

## Second Midterm Exam

Fall 2018

Econ 180-367

Closed Book.

Formula Sheet Provided. Calculators OK.

Time Allowed: 1 Hour 15 minutes

All Questions Carry Equal Marks

1. (15 points) You invest \$100 in a bond that sells at par and has a coupon rate of 4% (paid semiannually; with semiannual compounding) and a remaining time to maturity of 3 years? What is the duration of this bond?

2. (10 points) Today, the one-year Treasury yield is 2 percent, the two-year Treasury yield is 2.4 percent, and the three-year yield is 2.8 percent. All of these numbers are annual interest rates with annual compounding. If the Expectations Hypothesis is correct, what is the expected one-year Treasury yield **two** years from today?

3. (20 points) Consider a zero-coupon bond with a maturity of ten years. The face value of the bond is \$1,000 and the price of the bond today is \$400.

(a) What is the yield-to-maturity on this bond (using semiannual compounding)?

(b) Suppose that in one years time, the price of the bond rises to \$450. What is the holding period return on this bond over this year?

4. (20 points) Suppose that the economy is described by the APT model with a single factor. The risk-free rate is 4 percent. X and Y are two well-diversified portfolios with the following returns:

Portfolio	Beta	Expected Return
X	1	9%
Y	2	10%

Is there an arbitrage opportunity? If so, what exactly is it?

5. (10 points). Wyman enterprises has dividends that grow at 10 percent per annum. Dividends per share will be \$5 *next* year. The required return is 15 percent. What price should a share of Wyman enterprises sell for today?

6. (30 points)

(i) Which of the following statements is correct of Treasury and corporate bonds that are currently trading?

A. All Treasury bonds are callable, but no corporate bonds are callable.

B. All corporate bonds are callable, but no Treasury bonds are callable.

C. Many Treasury and corporate bonds are callable.

D. No Treasury or corporate bonds are callable.

E. No Treasury bonds are callable while many (but not all) corporate bonds are callable.

(ii) Studies of liquidity spreads in security markets, as discussed in class, have shown that:

- A. Liquid stocks earn higher returns than illiquid stocks.
- B. Illiquid stocks earn higher returns than liquid stocks.
- C. Both liquid and illiquid stocks earn the same returns.
- D. Illiquid stocks are good investments for frequent, short-term traders.
- E. None of the above are true.

(iii) How many US corporations currently have AAA credit ratings from Standard and Poors?

- A. 2.
- B. 15.
- C. 46.
- D. 251.
- E. Over 500.

(iv) Which of the following is the DV01 of a bond?

- A. How much the price of the bond rises when the interest rate falls by a basis point.
- B. How much the price of the bond falls when the interest rate falls by a basis point.
- C. A regulatory filing with the SEC when a bond is first issued.
- D. A method for default valuation of a bond used for accounting purposes by the SEC.
- E. A method for default valuation of a bond used for accounting purposes by Standard and Poors.

(v) Loss aversion refers to the phenomenon where:

- A. Investors are risk averse about gains and losses.
- B. Investors are risk averse about losses but risk seeking about gains.
- C. Investors are risk seeking about losses but risk averse about gains.
- D. Investors try to avoid investments in which they do not know the odds of different outcomes.

(vi) Based on the discussion in class, firms with bad earnings announcements tend to:

- A. Underperform the market on the day of the earnings announcement only.
- B. Underperform the market on the days before the earnings announcement and the day of the earnings announcement only.
- C. Underperform the market on the day of the earnings announcement and the days after the earnings announcement only.
- D. Underperform the market on the days before the earnings announcement and the days after the earnings announcement, but not on the announcement day itself.
- E. Underperform the market on the days before the earnings announcement, the day of the earnings announcement and the days after the earnings announcement.

(vii) Which of the following is closest to the current ten-year TIPS yield:

- A. 1 percent.
- B. 3 percent.
- C. 5 percent.
- D. 8 percent.
- E. 20 percent.

(viii) In March 2000, 3Com announced that at the end of that year, it would give their shareholders 1.5 shares in Palm for each 3Com share they owned. After the announcement, the price of a share in 3Com was \$81.11. The price of a share of Palm was \$95.06. Which of the following is the implied arbitrage strategy?

- A. Buy 1 share in Palm and short 1.5 shares in 3Com.
- B. Buy 1 share in 3Com and short 1.5 shares in Palm.
- C. Buy 1.5 shares in Palm and short 1 share in 3Com.
- D. Buy 1.5 shares in 3Com and short 1.5 shares in Palm.

(ix) A perpetuity pays coupons of \$2 per year and the yield is 4 percent per annum (with annual compounding). What is the price of this perpetuity?

- A. \$50.
- B. \$64.
- C. \$100.
- D. \$128.
- E. \$200.

(x) The clean price for a U.S. Treasury bond is \$101. The settlement date is 91 days since the last coupon date and 91 days before the next coupon date. The coupon rate is 4 percent per annum. Which of the following is the dirty price of the bond?

- A. \$97
- B. \$99
- C. \$100
- D. \$102
- E. \$103

## Solutions with grading rubric

1. Because it trades at par, the face value of the bond is equal to the price, which is \$100. The duration is:

$$0.5 \frac{1}{100} \frac{2}{1.02} + 1 \frac{1}{100} \frac{2}{1.02^2} + 1.5 \frac{1}{100} \frac{2}{1.02^3} + 2 \frac{1}{100} \frac{2}{1.02^4} + 2.5 \frac{1}{100} \frac{2}{1.02^5} + 3 \frac{1}{100} \frac{102}{1.02^6} = 2.86$$

The duration is 2.86 years.

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 discount rate as 4 percent every 6 months.

2. The precise answer is

$$\frac{1.028^3}{1.024^2} - 1 = 0.036$$

or 3.6%. Simply writing  $(3 \cdot 2.8) - (2 \cdot 2.4) = 3.6\%$  is also acceptable.

3. (a) The yield solves  $\frac{1000}{(1 + \frac{r}{2})^{20}} = 400$ . This means  $r = 2 * [(\frac{1000}{400})^{1/20} - 1] = 9.38\%$ . This is the

annualized yield, which is what I was looking for. I accepted half this, as the yield per 6 months as correct.

(b) Since there are no coupons, the holding period return is  $\frac{450 - 400}{400} = 12.5\%$ .

10 points for each part. No credit on part (b) for people who added in imaginary coupons in working out the holding period return: it is a zero coupon security.

4. Yes there is. There has to be because you cannot have both

$$9 = 4 + \lambda$$

and

$$10 = 4 + 2\lambda$$

Here is the arbitrage.

- Go long \$100 in portfolio X.
- Short \$50 in portfolio Y.
- Borrow \$50 at the riskfree rate.

The investment costs nothing up front. The total payoff is

$$100 * (1.09 + F) - 50 * (1.10 + 2F) - 52 = 109 - 55 - 52 = \$2$$

which is an arbitrage.

5 points if you say go long X and short Y without giving specific amounts.

No credit for doing the arbitrage backwards.

5. The price should be  $\frac{D_1}{k - g} = \frac{5}{0.15 - 0.1} = \frac{5}{0.05} = \$100$

6. (i) E.

(ii) B.

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