

First Midterm Exam

Fall 2018

Econ 180-367

Closed Book.

Formula Sheet Provided. Calculators OK.

Time Allowed: 1 hour 15 minutes

Please write your answers on the page below each question

1. (15 pts) A stock costs \$10 today and in one year it will be worth \$7, \$13 or \$16, each with equal probability. The stock pays no dividends. What is the variance of the holding period return?

2. (10 points) Suppose that the CAPM holds and that General Motors, the market portfolio, and the risk-free asset have the following characteristics.

Asset	Expected Return
General Motors	8%
Market Portfolio	14%
Risk-Free Asset	2%

What is the beta of General Motors shares?

3. (15 points) Suppose that there are two risky assets: A and B, with the following properties.

	Expected Return	Standard Deviation
Asset A	0.07	0.2
Asset B	0.12	0.4

The risk-free rate is 4 percent, and assets A and B are uncorrelated. What is the portfolio of A and B that maximizes the Sharpe ratio? (please give the weight on each asset)

4. (10 points) Suppose that a firm has an equity beta of 0.9. It has \$200 million in debt and \$100 million in equity. There are no taxes. What is the unlevered beta of the firm?

5. (10 points) Sue's utility function is $w^{1/2}$ where w is wealth in dollars. Sue is offered an asset which has a 20% chance of being worth \$100 and an 80% chance of being worthless. What is the certainty equivalent of this gamble for Sue?

6. (10 points) An investor has a mean-variance utility function of the form $E(r) - \frac{A}{2}\sigma^2$ where $E(r)$ is expected return and σ^2 is the variance of returns. She is forming an optimal portfolio combining a risk-free asset and a risky asset, with Sharpe ratio 0.4. The standard deviation of the risky asset is 0.2. Her risk aversion, A , is 5. What weight does she put on the risky asset?

7. (30 points) Multiple choice questions. Only one option is correct. Please indicate which one it is.

(i) Which of the following best describes the income tax treatment of interest on Treasuries and municipal securities?

- A. Treasury interest is subject to state and local tax and municipal interest is subject to federal tax.
- B. Treasury interest is not subject to state and local tax, but municipal interest is subject to federal tax.
- C. Treasury interest is subject to state and local tax, but municipal interest is not subject to federal tax.
- D. Treasury interest is not subject to state and local tax and municipal interest is not subject to federal tax.
- E. Treasury interest is not subject to state and local or federal income tax.

- (ii) Which of the following best describes average returns on portfolios of stocks
- A. Stocks with large market cap have **higher** average returns than stocks with low market cap, and stocks with high book-to-market ratios have **higher** average returns than stocks with low book-to-market ratios.
 - B. Stocks with large market cap have **higher** average returns than stocks with low market cap, and stocks with high book-to-market ratios have **lower** average returns than stocks with low book-to-market ratios.
 - C. Stocks with large market cap have **lower** average returns than stocks with low market cap, and stocks with high book-to-market ratios have **higher** average returns than stocks with low book-to-market ratios.
 - D. Stocks with large market cap have **lower** average returns than stocks with low market cap, and stocks with high book-to-market ratios have **lower** average returns than stocks with low book-to-market ratios.
 - E. Market cap and book-to-market ratios are irrelevant for the average return on stocks.

(iii) What is the longest maturity of Treasury bills trading?

- A. 3 months.
- B. 1 year.
- C. 2 years.
- D. 10 years.
- E. 30 years.

(iv) Which of the following best describes the federal funds market?

- A. Uncollateralized loans between banks.
- B. Loans between banks collateralized by Treasuries.
- C. Uncollateralized loans from the Treasury to banks.
- D. Loans between banks collateralized by federal agency securities.
- E. Uncollateralized loans between US government agencies.

(v) The effective annual rate on an investment is 6.8 percent. What is the annual percentage return with quarterly compounding (four times a year)?

- A. 2.86 percent
- B. 6.63 percent
- C. 6.58 percent
- D. 6.92 percent
- E. 7.45 percent

(vi) Under regulation T, if you want to short \$100,000 in stock, what initial margin will you have to post?

- A. \$10,000.
- B. \$25,000.
- C. \$30,000.
- D. \$50,000.
- E. \$100,000.

(vii) Which of the following statements is true for a risk averse investor?

- A. The certainty equivalent of any gamble is less than its expected value and utility is a concave function of wealth.
- B. The certainty equivalent of any gamble is less than its expected value and utility is a convex function of wealth.
- C. The certainty equivalent of any gamble is equal to its expected value and utility is a convex function of wealth.
- D. The certainty equivalent of any gamble is greater than its expected value and utility is a concave function of wealth.
- E. The certainty equivalent of any gamble is greater than its expected value and utility is a convex function of wealth.

(viii) Which of the following is the annual standard deviation of stock index (S&P500) returns?

- A. 2 percent
- B. 4 percent
- C. 7 percent
- D. 10 percent
- E. 16 percent

(ix) If you buy a Treasury bill maturing 180 days after settlement for \$9,900, the quoted interest rate is:

- A. 0.5 percent.
- B. 1 percent.
- C. 1.01 percent.
- D. 2 percent.
- E. 2.02 percent.

(x) Which of the following is the current ratio of marketable Federal government debt outstanding to annual GDP?

- A. 0.8.
- B. 1.5.
- C. 2.5.
- D. 4.0.
- E. 8.0.

Solutions with Grading Rubric

1. The holding period returns are -0.3, 0.3 and 0.6 in the three scenarios. The expected holding period return is $-\frac{0.3}{3} + \frac{0.3}{3} + \frac{0.6}{3} = 0.2$. The variance is

$$\frac{(-0.3-0.2)^2}{3} + \frac{(0.3-0.2)^2}{3} + \frac{(0.6-0.2)^2}{3} = 0.14$$

So the variance of holding period returns is 14%.

2 points off for a purely algebraic mistake, defined as writing down the correct answer and then simplifying it incorrectly. 10 points for mixing up standard deviation and variance or for replacing probabilities with squared probabilities in the definition of variance. 5 points for getting the expected return but not the variance.

2. The expected return on GM is $8 = 2 + \beta * [14 - 2]$. Solving this gives $\beta = 0.5$.

3. The weight on asset A should be:

$$\frac{0.03 * 0.4 * 0.4}{0.03 * 0.4 * 0.4 + 0.08 * 0.2 * 0.2} = 0.6$$

and the weight on asset B should be 0.4.

Some students mixed up returns with excess returns or mixed up standard deviation with variance. If the answer was otherwise correct, 10 points. 2 points off for a purely algebraic mistake.

4. Unlevered Beta = $\frac{E}{E + D}$ * Levered Beta = $\frac{1}{1 + 2} * 0.9 = 0.3$.

No credit for using the wrong formula. 2 points off for a purely algebraic mistake, defined as writing down the correct answer and then simplifying it incorrectly. For example writing that "levered beta is $0.9/3=0.4$ " is treated as an algebraic mistake. Writing that levered beta is $3*0.9=2.7$ or $0.9/2=0.45$ is treated as wrong, with no credit.

5. The certainty equivalent solves

$$C^{1/2} = 0.2 * 100^{1/2} + 0.8 * 0^{1/2} = 2$$

and so $C = 4$.

No credit for writing the equation without the square roots (that's not expected utility). 2 points off for a purely algebraic mistake.

6. The weight is $\frac{SR}{A\sigma} = \frac{0.4}{5 * 0.2} = 0.4$.

7. (i) D.

(ii) C.

(iii) B.

(iv) A.

(v) B.

(vi) D.

(vii) A.

(viii) E.

(ix) D.

(x) A.

3 points per component.