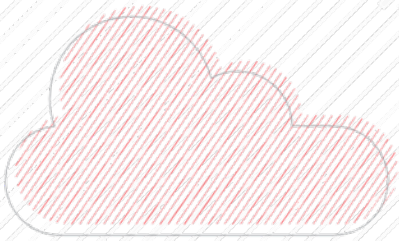
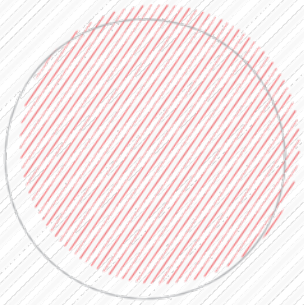
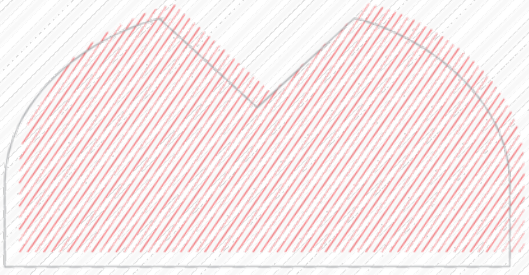
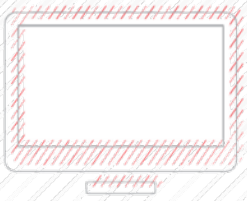
Using the Morningstar Global Risk Model

Morningstar Direct Training Guide









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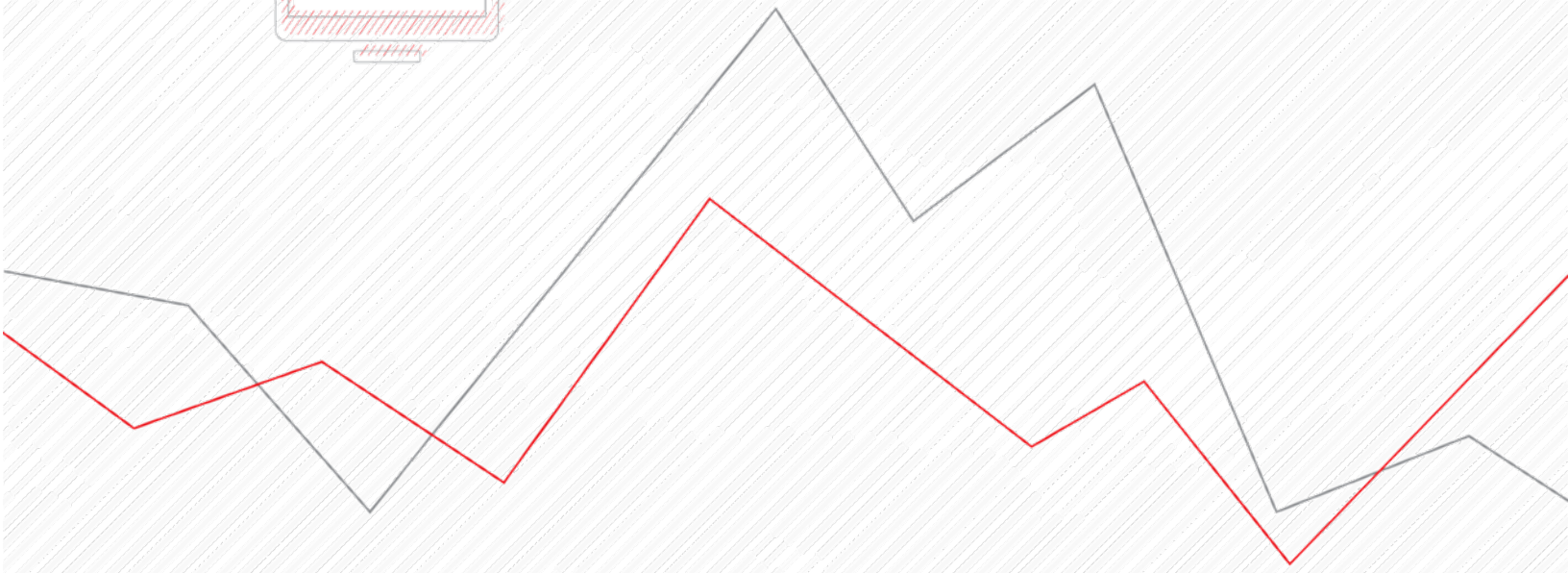

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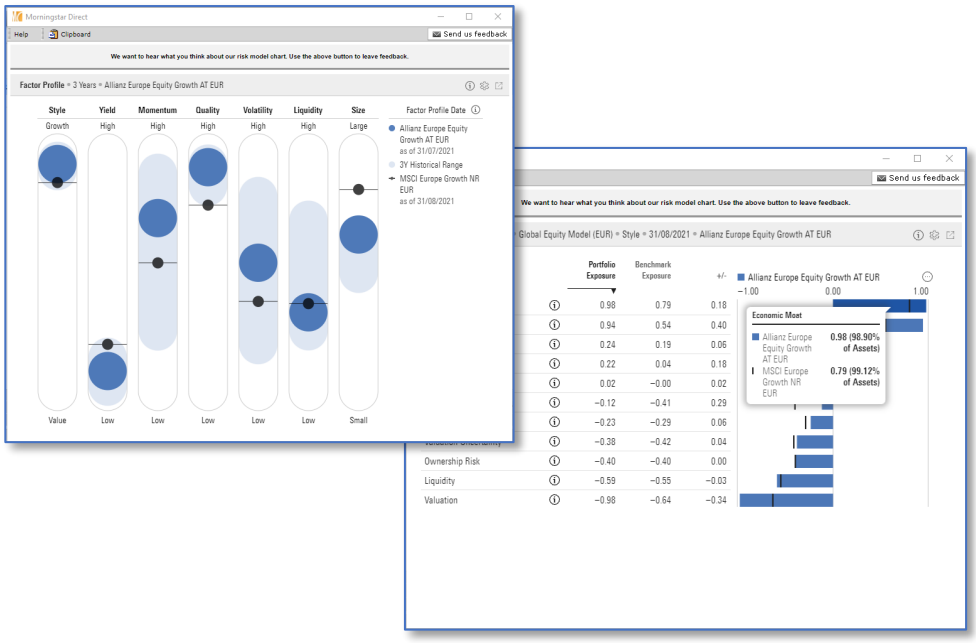
Risk Model

The Morningstar Global Risk Model provides a powerful new tool for comparing portfolios and benchmarks on a standardised, objective basis in Morningstar Direct™. Users can create custom market scenarios, perform what-if analysis on market movements, and gauge their portfolio exposures to as many as 37 distinct factors.

Morningstar Direct™ users can also benefit from an additional Global Risk Model package, providing access to Risk Factor Attribution, Risk Decomposition, Macro-Financial and Market-Driven Scenarios.



The Morningstar Risk Models offer a variety of charts and Presentation Studio components to assist Morningstar Direct clients in visualising and understanding the sources of risk in a managed product or custom portfolio.

The following models are currently available in Morningstar Direct™:

Risk Model	Available Currencies
Global Equity Model	AUD, CHF, CAN, EUR, GBP, HKD, JPY, SGD, USD & ZAR
Standard Factor Model	CAN & USD
Global Multi-Asset Model	CAN & USD
United Kingdom Equity Model	GBP
North America Equity Model	CAN & USD
Developed Europe Equity Model	EUR
Global Equity Risk Model – ESG	USD
Emerging Markets Equity Model	USD
Japan Equity Model	JPY

For further information about methodology, please refer to the Morningstar Risk Model Methodology paper.

In this workshop exercise guide, you will learn the following:

- Understanding the Factor Profile component
- What factors is a portfolio exposed to?
- How do I compare against other funds/models?
- What macro events will my portfolio be insulated from?
- How does this portfolio hold up under stress?

The Global Risk Model add-on package lets you understand the following:

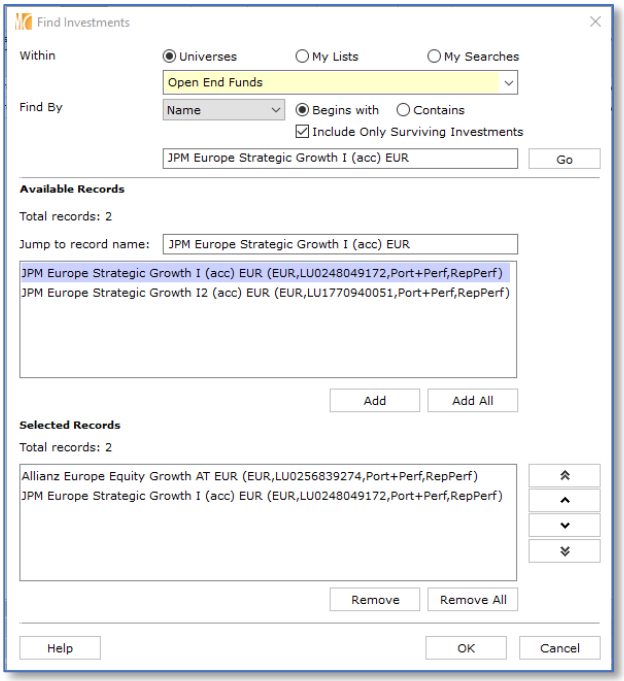
- Where is my portfolio's alpha coming from?
- What type of active risk does my portfolio have?
- How can I create my own macro or market events and how will my portfolio behave?

Exercise 1: Creating an Investment List

Prior to diving into Risk Model, let's create a list of investments to work with.

Do the following:

1. Log in to Morningstar Direct.
2. Go to **Workspace** > **Investments Lists** > **My Lists**.
3. From the toolbar, click **New**.
4. Select **Multiple** Investments and click **OK**. The **Find Investments** window opens.
5. Search for **Allianz Europe Equity Growth AT EUR** (**LU0256839274**) and click **Go**.
6. Click **Add**.
7. Search for **JPM Europe Strategic Growth I (acc) EUR** (**LU0248049172**) and click **Go**.
8. Click **Add**.



9. Click **OK**.
10. From the toolbar, click **Save**. The **Save As** window opens.
11. In the Name field, type **Risk Model** and click **OK**.

Your Investment List is now saved. We will now display the Risk Model standard data points in the grid.

Exercise 2: Viewing Standard Factor Risk Model Data

A View was created specifically for Risk Model, displaying Standard Factor Risk Model data.

The Morningstar Standard Factor Risk Model shows a fund's exposure to 33 risk factors, including the following seven Style factors that are widely accepted in the industry as reliable descriptions of the underlying drivers of market performance:

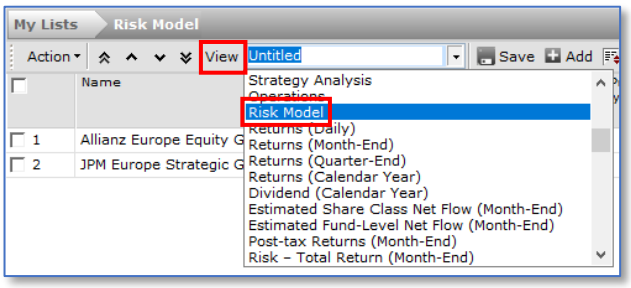
- Size
- Style (or value-growth)
- Quality
- Yield
- Liquidity
- Volatility
- Momentum

In the grid, this data is expressed as a percentage, reflecting a fund's placement within the risk model universe. For example:

- Large-cap funds will have a Size value closer to 100, and small-cap funds will have a Size value closer to 1.
- Growth-oriented funds will have a Style value closer to 1 and value-oriented funds will have a Style value closer to 100.

To view the values for a fund's exposure to the Style factors in the Standard Factor Risk Model, do the following:

1. Make sure you are in the **Risk Model** Investment List you just created.
2. From the toolbar, click the **View** drop-down menu and select **Risk Model**. The data displays in the grid view.



	Name	Factor Profile Date	Factor Profile - Liquidity	Factor Profile - Momentum	Factor Profile - Quality	Factor Profile - Size	Factor Profile - Style	Factor Profile - Volatility	Factor Profile - Yield
1	Allianz Europe Equity Growth AT EUR	31/07/2021	66.86	27.25	5.85	65.85	4.54	46.03	91.54
2	JPM Europe Strategic Growth I (acc) EUR	31/07/2021	56.53	8.07	10.42	56.99	10.53	40.52	81.32

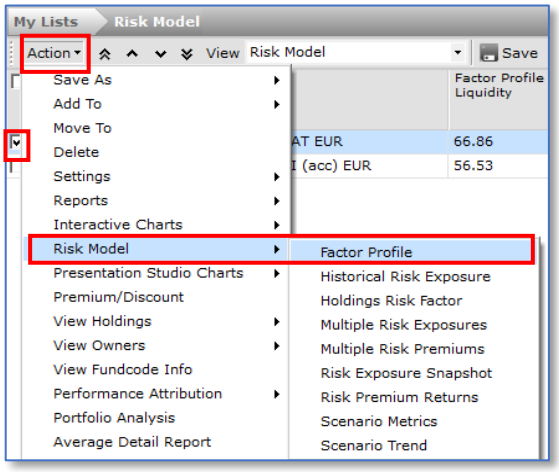
Check the values for the Allianz Europe Equity Growth fund. Are values closer to 1 or 100, or is it closer to a median value?

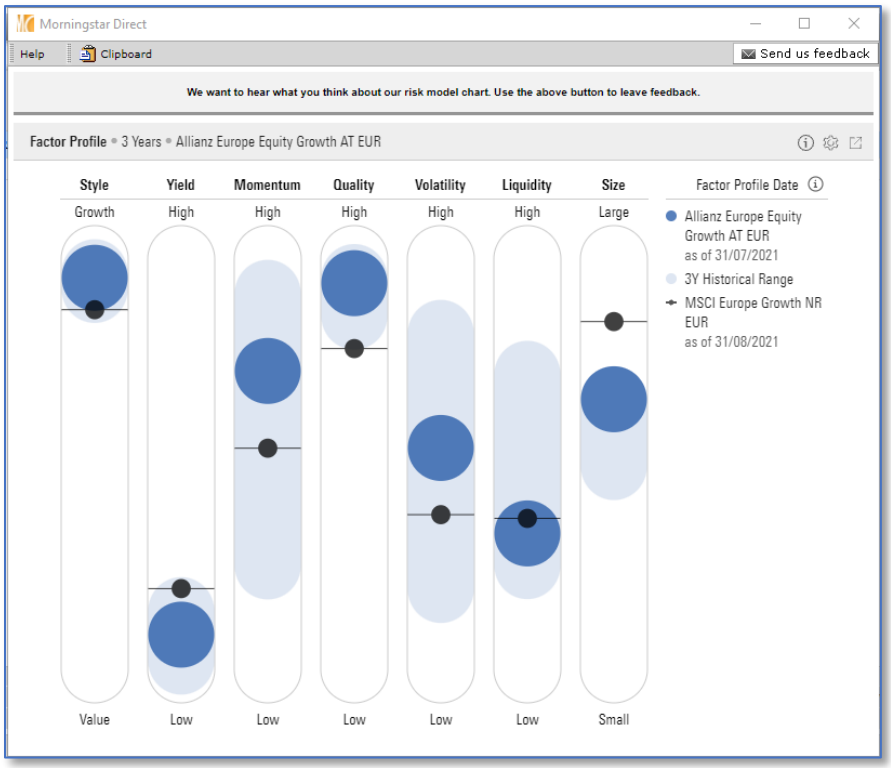
Exercise 3: Factor Profile component

The Morningstar Factor Profile shows an equity portfolio's exposure to seven standard investment factors that are broadly accepted in the investment industry as being important drivers of risk and return. At a glance, investors can use this new visual – and the underlying data – to better understand their holdings, diversify portfolios, manage expectations, and anticipate outcomes. A 3-year historical range is displayed by default (you can change to a 1-year or 5-year historical range). Please refer to the Factor Profile Methodology for more details.

☞ **Note:** The Morningstar Category Index and the MPT Index are the same outside of the Americas market. They are assigned at the Morningstar Category level.

1. To see these values from a relative rather an absolute perspective to the Morningstar Category Index (by default), select the checkbox to the left of the Allianz fund.
2. From the toolbar, click **Action > Risk Model > Factor Profile**. The Factor Profile component opens.



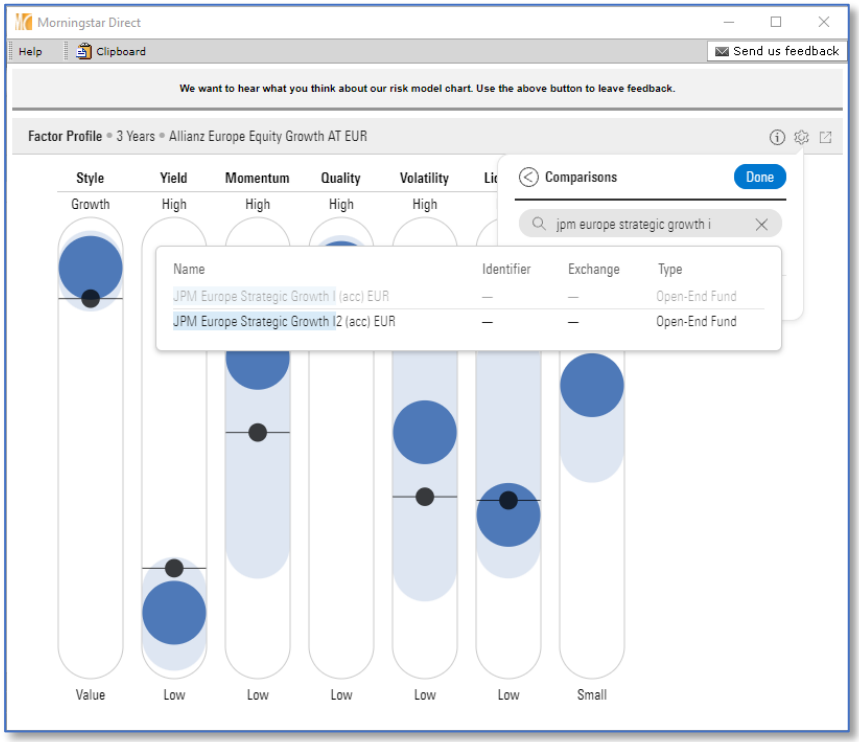


Exercise 4: Adding an Investment for Comparison Purposes

We now want to add another investment to the component for comparison purposes.

Do the following:

1. Click the gear icon to the right of the component to access the **Settings**.
2. Click **Comparisons**.
3. In the Search field, type "jpm Europe strategic growth i".
4. Click the first line (JPM Europe Strategic Growth I (acc) EUR).



5. Click **Done**.
6. Click on the side of the component to close the Settings panel.

The other investment was added to the component.

☞ **Note:** You could also select both investments from the grid and then go to **Action > Risk Model > Factor Profile**.

Exercise 5: What Factors is a Portfolio Exposed to?

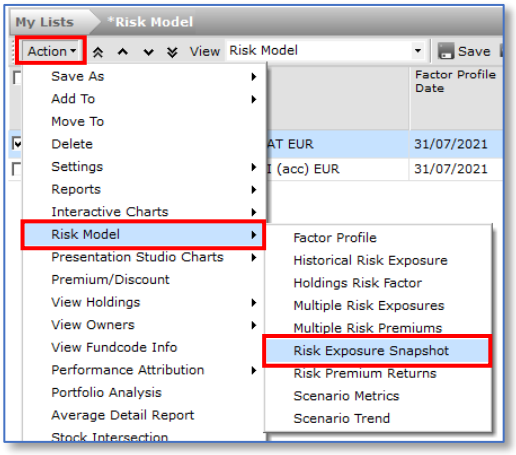
Beyond the Risk Model data seen in the grid and in the Factor Profile component, Morningstar Direct™ offers another way to visualise and understand a fund's exposure to risk factors with the **Risk Exposure Snapshot** component.

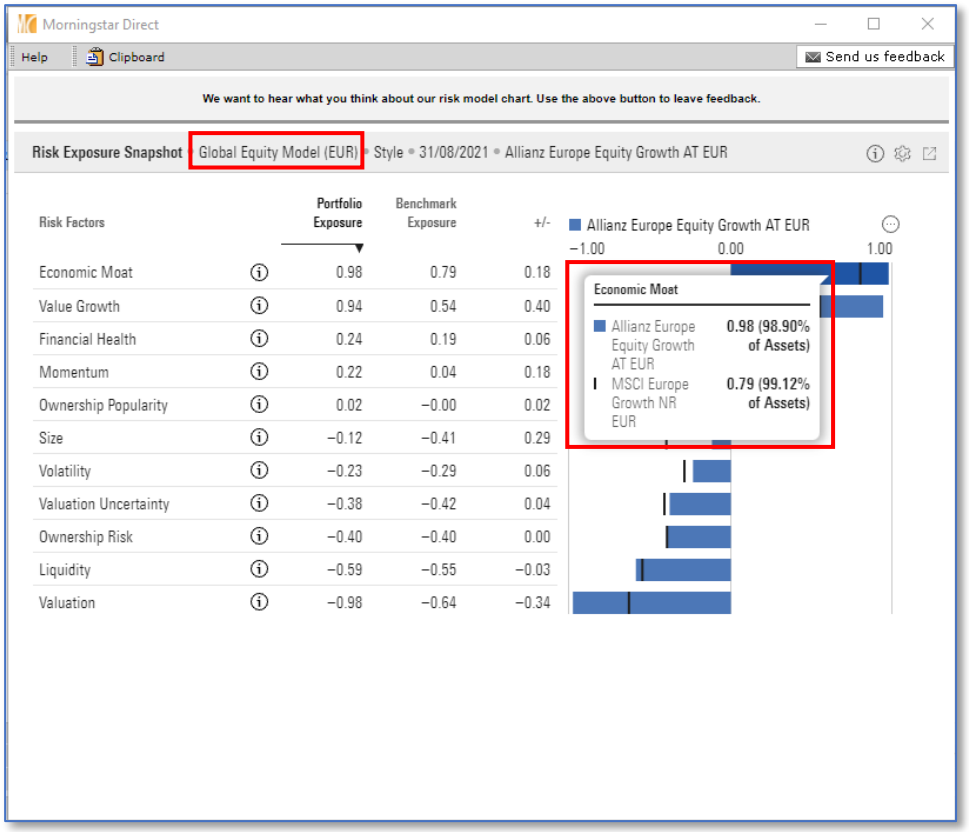
A factor is an observable condition (such as value/growth or market sector) appearing to influence asset returns. A factor exposure is a numeric measure of how much a particular asset tends to be affected by a factor. Exposures can be positive, negative, or zero, and can change over time.

Using the Risk Exposure Snapshot component helps identify strategy changes related to multiple factors and the associated risk premiums (the returns attributed to the specific factor).

To discover what factors a fund is exposed to, do the following:

1. Close the Factor Profile component (click the cross in the top-right corner) to return to your Investment List.
2. With the Allianz fund still selected, from the toolbar, click **Action > Risk Model > Risk Exposure Snapshot**. The component opens on screen.





The default Global Risk Model for the Allianz fund is the Global Equity Model (EUR).

3. Hover with the mouse over the bars to the right to see the **Percentage of Assets covered**.

Take a note of the Percentage of Assets covered.

Exercise 6: Changing Risk Model

Let's investigate which risk model is selected for the JPM fund.

Do the following:

1. Close the **Risk Exposure Snapshot** component to return to your Investment List.
2. Deselect the Allianz fund and select the **JPM** fund.
3. From the toolbar, go to **Action > Risk Model > Risk Exposure Snapshot**.

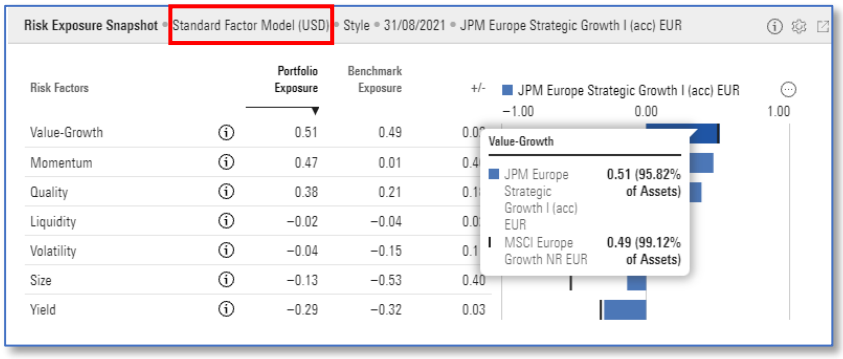
This time the selected risk model is the Global Multi-Asset Risk Model (USD) as denoted on the component title bar.

What is the Percentage of Asset covered with the Global Multi-Asset Risk Model (USD)?

We want to display the Standard Factor Model instead.

4. Click the **Gear** icon in the top-right corner of the window to access your Settings options.
5. Click **Morningstar Risk Models** and select the radio button for **Standard Factor Model**.
6. Click **Done**.
7. Click on the side of the component to close the Settings panel.

What is the Percentage of Assets covered with the Standard Factor Model?



Take the time to discover the other options available under Settings.

In the next exercise, we will see how to identify why the Global Multi-Asset Risk Model was selected.

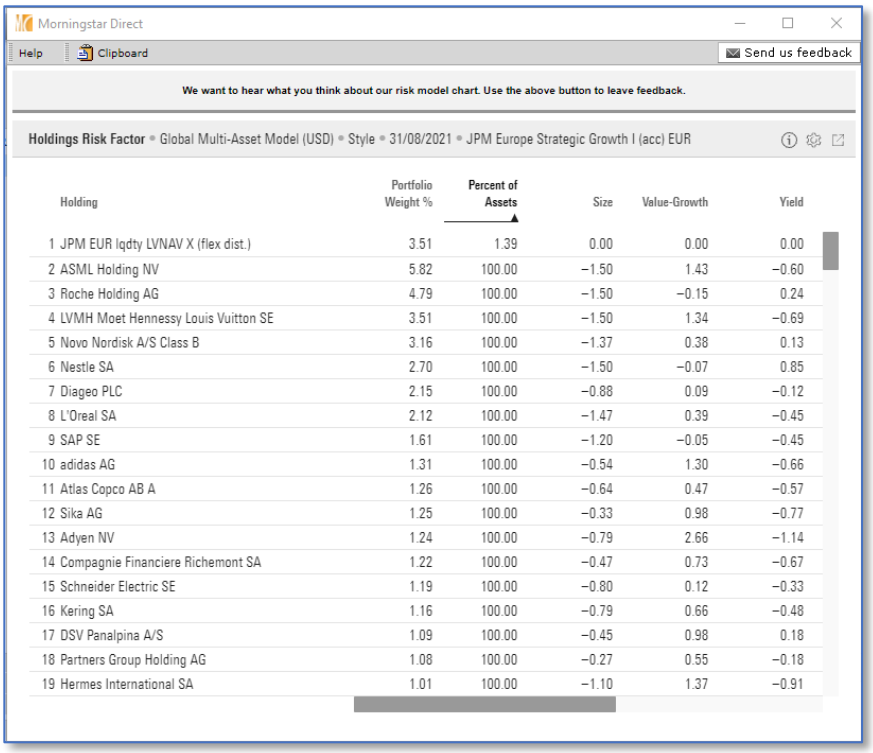
Exercise 7: Checking Coverage with the Holdings Risk Factor

We now want to understand why the Global Multi-Asset Risk Model is being used and not the Standard Factor Model for instance. Keep in mind that the model will be selected based on the widest coverage.

The **Holdings Risk Factor** component displays a table of risk factor data points for the holdings of a portfolio. Using this component helps discover and evaluate the underlying company-level risk factors in your portfolio, and which holdings are responsible for the overall exposures of the portfolio.

To compare the coverage between the Global Multi-Asset Risk Model and the Standard Factor Model in this scenario, do the following:

1. Close the Risk Exposure Snapshot component and return to the Investment List's grid view.
2. With the JPM investment selected, go to **Action > Risk Model > Holdings Risk Factor**.
3. Click the **Percent of Assets** column header to sort **Ascending**.



	Holding	Portfolio Weight %	Percent of Assets ▲	Size	Value-Growth	Yield
1	JPM EUR lqdty LVNAV X (flex dist.)	3.51	1.39	0.00	0.00	0.00
2	ASML Holding NV	5.82	100.00	−1.50	1.43	−0.60
3	Roche Holding AG	4.79	100.00	−1.50	−0.15	0.24
4	LVMH Moet Hennessy Louis Vuitton SE	3.51	100.00	−1.50	1.34	−0.69
5	Novo Nordisk A/S Class B	3.16	100.00	−1.37	0.38	0.13
6	Nestle SA	2.70	100.00	−1.50	−0.07	0.85
7	Diageo PLC	2.15	100.00	−0.88	0.09	−0.12
8	L'Oreal SA	2.12	100.00	−1.47	0.39	−0.45
9	SAP SE	1.61	100.00	−1.20	−0.05	−0.45
10	adidas AG	1.31	100.00	−0.54	1.30	−0.66
11	Atlas Copco AB A	1.26	100.00	−0.64	0.47	−0.57
12	Sika AG	1.25	100.00	−0.33	0.98	−0.77
13	Adyen NV	1.24	100.00	−0.79	2.66	−1.14
14	Compagnie Financiere Richemont SA	1.22	100.00	−0.47	0.73	−0.67
15	Schneider Electric SE	1.19	100.00	−0.80	0.12	−0.33
16	Kering SA	1.16	100.00	−0.79	0.66	−0.48
17	DSV Panalpina A/S	1.09	100.00	−0.45	0.98	0.18
18	Partners Group Holding AG	1.08	100.00	−0.27	0.55	−0.18
19	Hermes International SA	1.01	100.00	−1.10	1.37	−0.91

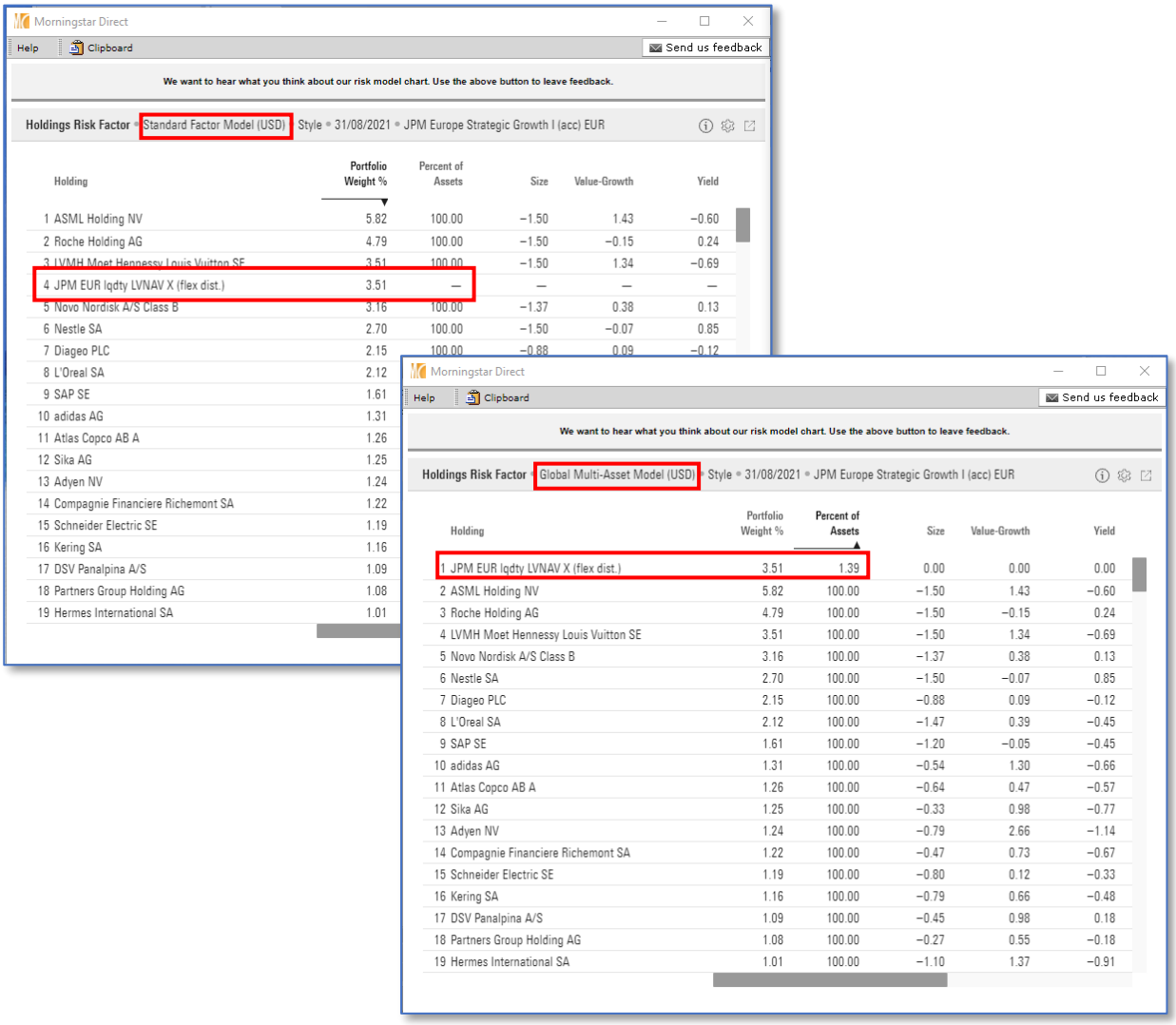
We are currently displaying the coverage of holdings under Global Multi-Asset Model.

Note the name of the investment with the lowest percent of assets at the top.

Let's now generate the same table and display the Standard Factor Model.

Do the following:

1. Keep the current window open (we will compare them side by side afterwards) and return to the grid.
2. Generate the same table again by going to **Action > Risk Model > Holdings Risk Factor**.
3. Click the **Gear** icon in the top-right corner to access the Settings.
4. Click **Morningstar Risk Models** and select **Standard Factor Model**.
5. Click **Done** and click on the side of the component to exit the Settings window.



You can now clearly see that the Global Multi-Asset Model was selected because it offers coverage of JPM EUR lqdty LVNAX X (flex.dist).

Switching to the Standard Factor Model would not cover this particular security and displaying the Holdings Risk Factor tables is a good way of checking the coverage offered.

Exercise 8: Historical Risk Exposure

Looking at the Risk Exposure Snapshot component, we note that the JPM fund has a high exposure to the Value-Growth factor, indicating higher growth.

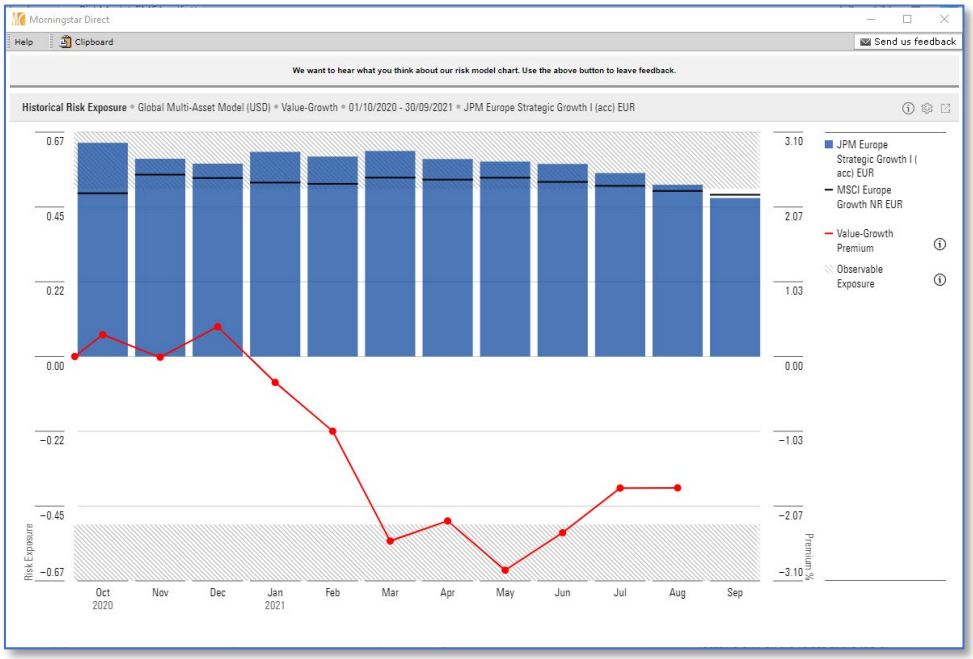
But what happened historically? Has a manager had consistent exposure to a factor over time? Did a manager increase or decrease exposure to a factor in light of a shift in the risk premium associated with it?

We can help answer these questions with the help of the **Historical Risk Exposure** component, which helps evaluate the risk embedded in an asset or portfolio of assets through time, by visualising exposures to factors captured by Morningstar's risk model. The component depicts one factor at a time (via the blue bar), along with how this exposure compares to a benchmark (the black line), as well as the premia that factor currently commands in the market (the red line).

In this exercise you will learn how to display the Value-Growth factor on the Historical Risk Exposure component.

Do the following:

1. Close both Risk Exposure Snapshot components and return to the Investment List's grid view.
2. With the JPM investment selected, go to **Action > Risk Model > Historical Risk Exposure**.
3. Click the **Gear** icon to the right of the window to access the Settings.
4. Click **Risk Factor Exposures >Style > Value-Growth**.
5. Click **Risk Premium** and select **Cumulative Returns**.
6. Click the side of the component to exit the Settings panel.



Compared to the global universe, the historical risk exposure chart confirms that the fund has much higher growth.

Take the time to discover the other options available under Settings, such as Time Period, Frequency, Benchmark.

Exercise 9: Multiple Risk Exposures

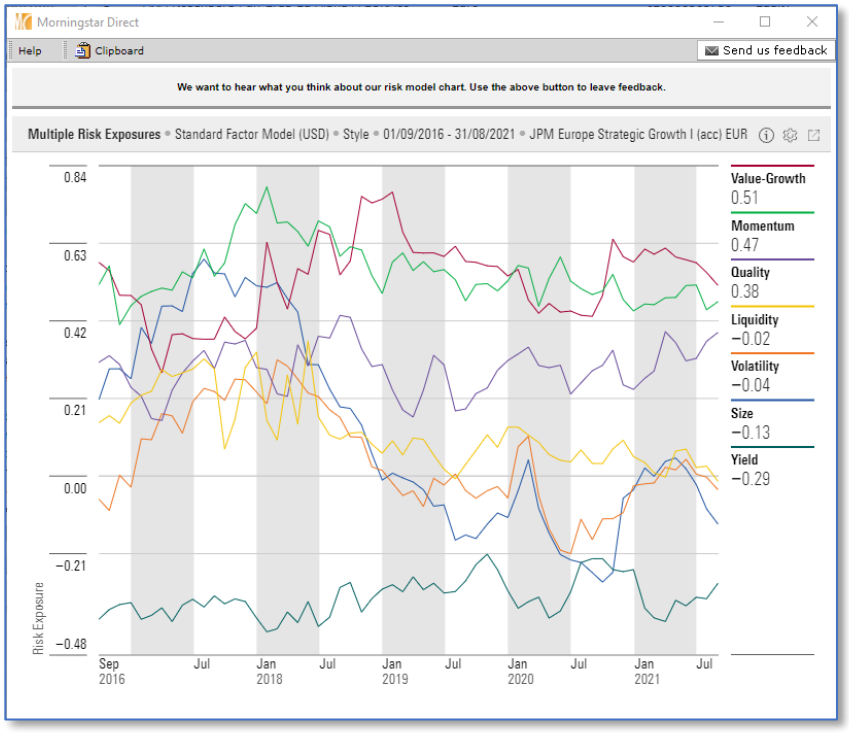
You can also use the Multiple Risk Exposures component to view the risk factors a portfolio has been exposed to over time. It is useful to identify strategy changes, consistency of process and to isolate a manager's strategy.

Do the following:

1. Close the Historical Risk Exposure component and return to the Investment List's grid view.
2. With the JPM investment selected, go to **Action > Risk Model > Multiple Risk Exposures**.

The Global Multi-Asset Model (USD) is displayed on screen, and the Style factors group is the default display group. Using the Settings panel, you can change Risk Model and display group, as well as time period amongst other things.

3. Click the **Gear** icon to the right of the window to access the Settings.
4. Click **Morningstar Risk Models** and select **Standard Factor Model (USD)**.
5. Click **Done**.
6. Click the side of the component to exit the Settings panel.



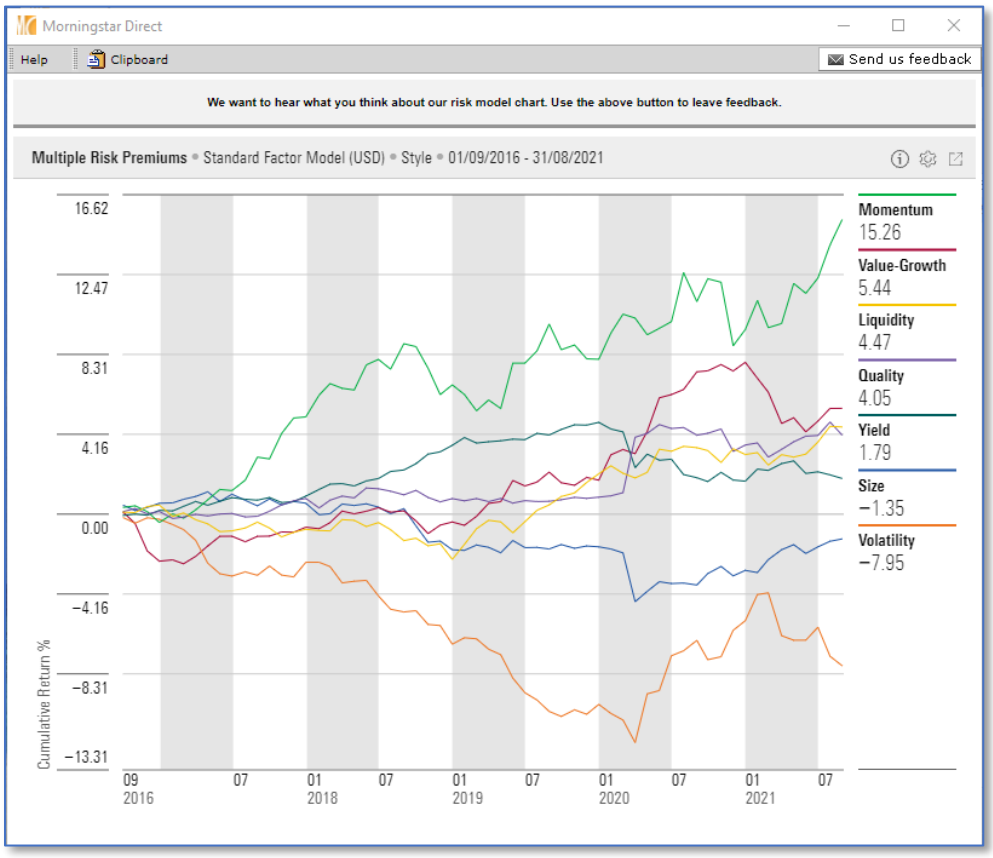
Which Style factor has the greatest value over 5 years as of the last month end?

Exercise 10: Multiple Risk Premiums

The Multiple Risk Premiums component visualises the return premia of each risk factor to show you what's in favour or out of favour within the broader capital markets over time. This view is agnostic of any investment and is designed to show you a market-level view.

Do the following:

1. Close the Multiple Risk Exposure component and return to the Investment List's grid view.
2. With the JPM investment selected, go to **Action > Risk Model > Multiple Risk Premiums**.
3. Click the **Gear** icon to the right of the window to access the Settings.
4. Click **Morningstar Risk Models** and select **Risk Model Currency – USD** using the drop-down menu.
5. Select **Standard Factor Model (USD)**.
6. Click **Done**.
7. Click the side of the component to exit the Settings panel.



Momentum is the factor most in favour over the last 5 years, followed by Value-Growth. By comparing to your portfolio, you can see which factors should be focused on to potentially attract more asset returns.

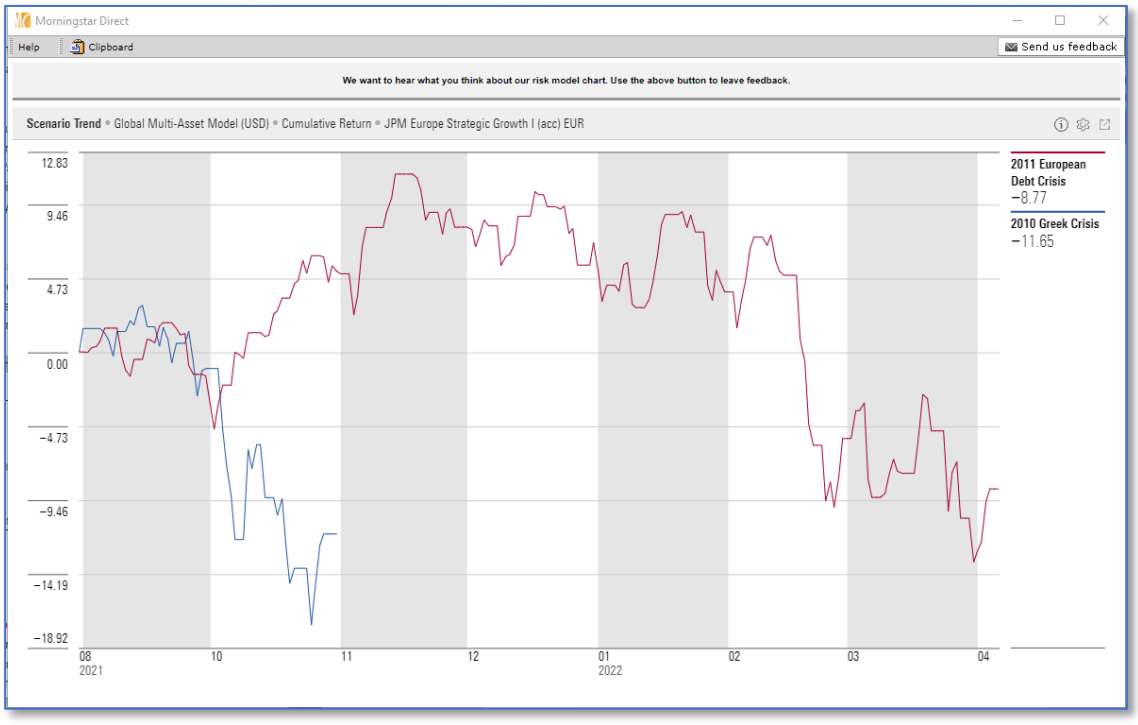
Exercise 11: Scenario Trend

The Morningstar Global Risk Model also offers a full complement of scenario analysis capabilities including historical scenarios, predefined Macro-Financial scenarios, and Market-Driven scenarios.

Find out how your investment's forecasted cumulative return would react if significant market and macroeconomic events occurred again today, like the 2010 Greek Crisis or the 2011 European Debt Crisis. You can select any of the pre-defined scenarios that Morningstar created, as well as surface custom scenarios if you have access to that capability.

Do the following:

1. Close the Historical Risk Exposure component and return to the Investment List's grid view.
2. With the JPM investment selected, go to **Action > Risk Model > Scenario Trend**.
3. Click the **Gear** icon to the right of the window to access the Settings.
4. Click **Scenarios**.
5. Deselect the scenarios located under Global Macro.
6. Scroll down and select **2010 Greek Crisis** and **2011 European Debt Crisis**.
7. Click **Done**.
8. Click the side of the component to exit the Settings panel.



Here we note that should these scenarios occur again today:

- 2010 Greek Crisis: the JPM fund would see a slight increase but significantly lose performance over the time period this crisis lasted.
- 2011 European Debt Crisis: the JPM fund would first see quite a significant increase but lose performance towards the end of the time period this crisis lasted.

In either scenario the fund would not fully recover during the time period.

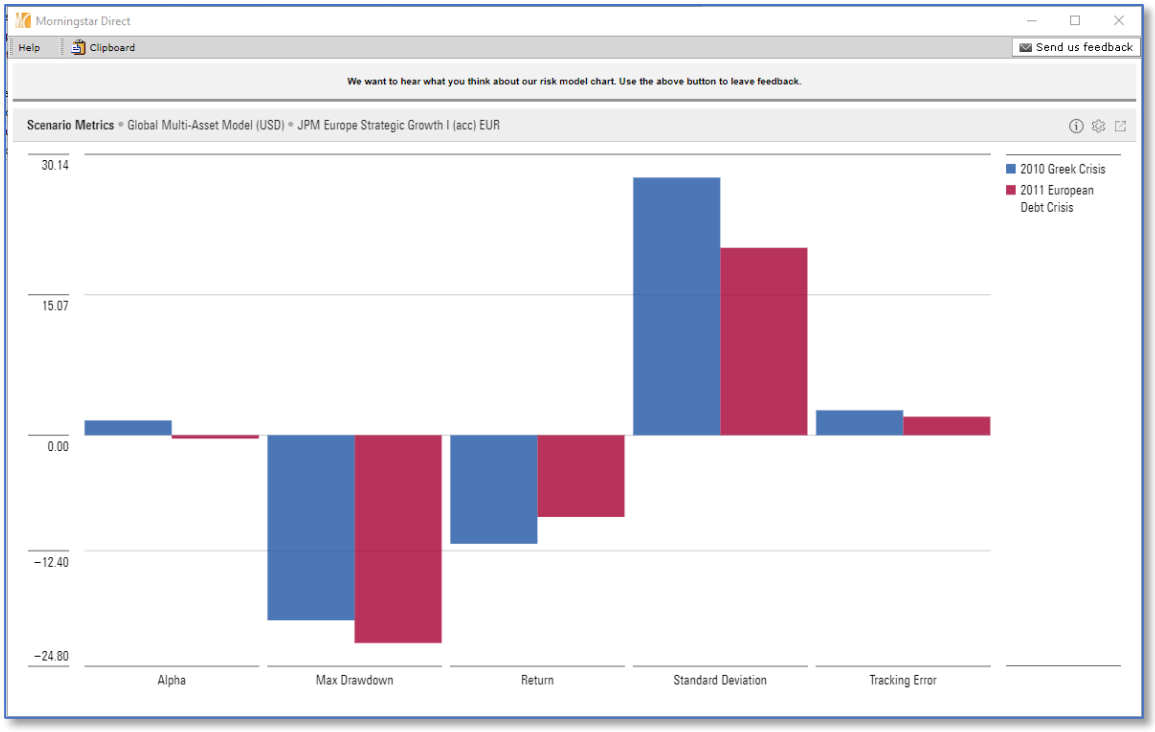
Exercise 12: Scenario Metrics

The Scenario Metrics component is used to answer the question, "What would happen to a fund or portfolio if markets were impacted by some well-known predefined historical event?" To answer this question, the historical returns for stocks are analysed as if the event were happening today.

By default, the Scenario Metrics component shows a chart which includes the Alpha, Max Drawdown, Return, Standard Deviation and Tracking Error for the entire time period of the predefined scenario of a selected fund for four scenarios. You can select any of the pre-defined scenarios that Morningstar has created, as well as surface custom scenarios if you have access to that capability.

Do the following:

1. Close Scenario Trend component and return to the Investment List's grid view.
2. With the JPM investment selected, go to **Action > Risk Model > Scenario Metrics**.
3. Click the **Gear** icon to the right of the window to access the Settings.
4. Click **Scenarios**.
5. Deselect the scenarios located under Global Macro.
6. Scroll down and select **2010 Greek Crisis** and **2011 European Debt Crisis**.
7. Click **Done**.
8. Click the side of the component to exit the Settings panel.



The component displays various statistics during each event, including a forecasted Tracking Error.

During which scenario would the fund occur a greater loss in performance as measured by Max Drawdown?

During which scenario would the fund occur a greater risk as measured by Standard Deviation?

Exercise 13: Leveraging the Presentation Studio Risk Model Templates

With Morningstar Direct™ you can use Presentation Studio to create your own presentations and factsheets.

The Morningstar team also created some templates around Risk Model, which you can leverage and modify to suit your reporting needs.

In this exercise you will learn how to generate the Risk Model template for an Equity fund. Please note that two other Risk Model templates exist, one for a fixed income investment and another one for a Model Portfolio created under the Portfolio Management module.

Do the following:

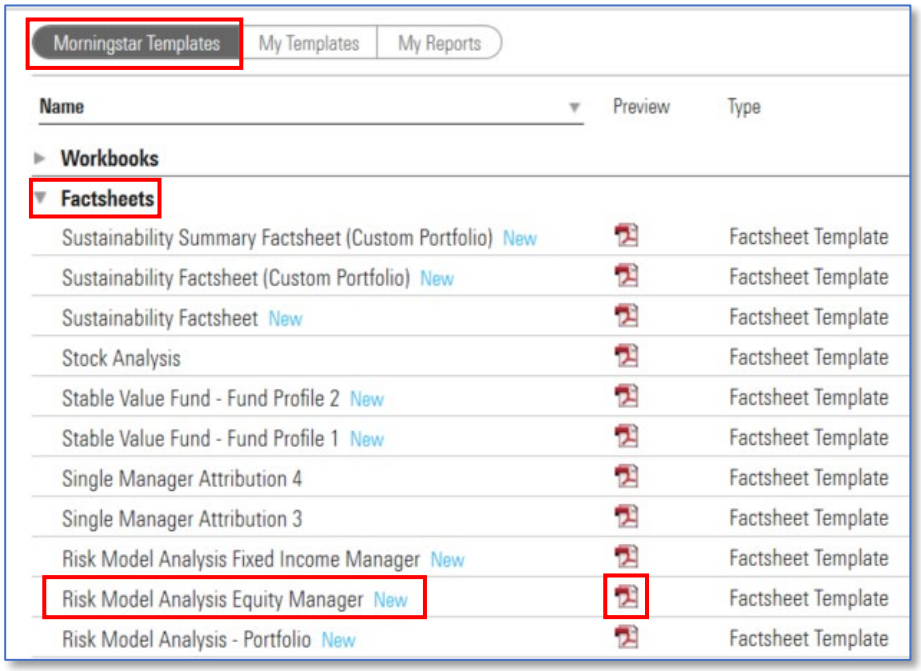
1. From the left navigation panel, click the Presentation Studio folder. The Presentation Studio landing page opens in a separate window.
2. Select the **Morningstar Templates** tab.
3. Expand the **Factsheets** section by clicking the arrow.
4. Click the **Name** column header twice to sort in a descending order.
5. Scroll down until you find the **Risk Model Analysis Equity Manager** template.

   ☞ **Note:** Click the PDF icon to view a sample report.

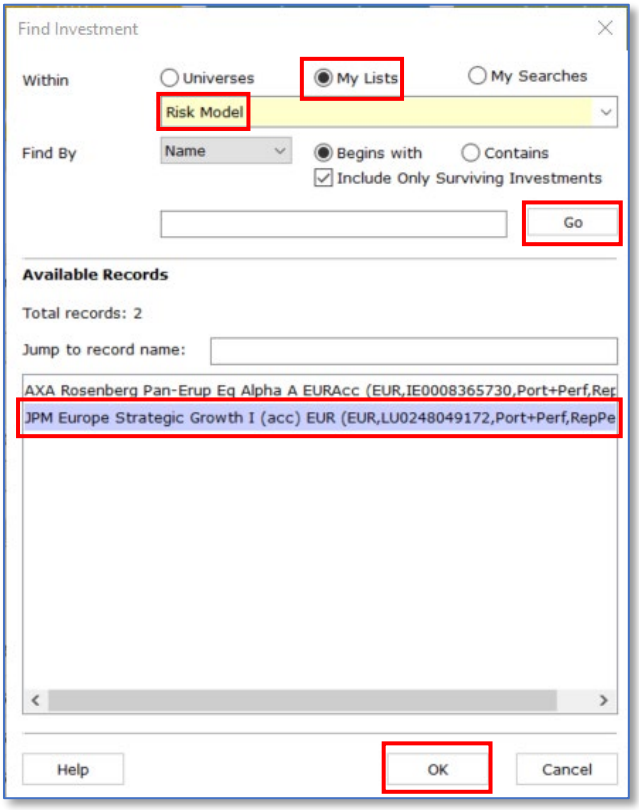
   ☞ **Note:** You will also find **Risk Model Analysis Fixed Income Manager** and **Risk Model Analysis – Portfolio**.

6. Double-click the template name to open it. **The Investments: Settings** window opens.

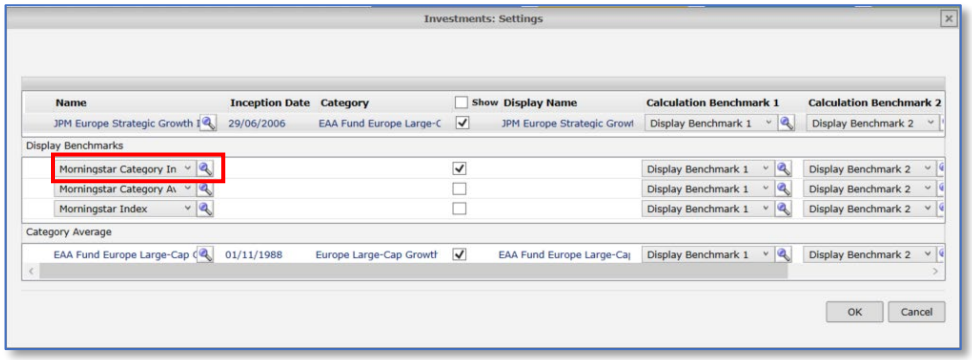
   ☞ **Note:** If the template name is greyed out, this means that you are on a version of Morningstar Direct™ that is earlier than the version the template was created on and you will therefore not be able to use it. You can, however, hover over the template name with your mouse and **click the three dots > Save As > A Duplicate Copy**. The template will then be saved under the My Templates tab and you will be able to open it. Any components from a more recent version will not display and you will have an empty space instead.



7. Under the **Name** column, click the magnifying glass. The **Find Investments** dialogue box opens.
8. Select the **My Lists** radio button.
9. Using the drop-down menu, select the **Risk Model** Investment List and click **Go**.
10. In the **Available Records** section, select the JPM fund.
11. Click **OK**. You are returned to the **Investments: Settings** window.



12. Under Display Benchmarks, use the first drop-down menu to select **Morningstar Category Index**.

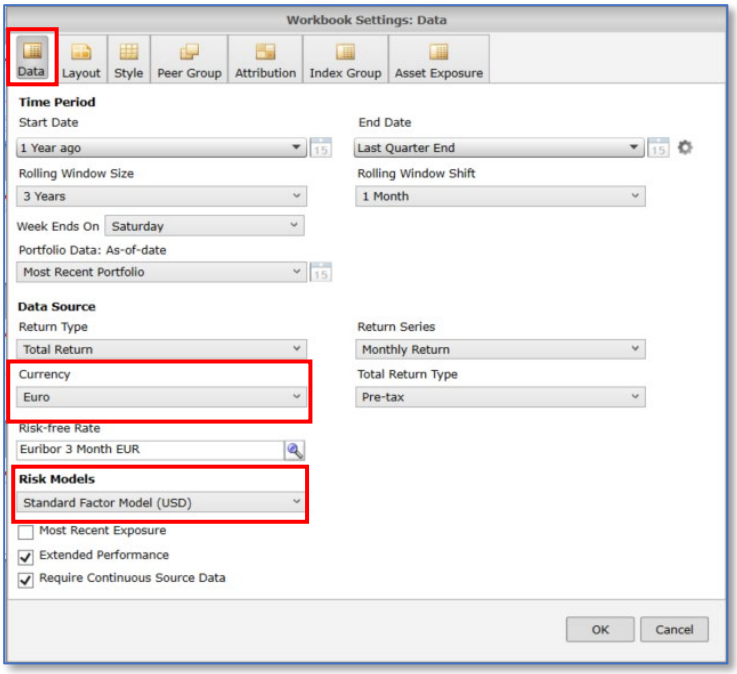


13. Click **OK**. The template opens in a new window.

When using a Morningstar Template, we recommend checking the report settings. In this exercise, you will learn how to check which Risk Model is used (and eventually change it), set the currency and layout options for the report.

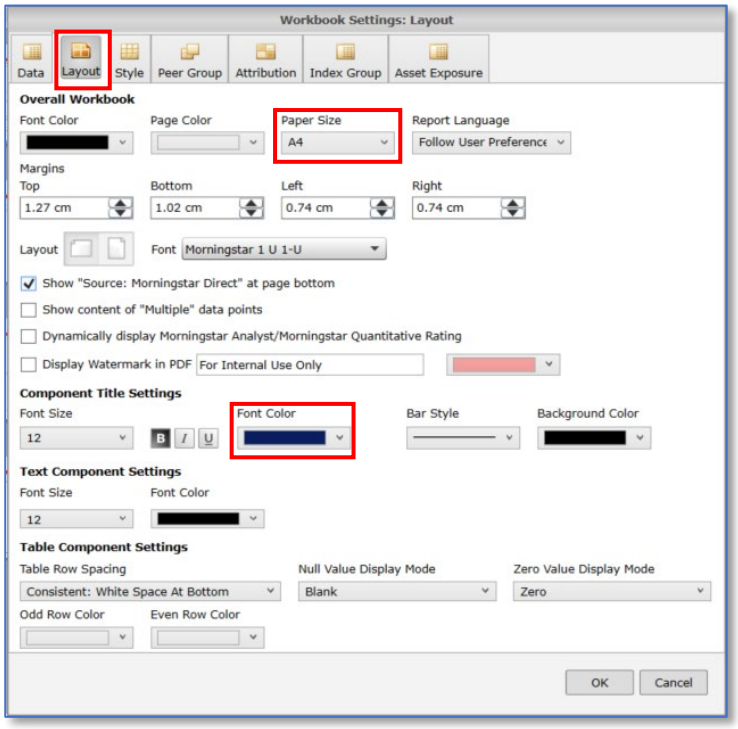
Do the following:

1. From the **Home** tab, click **Workbook**. The **Workbook Settings** window opens.
2. Using the **Currency** drop-down menu, select Euro (or the desired currency of your choice).
3. Using the **Risk Models** drop-down menu, note how Standard Factor Model (USD) is selected as the default risk model for this report.



You may change risk model to suit your purpose at this point, but in this exercise we will remain on the Standard Factor Model (USD).

4. Click the **Layout** tab.
5. Using the **Paper Size** drop-down menu, select **A4**.
6. Under **Component Title Settings**, use the Font Colour drop-down menu to change from red to dark blue (1st colour).



7. Click **OK** to validate your changes.

The report reloads with the applied settings.

This report contains many of the components we viewed in the previous exercises from the Workspace.

You will find all Risk Model components by clicking the **Performance** section the bottom-left corner of the window and switching to the **Risk Model** section.

All components will then appear on the bottom toolbar of the report. As usual with Presentation Studio, blue icons are chart components, and orange icons are table components.

You can go over the various components displayed on the report pages and make any changes as appropriate.

8. Click the **Gear** icon in the top-left corner of the window to save your report.

Please note that the last page of the report will only display data for those users who subscribe to the advanced Global Risk Model package.

The advanced Global Risk Model package includes Risk Factor Attribution, Risk Decomposition, and Custom Scenarios.

You can find out more about those items in Appendix A.

Appendix A: Advanced Risk Model

Advanced Risk Model provide access to additional risk model components, such as:

- Risk Factor Attribution: attribute the total fund return of a selected period into the 37 equity factors (Morningstar Global Equity Model) and residual return.
- Risk decomposition: attribute the total fund volatility of a selected period into the 37 equity factors (Morningstar Global Equity Model) and residual return
- Custom scenarios: create your own custom scenario where a time series of simulated or historical market return distributions generate simulated behaviour of a portfolio.

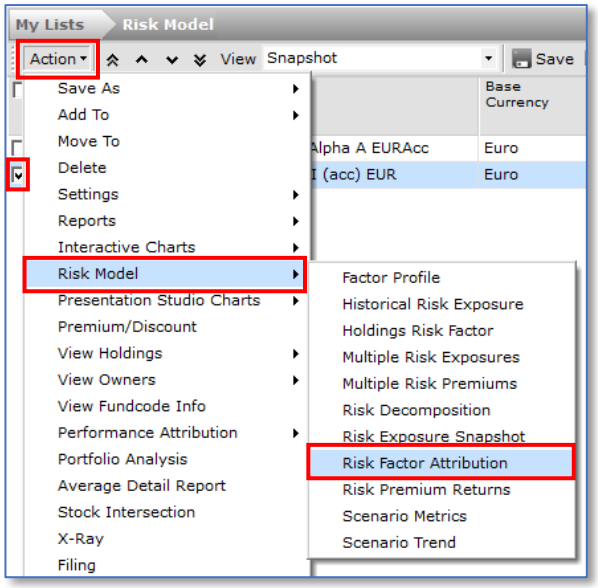
Risk Factor Attribution

With the Risk Factor Attribution component, you can see how the total fund return of a selected period is attributed into the 37 equity factors (Morningstar Global Equity Model) and residual return.

You will be able to identify the sources of return in your investment or portfolio as a result of your risk factor exposure. What was the true source of active returns for a fund for a given period? Was it the stock selections a manager made, or the fund's exposure to particular factors? This component attempts to discern that answer.

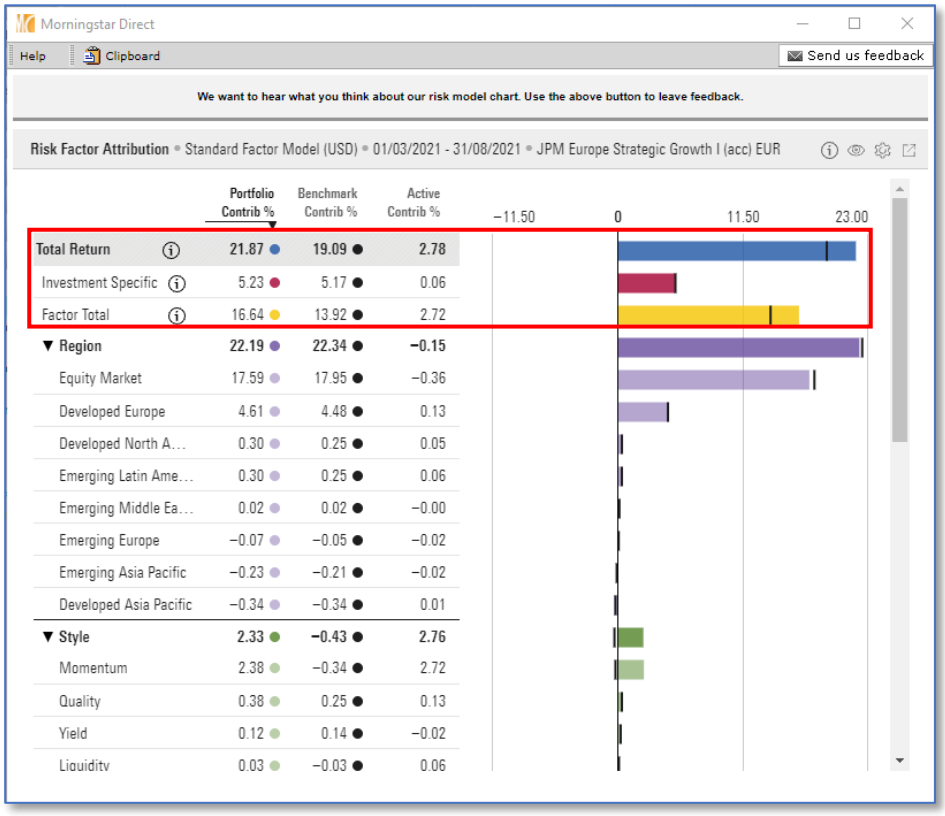
Do the following:

1. Using the left navigation panel, open the **Workspace** folder and go to **Investment Lists > My Lists**.
2. Double-click the **Risk Model** Investment List you created in Exercise 1: Creating an Investment List.
3. Select the JPM fund and go to **Action > Risk Model > Risk Factor Attribution**.



☞ **Note:** As a reminder, you will only see this option if you subscribe to the Advanced Risk Model.

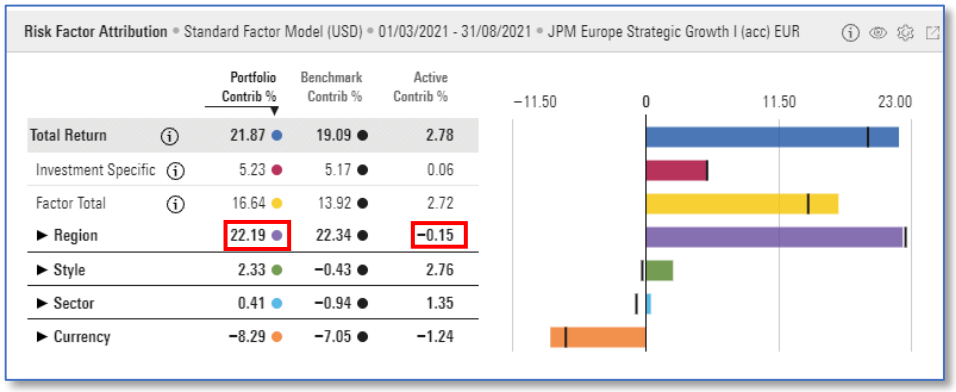
4. Click the **Gear** icon to the right of the window to access the Settings.
5. Click **Morningstar Risk Models** and select **Standard Factor Model (USD)**.



The Risk Factor Attribution component reveals a positive Portfolio Contribution in terms of Total Return, Investment Specific and Factor Total, outperforming the benchmark.

If we look at each group of factors, most of the return is derived from the regional factors, where this specific manager pretty much allocated the same way as the benchmark. You can easily see this by doing the following:

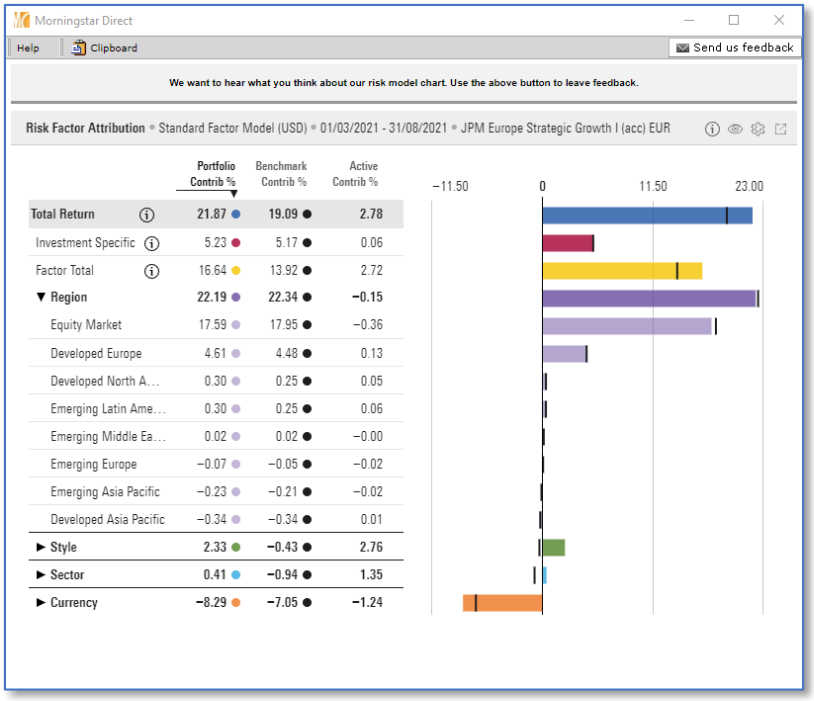
1. Click the arrow next to each group of factors to close it.



You now have a clear picture as to which group of factors contributed the most or the least to the Active Contribution (Portfolio Contribution – Benchmark Contribution).

☞ **Note:** the end date is one month in arrears due to the production schedule for the Morningstar Global Risk Model data.

2. Expand the **Region** section by clicking on the arrow.



Which regional factor has the highest Active Contribution?

☞ **Note:** The Equity Market factor results from our estimation methodology and captures the common equity market movement globally or for a specific region. For fixed-income securities, we currently group factors into duration and credit. You can find more details in Appendix C of the Risk Model Methodology paper.

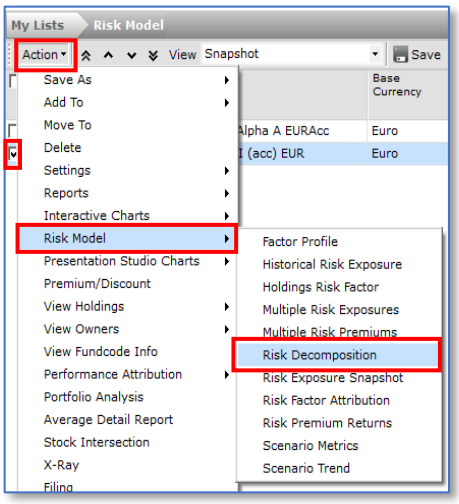
Risk Decomposition

Morningstar's Risk Decomposition component decomposes estimated portfolio risk into its individual factor components, allowing users to view the sources of total and active risk within each portfolio. With this tool, users can dissect estimated portfolio risk along the dimension of the factors in Morningstar's Global Risk Model, developing an understanding of each factor's marginal and total risk contribution.
You can find more details in the Risk Decomposition Methodology paper.

In this exercise you will discover what type of Active Risk your portfolio has.

Do the following:

1. Close the Risk Factor Attribution component and return to the Investment List's grid view.
2. With the JPM investment selected, go to **Action > Risk Model > Risk Decomposition**.

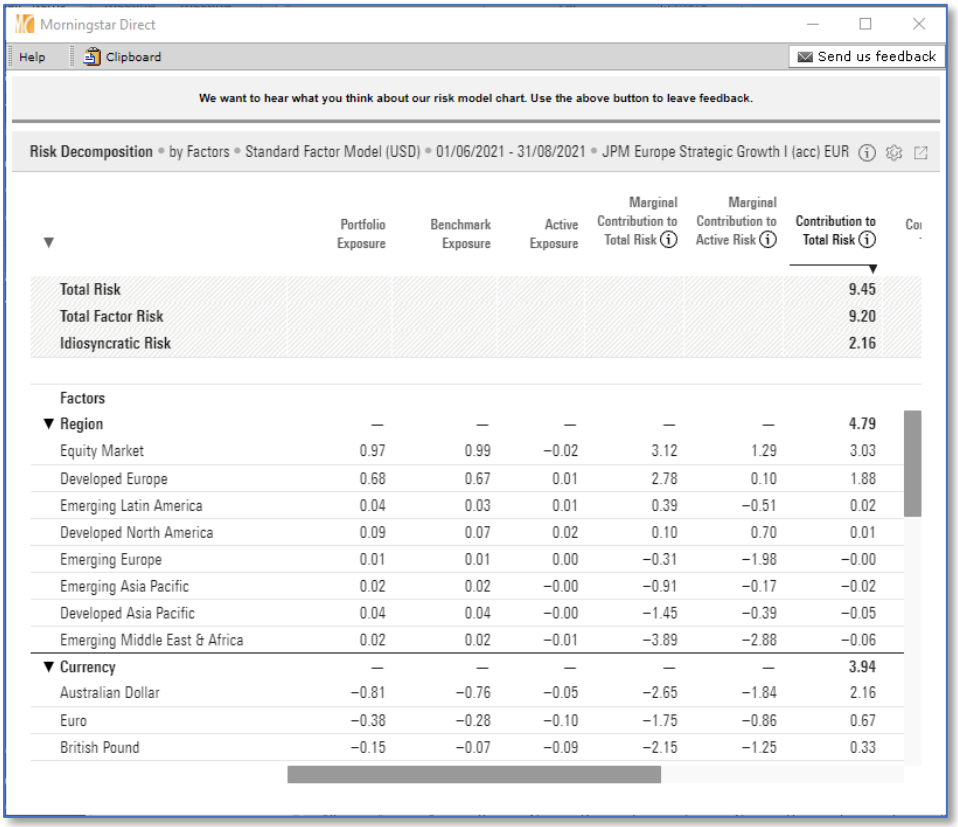


3. Click the **Gear** icon to the right of the window to access the Settings.
4. Click **Morningstar Risk Models** and select **Standard Factor Model (USD)**.
5. Click **Done**.

At this point you may also set the time period to something other than the default 3 months and choose a different benchmark than the default Morningstar Category Index. If you choose to decompose by holdings instead of factors, you will need access to the benchmark's constituent data.

6. Click the side of the component to exit the Settings panel.

☞ **Note:** The analysis is run over the last 3 months by default, but you could of course change the time period from the Settings panel.



	Portfolio Exposure	Benchmark Exposure	Active Exposure	Marginal Contribution to Total Risk	Marginal Contribution to Active Risk	Contribution to Total Risk
Total Risk						**9.45**
Total Factor Risk						**9.20**
Idiosyncratic Risk						**2.16**
Factors						
▼ **Region**	—	—	—	—	—	**4.79**
Equity Market	0.97	0.99	−0.02	3.12	1.29	3.03
Developed Europe	0.68	0.67	0.01	2.78	0.10	1.88
Emerging Latin America	0.04	0.03	0.01	0.39	−0.51	0.02
Developed North America	0.09	0.07	0.02	0.10	0.70	0.01
Emerging Europe	0.01	0.01	0.00	−0.31	−1.98	−0.00
Emerging Asia Pacific	0.02	0.02	−0.00	−0.91	−0.17	−0.02
Developed Asia Pacific	0.04	0.04	−0.00	−1.45	−0.39	−0.05
Emerging Middle East & Africa	0.02	0.02	−0.01	−3.89	−2.88	−0.06
▼ **Currency**	—	—	—	—	—	**3.94**
Australian Dollar	−0.81	−0.76	−0.05	−2.65	−1.84	2.16
Euro	−0.38	−0.28	−0.10	−1.75	−0.86	0.67
British Pound	−0.15	−0.07	−0.09	−2.15	−1.25	0.33

Here are a few definitions:

- **Marginal Contribution to Total Risk**: measures the impact to total portfolio risk caused by one-unit change from each exposure

➔ In the example of Equity Market, if the Portfolio Exposure goes up by 1%, then the Marginal Contribution to Total Risk will go up by 0.312.

- **Marginal Contribution to Active Risk**: measures the impact to active portfolio risk by one-unit change from each exposure

➔ In the example of Equity Market, if the Portfolio Exposure goes up by 1%, then the Marginal Contribution to Active Risk will go up by 0.129.

- **Contribution to Total Risk**: Portfolio Exposure from the beginning of period * Marginal Contribution to Total Risk

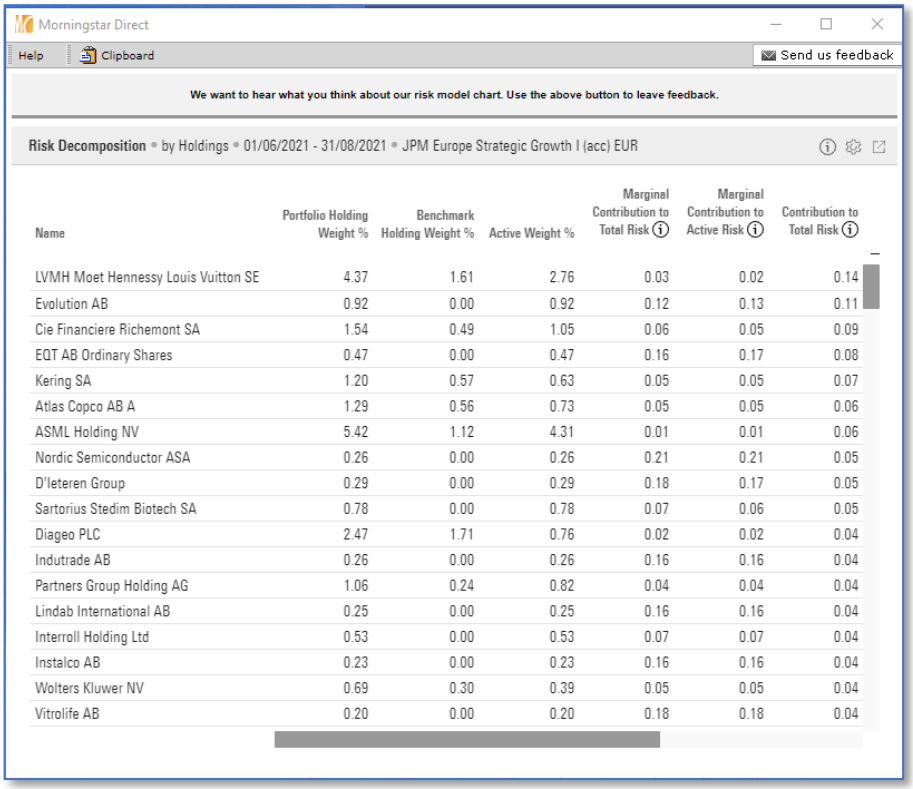
➔ In this example, Region is the factor group with the highest Contribution to Total Risk, and the Equity Market factor is the highest contributor.

You can also view the information at the holding level. Note that you will be required to have access to the index's constituent data for this type of analysis.

If you do have access to the index's constituent data, switch to an ETF proxy or another index where you have access.

To view holdings-level risk decomposition, do the following:

1. Click the **Gear** icon to the right of the window to access the Settings.
2. Click **Decomposition by** and select **Holdings**.
3. Click **Done**.
4. Click the side of the component to exit the Settings panel.



Name	Portfolio Holding Weight %	Benchmark Holding Weight %	Active Weight %	Marginal Contribution to Total Risk	Marginal Contribution to Active Risk	Contribution to Total Risk
LVMH Moet Hennessy Louis Vuitton SE	4.37	1.61	2.76	0.03	0.02	0.14
Evolution AB	0.92	0.00	0.92	0.12	0.13	0.11
Cie Financiere Richemont SA	1.54	0.49	1.05	0.06	0.05	0.09
EQT AB Ordinary Shares	0.47	0.00	0.47	0.16	0.17	0.08
Kering SA	1.20	0.57	0.63	0.05	0.05	0.07
Atlas Copco AB A	1.29	0.56	0.73	0.05	0.05	0.06
ASML Holding NV	5.42	1.12	4.31	0.01	0.01	0.06
Nordic Semiconductor ASA	0.26	0.00	0.26	0.21	0.21	0.05
D'leteren Group	0.29	0.00	0.29	0.18	0.17	0.05
Sartorius Stedim Biotech SA	0.78	0.00	0.78	0.07	0.06	0.05
Diageo PLC	2.47	1.71	0.76	0.02	0.02	0.04
Indutrade AB	0.26	0.00	0.26	0.16	0.16	0.04
Partners Group Holding AG	1.06	0.24	0.82	0.04	0.04	0.04
Lindab International AB	0.25	0.00	0.25	0.16	0.16	0.04
Interroll Holding Ltd	0.53	0.00	0.53	0.07	0.07	0.04
Instalco AB	0.23	0.00	0.23	0.16	0.16	0.04
Wolters Kluwer NV	0.69	0.30	0.39	0.05	0.05	0.04
Vitrolife AB	0.20	0.00	0.20	0.18	0.18	0.04

Which holding has the highest Contribution to Total Risk?

Custom Scenarios

With Scenario Analysis, you can access pre-defined scenarios using the Scenario Trend component as seen in Exercise 11: Scenario Trend.

With the Advanced Risk Model subscription, you can also create two types of custom scenarios:

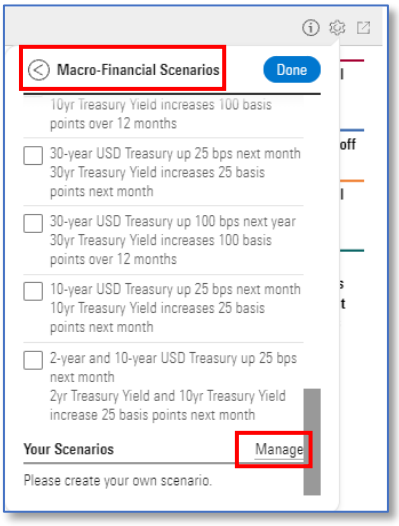
- Macro-Financial Scenarios
- Market-Driven Scenarios

With each item, you can create a new scenario based on an existing one or create a new one from scratch.

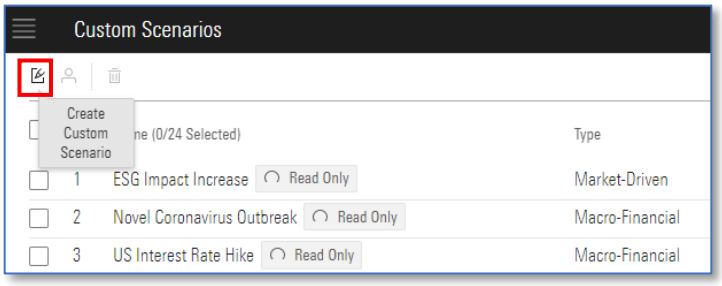
In this exercise you will learn how to create a custom scenario for each type from scratch.

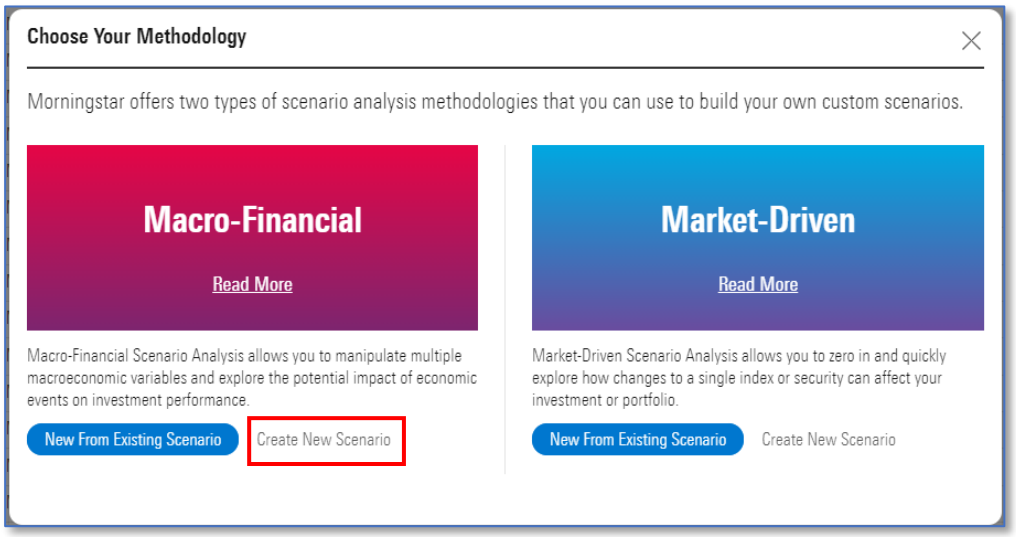
Do the following:

1. Close the Risk Decomposition component and return to the Investment List's grid view.
2. With the JPM investment selected, go to **Action > Risk Model > Scenario Trend**.
3. Click the **Gear** icon to the right of the window to access the Settings.
4. Click **Scenarios** and select **Macro-Financial Scenarios**.
5. Scroll down to the bottom of the list and click **Manage**. Your default web browser opens and takes you to the Custom Scenarios page on Direct Web edition.



6. In the top-left corner, click the **Create Custom Scenario** icon. The **Choose your Methodology** window opens.





From there you can choose the scenario type and either base it on an existing scenario or start from scratch.

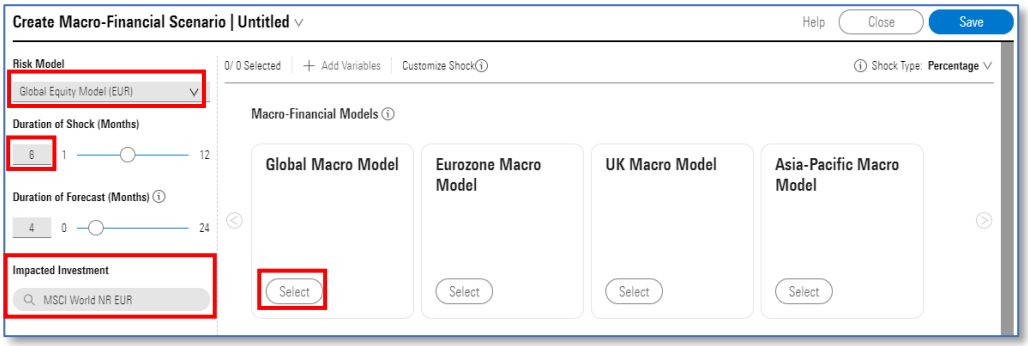
Macro-Financial Scenario

Today's headlines in the world is that oil price is up 20% and Europe inflation is up 30%. Let's see how this will affect portfolios. The shocks will take place over the default six months and then the forecast for the fund will be seen for the ensuing default 4 months.

To create a Macro-Financial scenario, do the following:

1. Under the **Macro-Financial** tile, click **Create New Scenario**. The **Create Macro-Financial Scenario** window opens.
2. Use the **Risk Model** drop-down menu to select **Global Equity Model (EUR)**.
3. Under **Macro-Financial Models**, click **Select** on the **Global Macro Model** tile.
4. Under Impacted Investment, type **MSCI World NR EUR** to see how it would be affected by this scenario.

☞ **Note:** You could select any investment of your choice.

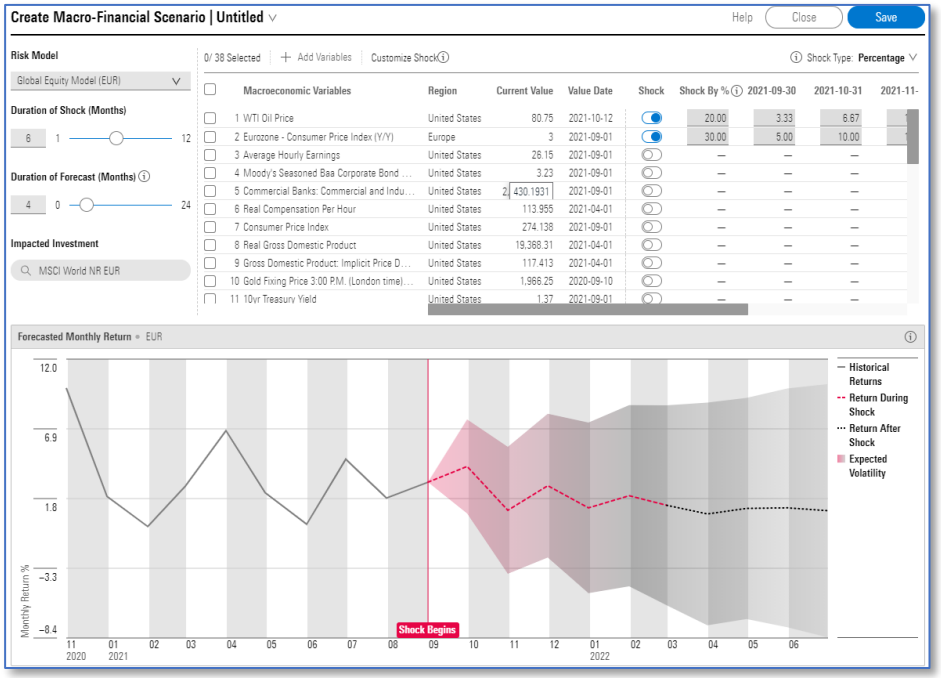


☞ **Note:** The **Impacted Investment** section is not compulsory, there is already a default benchmark there. Once you are back in Workspace, you can retrieve this scenario for the fund of your choice using the **Scenario Trend** component.

Various variables that can be used with this model appear on screen. You can either enter individual values under each month or enter the overall value in the Shock By % column and the system will fill in the data for you.

Do the following:

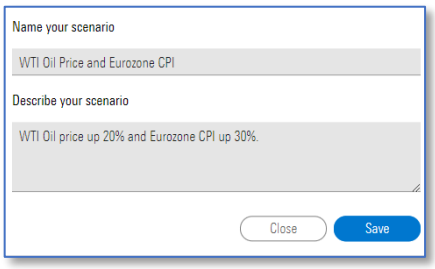
1. In the list of variables, activate the toggle switch for **WTI Oil Price**.
2. Under **Shock By %**, type **20**.
3. From the toolbar, click **Add Variables > Macro-Financial Models > Eurozone Macro Models**.
4. Click **Eurozone – Consumer Price Index (YY)** to add it to the list of variables.
5. Activate the toggle switch for **Eurozone – Consumer Price Index (YY)**.
6. Under **Shock By %**, type **30**.
7. In the **Forecasted Monthly Return** section, click **Calculate**.



The Forecasted Monthly Returns now displays the following information:

- Historical Returns
- Return During Shock
- Return After Shock
- Expected Volatility during and after Shock

8. Click **Save**.
9. Name the scenario **WTI Oil Price and Eurozone CPI**. You may also enter a description if required.



10. Click **Save** again.
11. Click **Close**.

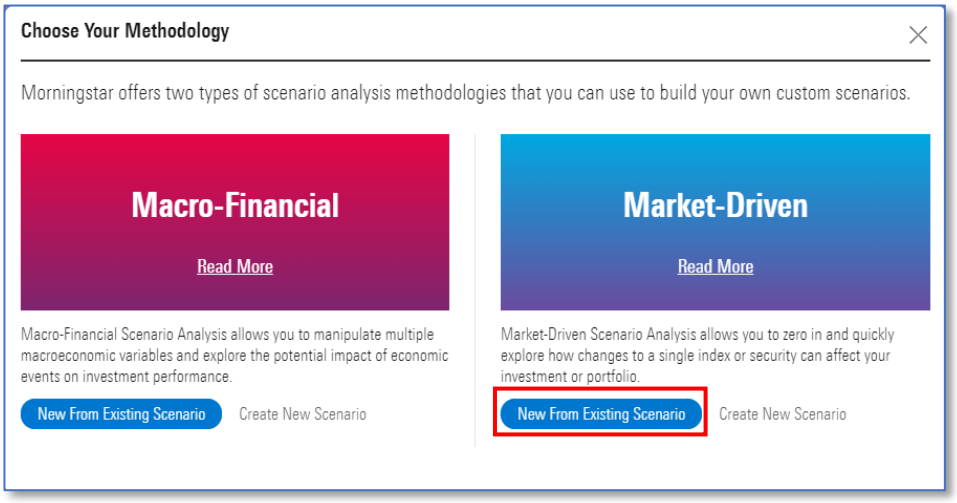
Market-Driven Scenario

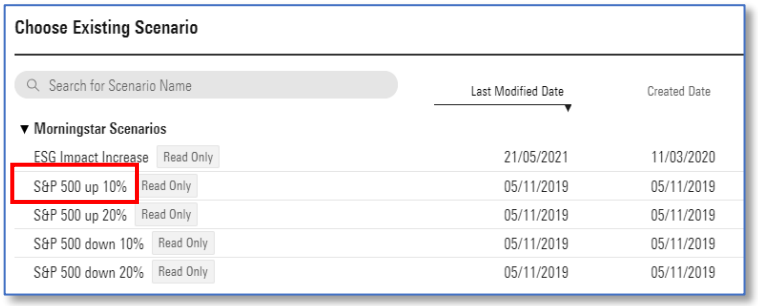
Let's now create a Market-Driven scenario, which allows users to select a market index to determine the impact of user-specified market shocks on factor exposures, portfolio returns, Value at Risk, or VaR, and Conditional Value at Risk, or CVaR.

In this exercise, we will leverage the S&P 500 up 10% scenario and modify it to see what happens if MSCI World NR EUR goes up 10% instead.

Do the following:

1. In the top-left corner, click the **Create Custom Scenario** icon. The **Choose your Methodology** window opens.
2. Under the **Market-Driven** tile, click **New from Existing Scenario**. The **Choose Existing Scenario** window opens.

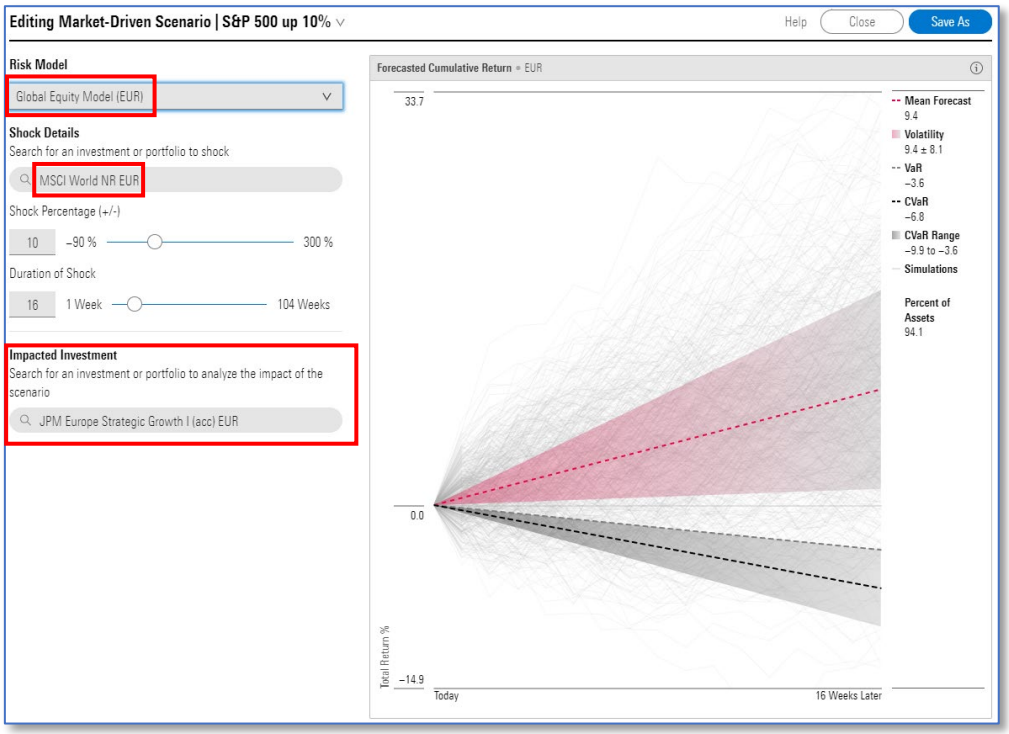




3. Click **S&P 500 up 10%**. The **Editing Market-Driven Scenario** window opens.
4. In the **Shock Details** section, search for **MSCI World NR EUR**.
5. Click on the name when it appears to select it.

We will keep the other values as they are.

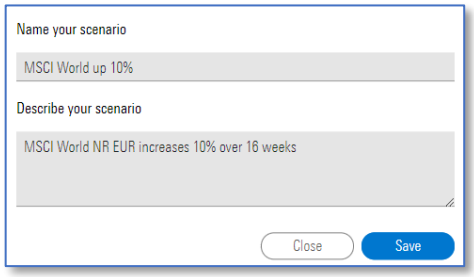
6. To see how it would affect the JPM fund, type **jpm Europe strategic growth I (acc) EUR** in the **Impacted Investment** field.
7. Click **Calculate** to view an example of the impact.



The Forecasted Monthly Returns now displays the following information:

- Mean Forecast
- Volatility
- VaR
- CVaR
- CVaR Range
- Simulations
- Percent of Assets

8. Click **Save As**.
9. Name the scenario **MSCI World up 10%**. You may also enter a description if required.

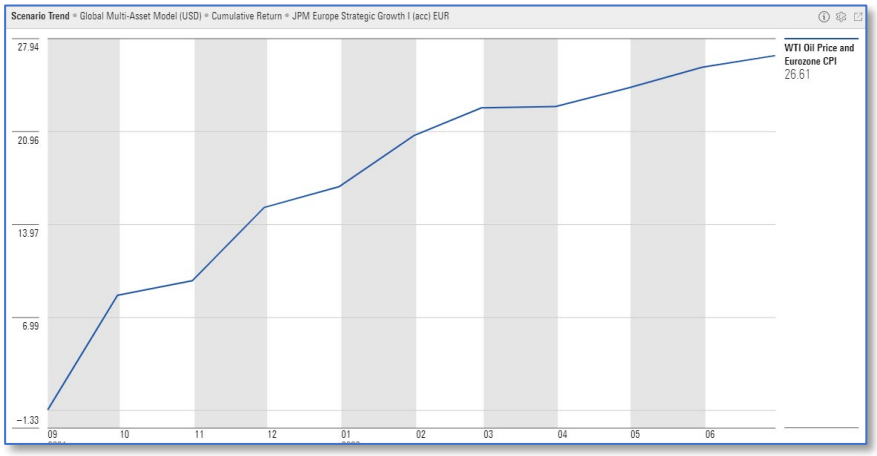


10. Click **Save** again.
11. Click **Close**.
12. Close your web browser and return to Morningstar Direct.

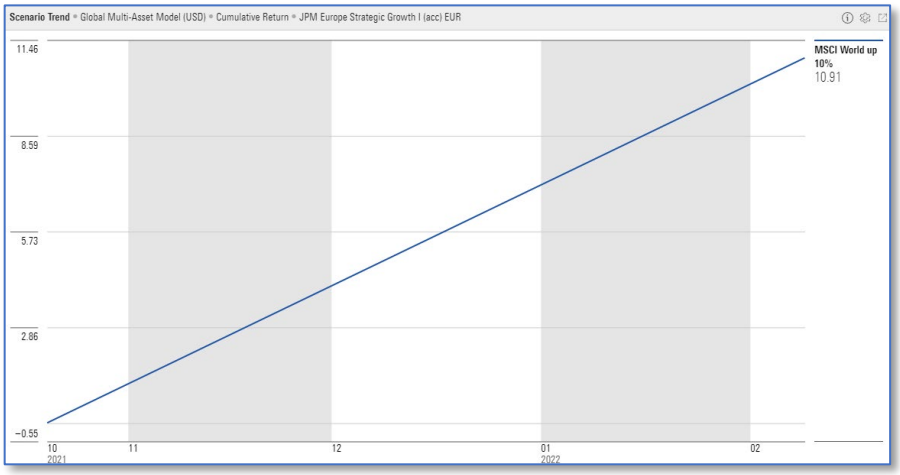
You can now access those custom scenarios via the **Scenario Trend** component. If the component is still open, you will need to close it and regenerate the chart to pick up the new scenarios.

Do the following:

1. Close the Scenario Trend component and return to the Investment List's grid view.
2. With the JPM investment selected, go to **Action > Risk Model > Scenario Trend**.
3. Click the **Gear** icon to the right of the window to access the Settings.
4. Click **Scenarios** and select **Macro-Financial Scenarios**.
5. Scroll down to the bottom of the list and select the **WTI Oil Price and Eurozone CPI** scenario.
6. Click **Done**.
7. Click the side of the component to exit the Settings panel to view the impact on this investment during this Macro-Financial scenario.



8. Click **Scenarios** and select **Market-Driven Scenarios**.
9. Scroll down to the bottom of the list and select the **MSCI World up 10%** scenario.
10. Click **Done**.
11. Click the side of the component to exit the Settings panel to view the impact on this investment during this Market-Driven scenario.



Appendix B: Risk Model Components – Definitions & Methodologies

Factor Profile Morningstar Factor Profile Methodology

The Morningstar Factor Profile shows an equity portfolio's exposure to seven standard investment factors that are broadly accepted in the investment industry as being important drivers of risk and return. At a glance, investors can use this new visual – and the underlying data – to better understand their holdings, diversify portfolios, manage expectations, and anticipate outcomes.

Style – The style factor describes the aggregate expectations of market participants for the future growth and required rate of return for a stock, based on the same measures used for the Morningstar Style Box. A higher exposure to the style factor indicates higher growth.

Yield – The yield factor describes the dividend and buyback yield of a company, based on the trailing 12 months. A higher exposure to the yield factor indicates higher yield for investors.

Momentum – The momentum factor describes how much a stock has risen in price over the past year relative to other stocks, calculated by subtracting the trailing 1-month return from the trailing 12-month return. A higher exposure to the momentum factor indicates the company has performed well recently.

Quality – The quality factor describes the profitability and financial leverage of a company, based on an equally weighted mix of trailing 12-month return on equity and debt-to-capital ratios. A higher exposure to the quality factor indicates a higher quality of the firm.

Volatility – The volatility factor describes the maximum observed spread in long-term returns, based on the trailing 12-month standard deviation of daily returns. A higher exposure to the volatility factor indicates larger variation in long-run outcomes.

Liquidity – The liquidity factor describes the trading frequency of a company, based on trailing 30-day share turnover. A higher exposure to the liquidity factor indicates higher share turnover.

Size – The size factor describes the market capitalization of a company, based on the same measure used for the Morningstar Style Box. A higher exposure to the size factor indicates smaller market capitalization (though we plot large-cap exposure at the top of the size capsule to simplify the Factor Profile visual and keep all "high" or "large" indicators aligned at the top).

Historical Risk Exposure

The Historical Risk Exposure component helps you evaluate the risk embedded in an asset or portfolio of assets through time, by visualizing exposures to factors captured by Morningstar's risk model. The component depicts one factor at a time (via the blue bar), along with how this exposure compares to a benchmark (the black line), as well as the premia that factor currently commands in the market (the red line).

Use this component to identify strategy changes related to a specific factor. Has a manager had consistent exposure to a factor over time? Did a manager increase or decrease exposure to a factor in light of a shift in the risk premium associated with it?

Holdings Risk Factor

The Holdings Risk Factor component displays a table of risk factor data points for the holdings of a portfolio. Use this component to discover and evaluate the underlying company-level risk factors in your portfolio, and which holdings are responsible for the overall exposures of the portfolio.

Multiple Risk Exposures

In the Multiple Risk Exposures component, you can view the risk factors a portfolio has been exposed to over time. This component can be used to identify strategy changes, consistency of process, and to isolate a manager's strategy.
You can use the Component Settings icon to turn factors off, or switch to a different group of factors. Move the cursor over a line to see its value at a point in time.

Multiple Risk Premiums

This component visualises the return premia of each risk factor to show you what's in favour or out of favour within the broader capital markets over time. This view is agnostic of any investment and is designed to show you a market level view.

Risk Decomposition (add-on) Risk Decomposition Methodology

Morningstar's Risk Decomposition component decomposes estimated portfolio risk into its individual factor components, allowing users to view the sources of total and active risk within each portfolio. With this tool, users can dissect estimated portfolio risk along the dimension of the factors in Morningstar's Global Risk Model, developing an understanding of each factor's marginal and total risk contribution.

Risk Exposure Snapshot Morningstar Risk Model Methodology

Track an investment's underlying factor exposure at a single point in time or through twenty years of history to get a picture of the potential sources of risk.
A factor is an observable condition (such as value/growth or market sector) appearing to influence asset returns. A factor exposure is a numeric measure of how much a particular asset tends to be affected by a factor. Exposures can be positive, negative, or zero, and can change over time.
Use the Risk Exposure Snapshot component to identify strategy changes related to multiple factors and the associated risk premiums (the returns attributed to the specific factor).

Risk Factor Attribution (add-on) Morningstar Risk Model Performance Attribution Methodology

Identify the sources of return in your investment or portfolio as a result of your risk factor exposure. What was the true source of active returns for a fund for a given period? Was it the stock selections a manager made, or the fund's exposure to particular factors? This component attempts to discern that answer.

Risk Premium Returns

The Risk Premium Returns component presents factor trailing and calendar year returns at the market level in both a table view (default) and bar graph view. Use it as a complimentary component to the Multiple Risk Premiums component to see the factor returns during more specific time periods. This view is agnostic of any investment and is designed to show you a market level view.

Scenario Metrics Morningstar Risk Model Historical Scenario Analysis Methodology

The Scenario Metrics component is used to answer the question, "What would happen to a fund or portfolio if markets were impacted by some well-known predefined historical event?" To answer this question, the historical returns for stocks are analysed as if the event were happening today.
By default, the Scenario Metrics component shows a chart which includes the Alpha, Max Drawdown, Return, Standard Deviation and Tracking Error for the entire time period of the predefined scenario of a selected fund for four scenarios. You can select any of the pre-defined scenarios that Morningstar has created, as well as surface custom scenarios if you have access to that capability.

Scenario Trend

See your investment's forecasted cumulative return if significant market and macroeconomic events occurred again today, like the 2003 Bond Selloff, 2020 Novel Coronavirus Outbreak, or 2014-2015 Oil Price Drop. You can select any of the pre-defined scenarios that Morningstar has created, as well as surface custom scenarios if you have access to that capability.

Macro-Financial Scenario Analysis Methodology
Macro-Financial Scenario Analysis for Manager Selection
Market-Driven Scenario Analysis Methodology
Market-Driven Scenario Analysis for Investment Research