability can then be obtained in a similar way to a logit or probit estimation process if the probability distribution of asset values is known, or credit rating levels could be applied across the range of DTD values

These slides have been drafted by the Department of Finance, La Trobe Business School based on Fabozzi (2007). 5.49