

UNIVERSITY OF CHICAGO
Booth School of Business

Bus 35120 – Portfolio Management

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Assignment #10

Due: June 2 by 8:15am

Be as clear and brief as possible. A sample program that can help you complete Part B of the assignment can be downloaded from Canvas.

A1. CASE STUDY: “Long-Term Capital Management, L.P. (A, B, C, D).” Read the case and answer the following questions.

1. Describe LTCM’s investment strategy in less than 100 words.
2. What are the main similarities and differences between LTCM and DFA?
3. Why did LTCM decide to return \$2.7bn to its investors at the end of 1997? With the benefit of hindsight, was this a good decision?
4. Prior to 1998, what were LTCM’s biggest advantages over its competitors?
5. Prior to 1998, what steps did LTCM take to insure itself against failure?
6. What went wrong in 1998?

A2. CASE STUDY: “The Quant Meltdown in August 2007.” Read the case and answer the following questions.

1. What was the big news that caused the quantitative hedge funds’ losses in the first week of August 2007?
2. Why did so many hedge funds perform poorly at the same time?
3. If you were in charge of a quantitative hedge fund, would you modify your investment strategy in light of these events? If so, how?

Be prepared to discuss both cases in class.

B. DATA ANALYSIS. You are a general partner of a hedge fund called Riteput, whose initial capital base is \$50 million. You charge 2% of assets under management plus 20% of any profits in excess of the T-bill rate, on an annual basis. You tell your investors that they should be willing to pay you so much because you follow a valuable investment strategy that is profitable almost all of the time. Of course, you do not reveal the specifics of your strategy.

Your investment strategy is simple: You keep all of your capital invested in T-bills, and you write out-of-the-money put options on the S&P 500 index. On the last day of each

month, you write/sell S&P 500 European put options that have 60 days to expiration and that are 20% out of the money (i.e., the strike price is 20% below the current level of the S&P 500 index). In exchange for writing these puts, you collect premiums equal to the fair Black-Scholes prices of these options. You write enough options to collect premiums that give you an immediate 4% monthly return on capital.

After completing this transaction, you leave your office for a month-long tour of golf courses and wineries. You come back one month later, close the option position by buying back the options you wrote, write new 60-day put options, and get back to golf and wine. You do this every month. Not a bad lifestyle, if you can keep it going.

Download the history of daily returns and levels of the S&P 500 index from WRDS. After logging in to WRDS, go to CRSP and download the January 1, 1980 – Dec 30, 2016 daily return and level of the S&P Composite index. Delete the first row (text labels) and save the file as “sp500_daily.txt”. The first column is the date (YYYYMMDD), the second is the S&P return (“sprtrn”), and the third is the S&P index level (“spindx”). For simplicity, assume that the S&P volatility is constant and equal to its sample estimate, that the T-bill rate is 0.01% per day, that there are no withdrawals or additions to the fund, and that you face no transaction costs.

1. Suppose you started your hedge fund on March 1, 1994.
 - (a) On what day did you (Riteput) go out of business? Why?
 - (b) Plot the daily evolution of Riteput’s capital. What is the fraction of months in which Riteput made money (had a positive return) before its last month?
 - (c) Judging by its Sharpe ratio since inception, did Riteput look like an attractive investment in the last month prior to its demise? How does its Sharpe ratio compare to the S&P’s (ex-dividend) Sharpe ratio over the same period?
 - (d) Why did the Sharpe ratio fail to predict Riteput’s approaching doom?
 - (e) Plot the evolution of your monthly compensation prior to Riteput’s demise.¹ Exactly how much did you earn in July 1998? What is your cumulative compensation? Does this compensation reflect your superb investment skills?
 - (f) Why do you think I chose March 1994 as the starting date?
2. Answer all numerical questions in part 1 (without plots) when options are 15% and 10% out of the money (instead of 20%). Does going less deep out of the money make Riteput’s strategy appear more or less attractive before the trouble hits? Does it make you richer? Why?
3. Suppose you can start your hedge fund on the 1st trading day of any month
 - (a) in the early 1980s, between January 1980 and December 1985
 - (b) in the 1990s, between January 1990 and December 1999
 - (c) in the 2000s, between January 2000 and December 2016

¹Assume, for simplicity, that you get paid monthly rather than annually. Each month, you get 2/12% of assets under management, plus 20% of any profits in excess of the T-bill rate in that month.

With the benefit of hindsight, what month would you choose in each of the three cases, given that you want to maximize your cumulative total compensation? In all three cases, produce the same plots as in part 1, and explain what caused the fund to collapse. (Note: We are back to options that are 20% out of the money.)

4. What techniques can investors use to detect Riteput's strategy?
5. Riteput is to Powerball as the duration of human pregnancy is to ...?

- (a) the time students take to complete a one-hour exam
- (b) the time it takes to fly from Chicago to New York

Pick the better match and briefly explain.

6. What if anything have you learnt from this exercise?

C. EXAM-LIKE QUESTIONS.

1. Explain why the prototypical hedge fund strategy, the "market-neutral" strategy, is sometimes described as "two-alpha, no beta." Use no more than 50 words.
2. You are a general partner in a small market-neutral biotech hedge fund. Your research analysts have estimated that Amgen has an alpha of 3% per year and a beta of 1.6, and that Genentech has an alpha of -2% per year and a beta of 1.2.
 - (a) Suppose you want to split the fund's capital among these two stocks only (i.e., form a unit-cost portfolio of the two stocks) in a way that makes the fund market-neutral. What positions (long or short) do you establish?
 - (b) What is the alpha of the resulting portfolio? What is the portfolio's expected excess return? Is the portfolio attractive?
 - (c) Suppose that, in addition to Amgen and Genentech, you can also invest in a riskless T-bill (i.e., form a unit-cost portfolio of the three assets). What is the minimum/maximum weight on Amgen that is necessary to ensure that the three-asset market-neutral portfolio has a positive alpha?
 - (d) Now suppose that you cannot invest in the T-bill but you can invest in the stock of Immunex instead. Your research analysts have estimated that Immunex has an alpha of -2% per year and a beta of 1.8. You want to split the fund's capital among the three stocks (i.e., form a unit-cost portfolio of the three stocks) in a way that makes the fund market-neutral with a positive alpha. What is the minimum/maximum weight on Amgen?
 - (e) Do you need to know Immunex's beta to answer the question in part (d)?
3. The Down Up Money Business association ("DUMB" for short) has 50 hedge fund members, all of whom follow uncorrelated market-neutral strategies. None of these funds add value, in the sense that their true expected returns in excess of the risk-free rate are all zero. All funds have return volatilities of 20% per year. What is the probability that at least one of these funds will achieve an average excess return greater than 10% per year over the next 10 years?

4. Your financial wealth is currently invested in the market portfolio, with expected excess return of 6% per year and 15% volatility. You are approached by a hedge fund manager whose portfolio is market-neutral, with expected return of 2% per year in excess of the risk-free rate and an annual volatility of 20%. You are a mean-variance investor. Will you invest part of your wealth with this manager? If so, how much? How will the Sharpe ratio of your portfolio change as a result of this investment?
5. To what extent can market-neutral strategies be perceived as alternatives to cash investments?