ISMA CENTRE - THE BUSINESS SCHOOL
OF THE FINANCIAL MARKETS

UNIVERSITY OF READING
ENGLAND

IFID Certificate Programme

Credit Analysis and Products

Credit Ratings

Table of contents

1. Overview

In this section we will look at ratings in more detail and answer the following questions:

- What is a credit rating?
- What does the credit rating tell us?
- How are bonds rated?
- What should be the relationship between the rating on a bond and its yield spread to treasuries?

Learning Objectives

By the end of this module, you will be able to:

1. Distinguish between a bond credit rating and a corporate rating
2. Identify the factors that the rating agencies typically consider when assigning:
   - A corporate credit rating
   - A bond credit rating
3. Distinguish between the following categories of debt:
   - Senior secured
   - Senior unsecured
   - Senior subordinated
   - Junior subordinated
4. Explain the difference between contractual and structural debt subordination
5. Describe the notching process that an agency typically applies to the rating of a company's debt
6. Define default probability, loss severity and recovery value
7. Describe the information that is contained in the following tables published by the rating agencies:
   - Credit migration/transition matrices
   - Ratings mortality
   - Recovery rates
8. Describe one way in which a breakeven yield spread for a bond may be derived, given its expected default probability and recovery rate
9. Define the credit curve and describe a methodology for deriving the default probabilities implied in it

2. Corporate Vs Bond Ratings

At this point we need to make the distinction between a **corporate credit rating** (**CCR**) and a **bond credit rating**.

Corporate credit rating = function of **Probability of default** only

Bond credit rating = function of **Probability of default** x **Loss severity**

Loss severity = function of the level of subordination

Rating Mortality

For any CCR, the rating agencies gather default data on all bonds previously rated by them. The table below shows the yearly (or **marginal**) percentage default rates and the cumulative default rates over a period of up to 10-years after issue, for bonds with different credit ratings.

Based on 933 issues
Source: Standard & Poor's (NY) and author's compilation

	Yrs	1	2	3	4	5	6	7	8	9	10
AAA	Yearly	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
	Cumulative	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.03
AA	Yearly	0.00	0.00	0.35	0.19	0.00	0.00	0.00	0.00	0.03	0.02
	Cumulative	0.00	0.00	0.35	0.54	0.54	0.54	0.54	0.54	0.57	0.59
A	Yearly	0.00	0.00	0.02	0.07	0.03	0.08	0.05	0.09	0.06	0.00
	Cumulative	0.00	0.00	0.02	0.09	0.12	0.20	0.25	0.34	0.40	0.40
BBB	Yearly	0.12	0.48	0.55	0.59	0.56	0.58	0.72	0.15	0.05	0.26
	Cumulative	0.12	0.60	1.14	1.73	2.28	2.85	3.55	3.70	3.75	3.98
BB	Yearly	0.96	1.65	3.15	1.54	2.15	0.95	1.65	0.45	1.75	3.75
	Cumulative	0.96	2.59	6.50	7.12	9.12	9.98	11.47	11.87	13.41	16.66
B	Yearly	1.60	4.94	5.95	6.72	5.94	4.15	3.12	2.10	1.65	0.85
	Cumulative	1.60	6.46	12.03	17.85	22.73	25.94	28.25	29.76	30.92	31.51
CCC	Yearly	4.35	13.26	14.84	8.15	3.02	9.15	4.56	3.26	0.00	4.15
	Cumulative	4.35	17.03	31.00	36.62	38.53	44.15	46.70	48.44	48.44	50.58

The statistics confirm the significance of CCRs:

1. Defaults increase consistently as a bond rating is lowered
2. The cumulative probability of default is higher the further we go from date of issuance

However, notice that the marginal probability of default for the lowest rated bonds falls over time, suggesting most of the credit risk on these bonds lies in the short-term: if they survive through this period, they are likely to continue paying!

Also, the data makes no distinction between industry sectors: implicitly, it attributes the same default probability to all issuers in the same rating category, regardless of whether they are banks, corporate or sovereign issuers.

The credit rating of a senior bond typically equals that of its CCR

The rating of a **subordinated bond** is always lower than its CCR and the degree to which it is lower is determined by the agencies' **notching process**, which is described in the next section.

3. Debt Subordination

Debt subordination places a debt holder behind other lenders in the event of default by the issuer.

Types

There are 3 types of subordination that the credit analyst needs to be aware of:

1. **Contractual**, conferred by written contractual agreement – e.g. the loan documentation
2. **Structural**, results from the legal make-up of the issuing group
3. **Temporal**, results from mismatches in the timing of various debt issues. For example, later issues may be conferred a more senior status than earlier issues

The example below shows how an issuer's debt seniority may be ranked taking both contractual and structural subordination aspects into account.

Example

Both the operating company and the holding company of the XYZ Inc group issues debt, but the operating company holds the group's assets while the debt of the holding company has not been assigned to the operating company, so the holding company can only service its obligations out of any dividend paid to it by the operating company.

The table below shows how one might rank the group's debt seniority from the information provided.

Holding Company

5. Senior secured
6. Senior unsecured
7. Senior subordinated
8. Junior subordinated

Dividends from operating company ^ |

Operating company

1. Senior secured
2. Senior unsecured
3. Senior subordinated
4. Junior subordinated

The Notching Process

Rating agencies notch downwards for subordination, typically one notch for investment grade and two notches for high yield issuers.

Example 1: if the senior debt has an A rating, its subordinated debt will typically incur an A- rating

Example 2: if the senior debt attracts a BB rating, its subordinated debt will typically incur a B+ rating

As a further qualifier, another standard practice (at least at S&P) is to notch according to how highly geared is the issuer's balance sheet and how much of its debt is senior to be bond being graded:

- Debt senior to bond < 15% of net assets: no notching
- 15% <= Debt senior to bond <= 30%: a one notch downgrade
- Debt senior to bond <= 30%: a two notch downgrade

4. Default and Recovery

In the event of a corporate default, the loss to the bondholder will be mitigated by the **recovery value** that can be extracted from the assets under liquidation. The notching process described in the previous section is designed to reflect the different recovery rates that are likely, depending on the bond's seniority.

Example

Credit analysts who follow XYZ Inc estimate that, in the event of liquidation, the assets of the company would be worth only USD 1 billion.

Below is a summary of the company's debt structure:

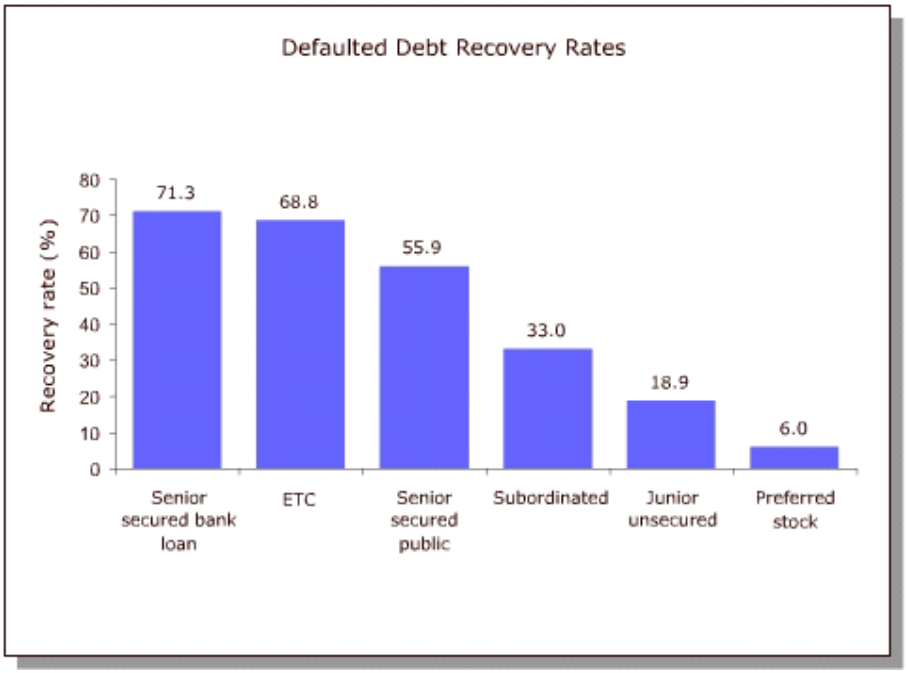
	USD millions
Senior secured	300
Senior unsecured	200
Other senior creditors	300
Senior subordinated	600
Junior subordinated	200

? What would be the percentage recovery rate on each class of bond in the event of insolvency?

Answer

Cash flow analysis		**Recovery rates**
Asset liquidation	+1,000	
Secured debt	(300)	**100%**
	+700	
Senior debt	(200)	**100%**
Other senior creditors	(300)	**100%**
	+200	
Subordinated debt	(600)	200/600 **= 33%**
	0	
Junior subordinated	(200)	**0%**

The rating agencies make available historical information on average recovery values, as percentage of principal lent, per bond ranking:



5. Default and Yield Spread

In the previous section we stated that a bond's credit rating is a function of its default probability and its expected loss severity – as indeed is its yield spread over treasuries (the risk-free rate).

The credit triangle:

- **Default probability**
- **Loss severity**
- **Credit spread**

One way of expressing the relationship between the three elements of the credit triangle is through following relationship:

Expected yield on a surviving risky bond = Risk free rate + Expected loss on bond

$(R_f + DP) \times (1 - P) = R_f + P \times (1 - RV)$

DP

$$= \frac{R_f + P \times (1 - RV)}{(1 - P)} - R_f$$

Where:
DP = Default yield premium (over risk-free rate)
R_f = Risk-free rate
P = Average marginal default rate
RV = Recovery value
(so 1 – RV = Expected loss
which depends on whether bond is senior or subordinated)

Example

Given information below, what should be the yield spread on the senior unsecured debt of a BBB rated company?

Risk-free rate = 4.50%
Recovery value of senior unsecured debt = 68.80%
Average annual marginal default rate = 0.50%

$$DP = \frac{0.045 + 0.005 \times (1 - 0.688)}{(1 - 0.005)} - 0.045$$

= 0.00179 or **18 basis points**

5.1. The Credit Curve

The example on the previous page suggested one way that we could derive an entire **credit curve** by taking the bond mortality table shown in section *Corporate Vs Bond Ratings* as a proxy for default probabilities on bonds with different maturities, together with the recovery rates shown in section *Default and Recovery*.

Credit curve: a graphical representation of the average credit spread on bonds with the same credit rating but different maturities. Credit curves typically show slightly higher credit spreads for long-maturity bonds than for short-maturity bonds with the same rating.

In reality bond defaults tend to be very rare events, so estimated breakeven credit spreads based on such calculations are unlikely to be reliable guides for investors. In practice, analysts tend to use a formula such as the one introduced on the previous page as a way of backing out implied default probabilities from observed credit spreads and default recovery rates.

The implied default probabilities calculated from observed credit spreads and recovery rates tend to be higher than the actual default statistics observed by the credit rating agencies.

This observation provides the basic argument for including corporate bonds in most fixed income portfolios: such portfolios tend to earn above-average returns even after allowing for an element of loss on them on account of bond default.

6. Exercise

Below are two companies with their own corporate ratings.

a) Complete the table below, showing the rating of their senior and subordinated bonds:

	Company X	**Company Y**
Corporate credit rating	A	A+
Senior bond rating		
Subordinated bond rating		

b) Assume the following:

Default probabilities:
A+ rated company 0.2%
A rated company 0.3%
A- rated company 0.5%

Recovery values:
Senior debt 70%
Subordinated debt 30%

Expected loss = Default probability x (1 – Recovery value)

Calculate below the expected losses on the bonds rated in the previous question. Enter your answer in percentages rounded to 2 decimal places

	Company X	**Company Y**
Corporate credit rating	A	A+
Senior bond		
Subordinated bond		