

Principles of Finance

Prof. Dr. Dennis A. V. Dittrich

2014

Guest Lecture: Urban Economics

On Friday December 12th we will have a lecture of Dr. Wendland and discussion afterwards with the topic **Urban Economics** (room Berlin from 10.00 to 12.30)

In particular Dr. Wendland will focus on the real estate market in Berlin, its development and some methods of real estate evaluation.

In the coming term (Spring 2015) Dr. Wendland is going to teach two classes at Touro with the focus on Real Estate Y **Real Estate Management** and **Urban Economics**

Attendance is mandatory

Quizzes as Homework

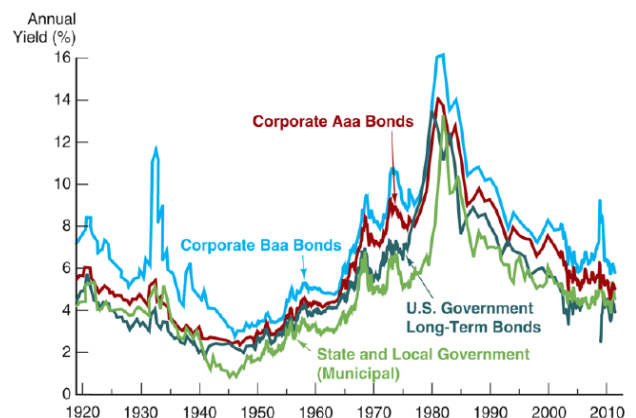
You are encouraged to hand in the solution to the problem sets jointly in groups of up to three students. Every member of the group should be able to explain their solution if asked to do so.

<http://economicscience.net/content/principles-finance-2014>

First problem set due on Dec. 11th, beginning of lecture.

Long-Term Bond Yields, 1919-2011

Risk Structure of Interest Rates



Risk Structure of Interest Rates

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

- ▶ Default risk
- ▶ Liquidity
- ▶ Tax considerations

Risk Structure of Interest Rates

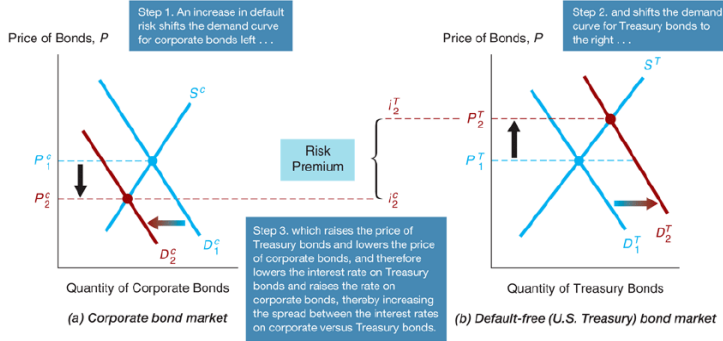
Default risk probability that the issuer of the bond is unable or unwilling to make interest payments or pay off the face value

- ▶ U.S. Treasury bonds are considered default free (government can raise taxes).

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

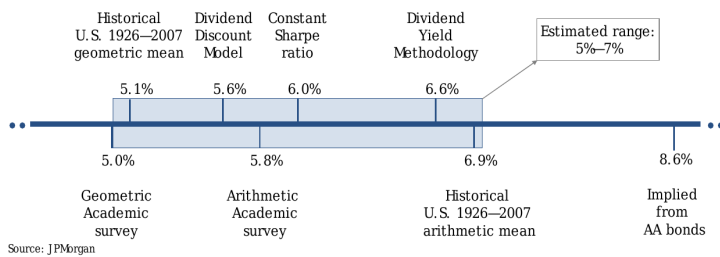
- ▶ the risk premium refers to the amount by which an asset's expected rate of return exceeds the risk-free interest rate
- ▶ the market (risk) premium is the historical difference in return of the market over the risk-free interest rate
- ▶ the equity (risk) premium is the return of a portfolio over the risk-free rate required by an investor

Response to an Increase in Default Risk on Corporate Bonds



Risk premiums on corporate bonds are usually anti-cyclical, that is, they decrease during business cycle expansions and increase during recessions. Why?

Estimate(s) of the Market Risk Premium



- ▶ the MRP reflects a broader outlook on the whole economy
- ▶ the expected return of an asset is often expressed as a function of the MRP:
Expected return on an asset = Risk-free rate of return + β * market risk premium

Capital Asset Pricing Model: β

- ▶ An asset's β is a measure of co-movement and relative risk

$$\beta_i = \frac{\rho_{im}\sigma_i}{\sigma_m}$$

where

- ρ_{im} the correlation between returns on the asset i and the market portfolio
- σ_i standard deviation of returns on asset i
- σ_m the standard deviation of returns on the market portfolio

Bond Ratings by Moody's, Standard and Poor's, and Fitch

| Moody's | Rating S&P | Fitch | Definitions |
|---------|------------|-------|---------------------------------|
| Aaa | AAA | AAA | Prime Maximum Safety |
| Aa1 | AA- | AA- | High Grade High Quality |
| Aa2 | AA | AA | |
| Aa3 | AA- | AA- | |
| A1 | A+ | A+ | Upper Medium Grade |
| A2 | A | A | |
| A3 | A- | A- | |
| Baa1 | BBB+ | BBB+ | Lower Medium Grade |
| Baa2 | BBB | BBB | |
| Baa3 | BBB- | BBB- | |
| Ba1 | BB+ | BB+ | Noninvestment Grade Speculative |
| Ba2 | BB | BB | |
| Ba3 | BB- | BB- | |
| B1 | B- | B- | Highly Speculative |
| B2 | B | B | |
| B3 | B- | B- | |
| Caa1 | CCC+ | CCC | Substantial Risk |
| Caa2 | CCC | --- | In Poor Standing |
| Caa3 | CCC- | --- | |
| Ca | --- | --- | Extremely Speculative |
| C | --- | --- | May Be in Default |
| --- | --- | DDD | Default |
| --- | --- | DD | --- |
| --- | D | D | --- |

Junk Bonds

- ▶ Junk Bonds have a rating of Baa / BBB and worse
- ▶ They are referred to as **Junk** in that they are very risky investments, but provide high yields to investors who buy them at very low prices and are therefore compensated with a high risk premium.

Risk Structure of Interest Rates

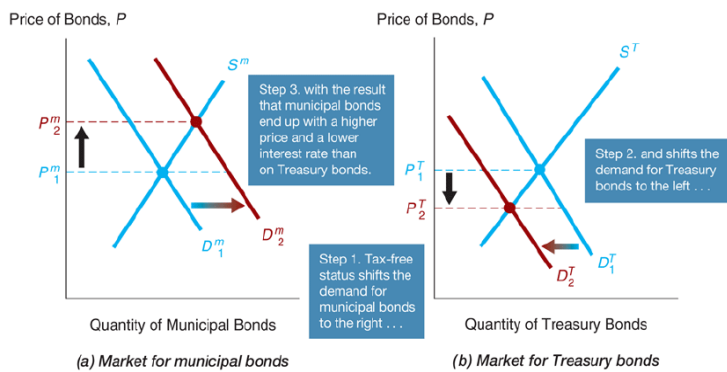
Liquidity the relative ease with which an asset can be converted into cash

- ▶ Cost of selling a bond
- ▶ Number of buyers/sellers in a bond market

Income tax considerations Interest payments on municipal bonds are exempt from federal income taxes. [USA]

Which should have the higher risk premium on its interest rate, a corporate bond with a Moody's Baa rating or a corporate bond with a C rating? Why?

Interest Rates on Municipal and Treasury Bonds



Predict what will happen to interest rates on a corporation's bonds if the government guarantees today that it will pay creditors if the corporation goes bankrupt in the future. What will happen to the interest rates on Government securities?

Term Structure of Interest Rates

- ▶ Bonds with identical risk, liquidity, and tax characteristics may have different interest rates because the time remaining to maturity is different

Yield curve a plot of the yield on bonds with differing terms to maturity but the same risk, liquidity and tax considerations

Upward-sloping long-term rates are above short-term rates

Flat short- and long-term rates are the same

Inverted long-term rates are below short-term rates

Observations that the Theory of the Term Structure of Interest Rates Must Explain

1. Interest rates on bonds of different maturities move together over time



Observations that the Theory of the Term Structure of Interest Rates Must Explain

2. When short-term interest rates are low, yield curves are more likely to have an upward slope; when short-term rates are high, yield curves are more likely to slope downward and be inverted
3. Yield curves almost always slope upward

Three Theories to Explain the Three Facts

Expectations theory explains the first two facts but not the third

Segmented markets theory explains fact three but not the first two

Liquidity premium theory combines the two theories to explain all three facts

Expectations Theory

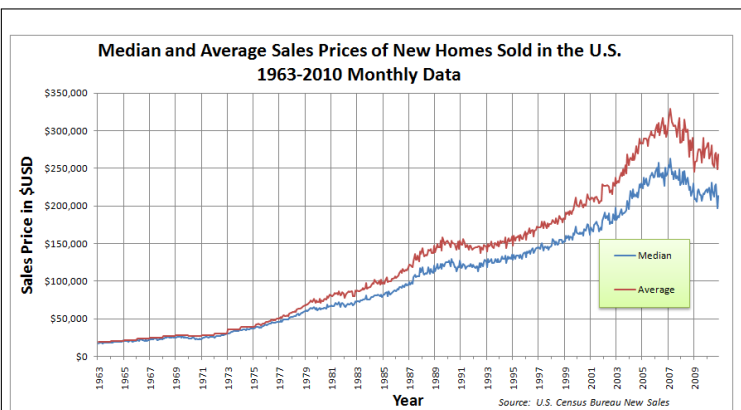
- ▶ The interest rate on a long-term bond will equal an average of the short-term interest rates that people expect to occur over the life of the long-term bond
- ▶ Buyers of bonds do not prefer bonds of one maturity over another; they will not hold any quantity of a bond if its expected return is less than that of another bond with a different maturity
- ▶ Bond holders consider bonds with different maturities to be perfect substitutes

Expectations Theory: Example

- ▶ Let the current rate on one-year bond be 6%.
- ▶ You expect the interest rate on a one-year bond to be 8% next year.
- ▶ Then the expected return for buying two one-year bonds (first one and after it matures the second) averages $(6\% + 8\%)/2 = 7\%$.
- ▶ The interest rate on a two-year bond must be 7% for you to be willing to purchase it.

True, False, or Uncertain?

According to the expectation theory of the term structure of interest rates, it is better to invest on one-year bonds, reinvested over two years, than to invest in a two year bond, if interest rates on one-year bonds are expected to be the same in both years. T



- ▶ numbers of foreclosures in USA began to increase in 2006
- ▶ USA housing prices began declining in early 2007: Begin of the Great Recession

Yield curve and expectations

- Upward-sloping** Investors expect the economy to grow in the future, this growth is associated with a greater expectation that inflation will rise in the future rather than fall, and, consequently, interest rates to go up in the future:
long-term rates are above short-term rates
- Flat** Investors have no clear prediction about the future development of the economy:
short- and long-term rates are the same
- Inverted** Investors expect the economy will slow or even decline in the future; a predictor of economic recession:
long-term rates are below short-term rates

Expectations Theory

- ▶ Explains why the term structure of interest rates changes at different times
- ▶ Explains why interest rates on bonds with different maturities move together over time (observation 1)
- ▶ Explains why yield curves tend to slope up when short-term rates are low and slope down when short-term rates are high (observation 2)
- ▶ Cannot explain why yield curves usually slope upward (observation 3)

Segmented Markets Theory

- ▶ Bonds of different maturities are not substitutes at all
- ▶ The interest rate for each bond with a different maturity is determined by the demand for and supply of that bond
- ▶ Investors have preferences for bonds of one maturity over another
- ▶ If investors generally prefer bonds with shorter maturities that have less interest-rate risk, then this explains why yield curves usually slope upward (observation 3)

If bond investors decide that 30-year bonds are no longer as desirable an investment, predict what will happen to the yield curve, assuming

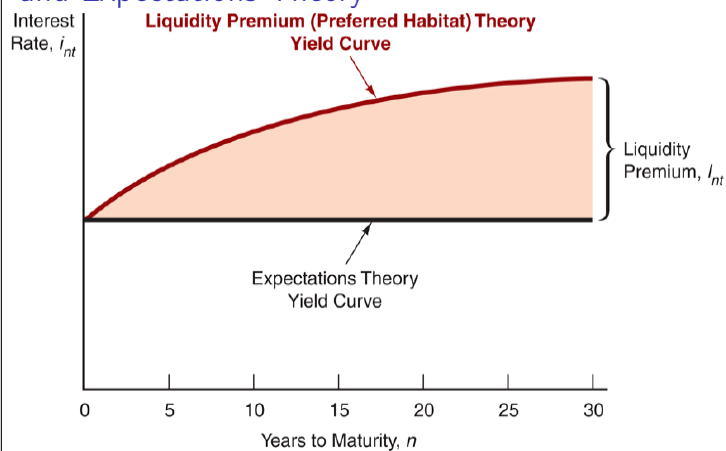
- the expectation theory of the term structure holds.
- the segmented markets theory of the term structure holds.

Liquidity Premium & Preferred Habitat Theories

Liquidity Premium Theory The interest rate on a long-term bond will equal an average of short-term interest rates expected to occur over the life of the long-term bond plus a liquidity premium that responds to supply and demand conditions for that bond

- Preferred Habitat Theory** Bonds of different maturities are partial (not perfect) substitutes
- ▶ Investors have a preference for bonds of one maturity over another
 - ▶ They will be willing to buy bonds of different maturities only if they earn a somewhat higher expected return
 - ▶ Investors are likely to prefer short-term bonds over longer-term bonds

The Relationship Between the Liquidity Premium and Expectations Theory



Liquidity Premium and Preferred Habitat Theories

$$i_{nt} = \frac{i_t + i_{t+1}^e + i_{t+1}^e i_{t+2}^e + \dots + i_{t+n-1}^e}{n} + l_{nt}$$

where l_{nt} is the liquidity premium for the n -period bond at time t ; it is always positive and rises with the term to maturity

- ▶ Interest rates on different maturity bonds move together over time; explained by the first term in the equation
- ▶ Yield curves tend to slope upward when short-term rates are low and to be inverted when short-term rates are high; explained by the liquidity premium term in the first case and by a low expected average in the second case
- ▶ Yield curves typically slope upward; explained by a larger liquidity premium as the term to maturity lengthens

Calculate the liquidity premium for each multi-year bond using the below expected future one-year bond interest rates, as well as the current interest rates on multi-year bonds.

| Year | 1-Year Bond Rate | Multi-Year Bond Rate |
|------|------------------|----------------------|
| 1 | 2% | 2% |
| 2 | 3% | 3% |
| 3 | 4% | 5% |
| 4 | 6% | 6% |