

UNIVERSITY OF CHICAGO
Booth School of Business

Bus 35120 – Portfolio Management

Prof. Lubos Pastor

Assignment #5

Due: April 28 by 8:15am

Be as clear and brief as possible. The data for Part B of the assignment can be downloaded from Canvas, along with a sample program that can help you complete Part B.

A.1. CASE STUDY: “Yale University Investments Office: February 2011.” Read the case study and answer the following questions.

1. How does Yale’s investment strategy differ from that of the average endowment?
2. What is the justification behind the ‘Yale model’ (or ‘endowment model’)?
3. What analytical tools does Yale’s Investment Office rely on?
4. According to Swensen, “X doesn’t show up in a mean-variance model. You have to think about it very carefully.” What is X? How does Yale manage X?
5. Should Yale change its investment philosophy going forward? Why or why not?

A.2. CASE STUDY: “Fixed Income Arbitrage in a Financial Crisis: U.S. Treasuries in 2008.” Read the case study and answer the following questions.

1. What trade did Mr. Franey contemplate and then execute in November 2008?
2. What do you think was the reason behind the yield spread between the two bonds?

A.3. CASE STUDY: “The Dimensional Fund Advisors.” Read pages 6-8 of the case.

Be prepared to discuss all three case studies in class.

B. DATA ANALYSIS. The purpose of this assignment is to examine the potential benefits of international value investing. We will analyze the value effect in six non-U.S. countries: Australia, France, Germany, Italy, Japan, and the UK.

Monthly returns on the international B/M-sorted portfolios are in 6 text files: *australia.txt*, *france.txt*, *germany.txt*, *italy.txt*, *japan.txt*, and *uk.txt*. In each country file, the first column is the date, column 3 are the returns on high-B/M stocks, and column 4 are the low-B/M stock returns. Returns are monthly, in dollar terms, and they span January 1975 to December 2016. Monthly returns on the three Fama-French factors are in *ff_factors_192607_201612.txt*. Column 1 is the date, column 2 is excess market returns, column 3 is SMB returns, column 4 is HML returns.

For each country, construct the returns on a spread portfolio that is long in the high-B/M stocks and short in the low-B/M stocks (buy value, sell growth). These portfolios are similar to the Fama-French HML portfolio for the U.S.

1. For which countries is the value effect significantly different from zero in the full sample? Based on your results, do you agree with the opinion of the casewriter on page 4 of the DFA case that you read last week?
2. For each country, plot the 5-year moving average of the value minus growth returns. Which stocks performed better during the 2007-2008 financial crisis (mid-2007 through end-2008), value or growth? Does your answer support the Fama-French argument that the value premium is due to risk?
3. Augment the international data with HML returns. Estimate the 7×7 correlation matrix of the value-growth spreads. Based on your results, do you agree with the opinion of the casewriter on pages 4-5 of the DFA case?
4. Given the correlations, would you recommend for U.S. value investors to go global?
5. Combine the 7 value-growth spreads into a portfolio with minimum total risk. Compare the portfolio's standard deviation with that of HML. Any surprise?
6. Consider a mean-variance investor who currently holds all of her \$1 million in the U.S. market portfolio. She holds zero position in the risk-free T-bill, and she considers such a position optimal, given the historical moments of assets returns. What is the investor's risk aversion γ ? Explain how you obtained your result.
7. This investor is considering tilting her portfolio toward value stocks. She is unwilling to invest internationally, but she is willing to invest in HML. Using the sample estimates of expected returns, variances, and covariances, compute the optimal allocation of this investor across the U.S. market, HML, and the T-bill. Interpret the T-bill position.
8. How much did the investor's Sharpe ratio increase as a result of the value tilt? How much did the squared Sharpe ratio increase?
9. Compute HML's information ratio relative to the U.S. market. How does the square of this ratio compare to the improvement in the squared Sharpe ratio that you computed in the previous part?
10. Now suppose this investor is willing to take positions in any of the seven international value-growth spreads. Using the sample estimates as before, construct the investor's optimal portfolio of the eight risky assets (U.S. market and the seven value-growth spreads) and the T-bill.¹
11. Compare the resulting Sharpe ratio with the Sharpe ratio obtained by the U.S.-only optimal combination of the market with HML. Given this comparison, would you recommend for U.S. value investors to go global?

¹*Hint:* All returns here are excess returns, by construction. Investing \$1 in a value-growth spread can be interpreted as going long \$1 in value stocks, short \$1 in growth stocks, and investing \$1 in the T-bill.

C. EXAM-LIKE QUESTIONS.

1. What does the CAPM predict about the intercept from the regression of any stock's excess returns on the excess market return? What does the CAPM predict about the stock betas?
2. What does the CAPM predict about the intercept from the regression of any stock's excess returns on the three Fama-French factors? What does the CAPM predict about the three factor loadings/betas?
3. What is it about small stocks and value stocks that causes them to earn high average returns, according to Fama and French?
4. Using only information from Lecture 5, calculate the historical (1927-2016) Sharpe ratios for the three Fama-French factors. (Note: All three factors are already expressed as excess returns.)
5. Which of the 25 portfolios from Lecture 5 appear to be the most overpriced relative to the Fama-French model? Underpriced?
6. Revisit the crime factor from Lecture 5. Suppose that all honest people suddenly decide not to be invested in the stock market, and only criminals end up holding stocks. Criminals are happy when crime goes up and unhappy when crime goes down. What happens to the prices of guns stocks relative to BMW?
7. True or False? GMO combines its value and momentum strategies to maximize the information ratio because doing so allows for the biggest possible improvement in the overall Sharpe ratio relative to the benchmark.
8. True or False? GMO engages in slicing in order to gain more flexibility in deciding what fraction of their portfolio to update in response to new signals.
9. **(not graded)** Read the following article that came out in The Wall Street Journal on February 25, 2009. Do you agree with Jeremy Siegel?

The S&P Gets Its Earnings Wrong

By Jeremy Siegel

February 25, 2009; The Wall Street Journal, page A13

Standard & Poor's recently shocked investors with an announcement that reported earnings for its S&P 500 Index for the fourth quarter of 2008 are forecast to be negative for the first time since such data were calculated in 1936. S&P further reports that for all of 2008, earnings are expected to be less than \$40 per share, indicating that the market now has a price/earnings ratio over 20, well above its historical average of 15.

What this dismal news actually reflects is the bizarre way in which S&P (and most other index providers) calculate "aggregate" earnings and P/E ratios for their indexes. Unlike their calculation of returns, S&P adds together, dollar for dollar, the large losses of a few firms to the profits of healthy firms without any regard to the market weight of the firm in the S&P 500. If they instead weight each firm's earnings by its relative market weight, identical to how they calculate returns on the S&P 500, the earnings picture becomes far brighter.

A simple example can illustrate S&P's error. Suppose on a given day the only price changes in the S&P 500 are that the largest stock, Exxon-Mobil, rose 10% in price and the smallest stock, Jones Apparel Group, fell 10%. Would S&P report that the S&P 500 was unchanged that day? Of course not. Exxon-Mobil has a market weight of over 5% in the S&P 500, while the weight of Jones Apparel is less than .04%, so that the return on Exxon-Mobil is weighted 1,381 times the return on Jones Apparel. In fact, a 10% rise in Exxon-Mobil's price would boost the S&P 500 by 4.64 index points, while the same fall in Jones Apparel would have no impact since the change is far less than the onehundredth of one point to which the index is routinely rounded.

Yet when S&P calculates earnings, these market weights are ignored. If, for example, Exxon-Mobil earned \$10 billion while Jones Apparel lost \$10 billion, S&P would simply add these earnings together to compute the aggregate earnings of its index, ignoring the vast discrepancy in the relative weights on these firms. Although the average investor holds 1,381 times as much stock in Exxon-Mobil as in Jones Apparel, S&P would say that that portfolio has no earnings and hence an "infinite" P/E ratio. These incorrect calculations are producing an extraordinarily low reported level of earnings, high P/E ratios, and the reported fourth-quarter "loss."

As the fourth-quarter earnings season draws to a close, there are an estimated 80 companies in the S&P 500 with 2008 losses totaling about \$240 billion. Under S&P's methodology, these firms are subtracting more than \$27 per share from index earnings although they represent only 6.4% of weight in the index. S&P's unweighted methodology produces a dismal estimate of \$39.73 for aggregate earnings last year.

If one applies market weights to each firm's earnings using the same procedure that S&P employs to compute returns, the results yield a more accurate view of the current profit picture. Market weights produce a reported earnings estimate of \$71.10 for 2008 – nearly 80% higher than the unweighted procedure. The reason for this stark difference is that the firms with huge losses generally have extremely low market values and hence have a much smaller impact on the total earnings in the index.

Similarly, operating earnings (essentially, earnings before write-offs), of the S&P 500 are boosted to \$81.94 per share when earnings are weighted by market value, yielding a P/E ratio of about 9.4 for the market, instead of S&P's \$61.80, which yields a P/E ratio of 12.5 when firm profits are simply added. Even the negative earnings for the fourth quarter disappear when market weights are accounted for, as fourth-quarter GAAP earnings on the S&P 500 Index total \$7.44 per share and operating earnings reach \$14.40.

No one can deny that the recent economic downturn has badly hurt corporate earnings. But let's not fool ourselves into thinking that this is an expensive market. When computed accurately, P/E ratios show that this market is much cheaper than is currently being reported by the S&P. Those who venture into today's stock market are indeed buying good values.

Mr. Siegel is professor of finance at the University of Pennsylvania's Wharton School.