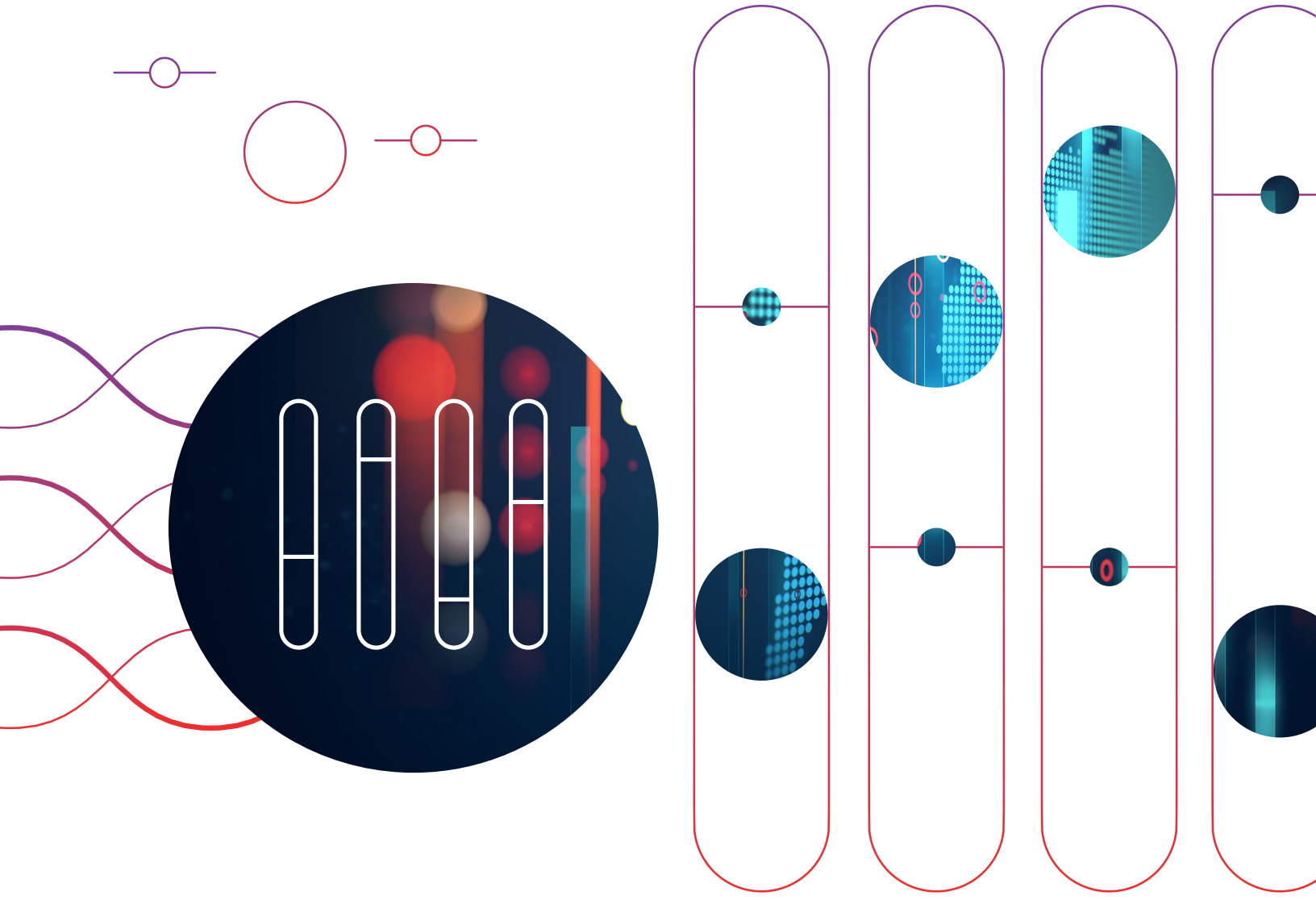
MORNINGSTAR Indexes

Investable factor index strategies



February 2023

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Morningstar Global Factor Indexes balance strong factor exposure with practical considerations

What is an investment factor? Among the metaphors invoked to explain the concept: musical elements, nutrients, and atoms. "Sources of security return" is the prosaic definition. Factors can be observed with common security characteristics that can be used to analyze and forecast investment returns. Within equities, several have been identified that have outperformed the market over long periods. They include value, momentum, quality, small size, yield, and low volatility.[1] These factors have been well-vetted in academic literature. Their persistence is supported by strong economic rationale, related to either risk or investor behavior.

Indexes allow investors to research factors and, through passive investment strategies, access factor premiums in a transparent, efficient, and low-cost manner. Packaging sources of outperformance that active managers have long exploited either knowingly or unknowingly, rules-based factor strategies have gained considerable market traction. Because cyclicality comes with the territory, passive factor investors should be, at least in theory, better prepared to stick it out for the long term than with active managers that have "lost their touch."

However, when compared with traditional market exposure indexes, factor strategies are undoubtedly more complex. They must be analyzed like an active strategy. Not only must the factor and its behavior patterns be understood, but index construction rules must be evaluated. Factor definitions can vary. So too can implementation. Differences in selection rules, weighting schemes, and constraints mean that indexes targeting the same factor can diverge to a far greater extent than beta benchmarks representing the same market segment.

The Morningstar Global Factor Indexes aim to deliver strong exposure to industry-standard factors, with high investment capacity, low transaction costs, and constraints to mitigate unintended sector and regional bets. The indexes follow a consistent design framework and are powered by transparent rules. They can be used for research, benchmarking, and investing.

[1] Low volatility has historically been associated with better risk-adjusted performance than the market, not necessarily higher absolute returns.

Navigating the Factor Zoo

The term "Factor Zoo" was coined by Campbell Harvey and Yan Liu to describe the more than 400 factors published in top journals since the early 1960s.[2] Skepticism is warranted. Many are variations on the same theme, unearthed through deep data mining, and brought to market with the express purpose of capturing assets into a strategic beta product. As the sayings go: "Torture the data until it confesses" and "There's no such thing as a bad back-test."

Recognizing the importance of factors, Morningstar built a risk model to help investors understand their risk exposures and performance through a factor lens. Among the factors included in the standard version of the Morningstar Risk Model are seven well-documented sources of return: style (value), yield, momentum, quality, volatility, liquidity, and size.[3] Why so few? "A small number of independent sources of market movement drive the majority of variation in asset returns," as the methodology document explains, based on findings from the academic literature.

These factors also offer practical benefits; they have been:

1. Independently vetted and peer reviewed by academic researchers who don't have products to sell.
2. Robust to different definitions
3. Efficacious out of sample and persistent across different time periods, asset classes, and regions.
4. Supported by strong economic rationale. The factors may earn compensation for risk or exploit mispricing from behavioral biases or market friction.

What follows is a summary of six of the seven factors with descriptions of the academic rationale for their existence. Liquidity is excluded; although it has been identified as material in theory, it is a difficult factor to capture in practice given that securities with low liquidity can be difficult to trade, making portfolio implementation difficult. Factor definitions will be detailed later in this paper.

Value: Value investing is about buying low and selling high—targeting stocks trading at low multiples of fundamental measures like earnings, book value, cash flow, sales, and dividends. Value investing is backed by strong economic rationale and empirical evidence. Lower valuations should reflect higher expected returns, either as compensation for risk or because investors may be overly pessimistic about these stocks' prospects.[4]

Momentum: Momentum describes short-term performance persistence.[5] Momentum strategies target stocks with strong recent returns, based on the premise they are likely to continue to outperform. There's substance to this strategy. Prices may adjust more slowly than they should to new information, as investors often initially underreact. This alone can cause performance to persist. Once a trend is established, more investors may jump into the trace, further fueling price momentum.

[2] Harvey, Campbell & Yan Liu, "A Census of the Factor Zoo" https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3341728

[3] See: Morningstar Risk Model for more information

[4] For academic work on the value factor see: https://www.jstor.org/stable/2329112

[5] For academic work on momentum see: https://www.jstor.org/stable/2328882 and https://www.jstor.org/stable/2329556

Quality: The shares of companies with strong profitability and balance sheets have performed better historically than less-profitable and more highly indebted counterparts.[6] They tend to be less risky than the market and hold up better during downturns, characteristics that intuitively wouldn't lead to an expectation of higher returns. However, investors may have historically underestimated the long-term durability of these firms' strong cash flows, leading to an impressive long-term track record of risk-adjusted returns.

Small Size: Historically, smaller-cap stocks have tended to outperform their larger counterparts.[7] The small-cap premium is rooted in risk. Smaller, less-proven companies are more volatile than their larger cousins and should compensate investors for the extra risk they bear.

Yield: Higher-yielding stocks have historically offered superior returns than their lower-yielding counterparts.[8] This strategy targets stocks with high shareholder yields, inclusive of dividend yield and buyback yield. Companies with generous cash distribution yields tend to be more stable, profitable, and trade at lower valuations. Their shareholders are more loyal because they are holding the stock for income and total return. And the dividend commitment tends to instill discipline and lead to careful stewardship.

Low Volatility: Stocks with low past volatility have tended to offer better risk-adjusted performance than those with high volatility.[9] Unlike many of the other factors, there isn't a clear risk-based explanation for this effect. The anomaly is typically explained through investor behaviour, given leverage and tracking error constraints. Professional investors overly focused on returns and unable to leverage their portfolios can crowd into volatile stocks, which have greater upside potential than their more staid counterparts. So can retail investors looking for lotterylike upside. As a result, not only are low-volatility stocks more resilient during "risk-off" market environments, but they may also be priced to offer a more favorable risk/reward trade-off over the long term.

> "No pain, no premium."

While there is strong empirical and theoretical support for these factors, they won't always outperform. Cyclicality is a feature not a bug of factor investing. Adherents to the value, size, and yield factors suffered years of underperformance, in the late 1990s, and then for an even longer period following the 2007-09 global financial crisis; a market epoch initially nicknamed for large-cap growth leaders Facebook, Apple, Amazon.com, Netflix, and Google, or FAANG. Quality is notorious for lagging during market rallies though earning its keep in downturns. Momentum has been criticized for working on paper, but breaking down in practice due to frictions like trading costs and taxes, not to mention sharp reversals after market inflection points.

Of course, if factors outperformed consistently and predictably, they would be arbitraged away and lose efficacy. Investors would do well to bear in mind a tagline coined by Corey Hoffstein of Newfound Research: "No pain, no premium."

[6] For academic work on quality see: http://rnm.simon.rochester.edu/research/OSoV.pdf and http://www.econ.yale.edu/~shiller/behfin/2013_04-10/asness-frazzini-pedersen.pdf

[7] For academic work on the small-cap premiums see: https://www.ivey.uwo.ca/media/3775518/the_cross-section_of_expected_stock_returns.pdf

[8] For academic work on yield see: https://www.jstor.org/stable/2327346

[9] For academic work on low volatility see: http://rnm.simon.rochester.edu/research/UDE.pdf https://pages.stern.nyu.edu/~lpederse/papers/BettingAgainstBeta.pdf

Indexing factors effectively

Indexes are well suited for capturing factor exposures. Unlike an active manager targeting value stocks, small caps, or dividend-payers, indexes follow their rules through thick and thin, avoiding the kind of style drift that can undermine investor objectives. In addition to consistency, rules-based passive factor strategies offer transparency and typically far lower costs than active strategies.

But factor indexing is more complex than a benchmark simply meant to represent a market segment. Factor index design must strike a balance between purity of exposure and investability, including liquidity, capacity, and diversification.

Liquidity is a key consideration for any investment. Passive strategies are generally less successful in illiquid areas, when they have difficulty trading securities.[10] Illiquidity can cause divergence between an index and a strategy tracking it. It can also generate higher transaction costs. Capacity is lower for strategies that focus on less liquid asset classes, have narrower portfolios, and higher turnover. A large fund has more difficulty trading—the proverbial oceanliner navigating narrow straits. A large asset base tracking a concentrated index is at risk of pushing up or down prices as its buys and sells. Rebalancing can be complicated. Trading in areas with wide bid-ask spreads can have a negative impact on a strategy's returns. The more trading a strategy entails, the greater the potential transaction costs.

Unintended bets are another pitfall that factor indexes must navigate. Ideally, index behavior should be determined by the performance of the factor. Sector exposures or regional exposures should not unduly influence behavior. For example, Morningstar has found that strategies focused on quality and value often end up with industry tilts that can be unintended sources of risk.[11] Nor should the returns of a small group of stocks overly influence factor index performance. Index rules must be designed to minimize stock specific and sector-specific risk and let the factor shine.

Unintended bets are another pitfall that factor indexes must navigate. Ideally, index behavior should be determined by the performance of the factor.

It would be misguided to reverse engineer construction rules based on what performs best in back-testing. Just because a particular feature was effective historically does not mean it will succeed in the future. Optimally, a factor index methodology should be rooted in a strong intellectual foundation with a theoretical argument and empirical results to support its design. Consistently applying well-reasoned rules through thick and thin is a good strategy for weathering uncertain market conditions.

[10] See: Morningstar Active/Passive Barometer. https://www.morningstar.com/articles/1109101/where-do-active-fund-managers-hold-the-upper

[11] Bryan, Alex. "Quality and Value Without the Side Sector Bets." Morningstar. July 10, 2019. https://www.morningstar.com/articles/935493/quality-and-value-without-the-side-sector-bets

Morningstar Global Factor Indexes

The Morningstar Global Factor Indexes are designed to deliver strong exposure to industry-standard equity factors.[12] The indexes are constructed using a transparent, rules-based methodology that aims to mitigate unintended sector and regional biases and facilitate investability. They can be used for research, benchmarking, and investing.

The indexes include six single-factor benchmarks:

Value **Size** **Quality** **Momentum** **Low Volatility** **Yield**

Defining factors

These indexes leverage industry-standard factor definitions from the Morningstar Risk Model.[13] Value, quality, yield, and small size are defined on a sector-relative basis within each region. Most of the historical benefits from these slow-moving factors has come from intrasector stock selection, as sector-specific dynamics reduce cross-sector comparability.[14] Intrasector ranking reduces persistent sector tilts that could contribute to active risk.

Low Volatility and Momentum are ranked relative to Morningstar's eligible coverage within each region. These price-based factors tend to be faster-moving than the other four factors and more comparable across sectors. Here, factor-driven sector tilts may be more beneficial, especially for momentum..

Value: The Morningstar Global Factor Indexes define value in accordance with the Morningstar Style Box™ methodology, which is robust and incorporates historical and forward-looking value and growth metrics. The value inputs (weightings in parentheses) include:

Value	Weighting %
Price/earnings forward	50.0
Dividend yield	12.5
Price/book	12.5
Price/cash flow	12.5
Price/sales	12.5

[12] For a comprehensive discussion of index construction, see rulebook https://indexes.morningstar.com/our-indexes?filterPattern=global%20factor

[13] The momentum indexes follow a slightly different momentum definition from the version included in the risk model, using local price returns in place of U.S. dollar-denominated returns.

[14] Bryan, Alex. "The Impact of Industry Tilts on Factor Performance." Morningstar. Mar. 15, 2017. https://www.morningstar.com/content/dam/marketing/shared/pdfs/Research/The_Impact_of_Industry_Tilts_on_Factor_Performance.pdf?

Lower-growth characteristics also translate into higher-value style scores.

Quality: This is measured as the equally weighted z-score of a company's profitability (trailing 12-month return on equity) and the z-score of its financial leverage (trailing 12-month debt/capital).

Yield: This is measured as the trailing 12-month shareholder yield, which includes dividends and net buybacks. Total shareholder yield offers a more complete picture of shareholder distributions than dividend yield alone.

Size: The normalized value of the logarithm of a firm's market capitalization, where smaller stocks are favored.

Low Volatility: Weighted average of idiosyncratic volatility over the past six months (50%), total volatility over the past six months (25%), MAX5/lottery factor (25%), which is based on the highest five day returns over the past month where lower values are favored. This composite provides a more complete view of risk than a security's total volatility alone.

Momentum: This factor is measured as the trailing 12-month return (in local currency), excluding the most recent month, minus the local risk-free rate. This definition aligns with the momentum factor as defined by the academic literature.

Index eligibility

Each factor index is derived from its corresponding standard parent benchmark from the Morningstar Target Market Exposure Index family, which represents the top 85% of equity market capitalization in its segment. The focus on large- and mid-cap stocks facilitates high-investment capacity. To be eligible for inclusion, each stock must have valid factor exposure scores.

Index selection

Within each parent index, constituents are ranked by their factor exposure. All factors are measured relative to each broad region.[15] The quality, size, value, and yield factor exposures are also measured on a sector-relative basis. For low volatility and momentum, no sector relative adjustments are made. The highest ranking 30% of the parent index's float-adjusted market capitalization is targeted for inclusion in each index. Focusing on a percentage of the parent index as opposed to a fixed number of securities ensures that a consistent portion of the market is represented.

Index tilt weighting

Constituents are weighted by the product of their float-adjusted market capitalization and strength of their factor exposure, subject to constraints to limit unintended risk.

Weighting constraints and turnover buffers

Sector, regional, and individual stocks weights are constrained relative to the parent index to limit unintentional bias (constraints are looser for momentum and low volatility than for the others). Turnover buffer rules are also applied to mitigate potential transaction costs.

[15] The regions for relative scoring are defined in the Morningstar Risk Model. These include: Developed North America, Developed Europe, Developed Asia Pacific, Emerging Latin America, Emerging Europe, Emerging Asia Pacific, Emerging Middle East & Africa.

Reconstitution/rebalancing

The indexes are rebalanced semiannually.

This process is designed to result in strong factor exposure balanced for investability considerations. While it is possible to produce indexes with stronger factor exposure, this design anticipates that these indexes may be used as the basis for investment portfolios.

Exhibit 1: Index construction process

Starting universe	Index eligibility	Portfolio construction	
• Morningstar Global Target Market Exposure Indexes • Large/mid indexes covering the top 85% of the investable market	• Parent index stocks are ranked by their exposure to the targeted factor • The highest-ranking stocks representing 30% of the float-adjusted market capitalization of the parent index are selected for factor index inclusion • Buffers are applied to favor existing constituents, mitigating unnecessary turnover	• Constituent weights are tilted from their float-adjusted market cap based on the strength of their factor exposures • Constraints at the individual stock, sector, and regional level are applied to limit unintended biases	Morningstar Global Factor Indexes

Source: Morningstar Indexes. Data as of 12/31/2022.

Strong factor exposure with high capacity

The efficacy of Morningstar Global Factor Indexes should be gauged not by their outperformance over a back-test period, but by the strength and consistency of their factor exposure and their investability. After all, factor premiums take years to play out. Performance is deeply dependent on the period studied. Results can shift dramatically with changes to start- and end points. Morningstar factor indexes' history begins in mid-2008, at the dawn of a lengthy period of dominance growth stocks.

Factor purity can be assessed with a number of different tools. The Morningstar Factor Profile provides a snapshot of an equity portfolio's exposure to the factors. Factor exposure can be assessed relative to peers and benchmarks. Powered by the Morningstar Risk Model, the tool is holdings-based. The Morningstar Factor Profile can be thought of as a portfolio's unique signature or fingerprint, which helps explain its relative performance.

The Morningstar Factor Profile shows factor exposures relative to the entire Morningstar global equity coverage, so broad market indexes may also show non-neutral factor exposures. The benchmark-relative comparisons matter more than the absolute values.

Third-party factor analytics are also available. The Fama and French Three-Factor Model was the first of these frameworks, adding value risk and size risk to the market risk factor as defined by the capital asset pricing model. The Carhart Four Factor Model added momentum to the toolkit. And the Frazzini Factor Model brings in quality and low volatility. These are return-based frameworks, which infer factor characteristics from how a portfolio performs, rather than from what it holds.

What follows is a discussion of the global, all-inclusive index variants of six single-factor indexes: value, size, quality, momentum, yield, and low volatility. Each index is compared with its parent, the Morningstar Global Target Market Exposure Index, which represents the top 85% of market capitalization across developed and emerging-market equities. The data below covers returns, risk, liquidity measures, and the Morningstar Factor Profile. Morningstar Factor Index returns are also regressed against data and factor definitions published by the French Data Library or AQR Capital Management, which includes the Frazzini factor data.[16]

The exhibits below show that the Morningstar factor indexes deliver strong exposure to their targeted factors and are liquid (measured by days to average daily trading volume).

Exhibit 2: Performance and factor regression summary

	Morningstar Global Value Factor	Morningstar Global Size Factor	Morningstar Global Quality Factor	Morningstar Global Momentum Factor	Morningstar Global Low Volatility Factor	Morningstar Global Yield Factor	Morningstar Global TME
Return (%)	6.03	6.49	7.31	6.39	6.83	7.58	6.38
Annualized Alpha (%)	**–1.80**	–0.60	0.72	0.72	**–2.76**	–0.48	0.00
Beta	**0.94**	**1.06**	**1.04**	**1.14**	**0.82**	**0.97**	**1.01**
Std Dev (%)	17.60	18.81	17.06	18.94	12.78	17.22	16.97
Sharpe-Ratio	0.31	0.31	0.39	0.31	0.49	0.41	0.34
Tracking Error (%)	4.77	3.47	2.79	6.51	6.68	3.81	0.00
Turnover (%)	64.47	24.53	38.22	106.23	69.23	58.52	4.36
Size	**–0.29**	**0.16**	–0.04	0.08	**-0.34**	**-0.26**	**–0.14**
Value	**0.47**	**0.15**	**–0.17**	**–0.17**	**0.16**	**0.32**	0.01
Momentum	**0.09**	–0.01	**–0.11**	**0.32**	**0.08**	–0.01	–0.01
Low Beta	0.06	0.04	0.00	-0.08	**0.18**	0.06	**0.02**
Quality	0.04	**0.08**	**0.16**	**–0.20**	**0.31**	**0.16**	**0.03**

Source: Morningstar Indexes. Data from Jun 2008-Dec. 2022.

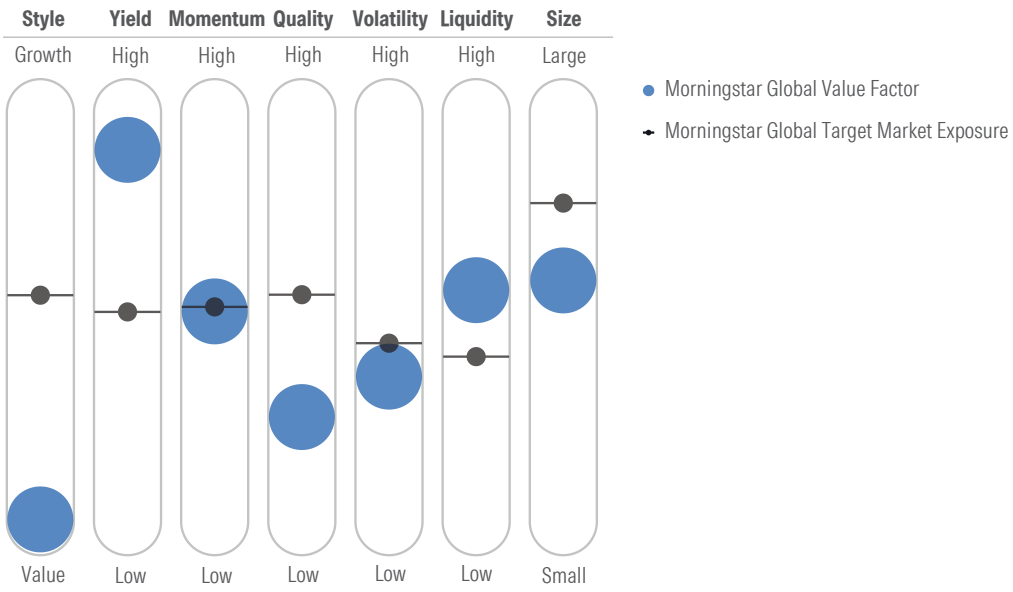
Note: Bolded figures are statistically significant at the 5% level.

[16] See https://www.aqr.com/

Value

The Morningstar® Global Value Factor Index™ has exhibited strong exposure to value within the style factor based on the Morningstar Factor Profile. The index also displayed significant exposure to yield, as many stocks that are returning cash to shareholders are located on the value side of the market. A returns-based factor regression corroborates this strong value orientation, as shown in Exhibit 2.

Exhibit 3: Morningstar Global Value Index Factor Profile



Source: Morningstar Direct. Data as of 12/16/2022.

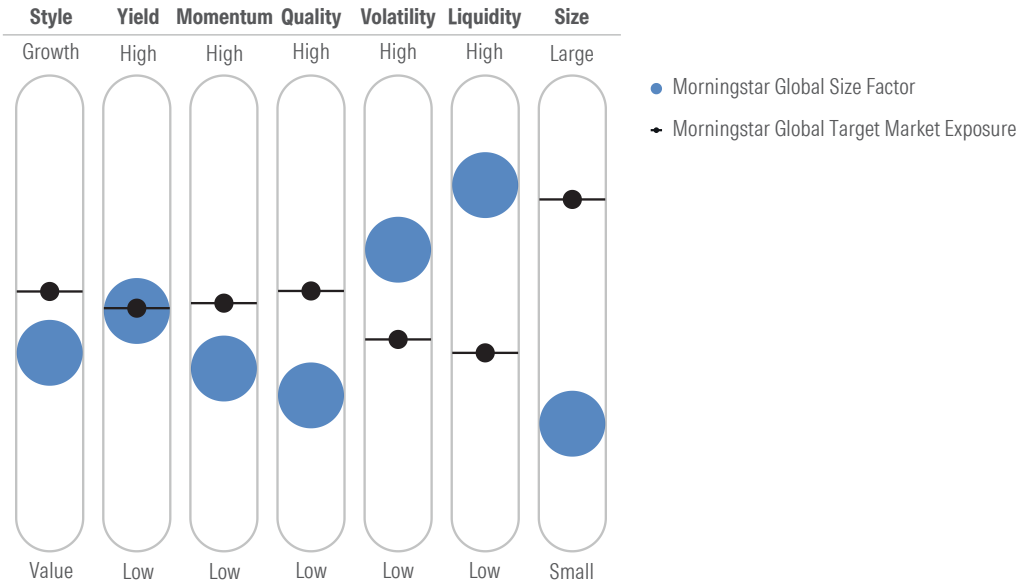
Unsurprisingly, the value index underperformed the broad global equity market by since its backdated performance start date in June 2008. This period has been challenging for value strategies of all stripes, particularly those with pronounced value tilts, as this index has historically exhibited.

This index also exhibits high-investment capacity. Nearly 100% of the index weight is tradable within five days based on recent average daily trading volume.

Size

The Morningstar® Global Size Factor Index™ has shown high exposure to the size factor based on the Morningstar Factor Profile, indicating a tilt toward smaller-cap stocks. The index unsurprisingly displays significant exposure to low liquidity, as smaller caps tend to be less-heavily traded than larger caps. The index also displayed strong exposure to the size factor on the Frazzini factor data. Exposure to other factors is minimal or negative.

Exhibit 4: Morningstar Global Size Index Factor Profile



Source: Morningstar Direct. Data as of 12/16/2022.

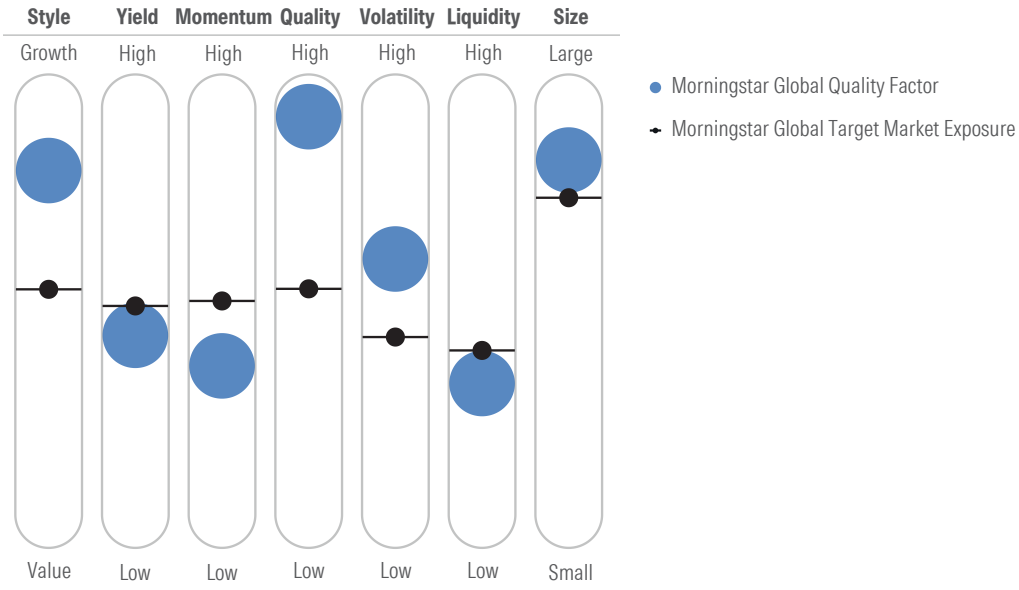
The size factor index slightly outperformed the broad global equity market since June 2008. Unsurprisingly, the index has been significantly more volatile than the market, as smaller-cap stocks tend to bounce around more than larger caps.

Despite its smaller-cap tilt, this index facilitates investability with low turnover, and nearly 100% of index weight tradable within five days based on recent average daily trading volume.

Quality

The Morningstar Factor Profile and regression analysis show the Morningstar® Global Quality Factor Index™ has exhibited high exposure to the quality factor, as expected. It's not surprising to see negative exposure to size and value, given that stocks with those exposures tend to be less profitable and more leveraged.

Exhibit 5: Morningstar Global Quality Index Factor Profile



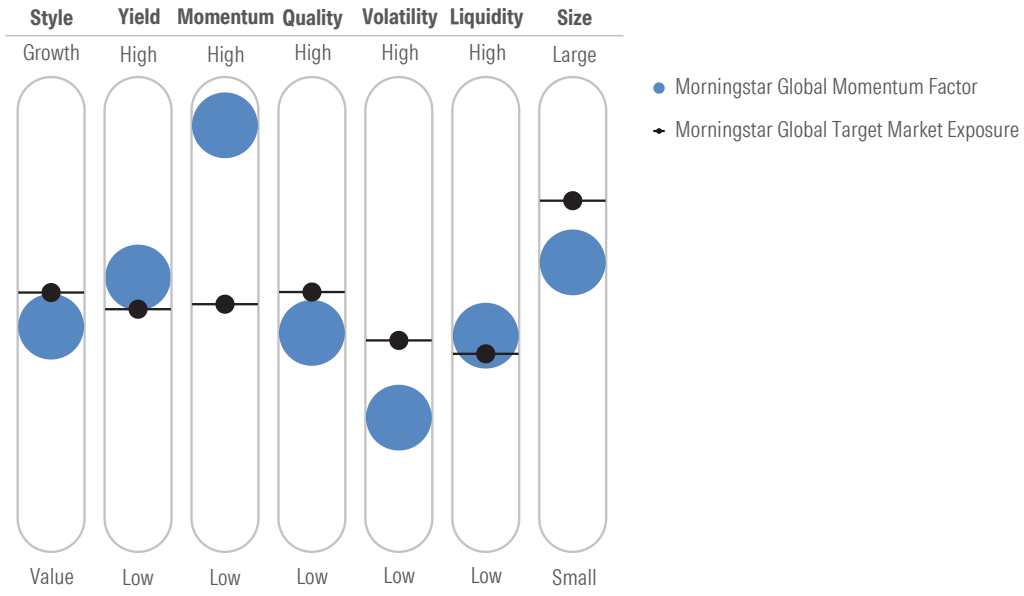
Source: Morningstar Direct. Data as of 12/16/2022.

The quality index has performed well since June 2008 as illustrated in Exhibit 2. Many of the mega and large-cap stocks that lead the market had strong returns on equity and little leverage. The index facilitates investability with reasonably low turnover and nearly 100% of index weight tradable within five days.

Momentum

The Morningstar® Global Momentum Factor Index™ has displayed high exposure to the momentum factor based on the Morningstar Factor Profile and regression analysis. Yet, it delivered similar returns to the market benchmark since June 2008, as shown in Exhibit 2. It underperformed over much of its life, largely due to the significant underperformance of the momentum factor during the global financial crisis.[17] Momentum has been the most procyclical of the Morningstar Global Factor Indexes, with the highest market beta of the group.

Exhibit 6: Morningstar Global Momentum Index Factor Profile



Source: Morningstar Direct. Data as of 12/16/2022.

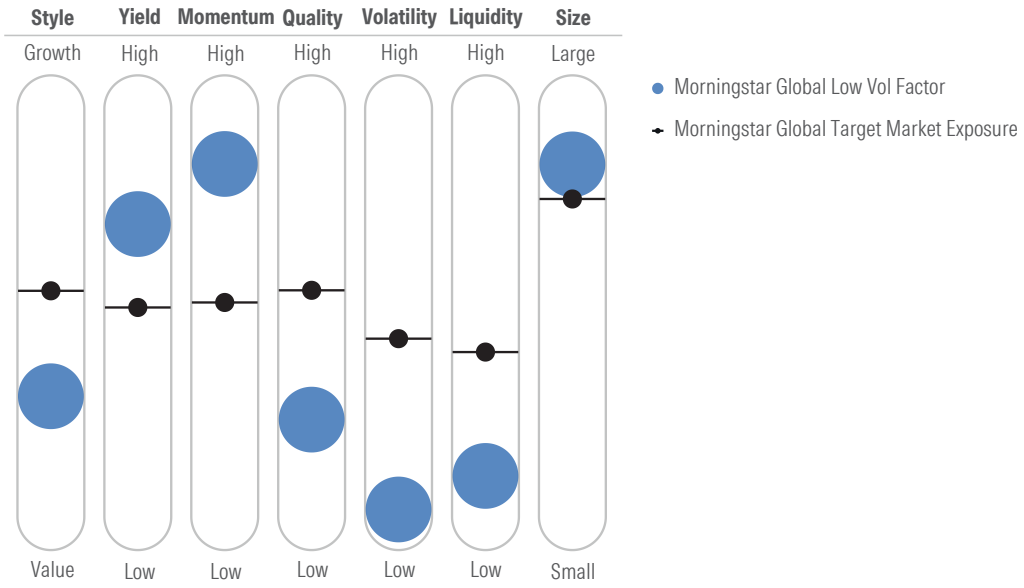
Investability is strong, which is important for a fast-moving factor that requires more portfolio turnover than others. Nearly 100% of index weight is tradable within five days based on recent average daily trading volume.

[17] A portfolio replicating the classic Fama-French momentum factor premium would have underperformed during this time.

Low Volatility

The Morningstar® Global Low Volatility Factor Index™ has exhibited strong exposure to less-volatile stocks, based on the Morningstar Factor Profile and regression analysis. As expected, it also carried a low market beta, shown in Exhibit 2. While the index appeared to favor lower-quality stocks in the Morningstar Factor Profile (which focuses on return on equity and leverage), the Frazzini factor data suggests the index has tended to perform well when quality stocks did well. This may be because the Frazzini quality factor includes volatility in its definition.

Exhibit 7: Morningstar Global Low Volatility Index Factor Profile



Source: Morningstar Direct. Data as of 12/16/2022.

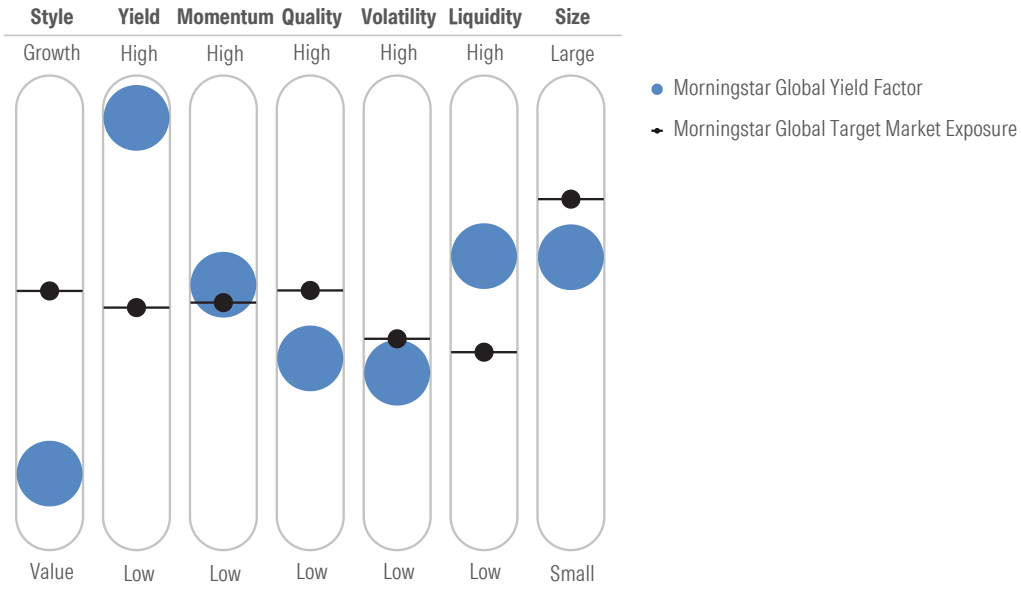
The low-volatility index delivered higher returns than the market since June 2008 and delivered even stronger risk-adjusted performance, as shown in Exhibit 2. Unsurprisingly, it has been far less volatile than the market as measured by beta and standard deviation of returns. The index has also deviated very significantly from the broad equity market, so it represents a distinctive exposure.

Index investability looks good, with reasonably low turnover and nearly 100% of index weight is tradable within five days using recent average daily trading volume.

Yield

The Morningstar® Global Yield Factor Index™ has shown to have high exposure to the yield factor based on the Morningstar Factor Profile. Unsurprisingly, the index displayed high exposure to value and quality factors, which are linked to yield. The high exposure to the momentum factor shown in the factor profile reflects the strong recent performance of the yield factor.

Exhibit 8: Morningstar Global Yield Index Factor Profile



Source: Morningstar Direct. Data as of 12/16/2022.

The yield index outperformed more than any of the other Morningstar Global Factor indexes since June 2008, as Exhibit 2 shows. The index considers dividends and share buybacks. Dividend-paying stocks are more commonly found on the value side of the market, which explains the index's exposure to the value factor. Dividend payers lagged the market during years of growth leadership, but have recently bounced back. The index's inclusion of stocks repurchasing their own shares also lifted returns. The index displayed strong exposure to the value factor based on the Frazzini factor data, as shown in Exhibit 2. Companies returning cash to shareholders tend to be larger, more profitable, and less volatile, which is why the index exhibits exposure to those factors.

Reasonably low turnover and nearly 100% of index weight tradable within five days suggest strong index investability.

Solutions built to empower investor success

As expected, some factors have outperformed and others have underperformed over our historical record. If a factor has lagged, it does not mean that the premium has disappeared. Markets are cyclical and success for factor investors is measured in decades not years. Leadership is always in flux. In factor investing, patience is often required.

The Morningstar Global Factor Indexes are designed to deliver strong exposure to industry-standard factors, with high investment capacity, low transaction costs, and constraints to mitigate unintended bets. These indexes follow a consistent design framework to protect against overengineering and are powered by transparent rules. Well-constructed factor indexes rooted firmly in academic theory, thoughtfully constructed to deliver strong exposure and maintain investability, are designed to work in practice, not just in theory.

Investors can use these indexes as the foundation for long-term investment strategies, to express tactical views on factors, or as performance benchmarks. They are well suited to factor rotation strategies, given their consistent parent index and target market coverage. Regardless of the market environment, these indexes are effective tools for evaluating and managing factor exposures.

Appendix—Definitions

Annualized Alpha—the excess return, which is not accounted for by the risk factors (market, size, value, momentum, quality, and low beta), which is measured via a linear regression, stated as a yearly amount.

Annualized Return—the absolute return of the factor index, stated as a yearly amount.

Beta—the sensitivity of the factor index to the benchmark, calculated by linear regression.

Standard Deviation—a statistical measure of absolute risk of the factor index returns, stated as a yearly amount.

Sharpe ratio—a statistical ratio, which compares absolute return of the index in excess of the risk-free rate with the standard deviation.

Tracking error—a statistical measure of risk of the factor index returns relative to the benchmark returns, stated as a yearly amount. As the name suggests, it is a measure of how closely the factor index tracks the benchmark.

Factor betas and p-values—the values here come from a linear regression model versus the risk factors (market, size, value, momentum, quality, and low beta) and are referred to as factor loadings or factor exposures.

Average annual turnover—this is a measure of average annual trading activity of the portfolio on a two-way basis, so that buying and selling are considered.

Portfolio weight with more than 5 days to trade—this is the amount of a $1 billion portfolio that could be fully traded within a limit of five open market days.

About Morningstar Indexes

Morningstar Indexes was built to keep up with the evolving needs of investors—and to be a leading-edge advocate for them. Our rich heritage as a transparent, investor-focused leader in data and research uniquely equips us to support individuals, institutions, wealth managers and advisors in navigating investment opportunities across major asset classes, styles and strategies. From traditional benchmarks and unique IP-driven indexes, to index design, calculation and distribution services, our solutions span an investment landscape as diverse as investors themselves.

For more information, visit indexes.morningstar.com, or contact us at indexes@morningstar.com