

### Exam 1 Prep on Optimal Portfolio Construction

- 1) Use the monthly data for the 30 Dow Jones Index stocks + S&P500 in *Week4E1PrepData.xlsx*. Use 5 years of data through Jun 2024. Save your file as **Lastname\_Firstname\_W4E1Prep.xlsx**.
- 2) Review all the tabs. You will be asked to save your work in the spaces allotted to the answers. You are not allowed to delete/move anything that is already in the tabs.
- 3) In "DJReturns", compute cont. return starting at B3. In Rows 64-5, compute the means and st deviations (.p). In rows 69-99, generate the ENTIRE covariance matrix using Data Analysis, pasting appropriately. In rows 103-133, compute the covariance matrix using matrix algebra.
- 4) In "DJFrontier", transpose the mean returns on the 30 stocks into col A under Means. Type in trial weights in col C. Enter matrix algebra formulae for PFMean, PFVar and PFStD in col C.
- 5) Run (unconstrained) efficient portfolio optimizations for stdev=4% and stdev=7%. Save the results in columns F and I. In col L, construct the risky-risky linear combination of the two efficient portfolios. Construct a data table starting at K10 with the headers of stdev and mean of the combination. Adjust the trial weights to trace out the curve in the frontier.
- 6) Plot the efficient frontier on a graph occupying roughly the pink space provided. Add the title; label the axes. Add the 30 DJ stocks. Label them. Scale the axes for the graph to be readable.
- 7) In C7, enter the Sharpe ratio formula for  $R_F=0.03\%$ . Use that to run Sharpe ratio optimizations to determine the tangent portfolio. Save the results in the range starting at X1. In col AB, construct a risky-riskless combination. Populate the data table starting at AA8.
- 8) Add to the Plot in 6) the tangent CML line constructed in the data table in 7). Also, add the tangent portfolio; label it. Rescale the graph appropriately if necessary.
- 9) Include the SP500 in your plot of the efficient frontier. Label the dot.
- 10) In col AF add weights for an equal-weighted portfolio of the 30 stocks. Add the equal-weighted portfolio to the plot. Label the dot.
- 11) Consider a *PensionFund*, which can invest in all 30 firms but is not allowed to enter into any short positions. Determine the maximum expected rate of return that such an investor could earn for a portfolio standard deviation of 5% and of 6%. Do not use the "make non-negative" check box in the solver's dialog box; figure out a different way by entering a new condition. Save the results in cols AI and AL, resp. Add the two pension portfolios to the plot. Label the dots.
- 12) Consider a special investor called *DisavowellInvestor*. This investor does not invest in firms whose names start with vowels: Apple (AAPL), Amgen (AMGN), Amex (AXP), IBM, and Intel (INTC). She excludes AAPL, AMGN, AXP, IBM, INTC from her portfolio. Determine the maximum expected rate of return that such an investor could earn for a portfolio standard deviation of 7%. Compare her maximum expected return to the one that a normal investor (i.e., one that potentially invests in all firms) could earn. **Prove numerically** that her portfolio is inefficient (compare the means).
- 13) Is the equal-weighted portfolio in 10) efficient? **Prove numerically** that it is not.
- 14) In "SP Hist", produce a histogram of the S&P500 returns in 1% bucket increments using the array function frequency().
- 15) Annotate your spreadsheet with comments; Label all graphs, dots; format appropriately. Use color and lines to increase the visibility of important results.

\*\*\*\*Complete the entire spreadsheet, answer 10 questions on Canvas, upload in the last question of the homework quiz.\*\*\*\*

ENJOY ALL THE EXCEL FUN! BE PROUD OF YOUR COMPLETED WORK