FRANKLIN TEMPLETON INVESTMENTS

Franklin LibertyShares™

Topic Paper

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Advancements in Smart Beta Index Design: Not All Factors Are Created Equal

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Since the 1970s, investment strategies that seek to track cap-weighted indexes have become an increasingly popular choice for many investors. While these strategies offer broad market exposure, they also have limitations.

This paper explores some of the shortcomings of cap-weighted index investing and presents the results of our research, which suggests that designing an index around criteria other than market cap may offer investors an attractive alternative.

As an individual stock's price rises, its market capitalization increases. If its price rises more than other stocks, then its weighting in a cap-weighted index will also grow. This occurrence results in concentrations in large- and mega-capitalization stocks, and expensive stocks, which may carry unwanted risks.

In recent years, more advanced approaches to index construction have emerged that seek to improve on capitalization-weighted indexes. Sometimes called *Smart Beta*,[1] these indexes are constructed based on criteria other than market capitalization, and the methodologies behind them range from simple to relatively complex.

At Franklin Templeton, we set out to develop a rules-based index methodology grounded in research-based insights that could serve as a component of an investor's core portfolio.

THIS PAPER LAYS OUT OUR BELIEF THAT:

1. **A factor approach represents a step forward in index design**
2. **Combining multiple factors into a single index may improve portfolio diversification**
3. **Customized factor definitions and weights may be combined to pursue market returns with lower volatility, to seek better risk-adjusted returns**

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1 Capitalization-Weighted Indexes: Market Exposure with Unexpected Risks

Many investors hold index funds at the core of their portfolios. These funds generally replicate market cap-weighted indexes like the MSCI All Country World Index (MSCI ACWI Index), the S&P 500 Index or the FTSE All-World Index. These funds have long been considered a simple way to gain broad market exposure. However, it is important to understand how market cap weighting works and how it can affect investment results.

By design, cap-weighted indexes are more heavily weighted in the largest companies in a given universe. As illustrated in Figure 1, these indexes have several characteristics that may not be widely recognized: They lean toward large-cap stocks because indexes include stocks in proportion to their market capitalization; the largest holdings tend to be over-valued; and they may include unexpected concentrations of stocks in a few industries or countries.

These limitations may have a meaningful impact on investor outcomes, which is why we believe a different approach to index construction may better meet investor needs.

Figure 1: Hidden Concentrations in Cap-Weighted Indexes

Large- and Mega-Cap Stocks

Largest 2% of companies in the MSCI ACWI Index account for 26% of the index.

Over-Valued Stocks

Of the largest 10 stocks in the MSCI ACWI Index, 70% are overvalued.*

Sector Weights

Increases in sector concentration such as technology or commodities have at times created additional risk, and could drag down overall index performance.

Geographic Weights

The largest three countries in the MSCI Emerging Markets Index account for over 50% of the index.

*1/1/07–12/31/16. Based on current price-to-earnings (P/E) versus 10-year average P/E.
Source: FactSet, MSCI, as of 3/31/17.

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2 Smart Beta: A Step Forward

A Smart Beta approach includes stocks in an index based on criteria other than market capitalization. One of the simplest approaches weights each security equally rather than weighting them by market capitalization. Others take a quantitative approach that systematically analyzes, selects, weights and rebalances portfolio holdings based on certain characteristics—called factors—with some focusing on a single factor and others combining factors in a single index.

A factor is a primary characteristic of a stock that helps explain its risk/return behavior over time. Decades of academic research supports the validity of factors' impact on stock price movement. Examples of underlying factors that researchers have cited as delivering risk premia over time include:

- **Quality:** As early as the 1930s, Benjamin Graham at Columbia Business School recognized that companies with solid balance sheets, good profitability and continuous earnings growth performed better than other stocks over long periods.[2]
- **Value:** Also in the 1930s, Benjamin Graham and his colleague David Dodd confirmed that so-called value stocks systematically outperform growth stocks. Then, in the 1990s, Fama and French published their findings that value stocks have outperformed growth stocks.[3]
- **Low Volatility:** In the 1970s, Michael Jensen and Fischer Black demonstrated that low volatility stocks outperformed stocks with higher volatility over prolonged periods. This seems counterintuitive, because many traditional models predict that investments with higher volatility should yield higher returns. Nevertheless, Jensen and Black's results have been borne out by multiple studies since their initial paper.[4]

> "It is precisely because these factors have delivered risk premia over time that index providers have developed indexes designed to track their performance."

- **Momentum:** In the 1990s, Jegadeesh and Titman[5] were among the first to demonstrate that buying stocks that have performed well in the past, and selling stocks that have performed poorly in the past, generated significant positive returns over three- to 12-month holding periods. In 1997, Carhart demonstrated how such a strategy could be implemented.[6]

It is precisely because these factors have delivered risk premia over time that index providers have developed indexes designed to track their performance. Figure 2, on the following page, illustrates how four of these factor indexes have performed versus a comparable market cap-weighted index.

- MSCI ACWI Quality Index
- MSCI ACWI Value Index
- MSCI ACWI Momentum Index
- MSCI ACWI Minimum Volatility Index

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Figure 2: Several Factors Have Outpaced the MSCI ACWI Index

MSCI ACWI Factor Indexes: Growth of $10,000
November 2002–December 2016

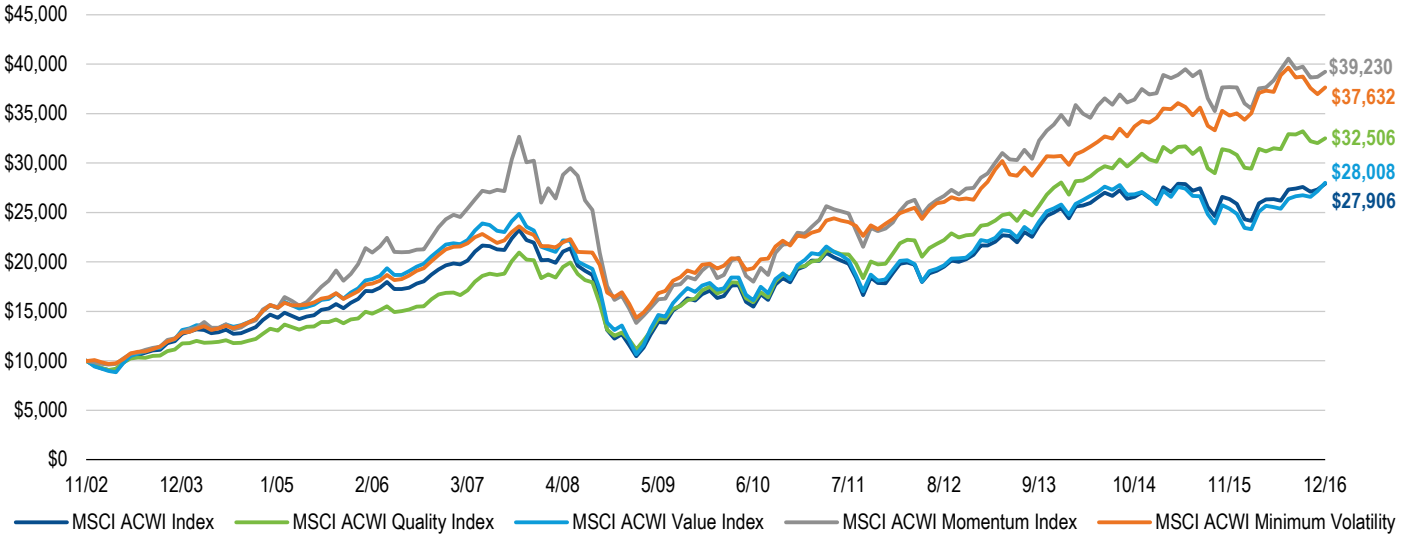

Figure 3: Different Factors Have Delivered over Different Timeframes

Calendar Year Returns (%): MSCI Factor Indexes (USD)
2007–2016

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Momentum	Minimum Vol	Quality	Momentum	Minimum Vol	Momentum	Momentum	Minimum Vol	Minimum Vol	Value
24.39	-25.56	35.97	15.95	5.34	17.54	26.84	10.95	2.76	12.57
Quality	Quality	Value	Minimum Vol	Momentum	Value	Quality	Quality	Momentum	Minimum Vol
19.52	-36.24	31.70	14.32	1.93	15.55	23.24	8.22	1.94	7.43
Minimum Vol	Value	Momentum	Quality	Quality	Quality	Value	Momentum	Quality	Quality
6.95	-41.53	19.29	11.47	1.56	14.95	22.43	5.92	1.48	5.53
Value	Momentum	Minimum Vol	Value	Value	Minimum Vol	Minimum Vol	Value	Value	Momentum
6.67	-45.16	17.16	10.22	-7.35	10.06	16.90	2.86	-6.26	4.21

MSCI ACWI Quality Index | MSCI ACWI Value Index | MSCI ACWI Momentum Index | MSCI ACWI Minimum Volatility Index

Source: MSCI. **Past performance is not an indicator or a guarantee of future performance. Factor index performance is derived from back-tested pre-inception performance and is not representative of any ETF's performance.** MSCI ACWI Quality Index was incepted on 12/18/12, MSCI ACWI Momentum Index was incepted on 2/15/13, MSCI ACWI Minimum Volatility Index was incepted on 11/30/09, MSCI ACWI Value Index was incepted on 12/8/97. While the information is based on hypothetical pre-inception index returns for MSCI ACWI Quality Index, MSCI ACWI Momentum Index, MSCI ACWI Minimum Volatility Index and MSCI ACWI Value Index, they do not represent any ETF's actual performance. They provide a general indication of the risk/return profile of the respective MSCI single factor indexes. Index returns are adjusted for withholding taxes. Returns data represents average annual total returns and assumes reinvestment of interest or dividends. Indexes are unmanaged, and one cannot invest directly in an index. They do not reflect any fees, expenses or sales charges.

As we can see in Figure 3 above, individual factor performance has varied considerably from year to year over the past decade as each factor has swung in and out of favor. Given this variability in performance, it may be difficult for investors to predict which factors would be in favor in a given time period. Even if such prediction were possible, frequently switching from factor to factor could increase an investor's transaction costs; moreover, it would be time consuming to execute. Given these considerations, investors may instead wish to consider combining factors into a single investment in the context of their investment goals and time horizon.

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3 Factor Combinations: The Importance of Weights and Measures

Our proprietary research helped us identify a mix of factors that could pursue market returns with lower risk than the cap-weighted index—one that would potentially serve as an attractive component for an investor's core portfolio. This research focused on both factor measures and factor weights.

Our approach was grounded in academic research on factor behavior, insights from Franklin Templeton's bottom-up fundamental investing expertise and our extensive quantitative capabilities.

We examined two hypothetical scenarios versus the MSCI ACWI Index:

- An equal-weighted combination of four factors measured using Franklin Templeton's definitions described below
- A combination of these same Franklin Templeton-defined factors in strategic weights

Custom factor measures and weights that are based on Franklin Templeton's definitions are identified as "LibertyQ" in our analysis.

Reconsidering factor measures. While standard approaches to measuring factor exposure are widely accepted, we sought to determine whether custom factor measures could provide a more comprehensive and nuanced evaluation of a stock's exposure to each factor.

As fundamental active managers, Franklin Templeton looks to identify attractively priced companies with strong balance sheets. In conducting our analysis, we focused on those factors—Quality and Value—that are philosophically consistent with this approach and are grounded in economic rationale. We believe the desired attributes are reflected in these factors. We also believe these factors complement each other as we seek to identify attractive stocks.

Following are Franklin Templeton's definitions for Quality and Value:

LibertyQ Quality Factor: Quality has several definitions in the market place, with measurement sometimes limited to a single metric. By contrast, Franklin Templeton's measurement criteria seek to replicate traditional financial statement analysis. That is why our comprehensive measures include return on equity ratio (ROE); cash return on assets (ROA); leverage (average of market leverage, book leverage and debt-to-assets); and five-year earnings variability. We believe the inclusion of cash ROA provides an additional measure of company quality and helps mitigate accounting differences across many different countries. In addition, we believe that including three leverage metrics paints a more complete picture of a company's debt quality.

Figure 4: Franklin Templeton Factor Measures vs. Standard MSCI Factor Measures

Performance Statistics: 14 Years Annualized
As of December 31, 2016

	LibertyQ Quality Factor	MSCI ACWI Quality Factor Index	LibertyQ Value Factor	MSCI ACWI Value Factor Index	LibertyQ Low Volatility Factor	MSCI ACWI Minimum Volatility Factor Index	LibertyQ Momentum Factor	MSCI ACWI Momentum Factor Index
Annualized Return (%)	12.65	9.66	13.26	8.82	12.07	10.03	11.82	10.03
Standard Deviation (%)	13.99	11.49	18.11	13.63	9.77	9.24	14.53	14.43
Tracking Error*	4.21	3.74	7.37	2.44	6.55	6.36	6.18	6.65
Annualized Excess Return (%)*	4.17	1.19	4.79	0.35	3.60	1.56	3.34	1.56
Information Ratio*	0.99	0.32	0.65	0.14	0.55	0.24	0.54	0.24

*Annualized excess return, tracking error, and information ratio for each factor were calculated versus the MSCI ACWI Index.

Source: Franklin Templeton, MSCI. **Past performance is no guarantee of future results.** MSCI factor index performance is derived from back-tested pre-inception performance for MSCI ACWI Quality Index (incepted 12/18/12); MSCI ACWI Momentum Index (incepted 2/15/13); MSCI ACWI Minimum Volatility Index (incepted 11/30/09); and MSCI ACWI Value Index (incepted 12/8/97). LibertyQ factor data represents hypothetical, back-tested performance calculated by Franklin Templeton for factor methodology research purposes. It does not represent any ETF's actual performance. It is not possible to invest directly in a factor. Index returns assume reinvestment of interest or dividends and are adjusted for withholding taxes. Risk is measured by the annualized standard deviation of monthly total returns. Indexes are unmanaged, and one cannot invest directly in an index. They do not reflect any fees, expenses or sales charges.

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LibertyQ Value Factor: Franklin Templeton's measurement of Value applies a blend of trailing and forward earnings/price ratios because we believe it provides a more nuanced calibration of a firm's outlook from a valuation perspective. In addition, we utilize another metric—dividend yield—which others often consider a stand-alone factor but we include it as one of our criteria.

Please see Appendix 2 for description and rationale for all Four LibertyQ factor measures.

Figure 4, on the previous page, demonstrates how LibertyQ factor definitions improved risk-adjusted performance compared with standard factor measures. As we can see, the information ratios for the LibertyQ Quality, Value, Low Volatility and Momentum factors were substantially better than the standard measures.

LibertyQ factor weights. Weighting each factor equally would clearly be the simplest approach to constructing a multi-factor Smart Beta index. As active managers, however, Franklin Templeton recognizes that not all factors are created equal.

In pursuit of persistent returns, factor weightings should be rooted in a strong economic rationale, which we believe is best represented by Quality and Value. This approach is consistent with Franklin Templeton's active management philosophy. By contrast, we believe that factors such as Momentum and Low Volatility should have less emphasis in factor allocations.

As we considered the relative weightings of Quality and Value, we noted that the LibertyQ Quality factor clearly produced higher risk-adjusted returns than the LibertyQ Value factor, with information ratios of 0.99 and 0.65, respectively, as shown in Figure 5 below. Consequently, we have assigned a 50% weighting to the Quality factor and a 30% weighting to the Value factor. We believe these weightings tilt sufficiently toward Quality to make a meaningful difference in returns over time while also retaining balance and helping to ensure diversification.

Momentum and Low Volatility also play important—if smaller—roles in Franklin Templeton's factor weights. With each assigned a 10% weight, Momentum may help identify investment trends

Figure 5: LibertyQ Quality Factor vs. LibertyQ Value Factor

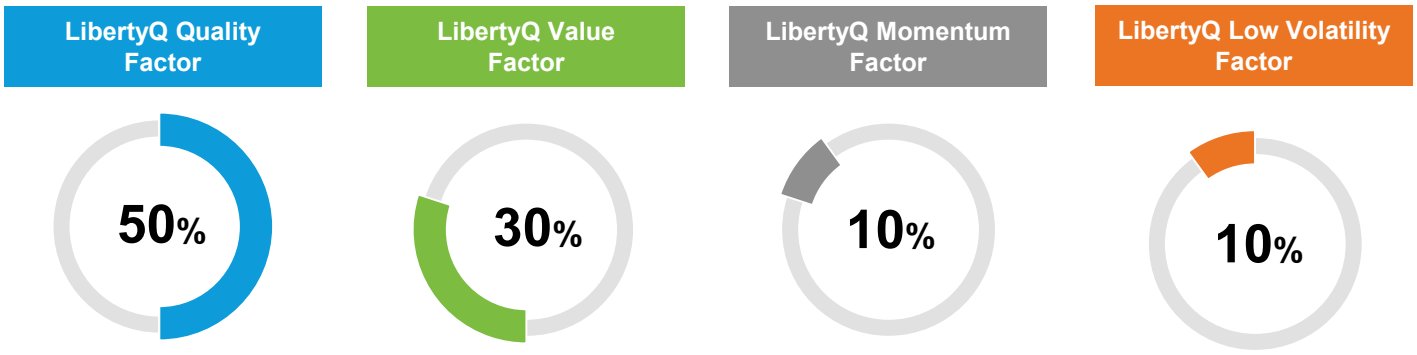
Performance Statistics: 14 Years Annualized
As of December 31, 2016

	LibertyQ Quality Factor	LibertyQ Value Factor
Annualized Return (%)	12.65	13.26
Standard Deviation (%)	13.99	18.11
Tracking Error*	4.21	7.37
Annualized Excess Return (%)*	4.17	4.79
Information Ratio*	0.99	0.65

*Annualized excess return, tracking error and information ratio for each factor were calculated versus the MSCI ACWI Index.

Source: Franklin Templeton, MSCI. **Past performance is no guarantee of future results.** LibertyQ factor data represents hypothetical, back-tested performance calculated by Franklin Templeton for factor methodology research purposes. It does not represent any ETF's actual performance. It is not possible to invest directly in a factor. Risk is measured by the annualized standard deviation of monthly total returns.

Factor Weights: An Emphasis on Quality and Value



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and avoid value traps, while Low Volatility may help provide a defensive measure against market downturns.

We then examined performance characteristics of two different scenarios that use Franklin Templeton's custom factor measures—one that combined factors in equal weights, and a second that combined factors based on the strategic weights outlined above—and compared them to the MSCI ACWI Index. Results of our analysis presented in Figure 6 yield two insights for the 10-year time period:

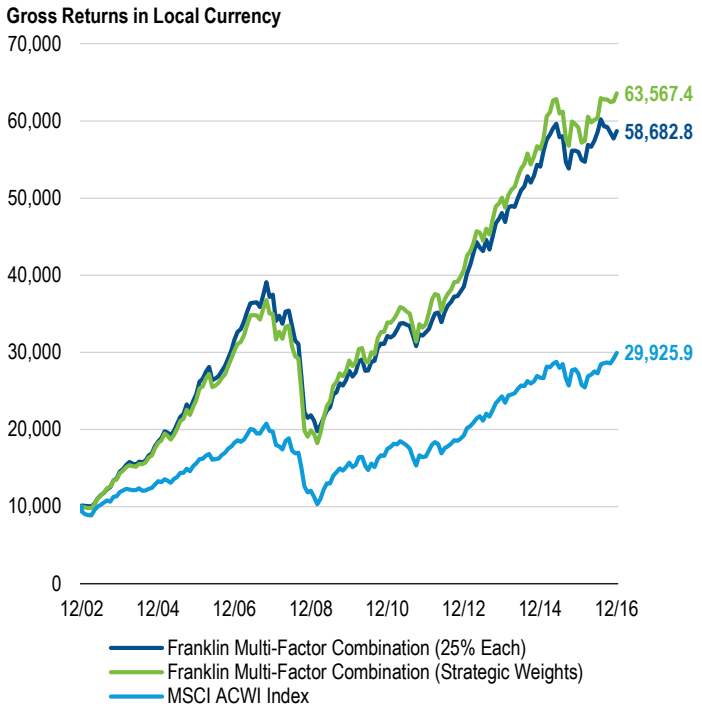
- **Combining LibertyQ factor measures in equal weights** improved hypothetical risk-adjusted returns (as measured by Sharpe ratio and information ratio) versus the MSCI ACWI Index
- **Combining LibertyQ factor measures using the strategic weights** presented in Figure 5 yielded even stronger hypothetical absolute and risk-adjusted returns

Our research set out to determine whether factor methodology refinements could yield market returns with lower risk than the cap-weighted index. The results were encouraging: We learned that more rigorous definitions of factors, as well as factor weights rooted in a solid economic rationale, each had a positive impact on overall returns. Moreover, they yielded improved hypothetical returns—both on an absolute and risk-adjusted basis.

> "We learned that more rigorous definitions of factors, as well as factor weights, rooted in a solid economic rationale each had a positive impact on overall returns."

Figure 6: Research Results: Various Factor and Weighting Scenarios

Growth of 10K: 14-Year Period
As of December 31, 2016



Performance Statistics: 14 Years Annualized
November 2002–December 2016

	Annualized Return (%)	Sharpe Ratio	Tracking Error	Info. Ratio	Up Capture Ratio (%)	Down Capture Ratio (%)	Cumulative Return (%)
Franklin Multi-Factor (Strategic Weights)	**14.13**	**0.97**	**4.66**	**1.21**	**105.72**	**72.20**	**535.98**
Franklin Multi-Factor (25% Each)	13.34	1.02	6.09	0.80	94.45	59.58	477.56
MSCI ACWI Index	8.47	0.55	0.00	N/A	100.00	100.00	212.23

Performance for the MSCI ACWI Index represents actual performance. Franklin Templeton's combined-factor analysis (equal-weighted and strategic weights) represents hypothetical, back-tested performance calculated by Franklin Templeton for factor methodology research purposes. The actual performance of any exchange-traded product may vary significantly from the pre-inception data presented due to assumptions regarding fees, transaction costs, liquidity or other market factors.

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4 An Index Designed to Pursue Market Upside with Less Downside

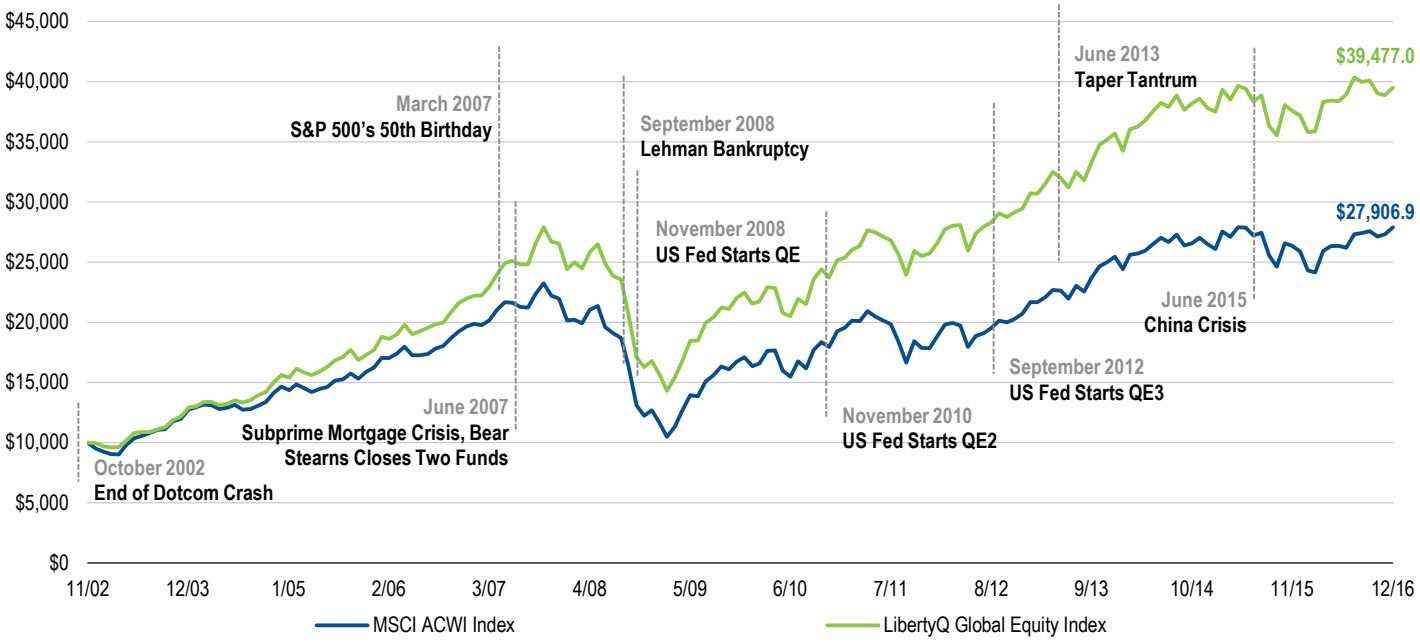
These insights were applied in developing the rules-based index methodology that forms the foundation for LibertyQ Global Equity Index, LibertyQ Emerging Markets Index and LibertyQ International Equity Hedged Index. The analysis below presents the back-tested performance of LibertyQ Global Equity Index versus the MSCI ACWI Index.

As illustrated in Figure 7 below, LibertyQ Global Equity Index delivered attractive hypothetical performance in both absolute terms and on a risk-adjusted basis. The index also demonstrated significant downside protection, which was important during the 2008–2009 recession and during the so-called taper tantrum in 2013, when the US Federal Reserve (Fed) announced it would be halting its policy of quantitative easing.

The sample period included a variety of market environments: relatively stable markets between 2002 and 2007, the worldwide credit crunch between 2007 and 2009, quantitative easing (QE) by the Fed between 2009 and 2014, and the tightening of US monetary policy from 2014 onward. Testing the rules-based methodology in all kinds of market conditions contributes, we believe, to the robustness of the results.

Figure 7: LibertyQ Global Equity Index: Better Performance over Time

MSCI ACWI Index and LibertyQ Global Equity Index: Growth of $10,000
November 2002–December 2016



Annualized Performance Statistics
November 2006–December 2016

	Annualized Return (%)	Annualized Sharpe Ratio	Tracking Error	Annualized Information Ratio	Upside Capture (%)	Downside Capture (%)	Cumulative Return (%)
MSCI ACWI Index	7.57	0.47	0.00	—	100.00	100.00	179.63
LibertyQ Global Equity Index	**10.24**	**0.69**	**3.68**	**0.73**	**96.10**	**79.74**	**294.77**

Past performance is no guarantee of future results. Source: MSCI. Performance for MSCI ACWI Index represents actual performance. LibertyQ Global Equity Index was incepted on 4/18/16 and hypothetical performance shown is calculated and presented by MSCI and represents back-tested pre-inception index performance. LibertyQ Global Equity Index is based on the MSCI ACWI Index. It was developed using a methodology developed with Franklin Templeton to reflect Franklin Templeton's desired investment strategy. LibertyQ indexes are unmanaged and one cannot invest directly in an index. The hypothetical, back-tested pre-inception performance data of LibertyQ Global Equity Index does not reflect the deduction of fees/charges applicable to the Franklin LibertyQ ETFs and the actual performance of the ETFs may vary significantly from the pre-inception performance results. Returns data assumes reinvestment of interest or dividends. The Franklin LibertyQ ETFs are not sponsored, endorsed, issued, sold or promoted by or affiliated with MSCI Inc. MSCI Inc. does not make any representation regarding the advisability of investing in the Franklin LibertyQ ETFs. See the prospectus or statement of additional information Franklin LibertyQ ETFs for further information.

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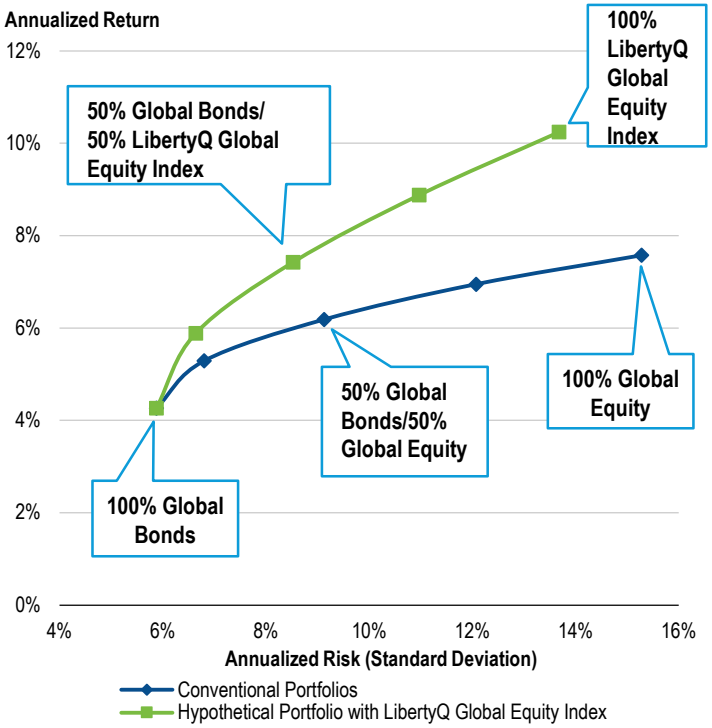
Figure 7 on page 8 offers several insights about LibertyQ Global Equity Index's returns for the period:

1. **Better absolute returns:** The LibertyQ Global Equity Index yielded higher annualized returns than the cap-weighted index. Cumulatively, over the 14-year period, this meant a two-thirds better return compared to the MSCI ACWI Index.
2. **Improved risk-adjusted returns:** The risk-adjusted performance of the LibertyQ Global Equity Index—as evidenced by its Sharpe ratio—also outshone that of its cap-weighted counterpart. Just as important, its information ratio, which many investors see as an indication of consistency, was greater than 1, which is generally considered a healthy number.
3. **Better downside protection:** Notwithstanding its higher return, LibertyQ Global Equity Index offered better resistance to market declines during this time period, capturing just 79.74 of the MSCI ACWI Index's downside.
4. **A history of improved risk and return as part of a core portfolio:** Our analysis suggests that using LibertyQ Global Equity Index as part of a core allocation could complement or replace a capitalization-weighted portfolio or be used alongside an active manager. Whatever the approach, we believe it can be an attractive addition for many different types of investors. Figure 8 illustrates how adding various allocations of LibertyQ Global Equity Index to a passive portfolio could have improved investment outcomes.

Figure 8: LibertyQ Global Equity Index Helped Move the Efficient Frontier

Risk/Return Allocation Frontier (USD)
December 2002–December 2016



Performance data represents pre-inception hypothetical performance, which does not guarantee future results. *The actual performance of any exchange-traded product may vary significantly from the pre-inception data presented due to assumptions regarding fees, transaction costs, liquidity or other market factors.*

Source: MSCI. Performance for MSCI and Barclays indexes presented above represents actual performance. LibertyQ Global Equity Index was incepted on 4/18/16 and hypothetical performance shown is derived, calculated and presented by MSCI and represents back-test pre-inception performance. This information combines back-tested returns for the LibertyQ Global Equity Index with returns for the indexes identified above. The LibertyQ Global Equity Index is based on the MSCI ACWI Index. It was developed using a methodology developed with Franklin Templeton to reflect Franklin Templeton's desired investment strategy. LibertyQ Global Equity Index is unmanaged and one cannot invest directly in an index. The hypothetical, back-tested pre-inception performance data of the LibertyQ Global Equity Index does not reflect the deduction of fees/charges applicable to the Franklin LibertyQ ETF and the actual performance of the ETF may vary significantly from the pre-inception performance results. Returns data assumes reinvestment of interest or dividends. The Franklin LibertyQ ETFs are not sponsored, endorsed, issued, sold or promoted by or affiliated with MSCI Inc. MSCI Inc. does not make any representation regarding the advisability of investing in the Franklin LibertyQ ETFs. See the prospectus or statement of additional information Franklin LibertyQ ETFs for further information.

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5 LibertyQ Global Equity Index: Toward a Stronger Core Portfolio

Market cap-based indexes serve a useful purpose as indicators of broad market performance. When it comes to constructing an investment portfolio, however, decades of research have demonstrated the effectiveness of factor investing.

Franklin Templeton has now applied its expertise, conducting extensive research to design an advanced model that is reflected in the LibertyQ multi-factor indexes—an approach that we believe will create stronger core portfolios.

Chandra Seethamraju, Ph.D.
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ABOUT THE AUTHOR

Chandra Seethamraju is a vice president and director of systematic modeling within Franklin Templeton Solutions, focusing on conducting empirical research to support the different investment strategies that the group offers. He is also responsible for developing the models and the methodology that underlies Franklin Templeton's Smart Beta ETFs. Prior to joining Franklin Templeton Investments in 2013, Chandra was a vice president and senior research analyst at Mellon Capital Management in San Francisco where he developed quantitative active equity stock selection strategies for seven years. Prior to that, Chandra spent six years as an assistant professor at Olin Business School, Washington University in Saint Louis, focusing on academic equity research.

Chandra earned his Ph.D. in business administration from NYU's Stern School of Business, an M.B.A. in finance from Drexel University and a bachelor's degree in commerce from Osmania University in Hyderabad, India. He is a Chartered Accountant (Institute of Chartered Accountants of India, inactive).

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Appendix 1: LibertyQ Global Equity Index Construction

LibertyQ Global Equity Index applies a quantitative, rules-based methodology to select approximately 25% of stocks from broader market cap-weighted indexes. Stocks are selected based not on their market caps, but rather on their fundamental characteristics. Here is a step-by-step guide to the process:

The starting point for the LibertyQ Global Equity Index is the MSCI ACWI Index, which captures large- and mid-cap stocks across 23 developed markets and 23 emerging-market countries. With 2,490 constituents (as of January 2016), the MSCI ACWI Index covers approximately 85% of investable equities globally.

1. Each of the MSCI ACWI Index's constituents is awarded a score in each of the above criteria: Value, Quality, Low Volatility and Momentum.
2. These scores are normalized (~N(0,1)), removing outliers beyond -3 and +3.
3. The weight for each factor is applied to each stock's scores: 50% of each stock's quality score, 30% of its value score, 10% of its low volatility score and 10% of its momentum score.
4. The composite score represents the sum of the weighted factor scores.
5. Based on these composite scores, the investment universe (in this case the MSCI ACWI Index) is re-ranked. Only the top 600 stocks, approximately 25% of the market universe, are included in the LibertyQ Global Equity Index. The factor scores for each stock in the LibertyQ Global Equity Index are multiplied by its market cap to obtain a factor-tilted index weighting for each stock. The maximum weight per stock is 1%.

The diagram on the next page offers a hypothetical example of how each stock is scored.

Overview: Index Construction Methodology

Parameter	ACWI
Universe	Parent Index (ACWI)
Variables	• **Quality Z-Score:** ROE, five-year, YOY, EPS variability, cash ROA, leverage • **Value Z-Score:** P/E, P/E fwd with 10% weight to yield for ex financials, P/B with 10% weight to yield for financials • **Momentum Z-Score:** 12-month and six-month risk-adjusted momentum • **Volatility Z-Score:** Historical Barra beta calculated based on 104-week return • **Region Relative Z-Scores** • Z-Scores Winsorized at +-3
Selection	• **Custom Weighted Z-Score:** 50% Quality + 30% Value + 10% Momentum + 10% Low Volatility • Top 600 securities by composite Z-score
Weighting	• Factor tilt weighting (factor score market cap)
Constraints	• Security weight capped at 1%
Rebalancing	• Semi-annual rebalancing • 50% stock selection buffers for top 600 securities selected based on Z-score • 50% turnover buffer

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The Franklin Templeton Factor Methodology: A Hypothetical Example

		HYPOTHETICAL STOCK			
		QUALITY 50%	**VALUE** 30%	**MOMENTUM** 10%	**LOW VOLATILITY** 10%
1 APPLY FACTOR MEASURES	Factor exposures measured based on pre-defined quantitative criteria	Return on Equity (ROE); Earnings Variability; Cash Return on Assets; Leverage	Blended P/E (average of Trailing and Forward); Dividend Yield; Financials–P/B, Dividend Yield	Six-Month Risk-Adjusted Price Momentum; 12-Month Risk-Adjusted Price Momentum	Historical beta based on two-year weekly returns
2 CALCULATE FACTOR SCORE	Individual factor scores range from +3 to -3	**3**	**-2**	**1.2**	**-2**
3 CALCULATE WEIGHTED FACTOR SCORE	Factor scores multiplied by factor weights create weighted factor scores	**1.5**	**-0.6**	**0.12**	**-0.2**
4 CALCULATE COMPOSITE SCORE	The sum of weighted factor scores creates a composite score for each stock	**0.82**			
5 CREATE CUSTOM INDEX	Stocks are re-ranked based on their Composite Scores. Those that rank in the top 25% are included in the LibertyQ Index	A stock is included or excluded from the LibertyQ Index depending on the ranking of its composite score versus other stocks in the universe			

The above information is for illustrative purposes only. It represents a hypothetical example of Franklin Templeton's factor scoring methodology and does not represent any stock included in a LibertyQ index.

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Appendix 2: Franklin Templeton's Factor Measures

LibertyQ Global Equity Index uses Franklin Templeton's proprietary factor definitions. In our view, these definitions paint a more complete and accurate picture of stocks' factor exposures.

	Factor Measurement	Rationale
Quality	• Return on equity ratio (ROE) • Cash return on assets (ROA) • Average of market leverage, book leverage and debt-to-assets ratio • Five-year earnings variability	• Inclusion of cash ROA provides an additional measure of company quality • Cash ROA is more resistant to accounting choices than other measures • Inclusion of three leverage measures, instead of one, paints a more complete picture
Value	**Ex-Financials:** • Blended P/E (average of trailing and forward) • Dividend yield **Financials:** • Price-to-book value (P/B) • Dividend yield	• Combining forward-looking and trailing P/E helps identify companies that are both attractively valued and poised for strong performance
Low Volatility	• Historical Barra beta, based on 104-week return	• Market-observed variable • LibertyQ Global Equity Index applies best industry standards
Momentum	• Six-month risk-adjusted price momentum • 12-month risk-adjusted price momentum	• Risk-adjusted price momentum may provide a more nuanced signal of directional price movements, which may be more likely to persist • Inclusion of six- and 12-month measure examines both near- and medium-term historical behavior

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1. *Smart Beta* falls in the same group of solutions that investors refer to as strategic beta, enhanced beta, advanced beta, factor investing, fundamental indexing, enhanced indexing or similar names. All these terms have one thing in common: They refer to indexes in which an individual security's weight is not determined by its market cap but by some other, non-market cap-related factor.
2. Source: Graham, Benjamin and Dodd, David L., *Security Analysis*, 1934.
3. Source: Fama, E.F. and French, K.R., "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics*, 1993, Volume 33, Issue 1, 3–56.
4. Source: Jensen, M.C., ed. Studies in the Theory of Capital Markets, New York: Praeger, 1972.
5. Source: Jegadeesh, N. and Titman, S., "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency," *Journal of Finance*, Volume 48, Issue 1, March 1993, 65–91.
6. Source: Carhart, M., "On Persistence in Mutual Fund Performance," *Journal of Finance*, Volume 52, Issue 1, March 1997, 57–82.

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