

Finance 4000

Money and Capital Markets

Fourth class

- Duration and Interest-rate Risk of Bonds

- What is the relationship between duration and the price of a bond?

- $$\text{Proportional } \Delta P_b \approx -\text{Duration} \frac{\Delta i}{1+i}$$

- Proportional ΔP_b is the *proportional* change in the price of a bond

- Δi be the change in the interest rate

- Example

- Suppose that the duration of a bond is 10 years and the yield to maturity is 5 percentage points per year

- A increase in i by 1 percentage point is associated with a proportional decrease in the price of the bond by 0.097 or 9.7 percent [10·0.01/1.05 multiplied by 100 to get the percentage change]

- * The bond loses the fraction 0.097 of its value or 9.7 percent

- Simplify by using modified duration
 - Modified duration = duration / (1+i)
 - ~~Equation 12.10~~ ~~Modified Duration~~
 - If i in percentage points then can think of percentage change in price
 - If modified duration is 10 years, an increase in i by 1 percentage point per year is associated with a 10 percent fall in price
 - Need not concern ourselves with level of the interest rate to compute effect of change in yield on price if given modified duration

- The Determination of the Interest Rate
 - Loans and bonds
 - Borrowing and lending
 - Demand and supply
- The demand for loans and the supply of loans determine the equilibrium interest rate and quantity of loans
- The Demand for Loans — borrowers
 - The *quantity demanded* of loans is the amount that borrowers want to borrow
 - Households, firms and the government
 - The *demand* for loans is the relationship between the amount that borrowers want to borrow and the interest rate on loans
 - In short, the *demand* for loans is the relationship between the *quantity demanded* of loans and the interest rate
 - The *demand curve* for loans is the curve showing the relationship between the *quantity demanded* of loans and the interest rate on loans

- We will suppose that a higher interest rate on loans implies that households want to borrow less
- This implies that the demand curve is downward sloping
- What else affects the demand for loans?

- Variable	Effect on demand
- Expected inflation rate	+
- Expected return on other assets	+
■ Investment opportunities	
- Government deficits	+
- Other variables could be added such as	
■ Income in the future relative to today	

- $L^d = f^d(i, \text{Expected inflation},$

-
+

 $\text{investment opportunities, government deficit,..})$

+
+

L^d is the quantity of loans demanded

- Supply of loans — lenders
 - In the economy, ultimately households
 - Households supply funds to banks and other financial intermediaries
 - Households own firms
 - Households pay taxes that fund government
 - The *quantity supplied* of loans is the amount that lenders want to lend
 - The *supply* of loans is the relationship between the amount of loans that lenders want to lend and the interest rate on loans
 - In short, the *supply* of loans is the relationship between the *quantity supplied* of loans and the interest rate
 - The *supply curve* of loans is the curve showing the relationship between the *quantity supplied* of loans and the interest rate on loans
 - We will suppose that, the higher the interest rate, the more lenders want to lend

- This implies that the supply curve is upward sloping
- What else affects the supply of loans?

	Variable	Effect on demand
-	Wealth	+
-	Expected return on other assets	-
-	Expected inflation rate	-
-	Riskiness of loans	-
-	Other variables could be added such as	
	■ Income in the future relative to today	
	■ Taxes	

- $L^s = f^s(i, \underset{-}{\text{Wealth}}, \underset{+}{\text{Expected return on other assets}}, \underset{-}{\text{Expected inflation}}, \underset{-}{\text{Riskiness of loans}}, \dots)$

L^s is the quantity of loans demanded

- Equilibrium
 - Definition: Quantity of loans demanded equals the quantity supplied
$$L^d=L^s$$
 - Only at that interest rate can borrowers and lenders both be doing what they want
- Effect of changes in demand and supply
- Effect of an increase in the expected inflation rate
- Effect of an increase in the government deficit

- The demand and supply of bonds

- Fixed promised payments

- $$P_{bt} = \frac{CP_{t+1}}{1+i}$$

- CP_{t+1} is constant, P_{bt} and i change

- A higher interest rate implies a lower price

- The Demand for Bonds — buyers of bonds -- lenders

- The *quantity demanded* of bonds is the amount that buyers want to hold

- In the economy, ultimately households

- Households supply funds to banks and other financial intermediaries

- Households own firms

- Households pay taxes that fund government

- The *demand* for bonds is the relationship between the amount of bonds that households want to hold and the price of bonds
 - In short, the *demand* for bonds is the relationship between the *quantity demanded* of bonds and the price of bonds
 - The *demand curve* for bonds is the curve showing the relationship between the *quantity demanded* of bonds and the price of the bonds
- We will suppose that a higher price of bonds implies that households want to hold fewer bonds
 - A higher price of bonds means that you pay more now for the same number of dollars in the future
- This supposition means that the demand curve is downward sloping

- What else affects the demand for bonds?

- Variable	Effect on demand
- Wealth	+
- Expected return on other assets	-
- Expected inflation rate	-
- Riskiness of bonds	-
- Other variables could be added such as	
■ Income in the future relative to today	
■ Taxes	

- $B^d = f^{B^d}(P_b, \textit{Wealth}, \textit{Expected return on other assets},$
- + -
Expected inflation, Riskiness of bonds, ...)
- -

B^d is the quantity of bonds demanded

- Supply of bonds — issuers, borrowers
 - households, firms and the government
 - The *quantity supplied* of bonds is the amount that borrowers want to create
 - The *supply* of bonds is the relationship between the amount of bonds that borrowers want to create and the price of the bonds
 - In short, the *supply* of bonds is the relationship between the *quantity supplied* of bonds and the price of bonds
 - The *supply curve* of bonds is the curve showing the relationship between the *quantity supplied* of bonds and the price of bonds
 - We will suppose that, the higher the price, the more issuers want to create
 - This implies that the supply curve is upward sloping

- The supply of bonds in the short run