

Econ 252 - Financial Markets

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Problem Set 3

Question 1

Consider a standard coupon bond that matures 25 years from today. The principal value of the contract is \$10,000, and the coupon rate is 7%.

("Standard" refers to a non-callable bond contract.)

- (a) If the yield of the bond is 5%, what is the price of the bond today if the coupon is paid annually with the first coupon payment occurring twelve months from now?
- (b) If the yield of the bond changes to 8%, what is the new price of the bond if the coupon is paid annually with the first coupon payment occurring twelve months from now?
- (c) Repeat parts (a) and (b) for the case that the coupon is paid semiannually with the first coupon payment occurring six months from now.
- (d) Consider the coupon bond whose coupons occur annually and whose yield is 5%, i.e. the contract that you used in part (a). Suppose you wanted to create a discount bond with the same maturity, the same yield, and the same price as the coupon bond. What would the principal value of this discount bond have to be?

Question 2

Consider a consol that pays \$50 every year with the first payment occurring twelve months from now and suppose that its yield is 3.5%.

(a) Compute the price of this consol bond today.

(b) If instead of annual payments of \$50, the consol bond pays \$25 semiannually with the first payment occurring six months from now, what is its price today?

Now, imagine that, instead of a consol bond, the contract has the form of an annuity that pays \$50 every year for 30 years with a 3.5% yield. The annuity's first payment will be twelve months from now.

(c) Compute the price of this annuity today.

(d) If instead of annual payments of \$50, the annuity pays \$25 semiannually with the first payment occurring six months from now, what is its price today?

Question 3

Suppose that you have a standard coupon bond with principal value \$500 that matures in 10 years. The coupon rate is 4% and the coupon is paid semiannually with the first coupon payment occurring six months from now.

("Standard" refers to a non-callable bond contract.)

(a) If the price of the coupon bond is \$520.94, is the yield approximately equal to 2%, 3.5%, or 4.5%?

(Hint: One of these three yield values is the correct answer. You actually only need to compute the value of the payment stream for one of these yield values. Even if you did not pick the correct yield for your computation, you can argue which yield is the correct answer.)

For parts (b) and (c), the maturity of the above coupon bond will change. The coupon rate remains at 4% and the coupon payments are still semiannually with the first coupon payment occurring six months from now.

(b) If the coupon bond matures in 5 years and its price is \$560.00, is the yield approximately equal to 1.5%, 3%, or 5%?

(Hint: One of these three yield values is the correct answer.)

(c) If the coupon bond matures in 15 years and its price is \$472.94, is the yield approximately equal to 1%, 4%, or 4.5%?

(Hint: One of these three yield values is the correct answer. You actually do not need any calculations at all for this part.)

(d) Using your answers for parts (a) through (c), sketch the yield curve of the coupon bond. Is the yield curve positive, inverted, or flat?

Question 4

For this question, please use the 6-month convention for interest rates.

Suppose that the annualized 6-month spot rate today is 4% and that the annualized 18-month spot rate today is 6%.

- (a) Compute the (annualized) forward rate between 6 and 18 months.
- (b) Assume that you will collect \$ a ($a > 0$) 6 months from now and describe an investment strategy for this amount of money that allows you to replicate the forward rate (known today) from part (a). Importantly, you are only allowed to use the two spot rates given above.
- When describing your investment strategy, carefully describe the steps that you take today and the consequences that these steps will have at any future moment in time.
- (c) What is today's expectation of the 12-month spot rate 6 months from now according to the Pure Expectations Theory?
- (d) The Liquidity Theory (of the term structure of interest rates) casts doubt on the way by which today's expectation of the 12-month spot rate 6 months from now is determined according to the Pure Expectations Theory. What is the key feature of the Liquidity Theory and what decomposition of forward rates does it suggest?

Suppose that, in addition to the two spot rates above, you are given the annualized 5-year spot rate 8%.

- (e) Compute the (annualized) forward rate between 6 months and 5 years.

QUESTION 4 CONTINUES ON THE NEXT PAGE.

CONTINUATION OF QUESTION 4.

- (f) Analogous to part (b), describe an investment strategy that allows you to replicate the forward rate (known today) from part (e) and that only involves spot rates.

- (g) Compute the (annualized) forward rate between 18 months and 5 years.

Question 5

Consider an imaginary Corporation X whose stock is publicly traded at the New York Stock Exchange. The value of its assets is \$100,000,000 and the value of its liabilities is \$70,000,000, according to its last quarterly filing with the SEC (Form 10-Q).

- (a) What is the value of X's shareholders equity according to its last quarterly filing?
- (b) Suppose that there are 5,000,000 shares of Corporation X that trade at \$15 per share. What is X's market capitalization?
- (c) According to your answers to parts (a) and (b), would you consider buying all shares of Corporation X to liquidate it?
- (d) Imagine that X issues a bond contract that is worth \$1,000,000 and keeps the proceeds without re-investing them. What is the new value of X's assets, liabilities, and shareholder equity?
- (e) Ignore the issuance in part (d). Now, imagine that X issues new shares that are worth \$5,000,000 and keeps the proceeds without re-investing them. What is the new value of X's assets, liabilities, and shareholders equity?