
Factor Profile Performance Analyzer Notebook

Guide to using the Factor Awareness Dashboard.

Morningstar Quantitative Research

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Executive Summary

Factor investing is an evolving concept within the investment management space, with a focus on understanding portfolio performance through the lens of factors as opposed to asset classes. In this sense, factors are proven investment patterns observed on securities over long periods that have translated to a differentiated source of returns for investors. Factor investing has led to the evolution of risk models such as the Morningstar Risk Model. The Morningstar Factor Profile Performance Analyzer builds upon the output of the Morningstar Risk Model and uses seven popular industry-standard style factors—size, style (or value-growth), quality, yield, liquidity, volatility, and momentum—as reliable descriptors of the underlying drivers of market performance.

There are various use cases for equities pertaining to factor profile, and accordingly, the Factor Profile Performance Analyzer notebook is now available in Direct. The notebook is focused on equity level analysis only. For fund level analysis, Risk Model modules provide a better analysis ecosystem. Some benefits that investors can derive by using the new notebook are:

1. **Evaluation Over Diverse Estimation Universe:** Factor performance can be evaluated globally and in seven local markets through the use of Morningstar regional indexes as a base. As factor performance varies across markets, using regional indexes allows for consistent and more-precise risk analytics that are localized to certain markets, enabling superior performance and decision-making. Alongside, we allow varied weighting schemes for the evaluation of factors—namely, equi-weighted, market-cap-weighted, and value-weighted schemes.
2. **Examine Performance Trends Across Factors:** Managers can view the performance of seven style factors & 11 Morningstar sectors over varying periods from 2010 till the latest month. Factor performance varies across markets, and analyzing factor shifts is particularly useful during periods such as the COVID-19 pandemic of 2020 and inflation in 2022.
3. **Examine Performance Trends for Individual Factors:** We have added intuitive charts and detailed metrics on factors that help us evaluate performance through rigorous backtests over the entire history of our risk model. Portfolio reports can be exported to an Excel spreadsheet that can then be shared with other stakeholders.

4. **Factor Rankings:** The notebook allows for stock screening based on seven style factors over diverse universes. Users can view factor scores not only for securities within their interest list based on sectors but also export the factor rankings for further evaluation.

This document serves as a user guide for the Factor Profile Performance Analyzer notebook. In the following sections, we briefly review each of the notebook modules.

Evaluation Over Estimation Universe

The first inputs taken by the Factor Awareness Dashboard notebook are the universe and the weighting method. Using these inputs, we create long-short and top-quintile portfolios that represent factor performance. Widely available literature shows that factors have varied performance across markets, and investors would benefit from localized views of factor performance to make sound investment decisions.

As of now, the notebook supports eight custom universes enabled through Morningstar Indexes. These indexes are US Market Index, UK Index, Japan Index, Canada Index, Australia Index, China Index, India Index, and the Global Markets Index. The scope of the Factor Awareness Dashboard can be widened to include funds and other securities but currently serves analysis on only stocks. By selecting one of the indexes in the Universe Selection dropdown, the user delineates the universe or list of stocks on which the forthcoming analysis will be performed.

After the list is decided, the user would need to decide on a weighting method to evaluate factor performance. Currently, the notebook supports three weighting methods for portfolio creation — equi-weighting, market-cap-weighting, and value-weighting. Equi-weighted portfolio weights are decided by taking a simple average of the comprising securities. Market-cap weights are calculated by taking a weighted average according to market capitalization of companies to which the securities pertain, and value-weights are created similarly, using the Morningstar value-growth factor. Each of these weighting techniques is specific to investors and has various pros and cons. For example, market-cap weighting is the most popular technique but leads investors to take more long positions as the market rises and short positions when the market falls. The equi-weighted method removes the emphasis on market cap but can lead to high turnover, driven by the constant buying and selling to keep the weighting equal. The value-weighted method is new and driven by need for the use of fundamental factors.

After these selections, the notebook proceeds to gather data on the performance of long-short and top-quintile portfolios of all risk model industry standard style factors and sectors, created based on selected characteristics. These selection capabilities are described in the exhibits below.

Exhibit 1: Annualized Performance Summary Comparison of Themes and Global Equities

Select Fund Universe

US - Morningstar US Market Index

UK - Morningstar UK Index ✓

Japan - Morningstar Japan Index

Canada - Morningstar Canada Index

Australia - Morningstar Australia Index

China - Morningstar China Index

India - Morningstar India Index

Select Type of Portfolio:

○ Long-Only

●

 Long-Short

Select Weighting Method ⓘ

Equal-Weighted

Market Cap-Weighted ✓

Value Factor-Weighted

Examine Performance Trends Across Factors

Factor Returns

Once the universes are selected, the factor and sector returns visualization demonstrates the returns of the factor profile standard style factors and Morningstar sector classifications in the form of interactive charts over various time periods. In this sense, the factor portfolios would be pure factor portfolios. The performance of factors varies across various markets. As an example, Exhibits 2A and 2B demonstrate the performance of the momentum factor in the United Kingdom versus the Japan market. The momentum factor works well in the U.K. market but underperforms in the Japan market.

Exhibit 2A: Factor Returns in the U.K. Market

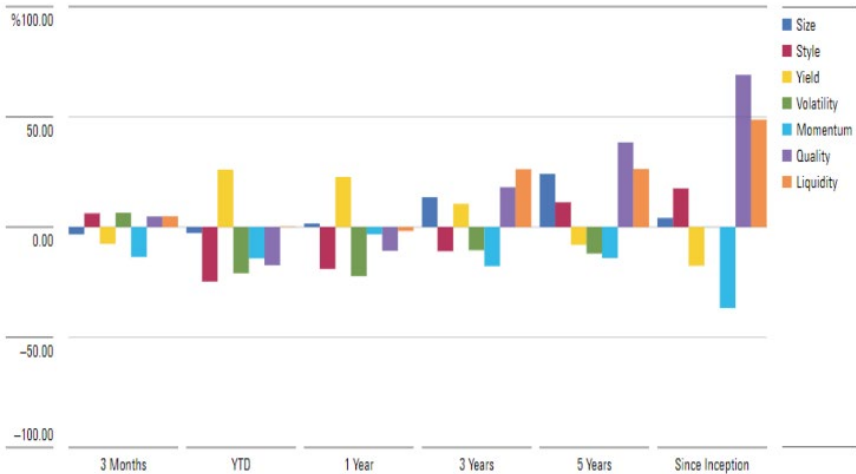
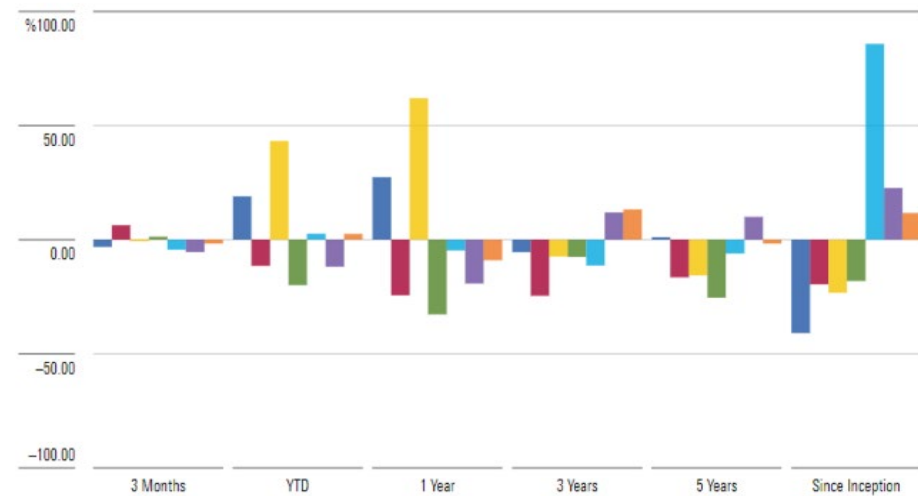
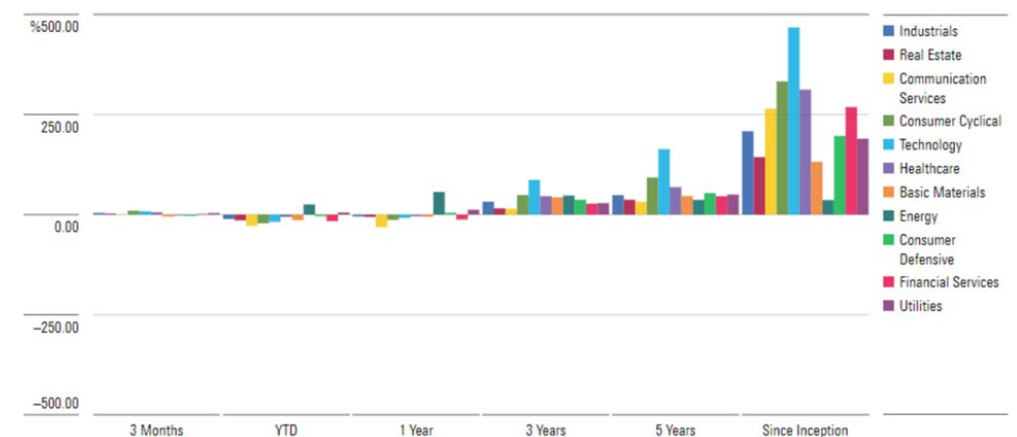


Exhibit 2B: Factor Returns in the Japan Market

Sector Returns

Similarly, the notebook will also display the returns of portfolios pertaining to various sectors according to the Morningstar sector classifications over the given period. Exhibit 3 describes this for U.S. markets. The technology sector has demonstrated exceptional returns since inception (2012). The rise of interest rates and inflation in 2022 triggered a collapse of technology sector stocks; hence, the energy sector has been outperforming for the past year.

Exhibit 3: Sector Returns in the U.S. Market

Historical Yearly Factor Returns

Exhibit 4 describes the performance of seven style factors for past 10 years. We can view the long-only as well as the long-short returns for the selected universe (U.S. markets in Exhibit 4). This helps us better understand the periods when various factors performed well. As an example, the liquidity factor

performed exceptionally well in 2020, driven by the quantitative-easing actions of the U.S. Federal Reserve. However, in 2022, quality and yield factors are experiencing better returns than other factors. We have capability to download the visuals for separate analysis here.

Exhibit 4: Historical Yearly Factor Returns in the U.S. Market

Export to Excel

Factors	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Size	-3.05	5.35	7.22	-18.88	6.16	9.43	5.75	-9.35	4.50	-0.41
Style	2.09	1.34	20.89	-20.45	15.10	11.93	11.58	52.70	-11.62	-22.27
Yield	-10.80	3.84	-16.11	9.06	-5.35	-10.22	9.82	-39.64	21.00	7.44
Volatility	3.98	0.45	-8.72	3.50	-4.11	-17.65	4.12	61.43	-22.06	-21.58
Momentum	1.86	6.15	23.68	-18.06	11.95	7.32	-8.19	12.00	-22.77	0.37
Quality	-8.68	3.19	2.46	-12.58	7.53	10.10	6.06	17.09	11.18	6.84
Liquidity	-4.07	-4.33	-12.69	8.73	-1.78	-11.92	1.02	48.75	-10.04	-14.42

Factor Exposure Correlation

Factors may often demonstrate correlation during varied periods. This may be indicative of crowding effect; hence, investors may need to take appropriate actions. The notebook is capable of evaluating factor correlations (Spearman's rank correlation) across various time periods. As per Exhibit 5, the factors seem to be mostly uncorrelated except size, factor, and volatility, whereby one could say that small-cap stocks also have high volatility.

Exhibit 5: Factor Exposure Correlation

Please select a time period for analysis:
3 Years

Export to Excel

Factors	Size	Style	Yield	Volatility	Momentum	Quality	Liquidity
Size	1.00	-0.22	-0.16	0.53	-0.31	-0.31	0.08
Style	-0.22	1.00	-0.39	-0.07	0.28	0.18	0.01
Yield	-0.16	-0.39	1.00	-0.25	-0.11	0.07	-0.00
Volatility	0.53	-0.07	-0.25	1.00	-0.32	-0.40	0.32
Momentum	-0.31	0.28	-0.11	-0.32	1.00	0.20	-0.06
Quality	-0.31	0.18	0.07	-0.40	0.20	1.00	-0.14
Liquidity	0.08	0.01	-0.00	0.32	-0.06	-0.14	1.00

Examine Performance Trends for Individual Factors

Factor Metrics

Exhibit 6 describes the performance metrics such as compound annual growth rate, or CAGR, maximum drawdown, monthly Sharpe, annualized monthly mean, annualized monthly volatility, yearly mean, and so on, for factor portfolios. The results are arrived at using a monthly rebalance and backtest to create the factor return series.

Exhibit 6: Factor Metrics

Export to Excel			
Stat	Top 20%	Long-Short	Benchmark
CAGR	13.27%	0.17%	13.43%
Max Drawdown	-33.09%	-38.62%	-34.81%
Monthly Sharpe	0.97	0.07	0.96
Monthly Mean (Annualized)	13.38%	0.82%	13.58%
Monthly Volatility (Annualized)	13.75%	11.48%	14.17%
Yearly Mean	14.11%	0.65%	14.01%
Yearly Volatility	16.11%	8.79%	15.61%

Factor Returns

The section provides factor returns for various periods (ranging from one month to 10 years and from inception). Exhibit 7 displays the top-quintile portfolio, the long-short portfolio, and the selected universe.

Exhibit 7: Factor Returns

Export to Excel			
Time Period	Top 20%	Long-Short	Benchmark
1 Month	2.19%	0.50%	0.69%
3 Months	-3.47%	-2.31%	-3.31%
6 Months	-7.59%	-3.02%	-6.84%
Year-to-Date	-14.09%	-0.64%	-13.30%
1 Year	-6.71%	2.64%	-6.94%
3 Years (Annualized)	15.01%	-1.99%	14.58%
5 Years (Annualized)	12.06%	1.61%	12.33%
10 Years (Annualized)	13.14%	-0.27%	13.45%
Inception (Annualized)	13.27%	0.17%	13.43%

Factor Drawdown

Lastly, this section displays a factor drawdown chart for a long-only factor portfolio. A drawdown is a peak-to-trough decline during a specific period for the factor return series. A drawdown is usually quoted as the percentage between the peak and the subsequent trough. If a factor has \$100 invested in it and the factor returns drop to \$90 before moving back above \$100, then the factor is inferred to have a 10% drawdown. Drawdowns are important for measuring the historical risk of different investments,

comparing fund performance, or monitoring personal trading performance. Exhibit 8 demonstrates the drawdown for the size factor. During early periods of the pandemic, small-capitalization equities have seen massive falls in market prices. Similarly, quantitative tightening caused the same set of equities to demonstrate huge corrections in early 2022.

Exhibit 8: Factor Drawdown



Factor Rankings

Here, the user can view and export rankings of equities belonging to a specific sector or all sectors of the underlying universe. These rankings are based on the security’s exposures to risk model industry standard factors, and their sector classification is based on Morningstar sector tags. Exhibit 9 allows for more-thorough analysis of specific exposure of equities to various factors.

Exhibit 9: Factor Ranking

Select a Sector

All

Export to Excel

Company Name	Ticker	Sector	Size	Style	Yield	Volatility	Momentum	Quality	Liquidity
W.W. Grainger Inc	GWW	Industrials	5	2	2	4	2	1	4
Nikola Corp	NKLA	Industrials	2	1	5	1	5	5	1
Antero Midstream Corp	AM	Energy	3	3	1	3	2	3	2
General Electric Co	GE	Industrials	5	4	4	4	4	4	4
Super Micro Computer Inc	SMCI	Technology	2	4	4	1	1	2	2
Matthews International Corp	MATW	Industrials	1	5	1	5	3	4	5
Dell Technologies Inc	DELL	Technology	5	5	1	3	2	5	4
PBF Energy Inc	PBF	Energy	3	5	5	1	1	2	1
O'Reilly Automotive Inc	ORLY	Consumer Cyclical	5	2	1	4	1	4	3
Universal Display Corp	OLED	Technology	3	1	3	2	5	1	3

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The user can also generate baskets of 10 securities that are exposed the most and the least to a chosen factor within the selected universe. These baskets can also be filtered for sectors.

Exhibit 9A: Basket of Top 10 Size-Factor-Exposed Stocks in the U.S. Universe

Basket of Top Ten Size Stocks

[Export to Excel](#)

Company Name	Ticker	Sector
EXCO Resources Inc	EXCE	Energy
ITT Educational Services Inc	ESINQ	Consumer Defensive
HyperDynamics Corp	HDYNQ	Energy
Acorda Therapeutics Inc	ACOR	Healthcare
ION Geophysical Corp	IOGPQ	Energy
Pennsylvania Real Estate Investment Trust	PEI	Real Estate
CytRx Corp	CYTR	Healthcare
Lannett Co Inc	LCI	Healthcare
Eargo Inc	EAR	Healthcare
Zovio Inc	ZVO	Consumer Defensive

Exhibit 9B: Basket of Bottom 10 Size-Factor-Exposed Stocks in the U.S. Universe

Basket of Bottom Ten Size Stocks

[Export to Excel](#)

Company Name	Ticker	Sector
Amazon.com Inc	AMZN	Consumer Cyclical
Alphabet Inc	GOOGL	Communication Services
Microsoft Corp	MSF	Technology
Apple Inc	AAPL	Technology
Tesla Inc	TSLA	Consumer Cyclical
Berkshire Hathaway Inc	BRK.B	Financial Services
UnitedHealth Group Inc	UNH	Healthcare
Johnson & Johnson	JNJ	Healthcare
Facebook Inc	META	Communication Services
Visa Inc	V	Financial Services

FAQs on Factor Profile Performance Analyzer Notebook

► Why was the notebook created?

Factor investing is an investment approach that involves targeting attributes that can be seen as driving forces behind the return of securities. To this end, the Factor Awareness Dashboard will be of interest to investors seeking to better understand portfolio performance through underlying factor exposures, instead of asset classes, as traditionally done. The Factor Awareness Dashboard notebook is built on top of industry standard factors coming from the Morningstar Risk Model and allows us to understand factor performance across multiple universes and time horizons. It presents the user with analysis on factor returns, backtesting metrics, factor baskets, and much more, all at one place.

► Whom is it for, and how can it be used?

This notebook can help an investor, asset manager, or advisor better understand and analyze the drivers behind the performance of their portfolio. The information from this notebook can be used to achieve goals such as the elimination of human bias or the creation of well-diversified portfolios.

Some of the broad usages of this notebook are as follows:

An investor or an asset manager can review the comparative historical performance of factors over multiple time horizons across various markets. This information can be used to make smart allocations to various factors, depending on investment goals or mandates. Further, the notebook also provides baskets of stocks that can be used as a reference for stock selection pertinent to such smart allocations.

An investment advisor may use the information presented in this notebook to make clients aware of the return and risks associated with targeting factors. Among other things, the notebook can be used for performance attribution and stock selection.

Some example use-cases could be as follows:

- A. The investor would like a well-diversified portfolio. The insights in this notebook could help them identify factors that have low correlations among each other. These factors can be used to create a multifactor portfolio that is well-diversified.
- B. An asset manager may have a mandate to create a portfolio tilted toward the quality factor. The notebook can be used to easily look at how the quality factor has performed both in the recent past and in long term, how it correlates with other factors, and which stocks could be picked to ensure a maximum exposure to this factor.

Appendix

Data

Our study relies entirely on Morningstar Risk Model Data. The Risk Model is refreshed on a monthly basis (generally the second week of the month), and accordingly, the dashboard is updated on a monthly basis. The dashboard relies on the Morningstar Global Equity Risk Model USD version of the Risk Model regardless of the universe. The dashboard covers eight universes—U.S., China, India, Australia, Japan, U.K., Canada, and Global. The currency for all returns calculations and charts is USD.

About Morningstar Quantitative Research

Morningstar Quantitative Research is dedicated to developing innovative statistical models and data points, including the Morningstar Quantitative Rating, the Quantitative Equity Ratings, and the Global Risk Model.

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