**Am I Diversified?**

**Instructions for Students**

The purpose of adding additional stocks to a portfolio is to diversify – to reduce risk. The extent to which risk (as measured by standard deviation) is reduced is determined by the stocks’ covariances (correlations) with each other and their individual standard deviations.

In this exercise, you will select 30 stocks that will be used to construct 30 equally-weighted portfolios – with each portfolio having a different number of stocks in it. Your first portfolio will have one stock in it, the second will have two stocks in it, the third will have three, etc. Only the last portfolio will have all 30 stocks in it.

The stocks you select need to have been publicly traded for the past five years so there will be enough (60) returns to calculate an estimate of the standard deviation of their returns. You will need to know (or find) the ticker symbol for each stock. You will need be using Excel 365 (which is part of Microsoft 365) in order to access the StockHistory function.

For bests results, start by deleting the ticker symbols that are already in cells C15-C44. Also, if, when you delete or enter the ticker symbol for a stock, a long rectangular window pops up saying that Microsoft Excel cannot calculate a formula, simply click “OK” and continue.

On the “Inputs” worksheet of the Excel Spreadsheet “Am I Diversified”, you will need to enter the ticker symbols for your 30 stocks in column C. Place them in any order you want. Once you have them entered, Excel’s StockHistory function will look up the closing monthly prices for the most recent 61 months, and will record them, along with the corresponding monthly closing values for an ETF that tracks the S&P 500 (IVV) on the “price data” workpage. From there, the “Returns and Stand Dev” workpage is set up to calculate the monthly continuously compounded returns for each stock and its sample monthly standard deviation of returns. The “Corr. Matrix” page constructs a 30 x 30 correlation matrix and the “Var-Cov Matrix” page constructs a 30x30 variance/covariance matrix. Below the variance/covariance matrix, Excel calculates the standard deviation of each of the 30 equally-weighted portfolios by taking the square root of the sum of the cells in a weighted variance/covariance matrix. The “Graph” page of the spreadsheet plots a graph of the relationship between the size of the portfolio (1-30) and its standard deviation. The solid black line on the graph is the standard deviation of the S&P 500.

Take some time to analyze the Excel spreadsheet and understand why the correlation and variance/covariance matrices fill in for you and how we are using Excel to create the 30 different equally-weighted portfolios.

After your graph fills out, make a copy of the last worksheet which includes the graph. This is **graph #1**. Next, re-order your stocks (on the Inputs page) so that the one with the highest standard deviation is in the first cell C15 and the one with the lowest standard deviation is in cell C44. The graph will automatically change shape. Again, make a copy of the last worksheet. This is **graph #2.**

**Questions**:

1. Why did you select the 30 stocks you chose?
2. Compare your graph #2 with the illustration in your textbook. Does it appear the textbook illustration is similar to what you find with real-world data?
3. Does the ordering of the stocks affect the portfolio standard deviation for the final 30-stock portfolio? Why or why not?
4. Other than the one-stock portfolio, the standard deviation of each portfolio (Column S) is less than the average standard deviation of the stocks that comprise the portfolio (Column R). Why is that?
5. In your first graph, does the standard deviation of the portfolio ever go up when you add a stock to it? If so, why?
6. Do you believe it is possible to put together an equally-weighted 30-stock portfolio that has a lower standard deviation than the S&P 500? If so, what attributes would you look for in each of the 30 stocks? If not, why not?

Randomly replace 5-10 of stocks you chose with a group of stocks that are all in the same industry (or similar industries). Make a copy of the graph. This is **graph #3**.

1. What do you observe about this graph as you compare it to your prior graphs?
2. Column Q on the last worksheet calculates the average correlation of each stock with the other 29. When you changed the stocks in your portfolio so that many of them were in the same industry, how did it affect these values? If you want to lower the standard deviation of your portfolio, are the values in this column important to note? Why or why not?

Change your choice of stocks for as many of the 30 stocks as you want. This time, try to construct a 30-stock portfolio that will have the lowest possible standard deviation you can get. Consider this to be a competition with your classmates to see “How low can you go?” Make a copy of the graph. This is **graph #4**.

1. What is the standard deviation that you were able to achieve for this 30-stock portfolio?

Please turn in graphs 1-4 along with your answers to these nine questions.