

# Morningstar<sup>SM</sup> Global Risk Model Methodology

Morningstar announces the release of the first features in the Morningstar<sup>SM</sup> Global Risk Model.

## Overview

In this guide, you will learn how to:

- ▶ define the Global Risk Model
- ▶ identify the characteristics of the Global Risk Model
- ▶ identify the risk factors used in the Global Risk Model, and
- ▶ where to find more information.



The Global Risk Model is the latest enhancement to Morningstar Direct Cloud

## Defining the Morningstar Global Risk Model and Its Characteristics

In this section, you will learn:

- ▶ what the Morningstar Global Risk Model is
- ▶ the common terms associated with the Global Risk Model
- ▶ the categories of data in the Global Risk Model
- ▶ the number of securities covered by the Global Risk Model, and
- ▶ the historic availability of factor exposures and premia.

### Overview

The Morningstar Global Risk Model helps you comprehensively analyze investment risk and answer such questions as: “Is my mutual fund over-exposed to a certain stock sector?” “Do I hold too much in small-cap stocks right now?” etc. The model estimates the probability of future portfolio price movements — portfolios that have more exposure to large future price movements are riskier — and describes what features of the portfolio might lead to these big price movements.

You can measure the risk in portfolios and securities, as well as discover the sources of that risk. The Global Risk Model tracks the underlying economic exposure to 36 factors, so you can quickly see how a variety of market conditions could affect your investments.

The factor exposures also identify underlying revenue drivers to find an investment’s true sources of returns. These exposures include factors derived from the proven, forward-looking analysis of Morningstar’s Research team. The Morningstar Global Risk Model goes beyond standard risk models to project a mutual fund portfolio’s vulnerability to extreme market events.

### What is the Morningstar Global Risk Model?

The following terms are used in describing the Global Risk Model, and are essential to your understanding of how the Global Risk Model works:

**What are some common terms associated with the Global Risk Model?**

<b>Term</b>	<b>Definition</b>
Asset return	the return of an investible security over a time period
Factor	an observable data point, such as liquidity or stock sector, that appears to influence asset returns
Factor exposure	<ul style="list-style-type: none"> <li>▶ estimated using a 7,000-stock universe as the benchmark</li> <li>▶ a measurement of how much an asset’s return is influenced by a factor</li> <li>▶ can be positive, negative, or zero, and</li> <li>▶ changes through time.</li> </ul>
Factor premia	the average returns for one unit of extra exposure to a single risk factor after all other risk factors have been accounted for

Let’s say you want to add an energy stock to your mutual fund, but you are concerned because you don’t know the proper weighting. By investing in the energy stock, you will rebalance your mutual fund and change its risk exposures. The Global Risk Model can help you see how this exposure may influence your portfolio’s returns.

By adding an energy stock, you are adding that stock’s exposure to your mutual fund. For example, an energy stock may be 75% exposed to movements in the energy sector, and 25% exposed to movements in the financial sector. Therefore, adding an energy stock does not necessarily mean adding only energy exposure to the mutual fund.

For each factor exposure, there are associated return premia. Each additional dollar invested in a given factor affects the returns.

When forecasting a portfolio’s return distribution (i.e., expected return and variance), a forecast takes into account the portfolio’s exposures, the associated market premia for each factor exposure, and how the different factor premia interact with each other.

A stock’s expected return is the sum of the factor premia, weighted by the portfolio’s exposure to that factor. The exposures change over time. For instance, Value/Growth is a factor, because of the tendency for all the value stocks to move in synchrony and in the opposite direction of growth stocks. But suppose a value stock is revalued by the market to become a growth stock; it will stop moving with the value stocks and start moving with the growth stocks. The Global Risk Model represents this by changing the stock’s exposure to the Value/Growth factor, and moving the stock’s exposure from value to growth.

Morningstar has identified three main categories of data points related to the Global Risk Model:

- ▶ Global Risk Model Factor
- ▶ Global Risk Model Premia, and
- ▶ Global Risk Model Forecasted Statistics.

They are described in the following table.

Global Risk Model Factor	Global Risk Model Premia	Global Risk Model Forecasted Statistics
<p>Factor exposures are the fundamental building blocks of the Global Risk Model. Factors are subdivided into Style, Region, Sector, and Currency.</p>	<p>Factor premia are the returns per unit of factor exposure. This is one of the core outputs of the Global Risk Model. For example, the greater the exposure to a risk factor, the greater the impact on returns (either positive or negative).</p>	<p>Factor premia and factor exposures can be combined to form expectations about what the future will hold for each security.</p>

**What are the Global Risk Model categories of data?**

The dimensions of coverage are as follows:

- ▶ Equity Portfolio factor exposures: 30,000 unique portfolios, and
- ▶ Forecast: 10,000 portfolios.

While we are providing factor exposures for 30,000 portfolios, we are providing forecasts for only 10,000 portfolios. We do not have sufficient coverage of the portfolio holdings of the other 20,000 portfolios to justify a forecast.

Morningstar calculates risk exposures for all equity portfolios, but forecasts are calculated only if we can generate risk forecasts for at least 80% of the portfolio.

*Note:* Money market funds and funds of funds are excluded, but ETFs and any equity separately managed accounts with holdings information are included.

**How many securities are covered under the Risk Model?**

Forecasts are made for the following discrete windows:

- ▶ one day (the next market day)
- ▶ one week
- ▶ one month
- ▶ three months
- ▶ six months, and
- ▶ twelve months.

**What is the timing of the forecasts?**

## Identifying and Understanding the Factors Used in the Global Risk Model

It is common knowledge that investment involves risk. How can you minimize risk and keep your investments safe? The simple answer is to stay away from risky investments. But how do you know what investments are risky?

### Overview

In the Global Risk Model, Morningstar has identified 36 risk factors, as well as the ways each can affect the performance of stocks and portfolios.

In this section, you will learn the following:

- ▶ what factors are considered in risk modeling
- ▶ what the style risk factors are
- ▶ what the sector risk factors are
- ▶ what the region risk factors are
- ▶ what the currency risk factors are, and
- ▶ what the resulting values represent.

Morningstar identifies 36 risk factors, which are divided into four groups:

- ▶ style
- ▶ sector
- ▶ region, and
- ▶ currency.

### What factors are considered in risk modeling?

The exposures to the factors are transformed so that they have a roughly normal distribution with a mean of 0 and a standard deviation of 1.

All factors are updated on a daily basis.

In lists and screeners, the risk factors are presented as data points.

Name	Risk Factors - Portfolio: Valuation (mo-end)	Risk Factors - Portfolio: Economic Moat (mo-end)	Risk Factors - Portfolio: Val Uncertainty (mo-end)
1 Fidelity® Large Cap Core Enhanced Index	0.17	1.08	-0.91
2 Oakmark Select I	0.45	0.49	-0.50
3 Vanguard Structured Large-Cap Eq I	0.07	0.85	-0.92

These data points are available either from pre-built views or custom view that you create

Style is Morningstar's umbrella title for the 11 most basic attributes of an investment or portfolio. Style can be an important factor in identifying which stocks or portfolios will appeal to a particular type of investor. For instance, if a portfolio includes a large number of stocks with a wide economic moat and strong financial health, these are contributors to its style. Such a portfolio might be attractive to an investor whose primary concern is safety.

### What are the style risk factors (data points)?

The style data points are described in the following table:

Factor Name	Definition	Interpretation
Valuation	Ratio of quantitative fair value estimate to most recent closing price.  Represents how cheap or expensive a stock is, relative to its fair value estimate.	The Valuation factor is unbounded, which means no upper or lower limit exists for it. A higher score indicates cheaper stocks. A score of zero indicates an average valuation (in other words, equal to the stock universe average valuation).  Higher scores indicate Morningstar's belief that the company is undervalued, and has an increased likelihood of generating positive returns.
Economic Moat	Assesses the strength of a firm's competitive advantages by evaluating the sustainability of its profits.	Higher scores indicate a wider moat and Morningstar's belief that a firm will be able to keep competitors at bay for an extended period.
Val Uncertainty	The level of a Morningstar analyst's uncertainty around the fair value estimate for a company.	The Valuation Uncertainty factor is unbounded, which means no upper or lower limit exists for it. Higher scores imply greater uncertainty around a company's stock price, so a greater range of outcomes is expected.  A score of zero indicates an average level of uncertainty.
Fin Health	A market-driven score indicating the financial health of a company. The score uses market-level information (such as prices and volatility) as opposed to fundamental information (such as dividends). Assesses the strength of a firm's financial position and ranks companies on the likelihood that they will tumble into financial distress.	Higher scores imply stronger financial health and a lower risk of bankruptcy.  The scores are relative to the entire stock universe.

Factor Name	Definition	Interpretation
Ownership Risk	Measure of the ownership preference from managers with different levels of risk.	Higher scores indicate higher preference for risk among stock holders and fund managers who are comfortable with high levels of Morningstar Risk.
Ownership Popularity	Represents the growth in popularity over the past three months from the perspective of fund manager ownership,  <p>☞ Note: The time period of this risk factor looks back three months. Forecasting looks forward.</p>	Higher scores indicate that more funds have taken a long position on certain popular stocks, relative to those that have shorted the stock in the past three months (a fixed time period).
Value-Growth	Measure of the value or growth bias of stock, according to the market. We use Earnings Yield, Dividend Yield, and Book Yield to form expectations about what market prices should be. The difference between reality and our expectation is the value-growth bias.	The Value-Growth factor is unbounded, and higher scores indicated higher growth expectations and less value exposure.
Size	Measure of the market capitalization of stocks in a fund's portfolio, relative to other portfolios in its Morningstar Category.	Higher scores indicate greater investment in small market capitalization.
Liquidity	Measure of the share turnover over the past month.  <p>☞ Note: The time period of this risk factor looks back one month. Forecasting looks forward.</p>	<p>The Liquidity factor is unbounded, which means no upper or lower limit exists for it. Higher scores indicate higher more turnover. A score of zero indicates an average level of liquidity.</p> <p>The expected return for holding less-liquid stocks are higher because an investor who buys an illiquid stock is taking on more risk than one who buys a liquid stock, due to an illiquid stock being harder to sell. Therefore, the investor who buys an illiquid stock should be compensated for that risk through selling at a higher price, which corresponds to higher returns.</p>


Factor Name	Definition	Interpretation
Momentum	<p>Represents how much a stock has risen in price over the past year, relative to the entire stock universe covered by the Global Risk Model. Portfolio-level momentum is a weighted average of the underlying holdings.</p> <p>☞ Note: The time period of this risk factor looks back one month. Forecasting looks forward.</p>	Higher scores reflect higher returns over the past year, as well as a propensity for higher returns in the future.
Volatility	Measure of the widest range of returns over the past year.	Higher scores indicate a wider range of historical returns.



Sector risk factors measure the partial economic exposure of a company or portfolio to the 11 Morningstar stock sectors. Relying on sector classification to assess sector risk can be limiting, because sector classification is a binary yes or no. That is, a stock can belong to only one stock sector. As a consequence, sector risk may be under- or overstated for large conglomerates that operate multiple business lines across traditional sector lines.

### What are the sector risk factors (data points)?

Sector exposures are calculated based on a time-series regression of excess stock returns to a set of sector benchmarks. Sector benchmark returns, in turn, are calculated using a market-cap weighting scheme, using stocks from Morningstar's estimation universe.

 Note: The Morningstar estimation universe is a subset of the entire stock universe that consists of stocks that are large and liquid. To ensure global coverage, regional and sector filters are employed.

In a given stock sector, the risk factor is a measure of a company's responsiveness to stock market movements in that sector. A higher score indicates a higher responsiveness.

The sector data points are as follows:

- ▶ Fin Services
- ▶ Energy
- ▶ Real Estate
- ▶ Basic Materials
- ▶ Consumer Defensive
- ▶ Technology
- ▶ Telecommunications
- ▶ Industrials
- ▶ Consumer Cyclical
- ▶ Utilities
- ▶ Healthcare

Morningstar's region risk factors measure the partial economic exposure of a company or portfolio to seven geographic regions.

### What are the region risk factors (data points)?

Regional exposures are calculated based on a time-series regression of excess stock returns to a set of region benchmarks. Region benchmark returns, in turn, are calculated using a market-cap weighting scheme using stocks from the Morningstar's estimation universe.

- ☞ Note: The Morningstar estimation universe is a subset of the entire stock universe that consists of stocks that are large and liquid. To ensure global coverage, regional and sector filters are employed.

Stocks are assigned to regions on the basis of company-level Country ID. Regressions are five years in length and are run on a rolling, weekly basis. If a stock does not have five years of history, the time-series regression is run back to the inception date.

In a given region, the risk factor is a measure of a company's responsiveness to stock market movements in that region. A higher score indicates a higher responsiveness.

The region data points are as follows:

- ▶ Developed Americas
- ▶ Developed Europe
- ▶ Developed Asia Pacific
- ▶ Emerging Americas
- ▶ Emerging Europe
- ▶ Emerging Asia Pacific, and
- ▶ Emerging Middle East.

To see the list of the countries in each region, see page 38 of the [Morningstar Style Box Methodology](#).

In an increasingly globalized marketplace, firms frequently operate across multiple countries and regions. Morningstar's currency risk factors measure the partial economic exposure of a company or portfolio to one of seven exchange rates (measured against the US dollar).

### **What are the currency risk factors (data points)?**

Currency exposures are calculated based on a time-series quantile regression of excess stock returns to a set of exchange rates. Regressions are five years in length and are run on a rolling, weekly basis. If a stock does not have five years of history, the time-series regression is run back to the inception date.

For a given currency, the risk factor is a measure of a company's responsiveness to exchange rate movements. A higher score indicates a higher responsiveness.

 Note: Each currency risk factor is related to the exchange rate with the USD.

The currency data points are as follows:

- ▶ Euro
- ▶ Japanese Yen
- ▶ British Pound
- ▶ Canadian Dollar
- ▶ Swiss Franc
- ▶ Australian Dollar
- ▶ New Zealand Dollar

Each risk model factor is associated with a premia, which is represented as a data point. Premia are the average returns for one unit of extra exposure to a single risk factor after all other risk factors have been accounted for.

### What are the data points for premia?

That is, if the exposure for a fund to the Valuation factor is 1.22013, and the one-month premium for Valuation is 0.1, then the forecasted returns for the fund based on the Valuation factor alone would see it increase by 0.12201.

Premia are estimated using a 7,000-stock universe as the benchmark and can be positive or negative. A positive number indicates that taking on additional positive exposure would mostly likely result in higher returns. A negative number indicates that taking on additional positive exposure would most likely result in lower returns.

The premia data points are described in the following table:

Style Factor Premia	Region Factor Premia	Sector Factor Premia	Currency Factor Premia
Quant Valuation Premia	Developed Asia Pacific Premia	Basic Materials Premia	Euro Premia
Quant Moat Premia	Developed Europe Premia	Communication Services Premia	Japanese Yen Premia
Quant Uncertainty Premia	Developed North America Premia	Consumer Cyclical Premia	British Pound Premia
Quant Financial Health Premia	Emerging Asia Pacific Premia	Consumer Defensive Premia	Swiss Franc Premia
Momentum Premia	Emerging Europe Premia	Healthcare Premia	Canadian Dollar Premia
Liquidity Premia	Emerging Latin America Premia	Industrials Premia	Australian Dollar Premia
Volatility Premia	Emerging Middle East & Africa Premia	Real Estate Premia	New Zealand Dollar Premia
Size Premia		Technology Premia	
Value/Growth Premia		Energy Premia	
Ownership Risk Premia		Financial Services Premia	
Ownership Popularity Growth Premia		Utilities Premia	

The portfolio forecasting data points are as follows:

Data Point Name	Time Periods Available	Definition
Variance	One year, six months, three months, one month, one week, one day	Expected volatility of a stock or fund
Skewness		Expected skewness
Kurtosis		Expected kurtosis
CVAR		Expected Conditional Value-at-Risk
Value at Risk		Expected VaR
Prob. of Negative Rtn		Expected probability of negative return

**What are the data points for portfolio forecasting?**

To access the Global Risk Model data points, read the companion document to this guide, [Getting Started with the Morningstar Global Risk Model](#).

**How do I access the Global Risk Model data points?**

To learn more about the Morningstar Global Risk Model, read the following documents:

- ▶ [Fact Sheet: Morningstar Global Risk Model](#)
- ▶ [Methodology: Morningstar Global Risk Model](#), and
- ▶ [Methodology: Morningstar Global Risk Model Factor Exposures](#).

**Where can I get more information on the Global Risk Model?**