First Midterm Exam

Fall 2021 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) John's utility function is $-\frac{1}{W}$ where W is her wealth. John has no wealth to start.

(a) What is John's coefficient of relative risk aversion?
(b) John is offered a gamble that gives $250 with probability 0.25 and $75 otherwise. What is the certainty equivalent of this gamble for John?

2. (5 pts) An asset pays an investor $5 in one year from now and another $105 in two years. The effective annual interest rate (EAR) is 5%. What is the present value of this asset?

3. (15 points) Suppose that there are two stocks: X and Y. Stock X has a standard deviation of 40%. Stock Y has a standard deviation of 50%. The correlation between the stocks is 0.5. I form a portfolio with a weight of ¾ in X and ¼ in Y. What is the standard deviation of the portfolio return?

4. (15 points) Suppose that there are two risky assets: A and B, with the following properties.

	Expected Return	Standard Deviation
Asset A	0.08	0.2
Asset B	0.12	0.4

The risk-free rate is 4 percent, and assets A and B have covariance 0.02. What is the portfolio of A and B that maximizes the Sharpe ratio? (please give the weight on each asset)

5. (10 points) Suppose that the CAPM holds and that Stock A, the market portfolio, and the risk-free asset have the following characteristics.

Asset	Expected Return	Standard Deviation
Stock A	9%	45%
Market Portfolio	13%	25%
Risk-Free Asset	3%	0%

What is the beta of stock A?

6. (10 points) Suppose that Pfizer stock costs $40. You buy 1,000 shares for a total price of $40,000, but you buy the stock using a margin loan, borrowing $20,000. The initial margin is 50% and the maintenance margin is 25%.

(a) At what price for Pfizer stock do you first have to post additional margin?
(b) Suppose that the price of Pfizer stock plunges to $15 immediately after you buy it. How much margin do you have to post?

7. (30 points) Multiple choice questions. Only one option is correct. Please indicate which one it is.
(i) In money markets, which of the following best describes the Eurodollar market?
A. The market in collateralized interbank loans denominated in dollars but based in London.
B. The market in uncollateralized interbank loans denominated in dollars but based in London.
C. The market in Treasury securities based in Europe.
D. The market in collateralized interbank loans denominated in euros but based in New York.
E. The market in European government debt based in the United States.

(ii) In money markets, which of the following best describes a repurchase agreement
A. An agreement by a company to buy back stock issued in an Initial Public Offering.
B. A promise by an underwriter to buy any bonds that are not sold to the public in an Initial Public Offering.
C. An option that a company has to buy back commercial paper before maturity.
D. An agreement to sell an asset today and but it back tomorrow at whatever the market price turns out to be tomorrow.
E. An agreement to sell an asset today and buy it back tomorrow at a different price that is agreed today.

(iii) Which of the following statements is **not** correct?
A. APT assumes that investors are risk averse.
B. APT assumes that investors prefer more wealth to less.
C. APT allows the return generating process to have more than one common factor.
D. APT assumes that the return generating process is a linear factor model.
E. APT assumes that short sales are allowed.

(iv) A Treasury bill trades at a quoted interest rate of 1 percent and a maturity of 180 days from now. The face value is $10,000. What is the price that you will pay for this bill?
A. $9,800.00.
B. $9,900.00.
C. $9,990.99.
D. $9,950.00.
E. $9,950.37.

(v) Consider a single factor model with APT. X and Y are two well diversified portfolios. The risk-free rate is 4 percent. The expected return on portfolio X is 10 percent. The factor beta of portfolio X is 1 and the factor beta of portfolio Y is ½. What is the expected return on portfolio Y?
A. 4 percent
B. 6 percent
C. 7 percent
D. 10 percent
E. 13 percent

(vi) What is the current minimum tick size on the New York Stock Exchange?
A. 1 cent.
B. 2 cents.
C. 6.125 cents.
D. 12.5 cents.
E. 1 dollar.

(vii) Which of the following is closest to the US CPI inflation rate over the 12 months ending in August 2021.
A. -1 percent
B. 1 percent
C. 2 percent
D. 4 percent
E. 7 percent.

(viii) A firm has an equity (levered) beta of 0.5. It's assets are $100 million and it's debt is $80 million. What is it's asset (unlevered) beta?
A. 0.1
B. 0.4.
C. 0.6.
D. 1.
E. 2.5.

(ix) An investor is deciding how to allocate $1,000 between Treasury bills (return: 10 basis points) and a stock index (expected return: 4.1 percent with standard deviation of 20 percent). The investor has the utility function $E(r)-\sigma^2$ where $E(r)$ is the expected portfolio return and σ^2 is the portfolio variance. How much will this investor put in stocks?
A. $1,000
B. $500
C. $400
D. $200
E. $100

(x) Stock A has an expected return of 10% and a standard deviation of 20%. The market expected return is 8% and the market standard deviation is 16%. If the CAPM is right, which of the following can be the beta of stock A?
A. 0.5
B. 0.9
C. 1.1
D. 1.5
E. Any of these betas are possible.

Solutions

1. (a). $U'(W) = \frac{1}{W^2}$ and $U''(W) = -\frac{2}{W^3}$ so the coefficient of relative risk aversion is 2.

(b) The certainty equivalent, CE, solves $-\frac{1}{CE} = -\frac{0.25}{250} - \frac{0.75}{75} = -0.011$. Solving this gives the certainty equivalent of \$90.91.

8 points for (a) and 7 for (b). 2 off for an algebra mistake. In part (a), 2 off for flipping the sign of risk aversion (-2) and 4 off for using the wrong formula.

2. $\frac{5}{1.05} + \frac{105}{1.05^2} = 100$

2 points off for a purely algebra error.

3. The variance of the portfolio return is $\frac{9}{16} * 0.4^2 + \frac{1}{16} * 0.5^2 + 2 * \frac{3}{4} * \frac{1}{4} * 0.4 * 0.5 * 0.5 = 0.143125$. So the standard deviation of the portfolio return is 37.8%.
12 points for algebra mistake only. 8 points for writing out a version of the covariance formula but with a specific mistake. 11 points for incorrectly putting a minus on the last term. No points for a major error in the formula, like omitting the covariance term altogether.

4. The weight on asset A is $\frac{0.04 * 0.16 - 0.08 * 0.02}{0.04 * 0.16 + 0.08 * 0.04 - 0.12 * 0.02} = \frac{2}{3}$ and so the weight on asset B is 1/3.

12 points for an algebra mistake. 8 points for putting expected returns in place of expected excess returns.

5. The standard deviations are irrelevant. The beta solves the equation $9 = 3 + \beta(13 - 3)$ and so beta is 0.6.

No credit if you get the CAPM equation wrong. 8 points for algebra mistake.

6. (a) Solve the equation $\frac{1000P - 20000}{1000P} = 0.25$ which corresponds to P=26.67.

(b) Solve the equation $\frac{15000 + M - 20000}{15000} = 0.25$ which corresponds to M=8,750

5 points per part. 4 points per part if you wrote out the equation but made an algebra mistake, or if you put the original price in the denominator (which would get you $30 for (a) or $15,000 for (b)). 2 points on the second part if you wrote $3,750 (which is doesn't take account of the fact that you are underwater). No credit on the first part if you work on a margin of 50%, because that's not the additional maintenance margin. No credit for other answers.

7. (i) B.
(ii) E.
(iii) A.
(iv) D.
(v) C.
(vi) A.
(vii) D.
(viii) A.
(ix) B.
(x) C.
3 points per component.

In (x), the answer I was looking for was C. A and B cannot be right because the expected return on the stock is above the expected market return and so the beta must be above 1. D cannot be right because the variance of stock A must be at least as big as β^2 times the variance of market returns. But it was a bit confusing because C implies a negative riskfree which is possible (and happens) but odd. As I concluded that this was a rather confusing question, I gave everyone credit for (x) regardless of how they answered.