

## Second Midterm Exam

Fall 2019

Econ 180-367

Closed Book.

Formula Sheet Provided. Calculators OK.

Time Allowed: 1 Hour 15 minutes

All Questions Carry Equal Marks

1. (20 points) Suppose that you buy a bond with a 2% coupon rate (annual rate with semiannual compounding) and with a \$100 face value and a time to maturity of 3 years. The bond costs \$100.  
(a) What is the duration of this bond at the time that you buy it?  
(b) You sell the bond after 6 months for \$99. What is your holding period return over the 6 month period (not annualized)?

2. (10 points) Today the one-year Treasury yield is 2 percent and the two-year Treasury yield is 1.9 percent. Both of these numbers are annual interest rates with annual compounding. What is the forward rate from one to two years hence?

3. (10 points) Consider a zero-coupon bond with a maturity of ten years. The face value of the bond is \$100 and the price of the bond today is \$40. What is the yield-to-maturity on this bond (using semiannual compounding)?

4. (20 pts) Consider the following data for a one-factor economy. All portfolios are well diversified.

Portfolio	Expected Return	Beta
A	12%	1.2
B	?	1
F	6%	0

(a) According to APT, what is the expected return on portfolio B?

(b) Suppose that another portfolio, portfolio E, is well diversified with a beta of 2 and an expected return of 15%. Would an arbitrage opportunity exist? If so, what would be the arbitrage strategy?

5. (10 points). Suppose that Remsen Enterprises earnings will be 2 dollars per share next year, and the retention rate is 50%. Earnings will grow at a 3 percent annual rate forever. The required rate of return on Remsen Enterprises stock is 5 percent. According to the dividend discount model, what is the market price of Remsen shares today?

6. (30 points) Multiple Choice Questions.

(i) Which of the following is the most standard annual fee structure for hedge funds?

- A. 2 percent of the value of the assets and 1 percent of the profits.
- B. 1 percent of the value of the assets and 2 percent of the profits.
- C. 20 percent of the value of the assets and 2 percent of the profits.
- D. 2 percent of the value of the assets and 20 percent of the profits.
- E. 2 percent of the value of the assets and 2 percent of the profits.

(ii) Which of the following the best definition of preferred stock?

- A. A stock with extra voting rights.
- B. A stock that can be bought by international investors.
- C. A stock that pays dividends even if the firm is in bankruptcy.
- D. A stock that pays twice the dividend paid to ordinary shareholders.
- E. A stock that pays a fixed dividend as long as ordinary shareholders are receiving any dividends.

(iii) Which of the following is the best definition of TIPS securities, as discussed in class?

- A. A Treasury security that pays principal and coupon tied to inflation.
- B. A Treasury security marketed to international investors.
- C. A bond with a floating interest rate.
- D. A municipal bond that is senior to other municipal bonds in default.
- E. A hybrid debt-equity financial instrument.

(iv) Which of the following best describes the US Treasury yield curve over the last 50 years?

- A. The yield curve has typically been downward sloping. The occasions when it was upward sloping came just before bursts of inflation.
- B. The yield curve has typically been upward sloping. The occasions when it was downward sloping came just before bursts of inflation.
- C. The yield curve has typically been downward sloping. The occasions when it was upward sloping came when the federal funds rate was unusually high.
- D. The yield curve has typically been upward sloping. The occasions when it was downward sloping came just before recessions.
- E. The yield curve has typically been downward sloping. The occasions when it was upward sloping came just before recessions.

(v) Which of the following is the best definition of a closed end fund?

- A. A mutual fund which last for a fixed time period.
- B. A mutual fund where the number of shares is fixed.
- C. A mutual fund where shares can only be redeemed by selling them to the manager.
- D. A mutual fund where large investors can cancel the shares and obtain the underlying securities.
- E. A mutual fund investing only in US securities.

(vi) Which of the following five bonds has the longest duration?

- A. A 10 year bond with a 2 percent coupon rate.
- B. A 10 year bond with a 5 percent coupon rate.
- C. A 10 year bond with a 10 percent coupon rate.
- D. A 30 year bond with a 3 percent coupon rate.
- E. A 30 year bond with a 2 percent coupon rate.

(vii) You buy a US Treasury bond with a 2% annual coupon rate for settlement 92 days since the last coupon. There are 184 days between the last and the next coupon. The clean price is \$101. What is the dirty price?

- A. \$100.00.
- B. \$100.50.
- C. \$101.00.
- D. \$101.50.
- E. \$102.00.

(viii) Researchers have found that stock returns tend to be predictably higher in January than in other months of the year. Which of the following best characterizes the implication of this finding for the efficient markets hypothesis (EMH)?

- A. It is evidence in favor of all forms of the EMH.
- B. It is evidence in favor of the semi-strong form of the EMH.
- C. It is evidence in favor of the strong form of the EMH.
- D. It is evidence against the weak form of the EMH.
- E. It is evidence against the semi-strong form of the EMH.

(ix) Which of the following is the name given to the phenomenon where investors try to avoid investments in which they do not know the odds of different outcomes?

- A. Ambiguity aversion.
- B. Prospect theory.
- C. Anchoring.
- D. Loss aversion.
- E. The leverage cycle.

(x) Suppose that the one-year interest rate is 2 percent, the two-year interest rate is 2.5 percent, and that the expectations hypothesis of the term structure holds. What must be the approximate expected one-year interest rate be in one years time?

- A. 1 percent.
- B. 1.5 percent.
- C. 2 percent.
- D. 3 percent.
- E. 4 percent.

## Solutions with grading rubric

1. (a) The duration is:

$$0.5 \frac{1}{100} \frac{1}{1.01} + 1 \frac{1}{100} \frac{1}{1.01^2} + 1.5 \frac{1}{100} \frac{1}{1.01^3} + 2 \frac{1}{100} \frac{1}{1.01^4} + 2.5 \frac{1}{100} \frac{1}{1.01^5} + 3 \frac{1}{100} \frac{101}{1.01^6} = 2.93$$

The duration is 2.93 years.

15 points for part (a).

7 points if you do it correctly but forget to include the principal repayment for the last term.

7 points for forgetting to divide weights by price.

10 points for incorrectly treating the coupon and/or discount rate as 2 percent every 6 months.

13 points for a purely arithmetic error.

(b)  $\frac{99-100+1}{100} = 0$ . 5 points for part (b). No partial credit.

2. The precise answer is

$$\frac{1.019^2}{1.02} - 1 = 0.018$$

or 1.8%. Simply writing  $(2*1.9)-(2*1)=1.8\%$  is also acceptable. No partial credit.

3. The yield solves  $\frac{100}{(1+\frac{r}{2})^{20}} = 40$ . This means  $r = 2 * [(\frac{100}{40})^{1/20} - 1] = 9.38\%$ . This is the annualized

yield, which is what I was looking for. I accepted half this, as the yield per 6 months, as correct. 5 points for incorrectly using annual compounding.

4. (a) Since the beta for portfolio F is zero, its expected return must equal the risk-free rate. From the APT from portfolio A:

$$0.12 = 0.06 + 1.2\lambda$$

which means that  $\lambda = 0.05$ . Now for portfolio B, the expected return must be  $0.06 + \lambda = 0.06 + 0.05$ , which is 11%. 5 points for part (a).

(b) The expected return on portfolio E must be  $0.06 + 2\lambda = 0.06 + 0.1 = 0.16$ . Since we are told that the expected return is 15%, an arbitrage opportunity exists. Here is an arbitrage strategy.

1. Invest -\$100 in E. Payoff is  $-100*(1.15+2F)$

2. Invest +\$200 in B. Payoff is  $200*(1.11+F)$

3. Invest -\$100 in the risk-free asset. Payoff is  $-106$ .

The up-front cost is zero. The payoff is  $-115 - 200F + 222 + 200F - 106 = 1$

and so the investor makes \$1 for sure. That's an arbitrage. A similar arbitrage strategy could be executed using well-diversified portfolio A instead of well-diversified portfolio B. 15 points for part (b).

5. Dividends next year should be \$1. The price should be  $\frac{D_1}{k-g} = \frac{1}{0.05-0.03} = \frac{1}{0.02} = \$50$

8 points for putting 1.03 in the numerator; the questions said that it was the dividend next year.

5 points for putting 2 in the numerator.

3 points for making both of the above mistakes at once.

Other mistakes, like trying to put retention rate in the denominator: no credit.

- 6. (i). D.
- (ii). E.
- (iii). A.
- (iv). D.
- (v). B.
- (vi). E.
- (vii). D.
- (viii). E.
- (ix). A.
- (x). D.