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Factor Strategies in Brazil: A Practitioner's Guide

WHAT ARE FACTOR INDICES?

Capturing market idiosyncrasies and desired risk/return characteristics has been a fundamental component in the active management space for decades. Taking the fundamental ideology behind an investment strategy and democratizing them within an index allows for these rules-based portfolios to provide at minimum a gauge for relative performance and at best the ability to systematically capture alpha.

When looking at factor strategies in Brazil, we will be focusing on four different strategies.

Enhanced Value: At the most basic level, the goal of investing in value stocks is to buy stocks that are “cheap” or trading at a discount relative to their peers based on company fundamentals.

Momentum: The goal of momentum investing is to capture the stocks that have had the highest price appreciation relative to their peers with the expectation that they will further outperform in a rising market.

Quality: Investing in companies that have quality characteristics seeks to capture stocks that have fundamentals that exemplify a well-run company relative to their peers.

Low Volatility/Inverse-Risk Weighted: Low volatility or inverse-risk weighted strategies allow for participation in the market even during turbulent or volatile times.

Each strategy has its own risk/return characteristics that we will discuss throughout this paper.

Exhibit 1: Index Methodology

CATEGORY	S&P/BOVESPA ENHANCED VALUE INDEX	S&P/BOVESPA LOW VOLATILITY INDEX	S&P/BOVESPA MOMENTUM INDEX	S&P/BOVESPA QUALITY INDEX	S&P/BOVESPA INVERSE-RISK WEIGHTED INDEX
Constituent Selection	Top 25% of securities based on a value score derived from: - Book value to price - Earnings to price - Sales to price	Top 25% of securities based on one-year price volatility	Top 25% of securities based on 12-month price change on a risk-adjusted basis	Top 25% of securities based on a quality score derived from: - Return on equity - Accruals - Financial leverage	All securities in the universe are selected
Buffer	After the top 20%, current constituents within the top 30%	After the top 20%, current constituents within the top 30%	After the top 20%, current constituents within the top 30%	After the top 20%, current constituents within the top 30%	N/A
Weighting	Value score x float market cap	Weighted by the inverse of their volatility	Momentum score x float market cap	Quality score x float market cap	Weighted by the inverse of their volatility
Caps	Weight restrictions: - GICS sector: 40% - Maximum single stock weight: 10% - Minimum single stock weight: 0.05%	Weight restrictions: Maximum single stock weight: 10%	Weight restrictions: Maximum single stock weight: The lesser of 9% or three times the market-cap weight in the index	Weight restrictions: - GICS sector: 40% - Maximum single stock weight: 10% - Minimum single stock weight: 0.05%	N/A
Outliers/ Winsorization	- Ratios winsorized at the 97.5 and 2.5 percentiles - Average score is winsorized at ± 4	N/A	Score is winsorized at ± 3	- Ratios winsorized at the 97.5 and 2.5 percentiles - Average score is winsorized at ± 4	N/A
Rebalancing	June and December	March, June, September, and December	March and September	June and December	March, June, September, and December
Launch Date	April 30, 2015	April 30, 2015	April 30, 2015	April 30, 2015	April 30, 2015
Base Date	Dec. 17, 1999	Sept. 17, 1999	June 30, 1999	Dec. 17, 1999	Sept. 17, 1999

Source: S&P Dow Jones Indices LLC. Data as of July 2018. Table is provided for illustrative purposes.

A DEEPER DIVE INTO STRATEGY CONSTRUCTION

While these strategies are easy to understand philosophically, it is key to analyze how they are used to construct the index portfolios.

Enhanced Value: The [S&P/BOVESPA Enhanced Value Index](#) constituents are selected using three main criteria.

- 1) Earnings-to-Price Ratio:** Calculated as a company's trailing 12-month earnings per share divided by its share price. A key metric used for company valuation, we use this ratio to identify companies with

The S&P/BOVESPA Enhanced Value strategy focuses on using foundational financial ratios to select and weight value stocks.

earnings that may not be reflected in their share price when compared with other companies.

- 2) **Book Value-to-Price Ratio:** Calculated as a company's latest book value per share divided by its share price. This metric is key in understanding what proportion of a company's assets are priced into the shares of a company.
- 3) **Sales-to-Price Ratio:** Calculated as a company's trailing 12-month sales per share divided by its share price. This metric is used to identify companies that might not have consistent earnings but still maintain robust sales growth relative to their share price appreciation.

These ratios are then winsorized (at the 97.5 and 2.5 percentiles) to ensure the distribution is not distorted by extreme values, and the ratios are then transformed into z-scores. The scores are then averaged, and the average scores are winsorized to ± 4 .

The value score is then calculated using the winsorized average score, where scores greater than 0 are added to 1, scores equal to 0 are set to 1, and the reciprocal of 1 minus the score is taken for scores less than 0. This gives a value score range of 0.2 to 5. The top 20% of stocks are then selected for inclusion and any current constituents between 20% and 30% are given priority for inclusion. If the minimum count or percentage is not reached, stocks are then selected based on their value score.

In addition to the broader liquidity requirements, in order to be eligible for the S&P/BOVESPA Momentum Index, a stock have a trading history of at least 10 months.

Momentum: In addition to the broader liquidity requirements, in order to be eligible for the [S&P/BOVESPA Momentum Index](#), a stock have a trading history of at least 10 months.

To select constituents, a momentum value is calculated for all the stocks by looking at a price change over 12 months.¹ This value is then divided by the volatility of the stock to get a risk-adjusted momentum value. The momentum value is then converted to a z-score, and the z-score is winsorized at ± 3 .

The momentum score is then calculated using the winsorized score, where scores greater than 0 are added to 1, scores equal to 0 are set to 1, and the reciprocal of 1 minus the z-score is taken for scores less than 0. This gives a momentum score range of 0.25 to 4. The top 20% of stocks are then selected for inclusion, and any current constituents between 20% and 30% are given priority for inclusion. If the minimum count or percentage is not reached, stocks are then selected based on their value score.

¹ For stocks with less than 12 months of price history, the change over 9 months is used.

Similar to the enhanced value index, the S&P/BOVESPA Quality Index constituents are selected using three foundational financial criteria—return on equity, accruals ratio, and financial leverage.

Quality: Similar to the enhanced value index, the [S&P/BOVESPA Quality Index](#) constituents are selected using three foundational financial criteria.

- 1) **Return on Equity:** Calculated as a company's trailing 12-month earnings per share divided by its latest book value per share. A key metric used to understand the profitability of a company, this ratio is used to identify companies that can generate higher earnings relative to their book value.
- 2) **Accruals Ratio:** Calculated as the change of a company's net operating assets over the past year divided by its average operating assets over the past two years. This gives insight into the performance of a company (excluding financing decisions) and provides insight into the quality and sustainability of a company's earnings.
- 3) **Financial Leverage Ratio:** Calculated as a company's total debt divided by its book value. Leverage provides insight into the ability of a company to meet its outstanding debt obligations.

These ratios are then winsorized (at the 97.5 and 2.5 percentiles) to ensure the distribution is not distorted by extreme values, and the ratios are then transformed into z-scores. The scores are then averaged and the average scores are winsorized to ± 4 .

The quality score is then calculated using the winsorized average score, where scores greater than 0 are added to 1, scores equal to 0 are set to 1, and the reciprocal of 1 minus the score is taken for scores less than 0. This gives a quality score range of 0.2 to 5. The top 20% of stocks are then selected for inclusion, and any current constituents between 20% and 30% are given priority for inclusion. If the minimum count or percentage is not reached, stocks are then selected based on their quality score.

Low Volatility/Inverse-Risk Weighted: In addition to the broader liquidity requirements, in order to be eligible for the [S&P/BOVESPA Low Volatility](#) and [S&P/BOVESPA Inverse-Risk Weighted Indices](#), a stock must have been issued and trading for at least one calendar year.

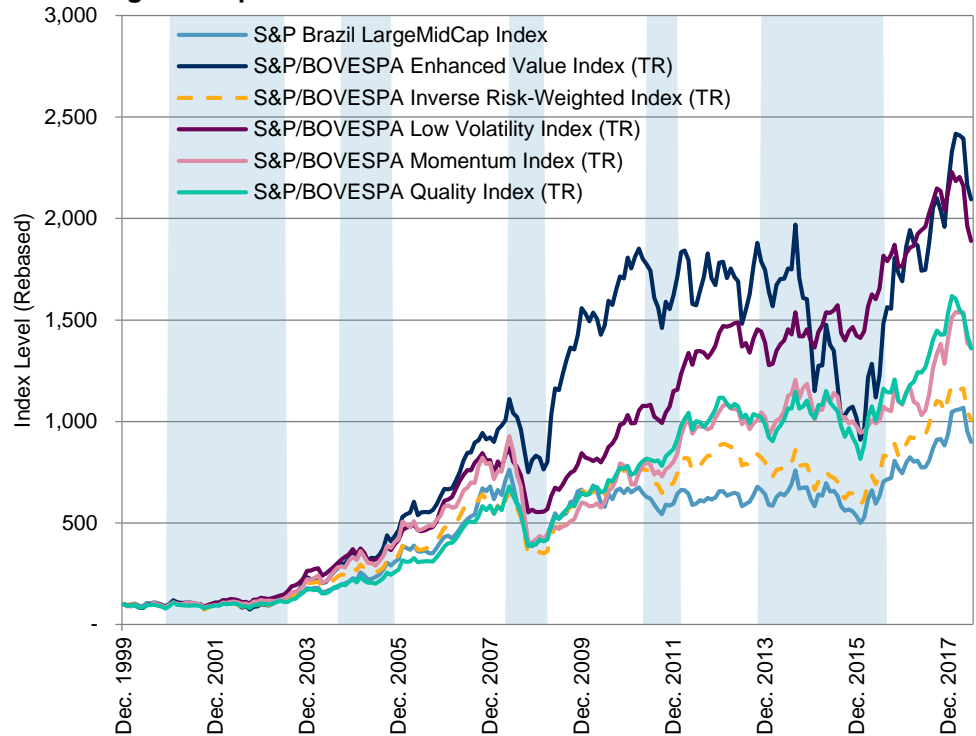
For the inverse-risk weighted index, the strategy is straightforward. The volatility for each eligible security in the index is calculated. The whole universe is then weighted by the inverse of its volatility, relative to the volatility of the eligible universe.

Similar to the inverse-risk weight index, the low volatility index starts by calculating the volatility for each eligible security in the index. The top 20% of stocks are then selected for inclusion, and any current constituents between 20% and 30% are given priority for inclusion. If the minimum count or percentage is not reached, stocks are then selected based on the lowest volatility.

HOW HAVE THESE STRATEGIES PERFORMED?

When looking at these strategies over time, the performance has varied significantly, and the risk/return characteristics have changed during different parts of the market cycle or within different market environments.

Exhibit 2: Performance of the S&P/BOVESPA Factor Indices and the S&P Brazil LargeMidCap Index



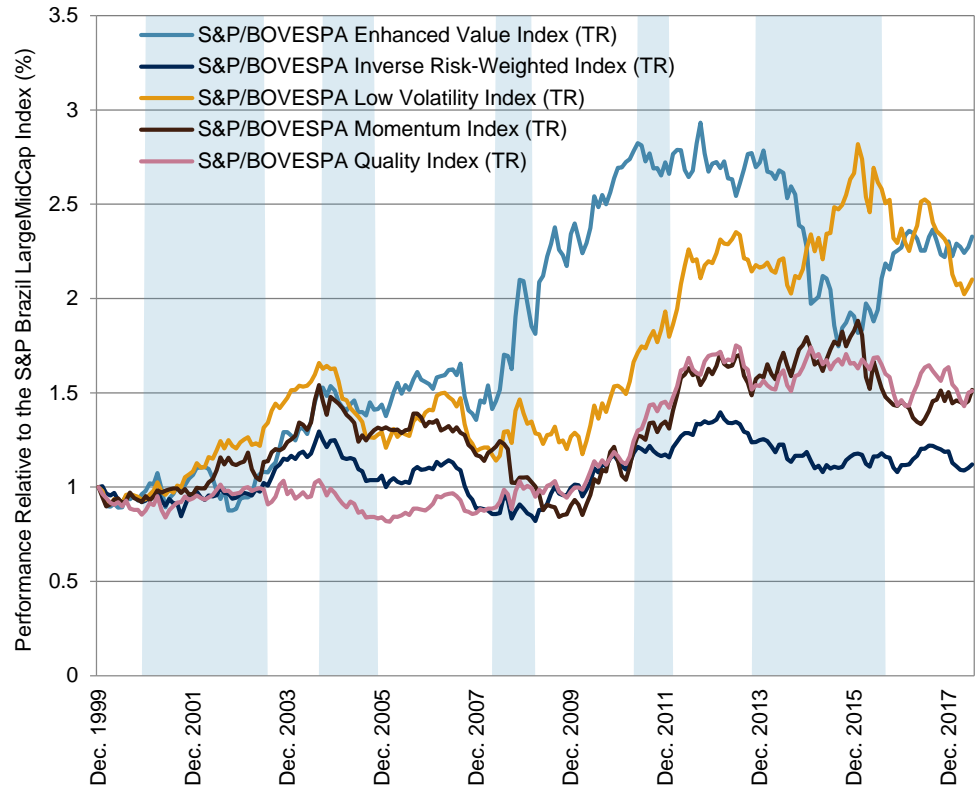
As one would expect, these strategies showed significantly different performance over time and across different market cycles, including recessions.

Source: S&P Dow Jones Indices LLC and St. Louis Federal Reserve Bank. Data from December 1999 to June 2018. Past performance is no guarantee of future results. Blue shading indicates recessions. Indices were rebased to 100 in December 1999. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

As one would expect, these strategies showed significantly different performance over time and across different market cycles, including recessions. But the best way to see this is to look at the relative performance of each strategy when compared with the S&P Brazil LargeMidCap Index.

Exhibit 3: Relative Performance of the Brazil Factor Strategies Versus the S&P Brazil LargeMidCap Index

Looking at the relative performance, one can see a clear difference between how some of the strategies performed relative to the S&P Brazil LargeMidCap Index.



Source: S&P Dow Jones Indices LLC and St. Louis Federal Reserve Bank. Data from December 1999 to June 2018. Past performance is no guarantee of future results. Blue shading indicates recessions. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Looking at the relative performance, one can see a clear difference between how some of the strategies performed relative to the S&P Brazil LargeMidCap Index. The difference is especially pronounced when looking at the [S&P/BOVESPA Enhanced Value Index](#) versus the [S&P/BOVESPA Low Volatility Index](#) during what the OECD has defined as periods of recession in Brazil, or when looking at the 10-year performance, which includes the global financial crisis (see Exhibit 4).

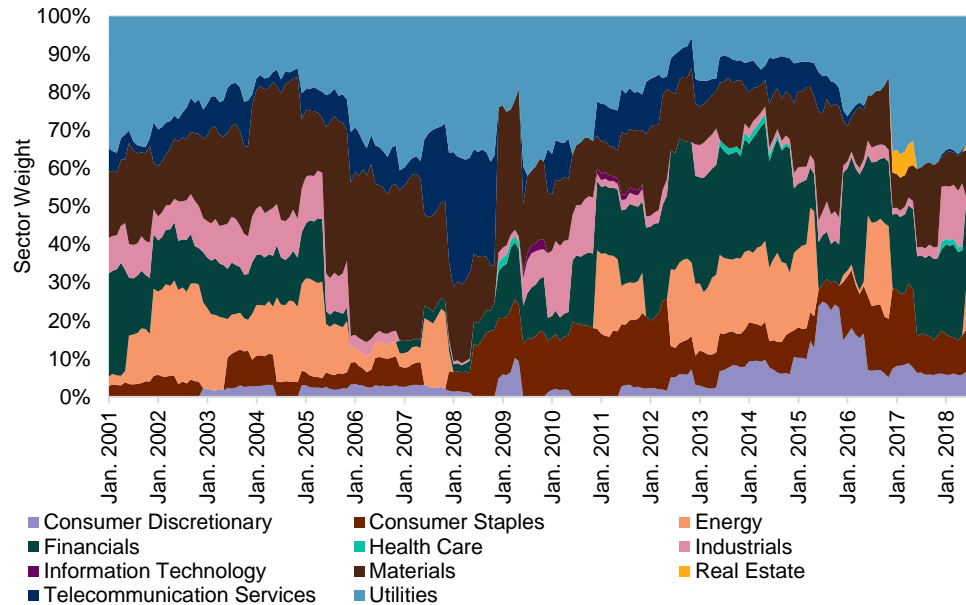
Exhibit 4: Risk/Return Comparison						
PERIOD	S&P BRAZIL LARGEMIDCAP INDEX (TR)	S&P/BOVESPA ENHANCED VALUE INDEX (TR)	S&P/BOVESPA INVERSE-RISK WEIGHTED INDEX (TR)	S&P/BOVESPA LOW VOLATILITY INDEX (TR)	S&P/BOVESPA MOMENTUM INDEX (TR) (BRL)	S&P/BOVESPA QUALITY INDEX (TR)
ANNUALIZED RETURN (%)						
1-Year	16.04	19.90	8.04	-3.49	29.27	7.28
3-Year	10.94	15.81	11.69	6.89	6.15	8.27
5-Year	9.09	7.17	5.17	6.65	6.70	5.91
7-Year	5.47	2.66	4.43	8.30	8.19	7.65
10-Year	2.73	7.23	5.45	8.96	4.78	7.94
15-Year	14.87	20.90	15.59	18.51	17.12	18.17
Cumulative	12.61	17.87	13.30	17.22	15.17	15.15
ANNUALIZED RISK (%)						
3-Year	22.21	30.87	18.86	13.83	17.86	19.11
5-Year	21.44	29.87	17.95	13.76	17.29	17.51
7-Year	19.84	27.49	17.09	13.47	16.47	16.27
10-Year	21.52	26.70	19.73	14.64	20.00	17.87
15-Year	22.32	25.85	20.50	17.26	22.07	19.23
Cumulative	23.26	27.29	22.03	18.82	22.61	20.74
RISK-ADJUSTED RETURN						
3-Year	0.49	0.51	0.62	0.50	0.34	0.43
5-Year	0.42	0.24	0.29	0.48	0.39	0.34
7-Year	0.28	0.10	0.26	0.62	0.50	0.47
10-Year	0.13	0.27	0.28	0.61	0.24	0.44
15-Year	0.67	0.81	0.76	1.07	0.78	0.94
Cumulative	0.54	0.65	0.60	0.91	0.67	0.73
RISK STATISTICS (% CUMULATIVE, MONTHLY)						
Best Monthly Return	0.20	0.29	0.20	0.17	0.20	0.19
Worst Monthly Return	-0.26	-0.20	-0.22	-0.15	-0.26	-0.17
Minimum Rolling 12-Month Return	-0.41	-0.48	-0.46	-0.34	-0.51	-0.34
Maximum Rolling 12-Month Return	0.82	1.40	1.17	1.18	1.08	0.76

Source: S&P Dow Jones Indices LLC. Data from December 1999 to June 2018. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

ALLOCATIONS AND SECTORS

When looking at sector allocation, the strategies are unconstrained in their ability to shift allocation across sectors, which provides dynamic and unique sector allocations across the suite of indices.

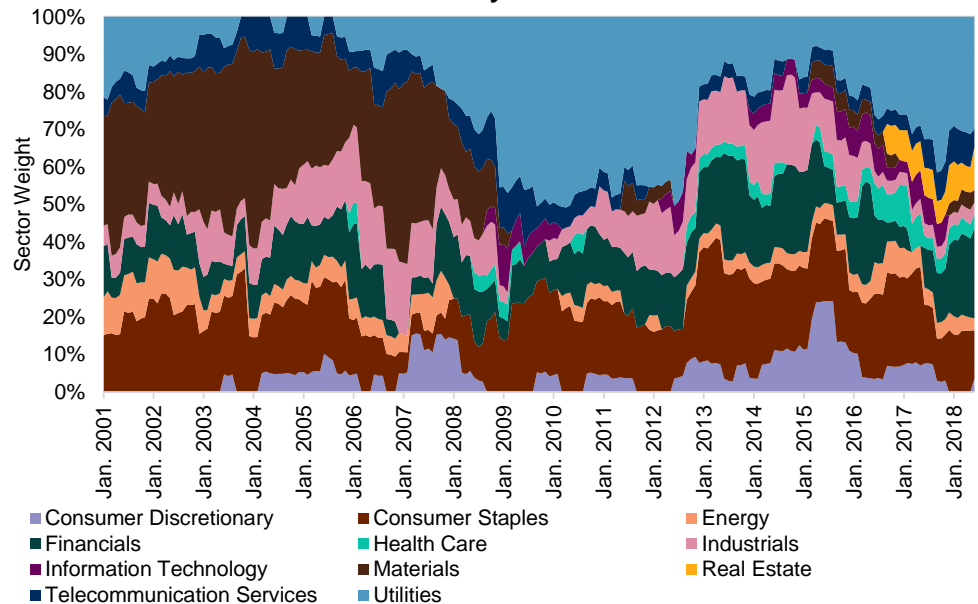
Exhibit 4: S&P/BOVESPA Enhanced Value Index Sector Allocation



The strategies are unconstrained in their ability to shift the allocation across sectors.

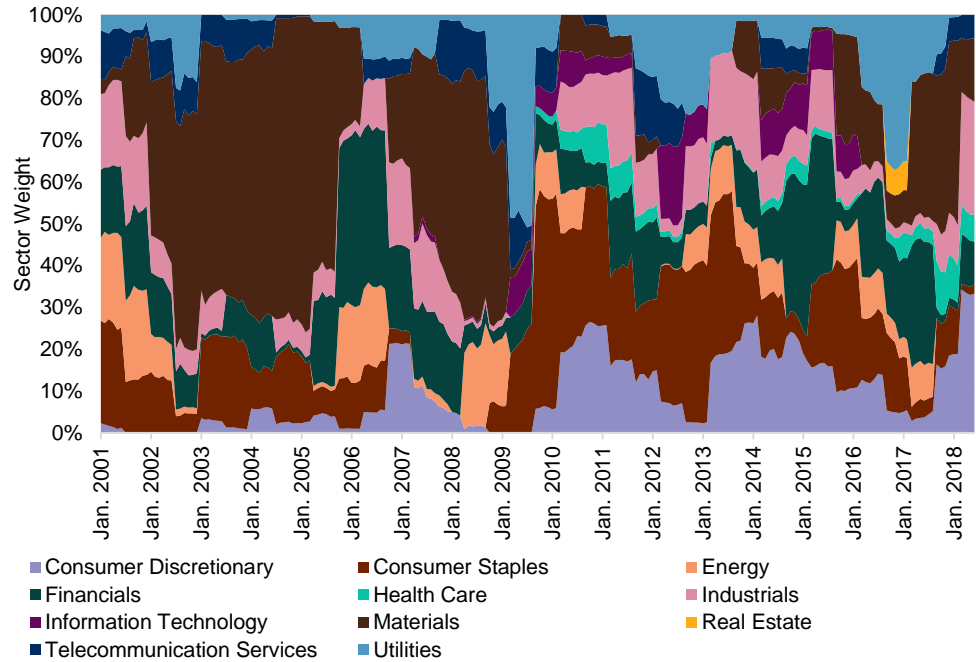
Source: S&P Dow Jones Indices LLC. Data from December 1999 to June 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 5: S&P/BOVESPA Low Volatility Index Sector Allocation



Source: S&P Dow Jones Indices LLC. Data from December 1999 to June 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

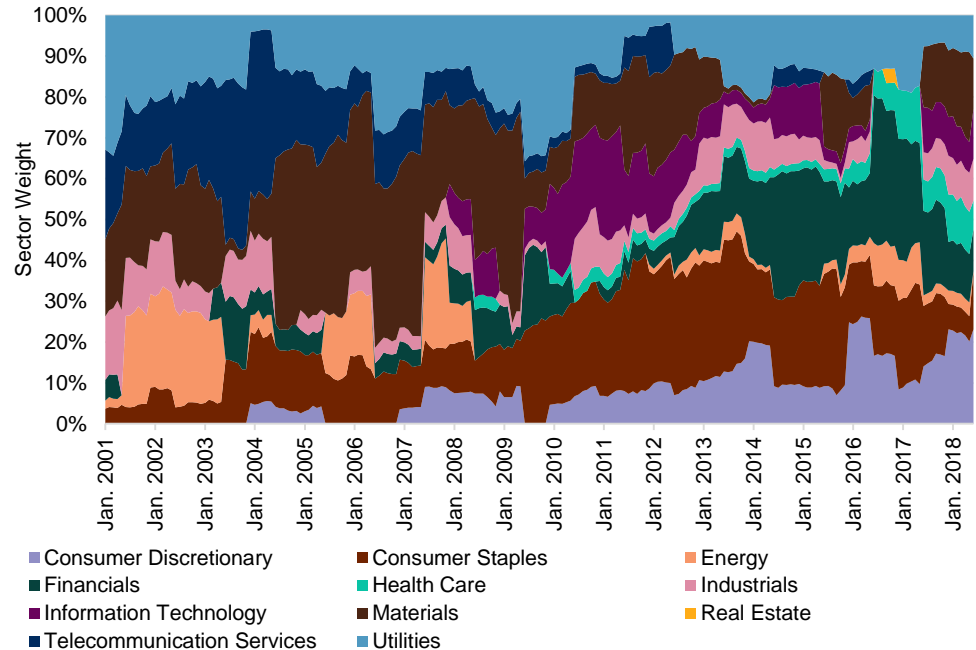
Exhibit 6: S&P/BOVESPA Momentum Index Sector Allocation



Source: S&P Dow Jones Indices LLC. Data from December 1999 to June 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Their ability to shift allocation across sectors provides dynamic and unique sector allocations across the suite of indices.

Exhibit 7: S&P/BOVESPA Quality Index Sector Allocation



Source: S&P Dow Jones Indices LLC. Data from December 1999 to June 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

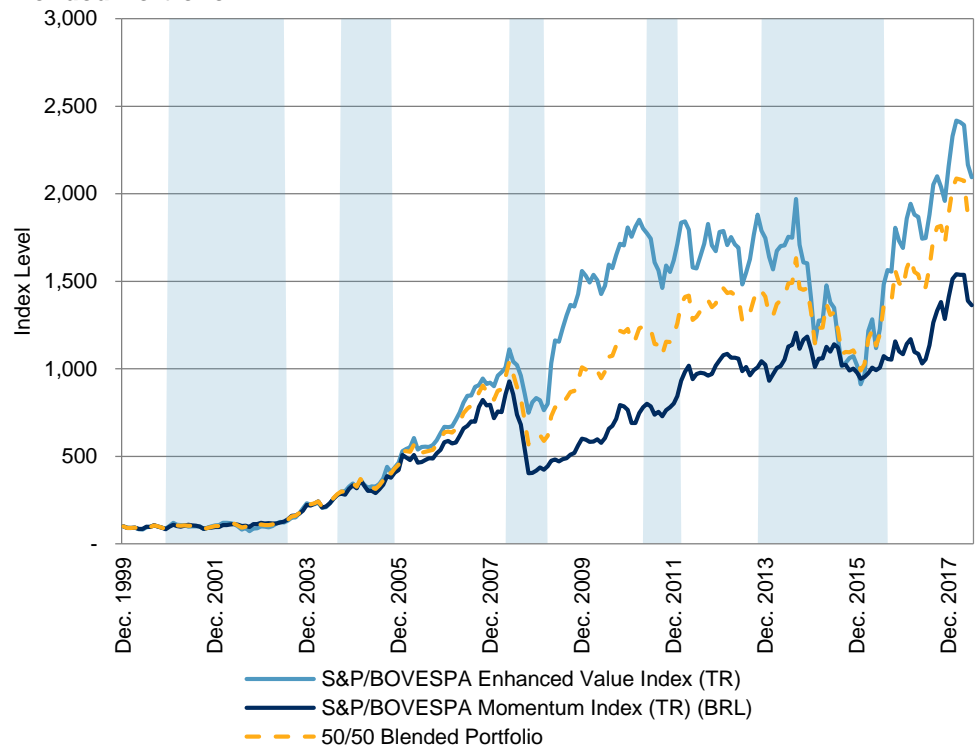
POSSIBLE USES OF FACTOR STRATEGIES

Factor strategies can be used in multiple ways, whether it be combining factor strategies to capture a view on the market or using a factor to augment a portfolio’s investment goal.

When looking at incorporating factors, we can see the example of a hypothetical value and momentum portfolio that uses a 50%/50% monthly weighting between the two strategies. Combining these strategies improved the overall risk/return characteristics beyond what had been achieved from a single factor strategy (see Exhibits 8 and 9).

Exhibit 8: Performance of S&P/BOVESPA Factor Strategies and a 50/50 Blended Portfolio

Combining value and momentum improved the overall risk/return characteristics beyond what had been achieved from a single factor strategy.



50/50 Blended Portfolio is hypothetical.
 Source: S&P Dow Jones Indices LLC. Data from December 1999 to June 2018. Past performance is no guarantee of future results. Blue shading indicates recessions. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 9: Risk/Return Comparison			
PERIOD	S&P/BOVESPA ENHANCED VALUE INDEX (TR)	S&P/BOVESPA MOMENTUM INDEX (TR) (BRL)	50/50 BLENDED PORTFOLIO
ANNUALIZED RETURN (%)			
1-Year	19.90	29.27	24.61
3-Year	15.81	6.15	11.47
5-Year	7.17	6.70	7.50
7-Year	2.66	8.19	5.88
10-Year	7.23	4.78	6.55
15-Year	20.90	17.12	19.48
Cumulative	17.87	15.17	17.01
ANNUALIZED RISK (%)			
3-Year	30.87	17.86	22.74
5-Year	29.87	17.29	21.94
7-Year	27.49	16.47	20.36
10-Year	26.70	20.00	21.20
15-Year	25.85	22.07	22.21
Cumulative	27.29	22.61	23.25
RISK-ADJUSTED RETURN			
3-Year	0.51	0.34	0.50
5-Year	0.24	0.39	0.34
7-Year	0.10	0.50	0.29
10-Year	0.27	0.24	0.31
15-Year	0.81	0.78	0.88
Cumulative	0.65	0.67	0.73
RISK STATISTICS (% CUMULATIVE, MONTHLY)			
Maximum Drawdown	-0.54	-0.57	-0.46
Best Monthly Return	0.29	0.20	0.18
Worst Monthly Return	-0.20	-0.26	-0.19
Minimum Rolling 12-Month Return	-0.48	-0.51	-0.37
Maximum Rolling 12-Month Return	1.40	1.08	1.20

50/50 Blended Portfolio is hypothetical.

Source: S&P Dow Jones Indices LLC. Data from December 1999 to June 2018. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

CONCLUSION

Factor strategies can provide unique risk/return characteristics that can potentially enhance a portfolio. Being able to understand how they are constructed is just as critical as understanding how they perform in different market environments. Leveraging tools (e.g., the [Factor Allocator™](#)) can enable a practitioner to do a deep dive analysis and truly understand the factors within their portfolios and how a factor strategy performs in different market and economic environments.

Factor strategies can provide unique risk/return characteristics that can greatly enhance a portfolio.

PERFORMANCE DISCLOSURE

The S&P/BOVESPA Enhanced Value Index, S&P/BOVESPA Momentum Index, S&P/BOVESPA Quality Index, S&P/BOVESPA Low Volatility Index, and S&P/BOVESPA Inverse-Risk Weighted Index were launched on April 30, 2015. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. Complete index methodology details are available at www.spdji.com.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the Index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its datafeed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at www.spdji.com for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities, fixed income, or commodities markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

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