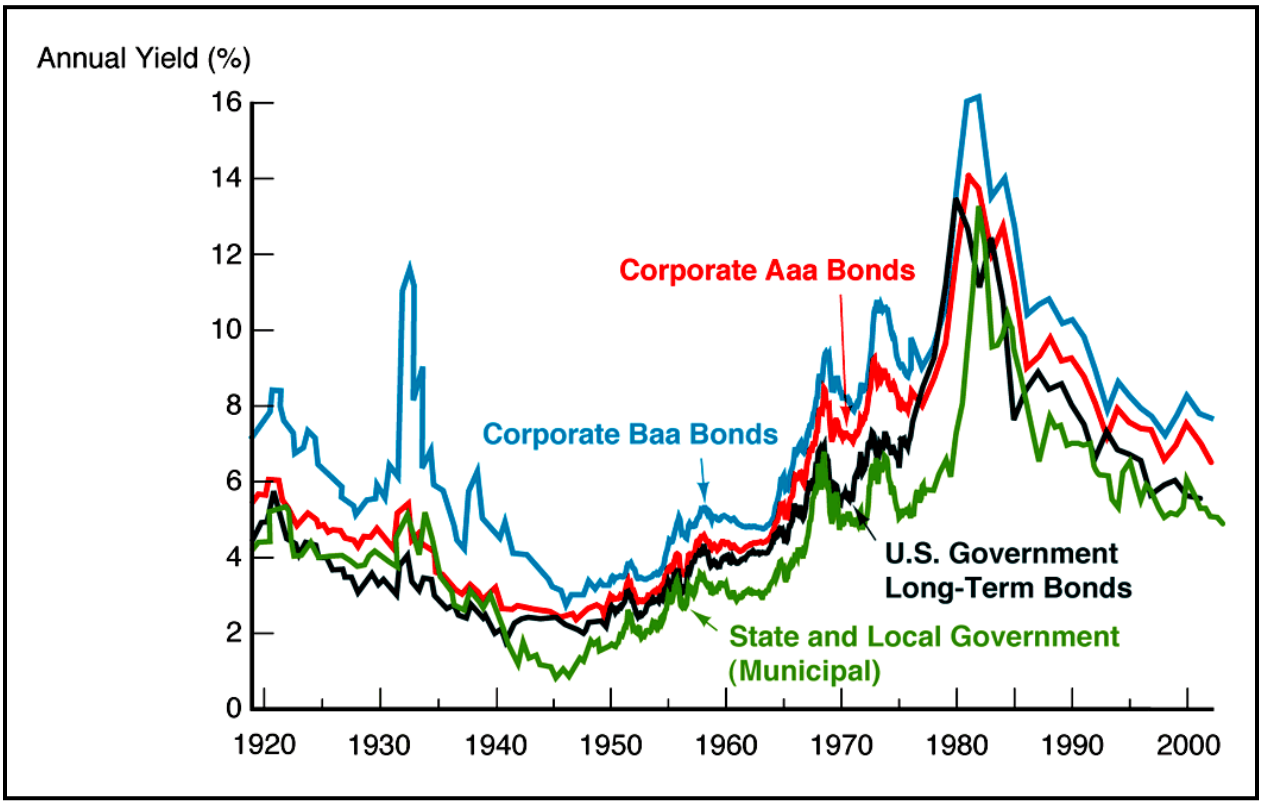
Chapter 6 – The Risk and Term Structure of Interest Rates

Risk structure of interest rates



Bonds with the same maturity have different interest rates due to:

1) ***Default risk***: probability that the issuer of a bond is unable or unwilling to make interest payments or pay off the face value

    - U.S. Treasury bonds are considered default free

    - ***Risk premium***: the spread between the interest rates on bonds with default risk and the interest rates on (same maturity) Treasury bonds

Response to an Increase in Default Risk on Corporate Bonds – Supply/Demand Application

2) ***Liquidity***: the relative ease with which an asset can be converted into cash
    - Cost of selling a bond
    - Number of buyers/sellers in a bond market

3) ***Income tax considerations***
    Interest payments on municipal bonds are exempt from federal income taxes.

Bond (credit) Ratings and Risk

- Moody's and Standard and Poor's

Ratings Groups

- Investment Grade
- Non-Investment – Speculative Grade

S&P	Moody's	What it means
AAA	Aaa	Highest quality and creditworthiness
AA	Aa	Slightly less likely to pay principal + interest
A	A	Strong capacity to make payments, upper medium grade
BBB	Baa	Medium grade, adequate capacity to make payments
BB	Ba	Moderate ability to pay, speculative element, vulnerable
B	B	Not desirable investment, long term payment doubtful
CCC	Caa	Poor standing, known vulnerabilities, doubtful payment
CC	Ca	Highly speculative, high default likelihood, known reasons
C	C	Lowest rated class, most unlikely to reach investment grade
D		Already defaulted on payments
NR		No public rating has been requested
+ or -	& 1,2,3	Within-class refinement of AA to CCC ratings

Credit Ratings and Historical Default Frequencies

Moody's Rating	1985	1990	1995	2000	2006	2008	2009	2010
Aaa	0%	0%	0%	0%	0%	0%	0%	0%
Aa	0%	0%	0%	0%	0%	0%	0%	0%
A	0%	0%	0%	0%	0%	1.201%	0%	0.36%
Baa1	0%	0%	0%	0.29%	0%	0.271%	1.144%	0%
Baa2	0%	0%	0%	0%	0%	0.794%	0.74%	0%
Baa3	0%	0%	0%	0.98%	0%	0.321%	0.70%	0%
Ba1	0%	2.67%	0%	0.91%	0%	0%	2.27%	0%
Ba2	1.63%	2.82%	0%	0.66%	0.51%	0%	0.60%	0%
Ba3	3.77%	3.92%	1.72%	0.99%	0%	2.715%	4.01%	0%
B1	4.38%	8.59%	4.35%	3.63%	0.66%	1.783%	4.10%	0.85%
B2	7.41%	22.09%	6.36%	3.84%	0.50%	0.825%	8.68%	0%
B3	13.86%	28.93%	4.10%	11.72%	1.93%	3.198%	8.52%	0.56%

Default Risk – Price and YTM

Suppose there is a company called FlimFlam that issues one-year, 4% coupon bond, FV=$100. Suppose risk-free rate is 4%

- If risk free, the price of the FlimFlam bond is

Suppose there is 5% probability FlimFlam goes bankrupt in which you get nothing

Expected Value of FlimFlam bond payment			
Possibilities	**Payoff**	**Probability**	**Payoff x probability**
Full payment			
Default			

From the above table, you expect to receive $98.80 one-year from now.

- Discount at risk-free rate =
- Yield =
- Default Risk Premium = rate – risk-free rate

We can calculate the probability of repayment from the interest rates.

- Let $1+k$ be the return on a one-year corporate debt and $1+ i$ be the return on a one-year default risk-free treasury.
- The probability of repayment is $(1+i)/(1+k) = p$
- the probability of default is $1 – p$
- The probability of repayment:

Suppose 10% probability FlimFlam goes bankrupt

Expected Value of FlimFlam bond payment			
Possibilities	**Payoff**	**Probability**	**Payoff x probability**
Full payment			
Default			

From the above table, you expect to receive $93.60 one-year from now.

- Discount at risk-free rate =
- Yield =
- Default risk premium =

➔ Increased risk reduces bond demand.

Remember: Bond Yield = U.S. Treasury Yield + Default Risk Premium
OR Risk spread or default risk premium = Bond Yield - U.S. Treasury Yield