

# **Smart Beta Equities Multi-Factor Strategy**

*Prepared for the Employees'  
Retirement System of Rhode Island*

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# Executive Summary

- We propose to modify the existing multi-factor strategy by changing the way security weights are determined
- In the current strategy, security weights are determined by a rules-based approach whereby securities are ranked on their factor characteristics, and a multiplier applied such that high ranked securities are overweighted and low ranked securities are underweighted relative to benchmark weights.
- In the proposed strategy, security weights will be determined by applying an algorithm based on extension of mean-variance theory to factors. This approach balances the factor characteristics (or exposures) of the portfolio with other objectives including risk and turnover. Specifically the algorithm is designed to maximize the exposure of the portfolio to the Value, Quality, and Momentum factors while simultaneously minimizing risk and turnover, producing a more efficient portfolio.
- The proposed strategy has higher Information Ratio in the backtested and live period
- The factor definitions for Value, Quality, and Momentum remain the same in both portfolios

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# Account Summary

# Employees' Retirement System of Rhode Island

## Investment Summary

As of March 31, 2018

	Market Value (\$)
Employees' Retirement System of Rhode Island Advanced Beta QVM Strategy	1,209,111,856

## Statement of Asset Changes

The following changes took place in the Employees Retirement System of the State of Rhode Island account for the period of January 1, 2018 to March 31, 2018:

	Market Value 01/01/2018 (\$)	Contributions (\$)	Withdrawals (\$)	Change in Market Value* (\$)	Market Value 03/31/2018 (\$)
Employees' Retirement System of Rhode Island Advanced Beta QVM Strategy	1,216,999,444	—	—	(7,887,588)	1,209,111,856

## Summary of Performance

Following are the gross and net returns for the Employees Retirement System of the State of Rhode Island Portfolios versus the corresponding benchmarks as of March 31, 2018:

	One Month (%)	Three Months (%)	Year to Date (%)	Last 12 Months (%)	Three Years (%)	Five Years (%)	Since Inception (%)
<b>Employees' Retirement System of Rhode Island Advanced Beta QVM Strategy</b>							<b>Oct/2015</b>
Total Returns (Gross)	-2.18	-0.64	-0.64	15.44	N/A	N/A	14.33
MSCI World Index	-2.18	-1.28	-1.28	13.59	N/A	N/A	13.44
<b>Difference</b>	<b>0.00</b>	<b>0.64</b>	<b>0.64</b>	<b>1.85</b>	<b>N/A</b>	<b>N/A</b>	<b>0.89</b>
Total Returns (Net)	-2.18	-0.65	-0.65	15.40	N/A	N/A	14.28
MSCI World Index	-2.18	-1.28	-1.28	13.59	N/A	N/A	13.44
<b>Difference</b>	<b>0.00</b>	<b>0.63</b>	<b>0.63</b>	<b>1.81</b>	<b>N/A</b>	<b>N/A</b>	<b>0.84</b>

Source: SSGA

\* Includes dividends, interest, and realized/unrealized gains and losses. Past performance is not a guarantee of future results. The calculation method for value added returns may show rounding differences. Return periods of less than one year are not annualized. The performance for Employees' Retirement System of Rhode Island Portfolios shown above is reflected on a gross and net of fees basis as of March 31, 2018. Due to SSGA FM's CTA status, beginning with the September 2012 month-end period going forward, net returns will be reflected in addition to gross returns. Net returns will be expressed net of actual management fees, actual brokerage fees and trading commissions.

Net returns will not be expressed net of administration, custody and/or other fees that may be externally negotiated. If so, net returns would be lower than what will be reflected. Investing involves risk including the risk of loss of principal. The performance includes the reinvestment of dividends and other corporate earnings and is calculated in US dollars. Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

# Background: State Street/Rhode Island Partnership

This research was previously provided to Employees Retirement System of Rhode Island (ERSRI) in 2015. Such research is being presented to new ERSRI officers to show how ERSRI came to its decision to implement strategies in the portfolio that are utilized today.

# Research Review of Original Study for RI, Starting in 2015

## Research Performed for Rhode Island Treasury in 2015

**Begun in September 2014**

### **Includes:**

- Investigation of alternative definitions of quality including ROA, Change in ROA, ROE, Asset Turnover, Earnings Variability over different horizons
- Investigation of single factor portfolio construction methods to account for differentiation in weight of factor metrics
- Investigation of the impact of sector/country neutralization in portfolio construction
- Investigation of multiple factor portfolio construction methods to account for differentiation in weight of factor metrics

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Summary of Research Conducted Between 2014–2015 for ERSRI.

# 2015 Research Summary

## Key Research Findings in 2015

### Included

- Employing Percent Change in ROA versus level of ROA does not materially change outcome
- Employing ROE produces slight improvements over ROA
- Earnings Variability and Debt to Equity are weaker signals than ROA and ROE but can be useful as diversifying measures of Quality because of their lower correlation with the former
- Employing 10-year Earnings Variability over 5-year Earnings Variability does not materially change outcome
- Adding Asset Turnover does not materially change outcome
- Downweighting Debt to Equity and treating the top four quintiles equally impacts performance positively
- Sector neutralizing and country neutralizing the portfolios reduces excess returns; country neutralizing has a greater negative impact than sector neutralizing
- Bottom-up multi-factor portfolio construction impacts performance positively over top-down construction due to non-linear interaction effects between the factors

Source: SSGA

As of July 1, 2015

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# Smart Beta Factors: Low Valuation, Low Volatility and High Quality

## Why interest in these factors?

- Intuitive, attractive security attributes
  - Low Valuation: stocks with attractive valuations relative to rest of universe
  - High Quality: stocks of companies with high profitability and stable earnings, amongst others
  - Low Volatility: stocks with more consistent returns that tend to deliver reduced downside risk
- Empirical evidence highlights the outperformance of these factors historically
- Diversification benefits of combining Low Valuation, High Quality and Low Volatility
  - We believe combining these factors can improve performance consistency

## Factor performance expectations over long term

- Low Valuation
  - Positive excess return potential in variety of market environments
  - Has been associated with higher risk; tends to deliver strongest active returns in risk-seeking environments
- High Quality
  - Positive excess return potential in variety of market environments
  - Tends to exhibit defensive, lower volatility characteristics
- Low Volatility
  - Moderate excess return potential; most attractive active returns in risk averse markets
  - Defensive, low beta; may provide downside protection and lower volatility

Diversification does not ensure a profit or guarantee against loss.

The views expressed in this material are the views of SSGA and are subject to change based on market and other conditions.

# Portfolio Summary Provided in 2015

## Three factor Portfolio

### Factor Definitions

Attribute	Definition
Valuation	<b>Price/Fundamental</b> Fundamentals: Earnings, Cash Flow, Sales, Dividend, and Book Value
Momentum	<b>Total Return</b> Total return in the recent 12 months in USD
Quality	<b>(1) Profitability, (2) Earnings Consistency, and (3) Low Leverage</b> ROE, EPS variability, LT Debt/Equity

### Portfolio Construction

- Downweight Debt to Equity relative to ROE and EPS variability
- Downweight the bottom quintile of Debt to Equity and treat the top four quintiles equally

### Investable Universe

- Global developed market stocks

### Back-tested Period

- April/1993 – December/2014

### Rebalancing

- Quarterly

Source: SSGA GEBS

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Summary of Research Conducted Between 2014–2015 for ERSRI.

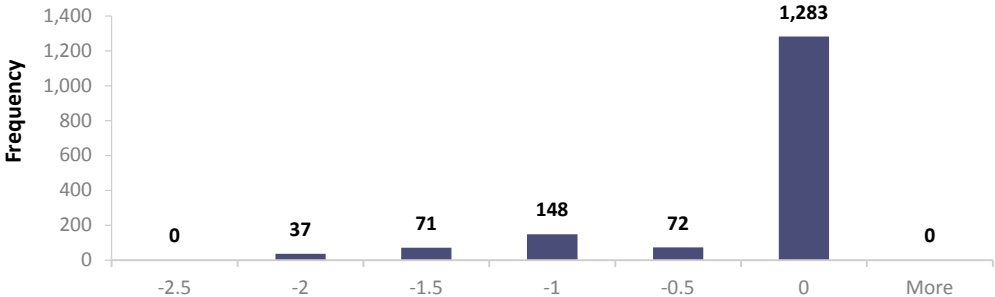
# Portfolio Methodology Provided in 2015

## How the Quality Score is Defined

### a Z-Score for Leverage

Z-score of leverage =  $\begin{cases} \text{Normalized leverage score, if the stocks is in the highest Debt-to-Equity quintile} \\ 0, \text{ if the stocks is in the other four quintiles ranked by Debt-to-Equity} \end{cases}$

Histogram of leverage z-score



### b Combine leverage z-score with ROE z-score and earnings variability z-score to form the quality factor score

Quality score =  $\begin{cases} 0.4 * \text{ROE z-score} + 0.2 * \text{Earnings Variability z-score} + 0.4 * \text{customized leverage z-score, if the stock is in the highest leverage quintile} \\ (2/3) * \text{ROE z-score} + (1/3) * \text{Earnings Variability z-score, if the stock is in the other 4 quintiles ranked by leverage} \end{cases}$

Source: SSGA  
 This research was previously provided to Employees Retirement System of Rhode Island (ERSRI) in 2015. Such research is being presented to new ERSRI officers to show how ERSRI came to its decision to implement strategies in the portfolio that are utilized today.  
 Summary of Research Conducted Between 2014–2015 for ERSRI.

# SSGA Multi-Factor Strategy

## Key Features

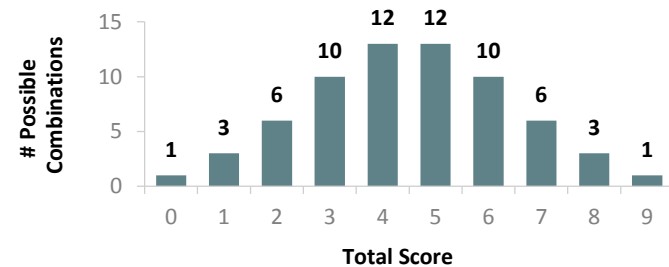
- Rules-based, transparent investment process
- Broadly diversified
- Security weights directly tied to cap weights

### 1 Independently sort universe by each factor, create quartiles containing approximately 25% of market cap

- Q1 = 25% of index weight with lowest valuation (or lowest volatility, or highest quality)
- Q2 = ...
- Q3 = ...
- Q4 = 25% of index weight with highest valuation (or highest volatility, or lowest quality)

### 2 Attach a score to each stock (one score for each factor) based on its quartile rank

- Q1 = 3
- Q2 = 2
- Q3 = 1
- Q4 = 0
- Valuation score + Volatility Score + Quality Score = Total Score
- 64 possible combinations of scores from 0 to 9
- (Min score:  $0+0+0=0$ , Max score:  $3+3+3=9$ )



### 3 Apply methodology to tilt security weights

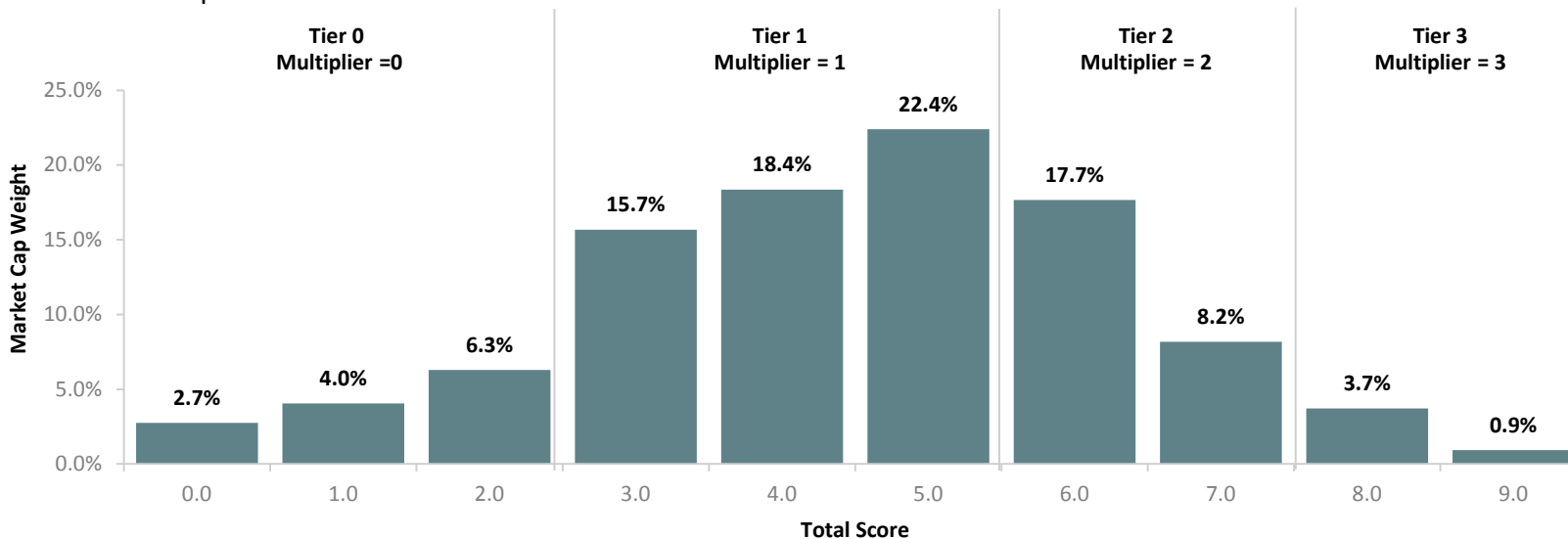
- Each stock grouped into a Tier based on its Total Score
- Apply a multiplier to cap weight of each Tier

Diversification does not ensure a profit or guarantee against loss. The information contained above is for illustrative purposes only.

# SSGA Multi-Factor Strategy

## Tilting Methodology

Re-allocates capital from unattractive to attractive



- (9) Total Score groups assigned to Tiers
- Multiplier applied to cap weight of each Tier
  - Tier 0: Multiplier = 0, thus these stocks are excluded
- Adjusted market cap determines tilted weights
  - Tilted weights sum to 100%
- Reconstitute methodology annually

Source: MSCI, FactSet, SSGA

As of March 31, 2016

Investment universe: MSCI World Index. Weights are as of the date indicated, are subject to change, and should not be relied upon as current thereafter.

Strategy is rebalanced annually.

The information contained above is for illustrative purposes only.

# Three Factor Portfolio — Back-Tested Performance Provided in 2015

## Three Factor Strategy Back-tested Performance

April 1993 – December 2014

	MSCI World	Multi-Factor Portfolio
Annualized Return (%)	7.82	9.76
Annualized Volatility (%)	14.98	14.18
Sharpe Ratio	0.33	0.49
Excess Return (%)	N/A	1.94
Tracking Error (%)	N/A	2.43
IR	N/A	0.80
Max Drawdown (%)	-53.65	-51.84
Average Ann. TO (%)	7	49
TC bps (assuming 30 bps one way)	4	29
TC bps (assuming 50 bps one way)	7	49
Net Ann. Return (assuming 30 bps one way) (%)	7.78	9.47
Net Ann. Return (assuming 50 bps one way) (%)	7.75	9.27

Source: MSCI, FactSet, SSGA

Past performance is not a guarantee of future results.

Index returns are unmanaged and do not reflect the deduction of any fees or expenses. Index returns reflect all items of income, gain and loss and the reinvestment of dividends and other income.

The portion of results through December 31, 2014 represents a back-test of the SSGA Global Multi-Factor Model, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reflect management fees, transaction costs, and other fees and expenses a client would have to pay, which reduce returns. Please reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. Performance is calculated in USD.

This research was previously provided to Employees Retirement System of Rhode Island (ERSRI) in 2015. Such research is being presented to new ERSRI officers to show how ERSRI came to its decision to implement strategies in the portfolio that are utilized today.

Summary of Research Conducted Between 2014–2015 for ERSRI.

# Three Factor Portfolio — Back-Tested Characteristics Provided in 2015

## Portfolio Characteristics

As of December 31, 2014

		Multi-Factor Portfolio	MSCI World Index
<b>Value</b>	Price/Earnings	16.80	17.33
	Price/Book	2.26	2.19
	Dividend Yield (%)	2.47	2.41
<b>Quality</b>	Price/Cash Flow	9.62	9.64
	Price/Sales	1.37	1.41
<b>Momentum</b>	ROE (%)	18.96	17.32
	Earnings Variability (exposure)	0.63	0.97
	LT Debt to Capital	36.07	35.99
<b>Risk</b>	Ret12M (%)	10.02	7.48
	% Specific Risk	18.42	
<b># of Securities Market Capitalization</b>	% Factor Risk	81.58	
	Axioma — Total Risk (%)	12.99	13.14
	Axioma — Predicted Beta	0.99	1.00
		1,400	1,636
		104,670	88,116

Source: SSGA, MSCI, Factset

Backtested results are not indicative of the past or future of any SSGA product. The portion of results through December 31, 2014 represents a back-test of SSGA Global Custom Multi-Factor Model, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reference Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results.

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Summary of Research Conducted Between 2014–2015 for ERSRI.

# Performance Attribution

## Attribution of Portfolio Performance Relative to MSCI World (Gross) Index (Gross Returns, in USD)

October 1, 2015 – March 31, 2018

Source of Return/Risk	Rhode Island Custom Three Factor Strategy *		
	Contribution to Return (%)	Contribution to Risk (%)	Avg Exposure
Portfolio	14.22%	9.51%	
Benchmark	14.11%	9.93%	
Active	0.11%	0.88%	
Specific Return	-0.12%	0.46%	
Factor Contribution	0.23%	1.00%	
Axioma Style	0.02%	0.16%	0.03
Custom Style	0.68%	0.61%	0.45
GEBS_LowVol	-0.10%	0.24%	0.07
GEBS_Momentum	0.23%	0.40%	0.14
GEBS_Quality	0.34%	0.18%	0.15
GEBS_Size	0.00%	0.06%	-0.03
GEBS_Value	0.22%	0.32%	0.12
Country	-0.25%	0.21%	
Industry	-0.07%	0.39%	
Currency	0.07%	0.16%	
Market	-0.23%	0.13%	

Source: SSGA, FactSet, Axioma

Benchmark is MSCI World.

\* Denotes live Rhode Island Treasury Custom Three Factor. Past performance is not a guarantee of future results.

Backtested results are not indicative of the past or future performance of any SSGA offering. The portion of results through March 31, 2018 represents a back-test of the Proposed Three Factor Optimized Strategy, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results.



# Investment Philosophy & Process

# Smart Beta Investment Philosophy

## We believe

<b>Grounded in Theory</b>	Factors which are grounded in theory, with wide support from the academic literature, have been shown to deliver returns in excess of cap weighted bench-marks over time
<b>Diversification</b>	While factors outperform over the long-term, short-term performance can be cyclical. Therefore, we believe a diversified mix of factors provides the best opportunity to outperform a cap-weighted benchmark over time.
<b>Optimization</b>	Optimization can efficiently trade off competing objectives, such as risk, return, turnover and factor exposure
<b>Implementation</b>	Overall implementation of a factor based portfolio is critical. Factor returns are only as good as an asset manager's ability to harvest them efficiently.

Past performance is not a guarantee of future results. While diversification does not ensure a profit or guarantee against loss, investors in Smart Beta may diversify across a mix of factors to address cyclical changes in factor performance. However, factors may have high or increasing correlation to each other.

# Disciplined, Systematic Investment Process

## Global Core Factors

### 1 Identify Factors

Identify economically sensible and empirically valid factors

### 2 Construct Factors

Skillful construction to ensure efficient capture

### 3 Optimize Portfolio

Maximize factor exposure subject to risk constraints

### 4 Implement

Maximize outperformance potential

# Why Optimization?

## Portfolio Construction Challenge

Construct a portfolio with the highest expected return, given all constraints

## Benefits of Optimization

- Flexibility to balance the competing objectives to factor exposure (return) such as turnover and risk
- Minimize active exposures that do not provide out-performance expectations, such as currency, country, sectors, and industries
- Reduce the impact from stock specific returns, so that overall portfolio best represents the returns of the factors
- Well suited for higher tracking error portfolios, more concentrated portfolios, and faster moving signals such as momentum

# Constructing the Multi-Factor Portfolio Using Optimization

## Optimization Setup

Objective: Maximize  $f - \lambda \cdot \omega$

Where  $f$  is the a composite factor calculated for each security by equal weighting z-scores of quality, value, and momentum factors.  $\omega$  is the active variance of the portfolio calculated from the weights and the covariance matrix of stock returns (which itself is derived from a factor model).  $\lambda$  is the risk aversion coefficient

Parameter	Value
<i>Constraints</i>	
Country	Must be +/-5% relative to benchmark
Sector	Must be +/-5% relative to benchmark
Security	Must be +/-2% relative to benchmark (grandfathered to 2.5%)
Exposure to Value	0.3 minimum, 0.6 maximum for Value
Exposure to Momentum	0.3 minimum, 0.6 maximum for Momentum
Exposure to Size	Not constrained for the 3-factor strategy
Exposure to Volatility	Not constrained for the 3-factor strategy
Exposure to Quality	0.3 minimum, 0.6 maximum for Quality
Liquidity	20% of 20-day ADV buy or sell max
Turnover	Soft constraint of 20% two-way quarterly turnover
Buy Threshold	0.05%
Currency	Must be +/-5% relative to benchmark

The above targets are estimates based on certain assumptions and analysis made by SSGA. There is no guarantee that the estimates will be achieved. Index Universe: MSCI World Index constituents

# Analysis of the Proposed Strategy

# Comparison of Back-Tested Performance

January 1, 1997 – September 30, 2015

Annualized Performance (Gross — Back-Tested Performance)

	Rhode Island Custom Three Factor Strategy <sup>1</sup>	Proposed Three Factor Optimized Strategy <sup>2</sup>	MSCI World (Gross)	MSCI World (Net)
Return (%)	7.45	7.60	5.91	5.4
Risk (%)	14.91	15.52	15.67	15.66
Sharpe Ratio	0.5	0.49	0.38	0.34
Excess Return (%) Relative to MSCI World Gross Returns	1.54	1.69	—	—
Tracking Error (%)	2.60	2.04	—	—
Information Ratio	0.59	0.83	—	—
Max Drawdown (%)	-51.88	-54.20	-53.65	-54.03
Number of Names	1376	385		
Turnover (%)	51.8	38.6		

Source: MSCI, FactSet, SSGA

<sup>1</sup> Backtested Existing Rhode Island Treasury Custom Three-Factor (3 factors — Quality, Value, Momentum; custom Quality definition; rules-based portfolio construction).

<sup>2</sup> Backtested Proposed Three Factor Optimized (3- factors — Quality, Value, Momentum; custom quality definition). Past index performance is not a guarantee of future results.

Index returns do reflect (net) and do not (gross) reflect capital gains and losses, income, and the reinvestment of dividends. Backtested performance is not indicative of the past or future performance of any SSGA offering. The portion of results through September 30, 2015 represents a back-test of the SSGA Global Multi-Factor Optimized model (data in column 2) and SSGA Global Custom Multi-Factor model (data in column 1), which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. Performance is calculated in USD.

# Comparison of Back-Tested Performance Against Actual Performance of Current Strategy

October 1, 2015 – March 31, 2018

Annualized Performance

	Rhode Island Custom Three Factor Strategy (Gross of Fees)*	Rhode Island Custom Three Factor Strategy (Net of Fees)*	Proposed Three-Factor Optimized Strategy ^	MSCI World (Gross)	MSCI World (Net)
Return (%)	14.33	14.28	14.90	14.04	13.41
Risk (%)	9.62	9.62	9.85	9.94	9.94
Sharpe Ratio	1.49	1.48	1.51	1.41	1.35
Excess Return (%) Relative to MSCI World Gross Returns	0.29	0.24	0.86	—	—
Tracking Error (%)	0.81	0.81	1.58	—	—
Information Ratio	0.35	0.30	0.54	—	—
Max Drawdown (%)	-8.17	-8.18	-8.06	-8.62	-8.78
Number of Names	1440	1440	352		
Turnover (%)	54	54	40		

Source: MSCI, FactSet, SSGA

\* Backtested Existing Rhode Island Treasury Custom Three-Factor (3 factors — Quality, Value, Momentum; custom Quality definition; rules-based portfolio construction).

^ Denotes Backtested Proposed Three Factor Optimized (3- factors — Quality, Value, Momentum; custom Quality definition).

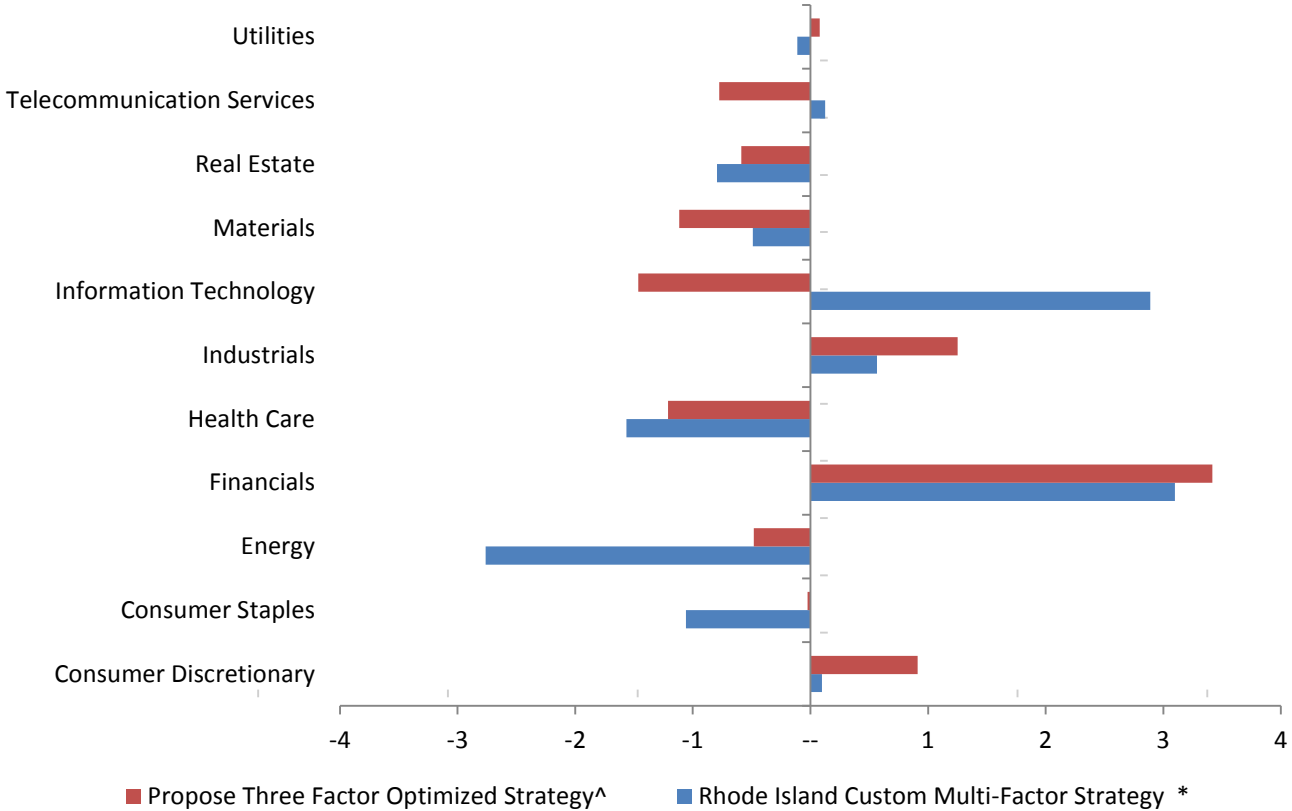
The performance figures contained herein are provided on a gross and net of fees basis. Index returns do reflect (net) and do not (gross) reflect capital gains and losses, income, and the reinvestment of dividends. Gross of fees do not reflect and net of fees do reflect the deduction of advisory or other fees which could reduce the return. Live performance reflects transaction costs. Past performance is not a guarantee of future results. Backtested performance is not indicative of the past or future performance of any SSGA offering. The portion of results through March 31, 2018 represents a back-test of the Proposed Three Factor Optimized model (data in column 3), which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 backtested performance does not reflect management fees, transaction costs, and other fees and expenses a client would have to pay, which reduce returns. Please reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. Performance returns for periods of less than one year are not annualized. Performance is calculated in US dollars.



# Comparison of Sector Characteristics

## Diversified Sector Exposure

Sector Weights as of March 31, 2018



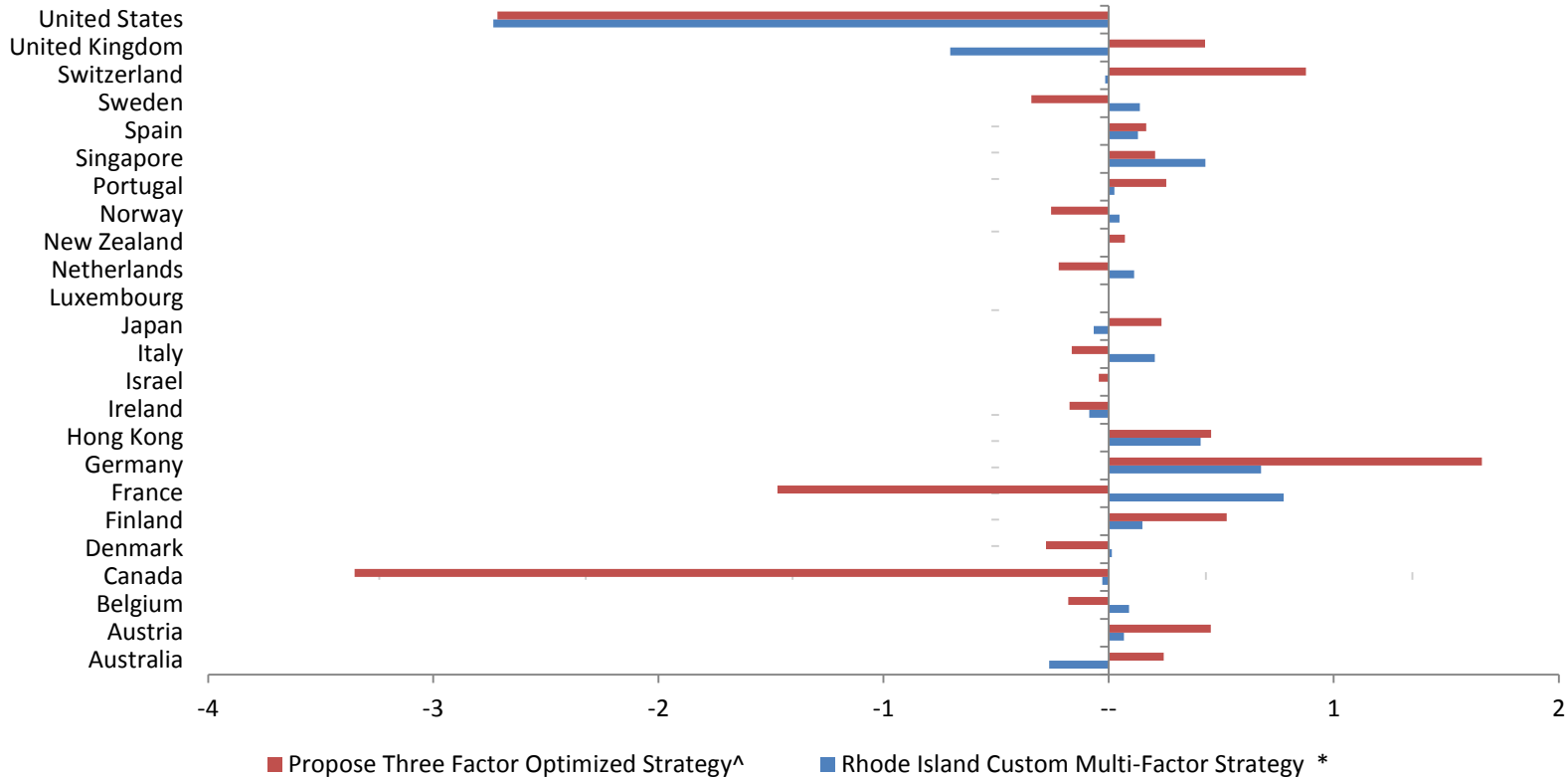
Source: SSGA, FactSet  
 As of March 31, 2018  
 \* Denotes live data.  
 ^ Denotes backtest data.

Backtested results are not indicative of the past or future performance of any SSGA offering. The portion of results through March 31, 2018 represents a back-test of the Proposed Three Factor Optimized model, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. Sector weights are as of the date indicated, subject to change, and should not be relied upon as current thereafter.

# Comparison of Country Characteristics

## Diversified Country Exposure

Country Weights as of March 31, 2018



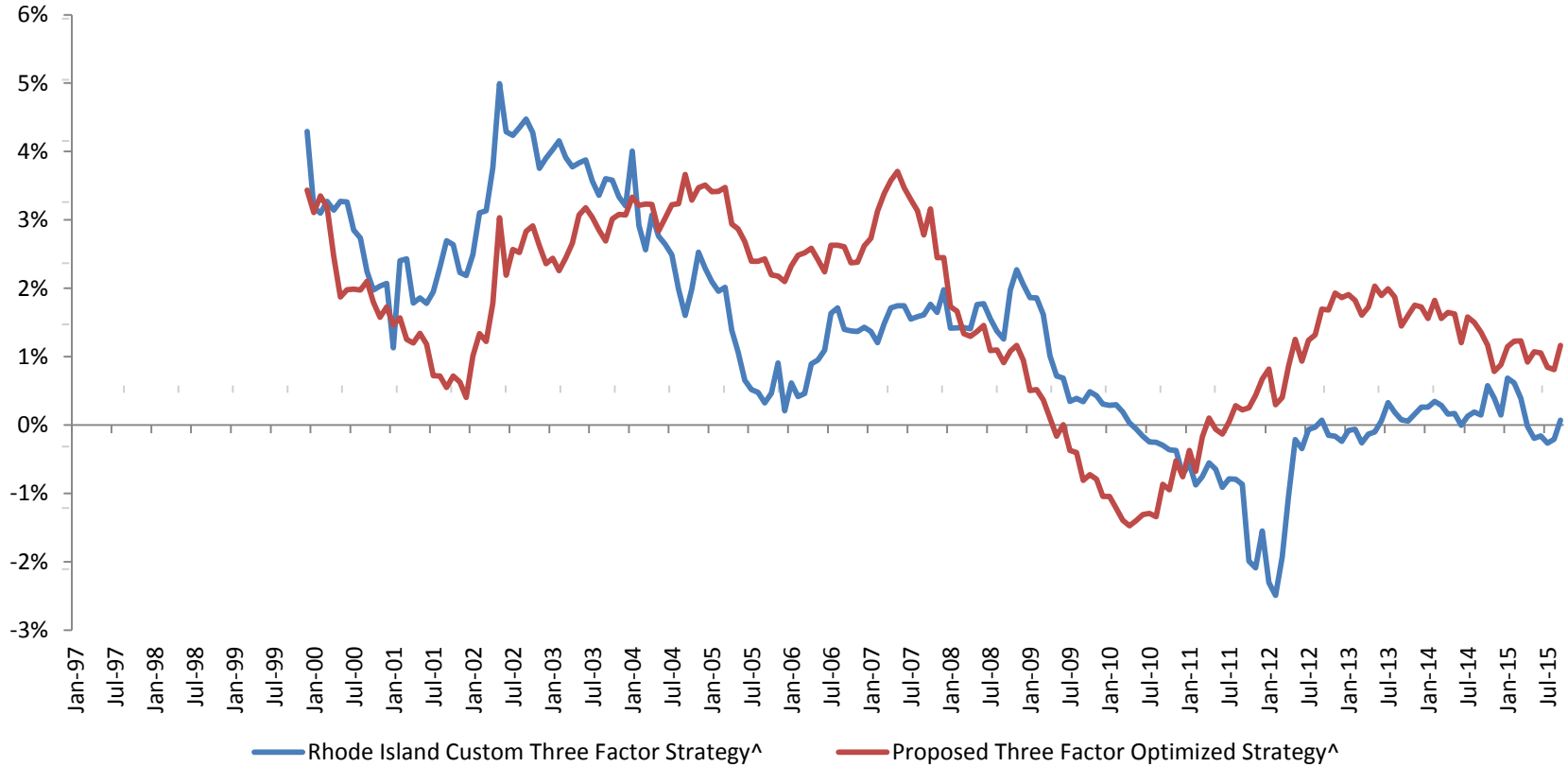
Source: SSGA, FactSet  
As of March 31, 2018  
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# Comparison of Rolling Excess Returns

## Rolling 3-year Excess Returns versus MSCI World (Gross ) Index

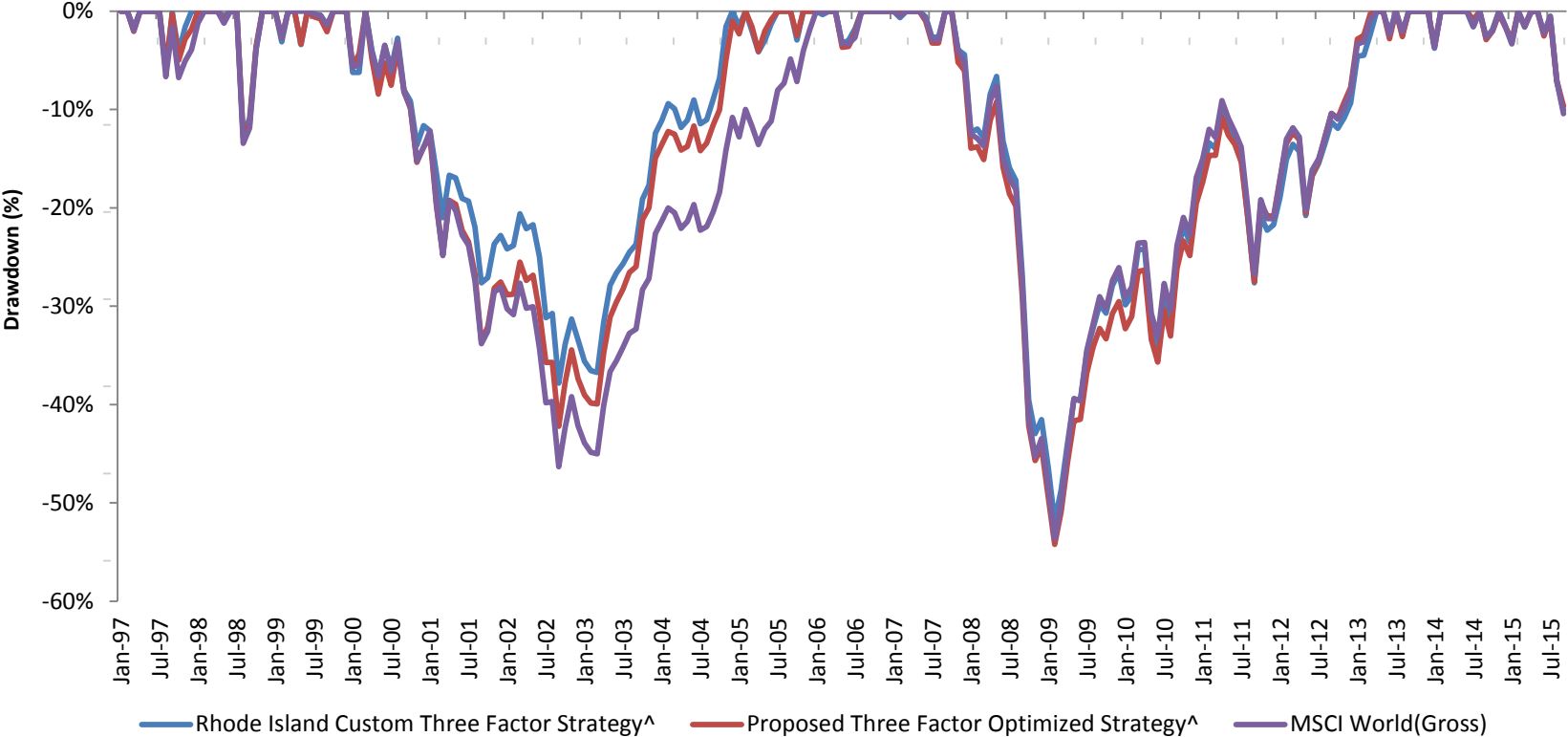


Source: State Street Global Advisors  
 Data is from January 1, 1997 through September 30, 2015  
 ^ Denotes backtest data.

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# Comparison of Historical Drawdown

## Historical Drawdown

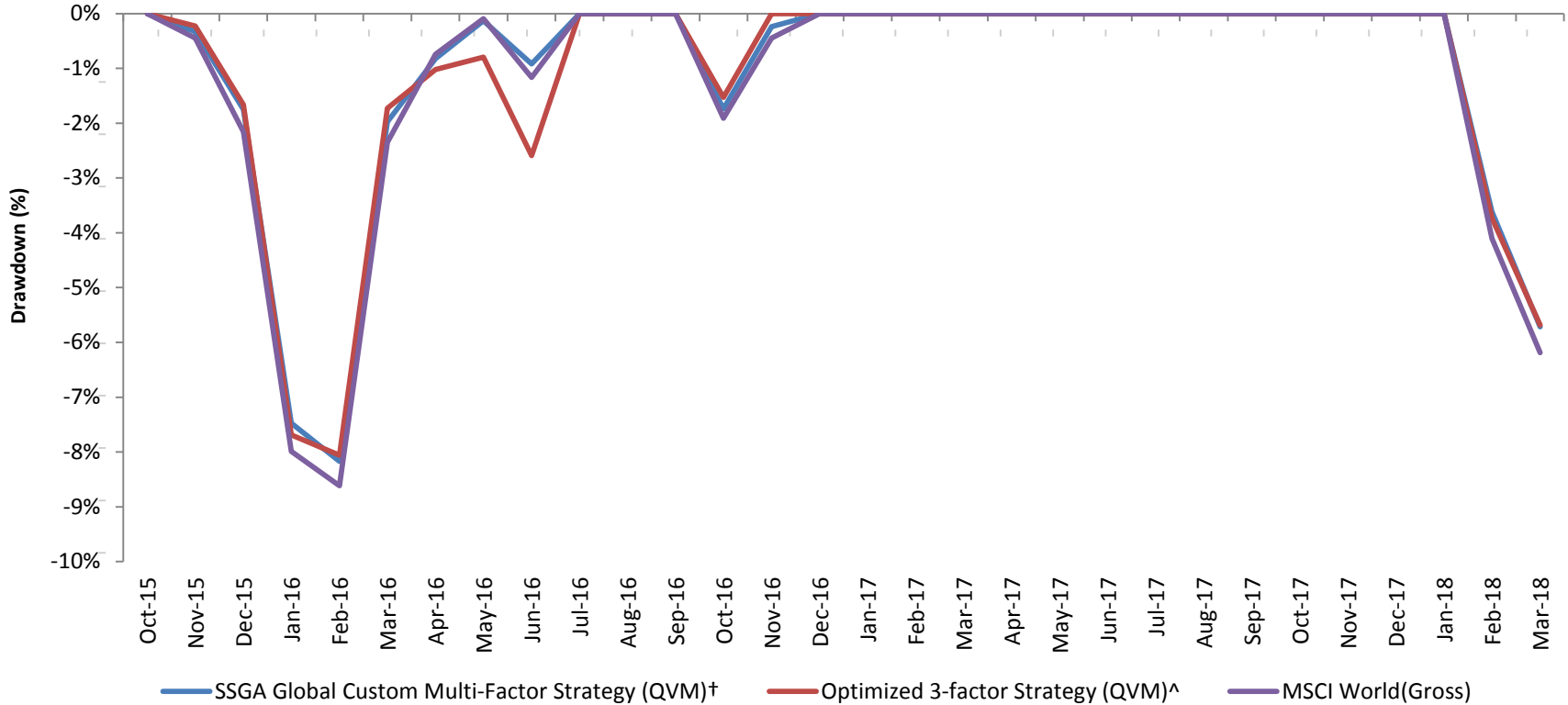


Source: State Street Global Advisors  
 Data is from January 1, 1997 through September 30, 2015.  
 ^ Denotes backtest data.

Index returns do reflect (net) and do not (gross) reflect capital gains and losses, income, and the reinvestment of dividends. Backtested performance is not indicative of the past or future performance of any SSGA offering. The portion of results through September 30, 2015 represents a back-test of the Rhode Island Custom Three Factor Strategy and Proposed Three Factor Optimized Strategy, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. The calculation method for value added returns may show rounding differences. Past index performance is not a guarantee of future results. Performance is calculated in USD.

# Comparison of Historical Drawdown

## Historical Drawdown



Source: State Street Global Advisors

Data is from October 1, 2015 through March 31, 2018

\* Denotes live data.

^ Denotes backtest data.

Index returns do reflect (net) and do not (gross) reflect capital gains and losses, income, and the reinvestment of dividends. Backtested performance is not indicative of the past or future performance of any SSGA offering. The portion of results through December 31, 2017 represents a back-test of the Proposed Three Factor Optimized Strategy, which means that those results were achieved by means of the retroactive application of the model, which was developed with the benefit of hindsight. All data shown above does 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 reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. The calculation method for value added returns may show rounding differences. Past index performance is not a guarantee of future results. Performance returns for periods of less than one year are not annualized. Performance is calculated in US dollars.

# Performance Attribution

## Attribution of Portfolio Performance Relative to MSCI World (Gross) Index (Gross Returns, in USD)

October 1, 2015 – March 31, 2018

Source of Return/Risk	Rhode Island Custom Three Factor Strategy *			Proposed Three Factor Optimized Strategy ^		
	Contribution to Return (%)	Contribution to Risk (%)	Avg Exposure	Contribution to Return (%)	Contribution to Risk (%)	Avg Exposure
Portfolio	14.22%	9.51%		14.90%	9.85%	
Benchmark	14.11%	9.93%		14.11%	9.93%	
Active	0.11%	0.88%		0.80%	1.60%	
Specific Return	-0.12%	0.46%		-1.76%	1.31%	
Factor Contribution	0.23%	1.00%		2.55%	1.31%	
Axioma Style	0.02%	0.16%	0.03	0.06%	0.20%	0.09
Custom Style	0.68%	0.61%	0.45	1.99%	1.18%	1.43
GEBS_LowVol	-0.10%	0.24%	0.07	0.01%	0.07%	0.01
GEBS_Momentum	0.23%	0.40%	0.14	0.28%	0.72%	0.27
GEBS_Quality	0.34%	0.18%	0.15	0.85%	0.45%	0.36
GEBS_Size	0.00%	0.06%	-0.03	0.04%	0.32%	0.27
GEBS_Value	0.22%	0.32%	0.12	0.81%	1.22%	0.52
Country	-0.25%	0.21%		-0.15%	0.17%	
Industry	-0.07%	0.39%		0.56%	0.51%	
Currency	0.07%	0.16%		0.11%	0.14%	
Market	-0.23%	0.13%		-0.01%	0.01%	

Source: SSGA, FactSet, Axioma

Benchmark is MSCI World.

\* Denotes live Rhode Island Treasury Custom Three Factor. Past performance is not a guarantee of future results.

^ Denotes Backtested Proposed Three Factor Optimized (3- factors — Quality, Value, Momentum; custom quality definition)

Backtested results are not indicative of the past or future performance of any SSGA offering. The portion of results through March 31, 2018 represents a back-test of the Proposed Three Factor Optimized Strategy, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results.

# Performance Attribution

## Attribution of Portfolio Performance Relative to MSCI World (Gross) Index (Gross Returns, in USD)

January 1, 2017 – March 31, 2018

Source of Return/Risk	Rhode Island Custom Three Factor Strategy*			Proposed Three Factor Optimized Strategy^		
	Contribution to Return (%)	Contribution to Risk (%)	Avg Exposure	Contribution to Return (%)	Contribution to Risk (%)	Avg Exposure
Portfolio	17.60%	7.26%		20.03%	7.33%	
Benchmark	17.05%	7.56%		17.05%	7.56%	
Active	0.56%	0.90%		2.98%	1.31%	
Specific Return	-0.22%	0.47%		0.37%	1.23%	
Factor Contribution	0.77%	0.82%		2.61%	1.24%	
Axioma Style	0.01%	0.13%	0.07	0.03%	0.15%	0.06
Custom Style	0.80%	0.56%	0.47	1.79%	1.29%	1.53
GEBS_LowVol	-0.08%	0.13%	0.04	0.03%	0.06%	-0.01
GEBS_Momentum	0.69%	0.34%	0.16	1.26%	0.62%	0.30
GEBS_Quality	0.34%	0.16%	0.14	0.92%	0.43%	0.37
GEBS_Size	-0.01%	0.05%	-0.02	0.09%	0.29%	0.29
GEBS_Value	-0.13%	0.33%	0.14	-0.52%	1.19%	0.57
Country	-0.20%	0.22%		0.00%	0.17%	
Industry	0.47%	0.42%		0.67%	0.39%	
Currency	-0.08%	0.15%		0.12%	0.11%	
Market	-0.24%	0.07%		0.00%	0.00%	

Source: SSGA, FactSet, Axioma  
Benchmark is MSCI World.

\* Denotes live Rhode Island Treasury Custom Three Factor. Past performance is not a guarantee of future results.

^ Backtested Proposed Three Factor Optimized (3- factors — Quality, Value, Momentum; custom quality definition)

Backtested results are not indicative of the past or future performance of any SSGA offering. The portion of results through March 31, 2018 represents a back-test of the Proposed Three Factor Optimized Strategy, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results.

# Appendix A: Additional Analysis



# Additional Approaches for Comparison

1. “Standard” quality definition using existing rules-based portfolio construction (denoted Standard/Rules-Based)
2. “Standard” quality definition using new optimization-based portfolio construction (denoted Standard/Optimized)
3. “Standard” quality definition using new optimization-based portfolio construction with **5 factors** (denoted Standard/Optimized/5-factor)

# SSGA Factor Definitions

Attribute	Definition
Valuation	<b>Price/Fundamental</b> Fundamentals: Earnings, Cash Flow, Sales, Dividend, and Book Value
Volatility	<b>Volatility of Total Return</b> 60-month variance
Momentum	<b>Total Return</b> Trailing 11-month returns from t-12 to t-1
Quality	<b>(1) Profitability, (2) Earnings Consistency, and (3) Low Leverage</b> ROA (Standard), ROE (Rhode Island custom), EPS variability, LT Debt/Equity
Size	<b>Free-float adjusted Market Cap</b>

# Portfolio Methodology

## Inputs

- **Universe:** MSCI World Index constituents
- **Factor Inputs:** SSGA Factors (see slide 33)
- **Time period:** July 1997 – June 2017
- **Rebalancing frequency:** Quarterly rebalancing
- **Risk Model:** Axioma Worldwide Medium Horizon Fundamental Risk Model

# Comparison of Back-Tested Performance

July 1, 1997 – September 30, 2015

Annualized Performance (Gross — Back-Tested Performance)

	Rhode Island Custom Three Factor Strategy <sup>1</sup>	SSGA Three Factor Strategy (Standard/Rules-Based) <sup>2</sup>	Proposed Three Factor Optimized Strategy (Standard/Optimized) <sup>3</sup>	SSGA Five Factor Optimized Strategy (Standard/Optimized/5-factor) <sup>4</sup>	MSCI World <sup>†</sup>
Return (%)	6.71	6.65	6.87	7.26	4.73
Risk (%)	14.96	15.01	15.48	15.2	15.73
Sharpe Ratio	0.45	0.44	0.44	0.48	0.3
Excess Return (%)	1.99	1.92	2.14	2.53	—
Tracking Error (%)	2.59	2.55	1.89	2.25	—
Information Ratio	0.77	0.75	1.13	1.13	—
Max Drawdown (%)	-51.88	-51.17	-53.7	-53.32	-54.03

Source: MSCI, FactSet, SSGA

<sup>†</sup> MSCI World (Net) Index.

<sup>1</sup> Backtested Existing Rhode Island Treasury methodology (3 factors — Quality, Value, Momentum; custom Quality definition; rules-based portfolio construction).

<sup>2</sup> Backtested Rules based 3 factors — Quality, Value, Momentum; quality uses SSGA definition.

<sup>3</sup> Backtested Optimized 3-factor portfolio (3- factors — Quality, Value, Momentum; quality uses SSGA definition)

<sup>4</sup> Backtested Optimized 5-factor portfolio (5-factors — Quality, Value, Momentum, Size, Low Volatility; quality uses SSGA definition. Past performance is not a guarantee of future results.

Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

The calculation method for value added returns may show rounding differences.

Backtested performance is not indicative of the past or future performance of any SSGA offering. The portion of results through September 30, 2015 represents a back-test of the Rhode Island Three Factor Strategy, SSGA Three-Factor Strategy, Proposed Three Factor Optimized Strategy, SSGA Five Factor Optimized Strategy, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results.

# Comparison of Performance during Live Period

October 1, 2015 – June 30, 2017

Annualized Performance (Gross Performance)

	Rhode Island Custom Three Factor Strategy <sup>†</sup>	SSGA Three Factor Strategy (Standard/ Rules-Based) <sup>1</sup>	Proposed Three Factor Optimized Strategy (Standard/Optimized) <sup>2</sup>	SSGA Five Factor Optimized Strategy (Standard/ Optimized/5 factor) <sup>3</sup>	MSCI World <sup>†</sup>
Return (%)	14.04	14.12	14.03	15.54	13.87
Risk (%)	9.73	9.52	9.77	9.34	10.06
Sharpe Ratio	1.44	1.48	1.44	1.66	1.38
Excess Return (%)	0.17	0.25	0.16	1.67	—
Tracking Error (%)	0.73	0.82	1.22	1.51	—
Information Ratio	0.24	0.31	0.13	1.11	—
Max Drawdown (%)	-8.17	-7.99	-7.89	-6.75	-8.78

Source: MSCI, FactSet, SSGA

<sup>†</sup> Live Global Custom Multi-factor Fund.

<sup>1</sup> Backtested Rules based 3 factors — Quality, Value, Momentum, where quality uses SSGA definition.

<sup>2</sup> Backtested Optimized 3-factor portfolio (3-factors — Quality, Value, Momentum; SSGA standard Quality definition).

<sup>3</sup> Backtested Optimized 5-factor portfolio (5-factors — Quality, Value, Momentum, Size, Low Volatility; standard definitions).

Past performance is not a guarantee of future results.

Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

The calculation method for value added returns may show rounding differences.

Backtested performance is not indicative of the past or future performance of any SSGA offering. The portion of results through June 30, 2017 represents a back-test of the Rhode Island Three Factor Strategy, SSGA Three Factor Strategy, Proposed Three Factor Optimized Strategy, SSGA Five Factor Optimized Strategy, which means that those results were achieved by means of the retroactive application of the model which was developed with the benefit of hindsight. All data shown above does 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 reference the Backtested Methodology Disclosure for a description of the methodology used as well as an important discussion of the inherent limitations of backtested results. Performance returns for periods of less than one year are not annualized. The performance figures contained herein are provided on a gross of fees basis and do not reflect the deduction of advisory or other fees which could reduce the return. Performance is calculated in US dollars.

# Appendix B: Index Fund Performance and Asset Summary

# Employees' Retirement System of Rhode Island

## Investment Summary

As of March 31, 2018:

	Market Value (\$)
Employees Retirement System of the State of Rhode Island	2,582,354,642
Rhode Island OPEB System Trust	165,991,487
<b>Total</b>	<b>2,748,346,129</b>

## Statement of Asset Changes

The following changes took place in the Employees Retirement System of the State of Rhode Island account for the period of January 1, 2018 to March 31, 2018:

	Market Value 01/01/2018 (\$)	Contributions	Withdrawals (\$)	Change in Market Value* (\$)	Market Value 03/31/2018 (\$)
State Street Russell 3000 Index NL Fund	1,203,151,971	—	(20,000,000)	(7,492,402)	1,175,659,569
State Street MSCI EAFE Index NL Fund	937,858,847	—	—	(13,402,931)	924,455,916
State Street MSCI Canada Index NL Fund	114,225,665	—	—	(8,220,127)	106,005,538
State Street MSCI Emerging Markets Index NL Strategy	371,237,075	—	—	4,996,544	376,233,619
<b>Total</b>	<b>2,626,473,558</b>	<b>—</b>	<b>(20,000,000)</b>	<b>(24,118,916)</b>	<b>2,582,354,642</b>

## Statement of Asset Changes

The following changes took place in the Rhode Island OPEB System Trust account for the period of January 1, 2018 to March 31, 2018:

	Market Value 01/01/2018 (\$)	Contributions	Withdrawals (\$)	Change in Market Value* (\$)	Market Value 03/31/2018 (\$)
State Street S&P 500 Index NL Strategy	165,822,562	1,495,000	—	(1,326,075)	165,991,487
<b>Total</b>	<b>165,822,562</b>	<b>1,495,000</b>	<b>—</b>	<b>(1,326,075)</b>	<b>165,991,487</b>

Source: SSGA

\* Includes dividends, interest, and realized/unrealized gains and losses. Past performance is not a guarantee of future results.

# Employees' Retirement System of Rhode Island

## Summary of Performance

Following are the gross and net returns for the Employees Retirement System of the State of Rhode Island Portfolios versus the corresponding benchmarks as of March 31, 2018:

	One Month (%)	Three Months (%)	Year to Date (%)	Last 12 Months (%)	Three Years (%)	Five Years (%)	Since Inception (%)
<b>State Street MSCI Canada Index NL Fund</b>							<b>Sep/2012</b>
Total Returns (Gross)	-0.86	-7.20	-7.20	5.63	3.36	2.25	3.04
MSCI Canada Index	-0.93	-7.35	-7.35	4.91	2.64	1.55	2.32
<b>Difference</b>	<b>0.07</b>	<b>0.15</b>	<b>0.15</b>	<b>0.72</b>	<b>0.72</b>	<b>0.70</b>	<b>0.72</b>
Total Returns (Net)	-0.86	-7.20	-7.20	5.60	3.33	2.22	3.00
MSCI Canada Index	-0.93	-7.35	-7.35	4.91	2.64	1.55	2.32
<b>Difference</b>	<b>0.07</b>	<b>0.15</b>	<b>0.15</b>	<b>0.69</b>	<b>0.69</b>	<b>0.67</b>	<b>0.68</b>
<b>State Street MSCI EAFE Index NL Fund</b>							<b>Sep/2012</b>
Total Returns (Gross)	-1.72	-1.43	-1.43	15.19	5.91	6.84	8.88
MSCI EAFE® Index	-1.80	-1.53	-1.53	14.80	5.55	6.50	8.54
<b>Difference</b>	<b>0.08</b>	<b>0.10</b>	<b>0.10</b>	<b>0.39</b>	<b>0.36</b>	<b>0.34</b>	<b>0.34</b>
Total Returns (Net)	-1.72	-1.44	-1.44	15.16	5.88	6.81	8.85
MSCI EAFE® Index	-1.80	-1.53	-1.53	14.80	5.55	6.50	8.54
<b>Difference</b>	<b>0.08</b>	<b>0.09</b>	<b>0.09</b>	<b>0.36</b>	<b>0.33</b>	<b>0.31</b>	<b>0.31</b>

Source: SSGA

The calculation method for value added returns may show rounding differences. Past performance is not a guarantee of future results. Return periods of less than one year are not annualized. The performance for Employees' Retirement System of Rhode Island Portfolios shown above is reflected on a gross and net of fees basis as of March 31, 2018. Due to SSGA FM's CTA status, beginning with the September 2012 month-end period going forward, net returns will be reflected in addition to gross returns. Net returns will be expressed net of actual management fees, actual brokerage fees and trading commissions.

Net returns will not be expressed net of administration, custody and/or other fees that may be externally negotiated. If so, net returns would be lower than what will be reflected. Investing involves risk including the risk of loss of principal. The performance includes the reinvestment of dividends and other corporate earnings and is calculated in US dollars. Index returns reflect capital gains and losses, income, and the reinvestment of dividends.



# Employees Retirement System of the State of Rhode Island

## Summary of Performance

Following are the gross and net returns for the Employees Retirement System of the State of Rhode Island Portfolios versus the corresponding benchmarks as of March 31, 2018:

	One Month (%)	Three Months (%)	Year to Date (%)	Last 12 Months (%)	Three Years (%)	Five Years (%)	Since Inception (%)
<b>State Street MSCI Emerging Markets Index NL Strategy</b>							<b>Sep/2012</b>
Total Returns (Gross)	-1.88	1.35	1.35	24.88	8.67	4.89	6.16
MSCI Emerging Markets Index	-1.86	1.42	1.42	24.93	8.81	4.99	6.28
<b>Difference</b>	<b>-0.02</b>	<b>-0.07</b>	<b>-0.07</b>	<b>-0.05</b>	<b>-0.14</b>	<b>-0.10</b>	<b>-0.12</b>
Total Returns (Net)	-1.89	1.32	1.32	24.75	8.56	4.78	6.06
MSCI Emerging Markets Index	-1.86	1.42	1.42	24.93	8.81	4.99	6.28
<b>Difference</b>	<b>-0.03</b>	<b>-0.10</b>	<b>-0.10</b>	<b>-0.18</b>	<b>-0.25</b>	<b>-0.21</b>	<b>-0.22</b>
<b>State Street Russell 3000 Index NL Fund</b>							<b>Sep/2012</b>
Total Returns (Gross)	-2.01	-0.67	-0.67	13.79	10.27	13.06	13.63
Russell 3000® Index	-2.01	-0.64	-0.64	13.81	10.22	13.03	13.61
<b>Difference</b>	<b>0.00</b>	<b>-0.03</b>	<b>-0.03</b>	<b>-0.02</b>	<b>0.05</b>	<b>0.03</b>	<b>0.02</b>
Total Returns (Net)	-2.01	-0.68	-0.68	13.78	10.26	13.05	13.62
Russell 3000® Index	-2.01	-0.64	-0.64	13.81	10.22	13.03	13.61
<b>Difference</b>	<b>0.00</b>	<b>-0.04</b>	<b>-0.04</b>	<b>-0.03</b>	<b>0.04</b>	<b>0.02</b>	<b>0.01</b>

Source: SSGA

The calculation method for value added returns may show rounding differences. Past performance is not a guarantee of future results. Return periods of less than one year are not annualized. The performance for Employees' Retirement System of Rhode Island Portfolios shown above is reflected on a gross and net of fees basis as of March 31, 2018. Due to SSGA FM's CTA status, beginning with the September 2012 month-end period going forward, net returns will be reflected in addition to gross returns. Net returns will be expressed net of actual management fees, actual brokerage fees and trading commissions.

Net returns will not be expressed net of administration, custody and/or other fees that may be externally negotiated. If so, net returns would be lower than what will be reflected. Investing involves risk including the risk of loss of principal. The performance includes the reinvestment of dividends and other corporate earnings and is calculated in US dollars. Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

# Employees Retirement System of the State of Rhode Island

## Summary of Performance

Following are the gross and net returns for the Rhode Island OPEB System Trust Portfolios versus the corresponding benchmarks as of March 31, 2018:

	One Month (%)	Three Months (%)	Year to Date (%)	Last 12 Months (%)	Three Years (%)	Five Years (%)	Since Inception (%)
<b>State Street S&amp;P 500 Index NL Strategy</b>							<b>Jun/2011</b>
Total Returns (Gross)	-2.55	-0.77	-0.77	13.97	10.77	13.29	13.72
S&P 500®	-2.54	-0.76	-0.76	13.99	10.78	13.31	13.73
<b>Difference</b>	<b>-0.01</b>	<b>-0.01</b>	<b>-0.01</b>	<b>-0.02</b>	<b>-0.01</b>	<b>-0.02</b>	<b>-0.01</b>
Total Returns (Net)	-2.55	-0.77	-0.77	13.96	10.76	13.28	13.70
S&P 500®	-2.54	-0.76	-0.76	13.99	10.78	13.31	13.73
<b>Difference</b>	<b>-0.01</b>	<b>-0.01</b>	<b>-0.01</b>	<b>-0.03</b>	<b>-0.02</b>	<b>-0.03</b>	<b>-0.03</b>

Source: SSGA

The calculation method for value added returns may show rounding differences. Past performance is not a guarantee of future results. Return periods of less than one year are not annualized. The performance for Employees' Retirement System of Rhode Island Portfolios shown above is reflected on a gross and net of fees basis as of March 31, 2018. Due to SSGA FM's CTA status, beginning with the September 2012 month-end period going forward, net returns will be reflected in addition to gross returns. Net returns will be expressed net of actual management fees, actual brokerage fees and trading commissions. Net returns will not be expressed net of administration, custody and/or other fees that may be externally negotiated. If so, net returns would be lower than what will be reflected. Investing involves risk including the risk of loss of principal. The performance includes the reinvestment of dividends and other corporate earnings and is calculated in US dollars. Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

# Our Indexing Team

## Indexing Skillfully Delivered



As of December 31, 2017

\* Does not manage assets for the Global Equity Beta Solutions team.

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# Appendix C: Back-tested Footnotes and Important Disclosures

# CTA Disclosure

SSGA generally delegates commodities management for separately managed accounts to SSGA FM, a wholly owned subsidiary of State Street and an affiliate of SSGA. SSGA FM is registered as a commodity trading advisor (“CTA”) with the Commodity Futures Trading Commission and National Futures Association and as an investment adviser with the US Securities and Exchange Commission.

This communication is not specifically directed to investors of separately managed accounts (SMA) utilizing futures, options on futures or swaps. SSGA FM CTA clients should contact SSGA Relationship Management for important CTA materials.

# SSGA Custom Three-Factor Strategy (Rhode Island Existing Strategy) Back-Tested Performance Footnotes

Provides footnotes for back-tested performance shown on pages 14, 15, 23, 24.

## **SSGA Custom Three-Factor Strategy:**

Returns are back-tested from January 1, 1997 to March 31, 2018. Average turnover was approximately 64% annually (one-way), with quarterly rebalancing.

The testing methodology is a rules-based process to generate historical portfolios. The data used was only the data which would have been available at the time when the historical portfolios were generated, not what is available now. These processes help to 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 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 back-testing. Thus, the performance results noted above should not be considered indicative of the skill of the advisor or its investment professionals. The back-tested 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, back-tested 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 back-tested performance results subsequently achieved by following a particular strategy.

The back-tested performance data is reported on a gross of fees basis, does not reflect management fees, transaction costs, and other fees and expenses a client would have to pay. Additional fees, such as the management fee, would reduce the return. 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.

This material has been prepared or is distributed solely for informational purposes and is not a solicitation or an offer to buy any security or instrument or to participate in any trading strategy. It is not intended to supplement or replace the confidential offering memorandum and related offering materials, which should be the sole basis for evaluating the merits of the investment. All of the recommendations and assumptions included in this presentation are based upon current market conditions as of the date of this presentation and are subject to change. Past performance is no guarantee of future results. All investments involve risk including the loss of principal. All material presented is compiled from sources believed to be reliable, but accuracy cannot be guaranteed.

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# SSGA Global Custom Three-Factor Optimized Strategy (Proposed) Back-Tested Performance Footnotes

Provides footnotes for back-tested performance shown on pages 23-31, 36, 37.

## **SSGA Customized Three-Factor Optimized Strategy:**

Returns are back-tested from January 1, 1997 to March 31, 2018. Average turnover was approximately 64% annually (one-way), with quarterly rebalancing.

The testing methodology is an Optimized process to generate historical portfolios. The data used was only the data which would have been available at the time when the historical portfolios were generated, not what is available now. These processes help to 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 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 back-testing. Thus, the performance results noted above should not be considered indicative of the skill of the advisor or its investment professionals. The back-tested 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, back-tested 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 back-tested performance results subsequently achieved by following a particular strategy.

The back-tested performance data is reported on a gross of fees basis, does not reflect management fees, transaction costs, and other fees and expenses a client would have to pay. Additional fees, such as the management fee, would reduce the return. 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.

This material has been prepared or is distributed solely for informational purposes and is not a solicitation or an offer to buy any security or instrument or to participate in any trading strategy. It is not intended to supplement or replace the confidential offering memorandum and related offering materials, which should be the sole basis for evaluating the merits of the investment. All of the recommendations and assumptions included in this presentation are based upon current market conditions as of the date of this presentation and are subject to change. Past performance is no guarantee of future results. All investments involve risk including the loss of principal. All material presented is compiled from sources believed to be reliable, but accuracy cannot be guaranteed.

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# Back-Tested Footnotes for Research Conducted in 2015

## **Multi-Factor Performance:**

Information shown on slides 11-12 reflect portfolios back tested from April 1, 1993 to December 31, 2014. The performance includes the reinvestment of dividends and other corporate earnings and is calculated in US dollars. Returns are not adjusted for transaction costs. Returns are reported on a gross of fees basis.

## **Back-test Creation:**

The testing methodology used a rules-based process to generate historical portfolios. The data used was only that data which would have been available at the time when the historical portfolios were generated, not what is available now. These processes help to 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.

Annual portfolios were created, and returns are the result of a buy and hold assumption on each of these portfolios.

The back-test for this performance was created in 2015.

The 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. The back-tested 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.

The back-tested performance is not necessarily indicative of future performance, which could differ substantially. The benchmark used is the MSCI World Index. The index returns are unmanaged and do not reflect the deduction of any fees or expenses. The index returns reflect all items of income, gain and loss and the reinvestment of dividends and other income. All trademarks are property of their respective owners.

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Not all products will be available to all investors, please contact SSGA for further information regarding this strategy.

The performance information should not be shown without these accompanying notes.

The back-tested performance data is reported on a gross of fees basis. Additional fees, such as the advisory fee, would reduce the return. 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.



# SSGA Three Factor Strategy (Standard/Rules-Based) Back-Tested Performance Footnotes

## **SSGA Three Factor Strategy (Standard/Rules-Based) :**

Information regarding the SSGA Three Factor Strategy (Standard/Rules-Based) shown on slides 36-37 reflects portfolios back tested from January 1, 1997 to June 30, 2017.

The performance includes the reinvestment of dividends and other corporate earnings and is calculated in US dollars. Returns are not adjusted for transaction costs. Returns are reported on a gross of fees basis.

### **Back-test Creation:**

The testing methodology used a rules-based process to generate historical portfolios. The data used was only that data which would have been available at the time when the historical portfolios were generated, not what is available now. These processes help to 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.

Annual portfolios were created, and returns are the result of a buy and hold assumption on each of these portfolios.

The 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. The back-tested 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.

The back-tested performance is not necessarily indicative of future performance, which could differ substantially. The benchmark used is the MSCI World Index. The index returns are unmanaged and do not reflect the deduction of any fees or expenses. The index returns reflect all items of income, gain and loss and the reinvestment of dividends and other income. All trademarks are property of their respective owners.

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Not all products will be available to all investors, please contact SSGA for further information regarding this strategy.

The performance information should not be shown without these accompanying notes.

The back-tested performance data is reported on a gross of fees basis, does not reflect management fees, transaction costs, and other fees and expenses a client would have to pay. Additional fees, such as the advisory fee, would reduce the return. 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.

# SSGA Three Factor Optimized Strategy (Standard/Optimized) Back-Tested Performance Footnotes

## **SSGA Three Factor Optimized Strategy (Standard/Optimized) :**

Information regarding the SSGA Three Factor Optimized Strategy (Standard/Optimized) shown on slides 36-37 reflects portfolios back tested from January 1, 1997 to June 30, 2017.

The performance includes the reinvestment of dividends and other corporate earnings and is calculated in US dollars. Returns are not adjusted for transaction costs. Returns are reported on a gross of fees basis.

### **Back-test Creation:**

The testing methodology is an Optimized process to generate historical portfolios. The data used was only the data which would have been available at the time when the historical portfolios were generated, not what is available now. These processes help to 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.

Annual portfolios were created, and returns are the result of a buy and hold assumption on each of these portfolios.

The 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. The back-tested 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.

The back-tested performance is not necessarily indicative of future performance, which could differ substantially. The benchmark used is the MSCI World Index. The index returns are unmanaged and do not reflect the deduction of any fees or expenses. The index returns reflect all items of income, gain and loss and the reinvestment of dividends and other income. All trademarks are property of their respective owners.

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# SSGA Five Factor Optimized Strategy (Standard/Optimized/5-factor) Back-Tested Performance Footnotes

## **SSGA Five Factor Optimized Strategy (Standard/Optimized/5-factor) :**

Information regarding the SSGA Five Factor Optimized Strategy (Standard/Optimized/5-factor) shown on slides 36-37 reflects portfolios back tested from January 1, 1997 to June 30, 2017.

The performance includes the reinvestment of dividends and other corporate earnings and is calculated in US dollars. Returns are not adjusted for transaction costs. Returns are reported on a gross of fees basis.

### **Back-test Creation:**

The testing methodology is an Optimized process to generate historical portfolios. The data used was only the data which would have been available at the time when the historical portfolios were generated, not what is available now. These processes help to 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.

Annual portfolios were created, and returns are the result of a buy and hold assumption on each of these portfolios.

The 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. The back-tested 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.

The back-tested performance is not necessarily indicative of future performance, which could differ substantially. The benchmark used is the MSCI World Index. The index returns are unmanaged and do not reflect the deduction of any fees or expenses. The index returns reflect all items of income, gain and loss and the reinvestment of dividends and other income. All trademarks are property of their respective owners.

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The performance information should not be shown without these accompanying notes.

The back-tested performance data is reported on a gross of fees basis, does not reflect management fees, transaction costs, and other fees and expenses a client would have to pay. Additional fees, such as the advisory fee, would reduce the return. 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.

# Important Risk Information

Investing involves risk including the risk of loss of principal.

A Smart Beta strategy does not seek to replicate the performance of a specified cap-weighted index and as such may underperform such an index. The factors to which a Smart Beta strategy seeks to deliver exposure may themselves undergo cyclical performance. As such, a Smart Beta strategy may underperform the market or other Smart Beta strategies exposed to similar or other targeted factors. In fact, we believe that factor premia accrue over the long term (5–10 years), and investors must keep that long time horizon in mind when investing.

While diversification does not ensure a profit or guarantee against loss, investors in Smart Beta may diversify across a mix of factors to address cyclical changes in factor performance. However, factors may have high or increasing correlation to each other.

Equity securities are volatile and can decline significantly in response to broad market and economic conditions.

Investing in foreign domiciled securities may involve risk of capital loss from unfavourable fluctuation in currency values, withholding taxes, from differences in generally accepted accounting principles or from economic or political instability in other nations.

Companies with large market capitalizations go in and out of favor based on market and economic conditions. Larger companies tend to be less volatile than companies with smaller market capitalizations. In exchange for this potentially lower risk, the value of the security may not rise as much as companies with smaller market capitalizations.

Investments in mid-sized companies may involve greater risks than in those of larger, better known companies, but may be less volatile than investments in smaller companies.

Investments in small-sized companies may involve greater risks than in those of larger, better known companies.

Gross-of-fees performance does not reflect the deduction of investment management fees or performance allocations. A client's return will be reduced by the management fees and any other expenses incurred in the management of the account. 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%.

All information has been obtained from sources believed to be reliable, but its accuracy is not guaranteed. There is no representation or warranty as to the current accuracy, reliability or completeness of, nor liability for, decisions based on such information and it should not be relied on as such.

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Value stocks can perform differently from the market as a whole. They can remain undervalued by the market for long periods of time.

# Important Risk Information

Volatility management techniques may result in periods of loss and underperformance, may limit the ability to participate in rising markets and may increase transaction costs. Low volatility funds can exhibit relative low volatility and excess returns compared to the Index over the long term; both portfolio investments and returns may differ from those of the Index. The fund may not experience lower volatility or provide returns in excess of the Index and may provide lower returns in periods of a rapidly rising market. Active stock selection may lead to added risk in exchange for the potential outperformance relative to the Index.

A quality style of investing emphasizes companies with high returns, stable earnings, and low financial leverage. This style of investing is subject to the risk that the past performance of these companies does not continue or that the returns on “quality” equity securities are less than returns on other styles of investing or the overall stock market.

A momentum style of investing emphasizes investing in securities that have had higher recent price performance compared to other securities, which is subject to the risk that these securities may be more volatile and can turn quickly and cause significant variation from other types of investments.

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# Appendix D: Biographies

# Biographies



**Jennifer Bender, PhD**

Jennifer Bender, PhD, is a Senior Managing Director at State Street Global Advisors and Director of Research for the Global Equity Beta Solutions team. In this role, she is responsible for promoting the thought leadership of SSGA across key areas of passive investing including smart beta, thematic investing, and global equity investing. Previously, Jenn was a Vice President in the Index and Analytics Research teams at MSCI. In that role, she was responsible for research on equity index-related topics including asset allocation and indexing.

Prior to joining the Index Research team, Ms. Bender worked in the Barra Research group, focusing on portfolio construction and risk modeling. She began her career as an economist at DRI in 1996 and has held research roles at State Street Associates and Harvard University. Jenn holds MS and PhD degrees in Economics from Brandeis University. Her work has been published extensively in industry-leading journals and books such as the Institutional Investor Journals and Wiley Finance Series. She is on the Editorial Board of the Journal of Portfolio Management and a member of the Chicago Quantitative Alliance.



**Taylor Famiglietti, CAIA**

Taylor is a Principal at State Street Global Advisors and a Senior Client Service Manager for the Institutional Client Group. In this role, he is responsible for managing institutional client relationships located throughout the United States.

Prior to his current role, Taylor served as a Senior Client Service Manager on the ISG OCIO team. Prior to that, Taylor served as a Client Implementation Officer in the Client Implementation team at SSGA. He was responsible for the coordination, onboarding, and transitioning of all client activity working closely with operations, relationship management, and portfolio management teams.

Prior to joining SSGA in 2007, Taylor worked in various fund accounting divisions at JP Morgan and State Street Bank & Trust.

Taylor earned a Bachelor of Arts from Eckerd College and a Masters in International Business from Florida International University. He has earned the Chartered Retirement Plans Specialist® designation.

Taylor has earned the Chartered Alternative Investment Analyst® designation. He is a member of the CAIA® Association.

CAIA® and Chartered Alternative Investment Analyst® are registered trademarks of the Chartered Alternative Investment Analyst Association.

# Biographies



**Gaurav Mallik**

Gaurav is a Senior Managing Director of State Street Global Advisors and global head of the equity portfolio strategist team. He leads a team of professionals responsible for helping advisors, consultants and institutional clients analyze economic and market developments, assess the impact to their portfolios and identify specific products and solutions to help them manage risk and take advantage of market opportunities. His team covers all equity products: Index, Factor-based solutions and Fundamental Equities.

Prior to this role, he was responsible for redefining and growing SSGA's quantitative equity investment capability. He has considerable experience working with clients on strategies for investing in emerging markets and has managed assets covering both active emerging market equities and cross asset within emerging markets.

Prior to assuming this role, he was a part of the quantitative credit research team at State Street Global Markets. He joined State Street Global Markets from SKG, Inc., a company he founded with State Street in 2001 focused on trading illiquid bonds. Gaurav has 7 years' experience in research and quantitative modeling on the sell-side.

Gaurav holds an MBA in Finance from Cornell University, a Master in Electrical Engineering, with a focus on Neural Networks, from Boston University and a BS in Electrical Engineering from Robert Gordon's University in Aberdeen. He has written several papers on liquidity in credit markets and has presented research at academic and practitioner conferences.



**R. Kevin Smith**

Kevin is a Senior Managing Director of State Street Global Advisors ("SSGA") and Head of US and Latin America Sales for the Americas Institutional Client Group. He is responsible for managing a team of senior level client facing officers who distribute SSGA's suite of investment strategies and custom solutions to private and public sector retirement plans, the endowment and foundation community, the insurance sector, the sub advisory market and US official institutions.

Additionally, Kevin is a member of SSGA's Senior Leadership Team and Trade Management Oversight Committee.

Preceding his time at SSGA, Kevin held senior positions at Lehman Brothers, State Street Capital Markets LLC and Aberlyn Capital Management, a healthcare venture capital firm. He possesses over 20 years of experience in investment management and investment banking.

Kevin earned his MBA with distinction from Wake Forest University and an AB in History from Trinity College. He holds the FINRA series 7 and 63 registrations.