

# ***BIRRSMV Optimizer***

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Gary Grady

## **What is the BIRRSMV Optimizer?**

The BIRRSMV Optimizer is an addendum to BIRRSMV that makes it easy to use of the Solver feature of Excel to perform portfolio optimizations, even very sophisticated ones.

The version of the BIRRSMV optimizer described here, while quite functional, is still undergoing improvements in terms of capabilities, appearance, and ease of use.

## **Installing the BIRRSMV Optimizer**

The BIRRSMV Optimizer occupies the right-most tab on an alternative version of the BIRRSMV Excel template. The new template supports all of the current BIRRSMV features and simply adds one addition tab to the workbook, so installing it will not otherwise alter the behavior of BIRRSMV.

To use the BIRRSMV Optimizer, you must have version 1.11 or later of BIRRSMV. (To see which version you have installed, start BIRRSMV and click on the icon at the top left of the window and choose “About BIRRSMV...” from the resulting menu.)

When you installed BIRRSMV, an Excel template file named BIRRSMV.xlt was placed in the folder with the other BIRRSMV files. (You can let Windows search for it by using the Find feature on the Start menu. Note that Windows may hide the .xlt extension, but it should identify the file as an Excel template.) To install the BIRRSMV Optimizer, first rename the original BIRRSMV.xlt something else (for example, BIRRSMVNoOpt.xlt). You can rename a file by clicking on the file name to select it, pausing, then clicking it again. You should then be able to edit the name using the keyboard. Press Enter when finished. Next copy the Excel template file BIRRSMVO.xlt from the CD or other source into the same folder as the BIRRSMV.xlt you just renamed. Finally, rename BIRRSMVO.xlt to BIRRSMV.xlt.

If you decide not to use the BIRRSMV Optimizer, you can restore the original template by deleting or renaming the new one, then changing the name of the original one back to BIRRSMV.xlt.

Note: By default, Windows hides many file name extensions such as .xlt, so you may not see the .xlt at the end of the names above. In that case, make sure that the files you copy and rename are identified as Excel templates and not, for example, as applications.

## **Using the BIRRSMV Optimizer**

To perform an optimization, first create a portfolio holdings file listing the candidate stocks. (See the BIRRSMV User’s Guide for information on the format of a portfolio holdings file.) Note that at present, only a maximum of 200 stocks will be used in the optimization. If you want to work with more, you need to obtain the Solver upgrade (see Excel Help for more information), and you must also modify the Optimizer tab of BIRRSMV.xlt. Contact BIRR for assistance. The weights for the stocks can be anything. (You might

want to use an initial weight of 1 for each asset to serve as an indication that this is a list of candidate assets and not a real portfolio.)

Now run BIRRSMV as usual to generate an output Excel workbook. (At this point you can exit BIRRSMV if you like.)

Go to the rightmost tab of the Excel workbook, which should be named Optimizer. (You may need to hit the pointer buttons at the bottom left of the Excel window to be able to see all the tabs.)

At the left of the Optimizer tab spreadsheet, you'll see a section headed Factor Constraints, followed by a list of factors. Below the named factors you'll see additional placeholders with a factor name of 0. These you can ignore. To the right of the factor names are two columns of constraints, holding minimum and maximum values for portfolio sector exposure. To constrain the risk exposure of the portfolio for any of these factors, enter the desired minimum and maximum values in the appropriate columns.

To the right of the table of factor constraints is a list of assets, current asset weights, and minimum and maximum asset weights. You will almost always want to set a maximum value in order to avoid having too few assets in the optimized portfolio. For a conventional optimization (all positions long), make the minimum value 0 unless you want to guarantee that you hold some of the stock in question. The minimum and maximum values should be entered in decimal form. (Note that if you enter a number followed by a percent sign—for example, "10%"—Excel will automatically convert the number to the decimal equivalent (0.1).

When you've finished entering constraints, you can run the optimization by clicking Tools | Solver, and then clicking the Solve button. When the solution finishes, confirm that you want to use the results and click OK. You'll then see the weights that produced the solution you requested.

Typically you will want to optimize more than once, starting with fairly loose constraints and tightening or loosening them as needed until you obtain a solution that's as close as possible to your target.

The more familiar you are with Excel, the easier it is to use this Optimizer. For example, to copy the contents in a given cell into a group of adjacent cells, click on the cell whose contents you want to copy, then grab the dot at the lower right corner of that cell (the cursor should turn into a plus sign) and hold the mouse button down while dragging the cell pointer down or to the right to the extend the highlight to all the cells in question. You can learn about many more such short-cuts in any good book or web site about Excel.

*Important:* The optimizer does not alter the contents of any other tabs of the workbook. To see how the results of the optimization affect the analysis of the portfolio, copy the tickers and weights from the Optimizer tab into a text editor (such as Notepad), save the resulting text file, and use it as input to another run of BIRRSMV.

## Optimizing a long-short strategy

If you want to optimize a long-short strategy, you'll need to do a few additional things.

First, when creating the input portfolio for BIRRSMV, it's a good idea to give positive holding quantities to the stocks you intend to sell long and negative holding quantities to the stocks you intend to sell short. The exact values aren't important, and they needn't add to 1, but doing this will help keep the two groups of candidate stocks separate.

The long position should include Treasury bills (pseudo-ticker TBILL) as an asset to stand for short-sale proceeds. Without this, it's impossible to compute correct portfolio weights for a short sale. You may want to make the initial T-bill weight holding 0 in order to make it stand out.

One advantage of setting the initial weights this way is that you can go to the Exposures tab and sort the portfolio on the weight column to group all the long and short candidates into separate groups.

Once you've used BIRRSMV to generate the Excel workbook, go to the Optimizer tab. For the short-sale candidates, set the maximum asset weight to zero and the minimum weight a negative number. For the long-position candidates, make the minimum weight 0 and the maximum weight a positive number.

You want to have Treasury bills represent the short-sale proceeds, so you should make both the minimum and the maximum asset weight for T-bills the negation of the sum of the weights for the short-sale assets. (The total weight for short-sale assets will be a negative value, so negating it will give a positive value for T-bill holdings.) Here's how to do that:

Suppose, for purposes of illustration, that the weights for the short sale candidate assets are in cells H6 through H25 and the Tbills weight is in H26. Then in cell I26 (the minimum weight for T-bills) you would put the formula `=-SUM(H6:H25)`. In the adjacent cell J26 (the maximum weight for T-bills) you would put the formula `=I26`. (That is, the maximum value is the same as the minimum.) Change the row numbers as appropriate to the candidate assets in your portfolio.

You should also set constraints on factor exposures. For a market-neutral long-short strategy, for example, you would set the minimum and maximum values for factor exposures to keep them close to zero.

## Adding new constraints

The basic BIRRSMV Optimizer template described above sets constraints on risk exposures and on asset weights, but you can add as many additional constraints as you like. For example, you might wish to set bounds on the weights of subsets of stocks in order to control the portfolio's sector weightings. You can copy in data from other sources for this purpose. Doing this requires understanding Solver's capabilities and limitations, which are described in the Excel documentation and Help system.

If you make regular use of such additional constraints, you may find it useful to modify the BIRRSMV.xlt template file to include such additional constraints by default. If you do, we recommend keeping a copy of the original so you can always go back to it.

## Choosing an objective function

By default, the objective function—i.e., the value optimization seeks to maximize—is the weighted sum of the expected returns over the BIRRSMV reporting period. (This takes into account any forecast scenario you've entered.)

If you want to maximize a different variable such as your own future earnings estimate or ranking, you must modify the optimizer. Contact BIRR if you need help.

## Additional options

The Excel Solver offers a number of settings you can alter to control how results are achieved. Just click on the Options button of the Solver dialog box. If you want to make these changes permanent, you'll need to enter them in the template file.

You can remove the 200 stock limit and add some additional capabilities if you obtain the Solver upgrade from Frontline Systems ([www.frontsys.com](http://www.frontsys.com)). This will also require modifying the Excel template.

## Future enhancements

As noted at the start of this document, the BIRRSMV Optimizer is a new feature that is undergoing development. Our goals include improved integration into BIRRSMV and enhanced appearance and ease of use. We welcome your suggestions.

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