Final exam

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Please print your name and student ID number on the line below:

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- This exam has 30 questions. You have 90 minutes to take it.
- There are 17 multiple choice questions. These have **only one answer**.
  Mark your answer clearly in the box next to the question.
- There are 13 computation questions. For these, the answer is **always a number**.
  Write it in the line under the question. I will not check your work.
- You can bring one page of notes, front and back.
- You should bring a calculator, but it should not have wireless capability.

I. Short sales and dollar-neutral strategies

For Questions 1 through 5, assume that you short-sell one share of a stock worth $50.

Question 1: What is the minimum amount of *initial margin* required for this position under Regulation T? (Answer with a dollar amount.)

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Question 2: Suppose you deposit the proceeds of the short sale, plus an extra $50 cash, as margin for your short position. Then the stock price falls to $40, and you close out your position. What return did you earn on the $50 cash that you deposited, as a percent?

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Question 3: As in the previous question, suppose you deposit the short-sale proceeds, plus an extra $50 cash, as margin for your short position. Now suppose that instead of falling, the stock price rises to $100. You will receive a margin call from your broker. Suppose they request that you add only the minimum amount of additional collateral necessary to bring you in line with the *maintenance margin* requirement of Reg T. How much collateral will they request that you add? (Answer with a dollar amount.)

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Question 4: If you do not meet the margin call in the prior question, your broker will use the collateral in your account to close out your position. In this case, what return will you have earned on the $50 cash you deposited, as a percent? (It is a negative number.)

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Question 5: Now suppose the stock paid a dividend of $5 while you have the short position open. How does that affect you?

- □ A) You must pay $5 more when you reacquire the stock.
- □ B) You will receive $5 from your broker on the ex-dividend date.
- □ C) You must pay $5 to your broker on the ex-dividend date.
- □ D) There will be no impact on you.

For questions 6 through 10, imagine that you set up and operate a dollar-neutral fund following the structure that we described in class.

Question 6: If you initially raise $100m from investors, then what will the fund's total assets be after you set it up?

Question 7: Which of the following is the most likely benchmark that you would set for the returns on your fund?

- □ A) The return on short-term Treasury bills.
- □ B) The return on an index of corporate bonds.
- □ C) The return on a value-weighted portfolio of stocks.
- □ D) The return on an equal-weighted portfolio of stocks.

Question 8: Suppose you set up this fund so that its long portfolio consists entirely of common shares of Company 1, and its short portfolio consists entirely of shares of Company 2. During the first year, Company 1's stock price goes up by 20%, and Company 2's stock price goes down by 10%. Neither stock pays a dividend. Finally, suppose your fund earns the risk-free rate of return on any cash that it pledges as collateral for short positions. Then, what *excess* return will your fund deliver to its investors during the year? Ignore any fees that you might charge them.

Question 9: At some later date, suppose you pay out half the cash on your balance sheet to your investors as a distribution (and your broker allows you to do this). What will be the gross leverage ratio of the fund after this payout? (*Hint*: You can answer this without using any of the specific dollar amounts or percentages from questions 6 through 8, just knowing that the fund was set up like the dollar-neutral examples we did in class.)

Question 10: Suppose you accomplish the payout described in the prior question, but do not change the fund's long or short portfolios. Three of the following things will automatically change, while one will not. Which one will *not* change?

- □ A) The fund's excess return.
- □ B) The fund's volatility.
- □ C) The fund's CAPM alpha.
- □ D) The fund's information ratio.

Question 11: Which statement is true about market-neutral and dollar-neutral strategies?

□ A) Both maintain a market beta of exactly zero.
□ B) Both maintain exactly equal dollar amounts long and short.
□ C) Market-neutral strategies maintain a market beta of zero, dollar-neutral strategies maintain equal dollar amounts long and short.
□ D) Dollar-neutral strategies maintain a market beta of zero, market-neutral strategies maintain equal dollar amounts long and short.

Question 12: The Sharpe ratio of a market-neutral or dollar-neutral fund is often much lower than the Sharpe ratio of the market. What is the best response to this evidence?

□ A) We should conclude that these funds are not useful for investors.
□ B) We should conclude that short-selling hurts investment returns.
□ C) We should judge these funds on their volatility, not their Sharpe ratios.
□ D) We should judge these funds on their alpha, not their Sharpe ratios.

II. Factor models

Question 13: In the Fama/French approach to tracking factor performance, you form stock portfolios in June of each year, not January. The reasoning behind this was only really important for one of the factors listed below. Which one was it?

□ A) The market excess return
□ B) HML (value)
□ C) SMB (size)
□ D) UMD (momentum)

Question 14: Which of the following would *not* be surprising to find in the data?

□ A) A strong negative correlation between SMB and the market excess return.
□ B) A strong negative correlation between HML and the market excess return.
□ C) A strong negative correlation between HML and SMB.
□ D) A strong negative correlation between HML and UMD.

Question 15: Which of the following could cause HML to have a positive market beta?

□ A) If value stocks have much higher market beta than growth stocks.
□ B) If value stocks have much lower market beta than growth stocks.
□ C) If value stocks and growth stocks have similar, positive market beta.
□ D) It is impossible for HML to have positive market beta.

For questions 16 and 7, use the table below. It lists returns in a specific month on the portfolios that Fama and French create to calculate their HML factor:

S/L = 3%	S/M = 9%	S/H = 9%
B/L = 3%	B/M = 2%	B/H = 1%

Question 16: What is the value of HML during this month?

Question 17: What is the value of SMB during this month?

For questions 18 through 21, use the table below. It reports the results of a factor model regression for the annual excess returns on a specific mutual fund over ten years:

Intercept	β_M	β_{SMB}	β_{HML}
2%	1.0	0	0.5

Also use the following data on the average values of each factor in the regression:

$r_M - r_f$	*SMB*	*HML*
9%	5%	6%

Question 18: What was the fund's average excess return during this time?

Question 19: By how much did the fund outperform the return that would be predicted according to the Fama-French three-factor model?

Question 20: By how much did the fund outperform the return that would be required according to the CAPM?

Question 21: Suppose you repeat the regression with RMW added as another factor and find that the factor loading on RMW is 0.5, the estimated alpha drops to zero, and the other factor loadings in the regression stay the same. What was the average value of RMW during the time period of the data that you used in the regression?

Question 22: As you saw in Homework #1, an equal-weighted strategy forces you to do a lot of rebalancing activity in a very specific way. What pattern did this generate in the factor loadings of the equal-weighted S&P 500, in the example we did in class?

- □ A) Zero loading on the market excess return.
- □ B) Zero loading on HML.
- □ C) Negative loading on HML.
- □ D) Positive loading on HML.

Question 23: Based on the analysis we did in class, what is the most accurate way to think about the strategy of equal-weighting the S&P 500 instead of value-weighting it?

- □ A) Equal-weighting has generated worse past returns than value-weighting.
- □ B) Equal-weighting has generated similar past returns to value-weighting.
- □ C) Equal-weighting is an effective way to pursue some well-known strategies.
- □ D) Equal-weighting is a unique strategy, different from the others we know of.

Question 24: In that analysis, we also looked at the value-weighted S&P 500. It had a factor loading of about 1 on the Fama-French market factor and about 0 on HML, which makes sense. But it also had a strong *negative* loading on SMB. This happened because, unlike the value-weighted S&P 500 portfolio, the Fama-French market factor...

- □ A) ...is a passive strategy.
- □ B) ...includes *every* public stock.
- □ C) ...includes stocks from outside the United States.
- □ D) ...is measured with raw returns instead of excess returns.

III. The profitability factor

Question 25: In homework #5 you looked at a strategy that pursues stocks with high levels of asset growth rates, as a fraction of book assets. Suppose we redid this approach to pursue stocks with high capital expense as a fraction of *market capitalization* instead of book assets. What would you expect to find?

- □ A) CAPM alpha and Fama-French alpha both close to zero.
- □ B) CAPM alpha positive, Fama-French alpha close to zero.
- □ C) CAPM alpha close to zero, Fama-French alpha positive.
- □ D) CAPM alpha and Fama-French alpha both positive.

Question 26: In class we looked at stocks sorted into ten portfolios by operating profitability (meaning, profitability divided by book value of assets). For each of these portfolios, we ran a Fama-French 3-factor regression. One pattern we saw was that the factor loading on SMB was very strong and positive for portfolio 1 (lowest profitability), and fell steadily to a strong negative value for portfolio 10 (highest profitability). This pattern suggests that companies that are more profitable are also...

- □ A) ...larger in terms of market capitalization.
- □ B) ...smaller in terms of market capitalization.
- □ C) ...larger in terms of book value.
- □ D) ...smaller in terms of book value.

Question 27: Another pattern we saw was that the factor loading on HML was strong and *positive* for portfolios 3-6 (medium profitability), but strong and *negative* for 1 (lowest profitability) and 10 (highest profitability). What does this pattern suggest? Both the lowest-profitability companies, and the highest-profitability companies, are...

- □ A) ...small-cap stocks.
- □ B) ...large-cap stocks.
- □ C) ...value stocks.
- □ D) ...growth stocks.

Question 28: What evidence did we see about the profitability strategy?

- □ A) It has delivered zero CAPM alpha.
- □ B) It has delivered negative CAPM alpha.
- □ C) Its has delivered zero alpha in the Fama-French 3-factor model.
- □ D) It has delivered positive alpha in the Fama-French 3-factor model.

Question 29: It may seem obvious that investing in stocks with high profitability would generate better returns. Why is it actually not obvious under efficient-markets thinking?

- □ A) These stocks should also be expensive to buy in the first place.
- □ B) These stocks are very difficult to sell short.
- □ C) These stocks are really just value stocks by another name.
- □ D) These stocks are often reporting manipulated accounting figures.

Question 30: We looked at a paper called “Buffett's Alpha” that analyzes Warren Buffett's investing performance from the perspective of a factor model. In the initial CAPM regression, Buffett's investment decisions exhibited very strong alpha. As the authors added more "factors" into their regressions, the alpha (intercept) fell to the point that it was not significant. How do we interpret this finding?

- □ A) Buffett did not actually outperform the market, despite what people think.
- □ B) Buffett outperformed the market, but only by taking on large market beta.
- □ C) Buffett outperformed the market, mainly by following a few simple ideas.
- □ D) Buffett outperformed the market in ways that no one else can imitate.