

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. At age 55, Jones bought a \$1 million life insurance policy for \$3,000 a year for 15 years, payable annually beginning on the day Jones signed the policy. He did not die during the policy period. How much money would Jones have had after 15 years if, instead of buying the insurance policy, he had invested \$3,000 each year, earning a 10% annual return? (Just set up.)
  
2. A 2016 *Los Angeles Times* article reported that California’s largest public pension fund CalPERS had a disappointing year, in that the CalPERS “bond portfolio saw a particularly dramatic uptick of 9.3%, ... but the same factors that drove up the value of bonds cost CalPERS in other areas, specifically its stock investments, which make up more than half of the pension fund’s portfolio and lost 3.4% for the year.” Explain why this story either does or does not make sense.
  
3. *Bloomberg Businessweek* reported that Russians can get loans through an ATM: “The interest rate is 2 percent a day, which works out to 730 percent on an annualized basis.”
  - a. How did they get the 730 percent number?
  
  - b. What is the effective annual interest rate, taking into account daily compounding and assuming 365 days in a year?

4. The economic value added (EVA) model says that firms create value for their stockholders by earning profits that exceed the stockholder's required return. Suppose that a firm has no debt and that all earnings are paid out as dividends. It has assets  $K$  that earn an annual rate of return  $\rho$ , and shareholder's required rate of return is  $R$ . Which of these equations for the value of the firm is most consistent with EVA analysis?

Explain your reasoning.

- a.  $V = (\rho K - RK)/R$
- b.  $V = K + (\rho K - RK)/R$
- c.  $V = K$
- d.  $V = \text{sum of } (\rho K - RK)$

5. Explain why you either agree or disagree with this plan: "I have a \$500,000, 3% mortgage on my million-dollar house and \$2 million in my IRA. I am going to use some of my IRA money to pay off my mortgage."

6. In his senior theses, a Pomona economics major investigated the relationship between inflation and interest rates by estimating the following equation using monthly data for the 20-year period 1996 through 2015:

$$R = 15.98 - 0.067P, \quad R^2 = 0.66$$

[25.26] [21.29]

where  $R$  = interest rate on 1-year Treasury bonds,  $P$  = consumer price index (CPI), and the  $t$ -values are in parentheses. What advice would you give this student?

7. Explain the logic behind Louis Rukeyser's observation that, "Almost invariably, the higher the yield [the ratio of a stock's dividend to its price] the lower the growth."

8. The [Motley] Fool School:

*Imagine you're looking at a newfangled invention called the "dollar machine." Once a year, for ten years, it spits out a brand-new dollar bill. How would you value this contraption?... Let's say you expect a rate of return equal to the stock market's historic rate of about 11 percent growth per year. If so, you might decide to pay just \$3.52 for the machine. \$3.52 invested for ten years earning 11 percent annually becomes \$10 [that is,  $\$3.52(1.11)^{10} = \$10$ ].*

Carefully explain why, if you have an 11% required return, you would pay (a) \$3.52, (b) more than \$3.52, or (c) less than \$3.52 for this dollar machine. Do not make any calculations to answer this question.

9. Critically evaluate: "I was doing a barbell strategy, with half my money invested in 1-year zeros with a 1% interest rate and half in 29-year zeros with a 3% interest rate. Then I realized that I could get a higher return with the same duration by investing all my money in 15-year zeros with a 2.5% interest rate."

10. A portfolio manager wrote that he looks at stocks as, "infinite-duration bonds with rising coupons.... When you think of it in those terms, you realize they're going to be affected by a rise in interest rates." Is the duration of a stock that pays growing dividends forever infinite? Explain your reasoning.