Using the EXCEL Solver

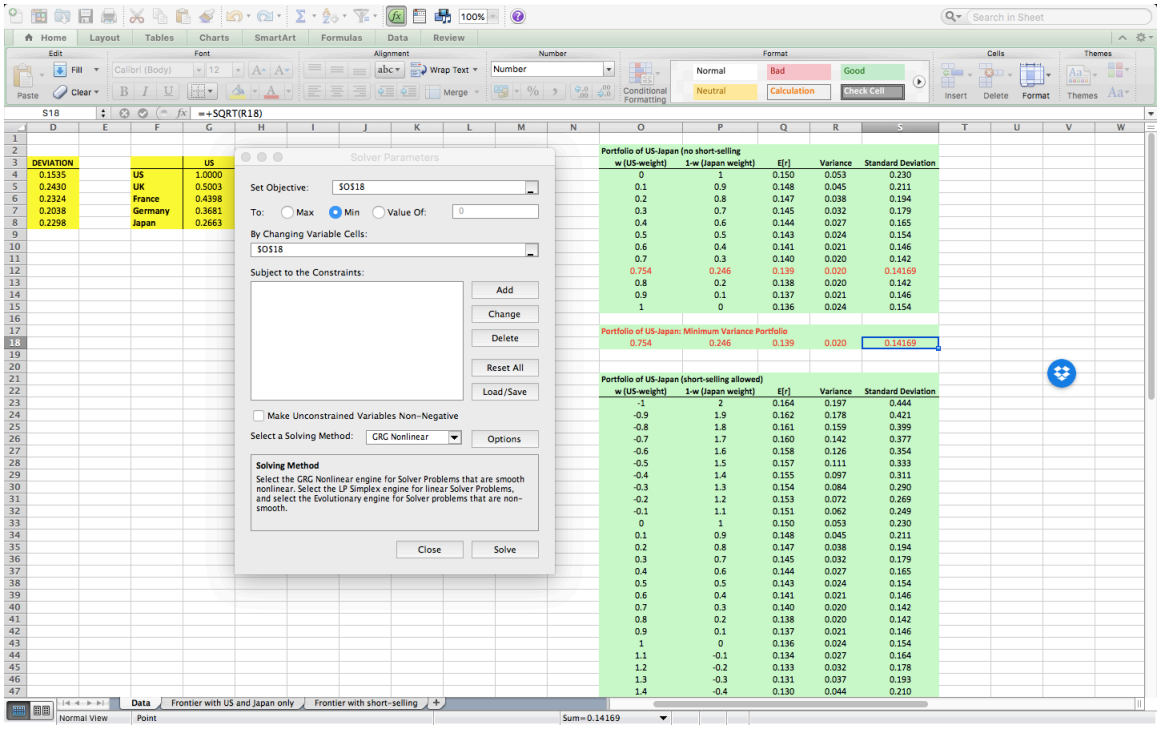
Excel's Solver is an easy-to-use and powerful optimizer. First, you will need to load the Solver Add-in program. For instructions, please go to https://support.office.com and search for 'Load Solver Add-in'.

This note explains how to use the Excel's solver in finding the minimum variance portfolio on the mean-variance frontier constructed from the U.S. and the Japanese equity markets. Please review the accompanying spreadsheet titled 'Mean_variance_frontier_US_Japan_only.xls'.

Focus on the section that is solving for the minimum variance portfolio in the spreadsheet.

Portfolio of US-Japan: Minimum Variance Portfolio				
0.754	0.246	0.139	0.020	0.14169

Under Tools, click on Solver – if you have successfully loaded the add-in, it will appear at the very bottom. The Solver has three parts:



The top section lets you choose a target cell by selecting the appropriate cell in **Set Objective**. This defines the variable you are trying to optimize. In the picture, that is the cell R18 – portfolio variance. In the Solver, below the target cell, you also need to select whether you are trying to maximize or minimize or set the objective equal to a certain value. We choose **Min** because we are seeking to minimize portfolio variance.

The next panel in the Solver lets you choose the decision variable. In other words, this is the choice variable. We are looking for the portfolio weights that will give us the minimum variance. In this example, it is the weight of the U.S. market in the portfolio. In the picture, this corresponds to O18.

The bottom panel is where you can include any constraints. In this instance, I have not included any constraints but, for example, one possible constraint might be a short-selling constraint. That would be equivalent to adding a constraint that says O18>0.

Finally, you hit SOLVE. The Solver then finds the solution to the optimization problem at hand, namely the portfolio weight that minimizes the portfolio variance.