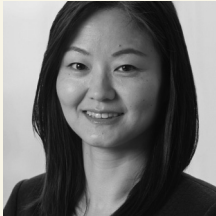# IQ INSIGHTS

Investing in the Quality Factor

by Taie Wang, CFA, *Deputy Head of Research for Smart Beta*

Continuing our series of investigations into Smart Beta factors, we look at quality in equities. This paper highlights how we think about the factor and why we consider our tilting methodology to be a better way to capture quality — either in a standalone portfolio or as a component of a multifactor approach.

Of all the essential equity factors — value, size, volatility, quality and momentum — quality is perhaps the one with the clearest economic intuition. After all, it makes sense that higher quality companies are rewarded with better returns over the longer term, since they have been better at deploying capital and generating wealth than their lower quality peers. Relative to other factors, however, quality has a mixed record of historical performance.

The idea of quality investing emerged early in the 20th century, first popularized by Benjamin Graham, who is often remembered as the father of value investing.[1] Interest in the quality factor has waxed and waned as the market has gone through various cycles, and investors have focused on different styles in different market environments. At the turn of this century, the corporate scandals and failures of firms like Enron and WorldCom redirected attention toward quality investing.

Since then, we might expect many investors who suffered significant losses during the global financial crisis to be drawn to high quality and low volatility stocks.

To better understand how adding exposure to the quality factor could enhance an equity portfolio, we focus on these main questions:

- How is quality defined?
- If there is a quality premium, why might it exist?
- What are the ways to capture the quality premium and the practical implications that quality investors may need to consider?
- How could quality be combined with other factors to obtain portfolio diversification benefits?

Different Definitions of Quality

The concept of quality has been around for many years, and fundamental investors have included quality in their stock selection processes for a long time. Among quantitative researchers, however, quality only became popular much later. One reason for this late adoption as a quant factor is that there is no industry wide, unanimously accepted definition of quality.

When Benjamin Graham first introduced the concept, he recommended five criteria related to quality: adequate enterprise size, strong financial conditions (measured by current ratios and net current assets), earnings stability (measured by 10 consecutive years of positive earnings), consistent dividend payments and growth in earnings. By screening on these criteria, investors could help to ensure that they would buy only high quality firms with projected sustainable earnings power.

In the active quantitative investment world, quality is more often referred to as earnings quality, with accruals-based measures proposed by Sloan (1996). If we accept the argument that earnings management is mostly a function of manipulating accruals, then it is intuitive to measure earnings quality by the relative magnitudes of the cash and accrual components of

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earnings — that is, the higher the total accruals as a percentage of assets, the greater the likelihood that earnings quality is low.

The Piotroski (2000) F-score is another accounting-based measure of financial strength, calculated as the sum of nine binary variables, with zero indicating weakness and one indicating strength. These include four profitability signals (positive earnings, positive cash flows, increasing return on assets and negative accruals), three liquidity signals (decreasing debt, increasing current ratio and no equity issuance) and two efficiency signals (rising gross margins and increasing asset turnover).

Grantham (2004) defines quality companies as "highly profitable, stable earnings, and low debt," while Greenblatt (2010) has proposed "Magic Formula" investing — buying only stocks with the highest combined ranks of quality and value, as measured by return on invested capital (ROIC) and earnings yield, respectively.

Novy-Marx (2013) argues that among popular notions of quality, gross profitability — measured by revenues minus the cost of goods sold, scaled by total book assets — is particularly powerful, especially for large cap stocks and for long-only investors.

Asness, Frazzini and Pedersen (2013) have proposed the "Quality minus Junk" factor, which is measured along four dimensions (profitability, growth, safety and payout). A strategy that takes long positions in high quality stocks and short positions in low quality stocks was found to earn significant risk-adjusted returns in the United States and globally across 24 countries.

Finally, Fama and French (2014) and Hou, Xue and Zhang (2014) find that high profitability and low investment help explain cross-sectional stock return differences.

Clearly, assessing the quality of companies is a highly subjective matter. Though the definition of quality varies widely among academics, asset managers and index providers, it is commonly associated with a company's competitiveness, efficiency, transparency, growth, financial and operating leverage, profitability and sustainability.

At State Street Global Advisors (SSGA), we follow the most well recognized and widely adopted definition of quality proposed by Grantham — namely, high profitability, stable earnings and low leverage. Companies that are highly profitable and financially stable, while taking on lower debt, are usually robust and well established. That suggests they are strong enough to weather economic difficulties and potentially earn long-term premiums.

Profitability is measured by net income before tax divided by total assets — that is, pre-tax return on assets (ROA) — which reflects how companies use their assets to generate earnings.

The rationale is that companies which are better at generating wealth from their assets will be recognized by the market and rewarded with a higher share price.

Earnings Variability is measured by the standard deviation of earnings per share (EPS) divided by median earnings for the past five years, which reflects the volatility of EPS. Dividing by median earnings normalizes volatility to make it more comparable across different companies, while using a five-year average removes some of the earnings variability inherent in cyclical high quality companies. Without this adjustment, a selection based on a shorter time frame could possibly eliminate some of those cyclical names, and the resulting portfolio would be less diversified.

Leverage is measured by total liabilities divided by shareholder equity, which indicates what percentage of equity and debt companies use to finance their assets. A lower level of debt means that a company is using less of its earnings to pay off interest and thus has more available to invest in its operations and distribute to shareholders.

We have analyzed other metrics — such as return on equity (ROE), ROIC, new debt to equity and cash flow variability — and found no meaningful improvement in performance. We believe that this definition is robust and captures the essence of quality.

PROFITABILITY	EARNINGS VARIABILITY	LEVERAGE
Return on assets	Standard derivation of earnings, scaled by median earnings	Long-term debt, divided by equity

Evidence of the Quality Premium

To determine whether quality — high profitability, stable earnings and low leverage — is associated with any premium, we can look at global developed markets and see if higher quality stocks outperform lower quality stocks. For each constituent stock of the MSCI World Index, we construct a quality score by equally weighting the normalized scores of return on assets, earnings variability and the debt to equity ratio. We rank the stocks by their quality scores and assigning them into three buckets, with each containing one third of the universe market capitalization. The stocks within each bucket are weighted by market cap. We reconstitute the buckets every March after annual reports have been released to obtain the historical annualized return and risk profiles of the low, medium and high quality buckets (see Figure 1) as well as their cumulative returns from April 1993 to October 2016 (see Figure 2).

The bucket of high quality stocks not only delivered higher annualized return over the testing period from 1993 to 2016, but the return volatility was also lower, resulting in the highest

Figure 1: Long-Term Quality Premium — MSCI World Index
April 1993 to October 2016

|	Low Quality	Medium Quality	High Quality	MSCI World
Return (%)	5.21	7.88	9.46	7.35
Volatility (%)	17.86	14.27	13.30	14.81
Sharpe Ratio	0.29	0.55	0.71	0.50

Source: SSGA, MSCI, FactSet.

Figure 2: Cumulative Returns of Low, Medium and High Quality Stocks — MSCI World Index
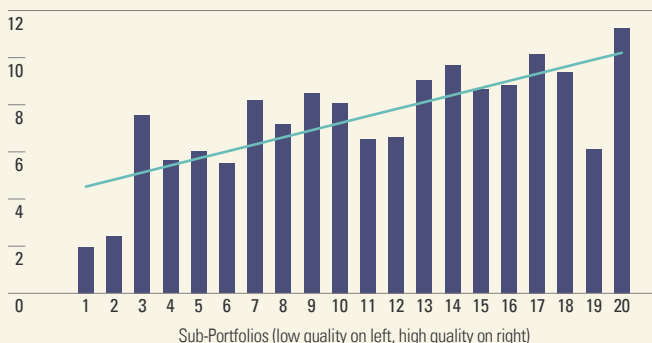April 1993 to October 2016

— Low Quality Bucket   — Medium Quality Bucket   — High Quality Bucket
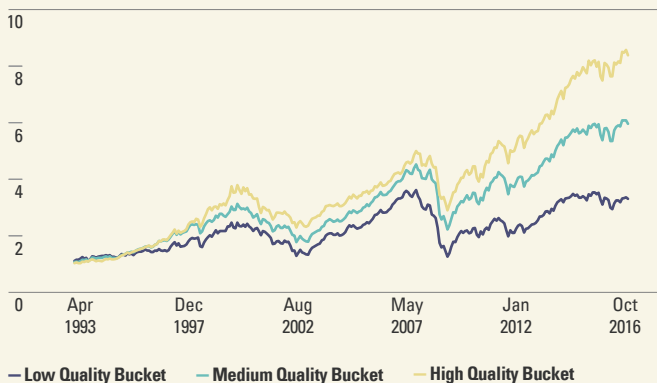
Source: SSGA, MSCI, FactSet.

Figure 3: Ratios of Price to Fundamentals of High Quality Bucket vs Low Quality Bucket — MSCI World Index
March 1998 to October 2016

— Price/Earnings   — Price/Book   — Price/Sales
— Dividend Yield   — Price/Cash Flow
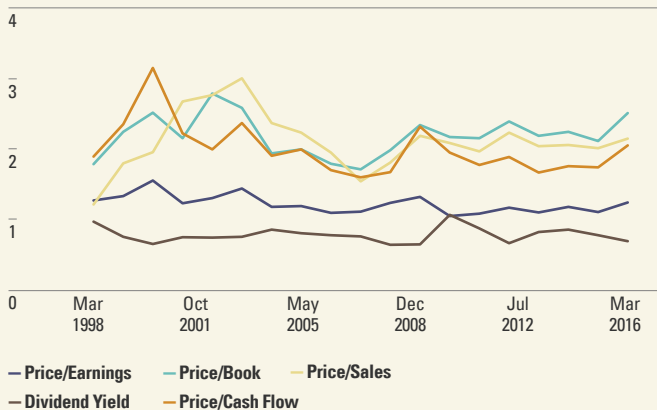
Source: SSGA, MSCI, FactSet.

Figure 4: Sub-Portfolio Return and Volatility
Quality-Sorted Returns of MSCI World Sub-Portfolios
Annualized US$ Returns (April 1993 to October 2016)

Sub-Portfolios (low quality on left, high quality on right)

Quality-Sorted Return Volatility of MSCI World Sub-Portfolios
Annualized US$ Return Volatility (April 1993 to October 2016)

Sub-Portfolios (low quality on left, high quality on right)
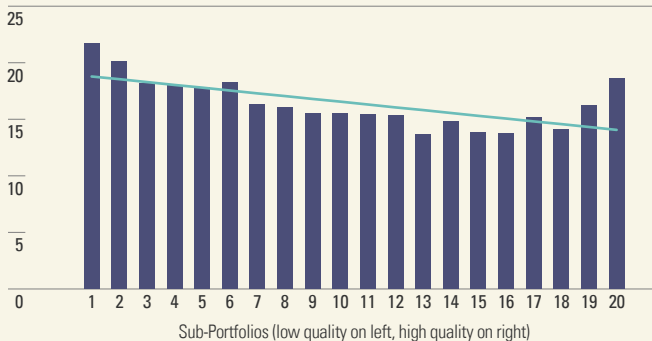
Source: SSGA, MSCI, FactSet.

Factor returns shown in Figures 1, 2 and 4 represent the returns of components of the MSCI World Index (at their cap weight) which have been grouped methodically based on their factor exposure. The performance assumes no transaction and rebalancing costs, so actual results will differ. Past performance is not a guarantee of future results. Index returns reflect all items of income, gain and loss and the reinvestment of dividends. Performance of an index is not indicative of the performance of any product managed by SSGA.

Sharpe Ratio. Among the three buckets, low quality stocks did deliver significant positive returns at times but the lowest annualized return with the highest return volatility over the long run — more than 200 basis points lower than the return of the market cap weighted MSCI World Index.

The academic work on quality — except for the accruals anomaly (earnings quality) — has been less broad than the work on other factors. As a result, the explanations for the quality premium have been more limited. Asness, Frazzini and Pedersen (2013) have posited that because investors undervalue the earnings growth of stable companies with low earnings volatility, these high quality stocks have been able to deliver higher subsequent returns. Another explanation relates high quality to low volatility, as these factors are correlated to some degree; so the drivers of the low volatility anomaly — such as the glamour and lottery effects, leverage aversion and the delegated agency model — can also be used to justify the quality premium.

Since high quality stocks tend to be large, well established companies, it can be argued that investors pay a higher price for high quality stocks on average — albeit not by a very large margin. Perhaps because of this puzzlingly modest impact of quality on price, high quality stocks have exhibited high risk-adjusted returns.

Historically, high quality stocks have tended to have more expensive valuations than low quality stocks, as evidenced by the ratios of price to various fundamentals in the high quality bucket vs the low quality bucket (see Figure 3).

Over the period from March 1998 to October 2016, the price to fundamental ratios of the high quality bucket versus the low quality bucket has been reasonably stable, without displaying any disrupting patterns so far. Higher quality stocks have not been too expensive to serve as a "safe haven"[5] for investors to flock to — especially during economic downturns or volatile markets — and therefore generally able to earn higher risk adjusted returns than their low quality counterparts.

Ways to Capture Quality Premium

With the emergence of Smart Beta, investors now can access the quality factor through transparent, consistent and low cost ways. Many index providers have launched quality related indices for direct investment (see sidebar for examples).

At SSGA, we apply our tilted framework to construct a Quality Tilted strategy, defining quality by profitability, earnings variability and leverage as described above. For each stock in the universe, these three metrics are normalized and equally weighted to get the combined quality score, which is used to rank the stocks and allocated them into 20 sub-portfolios — with sub-portfolio 1 comprising the lowest quality stocks and

Russell Defensive Index

Probably one of the earliest to incorporate quality elements, this index selects stocks by "stability probability" — an equal combination of the quality score and the volatility score[2] — with 35% of the universe capitalization with the highest stability scores classified as fully defensive and the next 30% as both defensive and dynamic at its annual rebalancing. The construction methodology makes this more like a traditional style index, in that the universe is dissected into different styles and the stock weights in the index are based on market capitalization.

MSCI Quality Index

By contrast, this index selects stocks from the cap-weighted parent index by three quality factors.[3] At the semiannual rebalancing, this index will include a fixed number of stocks with the highest quality scores based on the average of the Z-scores of these factors — about 30% of the market cap of the parent index. Each stock's weight is the product of its quality score and its market cap weight in the parent index, and the weights are normalized to add up to 100%. This methodology leads to a relatively higher conviction, higher exposure and higher tracking error strategy that is more suitable for investors willing to take more active risk relative to a cap-weighted benchmark.

FTSE Russell factor exposure indices — Quality

This index introduced more recently defines quality by two metrics — profitability and leverage.[4] At the annual reconstitution, the normalized composite quality score is transformed to a score ranging from zero to one using a cumulative normal mapping function, and each stock's weight is derived by tilting the market cap weight in the underlying index by that score. Because of its convoluted mapping methodology, some investors might deem this index to be too complicated.

sub-portfolio 20 the highest quality stocks. Each sub-portfolio contains 5% of the universe market cap, and stocks within each sub-portfolio are weighted by market cap.

Then we use a proprietary tilting methodology to allocate more capital to sub-portfolios with higher quality stocks and less capital to sub-portfolios with lower quality stocks, thereby increasing the exposure to high quality. Annual rebalancing at the end of March accounts for year-end reporting. This tilting framework helps bring about a final portfolio that is broad-based, mildly tilted to quality and with moderate tracking error — potentially making it a good option for investors who would like to allocate to Smart Beta strategies but have limited risk appetites or budgets.

Figure 5: Backtested SSGA DM Quality Tilted (Gross) vs MSCI World Index
April 1993 to October 2016

	SSGA DM Quality Tilted*	MSCI World**	Difference
Return (%)	8.63	7.35	1.28
Volatility (%)	13.76	14.81	-1.05
Sharpe Ratio	0.63	0.50	0.13

Figure 6: Backtested Cumulative Return of SSGA DM Quality Tilted (Gross) vs MSCI World Index
April 1993 to October 2016

— SSGA DM Quality-Tilted Portfolio*   — MSCI World**
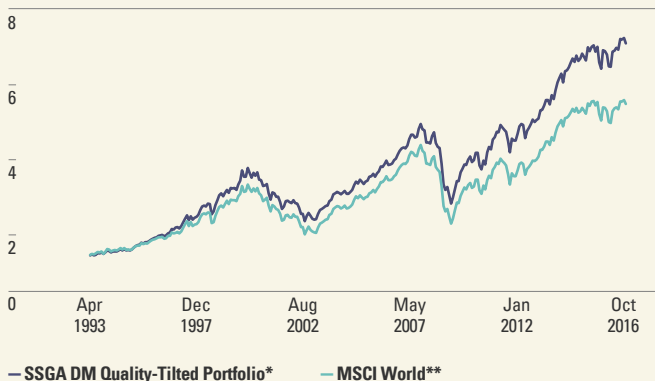
Source: SSGA, MSCI, FactSet.
For Figures 5 and 6: All returns are in USD. *Backtest performance is not indicative of the past or future performance of any SSGA offering. The portion of results through October 2016 represents a backtest of the SSGA Quality Tilted model, which means those results were achieved through the retroactive application of a model that was developed with the benefit of hindsight. All data shown above do not represent the results of actual trading and, in fact, actual results could differ substantially, and there is the potential for loss as well as profit. The performance does not reflect management fees, transaction costs and other fees and expenses a client would have to pay, which reduce returns. Please refer to the Backtesting Methodology for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. **Past performance is not a guarantee of future results. The index returns reflect all items of income, gain and loss and the reinvestment of dividends and other income.

Figure 7: Backtested SSGA EM Quality Tilted (Gross) vs MSCI EM Index
April 1995 to November 2016

	SSGA EM Quality Tilted*	MSCI EM**	Difference
Return (%)	7.32	5.93	1.39
Volatility (%)	21.76	23.12	-1.35
Sharpe Ratio	0.34	0.26	0.08

Figure 8: Backtested Cumulative Return of SSGA EM Quality Tilted (Gross) vs MSCI EM Index
April 1995 to November 2016

— SSGA EM Quality Tilted Portfolio*   — MSCI EM Index**

Source: SSGA, MSCI, FactSet.
For Figures 7 and 8: All returns are in USD. *Backtest performance is not indicative of the past or future performance of any SSGA offering. The portion of results through November 2016 represents a backtest of the SSGA Quality Tilted model, which means those results were achieved through the retroactive application of a model that was developed with the benefit of hindsight. All data shown above do not represent the results of actual trading and, in fact, actual results could differ substantially, and there is the potential for loss as well as profit. The performance does not reflect management fees, transaction costs and other fees and expenses a client would have to pay, which reduce returns. Please refer to the Backtesting Methodology for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. **Past performance is not a guarantee of future results. The index returns reflect all items of income, gain and loss and the reinvestment of dividends and other income.

Applying this methodology to developed markets in the MSCI World Index universe, we can calculate the gross backtested annualized return and volatility over the period from 1993 to October 2016 for each sub-portfolio, with the lowest quality companies in sub-portfolios 1–5 and the highest quality companies in sub-portfolios 16–20 (see Figure 4).

The generally upward trend of returns by quality-sorted sub-portfolios suggests that higher quality stocks tend to deliver higher returns, and vice versa. On the other hand, the volatility of the quality-sorted sub-portfolios appears smile-shaped, suggesting that lower quality stocks and higher quality stocks at both ends of the spectrum tend to exhibit

higher volatility — even though we have seen that the high quality group of stocks has lower return volatility overall (see Figure 1 above).

Over the past 23 years from April 1993 to October 2016, the Developed Market (DM) Quality Tilted portfolio could have had 128 basis points excess return over the cap weighted benchmark, with more than 100 basis points lower return volatility (see Figure 5 and Figure 6).

In terms of sectors, the Quality Tilted portfolio overweights sectors of big, stable companies, such as information technology, consumer staples and health care, while

Figure 9: Active Sector Weight of SSGA DM Quality-Tilted vs MSCI World
October 31, 2016

Figure 10: Active Country Weights of SSGA DM Quality Tilted vs MSCI World
October 31, 2016
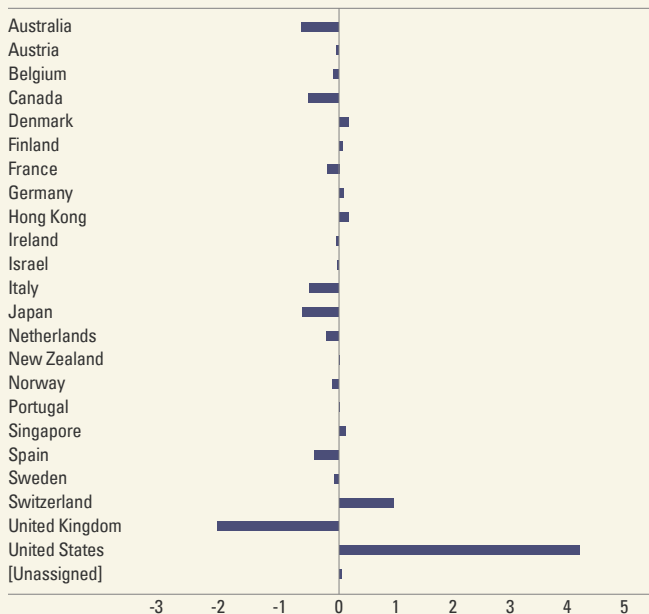
Source: SSGA, MSCI, FactSet.

For Figures 9 and 10: The results shown represent current results generated by our Quality Tilted model. The results do not reflect actual trading and do not reflect the impact that material economic and market factors may have had on SSGA's decision-making. The results shown were achieved by means of a mathematical formula, and are not indicative of actual future results which could differ substantially. This information should not be considered a recommendation to invest in a particular sector or to buy or sell any security shown. It is not known whether the sectors or securities shown will be profitable in the future.

underweighting sectors with volatile earnings and high leverage, such as financials and energy (see Figure 9).

In terms of country allocations, the main differences relative to the cap weighted MSCI World Index are the overweights of the US and Switzerland, and the underweights of the UK and Japan (see Figure 10).

Looking at the backtested performance of the Emerging Market (EM) Quality Tilted strategy from April 1995 to November 2016, we find that the return premium and risk reduction relative to the MSCI Emerging Markets Index (MSCI EM) is similar to the DM version (see Figure 7 and Figure 8). This suggests that even though EM stocks tend to behave differently than DM stocks, the quality premium exists not only in developed markets but also in emerging markets.

Cyclicality of Quality Factor

It is well known that factors tend to be cyclical, with ups and downs in performance versus cap weighted benchmarks. In

order to better understand the behavior of quality through various market cycles, we identified the major market peaks and troughs from April 1993 to October 2016 (see Figure 11) and examined the historical returns of the SSGA Quality Tilted strategy relative to the MSCI World Index (see Figure 12).

Figure 11: Backtested Performance of SSGA DM Quality Tilted Strategy* in Different Market Cycles (Gross)

Investing in the Quality Factor
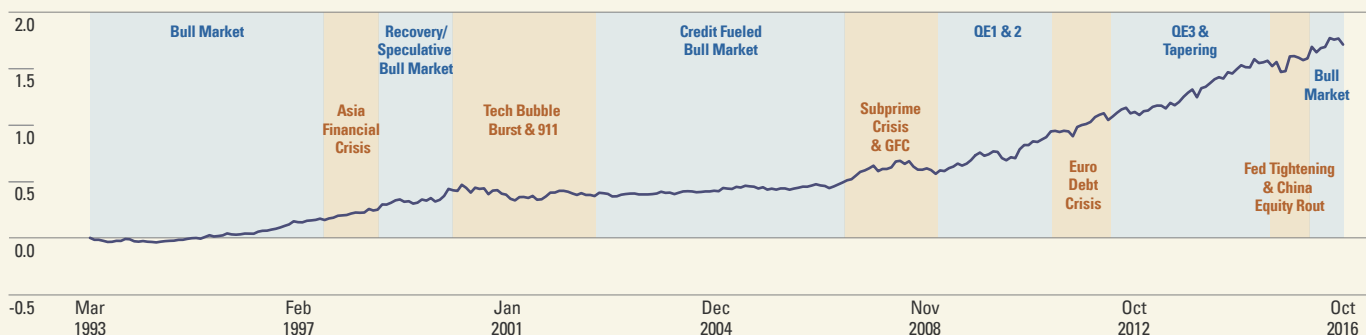
Figure 12: Backtested Excess Return of SSGA DM Quality Tilted Strategy in Different Market Cycles (Gross)

Market Cycle	Period	SSGA DM Quality Tilted Annual Return* (%)	MSCI World Annual Return** (%)	Excess Return (%)
Bull Market	Apr 1993–Jul 1997	19.58	17.35	2.23
Recovery	Sep 1998–Dec 1999	40.16	38.68	1.48
Bull Market	Oct 2002–May 2007	18.72	20.98	-2.26
QE 1 & 2	Mar 2009–Apr 2011	34.26	36.46	-2.20
QE 3 & Start of Tapering	Jun 2012–May 2015	16.99	17.74	-0.75
Bull Market	Mar 2016–Aug 2016	26.11	27.47	-1.36
Asia Financial Crisis	Aug 1997–Aug 1998	0.98	-2.61	3.58
Tech Bubble Burst & 9/11	Jan 2000–Sep 2002	-17.86	-19.92	2.06
Subprime & GFC	Jun 2007–Feb 2009	-28.21	-33.79	5.58
Euro Debt Crisis	May 2011–May 2012	-7.10	-11.37	4.28
Fed Tightening/China Equity Rout	Jun 2015–Feb 2016	-11.46	-15.20	3.74
Full Period	Apr 1993–Dec 2015	8.63	7.35	1.28

Source: SSGA, MSCI, FactSet.

For Figures 11 and 12: All returns are in USD. *Backtest performance is not indicative of the past or future performance of any SSGA offering. The portion of results through November 2016 represents a backtest of the SSGA Quality Tilted model, which means those results were achieved through the retroactive application of a model that was developed with the benefit of hindsight. All data shown above do not represent the results of actual trading and, in fact, actual results could differ substantially, and there is the potential for loss as well as profit. The performance does not reflect management fees, transaction costs and other fees and expenses a client would have to pay, which reduce returns. Please refer to the Backtesting Methodology for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. **Past performance is not a guarantee of future results. The index returns reflect all items of income, gain and loss and the reinvestment of dividends and other income.

Market cycles tend to fall into two types based on their main causes:

- Credit/Business Cycle — traditional business cycle

- Speculative Cycle — formation of asset bubbles

In bear markets (shaded in orange), the defensive nature of quality has helped the factor fare better than the broad equity market. When the economy slows, investors tend to flock to what the industry calls "safe havens," preferring stocks that are well established, profitable and stable, and that take on less leverage. Therefore the quality tilted strategy has outperformed the market cap weighted benchmark during those periods.

In bull markets (shaded in blue), the performance of quality has been mixed. The factor generally underperforms the broad equity market — for example, during the long value run in the credit fueled bull market between 2002 and 2007, and the bull market during the three rounds of US quantitative easing (QE) at the turn of this decade. Our backtested quality tilted strategy could have outperformed the market on a gross-of-fee basis, however, during the long bull run from 1993 to 1997 and the short speculative bull market before the tech bubble burst in early 2000.

Diversifying Effect of Quality

High quality stocks tend to be those big, well-established, stable companies with solid financial status and strong earnings. The quality factor shares some similarities with the low volatility factor, in that tilting to both factors could help lower portfolio volatility. On the other hand, quality factor can behave like the opposite of the value factor, which tends to pick smaller firms that may be in financial distress and thus face difficulty in getting capital or liquidity. These similarities and differences are apparent in the correlation of quality with other common factors in the developed world (see Figure 13).

Over the full period from April 1993 to October 2016, quality is negatively correlated with value and size, and positively correlated with volatility and momentum. However, looking at three-year rolling excess returns, the correlations between quality and other factors have varied over time (see Figure 14).

During the sub-period from 1993 to 2004, quality was somewhat negatively correlated with value and size, and positively correlated with volatility and momentum. Over the subsequent period from 2004 to 2016, however, the correlation of quality and other factors has increased in magnitude. Correlation with value and size has become more negative, while the correlation with volatility and momentum has

Figure 13: Backtested Correlation of Quality with Other Factors
April 1993 to October 2016

Apr 1993–Oct 2016	SSGA Value Tilted	SSGA Volatility Tilted	SSGA Size Tilted	SSGA Quality Tilted	SSGA Momentum Tilted
SSGA Value Tilted	1.00	0.23	0.55	-0.38	-0.42
SSGA Volatility Tilted	0.23	1.00	0.00	0.49	0.09
SSGA Size Tilted	0.55	0.00	1.00	-0.40	-0.27
SSGA Quality Tilted	-0.38	0.49	-0.40	1.00	0.38
SSGA Momentum Tilted	-0.42	0.09	-0.27	0.38	1.00

Figure 14: Backtested Rolling 3-Year Correlation of Quality with Other Factors
April 1993 to October 2016

— Value vs Quality   — Volatility vs Quality   — Size vs Quality   — Momentum vs Quality
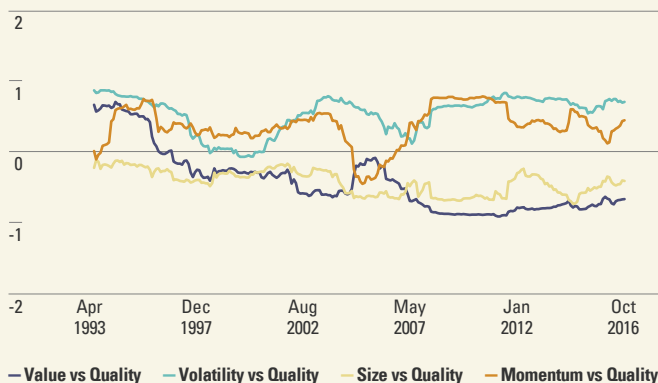
Source: SSGA, MSCI, FactSet.

For Figures 13 and 14 Backtest results are not indicative of the past or future performance of any SSGA offering. The portion of results through October 2016 represents a backtest of all SSGA Factor Tilted models, which means those results were achieved through the retroactive application of a models that were developed with the benefit of hindsight. All data shown above do not represent the results of actual trading and, in fact, actual results could differ substantially, and there is the potential for loss as well as profit. Please refer to the Backtesting Methodology for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results.

become more positive. There have also been periods when the correlations of quality with value, low volatility and momentum were all positive, as in the late 1990s.

So it stands to reason that quality could be combined with different factors to pursue various investment objectives. For example, a mix of quality and value can be a solid investment that has demonstrated both downside protection and upside potential. A 2015 white paper from MFS Investment Management studied the performance of quality as well as quality combined with value, concluding

that "owning companies that are both higher quality and inexpensively valued has been shown to be the best way to generate sustainable, long-term investment performance."

Another popular approach combines quality and low volatility into a strategy that aims to lower portfolio return volatility by capturing stable, low risk stocks along two dimensions — returns and fundamentals. For example, a portfolio constructed by first ranking stocks by equally weighted quality and volatility factors, then applying a simple tilt to the underlying cap weight, could have delivered annually a gross backtested excess return of 191 basis points and a return volatility reduction of 269 basis points relative to a cap weighted developed market benchmark over the period from April 1993 to June 2016.*

Quality can also be combined with both value and low volatility to construct a balanced strategy for the long term. Investing in value seeks stocks that are attractively priced, low volatility seeks stocks whose returns are relatively stable over time (and tend to hold up better in down markets) and quality seeks stocks that are profitable with whose relatively stable earnings over time and low debt-to-equity ratios. Most investors would agree these three are all good attributes in stocks.

In his 1989 shareholder letter, Warren Buffet summed up his investment philosophy simply: "It's far better to buy a wonderful company at a fair price than a fair company at a wonderful price." Frazzini, Kabiller and Pedersen (2012) make the argument that a significant proportion of Berkshire Hathaway's returns — that is, Buffett's "magic" — can be explained by value, low volatility and quality. Combining these factors has turned out to produce attractive diversification benefits. Likewise, SSGA's Developed Market Multi-Factor Strategy, which equally combines quality, value and low volatility with a tilting framework, could have resulted annually in 179 basis points of gross backtested excess return and 178 basis points of volatility reduction over a cap weighted benchmark from April 1993 to June 2016.*

All returns are in USD.

*Backtest performance is not indicative of the past or future performance of any SSGA offering. The portion of results through June 2016 represents backtests of SSGA single factor and Multi-Factor models, which means those results were achieved through the retroactive application of a model that was developed with the benefit of hindsight. All data shown above do not represent the results of actual trading and, in fact, actual results could differ substantially, and there is the potential for loss as well as profit. The performance does not reflect management fees, transaction costs and other fees and expenses a client would have to pay, which reduce returns. Please refer to the Backtesting Methodology for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results.

Summary

Quality investing took shape as an idea in the 1930s, and fundamental investors have included quality in their stock selection processes for a long time. However, it was not until much later that quality was adopted in the quantitative research world — likely because quality can be a more subjective matter. While the definition of quality has varied among investors, the industry's most widely accepted and adopted quality attributes are high profitability, stable earnings and low leverage.

Empirical evidence has shown that higher quality stocks have significantly outperformed their lower quality peers, with higher returns, lower return volatility and higher Sharpe Ratios. And now with the popularity of Smart Beta investing, investors can access the quality factor through very low cost, transparent and objective investment strategies to capture the quality premium. Quality can also be combined in a Smart Beta framework with other factors such as value and low volatility to target various investment objectives — participating in the upside, protecting against the downside and enhancing the potential for diversification.

In our view, investors considering a factor-based approach need to understand that not all index providers define quality in the same way. Nor do other Smart Beta methodologies generate broad-based portfolios with moderate tracking error, as does the SSGA quality tilting framework. This is especially important for investors who would like to gain exposure to the quality factor, but whose tolerance or budget for risk is constrained.

[1] In Graham's 1934 book *Security Analysis*, co-authored with David Dodd, he proposed defensive investment in stocks trading below their tangible book value as a safeguard against adverse future developments often encountered in the stock market.

[2] Russell's quality score is an equal combination of three quality variables (return on assets, earnings variability and leverage), while the volatility score is an equal combination of one-year price volatility and five-year price volatility.

[3] MSCI's quality factors are return on equity (trailing 12-month EPS / latest book value per share), debt to equity (total debt / book value) and earnings variability (standard deviation of year/year EPS growth over the past five fiscal years).

[4] Profitability comprises three equally weighted variables (return on assets, changes in asset turnover, and accruals), while leverage is measured by net operating cash flow divided by total debt.

[5] We use the term 'safe haven' not to imply that some assets or investments are devoid of risk, but rather in reference to the widely-used industry term. All investing carries risk of loss or principal and/or gains.

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Backtesting Methodology for Tilted and Multi-Factor Strategies

The backtested performance shown was created by the Global Equity Beta Solution teams at SSGA. The data used were only what would have been available at the time the historical portfolios were generated, not what is available now. These processes help eliminate various forms of survivorship bias, both in terms of a "smarter model" and in terms of making decisions based on information that was not available at the time. The backtested performance depicted is not reflective of any SSGA investment product or Strategy, and is provided only as an illustrative example of nonspecific Smart Beta investment processes, over the period from April 1993 to November 2016.

The testing methodology is a rules-based process to generate historical portfolios. All stocks in the universe are ranked and allocated into different buckets according to their corresponding size scores. A multiplier is then applied to each bucket so that each stock's cap weight is tilted by this ratio. To form the final portfolio, the final security weight is then normalized such that the total weight sums to 100%.

The backtest results shown do not represent the results of actual trading using client assets but were achieved by means of the retroactive application of an investment process that was designed with the benefit of hindsight, otherwise known as backtesting. Thus, the performance results noted above should not be considered indicative of the skill of the advisor or its investment professionals. The backtested performance was compiled after the end of the period depicted and does not represent the actual investment decisions of the advisor. These results do not reflect the effect of material economic and market factors on decision making. In addition, backtested performance results do not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risks associated with actual investing.

No representation is being made that any client will or is likely to achieve profits or losses similar to those shown. In fact, there are frequently significant differences between backtested performance results subsequently achieved by following a particular strategy.

The backtested performance may be reported on a gross of fees basis. Additional fees, such as the management fee, would reduce the return of an investment product that used one of these investment processes. For example, if an annualized gross return of 10% was achieved over a 5-year period and a management fee of 1% per year was charged and deducted annually, then the resulting return would be reduced from 61% to 54%. The performance includes the reinvestment of dividends and other corporate earnings and is calculated in US dollars.

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