CORPORATE BONDS
Corporate Bonds

Spread depends on:

1. Default Premium
2. State Taxes
3. Risk Premium
4. Liquidity
Major Problems

1. Valuation
2. Size of Risk Premium
3. Classification
Valuation

Value = \sum_{t=1}^{T} \frac{cf(t)}{\left(1 + r_{00t}^c\right)^t}

where:

1. $cf(t)$ is cash flow in $t$ (Promised).
2. $r_{00t}^c$ is corporate spot rate.
Why Moodies' grouping might be homogeneous:

A. Different Default Risk
   1. Gradations
   2. Different rankings across agencies

B. Different Liquidity

C. Different Tax Liability

D. Different Recovery Rates

E. Bond Age
Model Price = \[
\sum_{t=1}^{T} \frac{cf(t)}{(1+r_{00}^{c}t)^t} + \text{adj.}
\]

for AA

adj = +.135 (if less than one year) - .059 (if company rating above bond)

+....
Determining Risk Premium

**Basic Idea:** If no risk premium, would discount expected cash flow at riskless rate and on average get invoice price. Risk premium is thus extra return so that on average invoice price is correct.

Illustration

Let $E[cf(t)]$ be expected cash flow in $t$ then if no risk premium

$$
\text{Model Price} = \sum_{t=1}^{T} \frac{E[cf(t)]}{(1+r_{00t}^G)^t}
$$

where:

- $r_{00t}^G$ is riskless rate

and Model Price = invoice price on average
Let $P$ be Premium then find $P$ such that

$$\text{Model Price} = \text{Invoice Price}$$

$$\text{Model Price} = \sum_{t=1}^{T} \frac{E[cf(t)]}{\left(1 + r_{00t}^G + P_t\right)^t}$$

Note actual estimate

$$\text{Model Price} = \sum_{t=1}^{T} \frac{E[cf(t)]}{\left(1 + r_{00t}^C\right)^t}$$

and

$$P_t = r_{00t}^C - r_{00t}^G$$
Determining Expected Cash Flow

A. Ignoring state taxes

Consider one Period Bond

\[
\begin{array}{cc}
\text{State} & \text{Cash Flow} \\
\text{Doesn't Default} & \text{Principle + Interest} \\
\text{default} & a * \text{Principle} \\
\end{array}
\]

where \( a = \) recovery rate

\[
E[cf(1)] = (1 - P_1)(c + 100) + P_1 a \cdot 100
\]
Consider two Period Bond

in one \[ \left( 1-P_1 \right) c + P_1 (a \bullet 100) \]

in two \[ \left( 1-P_1 \right) \left( \left( 1-P_2 \right) c + 100 \right) + P_2 (a \bullet 100) \]

Consider three Period Bond

in one \[ \left( 1-P_1 \right) c + P_1 (a \bullet 100) \]

in two \[ \left( 1-P_1 \right) \left( \left( 1-P_2 \right) c + P_2 a \bullet 100 \right) \]

in three \[ \left( 1-P_1 \right) \left( 1-P_2 \right) \left( c + 100 \left( 1-P_3 \right) \right) + P_3 a \bullet 100 \]
B. Including state taxes

State taxes are deductible at federal lever. Therefore, effective rate is \( t_s \cdot \left( 1 - \frac{t}{g} \right) \)

Also note cash flows are changed because of capital loss if bankrupt

Consider One Period Bond

\[
E[\text{cf}(1)] = (1 - P_1) \left[ ct_s (1 - \frac{t}{g}) + 100 \right] + P_1 \frac{a \cdot 100}{1 - a} + P_1 (1 - a)(100) t_s \left( 1 - \frac{t}{g} \right)
\]

tax saving on capital loss
Consider Two Period Bond

in one

\[
\left(1 - P_1\right) c t s \left(1 - t_g\right) + P_1 \left(a \cdot 100\right) + P_1 \left(1 - a\right) 100 t_s \left(1 - t_g\right)
\]

in two

\[
\left(1 - P_1\right) \left[\left(1 - P_2\right) c t s \left(1 - t_g\right) + 100\right] + P_2 \left(a \cdot 100\right)
\]

\[
+ P_2 \left(1 - a\right) 100 t_s \left(1 - t_g\right)
\]

If options use

\[ V_{\text{opt}} = V_{\text{no opt}} + \text{option value} \]