# Working with the Asset Allocation Module in Morningstar Direct<sup>SM</sup>

The Asset Allocation module in Morningstar Direct<sup>SM</sup> allows users to determine how much of a portfolio to invest in cash, stocks, bonds, alternatives, and other asset classes. To keep users from having to repeat this process for every model portfolio or investment, the Asset Allocation module allows users to create a series of asset mixes to be reused in a variety of cases.

Additionally, the Asset Allocation module allows users to forecast potential outcomes for an asset mix, and model the risk associated with an asset class lineup. Finally, advisors can also use a Presentation Studio template embedded within the Asset Allocation module to create a meaningful report to analyze the asset class lineup.

This guide includes the following topics:

- Understanding Basic Information about Asset Allocation in Morningstar Direct (page 5)
- Constructing a Set of Asset Classes (page 7)
- Creating an Input File (page 12)
- Modifying the Case File (page 20)

#### Overview

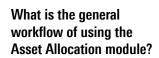
### Understanding Basic Information about Asset Allocation in Morningstar Direct

This section explains some introductory concepts about asset allocation and the work that's done for this type of task in Morningstar Direct. The following sections are covered here:

- What is the general workflow of using the Asset Allocation module? on page 5, and
- ► How is the work of asset allocation done? on page 6.

Using the Asset Allocation module includes the following general tasks:

- Build a set of asset classes to be analyzed. This does not entail assigning a weight to these asset classes, but merely giving each asset class a name and associating it with a representative index. Also, users can elect to use a pre-built set of asset classes from Morningstar, rather than needing to construct one from scratch.
- Create an Input file, which consists of the asset class set selected, capital market assumptions (of risk and return) for those asset classes, the distribution model and return methodology being used, and constraints assigned to the asset classes. Users can design their own set of inputs, or use one included in Morningstar Direct.
- 3. Design the Case file for the analysis of the asset allocation. The Case file consists of the actual asset mix(es) being used, the Efficient Frontier, Forecasting information, and a series of workspaces (tabs), which in turn are composed of charts and tables.
  - Note: Users can also elect to generate a Presentation Studio report illustrating the asset allocation lineup designed in the Asset Allocation module.



|   |                  |                       |                       |                |              |  |  |   |   |   |                     | Input con    |
|---|------------------|-----------------------|-----------------------|----------------|--------------|--|--|---|---|---|---------------------|--------------|
| Inputs Optimize                           |                  |                       |                       |                |              |  |  |   |   |   |                     |              |
| Untitled - Inp 🔻                          |                  | Asset Classes         |                       | 9              | Estimates    | T 🔁 🖷                                    | 1  | orts Run Simu                               |   |   |                     |              |
| Active Input                              | Manage Input     |                       | Options               | Currency       | Estimates    | Constraints Layou                        | t Run Rep                                    | orts Run Simu                               | lation                                      |   |                     |              |
| Input Workspace 🗙                         | Optimizer Worksp | ace 3 orecas          | ting Workspace        | de l           |              |  |  |   |   |   |                     |              |
| nput Summary                              |                  |                       | 20                    | E              | Export 🗆 🗙   | Correlations                             |  |   |   | 🖾 🔝 Export                                      | Edit 🗆 🗙            | Case file la |
| sset Classes                              | Arithmetic Mean  | Standard<br>Deviation |                       |                |              |  | <ul> <li>US Large</li> <li>Growth</li> </ul> | <ul> <li>US Large</li> <li>Value</li> </ul> | <ul> <li>US Small-Mid<br/>Growth</li> </ul> | <ul> <li>US Small-Mid</li> <li>Value</li> </ul> | Global Larg     Cap |              |
| US Large Growth                           | 13.23204         | 18.89561              |                       |                |              |  |  |   |   |   |                     | 1            |
| US Large Value                            | 13.07773         | 16.15931              |                       |                |              | <ul> <li>US Large Growth</li> </ul>      | 1.00   | 0.90  | 0.89  | 0.80  | 0                   |              |
| US Small-Mid Growth                       | 12.57527         | 25.00369              |                       |                |              | <ul> <li>US Large Value</li> </ul>       | 0.90   | 1.00  | 0.87  | 0.90  | 0                   |              |
| US Small-Mid Value                        | 14.18607         | 19.64330              |                       |                |              | US Small-Mid Growth                      | 0.89   | 0.87  | 1.00  | 0.93  | 0                   |              |
| Global Large Cap                          | 6.26030          | 17.30006              |                       |                |              | <ul> <li>US Small-Mid Value</li> </ul>   | 0.80   | 0.90  | 0.93  | 1.00  | 0                   |              |
| Global Small-Mid Cap                      | 6.78820          | 17.44792              |                       |                |              | <ul> <li>Global Large Cap</li> </ul>     | 0.84   | 0.87  | 0.78  | 0.75  | 1                   |              |
| US Government Bond                        | 5.12788          | 5.98176               |                       |                |              | <ul> <li>Global Small-Mid Cap</li> </ul> | 0.83   | 0.85  | 0.79  | 0.76  | 0                   |              |
| US Muni Bond                              | 6.82712          | 7.01860               |                       |                |              | US Government Bond                       | 0.05   | 0.03  | -0.00                                       | 0.01  | 0                   |              |
| US Other Bond                             | 7.48274          | 5.61881               |                       |                |              | <ul> <li>US Muni Bond</li> </ul>         | -0.02  | -0.06                                       | -0.09                                       | -0.09   | 0                   |              |
| • Cash                                    | 4.57951          | 1.08274               |                       |                |              | <ul> <li>US Other Bond</li> </ul>        | -0.08  | -0.09                                       | -0.16                                       | -0.13   | 0                   |              |
|   |                  |                       |                       |                |              | * Cash                                   | -0.07  | -0.05                                       | -0.06                                       | -0.06   | 0                   |              |
| Asset Class Statistics (                  | Historical)      |                       |                       |                | Edit 🗆 🗙     |  |  |   |   |   |                     |              |
| <ul> <li>Untitled - Input File</li> </ul> |                  |                       |                       |                | <u> </u>     |  |  |   |   |   |                     |              |
| Asset Classes                             | Arithmetic Mean  | Geometric Mean        | Standard<br>Deviation | CVaR Cutoff 5% | VaR Cutoff 5 |  |  |   |   |   |                     |              |
| US Large Growth                           | 10.67            | 8,64                  | 20.14                 | 40.51          |              |  |  |   |   |   |                     |              |
| US Large Value                            | 9.32             | 7.78                  | 17.49                 | 37.92          |              |  |  |   |   |   |                     |              |
| <ul> <li>US Small-Mid Growth</li> </ul>   | 10.78            | 8.30                  | 22.75                 | 41.66          |              |  |  |   |   |   |                     |              |
| US Small-Mid Value                        | 10.24            | 8.46                  | 19.92                 | 30.48          |              |  |  |   |   |   |                     |              |
| <ul> <li>Global Large Cap</li> </ul>      | 8.50             | 6.13                  | 21.52                 | 46.54          |              |  |  |   |   |   |                     |              |
| <ul> <li>Global Small-Mid Cap</li> </ul>  | 11.01            | 8.25                  | 23.54                 | 48.21          |              |  |  |   |   |   |                     |              |
| <ul> <li>US Government Bond</li> </ul>    | 5.03             | 4,86                  | 5.96                  | 8.47           |              |  |  |   |   |   |                     |              |
| US Muni Bond                              | 4.76             | 4.68                  | 4.24                  | 3.68           |              |  | 4  |   |   |   | •                   |              |
|   | 4.53             | 4.49                  | 3.11                  | 2.30           |              |  | 1.1  |   |   |   |                     |              |

Asset Allocation traditionally relies on two facets: Log-normal distributions to build assumptions of asset class risk and return, and mean-variance optimization to identify efficient asset mixes providing the greatest expected return for a given amount of expected risk – the series of portfolios known as the efficient frontier.

When developing asset-class assumptions, Morningstar Direct users have access to three distribution models:

- ► traditional log-normal distribution
- ► an enhanced version of log-normal known as the Johnson model, and
- ► the historical-data-based bootstrap method.

Log-Normal distribution, which is traditionally used for modeling asset classes, underestimates the chance of extreme events and it is considered thin-tailed. The Johnson distribution model has the ability to capture those extreme events by accounting for skewness and kurtosis, and it is considered fat-tailed.

Users can also use bootstrap historical data, applying these distribution models, to create asset class assumptions. (For the sake of simplicity, this document focuses on the Log-Normal model.)

Once asset allocation assumptions are established, users can run optimization to build efficient frontiers with various return and risk measures. After identifying optimal asset mixes, users can forecast the future performance of those asset mixes using Wealth and Return Percentiles, Wealth and Return Histograms, Target Wealth and Returns, and Probability of Loss. Users can apply inflation adjustment, cash flows, and rebalancing to forecasting for a more specific prediction of future returns and risk.

How is the work of asset allocation done?

This section shows users how to create a set of asset classes to be analyzed. The **Overview** following exercises are offered here:

- Customize an existing set of asset classes on page 7, and
- Create a custom set of asset classes on page 10.

The first step in using the Asset Allocation module is to select the asset classes to be used in an asset allocation lineup. Users can create a set of asset classes in one of the following ways:

- Use an existing asset class set and make whatever additions or deletions are needed, then save it with a unique name, or
- Manually add each asset class for an asset class set, and map it to a representative index or other benchmark.
  - Note: When creating an asset class set from scratch, users can also use a saved investment list of indexes or ETFs from Morningstar Direct for this purpose.

This exercise shows users how to modify an existing asset class set to create a new one. Although the Asset Allocation module is available in the desktop edition of Morningstar Direct, creating asset class sets is the only activity done here; the remaining asset allocation functionality is done in a browser window. The browser version of the Asset Allocation module also allows users to create asset class sets, so users are best to simply begin the work in the web-based edition of Morningstar Direct rather than in the desktop edition.

To create an asset class set from an existing asset class set, do the following:

- 1. Open a browser window, and go to http://direct.morningstar.com.
  - Note: When logging into the web-based version of Morningstar Direct, it's recommended to use Chrome in incognito mode. although Internet Explorer can also be used.

Exercise 1: Customize an existing set of asset classes

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2. Hover the cursor over the menu, then select Asset Allocation. The module opens in a new tab.

| Home<br>EXPLORE<br>Research | `<br>                         | M          | <b>RNINGSTA</b>    | <b>₽</b> Direct <sup>€</sup> |                                    |
|-----------------------------|-------------------------------|------------|--------------------|------------------------------|------------------------------------|
| Markets                     | Q Searc                       | ch for Sec | curities and Resea | arch                         |                                    |
| ANALYZE                     |                               |            |                    |                              |                                    |
| Lists & Screens             | ists & Screens                |            | ⊠ Create ∨         | Model Port                   |                                    |
| Model Portfolios            | ame                           | Туре       | Last Modified      | (i) There are r              |                                    |
| ► Your Files                | Iultiple Investments          | List       | 02/19/2020         | To create a nev              |                                    |
| Custom Data                 | nported List                  | List       | 02/15/2020         | upper right-ha               |                                    |
| Import                      | S Small Value 5 Star Funds &  | List       | 02/12/2020         |                              |                                    |
| Notes                       | ustom Database                | List       | 02/10/2020         |                              |                                    |
| Alerts                      | Iorningstar Prospects         | List       | 02/03/2020         |                              |                                    |
| EXTEND                      | ustainable Landscape U.S. Fu  | List       | 10/22/2019         |                              |                                    |
| Excel Add-In                | lodel Portfolio Holdings List | List       | 09/16/2019         |                              | Use the menu to select this option |
| Presentation Studio         | loderate Aggressive           | List       | 08/19/2019         |                              | select this option                 |

3. On the toolbar above the grid view, click **Asset Class Setup**. The Asset Class Setup window opens.

| \$<br>Input Files Case Files Investment Policies | Asset Class Setu     | ip 🕂 New    | Input 🕂 N  | ew Case 🛛 🕂  | New P | Click this button to a |
|--|----------------------|-------------|------------|--------------|-------|------------------------|
| Name   | Distribution Model   | Owner       | Permission | Last Updated | Creat | a new asset class se   |
| Five-Year  | Log-Normal           | Morningstar | Read Only  | 2013-06-14   | 201   |                        |
| Johnson  | Johnson              | Morningstar | Read Only  | 2013-06-12   | 201   |                        |
| Log-Normal                                       | Log-Normal           | Morningstar | Read Only  | 2013-06-20   | 201   |                        |
| Log-Normal Constrained                           | Log-Normal           | Morningstar | Read Only  | 2013-02-23   | 201   |                        |
| Log-Normal with Real Estate                      | Log-Normal           | Morningstar | Read Only  | 2013-02-23   | 201   |                        |
| One-Year   | Log-Normal           | Morningstar | Read Only  | 2013-02-23   | 201   |                        |
| Twenty-Year                                      | Log-Normal           | Morningstar | Read Only  | 2013-02-23   | 201   |                        |
| Weighted Historical                              | Bootstrap Historical | Morningstar | Read Only  | 2013-02-23   | 201   |                        |
|  |                      |             |            |              |       |                        |
|  |                      |             |            |              |       |                        |
|  |                      |             |            |              |       |                        |
|  |                      |             |            |              |       |                        |

- 4. From the Asset Class Set drop-down field, select Sample US Expanded.
- 5. Check the **Select All box** to the left of the Asset Class column header. All asset classes should be selected.
- 6. Uncheck the box for Gold, as this asset class will not be included in the asset class set.
- 7. Click Save As > Asset Class Set. The Asset Class Set Name dialog box opens.

|          |                 |                 | Asset                      | Class Setup   |                |                       | $\square$ ×                           |
|----------|-----------------|-----------------|----------------------------|---------------|----------------|-----------------------|---------------------------------------|
| Asse     | et Class Set    |                 |                            |               |                |                       |                                       |
| San      | nple US Expande | ed              | <b>*</b>                   | Delete        | Rename New Set | 🖌 Investment List 👻   |                                       |
|          | dd Delete       | Save As 🔻       |                            |               |                |                       |                                       |
| A        |                 | Asset Class Set |                            |               |                |                       | Be sure the correct                   |
| <u>.</u> | Asset Class     | Custom Database | y Index                    | Base Currency | Frequency      | Historical Date Range | asset classes are                     |
| ~        | Non-US Equity   |                 | MSCI EAFE PR USD           | US Dollar     | Monthly        | 1970-01 to 2020-01    | selected, then use<br>Save As menu to |
| •        | US Cash & Equ   | ivalents        | Citi Treasury Bill 3 Mon I | US Dollar     | Monthly        | 1978-01 to 2020-01    | select Asset Class                    |
| ~        | Non-US Gover    | nment Bonds     | Citi WGBI NonUSD USD       | US Dollar     | Monthly        | 1985-01 to 2020-01    |                                       |
| •        | Real Estate     |                 | FTSE NAREIT All REITS T    | I US Dollar   | Monthly        | 1972-01 to 2020-01    |                                       |
| ~        | US Inflation    |                 | US BLS CPI All Urban NS    | US Dollar     | Monthly        | 1913-02 to 2020-01    |                                       |
| •        | US Small Cap    | Value           | Russell 2000 Value TR U    | US Dollar     | Monthly        | 1979-01 to 2020-01    |                                       |
| ~        | US Large Cap    | Value           | Russell Top 200 Value T    | US Dollar     | Monthly        | 1986-01 to 2020-01    |                                       |
| •        | US Large Cap    | Growth          | Russell Top 200 Growth     | 1 US Dollar   | Monthly        | 1986-01 to 2020-01    |                                       |
| ~        | US Small Cap    | Growth          | Russell 2000 Growth TR     | US Dollar     | Monthly        | 1979-01 to 2020-01    |                                       |
| •        | US Corporate    | Bonds           | Barclays US Corporate H    | I US Dollar   | Monthly        | 1983-07 to 2020-01    |                                       |
| ~        | US Governmer    | nt Bonds        | Barclays US Govt/Credit    | US Dollar     | Monthly        | 1973-01 to 2020-01    |                                       |
|          | Gold            |                 | London Fix Gold PM PR U    | US Dollar     | Monthly        | 1968-05 to 2020-01    |                                       |
|          | •               |                 |                            |               |                |                       | V b                                   |
|          |                 |                 |                            |               |                |                       |                                       |
|          |                 |                 |                            |               |                | OK Can                | ncel                                  |

- 8. Name the asset class set Custom US Expanded, then click OK.
- 9. On the Asset Class Setup window, click **OK** to close it.

To create a unique set of asset classes from scratch, do the following:

1. Click the **Asset Class Setup** button on the toolbar above the spreadsheet grid. The Asset Class Setup window opens.

#### Exercise 2: Create a custom set of asset classes

| \$<br>Input Files Case Files Investment Policies | Asset Class Setu     | ip 🕂 New    | Input 🕂 🕂 N | ew Case 🛛 🕂  | New P |  |
|--|----------------------|-------------|-------------|--------------|-------|--|
| Name   | Distribution Model   | Owner       | Permission  | Last Updated | Creat | Click this button to add<br>a new asset class set. |
| Five-Year  | Log-Normal           | Morningstar | Read Only   | 2013-06-14   | 201   |  |
| Johnson  | Johnson              | Morningstar | Read Only   | 2013-06-12   | 201   |  |
| Log-Normal                                       | Log-Normal           | Morningstar | Read Only   | 2013-06-20   | 201   |  |
| Log-Normal Constrained                           | Log-Normal           | Morningstar | Read Only   | 2013-02-23   | 201   |  |
| Log-Normal with Real Estate                      | Log-Normal           | Morningstar | Read Only   | 2013-02-23   | 201   |  |
| One-Year   | Log-Normal           | Morningstar | Read Only   | 2013-02-23   | 201   |  |
| Twenty-Year                                      | Log-Normal           | Morningstar | Read Only   | 2013-02-23   | 201   |  |
| Weighted Historical                              | Bootstrap Historical | Morningstar | Read Only   | 2013-02-23   | 201   |  |
|  |                      |             |             |              |       |  |
|  |                      |             |             |              |       |  |
|  |                      |             |             |              |       |  |
|  |                      |             |             |              |       |  |

2. Click **New Set** > **Create**. The Asset Class Set Name dialog box opens.

| Asset Class Set       Sample US Consolidated     Delete     Rename     New Set     Investment List       Add     Delete     Save As      Get Firm-Level Group       Asset Class     Proxy Index     Base Currency     Historical Date Range       US Equity     Russell 3000 TR USD     US Dollar     Monthly     1979-01 to 2020-01 |                                  |
|--|----------------------------------|
| Add Delete Save As   | Select this control to create an |
| Add     Delete     Save As     Get Firm-Level Group       Asset Class     Proxy Index     Base Currency     Frequency  |                                  |
| Asset Class Proxy Index Base Currency Frequency Historical Date Range  |                                  |
|  | class set from                   |
| US Equity Russell 3000 TR USD US Dollar Monthly 1979-01 to 2020-01   |                                  |
|  |                                  |
| US Bonds Barclays US Agg Bond TF US Dollar Monthly 1976-01 to 2020-01  |                                  |
| US Cash Citi Treasury Bill 3 Mon U US Dollar Monthly 1978-01 to 2020-01  |                                  |
| Non-US Bonds Citi WGBI NonUSD USD US Dollar Monthly 1985-01 to 2020-01   |                                  |
| Non-US Equity MSCI EAFE PR USD US Dollar Monthly 1970-01 to 2020-01  |                                  |

3. Enter the name My Custom Asset Class Set, then click OK.

4. Click Add. The Add Asset Class dialog box opens.

|                           | As          | set Class Setup |               |                       |      |                     |
|---------------------------|-------------|-----------------|---------------|-----------------------|------|---------------------|
| Asset Class Set           |             |                 |               |                       |      |                     |
| My Custom Asset Class Set | •           | Delete Re       | ename New Set | 🗸 Investment List 🗸   |      |                     |
|                           |             |                 |               |                       |      |                     |
| Add Delete Save As 🔻      |             |                 | 1             |                       |      | Use this button to  |
| Asset Class               | Proxy Index | Base Currency   | Frequency     | Historical Date Range |      | add an asset class. |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               |                       |      |                     |
| 4                         |             |                 |               |                       | Þ    |                     |
|                           |             |                 |               |                       |      |                     |
|                           |             |                 |               | OK Ca                 | ncel |                     |
|                           |             |                 |               |                       |      |                     |

# 5. For the **Asset Class Name** and **Proxy Index** fields, use the following table to populate the asset classes:

Pote: To select an index, click once on its name, then click OK to add the asset class.

| Asset Class Name     | Proxy Index                   |
|----------------------|-------------------------------|
| US Large Growth      | Russell 1000 Growth TR USD    |
| US Large Value       | Russell 1000 Value TR USD     |
| US Small-Mid Growth  | Russell 2000 Growth TR USD    |
| US Small-Mid Value   | Russell 2000 Value TR USD     |
| Global Large Cap     | MSCI ACWI Ex USA Large NR USD |
| Global Small-Mid Cap | MSCI ACWI Ex USA Mid NR USD   |
| US Government Bond   | S&P US Treasury TIPS TR USD   |
| US Muni Bond         | BBgBarc Municipal TR USD      |
| US Other Bond        | BBgBarc US Agg Bond TR USD    |
| Cash                 | FTSE Treasury Bill 3 Mon USD  |

- 6. Repeat steps 4-5 until all asset classes have been added.
- 7. When all of the asset classes have been added to the set, click **OK** to close the Asset Class Setup window.

### **Creating an Input File**

With an Input file, users choose the settings by which a set of asset classes are constructed, including the time horizon an asset class set should be calculated from when determining expected risk and return values. Establishing these inputs the first step in analyzing and optimizing the allocation among the asset classes in the set.

Note: Updating the Input file also includes changing other variables, such as optimizing asset mixes for risk or return. This function is covered in later exercises.

An Input file contains the following information:

- ► Asset classes
- Expected return methodology
- Capital market assumptions
- Distribution models
- ► Constraints
- ► Currency settings, and
- ► Inflation series.

This section offers the following exercises and information to help users learn how to modify these Input settings as part of the asset allocation work, and how to understand the layout of the Asset Allocation interface:

- Create an input file on page 13
- ► What does the Asset Allocation window show? on page 14
- ► What does the Input Workspace show by default? on page 14
- ► Set the time horizon for analysis on page 15
- ► Analyze the correlation among asset classes on page 18, and
- Save the Input file on page 19.

### Overview

To create an input file, do the following:

## Exercise 3: Create an input file

1. From the Asset Allocation page, on the toolbar above the grid view, click **New Input**. The Asset Class Selection dialog box opens.

| Asset Allocation       |   |  |                      |             |            |            |  |  |
|------------------------|---|--|----------------------|-------------|------------|------------|--|--|
| Equity/Credit Research | * | Input Files Case Files Investment Policies | Asset Class Setu     | Jp 🕂 New    | Input 🕂    | Click this |  |  |
| Local Databases        |   | Name                                       | Distribution Model   | Owner       | Permission |            |  |  |
| Global Databases       |   |  |                      |             |            |            |  |  |
| Performance Reporting  |   | Five-Year                                  | Log-Normal           | Morningstar | Read Only  |            |  |  |
| Asset Allocation       |   | Johnson                                    | Johnson              | Morningstar | Read Only  |            |  |  |
| Asset Allocation       |   | Log-Normal                                 | Log-Normal           | Morningstar | Read Only  |            |  |  |
|                        |   | Log-Normal Constrained                     | Log-Normal           | Morningstar | Read Only  |            |  |  |
|                        |   | Log-Normal with Real Estate                | Log-Normal           | Morningstar | Read Only  |            |  |  |
|                        |   | One-Year                                   | Log-Normal           | Morningstar | Read Only  |            |  |  |
|                        |   | Twenty-Year                                | Log-Normal           | Morningstar | Read Only  |            |  |  |
|                        |   | Weighted Historical                        | Bootstrap Historical | Morningstar | Read Only  |            |  |  |

 From the Select an Class Set drop-down field, select My Custom Asset Class Set. The asset class set is now displayed in the dialog box, and the Select Model field should be set to Log-Normal.

| Asset Clas                  | ss Selection  |                           |
|-----------------------------|---------------|---------------------------|
| Asset Class Set             | Select Model  |                           |
| Select an asset class set 🔻 | Log-Normal 🔻  |                           |
| Select an asset class set   |               |                           |
| Sample US Consolidated      |               |                           |
| Sample US Expanded          |               | -                         |
| Sample Europe               | Base Currency |                           |
| - Sample UK                 |               | Choose the custom         |
| Sample Japan                |               | asset class set created   |
| EnCorr Sample               |               | in the previous exercise. |
| Custom US Expanded          |               |                           |
| My Custom Asset Class Set   |               |                           |
|                             |               |                           |
|                             |               |                           |
|                             |               |                           |
|                             |               |                           |
|                             |               |                           |
|                             |               |                           |
|                             |               |                           |
|                             |               |                           |
|                             |               |                           |
|                             |               |                           |

- 3. Click **OK**. The Input Settings window opens.
  - ☞ Note: This window can also be used to add or delete asset classes from the asset class set.
- 4. Click **OK** to close the Input Settings window. A browser window opens, and the Inputs tab is selected, as well as the Input Workspace sub-tab.
- 5. If needed, **maximize** the new browser window.

What does the Asset

Allocation window show?

The Asset Allocation window is really three distinct elements working together. At the top, is a toolbar. The icons here change based on the tab selected at the top of the window. The majority of the window is taken up by the following areas:

- ► Inputs
- ► Optimizer, and
- ► Forecasting.

These tabs are meant to be used in this order when creating an asset allocation. When a user selects a tab, the corresponding toolbar is selected as well. The components on a tab can be expanded, and some allow users to toggle between seeing information in a table vs. a chart.

Finally, at the bottom of the window is a components panel. Users can drag-and-drop these items onto a tab at any time. The selections here vary based not on which tab at the top is active, but rather on the option selected from the associated menu in the bottom-left corner.

Three components show by default on the Input Workspace on the Input tab. Each is explained in the following table:

What does the Input Workspace show by default?

| Component                              | Description   |
|--|---|
| Input Summary                          | This component shows the average return and standard deviation for each asset class in the asset class set. The only action a user can take here is to export the data to Microsoft <sup>®</sup> Excel <sup>®</sup> .   |
| Asset Class Statistics<br>(Historical) | This component shows more detailed statistics for the asset classes in the set. The settings can be edited to control what is displayed here.   |
| Correlations                           | This component shows users how closely correlated the<br>returns are between different asset classes in the set.<br>The less correlation between asset classes, the better.<br>The more asset classes included in an asset class set, the<br>more likely it will be that one or more are highly<br>correlated with one another. |

After new Inputs are created, the first step is to check the time horizon for the analysis. By default, historical values for risk and return are used for calculating these same estimates for the asset classes selected, but the values here can be changed.

## Exercise 4: Set the time horizon for analysis

To update the estimated values for the asset class set, do the following:

1. From the Input toolbar, click **Estimates**. The Estimates window opens.

| Inputs Optimize                          | r Forecasting    |                       |             |                 |                 |                           |                              |
|--|------------------|-----------------------|-------------|-----------------|-----------------|---------------------------|------------------------------|
| Untitled - Inp 💌<br>Active Input         | Manage Input     | Asset Classes         | ✓           | 100<br>Currency | H.<br>Estimates | Constraint                | Start by clicking this icon. |
| Input Workspace ×                        | Optimizer Worksp | ace Forecas           | ting Worksp | ace 🚽           |                 |                           |                              |
| Input Summary                            |                  |                       |             |                 | Export 🗆 🗙      | Correla                   |                              |
| Asset Classes                            | Arithmetic Mean  | Standard<br>Deviation |             |                 |                 |                           |                              |
| <ul> <li>US Large Growth</li> </ul>      | 13.23204         | 18.89561              |             |                 |                 |                           |                              |
| <ul> <li>US Large Value</li> </ul>       | 13.07773         | 16.15931              |             |                 |                 | ◆ US La                   |                              |
| <ul> <li>US Small-Mid Growth</li> </ul>  | 12.57527         | 25.00369              |             |                 |                 | <ul> <li>US La</li> </ul> |                              |
| <ul> <li>US Small-Mid Value</li> </ul>   | 14.18607         | 19.64330              |             |                 |                 | + US Sn                   |                              |
|  | 6.26030          | 17,30006              |             |                 |                 | <ul> <li>US Sn</li> </ul> |                              |
| <ul> <li>Global Large Cap</li> </ul>     |                  |                       |             |                 |                 | <ul> <li>Globa</li> </ul> |                              |
| <ul> <li>Global Small-Mid Cap</li> </ul> | 6.78820          | 17.44792              |             |                 |                 | <ul> <li>Globa</li> </ul> |                              |

2. From the Set-Up sub-tab on the Arithmetic Mean tab, expand the Historical section.

|  |                          | Estima                         | tes        |                 |            | ×            |  |
|--|--------------------------|--------------------------------|------------|-----------------|------------|--------------|--|
| Arithmetic Mean Sta                    | ndard Deviation          | Correlation                    | Input      | Summary         |            |              |  |
| Set-Up Baseline                        | Settings                 |                                |            |                 | _          |              |  |
| Asset Class                            | Building Block<br>Equity | Building Block<br>Fixed Income | САРМ       | Black-Litterman | Historical | User Defined | Note the values being used to calculate estimated return |
| <ul> <li>US Large Growth</li> </ul>    | 0                        | 0                              | 0          | 0               | ۲          | 0            | values for this asset class s                            |
| <ul> <li>US Large Value</li> </ul>     | 0                        | 0                              | $\bigcirc$ | $\bigcirc$      | ۲          | 0            |  |
| • US Small-Mid Growth                  | 0                        | 0                              | 0          | 0               | ۲          | 0            |  |
| <ul> <li>US Small-Mid Value</li> </ul> | 0                        | 0                              | $\bigcirc$ | 0               | ۲          | 0            |  |
| <ul> <li>Global Large Cap</li> </ul>   | 0                        | 0                              | 0          | 0               | ۲          | 0            |  |
| Global Small-Mid Cap                   | 0                        | 0                              | $\bigcirc$ | $\bigcirc$      | ۲          | 0            |  |
| • US Government Bond                   | 0                        | 0                              | 0          | 0               | ۲          | 0            |  |
| •                                      | 0                        | 0                              | 0          | -               |            |              |  |
| Building Block Equity                  |                          |                                |            |                 |            |              |  |
| Building Block Fixed Inc               | ome                      |                                |            |                 |            |              |  |
| ► CAPM                                 |                          |                                |            |                 |            |              | Click this section to expan                              |
| ▶ Black-Litterman                      |                          |                                |            |                 |            |              | onek uns section to expan                                |
| Historical                             |                          |                                |            |                 |            |              |  |

3. The Start Date for calculating the mean return for each asset class is listed; note that a number of different dates are present. The Input Summary tab on this window uses these time periods to calculate each asset class's arithmetic mean return. To run an analysis using a common time period (namely, the earliest common start date among the asset classes), click **Common Time Period**. then click **Apply**. The Start Date for each asset class updates to display the common start date.

|  |                   |            | Estir      | nates    |        |            |             |          | ×  |          |
|--|-------------------|------------|------------|----------|--------|------------|-------------|----------|--|----------|
| Arithmetic Mean Sta                    | ndard Devia       | tion Co    | orrelatio  | n Inp    | ut Sum | imary      |             |          |  |          |
| Set-Up Baseline                        | Settings          |            |            |          |        |            |             |          |  |          |
| US Small-Mid Growth                    | 0                 |            | 0          | 0        |        | 0          | ۲           | 0        | A  |          |
| <ul> <li>US Small-Mid Value</li> </ul> | 0                 |            | $\bigcirc$ | 0        |        | $\bigcirc$ | ۲           | 0        |  |          |
| <ul> <li>Global Large Cap</li> </ul>   | 0                 |            | $\bigcirc$ | 0        |        | 0          | ۲           | 0        |  |          |
| Global Small-Mid Cap                   | 0                 |            | $\bigcirc$ | 0        |        | $\bigcirc$ | ۲           | 0        |  |          |
| • US Government Bond                   | 0                 |            | $\bigcirc$ | 0        |        | 0          | ۲           | 0        |  |          |
| 4                                      | -                 |            | 0          | 0        |        | 0          |             | <b>F</b> |  |          |
| Building Block Equity                  |                   |            |            |          |        |            |             |          |  |          |
| Building Block Fixed Inc               | ome               |            |            |          |        |            |             |          |  |          |
| ► CAPM                                 |                   |            |            |          |        |            |             |          |  |          |
| Black-Litterman                        |                   |            |            |          |        |            |             |          |  |          |
| Historical                             |                   |            |            |          |        |            |             |          |  |          |
| Start Date                             | End Da            | te         |            | _        |        |            |             |          | -  |          |
|  |                   |            |            | A        | pply   | Common     | Time Period |          | Use these buttons to                             | apply    |
| Asset Class                            | Return            | Start Date |            | nd Date  |        |            |             |          | a common start date                              |          |
| OO OHIGH PHO OFOWER                    | Keturn<br>0.55155 | Start Date |            | end Date | ***    |            |             |          | calculating the mean<br>for all asset classes in | i the se |
| <ul> <li>US Small-Mid Value</li> </ul> | 1.11163           | 1979-01    |            | 2020-01  |        |            |             |          |  |          |
| <ul> <li>Global Large Cap</li> </ul>   | 0.50730           | 1994-06    |            | 2020-01  |        |            |             |          |  |          |
| Global Small-Mid Cap                   | 0.54881           | 1994-06    |            | 2020-01  |        |            |             |          |  |          |
| US Government Bond                     | 0.41760           | 2002-01    |            | 2020-01  |        |            |             |          |  |          |
|  |                   |            |            |          | _      |            |             | •        | T  |          |

4. Click the Standard Deviation tab.

- 5. Click **Common Time Period**. then click **Apply**. The Start Date for each asset class updates to display the common start date. The Start Date for each asset class updates to display the common start date.
  - Note: Do not click OK or close the Estimates window, as the next exercise still requires use of this resource.

|                   |          |              | E       | stimates |            |     |            |       | × |
|-------------------|----------|--------------|---------|----------|------------|-----|------------|-------|---|
| Arithmetic Mean   | Standard | Deviation    | Correl  | ation II | nput Summa | агу |            |       |   |
| Start Date        |          | Ind Date     |         |          |            |     |            |       |   |
|                   |          |              |         |          | Apply      | Com | mon Time P | eriod |   |
| Asset Class       |          | Standard Dev | viation |          | Start Date |     | End Date   |       |   |
| US Large Growth   |          |              |         | 4.83680  | 1979-01    |     | 2020-01    |       |   |
| US Large Value    |          |              |         | 4.14846  | 1979-01    |     | 2020-01    |       |   |
| US Small-Mid Gro  | wth      |              |         | 6.40389  | 1979-01    |     | 2020-01    |       |   |
| US Small-Mid Valu | Je       |              |         | 4.98772  | 1979-01    |     | 2020-01    |       |   |
| Global Large Cap  |          |              |         | 4.69541  | 1994-06    |     | 2020-01    |       |   |
| Global Small-Mid  | Сар      |              |         | 4.71388  | 1994-06    |     | 2020-01    |       |   |
| US Government B   | ond      |              |         | 1.64819  | 2002-01    |     | 2020-01    |       |   |
| US Muni Bond      |          |              |         | 1.90520  | 1980-01    |     | 2020-01    |       |   |
| US Other Bond     |          |              |         | 1.51724  | 1976-01    |     | 2020-01    |       |   |
| Cash              |          |              |         | 0.29998  | 1978-01    |     | 2020-01    |       |   |
|                   |          |              |         |          |            |     |            |       |   |

When analyzing an asset class set, it is important to check the correlation among them, to ensure no overlap exists.

- 1. The Estimates window should still be open. Click the **Correlation** tab. A common time period should be applied to all asset classes.
- 2. A Condition Number displays in the top-right corner of the tab. This number should be below 20. Anything higher signifies too much overlap between asset classes. If the Condition Number is too high, consider closing this window to remove overlapping asset classes, or change representative indexes used for an asset class.

Exercise 5: Analyze the correlation among asset classes

|   |   |   |  |   |   |  | <                               |
|---|---|---|--|---|---|--|---------------------------------|
| Arithmetic Mean Sta                     | ndard Deviatio                          |   | timates                                      | Summary                                     |   | >  |                                 |
| Start Date                              | End Date                                |   |  | _   |   | lumber: 19.534   | Note the Condition Number value |
| 2002-01                                 | 2020-01                                 |   | Calculate                                    | 2   | Co  | rrelation Test   |                                 |
|   | <ul> <li>US Large<br/>Growth</li> </ul> | <ul> <li>US Large</li> <li>Value</li> </ul> | <ul> <li>US Small-<br/>Mid Growth</li> </ul> | <ul> <li>US Small-<br/>Mid Value</li> </ul> | <ul> <li>Global</li> <li>Large Cap</li> </ul> | <ul> <li>Global</li> <li>Small-Mid</li> <li>Cap</li> </ul> |                                 |
| <ul> <li>US Large Growth</li> </ul>     | 1.00000                                 | 0.90455                                     | 0.88848                                      | 0.79980                                     | 0.83643                                       | 0.82500  |                                 |
| <ul> <li>US Large Value</li> </ul>      | 0.90455                                 | 1.00000                                     | 0.86623                                      | 0.90214                                     | 0.86501                                       | 0.84753  |                                 |
| <ul> <li>US Small-Mid Growt</li> </ul>  | 0.88848                                 | 0.86623                                     | 1.00000                                      | 0.93005                                     | 0.77534                                       | 0.78736  |                                 |
| <ul> <li>US Small-Mid Value</li> </ul>  | 0.79980                                 | 0.90214                                     | 0.93005                                      | 1.00000                                     | 0.75186                                       | 0.76373  |                                 |
| <ul> <li>Global Large Cap</li> </ul>    | 0.83643                                 | 0.86501                                     | 0.77534                                      | 0.75186                                     | 1.00000                                       | 0.98137  |                                 |
| <ul> <li>Global Small-Mid Ca</li> </ul> | 0.82500                                 | 0.84753                                     | 0.78736                                      | 0.76373                                     | 0.98137                                       | 1.00000  |                                 |
| US Government Bor                       | 0.04788                                 | 0.03176                                     | -0.00356                                     | 0.00971                                     | 0.16116                                       | 0.19697  |                                 |
| <ul> <li>US Muni Bond</li> </ul>        | -0.02256                                | -0.05738                                    | -0.08727                                     | -0.08657                                    | 0.03404                                       | 0.06772  |                                 |
| <ul> <li>US Other Bond</li> </ul>       | -0.08262                                | -0.08618                                    | -0.15861                                     | -0.12761                                    | 0.02239                                       | 0.06125  |                                 |
| <ul> <li>Cash</li> </ul>                | -0.06876                                | -0.04851                                    | -0.06457                                     | -0.06381                                    | 0.02831                                       | 0.01516  |                                 |
|   | •                                       |   |  |   |   | 1  | •                               |

3. Click **OK** to close the Estimates window. The Input Summary and Asset Class Statistics (Historical) components on the Input Workspace recalculate.

Now that the Inputs have been updated, users will see in upcoming exercises how to modify the Case file. This includes, in part, picking and modifying the tables and charts appearing on the various tabs in the interface. Before doing that, however, it will be useful to save the Input file itself, so it can be reused with a variety of Case files. In other words, users can design multiple page layouts and plug in the same set of input assumptions. To save the Input file, do the following:

Exercise 6: Save the Input file

1. In the top-left corner of the Morningstar Asset Allocation window, click the **Settings** icon, then choose **Save Inputs As**. The Save Input File dialog box opens.

| ¢ | Inputs Optimizer I   | Forecasting   |                       |              |                 |                        |
|---|--|---------------|-----------------------|--------------|-----------------|------------------------|
|   | Tips<br>Support  | 😴<br>ge Input | Asset Classes         | ✓ Options    | (1)<br>Currency |                        |
|   | Save Case (unsaved)<br>Save Inputs (unsaved)<br>Save Case As | zer Worksp    | ace Forecas           | ting Workspa | ace             |                        |
|   | Save Inputs As   | hetic Mean    | Standard<br>Deviation |              |                 | Use the Settings icon  |
|   | Export   | 9.89446       | 15.92321              |              |                 | to select this option. |
|   | Sign out   | 8.75702       | 15.68762              |              |                 |                        |
| + | US Small-Mid Growth  | 10.27908      | 21.51126              |              |                 |                        |

- 2. Type My Custom Inputs, then click OK.
- 3. When the confirmation message opens, click **OK**. The name of the Input file appears in the Active Input drop-down field. This field allows users to flip between different Input files within the same Case file.

| Inputs Optimize   | r Forecasting   |                       |           |               |   |  |  |  |  |
|---|-----------------|-----------------------|-----------|---------------|---|--|--|--|--|
| My Custom Inputs  Active Input                              | Manage Input    | Asset Classes         | ✓ Options | )<br>Currency | Note the name of t saved Input file her |  |  |  |  |
| Input Workspace × Optimizer Workspace Forecasting Workspace |                 |                       |           |               |   |  |  |  |  |
| Input Summary   |                 |                       |           |               |   |  |  |  |  |
| Asset Classes   | Arithmetic Mean | Standard<br>Deviation |           |               |   |  |  |  |  |
| <ul> <li>US Large Growth</li> </ul>                         | 9.89446         | 15.92321              |           |               |   |  |  |  |  |
| <ul> <li>US Large Value</li> </ul>                          | 8.75702         | 15.68762              |           |               |   |  |  |  |  |
| • US Small-Mid Growth                                       | 10.27908        | 21,51126              |           |               |   |  |  |  |  |

### Modifying the Case File

The Case file in the Asset Allocation module refers to more that just the layout of the charts and tables in the various workspaces. The following capabilities are also included as part of a Case file:

- The associated Inputs file(s)
- Asset mixes
- ► Optimization settings, and
- ► Forecasting settings, such as initial assets and cash flows.

This section offers the following exercises in support of learning how to work with a Case file:

- Optimize the asset allocation set on page 20
- ► Add and modify the Allocation Spectrum component on page 22
- ► Set constraints for an asset allocation on page 24
- ► Input an asset mix on page 25
- Create additional asset allocation mixes on page 27
- Evaluate the total risk for a set of asset classes on page 30
- Evaluate the active risk for a set of asset classes on page 32
- Save an asset mix as a custom benchmark on page 36
- ► Forecast returns for an asset mix on page 37, and
- ► Generate a report from the Asset Allocation module on page 41.

Having established the capital market assumptions and correlations among asset classes, the system can now build an Efficient Frontier using Mean-Variance Optimisation (MVO). Each frontier shows a series of 100 different asset mixes providing the greatest expected return (Y-axis) for a specified level of risk (X-axis).

Exercise 7: Optimize the asset allocation set

To run the simulation, do the following:

- 1. To access the Efficient Frontier, click the **Optimizer Workspace** tab.
- 2. From the toolbar, click **Optimization**. The Optimization Settings window opens.

| Inputs Optimiz                     | er Forecastin  | g             |                    |             |          |  |
|------------------------------------|----------------|---------------|--------------------|-------------|----------|--|
| My Custom Inputs 💌<br>Active Input | Wanage Input   | Asset Classes | Optimization       | Asset Mixes | Constrai | Click this icon to run the optimization process. |
| Input Workspace                    | Optimizer Work | space X Fore  | ecasting Workspace | e           |          |  |
| Asset Mix Statistics (             | Simulated)     |               |                    |             |          |  |
|                                    |                |               |                    |             |          |  |
|                                    |                |               |                    |             |          |  |
|                                    |                |               |                    |             |          |  |
|                                    |                |               |                    |             |          |  |

- 3. To the right of Risk drop-down field, select the **Resample checkbox**.
  - Note: Resampling produces more diversified and robust portfolios on the Efficient Frontier, where the system recognizes that capital market assumptions are forecasts and not a "sure thing."

|                          | Optimiz             | zation Settings |       | ×          |
|--------------------------|---------------------|-----------------|-------|------------|
| Asset-Only Optimization  | O Surplus Optimizat | tion            |       |            |
| Reward                   | Arithmetic Mean     |                 | Ŧ     |            |
| Risk                     | Standard Deviation  |                 | <br>- | 🕑 Resample |
| Return Display Frequency | Annually            | r               |       |            |
| Input File               | My Custom Inputs    |                 | <br>- |            |
| Select Assets            |                     | 1               |       |            |
| Asset                    |                     | Value           |       |            |
| US Large Growth          |                     | N/A             |       |            |
| US Large Value           |                     | N/A             |       |            |
| US Small-Mid Growth      |                     | N/A             |       |            |
| US Small-Mid Value       |                     | N/A             |       |            |
| Global Large Cap         |                     | N/A             |       |            |
| Global Small-Mid Cap     |                     | N/A             |       |            |
| US Government Bond       |                     | N/A             |       |            |
| US Muni Bond             |                     | N/A             |       |            |
| US Other Bond            |                     | N/A             |       |            |
| Cash                     |                     | N/A             |       |            |
|                          |                     |                 |       |            |
| Settings                 |                     |                 | ОК    | Cancel     |

- 4. Click **OK**. The Efficient Frontier reloads on the screen.
- 5. From the toolbar, click **Run Simulation**.

| Inputs Optimizer Forecasting                             | T                      |                     | 20.0000  | 1             |             |                      | 1                  |
|--|------------------------|---------------------|--|---------------|-------------|----------------------|--------------------|
| my custom inputs   | Classes Optimization   | Asset Mixes Constra | and a second | Layout        | Run Reports | 43<br>Run Simulation | Click this icon to |
| Input Workspace Optimizer Workspace                      | × Forecasting Workspac | e 📲                 |  |               |             |                      | update the page    |
| Asset Mix Statistics (Simulated)                         |                        | Edit                | × Efficient Frontier   |               |             |                      |                    |
|  |                        |                     | Active Frontier: My  | Custom Inputs |             |                      |                    |
|  |                        |                     | 12   |               |             |                      |                    |
|  |                        |                     | 11 -   |               | _           |                      |                    |
|  |                        |                     |  |               |             |                      |                    |
| Click 'Run Simulation' to see results for this component |                        |                     | 9  |               |             |                      | 1                  |
| Circk Run Simulation to see results for this component   |                        |                     | 3-   |               |             | / '                  |                    |
|  |                        |                     | Ę  |               |             |                      |                    |
|  |                        |                     | Arithmetic Mean  | /             |             |                      |                    |
|  |                        |                     | tthme  |               |             |                      |                    |
|  |                        |                     | ₹  | 1             |             |                      |                    |
| Composition  |                        | 💌 🔟 Edit            |  | /•*           |             |                      |                    |
|  |                        |                     | -  |               |             |                      |                    |
|  |                        |                     | 3  |               |             |                      |                    |

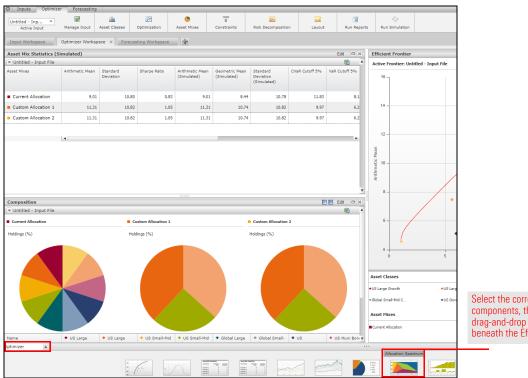
6. **Hover the cursor** over various points on the Efficient Frontier to see the corresponding asset mix for that location.

The Allocation Spectrum component provides additional insight on the possible risk and return outcomes of the various asset allocation mixes available. Each color on the chart represents a different asset class. As with the Efficient Frontier chart, the Allocation Spectrum contains 100 different asset mixes, with the more conservative ones to the left, and the more aggressive ones to the right.

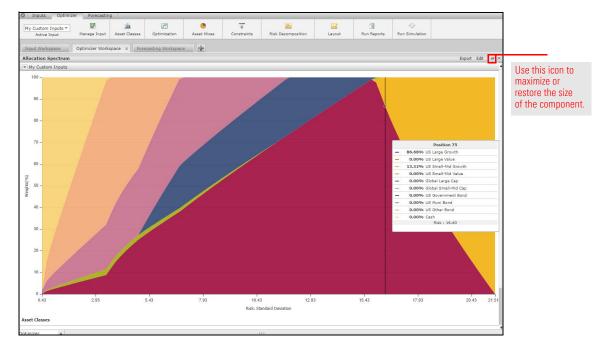
**Exercise 8: Add and** modify the Allocation Spectrum component

To include this component on the Optimizer Workspace, do the following:

- 1. From the **Components** menu in the bottom-left corner of the window, select the Optimizer components.
- 2. Click-and-drag the Allocation Spectrum component beneath the Efficient Frontier component.



Select the correct set of components, then drag-and-drop this chart beneath the Efficient Frontier.  Click the Maximize icon in the component, then hover the cursor over it, to see the various asset allocations available. Note that as risk increases, the exposure to a number of asset classes is 0%.



- 4. Click the **Restore** icon to resize the component.
- 5. To save the change of including the Allocation Spectrum component on the Optimizer Workspace, click the **Settings** icon, then select **Save Case As**.

| \$<br>Inputs Optimizer   | Forecasting  | )                     |              |                    |                        |
|--------------------------|--------------|-----------------------|--------------|--------------------|------------------------|
| Tips                     | <b>W</b>     | nla                   | 1            | ۲                  |                        |
| Support                  | ge Input     | Asset Classes         | Optimization | Asset Mi           |                        |
| Save Case (unsaved)      | zer Works    | pace × Fore           |              |                    |                        |
| Save Inputs              |              |                       |              |                    |                        |
| Save Case As             | ed)          |                       |              |                    | Use the Settings icor  |
|                          |              |                       |              |                    |                        |
| Save Inputs As           |              |                       |              |                    | to select this option. |
| Save Inputs As<br>Export | netic Mean   | Standard<br>Deviation | Sharpe Ratio | Arithme<br>(Simula | to select this option. |
|                          | — netic Mean |                       | Sharpe Ratio |                    | to select this option. |

- 6. Name the Case file My Custom Case File, then click OK.
- 7. When the confirmation message opens, click **OK**.

Setting constraints can be not just a useful exercise when creating an asset mix, but also a necessary one, in order to ensure each asset class has a minimum representation in a client's asset allocation, as well as to keep an asset class from being overrepresented. However, be careful when setting constraints, because too narrow of a constraint will significantly shrink the Efficient Frontier, and leave that many fewer asset mixes from which to select.

Also, although constraints are being set within the context of working with a Case file, note that these are actually saved as part of the Input file so the latter will need to be saved at the end of the exercise.

To set constraints for an asset allocation set, do the following:

1. From the toolbar, click **Constraints**. The Constraint Settings window opens.

| Dinputs Optimize                     | Forecasting     |                       |                   |                                |                            |  |                |
|--------------------------------------|-----------------|-----------------------|-------------------|--------------------------------|----------------------------|--|----------------|
| My Custom Inputs 🔻<br>Active Input   | Manage Input    | Asset Classes         | Optimization      | Asset Mixes                    | Constraints                | Risk De  | Click this icc |
| Input Workspace                      | Optimizer Works | pace X Fore           | casting Workspace | -                              |                            |  |                |
| Asset Mix Statistics (S              | imulated)       |                       |                   |                                | Edit 🗆 🗙                   | Efficien   |                |
| <ul> <li>My Custom Inputs</li> </ul> |                 |                       |                   |                                | 3                          | Active F   |                |
| Asset Mixes                          | Arithmetic Mean | Standard<br>Deviation | Sharpe Ratio      | Arithmetic Mean<br>(Simulated) | Geometric N<br>(Simulated) | Arithmetic Mear<br>1 - 2 - 6<br>1 - 1 - 1  |                |
|                                      | 4               |                       |                   |                                | •                          | Huy 1-   |                |
|                                      |                 |                       |                   |                                |                            | , in the second se |                |
|                                      |                 |                       |                   |                                | _                          | Asset Cla  |                |

- 2. In the **Min Holding** column, type **5** for each row.
  - ☞ Note: Leave the Max Holding value as 100 for each row.

| Cons                                     | traint Settings |             | ×  |                      |
|--|-----------------|-------------|----|----------------------|
| Individual Group Relative                |                 |             |    |                      |
| Asset Class                              | Min Holding     | Max Holding |    | The value must be    |
| <ul> <li>US Large Growth</li> </ul>      | 5               | 100         |    | entered in each row. |
| <ul> <li>US Large Value</li> </ul>       | 5               | 100         |    |                      |
| <ul> <li>US Small-Mid Growth</li> </ul>  | 5               | 100         |    |                      |
| <ul> <li>US Small-Mid Value</li> </ul>   | 5               | 100         |    |                      |
| Global Large Cap                         | 5               | 100         |    |                      |
| <ul> <li>Global Small-Mid Cap</li> </ul> | 5               | 100         |    |                      |
| <ul> <li>US Government Bond</li> </ul>   | 5               | 100         |    |                      |
| <ul> <li>US Muni Bond</li> </ul>         | 5               | 100         |    |                      |
| <ul> <li>US Other Bond</li> </ul>        | 5               | 100         |    |                      |
| <ul> <li>Cash</li> </ul>                 | 5               | 100         |    |                      |
|  |                 |             | ОК |                      |

3. Click **OK**. The Efficient Frontier and the Allocation Spectrum charts update.

4. To save these constraints, click the Settings icon, then select Save Inputs.

| ¢. | Inputs Optimizer | Forecasting |               |                   |          |                    |  |  |  |  |  |
|----|------------------|-------------|---------------|-------------------|----------|--------------------|--|--|--|--|--|
|    | Tips             | <b>V</b>    |               | 1                 | •        |                    |  |  |  |  |  |
|    | Support          | ge Input    | Asset Classes | Optimization      | Asset Mi |                    |  |  |  |  |  |
| 7  | Save Case        | zer Works   | ace X Fore    | casting Workspace |          |                    |  |  |  |  |  |
| 7  | Save Inputs      |             |               |                   |          | Use the Settings i |  |  |  |  |  |
|    | Save Case As     | ed)         | ed)           |                   |          |                    |  |  |  |  |  |
|    | Save Inputs As   |             |               |                   |          |                    |  |  |  |  |  |
|    |                  | netic Mean  | Standard      | Sharpe Ratio      | Arithme  |                    |  |  |  |  |  |
|    | Export           |             | Deviation     |                   | (Simula  |                    |  |  |  |  |  |
|    | Sign out         |             |               |                   |          |                    |  |  |  |  |  |

When the Optimizer Workspace tab is selected, the Efficient Frontier component initially shows only the asset classes from the asset class set being used. The other two default components are blank; they do not populate until the asset mixes are entered. This exercise shows users how to enter an existing asset allocation, and then optimize it for risk and return.

Exercise 10: Input an asset mix

To input a client's existing asset mix, do the following:

- 1. Click the **Optimizer Workspace** tab.
- 2. From the toolbar on the Optimizer Workspace, click the **Asset Mixes** icon. The Asset Mixes dialog box opens.

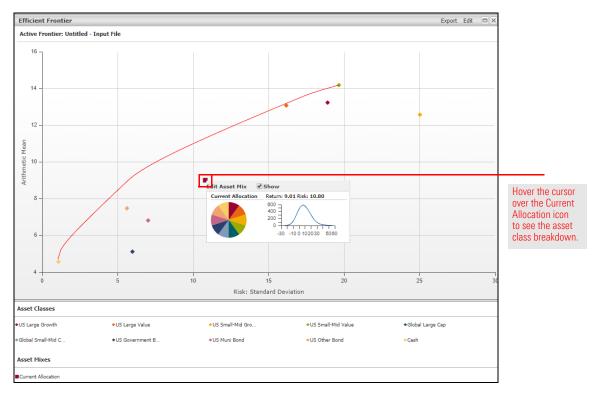
| Inputs Optimize         | r Forecasting       | 9                         |                           |                                  |               |   |
|-------------------------|---------------------|---------------------------|---------------------------|----------------------------------|---------------|---|
| Untitled - Inp 🔻        | Manage Input        | Asset Classes             | Optimization              | Asset Mixes                      | )<br>Constrai | This icon is not seen until the Optimizer Workspace tab is selected |
| Input Workspace         | Optimizer Works     | pace × Fore               | casting Workspace         | -                                |               |   |
| Asset Mix Statistics (S | imulated)           |                           |                           |                                  |               |   |
| 💌 Untitled - Input File |                     |                           |                           |                                  |               |   |
| Asset Mixes             | Expected<br>Surplus | Expected<br>Surplus Ratio | Expected<br>Funding Ratio | Surplus<br>Standard<br>Deviation | Arithme       |   |
|                         |                     |                           |                           |                                  |               |   |
|                         |                     |                           |                           |                                  |               |   |

- 3. Click **Add**. A row is added to the dialog box.
- 4. In the Name field, type Current Allocation.

5. In each asset class field enter 10.

|             |                    |                       |                     |                          | Asset Mi                 | xes          |                  |       |        |      | □ ×           |                       |
|-------------|--------------------|-----------------------|---------------------|--------------------------|--------------------------|--------------|------------------|-------|--------|------|---------------|-----------------------|
| Inpu        | ut Files           |                       |                     |                          |                          |              |                  |       |        |      |               |                       |
| Unt         | itled - Input File |                       | *                   |                          |                          |              |                  |       |        |      |               |                       |
|             |                    |                       |                     |                          |                          |              |                  |       |        |      |               |                       |
| Tota<br>Add |                    | As ▼ Import fr        |                     |                          |                          |              |                  |       |        |      |               |                       |
| _           |                    |                       |                     | 1                        |                          |              |                  | 1     |        |      |               | 1                     |
|             | Name               | US Small-Mid<br>Value | Global Large<br>Cap | Global Small-<br>Mid Cap | US<br>Government<br>Bond | US Muni Bond | US Other<br>Bond | Cash  | Total  | Show | Description   |                       |
|             | Current Allocation | 10.00                 | 10.00               | 10.00                    | 10.00                    | 10.00        | 10.00            | 10.00 | 100.00 |      | Fixed Weights | Use the Add button to |
|             |                    |                       |                     |                          |                          |              |                  |       |        |      |               | input the allocation  |
|             |                    |                       |                     |                          |                          |              |                  |       |        |      |               | to each asset class.  |
|             |                    |                       |                     |                          |                          |              |                  |       |        |      |               |                       |
|             |                    |                       |                     |                          |                          |              |                  |       |        |      |               |                       |
|             |                    |                       |                     |                          |                          |              |                  |       |        |      |               |                       |
|             |                    |                       |                     |                          |                          |              |                  |       |        |      |               |                       |
|             |                    |                       |                     |                          |                          |              |                  |       |        |      |               |                       |
|             |                    |                       |                     |                          |                          |              |                  |       |        |      |               | 1                     |

6. Click **OK**. Note the location of the current allocation relative to the Efficient Frontier.



To create an additional asset mix, the following options are available:

- manually enter an asset allocation, as in the previous exercise
- click a spot on the Efficient Frontier, or
- search for an asset class mix that matches a value, such as a client's existing standard deviation or return.

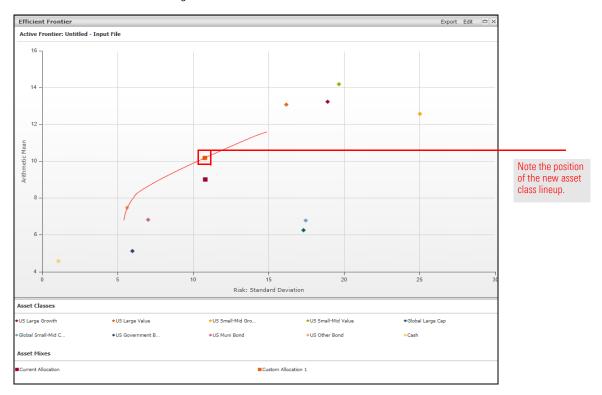
To create a new asset class on the Efficient Frontier component, do the following:

- 1. Position your mouse on the Efficient Frontier line, above the client's existing asset mix, as close to the center of it as possible, then **click once on the Efficient Frontier line**. The Asset Mixes dialog box opens.
- 2. In the Name field, type Custom Allocation 1.

Exercise 11: Create additional asset allocation mixes

|       |                     |                    |                   |                        | Asset Mi              | xes                 |                          |                          |        |   | □ ×           |              |
|-------|---------------------|--------------------|-------------------|------------------------|-----------------------|---------------------|--------------------------|--------------------------|--------|---|---------------|--------------|
| Input | t Files             |                    |                   |                        |                       |                     |                          |                          |        |   |               |              |
| Untit | tled - Input File   |                    |                   |                        |                       |                     |                          |                          |        |   |               |              |
| Total | : 2 Selected: 0     |                    |                   |                        |                       |                     |                          |                          |        |   |               |              |
| Add   | Delete Search Save  | e As 🔻 Import      | from 🔻            |                        |                       |                     |                          |                          |        |   |               |              |
|       | Name                | US Large<br>Growth | US Large<br>Value | US Small-Mid<br>Growth | US Small-Mid<br>Value | Global Large<br>Cap | Global Small-<br>Mid Cap | US<br>Government<br>Bond | Total  | Show  | Description   |              |
|       | Current Allocation  | 10.00              | 10.00             | 10.00                  | 10.00                 | 10.00               | 10.00                    | 10.00                    | 100.00 | <b>v</b>  | Fixed Weights |              |
|       | Custom Allocation 1 | 5.00               | 20.80             | 5.00                   | 20.69                 | 5.00                | 5.00                     | 5.00                     | 100.00 | <ul> <li>Image: A start of the start of</li></ul> | Fixed Weights | Note the new |
|       |                     |                    |                   | ]                      |                       |                     |                          | ]                        |        |   |               |              |
|       |                     |                    | 1                 |                        |                       |                     |                          |                          | •      |   |               | and the name |

3. Click **OK**. On the Efficient Frontier component, note the location of this new asset allocation relative to the client's original asset mix.



To select an asset mix based on an existing value in a current asset mix, do the following:

- 1. From the Asset Mix Statistics (Simulated) component, in the Current Allocation row, write down the **Standard Deviation value**.
- 2. Click the Asset Mixes icon. The Asset Mixes dialog box opens.

| Inputs Optimizer                                  | r Forecasting   |                       |                   |                                |                   |                      |
|---|-----------------|-----------------------|-------------------|--------------------------------|-------------------|----------------------|
| Untitled - Inp 🔻<br>Active Input                  | Manage Input    | Asset Classes         | Optimization      | Asset Mixes                    | Constrai          |                      |
|   | Optimizer Works | bace X Fore           | casting Workspace | 4                              |                   |                      |
| Asset Mix Statistics (Si<br>Untitled - Input File | mulated)        |                       |                   |                                |                   |                      |
| Asset Mixes                                       | Arithmetic Mean | Standard<br>Deviation | Sharpe Ratio      | Arithmetic Mear<br>(Simulated) | Geomet<br>(Simula | vvnie down mis value |
| Current Allocation                                | 9.01            | 10.                   | 30 0.4            | 33 9.0                         | 1                 |                      |
| Custom Allocation 1                               | 11.31           | 10.                   | 32 1.0            | 11.3                           | 1                 |                      |

3. Click the **Search** button. The Asset Mix Search dialog box opens.

|                        |                    |                   |                        | Asset Mi              | xes                 |  |
|------------------------|--------------------|-------------------|------------------------|-----------------------|---------------------|--|
| Input Files            |                    |                   |                        |                       |                     |  |
| Untitled - Input File  |                    | <b>T</b>          |                        |                       |                     |  |
| Total: 2 Selected: 0   |                    |                   |                        |                       |                     |  |
| Add Delete Search Save | As 🔻 Import        | from 💌            |                        |                       |                     | Click this button to   |
| Name                   | US Large<br>Growth | US Large<br>Value | US Small-Mid<br>Growth | US Small-Mid<br>Value | Global Large<br>Cap | an asset mix based<br>Standard Deviation<br>recorded in step 1 a |
| Current Allocation     | 10.00              | 10.00             | 10.00                  | 10.00                 | 10.00               |  |
| Custom Allocation 1    | 5.00               | 20.80             | 5.00                   | 20.69                 | 5.00                |  |
|                        |                    |                   |                        |                       |                     |  |

- 4. From the **Search for** drop-down field, select **Standard Deviation**.
- 5. In the **of** field, type the **Standard Deviation value** from step 1.
- 6. In the Name field, type **Custom Allocation 2**.

|                                    | Asset Mix Search  |
|------------------------------------|---|
| Search for One Asset Mix           | Search for Multiple Asset Mixes   |
| Search for<br>of<br>with reward of | Standard Deviation <ul> <li>Resample</li> <li>10.80</li> <li>(risk)</li> </ul> Arithmetic Mean <ul> <li> </li> </ul> <ul> <li>The second second</li></ul> |
| Name                               | Custom Allocation 2<br>✔ Do not adjust Asset Mix if Efficient Frontier changes µ  |
|                                    |   |

- 7. Click **OK** to close the Asset Mix Search dialog box.
- 8. Click **OK** to close the Asset Mix dialog box. The new asset allocation lineup appears in the three components on the workspace.

The next two exercises teach users how to make use of the Risk Decomposition table. Risk decomposition refers to breaking down the distribution of risk in an asset allocation lineup. From which asset classes does the most or least risk come from? How can an asset allocation lineup be altered in order to increase or decrease overall risk?

Risk decomposition gives users the ability to identify how the risk portion of a specific Asset Mix breaks down and how it can change if the allocation to each asset class is altered. Risk decomposition includes the following components:

- ► What asset classes contribute to the overall standard deviation (Total Risk), and
- ► What asset classes contribute to the overall tracking error (Active Risk).

To evaluate the total risk decomposition for an asset class set, the Risk Decomposition table must be added to the Optimizer Workspace. Do the following:

1. From the toolbar in the Optimizer Workspace, click the **Risk Decomposition** icon. The Risk Decomposition dialog box opens.

| Inputs Optimizer         | r Forecasting   |                       |              |                                |                               |                                      | _      | <b></b>  |
|--------------------------|-----------------|-----------------------|--------------|--------------------------------|-------------------------------|--------------------------------------|--------|--|
| Untitled - Inp 🔻         | Manage Input    | Asset Classes         | Optimization | Asset Mixes                    | Constraints                   | E<br>Risk Decompositio               | n      | Click this icon to begin<br>the risk comparison. |
| Input Workspace          |                 |                       |              |                                |                               |                                      |        |  |
| Asset Mix Statistics (Si | mulated)        |                       |              |                                |                               |                                      |        |  |
| Untitled - Input File    |                 |                       |              |                                |                               |                                      |        |  |
| Asset Mixes              | Arithmetic Mean | Standard<br>Deviation | Sharpe Ratio | Arithmetic Mean<br>(Simulated) | Geometric Mean<br>(Simulated) | Standard<br>Deviation<br>(Simulated) | CVaR C |  |
| Current Allocation       | 9.01            | 10.8                  | 0.83         | 9.0:                           | L 8.4                         | 4 10.78                              |        |  |
| Custom Allocation 1      | 10.18           | 10.7                  | 7 0.95       | 10.19                          | 9.6                           | 2 10.76                              |        |  |
| Custom Allocation 2      | 10.18           | 10.7                  | 7 0.95       | 10.19                          | 9.6                           | 2 10.76                              |        |  |
|                          |                 |                       |              |                                |                               |                                      |        |  |
|                          | •               |                       |              |                                |                               |                                      |        |  |
|                          |                 |                       |              |                                |                               |                                      |        |  |
|                          |                 |                       |              |                                |                               |                                      |        |  |

- 2. The Benchmark (Optional) field can be left as "None." A benchmark is not needed when calculating total risk, but is needed when calculating active risk. Click **OK**.
- 3. The components menu in the bottom-left corner of the screen should show the **Optimizer** components.
- 4. Click-and-drag the Risk Decomposition component beneath the Efficient Frontier component.



- 5. Click the Maximize icon in the component.
- 6. Collapse the Client Current Allocation asset mix.

Exercise 12: Evaluate the total risk for a set of asset classes

- 7. Note the values in the Percentage Contribution to Asset Mix SD column. Which asset class has the largest value here? How does it compare to the value in the Percentage Contribution to Asset Mix Return? Is the amount of risk being taken being compensated with return, or no? If not, consider reallocating weights among the asset classes.
- 8. Expand the Custom Allocation 2 asset mix.

|  | ge Input Asset Clas | sses Optimizat                  | ion Asset Mix                                 | ces Constrain                               | nts Risk Dec     | composition                                       |
|--|---------------------|---------------------------------|---|---|------------------|---|
| Input Workspace Optimi                   | zer Workspace 🗙     | Forecasting Worl                | kspace 🚽                                      |   |                  |   |
| isk Decomposition                        |                     |                                 |   |   |                  |   |
| sset Mix, Asset Class                    | Asset Mix Weight    | Contribution to<br>Asset Mix SD | Percentage<br>Contribution to<br>Asset Mix SD | Marginal<br>Contribution to<br>Asset Mix SD | Asset Mix Return | Percentage<br>Contribution to<br>Asset Mix Return |
| <ul> <li>Current Allocation</li> </ul>   | 100.00              | 10.35                           | 100.00  |   | 7.19             | 100.00  |
| Custom Allocation 1                      | 100.00              | 10.47                           | 100.00  |   | 7.76             | 100.00  |
| Custom Allocation 2                      | 100.00              | 10.36                           | 100.00  |   | 7.72             | 100.00  |
| <ul> <li>US Large Growth</li> </ul>      | 38.07               | 5.89                            | 56.86   | 15.48                                       | 9.89             | 48.77   |
| <ul> <li>US Large Value</li> </ul>       | 5.00                | 0.73                            | 7.06  | 14.63                                       | 8.76             | 5.67  |
| <ul> <li>US Small-Mid Growth</li> </ul>  | 5.00                | 0.98                            | 9.45  | 19.59                                       | 10.28            | 6.66  |
| <ul> <li>US Small-Mid Value</li> </ul>   | 5.00                | 0.87                            | 8.38  | 17.36                                       | 9.94             | 6.44  |
| <ul> <li>Global Large Cap</li> </ul>     | 5.00                | 0.81                            | 7.77  | 16.11                                       | 7.44             | 4.81  |
| <ul> <li>Global Small-Mid Cap</li> </ul> | 5.00                | 0.84                            | 8.13  | 16.86                                       | 9.67             | 6.26  |
| <ul> <li>US Government Bond</li> </ul>   | 17.04               | 0.20                            | 1.94  | 1.18  | 5.13             | 11.31   |
| <ul> <li>US Muni Bond</li> </ul>         | 9.90                | 0.03                            | 0.33  | 0.35  | 4.85             | 6.22  |
| <ul> <li>US Other Bond</li> </ul>        | 5.00                | 0.01                            | 0.08  | 0.17  | 4.64             | 3.00  |
| <ul> <li>Cash</li> </ul>                 | 5.00                | -0.00                           | -0.01   | -0.02                                       | 1.33             | 0.86  |

#### Compare each asset class' contribution to risk to its contribution to return.

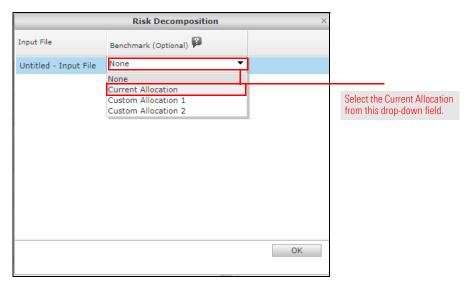
In order to calculate the active risk (tracking error) for an asset class set, another asset mix is needed to serve as the benchmark from which deviation is measured. To calculate the active risk for an asset class mix, do the following:

Exercise 13: Evaluate the active risk for a set of asset classes

1. From the toolbar in the Optimizer Workspace, click the **Risk Decomposition** icon. The Risk Decomposition dialog box opens.

| Inputs Optimize                           | r Forecasting   |                       |                 |                                | _                             |                                      |        |                                      |
|---|-----------------|-----------------------|-----------------|--------------------------------|-------------------------------|--------------------------------------|--------|--------------------------------------|
| Untitled - Inp 🔻                          | Manage Input    | Asset Classes         | Optimization    | Asset Mixes                    | 1<br>Constraints              | E<br>Risk Decompositio               | m      | Click this icon to the risk comparis |
| Input Workspace                           | Optimizer Works | bace X Foreca         | sting Workspace | ÷                              |                               |                                      |        |                                      |
| Asset Mix Statistics (Si                  | imulated)       |                       |                 |                                |                               |                                      |        |                                      |
| <ul> <li>Untitled - Input File</li> </ul> |                 |                       |                 |                                |                               |                                      |        |                                      |
| Asset Mixes                               | Arithmetic Mean | Standard<br>Deviation | Sharpe Ratio    | Arithmetic Mean<br>(Simulated) | Geometric Mean<br>(Simulated) | Standard<br>Deviation<br>(Simulated) | CVaR C |                                      |
| <ul> <li>Current Allocation</li> </ul>    | 9.01            | 10.80                 | 0.83            | 9.01                           | 8.44                          | 10.78                                |        |                                      |
| Custom Allocation 1                       | 10.18           | 10.77                 | 0.95            | 10.19                          | 9.62                          | 10.76                                |        |                                      |
| Custom Allocation 2                       | 10.18           | 10.77                 | 0.95            | 10.19                          | 9.62                          | 10.76                                |        |                                      |
|   |                 |                       |                 |                                |                               |                                      |        |                                      |
|   | •               |                       |                 |                                |                               |                                      |        |                                      |
|   |                 |                       |                 |                                |                               |                                      |        |                                      |
|   |                 |                       |                 |                                |                               |                                      |        |                                      |

2. From the **Benchmark (Optional)** drop-down field, select **Current Allocation**.



- 3. Click **OK**. The Risk Decomposition table refreshes and additional columns appear in the table. The table can be customized to remove some data columns from view.
- 4. Collapse the Client Current Allocation asset mix.

5. In the Risk Decomposition component, click **Edit** > **Settings**. The Settings dialog box opens.

| \$   | Inputs Optimizer For                              | ecasting         |                                 |   |   |                     |                                 |   |   |                |                                |                                 |  |
|------|---|------------------|---------------------------------|---|---|---------------------|---------------------------------|---|---|----------------|--------------------------------|---------------------------------|--|
| M    | Custom Inputs -                                   | ille             | 2                               | •   | *   |                     |                                 |   | 1   | -9             |                                |                                 |  |
|      | Active Input Manage                               | Input Asset Clas | ises Optimizati                 | on Asset Mb                                   | ces Constrai                                | nts Risk Der        | composition                     | Layout  | Run Reports                                 | Run Simulation |                                |                                 |  |
| In   | put Workspace Optimize                            | r Workspace X    | Forecasting Work                | space 👘                                       |   |                     |                                 |   |   |                |                                |                                 |  |
| Ris  | k Decomposition                                   |                  |                                 |   |   |                     |                                 |   |   |                | Export                         | Edit 8                          |  |
| Assi | et Mix, Asset Class                               | Asset Mix Weight | Contribution to<br>Asset Mix SD | Percentage<br>Contribution to<br>Asset Mix SD | Marginal<br>Contribution to<br>Asset Mix SD | Benchmark<br>Weight | Contribution to<br>Benchmark SD | Percentage<br>Contribution to<br>Benchmark SD | Marginal<br>Contribution to<br>Benchmark SD | Active Weight  | Contribution to<br>Active Risk | Percent<br>Contribu<br>Active P | Click this button to<br>change the columns |
| ۲    | Current Allocation                                | 100.00           | 10.35                           | 100.00  |   | 100.00              | 10.35                           | 100.00  | NaN   | 0.00           |                                |                                 | showing in the table                       |
| ۲    | Custom Allocation 1                               | 100.00           | 10.47                           | 100.00  |   | 100.00              | 10.35                           | 100.00  | NaN   | 0.00           | 1.94                           |                                 |  |
| ė    | Custom Allocation 2                               | 100.00           | 10.36                           | 100.00  |   | 100.00              | 10.35                           | 100.00  | NaN   | 0.00           | 1.91                           |                                 |  |
|      | US Large Growth                                   | 38.07            | 5.89                            | 56.86   | 15.48                                       | 10.00               | 1.47                            | 14.23   | 14.72                                       | 28.07          | 1.20                           |                                 |  |
|      | <ul> <li>US Large Value</li> </ul>                | 5.00             | 0.73                            | 7.06  | 14.63                                       | 10.00               | 1.48                            | 14.34   | 14.84                                       | -5.00          | 0.05                           |                                 |  |
|      | • US Small-Mid Growth                             | 5.00             | 0.98                            | 9.45  | 19.59                                       | 10.00               | 1.99                            | 19.22   | 19.89                                       | -5.00          | 0.07                           |                                 |  |
|      | <ul> <li>US Small-Mid Value</li> </ul>            | 5.00             | 0.87                            | 8.38  | 17.36                                       | 10.00               | 1.84                            | 17.75   | 18.37                                       | -5.00          | 0.27                           |                                 |  |
|      | <ul> <li>Global Large Cap</li> </ul>              | 5.00             | 0.81                            | 7.77  | 16.11                                       | 10.00               | 1.66                            | 16.06   | 16.62                                       | -5.00          | 0.13                           |                                 |  |
|      | <ul> <li>A clobal constraint with con-</li> </ul> | 5.00             | 0.04                            | 0.12  | 10.00                                       | 10.00               | 1.75                            | 16.03   | 17.00                                       | 5.00           | 0.17                           |                                 |  |

#### 6. Expand the Columns section.

- 7. Hide the following standard-deviation related data points by **deselecting** the following columns:
  - Contribution to Asset Mix SD
  - Percentage Contribution to Asset Mix SD
  - Marginal Contribution to Asset Mix SD
  - Contribution to Benchmark SD
  - Percentage Contribution to Benchmark SD, and
  - Marginal Contribution to Benchmark SD.

| Settings X  |  |
|---|--|
| Display +   |  |
| Columns   |  |
| <ul> <li>Asset Mix Weight</li> </ul>                          |  |
| Contribution to Asset Mix SD                                  |  |
| Percentage Contribution to Asset<br>Mix SD                    |  |
| Marginal Contribution to Asset Mit SD                         |  |
| <ul> <li>Benchmark Weight</li> </ul>                          |  |
| Contribution to Benchmark SD                                  |  |
| Percentage Contribution to<br>Benchmark SD                    |  |
| <ul> <li>Marginal Contribution to<br/>Benchmark SD</li> </ul> |  |
| <ul> <li>Active Weight</li> </ul>                             |  |
| <ul> <li>Contribution to Active Risk</li> </ul>               |  |
| Percentage Contribution to Active<br>Risk                     |  |
| Marginal Contribution to Active<br>Risk                       |  |
| Asset Mix Return  |  |
| Percentage Contribution to Asset<br>Mix Return                |  |
|   |  |
|   |  |

Take note of which columns have been hidden.

- 8. Close the Settings dialog box.
- 9. Consider the following questions:
  - ► What is the overall Contribution to Active Risk for the asset mix?
  - ► Which asset class has the highest Marginal Contribution to Active Risk?
  - Which has the lowest Marginal Contribution to Active Risk? Consider moving weight from asset classes with the highest Marginal Risk to the those with the lowest value in that column.

| My   | Active Inputs ▼ Manage                   |                  | ises Optimizat      | ion Asset Mix | kes Constrai                   |  | emposition                                 |                                 |
|------|--|------------------|---------------------|---------------|--------------------------------|--|--|---------------------------------|
| In   | put Workspace Optimize                   | r Workspace 🗙    | Forecasting Worl    | kspace 🗗      |                                |  |  |                                 |
| Ris  | k Decomposition                          |                  |                     |               |                                |  |  |                                 |
| Asse | et Mix, Asset Class                      | Asset Mix Weight | Benchmark<br>Weight | Active Weight | Contribution to<br>Active Risk | Percentage<br>Contribution to<br>Active Risk | Marginal<br>Contribution to<br>Active Risk | Take note of th asset classes w |
| Ŧ    | <ul> <li>Current Allocation</li> </ul>   | 100.00           | 100.00              | 0.00          |                                |  |  | the highest and                 |
| ŧ    | Custom Allocation 1                      | 100.00           | 100.00              | 0.00          | 1.94                           | 100.00                                       |  | lowest values h                 |
| -    | Custom Allocation 2                      | 100.00           | 100.00              | 0.00          | 1.91                           | 100.00                                       |  |                                 |
|      | • US Large Growth                        | 38.07            | 10.00               | 28.07         | 1.20                           | 62.85  | 4.27                                       |                                 |
|      | <ul> <li>US Large Value</li> </ul>       | 5.00             | 10.00               | -5.00         | 0.05                           | 2.62   | -1.00                                      |                                 |
|      | • US Small-Mid Growth                    | 5.00             | 10.00               | -5.00         | 0.07                           | 3.71   | -1.42                                      |                                 |
|      | <ul> <li>US Small-Mid Value</li> </ul>   | 5.00             | 10.00               | -5.00         | 0.27                           | 13.94  | -5.32                                      |                                 |
|      | <ul> <li>Global Large Cap</li> </ul>     | 5.00             | 10.00               | -5.00         | 0.13                           | 6.95   | -2.65                                      |                                 |
|      | <ul> <li>Global Small-Mid Cap</li> </ul> | 5.00             | 10.00               | -5.00         | 0.17                           | 8.69   | -3.32                                      |                                 |
|      | • US Government Bond                     | 17.04            | 10.00               | 7.04          | 0.03                           | 1.51   | 0.41                                       |                                 |
|      | <ul> <li>US Muni Bond</li> </ul>         | 9.90             | 10.00               | -0.10         | -0.00                          | -0.02  | 0.31                                       |                                 |
|      | • US Other Bond                          | 5.00             | 10.00               | -5.00         | -0.01                          | -0.38  | 0.14                                       |                                 |
|      | <ul> <li>Cash</li> </ul>                 | 5.00             | 10.00               | -5.00         | 0.00                           | 0.11   | -0.04                                      |                                 |

10. Click the **Restore** icon to resize the component.

To save an asset allocation as a custom benchmark, do the following:

1. From the toolbar on the Optimizer Workspace, click the **Asset Mixes** icon. The Asset Mixes dialog box opens.

Exercise 14: Save an asset mix as a custom benchmark

- 2. Check the **box** to the left of **Custom Allocation 2**.
- 3. Click the **Save As** button, then select **Save as Custom Benchmark**. The Save as Custom Benchmark dialog box opens.

|          |                     |              |            |             |              | Asset Mi     | xes          |                                 |                 |  |                                |
|----------|---------------------|--------------|------------|-------------|--------------|--------------|--------------|---------------------------------|-----------------|--|--------------------------------|
| Inpu     | ut Files            |              |            |             |              |              |              |                                 |                 |  |                                |
| Unt      | titled - Input File |              |            | *           |              |              |              |                                 |                 |  |                                |
| Tota     | al: 3 Selected: 1   |              |            |             |              |              |              |                                 |                 |  |                                |
| Add      | Delete Search       | Save As 🔻    | Import fr  | rom 🔻       |              |              |              |                                 |                 |  |                                |
|          | Name                | Save as Cus  | tom Bench  | mark        | US Small-Mid | US Small-Mid | Global Large | Use this command to save the    |                 |  |                                |
|          |                     | Add to Exist | ing Custon | n Benchmark | Growth       | h Value      | rowth Value  | owth Value Cap                  | rowth Value Cap |  | selected asset mix as a custom |
|          | Querrat Alleration  |              | 10.00      | 40.00       | 40.00        | 10.00        | 10.00        | benchmark in Morningstar Direct |                 |  |                                |
|          | Current Allocation  |              | 10.00      | 10.00       | 10.00        | 10.00        | 10.00        |                                 |                 |  |                                |
|          | Custom Allocation 1 | 4            | 5.00       | 20.80       | 5.00         | 20.69        | 5.00         |                                 |                 |  |                                |
| <b>v</b> | Custom Allocation 2 |              | 5.00       | 20.80       | 5.00         | 20.69        | 5.00         |                                 |                 |  |                                |
|          |                     | 1            |            |             |              |              | 1            |                                 |                 |  |                                |
|          |                     | A            |            | (           | 4 4          | ( 4          | (            |                                 |                 |  |                                |

- 4. Change the Portfolio Date field at the top to the most recent month-end date.
- 5. Check the **box** to the left of **Custom Allocation 2**.
- 6. Click **Apply**. The Portfolio Date in the Apply to area changes to match that in the Setting area.

|      | Save as Custom Benchmark |                |   |                |           |  |  |  |
|------|--------------------------|----------------|---|----------------|-----------|--|--|--|
| Set  | ting                     |                |   |                |           |  |  |  |
| Base | e Currency               | Portfolio Date |   |                |           |  |  |  |
| US   | Dollar 👻                 | 01/31/2020 📖   |   |                |           | -  |  |  |
|      |                          |                |   |                |           |  |  |  |
|      |                          |                |   |                |           |  |  |  |
| Арр  | ly to                    |                |   |                |           |  |  |  |
|      | Asset Mix                | Base Currency  | P | Portfolio Date |           |  |  |  |
|      | Custom Allocation 2      | US Dollar      | ( | 02/16/2020     |           |  |  |  |
|      |                          |                |   |                |           |  |  |  |
|      |                          |                |   |                |           |  |  |  |
|      |                          |                |   |                |           |  |  |  |
|      |                          |                |   |                |           |  |  |  |
|      |                          |                |   |                |           |  |  |  |
|      |                          |                |   |                |           | It is only after Apply is clicked that the |  |  |
|      |                          |                |   |                |           | is clicked that the<br>two highlighted     |  |  |
|      |                          |                |   |                |           | dates will match.                          |  |  |
|      |                          |                |   |                | Apply     |  |  |  |
|      |                          |                |   |                | Арріу     | <u> </u>                                   |  |  |
|      |                          |                |   |                | OK Cancel |  |  |  |
|      |                          |                |   | -              |           |  |  |  |

- 7. Click **OK** to close the Save as Custom Benchmark dialog box.
- 8. When the confirmation message opens, click OK.
- 9. Click **OK** to close the Asset Mixes dialog box.

The Forecasting Workspace shows potential investment outcomes if a client were to put money into an asset allocation lineup. Four components are included by default here. Several settings can be updated in these components, including toggling between graphs and tables, changing the initial investment amounts, and deciding whether to map an accumulation scenario or a draw-down scenario.

A wide variety of options is available when forecasting outcomes in the Asset Allocation module. For example, users can project what would happen if a client made regular contributions to an asset allocation, what would happen for someone in retirement who needed annual income, or a combination of contributions and withdrawals. This exercise shows users how to forecast the outcomes for a retirement withdrawal scenario, and then review what that cash flow will actually look like.

To use the Forecasting feature, do the following:

- 1. Click the Forecasting Workspace.
- 2. From the Forecasting toolbar, click the **Forecasting** icon. The Forecasting Settings window opens.

| 🍄 Inputs Optimi                           | zer Forecasting |             |                     |        |          |  |
|---|-----------------|-------------|---------------------|--------|----------|--|
| Untitled - Inp 🔻<br>Active Input          | Manage Input    | Asset Mixes | Forecasting         | Layout | E Run Re | This icon is not available unless<br>The Forecasting tab is selected |
| Input Workspace                           | Optimizer Works | pace Forec  | asting Workspace    | ×      |          |  |
| Wealth Percentiles                        |                 |             |                     |        |          |  |
| <ul> <li>Untitled - Input File</li> </ul> |                 |             |                     |        |          |  |
| Current Allocation                        |                 | <b>•</b> C  | Custom Allocation 1 |        |          |  |
| 20.0                                      |                 |             | 20.0                |        |          |  |
| 15.0                                      |                 |             | 15.0                |        |          |  |
| 10.0 -                                    |                 |             | 10.0 -              |        |          |  |
|   |                 | 2           |                     |        |          |  |

# Exercise 15: Forecast returns for an asset mix

3. On the Basic tab, the Initial Assets field is set to \$1. Because this exercise covers a decumulation scenario, change the **Initial Assets** field to **1000000**.

| Forecasting Settings  |  |
|---|--|
| Basic Display Cash Flows Time Varying Mix   |  |
| Initial Date     Back History     Simulations       2020     Image: Don't Show     ▼     2000                                     |  |
| Initial Assets Display Currency<br>1000000 US Dollar T  | Update this field to a value of one million. |
| Data Frequency         Forecasting Frequency         Return Display Frequency           Monthly         Annually         Annually |  |
| Rebalancing Always Rebalance  |  |
| Use random seed Inflation adjust 👔  |  |
|   |  |

- 4. Click the **Display** tab.
- 5. The scenario should project out 30 years in the future, which is not an option by default. For the **Project Year** area, click in the input field, type **30**, then click **ADD**.

| Forecasting Settings                      | ×                   |   |
|---|---------------------|---|
| Basic Display Cash Flows Time Varying Mix |                     |   |
| Percentiles                               |                     |   |
| 95<br>50<br>5                             | ADD                 |   |
| Project Year                              |                     |   |
| 5<br>10<br>20                             | 30<br>ADD<br>REMOVE | Note the value to enter in this field, and the button to click. |
| Target Return                             |                     |   |
| 0<br>8<br>15                              | ADD<br>REMOVE       |   |
| Target Value                              |                     |   |
| 8   |                     |   |

6. Click the **Cash Flows** tab.

7. Click Add. The Add Cash Flow dialog box opens.

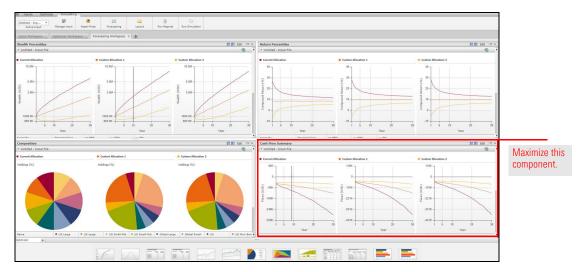
| Forecasting                           | Settings ×   |  |
|---------------------------------------|--|--|
| Basic Display Cash Flows Time Varying | Mix  |  |
| Add Edit Delete                       |  | Click this button to add the details   |
| Start Date End Date Type              | n Time Amount Minimum Description<br>Periods or Percent Amount | around the cash flow for the scenario. |
|                                       |  |  |
|                                       |  |  |
|                                       |  |  |
|                                       |  |  |

- 8. In the Start Date field, enter 2021
- 9. In the **End Date** field, scroll right and enter **2050**.
- 10. From the **Type** drop-down field, select % of most recent value.
- 11. In the Percent field, type -5.
  - ☞ Note: The value here needs to be negative, to correctly calculate the withdrawal amount.
- 12. In the Description field, type Retirement Drawdown.

| Add Cash Flow                         | Add Cash Flow × |                        |  |  |  |  |  |
|---------------------------------------|-----------------|------------------------|--|--|--|--|--|
| Start Date End Date                   |                 |                        |  |  |  |  |  |
| Type Per<br>% of most recent value -5 | rcent           | Note the values for    |  |  |  |  |  |
| Set Absolute Minimum Monetary Amount  | 2               | the highlighted areas. |  |  |  |  |  |
| Description                           |                 |                        |  |  |  |  |  |
| Retirement Drawdown                   |                 |                        |  |  |  |  |  |
|                                       |                 |                        |  |  |  |  |  |
|                                       | OK Cancel       |                        |  |  |  |  |  |

- 13. Click **OK** to close the Add Cash Flow dialog box.
- 14. Click **OK** to close the Forecasting Settings window.

15. In the Cash Flow Summary component, click the **Maximize** icon. This component is described in the next section.



The Cash Flow Summary component shows how much money a client will potentially be able to withdraw on an annual basis if they adhere to the asset allocation over time. Note the following important points about this component:

- ► For each year, three possible outcomes are shown. The 95th percentile is the best possible outcome; only a 5% chance exists of this happening. The 5th percentile is the bear-market scenario. There's a 95% chance the client will have at least this much money in a particular year. The 50th percentile represents the midpoint of outcomes for any one year. Half of the outcomes were worse than this value, and half were better.
- Focus on the asset allocation being recommended, and compare it to the client's current asset allocation. For instance, what is the 5th Percentile value in year 30 for the Current Allocation vs. Custom Allocation 2?
- ► Move the cursor over each graph to see the outflow values for any particular year.

What does the Cash Flow Summary component show? To generate a report using a Presentation Studio template directly from the Asset Allocation module, do the following:

 From the toolbar, click the **Run Reports** icon. The Run Report dialog box opens. The Template drop-down field should show the Asset Allocation Analysis (Morningstar Template). Exercise 16: Generate a report from the Asset Allocation module

| Inputs Optimiz                               | er Forecasting  | ]           |                  |        |                  |          |                                       |
|--|-----------------|-------------|------------------|--------|------------------|----------|---------------------------------------|
| Untitled - Inp 💌<br>Active Input             | Manage Input    | Asset Mixes | Forecasting      | Layout | 🗐<br>Run Reports | Run Sin  | Click this icon to generate a report. |
| Input Workspace                              | Optimizer Works | pace Forec  | asting Workspace | ×      |                  |          |                                       |
| Cash Flow Summary                            |                 |             |                  |        |                  |          |                                       |
|  |                 |             |                  |        |                  |          |                                       |
| Untitled - Input File                        |                 |             |                  |        |                  |          |                                       |
| Untitled - Input File     Current Allocation |                 |             |                  |        |                  | Custom   |                                       |
|  | 1               |             |                  |        |                  | Custom ( |                                       |
| Current Allocation                           |                 |             |                  |        |                  |          |                                       |
| Current Allocation                           |                 |             |                  |        |                  |          |                                       |
| Current Allocation                           |                 |             |                  |        |                  |          |                                       |
| Current Allocation                           |                 |             |                  |        |                  |          |                                       |
| Current Allocation                           |                 |             |                  |        |                  |          |                                       |

- 2. Check the box to the left of Current Allocation and Custom Allocation 2.
- 3. In the File Name field, type Recommended Asset Allocation.
- 4. Click **Run Report**. The dialog box closes, and a clock icon appears on the Run Report icon on the toolbar as the report is being processed.

|  | Run Report                     | ×                  |  |
|--|--------------------------------|--------------------|--|
| Setup report settings and click " F  | Run Report " to generate repo  | rt.                |  |
| Please ensure the template you cl<br>Otherwise, portions of your report<br>To change a report template, plea | t may be blank or may show du  | plicate data.      |  |
| Template Asset Allocation Ar   | nalysis (Morningstar Template) | •                  |  |
| Asset Mix  | Input File                     | Distribution Model |  |
| Current Allocation   | Untitled - Input File          | Log-Normal         |  |
| Custom Allocation 1  | Untitled - Input File          | Log-Normal         |  |
| Custom Allocation 2  | Untitled - Input File          | Log-Normal         |  |
| File Name Untitled   |                                |                    |  |
|  |                                |                    | Select both asset mix then click this buttor |
|  |                                | Run Report         |  |

5. When the report is ready, the Run Report icon shows a green check mark. To see the report, click the **Run Report** icon. The Run Report dialog box opens.



6. Click the **Report Complete:** link. The report will either be downloaded, or open in a new window, depending on the user's browser settings.

| Run Report ×                  |                                    |
|-------------------------------|------------------------------------|
| Report complete: Untitled     | Click this link to see the report  |
| Completed on 15:31 02/17/2020 | Click this link to see the report. |
|                               |                                    |
| Run New Report Close          |                                    |
|                               |                                    |

7. Click **Close** to close the Run Report dialog box.