

8. Long-term Debt-Paying Ability. Forecasting Financial Failure

8.1.1 Long-Term Solvency Ratios

Long-term solvency ratios (capital risk ratios, leverage ratios, gearing ratios, borrowing capacity ratio) are the main measures of credit risk of a company.

Long-Term Debt / Equity Ratio (total capitalization ratio)

$$(28) \quad \text{LT Debt / Equity Ratio} = \frac{\text{LT Debt}}{\text{Equity}}$$

This ratio measures long-term leverage. The higher is D/E ratio, the company is considered more credit risky by equity holders and debt holders, but also management, workers and the whole economic and social environment.

Long-Term Debt Plus Short-Term Debt / Equity Ratio

$$(29) \quad \frac{\text{Long Term Debt} + \text{Short Term Debt}}{\text{Equity}}$$

Debt Utilization Ratio

$$(30) \quad \text{Debt/Equity Ratio} = \frac{\text{LT Debt} + \text{Current Liabilities}}{\text{Equity}}$$

This ratio measures long-term and short-term leverage.

Total Liabilities / Tangible Net Worth

$$(31) \quad \frac{\text{Total Liabilities}}{\text{Tangible Net Worth}}$$

Total liabilities can be calculated as total assets less equity attributable to shareowners. Tangible Net Worth is equal to equity attributable to shareowners less intangible assets.

Debt Ratio, Debt

$$(32) \quad \begin{aligned} \text{Debt Ratio} &= \frac{\text{Total Liabilities}}{\text{Total Assets}} \\ &= \frac{\text{LT Debt} + \text{Current Liabilities}}{\text{Total Assets}} \end{aligned}$$

This ratio measures creditor financing.

Equity Ratio

$$(33) \quad \text{Equity Ratio} = \frac{\text{Equity}}{\text{Total Assets}}$$

This ratio measures owner financing. The sum of the two above ratios is equal to 100%.

Pledged assets to secured liabilities

$$(34) \quad \text{Pledged assets to Secured Liabilities} = \frac{\text{Book Value of Pledged Assets}}{\text{Book Value of Secured Liabilities}}$$

It measures protection to secured creditors.

8.1.2 Debt Service Ratios

Times Interest Earned, Coverage Ratio, Interest Coverage Ratio, Fixed Charges Cover Ratio, Debt Service Ratio

$$(35) \quad \frac{\text{Net Profits Before Taxes + Interest Expenses}}{\text{Interest Expenses}} \\ = \frac{\text{Net Profits Before Interest and Taxes}}{\text{Interest Expenses}}$$

It shows how many times the annual interest expenses are covered by the net operating income (income before interest and tax). It measures ability of a company to meet interest payments.

Debt Service Coverage Ratio

$$(36) \quad \frac{\text{Net Income + Depreciation + Interest Payments (LT Loans)}}{\text{Debt Service (Repayments + Interest Payments)}}$$

EBITDA / Gross Interest Expense Ratio

$$(37) \quad \frac{\text{EBITDA}}{\text{Gross Interest Expense}} > 3$$

Total Net Debt / EBITDA Ratio

$$(38) \quad \frac{\text{Total Net Debt}}{\text{EBITDA}} < 3$$

Debt / EBITDA Ratio

$$(39) \quad \frac{\text{Total Debt - Cash}}{\text{EBITDA}}$$

LT Debt EBITDA Ratio

$$(40) \quad \frac{\text{Long Term Debt - Cash}}{\text{EBITDA}}$$

8.1.3 Fundamental Methods of Credit Quality Analysis

Fundamental analysis techniques are the most traditional and still very popular methods used to examine credit quality. These methods are used by banks, rating agencies and corporations.

What does the credit quality depend on ? The 10 C's of credit should be examined. These 10 C's determine the credit quality and are used to examine a bank's borrower and also a corporation's client. The C's of credit include

1. character,
2. corporate governance,
3. communication,

4. capacity,
5. capital,
6. collateral,
7. covenants,
8. composition,
9. cooperation,
10. conditions.

Character

Character of the borrower includes the ethical reputation, qualifications, achievements and the history of relations with the lender especially with respect to borrowed funds and repayment of those funds.

Corporate governance

Communication

Capacity

Capacity is the ability of the borrower to repay its obligations. Discretionary cash flow (operating cash flow less nondiscretionary capital expenditures) is the cash flow available to a company after it has funded its basic operating and capex requirements. Discretionary cash flow analysis is an important tool in the capacity analysis.

Sources to pay off debt

- operating cash flow,
- financial cash flow (refinancing),
- investment cash flow (sale of assets).

Capital

Capital (economic capital) should be sufficient to cover losses. Capital structure (Debt : Equity) determines default probability.

Collateral

Collateral is traditionally defined as assets that secure a loan or other debt, so that the assets may be seized by the lender if the borrower fails to make proper payments on the loan. The useful life of the collateral will typically have to exceed, or at least meet, the term of the loan. In broader sense collateral includes not only pledged assets, but also the quality and the value of unpledged assets owned or controlled by the issuer.

Debt obligations can be secured or unsecured. Proceeds from a liquidation are distributed to creditors based on the absolute priority rule.

Senior debt is a debt that has priority of claim ahead of other obligations. Senior debt securities have claim to assets before subordinated debt in event of liquidation.

Subordinated debt is a debt having a claim against the issuer's assets that is lower ranking or junior to other obligations. It is paid after senior debt is satisfied.

Covenants

Covenants are the terms and conditions of the lending agreement protecting the interests of a lender. There are various kinds of limitations and restrictions. Rate covenants impose obligation to maintain the specified rates. Affirmative covenants force a borrower to do something. Negative covenants forbid the specified activities. Protective covenants require additional actions for example to maintain an insurance.

Covenants prevent the value transfer from debt holders to equity holders. A breach of any covenant provides an early warning to take action before the situation deteriorates further.

Material adverse change is a provision that permits the bank to refuse funding if the bank thinks that the borrower' financial situation has deteriorated significantly.

The maintenance test requires that ratio of earnings available for interest and fixed charges to be at least a certain minimum figure on each required reporting date for a certain preceding period.

The debt incurrence test requires that the required interest or fixed charge coverage figure adjusted for the additional borrowing must be a at a certain minimum level.

Dividend payments are often limited to a certain percentage of net income earned after a peg date (often issuance date of the debt). There also usually restrictions on a company repurchase of its common stock. Some indentures restrict to pay dividends for subsidiaries.

Composition

Composition or organizational structure of a borrower may be complex. It is important to look into the holding structure and predict how cash may flow between the parent company and subsidiaries. The assets of subsidiaries may be used as a collateral for a holding company.

Restricted subsidiaries are those considered to be consolidated for financial test purposes. Unrestricted subsidiaries are excluded from covenants and are not restricted to use new loans.

It is also important to analyze previous restrictions and prohibitions on dividend payments, intercompany loans and asset sales. Such restrictions may cause that the financial ratios for the holding company do not provide adequate information.

Cooperation

A loan provided to a borrower may be a syndicated loan.

Conditions

Conditions in the branch, the industry, the national economy and the global economy have huge effects on a borrower's credit quality. The previously discussed factors represent the unique factors and are part of the unique credit risk. The conditions determine the systematic risk.

8.1.4 Credit ratings

The most known rating agencies in the world are: Standard & Poor's Corporation, Moody's Investors Service Inc. and Fitch.

Credit rating agencies provide opinions on the creditworthiness of issuers of securities and other financial obligations. They rate issues of securities, corporate and governmental issuers and structured financings. They also assess the credit quality of financial guarantees,

bank loans, private placements, MBS (mortgage-backed securities) and ABS (asset-backed securities), mutual funds and the ability of insurance companies to pay claims. The fundamental premises of the rating agencies are: integrity, independence, objectivity, transparency, credibility and quality of their opinions and operations.

A credit rating is the opinion of the creditworthiness of an obligor, or the creditworthiness of an obligor with respect to a particular debt security or other financial obligation, based on relevant risk factors. Credit ratings that may apply to an issuer’s general creditworthiness or to a specific financial obligation. A rating does not form a recommendation to purchase, sell, or hold a particular security.

Standard & Poor’s

Standard & Poor’s traces its history back to 1860. Standard & Poor’s was an independent, publicly owned corporation until 1966, when all of its common stock was acquired by McGraw-Hill Inc., a major publishing company. Standard & Poor’s was the first major rating agency to assess the credit quality of, and assign credit ratings to, the claims-paying ability of insurance companies (1971), financial guarantees (1971), mortgage-backed bonds (1975), mutual funds (1983), and asset-backed securities (1985).

Table 11. Credit Ratings

Credit Quality	S&P's	Moody's
Investment grades		
The obligor’s capacity to meet its financial commitment on the obligation is extremely strong.	AAA	Aaa
The obligor’s capacity to meet its financial commitment on the obligation is very strong.	AA	Aa
An obligation is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligations in higher rated categories. However, the obligor’s capacity to meet its financial commitment on the obligation is still strong.	A	A
Adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitment on the obligation. An obligation rated ‘BBB’ exhibits adequate protection parameters.	BBB	Baa
Speculative grades		
Inadequate capacity to meet financial commitment on the obligation	BB	Ba
The obligor’s capacity or willingness to meet its financial commitment on the obligation is likely impair	B	B
The obligor is not likely to have the capacity to meet its financial commitment on the obligation in the event of adverse business, financial, or economic conditions.	CCC	Caa
A default has actually occurred.	D	D

Source: Standard and Poor’s and Moody’s Investors Service
18 categories

SnP18	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC	D
Moody18	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa	D

8.1.5 Default probabilities

Credit scoring

Credit scoring models use statistical data to calculate probability of default or to sort borrowers into default risk classes. For consumer loans the characteristics in credit scoring model might include age, income, assets, location etc. For corporate loans financial ratios are

used as variables. A statistical model quantifies or scores the default risk probability. Some credit scoring techniques use probability models, discriminative models and other econometric models.

Probability Model, Logit, Probit

Linear Probability Model

$$(41) \quad Z_i = \sum_{j=1}^n \beta_j X_{ij} + \xi_j$$

The Logit Model constraints the estimated probability of default to lie between zero and one. It calculates the cumulative probability of default according to the formula

$$(42) \quad F(Z_i) = \frac{1}{1 + e^{-Z_i}}$$

where

Z_i – is estimated by regression model similar to the linear probability model.

The probit model also constraints the estimated probability of default to lie between zero and one. The cumulative normal distribution function is used to calculate estimated probability of default.

Linear Discriminant Model

The most famous Altman's discriminant model is³:

$$(43) \quad Z = 1,2 X_1 + 1,4 X_2 + 3,3 X_3 + 0,6 X_4 + 0,999 X_5$$

where

X_1 – working capital / total assets,

X_2 – retained earnings / total assets,

X_3 - EBIT / total assets,

X_4 – market value of equity / book value of long term debt,

X_5 - sales / total assets.

Market Probability of Default

The implied probability of repayment can be calculated using spot or forward rates for a corporate security and government securities. The cumulative probability of repayment can be calculated using formula:

$$(44) \quad p_{wsT} = \frac{(1 + R_B)^T}{(1 + R_K)^T}$$

where

p_{wsT} – cumulative default probability in horizon T,

R_B – spot risk-free interest rate,

R_K – spot rate for a corporate security

T - maturity.

³ Por. E.I. Altman, *Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy*, *Journal of Finance*, September 1968, s. 189-209 oraz E.I. Altman, *Managing the Commercial Lending Process*, w: *Handbook of Banking Strategy*, John Wiley, New York 1985, s. 473-510.

8.1.6 Distance to default

Distance to default (default point) may be calculated:

$$(45) \quad d = \frac{S - S_d}{\sigma_{ROA} S}$$

where

S – market value of assets (Merton model),

S_d – default point (1/2 of long term debt + current liabilities),

σ_{ROA} - volatility of the firm's assets.

8.1.7 Migration matrix

Table 12. Migration Matrix (Moody's)

2001	Aaa	Aa	A	Baa	Ba	B	Caa	D	WR
Aaa	89,91	0,92	0,00	0,00	0,00	0,00	0,00	0,00	9,17
Aa	0,30	90,92	5,06	0,15	0,00	0,15	0,00	0,00	3,42
A	0,25	2,30	86,69	6,57	0,33	0,16	0,16	0,16	3,38
Baa	0,19	0,29	3,58	86,83	4,16	0,77	0,19	0,29	3,70
Ba	0,00	0,00	1,16	6,55	75,53	8,86	1,16	1,16	5,58
B	0,00	0,00	0,11	0,95	5,58	63,44	14,54	9,17	6,21
Caa-C	0,00	0,00	0,00	0,00	0,00	2,34	54,69	30,47	12,50

Source: Moody's Investors Service, Global Credit Research, February 2002

8.1.8 Risk premium

Market risk premium

Risk premium may be defined as

$$(46) \quad q = R_K - R_B$$

where

p_{wsT} – cumulative default probability in horizon T ,

R_B – spot risk-free interest rate,

R_K – spot rate for a corporate security

T - maturity.

More realistic situation is that the lender does not lose all principal. The recovery rate u depends on the type of collateral. We can use the following formula to establish the appropriate risk premium

$$(47) \quad 1 + R_B = p_{wsT}(1 + R_O) + (1 - p_{wsT})(1 + R_O)u$$

where

u – recovery rate

Risk premium is equal to:

$$(48) \quad q = R_O - R_B = \frac{(1 + R_B)}{p_{wsT} + u - p_{wsT}u} - (1 + R_B)$$

Task 8

1. Calculate and interpret long-term solvency ratios.
2. Calculate and interpret debt service ratios.

Problem 18. Long-term Solvency Ratios

Required:			
Calculate and interpret long-term solvency ratios.			
Solution			
	<i>Dec. 31, 2014</i>	<i>Dec. 31, 2013</i>	<i>Dec. 31, 2012</i>
<i>Long-Term Debt / Equity Ratio (total capitalization ratio)</i>			
$\text{LT Debt / Equity Ratio} = \frac{\text{LT Debt}}{\text{Equity}}$	0,6	0,6	0,4
<i>Long-Term Debt Plus Short-Term Debt / Equity Ratio</i>			
$\frac{\text{Long Term Debt} + \text{Short Term Debt}}{\text{Equity}}$	1,4	1,1	1,0
<i>Debt Utilization Ratio</i>			
$\text{Debt/Equity Ratio} = \frac{\text{LT Debt} + \text{Current Liabilities}}{\text{Equity}}$	2,1	1,7	1,7
<i>Total Liabilities / Tangible Net Worth</i>			
$\frac{\text{Total Liabilities}}{\text{Tangible Net Worth}}$	15,6	10,2	9,8
<i>Debt Ratio, Debt</i>			
$\text{Debt Ratio} = \frac{\text{Total Liabilities}}{\text{Total Assets}}$			
$= \frac{\text{LTDebt} + \text{Current Liabilities}}{\text{Total Assets}}$	67%	63%	62%
<i>Equity Ratio</i>			
$\text{Equity Ratio} = \frac{\text{Equity}}{\text{Total Assets}}$	33%	37%	38%
	100,0%	100,0%	100,0%
<i>Pledged assets to secured liabilities</i>			
$\text{Pledged assets to Secured Liabilities} = \frac{\text{Book Value of Pledged Assets}}{\text{Book Value of Secured Laibilities}}$	no information		

Problem 19. Debt Service Ratios

Required:			
Calculate and interpret debt service ratios.			
Solution			
	<i>Dec. 31, 2014</i>	<i>Dec. 31, 2013</i>	<i>Dec. 31, 2012</i>
<i>Times Interest Earned</i>			
$\frac{\text{Net Profits Before Taxes + Interest Expenses}}{\text{Interest Expenses}}$			
$= \frac{\text{Net Profits Before Interest and Taxes}}{\text{Interest Expenses}}$	20,1	22,1	27,2
<i>Debt Service Coverage Ratio</i>			
$\frac{\text{Net Income + Depreciation + Interest Payments (LT Loans)}}{\text{Debt Service (Repayments + Interest Payments)}}$	0,3	0,3	0,3
<i>EBITDA / Gross Interest Expense Ratio</i>			
$\frac{\text{EBITDA}}{\text{Gross Interest Expense}} > 3$	24,2	26,4	32,1
<i>Total Net Debt / EBITDA Ratio</i>			
$\frac{\text{Total Net Debt}}{\text{EBITDA}} < 3$	1,7	1,4	1,3
<i>Debt / EBITDA Ratio</i>			
$\frac{\text{Total Debt - Cash}}{\text{EBITDA}}$	5,3	4,6	4,2
<i>LT Debt EBITDA Ratio</i>			
$\frac{\text{Long Term Debt - Cash}}{\text{EBITDA}}$	2,5	2,4	2,0