MFE 230G Final Exam
Distributed: October 6, 2021 (7am PT)
Due: October 7, 2021 (7am PT)

Please read completely before taking the exam!!!!

Everyone is expected to follow the UC Berkeley Honor Code., which states that "As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others." For example, you agree that:

- You alone are taking the exam;
- You will neither receive assistance from anyone while taking the exam nor will you provide assistance to anyone while the exam is still in progress;
- You will not have any verbal, written, or electronic communication with anyone else while you or others are taking the exam – not even your instructors or GSI. Any question regarding the exam, make an assumption and be clear where you are using it.

Acknowledgement of following the code – Please write your name in the line (and add this to your submission) _____

You are responsible for any submission issues. Late submissions will be severely penalized upon the discretion of the instructors. Please double check that your work is readable upon submission. Also, double check that all of your code is visible if you are submitting via Jupiter notebook.

Equity Questions

1. You are planning to start up a new asset management firm and are considering two possible investment strategies:
   - Global Macro Hedge Fund Strategy:
     i. Correlation of your forecasts and subsequent returns is 0.1
     ii. You can forecast 15 asset class returns.
     iii. The correlation of your forecasts in a particular week are 93% correlated with your forecasts from the prior week, on average.
     iv. Because you are investing in liquid futures contracts and investing long-short, your transfer coefficient is 0.9.
   - Long-Only Stock Selection Strategy:
     v. You can forecast returns for 500 stocks with an information coefficient of 0.04.
     vi. You receive new information roughly every quarter.
     vii. The correlation of your actual portfolio (given transactions costs and the long-only constraint) and an idealized (zero transactions costs, unconstrained) portfolio is 0.35.

   a) What is the breadth of the global macro hedge fund strategy?

b) What is the transfer coefficient of the long-only stock selection strategy?

c) Which strategy has the higher expected information ratio?

d) What information coefficient for the stock selection strategy would lead to equal expected information ratios for the two strategies?

2. You observe the following data for Walmart (WMT) stock:

Walmart Stock

Price per share	$145
Earnings per share	$3.55
Dividend per share	$2.20
Average daily share volume	7,700,000
Return on equity	12.30%
Beta	0.48
Volatility	16.40%
Risk-free return	0.40%
Expected market excess return	6%

a. Estimate Walmart's earnings growth rate.

b. Estimate an alpha forecast for Walmart stock. Justify your calculation.

c. Let's assume that based on your alpha forecast, you decide to purchase 750,000 shares of Walmart. What is the expected price impact of your trade? You can assume that trading one day's volume costs one day's volatility.

The next two questions (Questions 3 and 4) utilize the Ken French data website for this: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

3. Focus on the 12 US Industry returns plus the Fama-French factor (HML, SMB) returns monthly. Use value-weighted returns.

a) Estimate the 14x14 covariance matrix of the monthly industry plus factor returns. Use all the historical data and a half-life of 30 months.

- Display the annualized standard deviations for each of these 14 factors, displayed from highest to lowest standard deviations.

b) Why are the standard deviations of the industries higher than those of the factors (HML, SMB)?

c) Assume that the market portfolio consists of the following weights on those 14 factors:

12-Industries + Factors	Weighting
Consumer Non-Durables	12.30%
Consumer Durables	3%
Manufacturing	6.00%
Energy	2.90%
Chemicals	2.50%
Business Equipment	27.40%
Telecom	11.40%
Utilities	2.50%
Shops	2.80%
Health	13%
Money	11.30%
Other	4.90%
HML	0.00%
SMB	0.00%

Estimate the betas of each of the factors relative to this market portfolio.

d) Build the fully-invested, minimum variance portfolio of the 12 industry portfolios. What are the holdings? What fraction of this portfolio is in short positions? You can assume that all the industry portfolios are long-only.

4. Imagine you are an analyst working for an institutional endowment. On bcourses, we have posted a spreadsheet containing the returns of two institutional investment strategies held by the endowment. Note that you only have data for the periods over which the endowment invested in these funds. To understand the performance of these two funds, you are going to analyze them using the Fama-French Developed Market 3-factor model (market, SMB, HML) and data available from Ken French's website (cited above). Note: RF column contains risk-free rate.

a. Estimate the exposure of each fund to the three factors plus the alpha (the mean excess return residual to the three factors).

b. Calculate the information ratios of the two funds.

c. Compare these two funds based on your empirical analysis. You should be able to compare the funds across at least five different aspects.

Currency Questions

In all of these questions please explain your answers and your economic reasoning:

1- Recent trends in US net foreign assets (NFA) and the implications:
   a. Which factors can affect NFA of a country overtime?
   b. Focusing on US NFA since 2000, what happened to these factors before the financial crisis? What is the main determinant of the pattern in US NFA since 2010?
   c. How many percent the US NFA will change if there is 30% decline in the US stock market but no change in other countries stock returns? Use Figure 3 in this paper to answer this question.
   d. Extra point: Can you think of a specific reason on why the true US NFA may not be as negative as the current estimates suggest? In other words, can you think of a major source of measurement error in the current estimates of US NFA?

2- Use this identity on the relation between the spot rate, yields on home and foreign currency and the risk premium on holding the foreign currency:

$$s_t = E_t\sum(i_{t+\tau} - i^*_{t+\tau}) + E_t\sum r^e_{t+\tau} + E_t[\lim s_{t+\tau}]$$

(note: s_t here is spot exchange rate in foreign currency per U.S. dollar – i.e. dollar appreciation means higher s_t)

   a. Briefly explain how tapering of the current bond purchase program by the Federal Reserve can affect US/EUR exchange rate?
   b. Let's assume there is an increase in inflation expectations, and therefore the Federal Reserve announces that it will increase its short term rate by one percentage point but only for one year and then it goes back to its previous plan for the short term rate. For simplicity let's assume that there is no change in ECB interest rate or Euro risk premium. What will

happen to the spot rate? What will happen to the one year forward rate (hint: assume $F_{t,t+1} = E_t[s_{t+1}]$)?

c. Now consider the case of a developing country with dollar debt. In particular, let assume that there are some rumors about the ability of borrowers in that country to pay back their debt and therefore the risk premium of that country increases. How does this affect the spot exchange rate of the developing country? Does the appreciation/depreciation of dollar make it easier for the borrowers in the developing country to pay back their debt or harder? Does it matter what the borrowed money is used for? (hint: compare the case of debt used for domestic consumption with the case of debt used for investment in an export-oriented sector).

d. Use your answer to part c to discuss what should be the optimal reaction of the developing country central bank in response to the increase in the country risk premium when the debt is used for domestic consumption vs. when the debt is used to finance an export-oriented sector.

3- Use the data from here, drop the observations that are before 1975 and answer the following questions:

a. Test the relation between the change in exchange rate and relative inflation rate of countries with respect to US for different horizons (i.e. 1 yr and 5 yr). What is relative PPP and is this hypothesis supported by the data? Now restrict the data to the period of 2000 afterward. Has the performance of relative PPP changed since then?

b. Use the short-term interest rate data and plot the cumulative return to a strategy that shorts dollar and goes long on the foreign currency since 2000 for each of the countries in the sample. Is there any specific pattern in deviations from UIP?

c. This data also includes total rate of return (i.e. capital gain+dividends) on stocks in each country (eq_tr). However, these returns are calculated in each country's local currency.

i. For each country calculate the correlation between the stock returns and exchange rate changes.

ii. Calculate the sharp ratio of unhedged investment in each country's stock market from the point of view of US investors (i.e. investors who only care about dollar return on their investment) and compare that with the sharp ratio of domestic investors investing in their own stock market.

iii. What is the implication of currency risk on US investors portfolio allocation?