

Investment Management Final

A

“I pledge my honor that I have not violated the Stern Code of Conduct in the completion of this examination.”

Full Name: _____

NetID: _____

- The exam will last one hundred and ten minutes.
- Total points: 100.
- We highly encourage you to manage your time.
- There are 15 multiple-choice questions, 4 true/false/uncertain questions, and 5 free-response questions.
- You are allowed a calculator.
- A formula sheet is provided on the next page.
- You may only use the blank scratch paper provided at the end of this exam packet.
- Please approximate calculations to two decimal points.

Spring 2026 - Redacted portfolio preview

Questions only - Versions A and B

Prepared collaboratively by the course teaching-fellow team.

Includes adapted course and practice materials.

Gray placeholders mark questions omitted from public release.

Only exam questions and formula sheets are included; blank scratch pages are omitted.

Original question numbers, variant order, and printed page numbers are retained.

Formula Sheet

Risk & Return	Portfolio Theory	Asset Pricing Models
Holding Period Returns $ann.HPR = \left(\frac{V(T)}{V(0)} \right)^{1/T} - 1$ $HPR = \frac{V(T)}{V(0)} - 1$ Expected Return $E[R] = p(1) \times R(1) + p(2) \times R(2) + \dots$ $= \sum_{s=1}^S p(s) \times R(s)$ Variance $Var[R] = \sigma^2 = p(1) \times (R(1) - E[R])^2 + p(2) \times (R(2) - E[R])^2 + \dots$ $= \sum_{s=1}^S p(s) \times (R(s) - E[R])^2$ Standard Deviation $StDev[R] = \sqrt{Var[R]} = \sigma$ Covariance $Cov[R_i, R_j] = \sigma_{ij}$ $= \sum_{s=1}^S p(s) \times (R_i(s) - E[R_i]) \times (R_j(s) - E[R_j])$ Correlation $Corr[R_i, R_j] = \rho_{ij} = \frac{cov[R_i, R_j]}{\sigma_i \sigma_j}$	2-Asset Portfolio Expected Return $E[R_p] = w_1 E[R_1] + w_2 E[R_2]$ 2-Asset Portfolio Variance $\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{12} \sigma_1 \sigma_2$ Risk-Free Asset Allocation (Expected Return) $E[R_p] = (1 - w)R_f + wE[R_i]$ $= R_f + w(E[R_i] - R_f)$ Risk-Free Asset Allocation SD $\sigma_p = w \sigma_i$ Capital Allocation Line $E[R_p] = R_f + \left[\frac{E[R_i] - R_f}{\sigma_i} \right] \sigma_p$ Gordon Growth Model $V_0 = \frac{(1 + g)D_0}{R - g} = \frac{E[D_1]}{R - g}$	Capital Market Line $E[R_p] = R_f + \left[\frac{E[R_M] - R_f}{\sigma_M} \right] \sigma_p$ Beta $\beta_i = \rho_{iM} \frac{\sigma_i}{\sigma_M} = \frac{cov[R_i, R_M]}{\sigma_M^2}$ $= \frac{\rho_{iM} \sigma_i \sigma_M}{\sigma_M^2}$ Security Market Line (CAPM) $E[R_i] = R_f + \beta_i (E[R_M] - R_f)$ Time-Series Regression (Alpha) $R_i - R_f = \alpha_i + \beta_i (R_M - R_f) + \epsilon_i$ Levered Beta (General) $\beta_E = \beta_A + (\beta_A - \beta_D) \frac{D}{E} \times (1 - T)$ Levered Beta ($\beta_D = 0$) $\beta_E = \beta_A \left[1 + \frac{D}{E} \times (1 - T) \right]$
Capital Budgeting	Options & Derivatives	
Net Present Value (NPV) $NPV = C_0 + \frac{C_1}{1 + R} + \frac{C_2}{(1 + R)^2} + \dots + \frac{C_T}{(1 + R)^T}$ Cash Flow Adjustments $CF = \text{Operating Revenues} - \text{Operating Costs}$ $- \text{Capital Expenditures} - \text{Income Taxes}$ Merger Synergy $PV(A + B) = PV(A) + PV(B) + \text{synergy}$	European Call Option Payoff at Expiration $C_T = \begin{cases} S_T - X & \text{if } S_T > X \\ 0 & \text{if } S_T \leq X \end{cases}$ European Put Option Payoff at Expiration $P_T = \begin{cases} 0 & \text{if } S_T \geq X \\ X - S_T & \text{if } S_T < X \end{cases}$ Put-Call Parity $\text{CALL premium} - \text{PUT premium} = \text{PV of (FX forward - FX strike)}$	

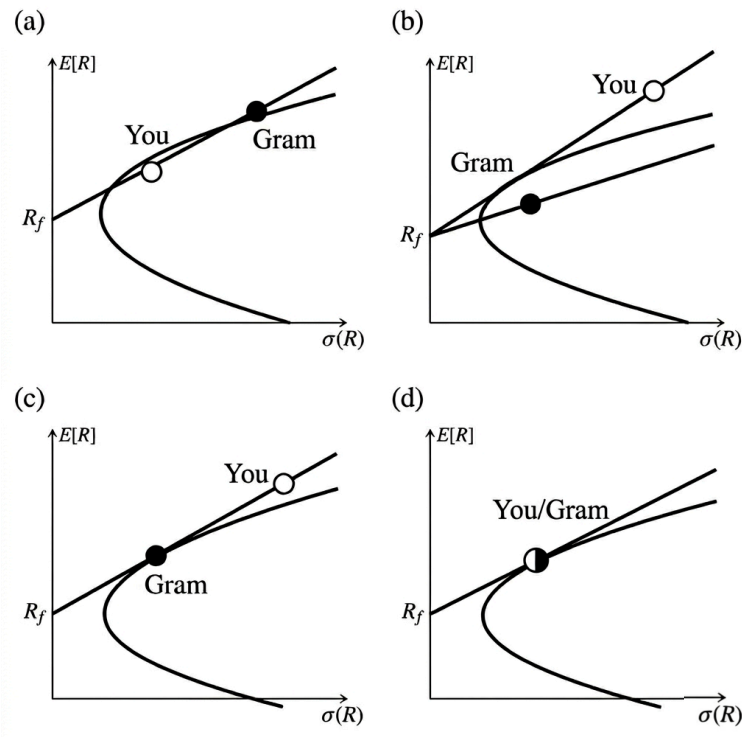
1 Multiple-Choice Questions

30 points.

1. [Question omitted from public preview]

2. [Question omitted from public preview]

3. You and your Grandma plot your portfolios on the Capital Market Line - and you prefer more risk than your Grandma. Assume CAPM assumptions and general investing advice hold. Which of the following graphs best represents your respective portfolios?



4. Suppose last year the market return was -36.55% . Which of the following investments do you expect did the best?
- Cash.
 - A single-stock position in a company in the Utilities industry.
 - A diversified investment in stocks in the Construction industry.
 - The S&P 500.
5. Suppose an investment in the SP500, with dividends reinvested, grows at an annualized rate of 8.15% . Suppose you invested 100 at the beginning of 2015 and reinvested all the dividends. What is the value of your portfolio in the beginning of 2021?
- $V_{2021} = \$100 * (1 + .0815 * 6)$
 - $V_{2021} = \$100 * (1 + .0815/6)^6$
 - $V_{2021} = \$100 * (1 + .0815)^6$
 - $V_{2021} = \$100 * (8.15)^6$

6. [Question omitted from public preview]

7. [Question omitted from public preview]

8. Suppose the CAPM-implied expected return on GameStart Inc is 25%, but in the data you find that the return is 30%. If the CAPM assumptions hold, which of the following statements is true?
- GameStart has a negative alpha. It is overpriced relative to the CAPM.
 - GameStart has a positive alpha. It is overpriced relative to the CAPM.
 - GameStart has a positive alpha. It is underpriced relative to the CAPM.
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9. Company A has an NPV of \$15M. It acquires Company B, and the merged company has an NPV of \$34M. If the synergy created has an NPV of \$3M, what was Company B's valuation?
- \$19M
 - \$15M
 - \$31M
 - \$16M
10. Company X trades at a Price-to-Earnings (P/E) ratio of 20x. It acquires Company Y, which trades at a P/E ratio of 10x, in an all-stock transaction. The market is perfectly efficient and accurately assesses that there will be absolutely zero economic synergies generated by this merger. Immediately following the completion of the deal, which of the following statements is most accurately true regarding the acquiring company's expected earnings per share?
- EPS will decrease, and the fundamental intrinsic value will decrease.
 - EPS will increase, and the fundamental intrinsic value will increase.
 - EPS will increase, but the fundamental intrinsic value will remain exactly the same.
 - EPS will remain unchanged, but the fundamental intrinsic value will increase.
11. How would you create a synthetic short stock position?
- Buy a call + short a put at the same strike price
 - Short a call + buy a put at the same strike price
 - Buy an at-the-money call + short an out-of-the-money put
 - Short an at-the-money call + buy an out-of-the-money put
12. An investor buys stock on margin. Over the next week, the stock price falls significantly. The investor receives a margin call from their broker. Which of the following actions would *satisfy the margin call*?
- Shorting the stock to hedge risk
 - Depositing additional funds or securities into the account
 - Borrowing more money from the broker to hold the position
 - Waiting for the stock price to recover

13. A project has the following cash flows: $-\$200$ at $t=0$, $+\$500$ at $t=1$, $-\$350$ at $t=2$. A colleague uses the IRR rule and finds an IRR of 25%, concluding the project should be accepted because the firm's cost of capital is 10%. Which of the following best explains why this conclusion may be unreliable?
- a. The IRR rule cannot be applied when the cost of capital is below 25%.
 - b. The NPV rule would always give the same answer as the IRR rule, so the conclusion is fine.
 - c. IRR ignores the scale of the project, making it unreliable for single-project decisions.
 - d. The project's cash flows change sign more than once, which can produce multiple IRRs.
14. Which is *NOT* true of private credit?
- a. It is primarily used to lend to distressed companies that cannot access traditional financing
 - b. There tends to be a cap on how much money investors in the fund can collect at once
 - c. It involves direct lending to companies outside the bond market
 - d. Private credit is typically provided by non-bank institutions
15. Evaluate the following statements about options.
- I. They are a type of future.
 - II. They separate cash flows from an underlying asset.
 - III. They are a type of derivative.
 - IV. All option positions have limited downside risk.
- Which of the following combinations is entirely correct?
- a. I only
 - b. II and IV
 - c. II and III
 - d. II, III, and IV
 - e. I, II, III, and IV

2 True/False/Uncertain

20 points. State True or False, and provide a clear written justification of 2–4 sentences. The justification is required for full credit.

1. [Question omitted from public preview]

2. [Question omitted from public preview]

[Redacted content]

3. [Question omitted from public preview]

[Redacted text block]

4. [Question omitted from public preview]

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3 Free-Response Questions

50 points.

1. **CAPM and Valuation.** You are trying to estimate the stock price for Ober Inc. The current risk-free rate is 2%, and the expected market return is 12%. The standard deviation of the market return is 20%, and the correlation between Ober's return and the market return is 0.80. Ober's own return standard deviation is 50%. Ober pays dividends once a year just before the new year.

(a) Assuming the CAPM holds, what is the expected return of Ober stock?

(b) Suppose that Ober pays an expected annual dividend of \$10 with zero growth. What is the price of the stock?

(c) Suppose instead that Ober pays an expected annual dividend of \$4 with annual growth rate of 10%. What is the price of the stock?

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- (d) An investor bought the stock of Ober at the beginning of 2015 when the expected dividend was \$10, just like in (b). At the beginning of 2016, the dividend unexpectedly changed to \$4 with 10% growth, like in (c). The investor sold the stock at the beginning of 2017. What was the annualized HPR of this investment? The investor kept the interim cash flows in a deposit account with 0% interest rates. When computing the sale price at the beginning of 2017, assume the new dividend model (from part c) has been reflected in prices since the beginning of 2016.

2. Portfolio Theory. The risk-free rate equals $R_f = 5\%$, and the return on the market portfolio has expectation $E[R_M] = 12\%$ and standard deviation $\sigma_M = 20\%$. Assume the CAPM assumptions hold.

(a) What is the equilibrium market risk premium? What is the Sharpe ratio of the market portfolio?

(b) Consider two assets with expected returns of 10% and 30% in a given year. What, if anything, can we say about the relative betas of these stocks?

(c) Consider two assets with return volatility of 50%. One asset has a beta of 1, the other a beta of 2. Which asset has a higher correlation with the market portfolio?

(d) An investor constructs a portfolio with 70% in the market portfolio and 30% in the risk-free asset. What is the Sharpe ratio of this portfolio? How does it compare to the Sharpe ratio of the market portfolio, and why?

- 3. Capital Budgeting.** For an outlay of \$8 million, you can purchase a tanker load of oil delivered to you in one year. Unfortunately, the net cash flow from selling the tanker load will be very sensitive to the growth rate of the world economy:

Slump = \$8M

Normal = \$12M

Boom = \$16 million

- (a) What is the expected cash flow? Assume the three outcomes for the economy are equally likely.

- (b) What is the expected rate of return on the investment in the project?

- (c) One share of stock Z is selling for \$10. The stock has the following payoffs after one year:

Slump = \$8

Normal = \$12

Boom = \$16

Calculate the expected rate of return offered by stock Z.

- (d) Calculate the project's NPV using the correct cost of capital. Is the project a good investment?

4. Options. 1) Identify which combination of META options or underlying stock best achieves the investor's objectives below. 2) Then, construct *profit* diagrams at expiration demonstrating the strategy.

- META currently trades at \$300; plot your diagrams between \$240 and \$360 in \$10 increments.
- At-the-money puts and calls cost \$30 each, the \$280 strike call costs \$40, and the \$320 strike call costs \$25.
- Calculate net profit assuming all positions are entered at current market prices, the risk-free interest rate is 0%, and there are no dividends.

(a) An investor wants to capture profits if META price declines and losses if META price increases. The investor wants to break even if META price does not change.

(b) An investor wants to benefit from META price drops, but does not want to lose more than \$30 on the investment.

(c) An investor believes META's stock price will move dramatically over the next month, either sharply up or sharply down, but has no directional view on which. The investor wants to profit from a large move in either direction but is willing to accept a moderate loss if the stock remains near \$300. Using the available prices provided, construct the lowest-cost strategy that expresses this view. Show the profit diagram and identify the exact break-even prices and maximum loss.

-
5. Pick any disaster or crisis (financial or otherwise) and, in a few sentences for each, explain how it was enabled by complexity, tight coupling, and human behavior. Bullet points are fine.

Investment Management Final

B

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1 Multiple-Choice Questions

30 points.

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18. Evaluate the following statements about options.

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 - II. They separate cash flows from an underlying asset.
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- Which of the following combinations is entirely correct?

- f. I only
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19. Which is *NOT* true of private credit?

- a. It is primarily used to lend to distressed companies that cannot access traditional financing
- b. There tends to be a cap on how much money investors in the fund can collect at once
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- e. Shorting the stock to hedge risk
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23. Company X trades at a Price-to-Earnings (P/E) ratio of 20x. It acquires Company Y, which trades at a P/E ratio of 10x, in an all-stock transaction. The market is perfectly efficient and accurately assesses that there will be absolutely zero economic synergies generated by this merger. Immediately following the completion of the deal, which of the following statements is most accurately true regarding the acquiring company's expected earnings per share?
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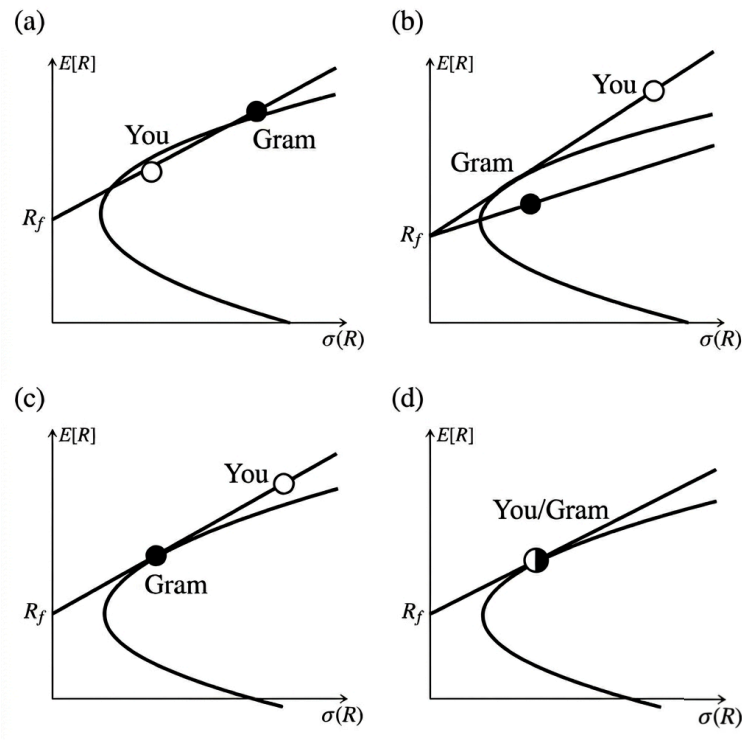
25. Suppose the CAPM-implied expected return on GameStart Inc is 25%, but in the data you find that the return is 30%. If the CAPM assumptions hold, which of the following statements is true?
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26. [Question omitted from public preview]

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28. Suppose an investment in the SP500, with dividends reinvested, grows at an annualized rate of 8.15%. Suppose you invested 100 at the beginning of 2015 and reinvested all the dividends. What is the value of your portfolio in the beginning of 2021?
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29. Suppose last year the market return was -36.55% . Which of the following investments do you expect did the best?
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7. [Question omitted from public preview]

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[Redacted content]

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6. CAPM and Valuation. You are trying to estimate the stock price for Ober Inc. The current risk-free rate is 2%, and the expected market return is 12%. The standard deviation of the market return is 20%, and the correlation between Ober's return and the market return is 0.80. Ober's own return standard deviation is 50%. Ober pays dividends once a year just before the new year.

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