

15.415 Finance Theory

Lecture 6: Valuation of
Fixed Income Securities III

Spring 1999

Overview

In this lecture, we consider three topics:

- **Corporate Bonds:** How are they designed to protect investors from defaults? How do we price them?
- **Municipal Bonds:** What is special about them?
- **Term Structure Theories:** What determines the shape of the term structure?

Overview on Corporate Bonds

Corporations often issue debt to fund capital purchases, to provide cash for daily operations, to acquire other companies, etc.

- \$555 billion in new debt issued by corporations through September, 1998.
- About \$2 trillion of corporate debt outstanding.

Source: *PSA The Bond Market Association*

In contrast to the government, a corporation can *default* on its debt.

Therefore, corporate bonds typically have features we have not yet seen: indenture agreements, trustees, security, sinking funds, put provisions, covenants, ratings, call provisions, etc.

Trustees, Indenture, and Default

In contrast to a government bond holder, an investor in a corporate bond must be concerned about violations of the bond agreement. There are several important issues:

- What are the company's promises related to the bond issue?

These are outlined in the *indenture agreement*, which contains the legal details of the bond issue.

- Who is responsible for determining that a company has broken its promises?

By law, a *trustee* must be retained for all SEC-regulated bond issues. The trustee is responsible for determining when a company has violated the indenture agreement.

- What rights do bondholders when the promises are broken?

These are outlined in the indenture. The trustee is responsible for notifying the bondholders and enforcing remedies in the event of a default.

Secured vs. Unsecured Debt

- Most corporate debt issues are unsecured. Unsecured debtholders have claims only on assets that are not pledged to other creditors.

A *debenture* is typically unsecured long-term debt; a *note* is typically unsecured short-term debt.

- Some debt issues (particularly those of utility companies) are secured. These debts are backed by specific assets.

Example: Central Hudson Gas & Electric Corp. 8 3/4s, 2001:

Secured equally and ratably with other series outstanding by a first mortgage lien.

- Some are credit-enhanced.

Example: Amoco Company, 8 5/8 debentures, 2016

Principal and interest unconditionally guaranteed by Amoco Corporation.

Senior and Subordinated Debt

The terms senior and subordinated refer to priority a given bond issue has in being repaid:

- In the event of a default, all claims of senior debtholders will be repaid before subordinated debtholders receive any money.
- Often used to prevent dilution of some debtholders' claims.

Example: General Host Corp. 11.5% senior notes, due 2002

Notes rank pari passu in right of payment with all existing and future senior indebtedness

Example: General Host Corp. 8% subordinated notes, due 2002

Subordinate to all senior indebtedness of the Company.

Sinking Funds

Bonds sometimes require borrowers to make regular payments into a *sinking fund* held by the trustee, who uses the funds to redeem bonds by

- purchasing the bonds in the market, or
- selecting the bonds according to serial numbers drawn in a lottery and redeeming them at par.

Example: Amoco Co., 8 5/8% debentures, due 2016

As a mandatory sinking fund, Company will pay to the Trustee ... in each of the years 1997 through 2015, inclusive, an amount sufficient to redeem \$9,000,000 principal amount of Debentures, in each case at 100% of their principal amount (the sinking fund redemption price), together with accrued interest... At its option, Company may pay into the sinking fund... an additional sum in cash up to 200% of the amount of mandatory sinking fund payment for each year.

The option is called a “triple-up option.”

Put Provisions

Sometimes bondholders are allowed to sell their bonds back to the company at a given price in the event of a material change in the company. This is an example of a *put option*.

Example: Corning Inc., 8 3/4% notes, due 1999

In the event that there occurs at any time prior to maturity both (a) a designated event with respect to the Company and (b) a rating decline, each holder of the notes shall have the right, at the holder's option, to require the Company to purchase all or any part of each holder's notes ... at 100% of the principal amount thereof, plus accrued interest...

Example: General Host Corp. 8% subordinated notes, due 2002

In the event that there shall occur a redemption event ...each holder...shall have the right..to require the Company to repurchase...notes at 100% of their principal amount... Company's ability to repurchase the notes...may be blocked by the subordination provisions of the notes. However, failure to repurchase would result in an event of default...

Covenants

Debt covenants are restrictions on the borrower's activities that may affect the value of the debt.

Examples:

- Limitations on the borrower's ability to incur additional debt
- Maintenance of certain ratios, such as interest coverage ratios
- Limitations on dividend payments
- Uses of debt for specific purposes.

Bond Ratings

Several companies provide ratings of a bond's credit quality. These are subjective assessments of a company's ability to repay the interest and principal.

- Higher-rated bonds are often called *investment grade bonds*.
- Lower-rated bonds are often called *junk bonds* or *high-yield debt*.
- Sources of ratings and other information:

Moody's Bond Record

S&P Bond Guide

Moody's Industrial Surveys

Moody's Public Utility Surveys

Insert of rating descriptions

Call Provisions

A *call provision* gives a corporation an option to redeem its bonds at a particular price at a particular time.

- This can allow a corporation to reduce its high-interest debt in times of low interest rates.
- *Example:* IBM Corp, 7% debentures, due 2045

Callable as a whole, or in part, at the option of Company at any time, at a redemption price equal to the greater of (i) 100% of the principal amount.. and (ii) the sum of the present values of the remaining scheduled payments of principal and interest thereon discounted...on a semiannual basis at the Treasury Rate plus 12.5 basis points...

- *Example:* IBM Corp, 7.5% debentures, due 2013

Not callable prior to maturity.

Calculating Yields

- The formula is essentially the same: YTM is semiannually compounded, coupons are typically semiannual.
- The accrued interest adjustment is slightly different because traders use a 30/360 day count convention. You can find a description of this convention in, e.g., Fabozzi, *Fixed Income Mathematics*.
- Sometimes, what is reported is the *yield to call* and *yield to worst*.

Insert of WSJ description

Municipal Bonds

Municipal bonds are bonds that are issued by state and local governments.

- Interest income from municipal bonds is exempt from federal taxes.
- *General obligation bonds* are backed by the taxing power of the issuer.
- *Revenue bonds* are backed by the revenue of a specific project (e.g., a toll road).
- *Industrial development bonds* are used to finance commercial enterprises (e.g., a football stadium).
- Tax-equivalent yield

$$\text{tax-equiv yield} = \frac{\text{yield on muni}}{1 - \text{marginal tax rate}}$$

Overview of Term Structure Theories

Recall that the relation between the current spot rate and time to maturity of bonds is known as the *term structure of interest rates*. In previous lectures, we have seen that current spot rates depend on maturity.

In this lecture, we will discuss what determines the shape of the term structure.

graph of today's term structure

graph of 1980 term structure

cool picture of several term structures

graph of one-month spot vs 10-year spot

The Expectations Hypothesis

The preceding graphs clearly show that the shape of the term structure is related to investors' expectations of future spot rates. But how?

- Extreme view: the *Expectations Hypothesis*

$$(1 + r_i)^i (1 + E({}_i r_n))^n = (1 + r_{i+n})^{i+n},$$

where ${}_i r_n$ is the unknown n -year spot rate at time i .

By definition, $(1 + r_{i+n})^{i+n} = (1 + r_i)^i (1 + {}_i f_n)^n$, so the Expectations Hypothesis says

$$E({}_i r_n) = {}_i f_n$$

This holds only if interest rates are certain.

- Historically, the Expectations Hypothesis has not held perfectly.

BM graph of returns on T-bills and T-bonds

Liquidity Preference

According to the Liquidity Preference Theory, long-term bonds are riskier investments because investors' horizons are relatively short.

- Investors require a *liquidity premium* to hold long-term bonds

The liquidity premium for period i is

$${}_i f_1 - E({}_i r_1)$$

- An increasing term structure can be consistent with increasing, flat, or decreasing expected spot rates

Example

Suppose that the one-year spot rate is 10% and the two-year spot rate is 10.5%.

- What is the forward rate ${}_1f_1$?
- According to the Expectations Hypothesis, what would be the expected one-year spot rate ${}_1r_1$?
- Suppose that investors require a 1% liquidity premium per year. What would be the expected one-year spot rate ${}_1r_1$?

graph (pg1) from BKM

graph (pg2) from BKM