

## Econ 233 - Data case 1

Due: Tuesday, April 26

You're a private banker managing a portfolio worth \$5 million for a rich client. Your client is only considering the following assets, for which your colleagues working in security analysis have provided you with the following expected returns. They also believe that the risk characteristics will be similar to those over the last 3 years, starting in January 2008 and up to April 15, 2011, using daily data.

Asset	T-bills	S&P 500 (SPY)	Google stock (GOOG)	Apple stock (AAPL)	Exxon Mobil stock (XOM)	Walmart stock (WMT)
Annual expected return $E(r)$	0.22%	5.36%	5%	4.5%	5.5%	3%

1. What are the annualized standard deviations using daily and monthly data for the S&P 500? What are the annualized arithmetic and geometric average rates of return?
2. What is the optimal risky-portfolio using the Markowitz model, and its Sharpe ratio?
3. What is the optimal risky-portfolio using the index model with numerical optimization? Use the calculated variance (as opposed to the observed variance), and the market model, i.e., total instead of excess returns, to estimate beta. Note that  $\sigma^2(e_i) = \Sigma(Y-Y')^2/(N-2)$ , and its square root is given by the output of `linest()`.
4. Explain in one sentence why the variances that you calculated in questions 2 and 3 differ (slightly).
5. What is the optimal risky-portfolio using the Treynor-Black model with expected (non-zero) alphas?
6. What is the optimal risky-portfolio using the Treynor-Black model with zero alphas?
7. Compare the weights of the 4 risky portfolios and the expected returns, standard deviations and Sharpe ratios of the 4 risky portfolios and the 5 securities in a table (hint: portfolios 1, 2 and 3 should be very similar).
8. If your risky portfolio is the one determined in question 3 and your client's utility function is  $U = E(r_c) - 1.5\sigma_c^2$ , how much money (in \$) should she put into T-bills and each of the 5 securities?
9. Assuming normality of returns, what is the probability that the complete portfolio described in questions 3 and 8 will have a negative return over a one-year period (hint: about 40%)?

### Notes

- Start early enough to have plenty of time (10-20 hours).
- Do not expect to get a high score as easily as on the Markov and Beta cases: poor work will result in 1 or 2 points out of 10.
- Pay attention to the difference between daily and annual estimates.
- Distinguish carefully between realized and expected returns, and between total and excess returns (or risk premiums).
- Submit both a properly formatted hardcopy and your electronic spreadsheet.