(1) Luenberger’s Examples 6.11 and 6.13 address mean-variance analysis for 5 assets with specified mean returns, variances, and covariances. (Note the typo, pointed out in class and fixed in my Excel spreadsheet: $\sigma_{35}$ should be $-0.27$ not $0.27$.) Consider what happens if we introduce a sixth investment opportunity with return $r_6$ such that $E[r_6] = 5$, $\text{Var}(r_6) = 2$, and $r_6$ is independent of $r_1, \ldots, r_5$:

(a) Find the minimum variance portfolio in the modified market, and evaluate its standard deviation $\sigma_{\text{min}}$.

(b) Find the general form of an efficient risky portfolio in the modified market.

(c) If the risk-free rate is $r_f = 10$, find the special fund $F$ in the modified market and evaluate the slope of the line it determines.

[Notice, with regard to (a) and (c), that introduction of an additional asset reduces the minimum variance, and reduces the risk you must take to get a given return. Why does this have to be so?]

(2) [Luenberger, Chapter 8, problem 7] Gavin Jones learned (as we did in class) that you cannot accurately estimate a typical stock’s return using the 12 monthly returns observed in a year. He thinks he can do better, still using data from a single year, by considering 24 overlapping month-long samples (sample 1 = Jan 1 to Feb 1; sample 2 = Jan 15 to Feb 15; sample 3 = Feb 1 to March 1; etc.). Is this a good idea? (In particular, does it give a better estimate than the one obtained by considering 12 nonoverlapping months?)