

Midterm (75 minutes)

No calculators allowed; if calculations are needed, write the explicit equation(s), identifying the variables. Do not write “ $Y = aX$ ; solve for  $X$ .” You can write “ $100 = 10X$ ; solve for  $X$ .” BE SURE TO EXPLAIN YOUR REASONING. If you want extra time, you can buy time at a price of 1 point a minute; for example, if your test is handed in 10 minutes after the scheduled finish time, 10 points will be subtracted from your test score.

1. In May 1992, a Japanese newspaper, *The Nikkei Weekly*, reported that Japanese life insurance companies traditionally “had concentrated on high-coupon bonds, disregarding those with coupon rates of less than 6%.” Why would any rational investor buy a bond with a 4% coupon when they could buy an equally risky bond with an 8% coupon?
2. In many state lotteries, the grand prize carries over to the next drawing if there is no winner. In 1992 the Virginia grand prize grew to \$27 million. A ticket cost \$1 and would win the grand prize if the buyer correctly picked 6 of 44 numbers, 1 to 44, not necessarily in order. An Australian syndicate attempted to purchase all 7,059,052 possible ticket combinations in order to ensure that it would win the lottery. It was only able to buy 5,000,000 tickets, but it did win the \$27 million jackpot, paid in 20 annual installments of \$1,350,000 beginning immediately. What was the implicit annual rate of return on its investment?
3. How would the Expectations Hypothesis explain the fact that when the Fed buys short-term Treasury bills there is generally a much larger effect on short-term interest rates than on long-term interest rates?

4. Professor Smith has bought yet another house and is comparing 15-year and 30-year fixed-rate amortized mortgages at 4 percent. Without doing any calculations,
  - a. Which loan has the higher monthly payments?
  - b. Which loan has the higher unpaid balance after 5 years?
  - c. Which loan has the higher total payments over the length of the loan?
  - d. If the mortgage is paid off after 5 years, which loan's stream of payments (including the unpaid balance after 5 years) has the higher present value at a 4 percent required return?
  - e. If the mortgage is paid off after 5 years, which loan's stream of payments (including the unpaid balance after 5 years) has the higher present value at a 10 percent required return?
5. Consider a company that has 1 million shares outstanding, assets of  $A = \$100$  million, and a profit rate of  $\rho = 15\%$ , so that it will earn \$15 million in profits during the coming year,  $E = \$15$  million. The company always retains one-third of its earnings for investment in new assets and uses the remainder to pay dividends at the end of each year. It has no debt and its assets increase each year by the amount of retained earnings. Its market price is always equal to its fundamental value. The shareholders' required rate of return is 10%. What is the value of Tobin's  $q$ ?
6. Use the economic value added model to estimate the value of the firm described in Exercise 5.

7. How much leverage would you have if you took \$40,000 out of your savings account to make a \$40,000 down payment and borrowed \$280,000 in order to buy a \$320,000 house?
  
8. A local banker recently said that he has a very low-interest variable-rate mortgage on his home, but he is concerned that interest rates may rise: “It will take at least a few years for this economy to return to a level where the Fed can raise rates significantly without killing the economy.” His strategy is to “reduce the principal as fast as I can while my rate is low so that if interest rates go up, at least the principal I am paying the higher rate on will be lower and hence the overall interest paid over the life of the loan will be pretty low—in fact lower than the rate I could get now if I refinanced at a fixed rate.” Evaluate this strategy.
  
9. In 1993, Walt Disney Co. issued 100-year bonds with 7.5% coupons and 7.5% yields to maturity. Morgan Stanley (the investment bank handling this issue) estimated that “if long-term yields...were to rise one percentage point, investors in the Disney bond would have a total return of negative 4.19% over the [first] year. If long-term rates were to fall one percentage point, however, the total return would be nearly 23%.”
  - a. Did this bond initially sell at a premium or discount from par value?
  
  - b. Estimate the duration of this bond, without using a complicated mathematical formula for the duration.
  
10. For an up-front fee of \$79 a year, you can get free two-day shipping on almost all Amazon products. Explain why this description of sunk costs is incorrect: “Because we’ve essentially paid shipping in advance, it becomes a sunk cost—so to make it a good deal, we try to amortize our investment [reduce the average cost of each purchase] by making more purchases on the site.”