Problem set 2
266: Fi. Markets and Institutions
Spring 2011
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Directions. You are to do this problem set alone.

Due Date/time. Your work is due by beginning of class (12:00 PM) May 3. You can hand the work in to me at the beginning of class. If you put the work under my office door or in my mailbox, it must be in before I leave for lecture at about 11:55 am.

Questions. If you have questions, email me or one of the TAs, raise them in class, or come to office hours.

Grading. All parts have equal value.

Note: Be sure to note the proper units (e.g., millions, billions, etc.) in the following answers.

1 Goldman Sachs, 10-k report

Obtain the 10-k report for Goldman Sachs. Specifically, i) go to http://www.sec.gov/, ii) Under 'filings and forms,' click on 'search for company filings', iii) Click on the link labelled 'Company or fund name, ticker symbol, CIK (Central Index Key), file number, state, country, or SIC (Standard Industrial Classification)' iv) Enter **GS** for ticker symbol and then hit the 'find companies' button. v) Put **10-k** in the 'filing type' box and hit the search button. You should see an entry for the 10-k filed in early 2011. vi) click the 'documents' button. In the resulting list of items, you should see a link for the 10-k.

1.1 Read the 'Our Business Segments and Segment Operating Results' section in Part 1 item 1 of the 10-k. Provide a one or two sentence description of the 4 business segments that that Goldman Sachs lays out in the 10-k.

1.2 In what markets U.S. markets does Goldman Sachs act as a market maker?

1.3 Goldman Sachs reports its rights as a designated market maker (DMM) on the NYSE as an intangible asset. What valuation does Goldman Sachs place on this intangible asset? (Note: Search for 'DMM' in the 10-k; repeat the search until you come to this information. Clarification, 2:00pm Apr 23: You can provide the net carrying amount or the gross or both, but you should label what you provide.)

1.4 What share was compensation and benefits of total operating expenses in the year ended Dec. 2010? (See Part II, item 8, Financial Statements and Supplementary Data)

1.5 What does Goldman Sachs report as total shareholders' equity as of Dec. 2010?

1.6 What is the ratio of total liabilities to shareholder equity as of Dec. 2010?

2 Value at Risk (VaR).

2.1 If a firm says that its 1-day 95 percent value at risk is $100 million, what does this mean?

2.2 According to the Goldman Sachs 10-k examined above, on how many trading days in 2009 did trading losses exceed the 95 percent one-day VaR computed by the firm?

(Hint: Search for 'daily trading' repeatedly.)

2.3 Suppose that my portfolio has 3 assets. My risk model says that there are 100 possible outcomes for the change in value of these assets between today and tomorrow. These outcomes are provided in the spreadsheet saved with the problem set.

According to the risk model portrayed in the spreadsheet, what is the 1-day, 95 percent value at risk?

Hints instructions for excel:

1. Fill in the column for the total change in value for each outcome. The value for outcome # 1 is already present. Copy the formula in that cell (put cursor in this cell and copy); then highlight the other 99 cells in the 'total' column (all at once) and paste the formula in.

2. Now sort all the data rows of the table from worst total outcomes to best. To do this hightlight all the data in the table including the row labels (columns d to i, rows 6 to 106). Click on 'Data' in the menu bar, then choose the 'sort' option to get the sort dialog box. In the 'sort by' option, choose Total. The 'sort on' option should be 'values' and 'sort order' should be 'smallest to largest.' Hit ok.

3. Find the value total losses, $-V$, such that there is only a 5 percent cumulative probability of losses more negative than $-V$. To do this, you can sum up the values in the probability column until you reach 5 percent and take the total losses for this row as $-V$.

Note: This is roughly the same as plotting a histogram of the total losses and reading off the 5^{th} percentile from the histogram. The histogram will give a slightly different answer depending on how many bins are in the histogram.

3 Hedge funds, alpha, beta.

If the results of the capital asset pricing model (CAPM) were correct, the only way to earn an expected return greater than the risk free rate using publicly available information is by taking risk. Using our standard notation, the CAPM says that for any portfolio, A,

$$i^e_{A,t} = i^{rf}_t + \beta(i^e_{M,t} - i^{rf}_t)$$

or, rearranging,

$$i^e_{A,t} - i^{rf}_t = \beta(i^e_{M,t} - i^{rf}_t).$$

This second form of the equation says that the 'excess return' above the risk free rate on portfolio A must entirely be attributable to a nonzero β. Remember that β captures the key feature of risk: how the asset return varies with the overall market portfolio return.

Analysts often modify the CAPM equation with an 'alpha':

$$i^e_{A,t} - i^{rf}_t = \alpha + \beta(i^e_{M,t} - i^{rf}_t).$$

Now the excess expected return can be due to alpha or beta.

3.1 What is the interpretation of alpha?

3.2 The fund charges 2 percent of the asset value each year in management fees and also takes an incentive fee of 20 percent of any gains (but none of any losses) each year. Investors invest the $1 million; at the end of the year the assets are worth $1.1 million. What was the annualized rate of return on the assets (ignoring fees)?

3.3 Continuing previous part. What annualized rate of return does the investor receive (after fees)? Assume that the fund first deducts 2 percent of the asset value at the end of the year to get an 'adjusted total value' and then takes 20 percent of any gain between the value initially invested and the adjusted total value.

3.4 Continuing. Suppose that the hedge fund return is risky. With 70 percent probability the $1 million invested will be worth $1.57 million at the end of the year. With 30 percent probability the value falls to zero at the end of the year.

What annualized rate of return does the investor receive (after fees) in the good outcome when the assets grow to $1.57 million?

3.5 Continuing again. The expected rate of return (before fees) on the assets is about 10 percent in the risky scenario just described:

$$\begin{aligned} 1 + i^e &= \frac{\text{expected future value}}{\text{cost today}} \\ 1 + i^e &= \frac{0.7 \times 1.57 + 0.3 \times 0}{1} \\ 1 + i^e &\approx 1.10 \\ i^e &\approx .10 \end{aligned}$$

What is the expected annualized rate of return to the investor (after fees)?

Hint: replace the future value of 1.57 in the above formula with the expected amount the investor would receive after paying 2 percent of the asset values and 20 percent of the gains.