Midterm exam #2

Investments (FIN 323), Fall 2024

William Mann (Emory University)

Please print your name on the line below:

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- This test has 30 questions. You have 75 minutes to take the test.
- There are 18 multiple choice questions. These have only one answer. Mark your answer clearly in the box next to the question.
- There are 12 free-answer questions. **Their answer is always a number, a dollar amount, or a percentage return or growth rate.** Write your answer in the line under the question. I will only grade the answer, not the calculations that you did. For these questions, **do not round your answer** unless I tell you to.
- You can bring one page of notes, front and back.
- You should bring a calculator, but it should not have wireless capability.

I. Evidence on the returns to active strategies

Question 1: In the figures we examined, which of the following types of stocks are NOT associated with above-average returns over the past century of data?

- □ A) Value stocks
- □ B) Growth stocks
- □ C) Small-cap stocks
- □ D) Momentum stocks (that is, stocks whose prices have been rising recently)

Question 2: Which types of stocks behaved in the way that reflects the traditional investing advice, of buying stocks that appear undervalued compared to fundamentals?

- □ A) Value stocks
- □ B) Growth stocks
- □ C) Small-cap stocks
- □ D) Stocks whose prices have been rising recently

Question 3: Each of the following steps is slightly different from the way we built the figures that we looked at in this week of class. Which of them could potentially lead to lookahead bias and reverse our conclusion?

- □ A) Define value and growth stocks in terms of **trailing** earnings
- □ B) Define value and growth stocks in terms of **forecasted** earnings
- □ C) Compare the return during each year *t* with price at the **end** of year *t.*
- □ D) Sort stocks into 8 portfolios instead of 10 portfolios.

Question 4: Which of the following did we NOT do in these figures?

- □ A) Avoid lookahead bias.
- □ B) Measure transaction costs.
- □ C) Focus on strategies that would have been investable in the past.
- □ D) Use many decades of historical data.

Question 5: What pattern did we find for stocks sorted on market capitalization? Larger market cap is associated with...

- □ A) Higher average returns *and* higher return volatility.
- □ B) Higher average returns but lower return volatility.
- □ C) Lower average returns but higher return volatility.
- □ D) Lower average returns *and* lower return volatility.

II. Diversification and portfolio optimization

Question 6: Suppose your cousin says the following:
"I will not need to cash in my investments until decades from now. So I only care about the amount of money I'll have at that point. So I just focus on getting the highest (arithmetic) average return from my portfolio, and I don't pay attention to its volatility."
What is the problem with her thinking that we highlighted at the start of this topic?

- □ A) There is no problem with her thinking.
- □ B) She ought to care about more than just the amount of money she will have.
- □ C) Volatility will affect the amount of money she has in the future.
- □ D) She will probably overpay in fees for the investments she chooses.

Question 7: In this week of class, we built figures with *volatility of excess return* on the horizontal axis, and *average excess return* on the vertical. Then we plotted risky investments in that figure, along with the possible portfolios you could build from them. We saw that the possible portfolios typically make a curve that bends to the left. But there is one special case where the curve becomes a straight line. What is it?

- □ A) Two risky investments with perfect positive correlation ($\rho = 1$).
- □ B) Two risky investments with perfect negative correlation ($\rho = -1$).
- □ C) Two risky investments with zero correlation ($\rho = 0$).
- □ D) Only one risky investment.

Question 8: Suppose an investor finds a way to improve the Sharpe ratio of her risky portfolio, but this also would lower the average return of that portfolio. Portfolio theory says the investor *should* make this change to her risky portfolio, and then do what?

- □ A) Invest more in both the risky portfolio and the risk-free rate of return.
- □ B) Invest more in the risky portfolio, and less in the risk-free rate of return.
- □ C) Invest less in the risky portfolio, and more in the risk-free rate of return.
- □ D) Invest less in both the risky portfolio and the risk-free rate of return.

Question 9: You find that over the last five years, an investment had an arithmetic average return of 10% per year and a volatility of 20% per year. What would be your best guess about the value of $1 invested initially by the end of those five years? Note that these are raw, not excess returns. (Round your answer to the nearest penny.)

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Question 10: Investment #1 has arithmetic average return $\mu_1 = 20\%$ and volatility $\sigma_1 = 40\%$. Investment #2 has $\mu_2 = 8\%$ and $\sigma_2 = 20\%$. What value of A would make a mean-variance investor equally happy holding either #1 or #2 as her *entire* wealth portfolio?

Question 11: Go back to the two investments in the prior question. What would be the (arithmetic) average return of a portfolio that allocates equally to the two investments?

Question 12: What would be the return volatility of the portfolio in the prior question (which allocates equally to the two investments in question #10), if the two investments have zero correlation? (Write the answer as a percent, and round to the nearest percent.)

Question 13: Suppose you are doing a portfolio optimization and you settle on a risky portfolio that has average excess return of $\mu = 10\%$, volatility of excess return $\sigma = 20\%$. If an investor allocates 75% of their wealth to this risky portfolio, and the rest to the risk-free investment, what will be the volatility of excess return for their overall wealth?

Question 14: Instead, suppose the investor wants the volatility of their portfolio excess return to be no more than 10%. What is the best average excess return they can get?

Question 15: Instead, suppose the investor has mean-variance utility with A=5. Then what is the optimal percentage of wealth they will allocate to the risky portfolio?

III. Portfolio statistics and the CAPM

Question 16: Suppose that all investments earned exactly the rate of return that the CAPM says they should earn. Which of the following would **not** then also be true?

- □ A) They would all have zero information ratio with respect to the market.
- □ B) They would all have zero alpha with respect to the market.
- □ C) They would all have zero beta with respect to the market.
- □ D) Their Sharpe ratios would be no greater than the market's Sharpe ratio.

Question 17: According to the CAPM, which of the following risk factors would most likely lead investors to require a higher rate of return for a company's stock?

- □ A) Risk that the CEO dies unexpectedly.
- □ B) Risk that sales fall due to a recession.
- □ C) Risk that hackers breach the company's systems.
- □ D) Risk that a new drug in development fails clinical trials.

Question 18: Suppose I build a scatter plot to compare the return on an investment with the market return. Each point in the plot is a month. The horizontal location of the point is the market's excess return that month. The vertical location of the point is the investment's excess return that month. How would beta appear in this figure?

- □ A) Beta would be the average value of all the dots' vertical positions.
- □ B) Beta would be the slope of a best-fit line drawn through the points.
- □ C) Beta would be where the best-fit line crosses the vertical axis.
- □ D) Beta would be where the best-fit line crosses the horizontal axis.

Question 19: If the CAPM beta of an investment is zero, what can we say about it?

- □ A) It is a risk-free investment.
- □ B) Its CAPM alpha will be negative.
- □ C) Its CAPM alpha will be zero.
- □ D) Its CAPM alpha will equal its average excess return.

For questions 20 through 25, use the following data about the excess return on an investment (i) and on the market portfolio (m). Here μ represents the arithmetic average excess return, and σ is the volatility of the excess return.

σ_m (volatility of market excess return)	10%
μ_m (average of market excess return)	1%
β_i (market beta of investment i)	2
σ_i (volatility of excess return for i)	40%
μ_i (average excess return of i)	4%

Question 20: Calculate the correlation of excess returns of i and the market portfolio.

Question 21: Suppose (only for this question) that the CAPM is "true," so the best prediction of future alpha values is always zero. Then, if the market excess return is 5% in a given month, what is our best prediction about the excess return of i in that month?

Question 22: Now do not assume that the CAPM is necessarily true, and instead calculate the CAPM alpha of i in the data behind the numbers above.

Question 23: How should we interpret the positive alpha that you just calculated?

- □ A) Investment i had a higher Sharpe ratio than a market index fund.
- □ B) i could have been used to increase the Sharpe ratio of an index investor.
- □ C) i underperformed its benchmark.
- □ D) i exhibited greater risk than the average stock.

Question 24: Calculate the information ratio of investment i with respect to the market. Round to three decimal places.

Question 25: Calculate the highest Sharpe ratio that could have been attained by allocating between i and the market portfolio. Round to three decimal places.

IV. Investment styles and the CAPM

Question 26: In the figures from this week, how did an investment's **alpha** appear?

□ A) The investment's position on **the y axis**.
□ B) The investment's position on **the x axis**.
□ C) The investment's **vertical** distance from a line that we drew.
□ D) The investment's **horizontal** distance from a line that we drew.

Question 27: In the figures from this week, how did an investment's **beta** appear?

□ A) The investment's position on **the y axis**.
□ B) The investment's position on **the x axis**.
□ C) The investment's **vertical** distance from a line that we drew.
□ D) The investment's **horizontal** distance from a line that we drew.

Question 28: What kind of evidence did we see about investing in small-cap stocks?

□ A) Small or zero alpha in each of the figures we looked at.
□ B) Large alpha in the 1950-2000 figure, little or no alpha in the others.
□ C) Large alpha in the 2000-present figure, little or no alpha in the others.
□ D) Large alpha in every figure we saw.

Question 29: What kind of evidence did we see about investing in value stocks?

□ A) Small or zero alpha in each of the figures we looked at.
□ B) Large alpha in the 1950-2000 figure, little or no alpha in the others.
□ C) Large alpha in the 2000-present figure, little or no alpha in the others.
□ D) Large alpha in every figure we saw.

Question 30: What kind of evidence did we see about momentum investing?

□ A) Small or zero alpha in each of the figures we looked at.
□ B) Large alpha in the 1950-2000 figure, little or no alpha in the others.
□ C) Large alpha in the 2000-present figure, little or no alpha in the others.
□ D) Large alpha in every figure we saw.