



SMART SRI EQUITY INVESTING: COMBINING ESG CRITERIA WITH FACTOR INVESTING

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1. INTRODUCTION

Both *Sustainable and Responsible Investing (SRI)* and *Factor Investing* are increasingly gaining the investor's attention. It is widely recognized that these investment techniques can substantially add value. Sustainable and Responsible Investing integrates longer-term business opportunities and risks, which, hence, are relevant factors to integrate into the portfolio. By exploiting some behavioural biases or structural market segmentations, Factor Investing leads to superior risk-adjusted returns. This paper proposes an equity portfolio construction methodology that combines both elements.

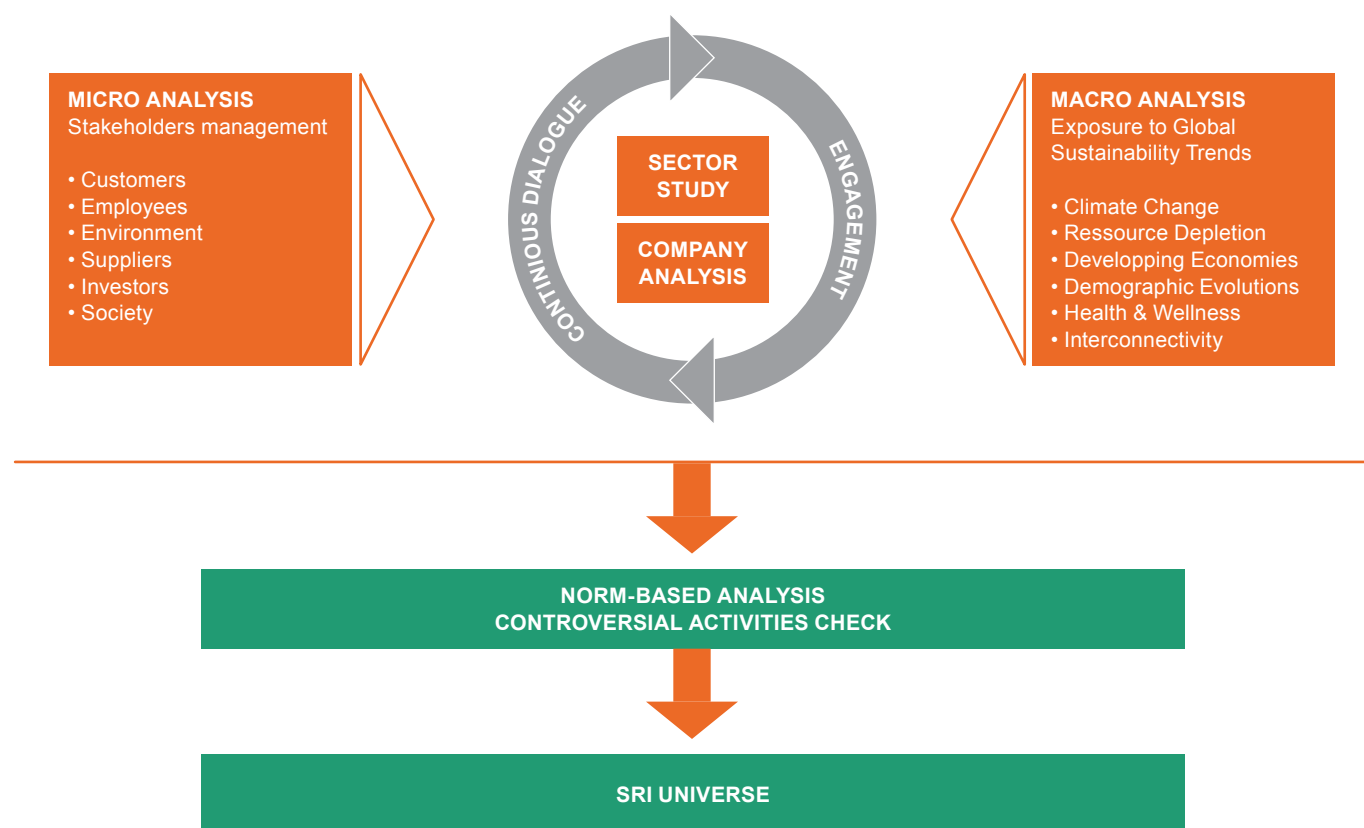
Firstly, Candriam's SRI methodology will be described and its effect on the portfolio shown. Secondly, the 3-step portfolio construction methodology will be outlined: a fundamental weighting of the eligible stocks, involving readjustment of the long tail of small stocks and the implementation of the factor tilts. The effect and added value of each of these steps will be illustrated. Thirdly, the different steps are combined in one portfolio that will turn out to have superior risk-adjusted returns. The last section concludes and additionally illustrates the out-of-sample performance of this index methodology.

Across this document, the proposed index methodology will always be applied to four different geographical regions to test its robustness and avoid any over-fitting. The four regions are: Europe, EMU, Japan and the US. All simulations start in February 2006 and end in December 2015. The out-of-sample return characteristics since the start of 2016 are shown in the last section.

2. SRI SCREENING

Candriam's SRI methodology ranks companies per sector and per geographical region (Europe, Asia Pacific and North America) based on Micro and Macro analyses. The Micro Analysis procedure assesses the company's management of customers, employees, the environment, suppliers, investors and the broad society. The Macro Analysis procedure measures the company's exposure to global sustainability trends such as climate change, resource depletion, developing economies, demographic evolutions, health & wellness and interconnectivity. The results of the Macro and Micro analyses are combined and the companies ranked per sector. The eligible companies are composed of the Top 70% of stocks within their sector in the respective universe. Additionally, a norms-based analysis based on an assessment of how companies comply with the ten principles of the United Nations Global Compact and a verification of controversial activities such as armaments, gambling, tobacco and nuclear activity will eliminate other companies.

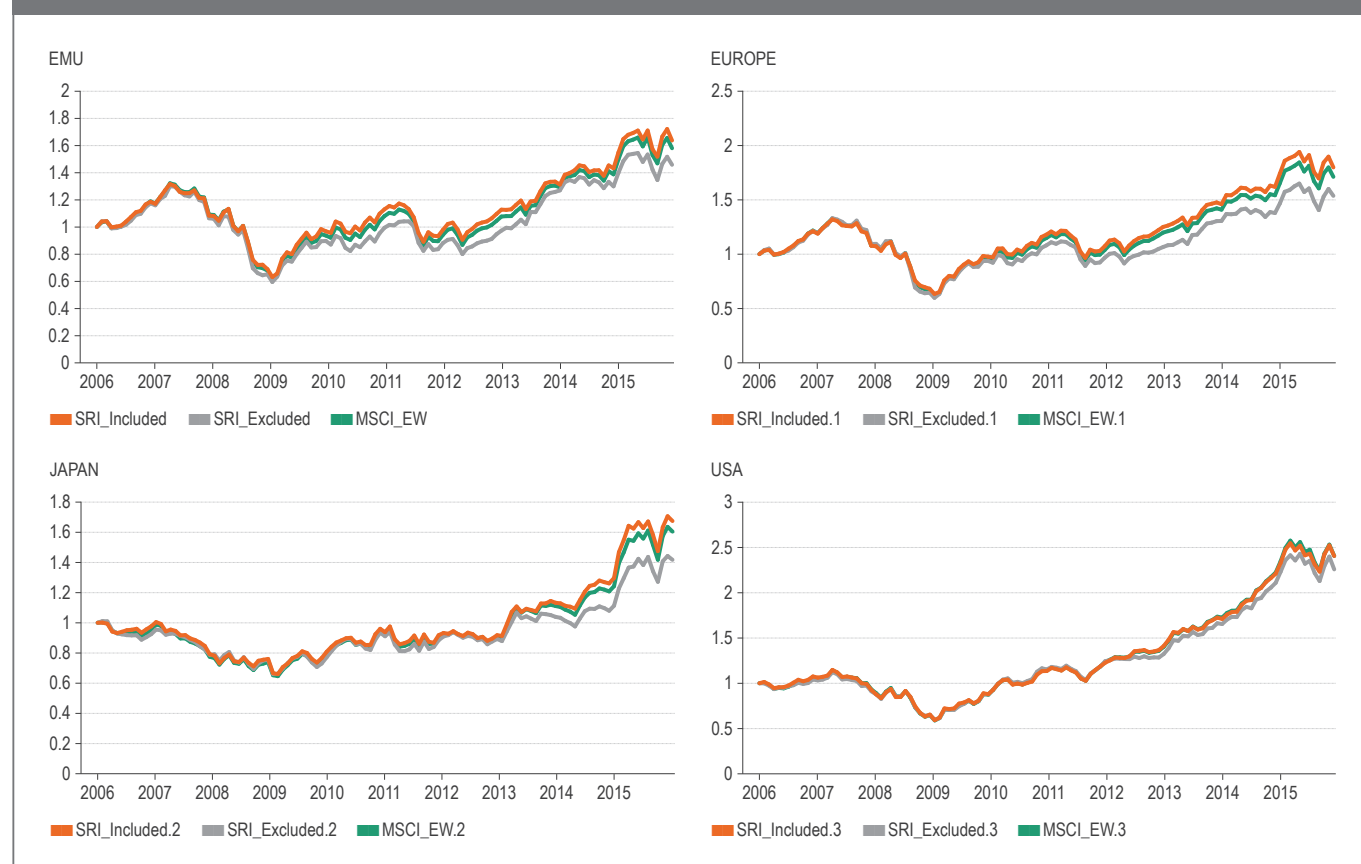
OVERVIEW OF CANDRIAM'S SRI APPROACH



To assess the financial impact of the SRI screening, SRI universe returns are compared with non-SRI universe returns and with the broad stock universe (all portfolios are equally weighted and rebalanced on a monthly basis). The graphs below illustrate that the average return of the SRI companies exceeds that of the broad market and of the non-SRI companies, showing, too, that the Sharpe Ratio improves when SRI companies alone are invested in.

This SRI universe is the starting point for the portfolio construction algorithm, which determines the weightings of these stocks. Non-SRI companies are not eligible for the portfolio. More information on Candriam's SRI methodology can be found on www.candriam.com

FIGURE 1: Candriam SRI Universe – Cumulative Return



Sources: Candriam, Factset

TABLE 1: Return characteristics SRI universe: EMU, Europe, Japan, USA

EMU	SRI_ Included	SRI_ Excluded	MSCI_ EW
Annualized Return	5.14	3.91	4.76
Annualized Std Dev	16.82	16.92	16.86
Annualized Sharpe (Rf=0%)	30.56	23.11	28.24
Maximum Drawdown	52.01	54.23	53.39

Europe	SRI_ Included	SRI_ Excluded	MSCI_ EW
Annualized Return	6.15	4.46	5.62
Annualized Std Dev	15.81	16.71	16.07
Annualized Sharpe (Rf=0%)	38.9	26.72	34.96
Maximum Drawdown	51.95	55.1	53.42

Japan	SRI_ Included	SRI_ Excluded	MSCI_ EW
Annualized Return	5.38	3.61	4.92
Annualized Std Dev	13.83	13.83	13.86
Annualized Sharpe (Rf=0%)	38.9	26.09	35.53
Maximum Drawdown	34.33	34.7	35.62

USA	SRI_ Included	SRI_ Excluded	MSCI_ EW
Annualized Return	9.33	8.63	9.34
Annualized Std Dev	15	14.61	14.98
Annualized Sharpe (Rf=0%)	62.21	59.1	62.34
Maximum Drawdown	48.39	46.74	48.38

Sources: Candriam, Factset

3. PORTFOLIO CONSTRUCTION

Contrary to most indices, individual stock weightings are not determined by market capitalization. Extensive literature has demonstrated that market-capitalization indices are less diversified than often assumed and skewed towards the most expensive stocks. Hence market-capitalization portfolio construction methods are not the most optimal methodologies (as also indicated in Haugen & Baker, 1991).

As an alternative, in this document individual stock weightings are determined via a 3-step process. First, a fundamental weighting for the company is determined that reflects the importance of the company based on common economic measures. Secondly, diversification is further increased by augmenting the weighting of the long tail of smaller companies. Lastly, stock weightings are tilted to reflect Value, Quality and Low Volatility factors. Below, we outline each of these steps, illustrating their impact on risks and returns.

3.1. Initial weighting based on fundamental criteria

A company's importance within the economy can be measured in many different ways. Candriam believes that elements of the balance sheet, income statement and cash flow statement should be integrated to have a meaningful assessment of the size of a company. Hence the equally weighted average of the size of the balance sheet, the total revenue, total income and cash flow generation are taken to determine a fair initial weighting for all companies. The table below illustrates this mechanism.

TABLE 2: Illustration of fundamental weighting

Company Name	INCOME STATEMENT		BALANCE SHEET	CASH FLOW STATEMENT	Sales Weighting	Net Earnings Weighting	Book Value Weighting	OCF Weighting	Fundamental Weighting
	Average Sales	Average Net Earnings	Last Book Value	Average OCF					
Royal Dutch Shell Plc Class B	319,611.30	13,645.50	167,725.80	29,699.30	5.44%	3.93%	4.22%	3.67%	4.31%
HSBC Holdings plc	74,877.60	11,543.40	153,191.10	17,787.00	1.27%	3.32%	3.86%	2.20%	2.66%
Banco Santander S.A.	78,541.40	4,729.80	88,610.00	39,062.80	1.34%	1.36%	2.23%	4.82%	2.44%
Total SA	162,028.40	7,839.40	88,199.30	20,152.70	2.76%	2.26%	2.22%	2.49%	2.43%
Allianz SE	98,271.00	5,309.40	67,744.00	21,642.40	1.67%	1.53%	1.71%	2.67%	1.89%
BNP Paribas SA Class A	93,898.20	4,584.20	89,540.00	15,963.80	1.60%	1.32%	2.25%	1.97%	1.79%
Nestle S.A.	75,562.20	9,006.50	51,746.50	11,737.50	1.29%	2.59%	1.30%	1.45%	1.66%
AXA SA	106,006.00	4,340.40	67,952.00	11,586.20	1.80%	1.25%	1.71%	1.43%	1.55%
Vodafone Group Plc	52,734.30	4,719.00	77,476.70	14,327.30	0.90%	1.36%	1.95%	1.77%	1.49%
Novartis AG	42,792.60	7,045.10	64,503.00	10,485.70	0.73%	2.03%	1.62%	1.29%	1.42%
TOTAL OF UNIVERSE	5,879,931.20	347,306.90	3,971,125.60	810,236.70					

Sources: Candriam, Factset

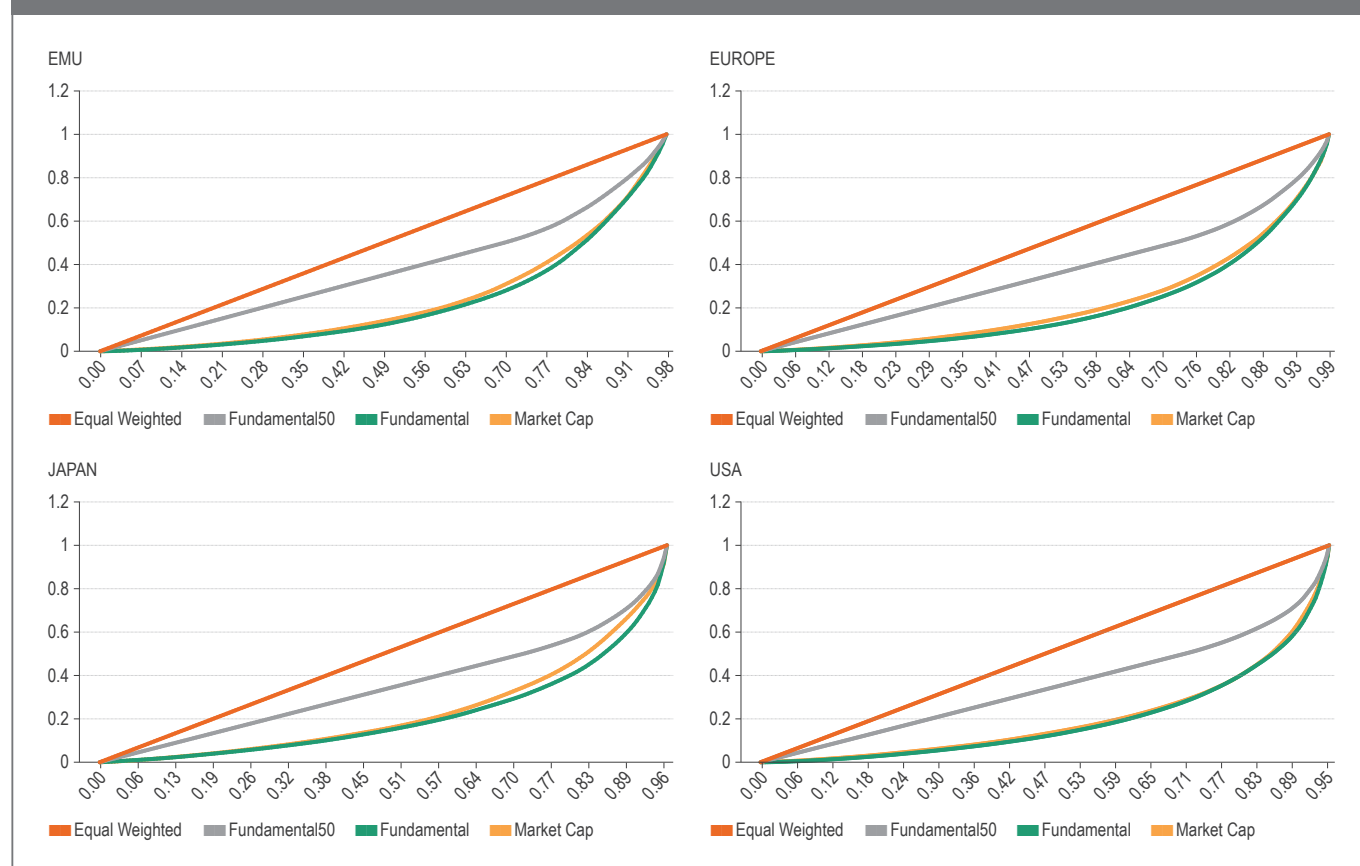
$$\text{Nestle Sales Weighting} = \frac{\text{Nestle Sales}}{\text{Total Sales}} = \frac{(75\,562.20)}{(5\,879\,931.2)} = 1.29\%$$

3.2. Increased diversification through an increased weighting of the long tail of smaller companies

The aforementioned measures still result in a fairly concentrated portfolio, albeit one less concentrated than a portfolio based purely on market-capitalization. In order to further diversify, weightings of the smallest companies are increased so that 50% of the portfolio is allocated to a certain minimum weighting. An additional benefit of this transformation is that the SRI characteristics of even very small companies can have a meaningful impact on the performance of the total portfolio.

Illustrated below is the Lorenz curve for a market-capitalization portfolio against a fundamental portfolio and a diversified fundamental portfolio (and, for illustrative purposes, an equal weighting portfolio). A Lorenz curve plots the cumulated weightings (%) in accordance with the percentile of the number of stocks that are indexed in non-decreasing order. The increased level of diversification of this second step can be clearly observed in the portfolio construction process.

FIGURE 2: Index Concentration



Sources: Candriam, Factset

The table below shows the effective number of stocks of the different methodologies. It turns out that applying the minimum weighting clearly increases effective diversification.

This transformation obviously also introduces a size bias into the portfolio, i.e., a bias towards stocks with a smaller capitalization.

TABLE 3: Average Effective Number of stocks
(from 01/2006 to 12/2015)

	EMU	Europe	Japan	USA
Market Cap Weighted – SRI Universe	58	80	58	80
Fundamental Weighted with 50% Min Wi – SRI Universe	106	164	85	137
Market Cap Weighted – MSCI Indices	85	129	96	144

Sources: Candriam, Factset, MSCI

TABLE 4: Average Number of stocks
(from 01/2006 to 12/2015)

	EMU	Europe	Japan	USA
SRI Universe	152	279	191	303
MSCI Indices	270	432	340	608

Sources: Candriam, Factset, MSCI

3.3. Factor biases: Value, Quality and Low Volatility

Factor investing (sometimes called Smart Beta) has gained in popularity in recent years. In essence, the technique is not new. Fama and French laid the foundations of factor investing already in 1993. But it gained in popularity when Low Volatility was “discovered” by Haugen and Baker in 2012. They provided evidence that investing in low-volatility stocks yielded superior risk-adjusted returns, contrary to conventional wisdom. Candriam already discussed this so-called anomaly in a previous paper, where we combined it with a Quality screening (Van de Maele and Jallet, 2015).

Most existing Smart Beta portfolios are based on one single factor (either Value, Quality, Momentum, Low Volatility or Size). However, real diversification benefits exist when different factors are combined in one portfolio. In this analysis, we combine Value, Quality and Low Volatility. A Size bias is already implicitly present due to the increased weighting of the long tail of smaller companies (see 3.2). Since the Momentum factor generates a relatively high turnover in the portfolio, it was not implemented in this analysis.

The table below indicates the measures used to define Value, Quality and Low Volatility.

TABLE 5: List of indicators to measure factors

Value	Quality	Low Volatility
Earnings Yield	EBITDA To Net Debt (<i>exFin</i>)	6/12/24-month Volatility of weekly returns
Operating Cash Flow Yield	OCF To (Capex + Dividend) (<i>exFin</i>)	
Sales To Enterprise Value	Operating Margin Trend*Stability (<i>exFin</i>)	
Financing Cash Flow Yield	ROCE Trend*Stability	
	ROE	

Sources: Candriam, Factset

- Value companies – cheapest regarding Earnings Yield, Operating Cash Flow Yield, and Sales-to-Enterprise Value – obtain the highest score.
- Low Volatility companies with historical low-return volatility obtain the highest score, based on weekly returns over 6 Months, 1 year and 2 years.
- Quality companies (differentiated by Financial sector) with low leverage and the highest profitability obtain the highest score. Measured by Return on Equity, EBITDA to Net Debt, Trend and Stability of Operating Margin and ROCE.

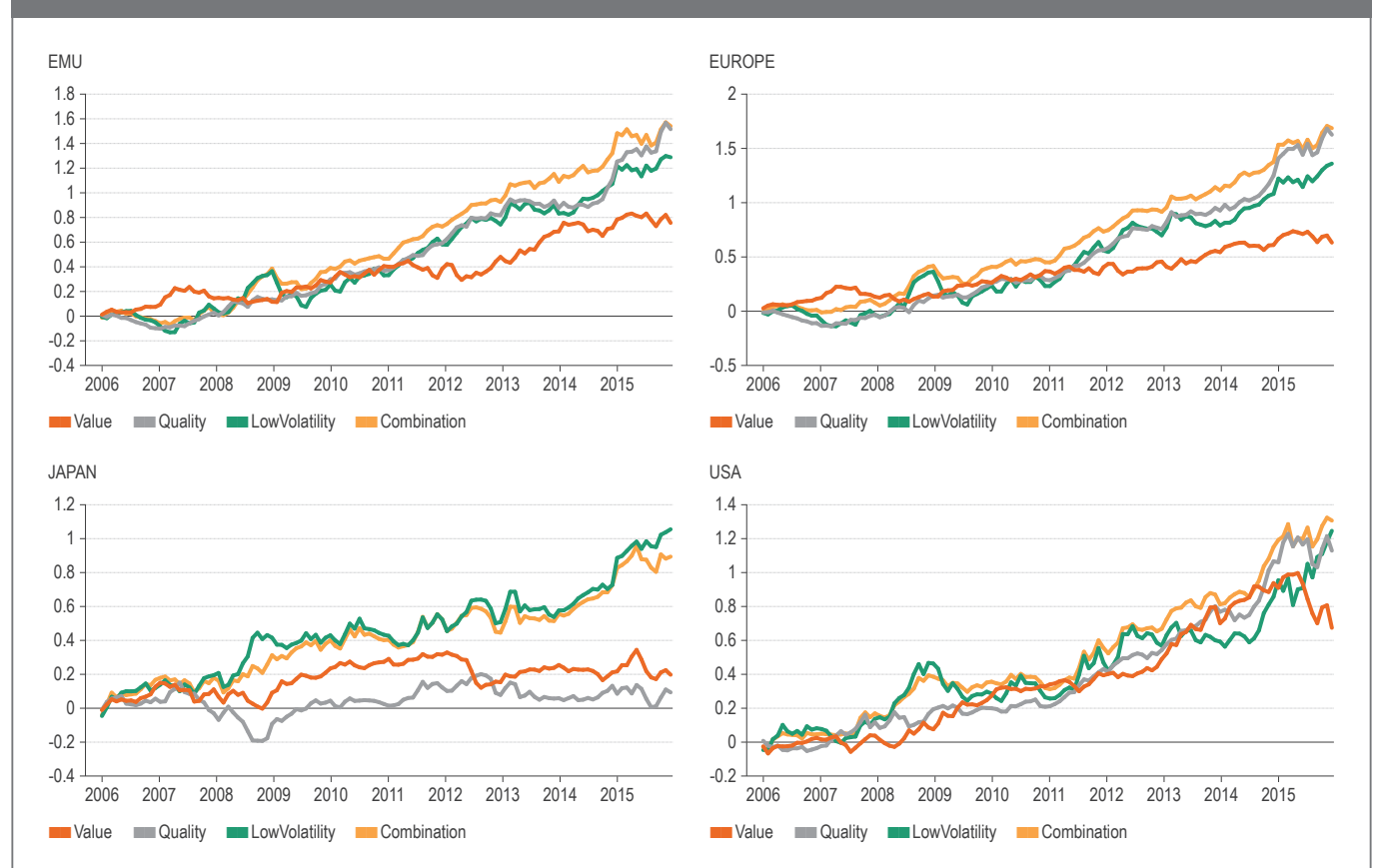
Smart SRI Equity investing: Combining ESG criteria with factor investing

In order to illustrate the added value of the 3 aforementioned factors, long/short portfolios were created for each of the individual factors. These portfolios were created by ranking each stock within its universe at factor level. Stocks were then classified in quintiles, where the Long-Short portfolios invest in the first quintile and short the last quintile (with an equal stock weighting in each quintile).

A combined Long/Short portfolio was also compiled, where the ranking of the stocks was based on Value, Quality and Low Volatility (each factor equally weighted).

The graph below shows the cumulative returns of these Long-Short portfolios. It turns out that the multi-factor approach undeniably adds value in all regions.

FIGURE 3: Candriam factor tilts – Cumulative Excess Return

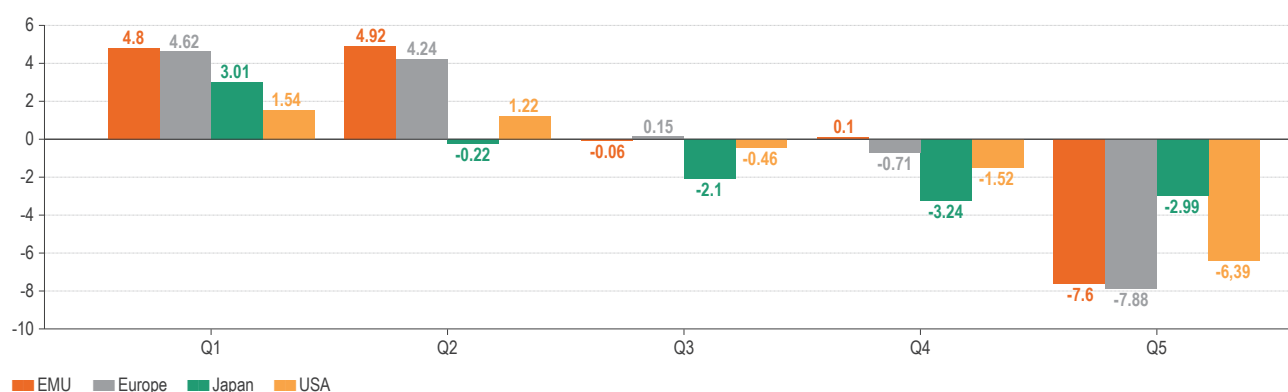


Sources: Candriam, Factset

Figure 4 shows the annualized excess return of the quintiles against the equally weighted universes. Q1 represents stocks in the top 20% and Q5 those in the bottom 20%. For each region, the excess returns follow a rather linear function, where performance decreases in accordance with the quintile.

The Sharpe Ratio, too, is presented in Figure 5, where the Q1/Q2 Sharpe Ratio is twice that of the equally weighted portfolio, and the Q4/Q5 negative or lower than it.

FIGURE 4: Factors combination – Annualized Excess Returns



Sources: Candriam, Factset

FIGURE 5: Factors combination – Annualized Sharpe Ratio



Sources: Candriam, Factset

4. PUTTING IT ALL TOGETHER

The last step in the portfolio construction process involves putting all these steps together. In essence, the factor tilts need to be applied to the ‘modified’ fundamental weightings. In order to do so, the following drifts are applied by quintile to the “modified” fundamental weightings and then rebased to 100%.

TABLE 6: Quintiles Factor Weighting

	Q1	Q2	Q3	Q4	Q5
EMU	+0.40%	+0.20%	Neutral	-0.20%	-0.40%
Europe	+0.20%	+0.10%	Neutral	-0.10%	-0.20%
Japan	+0.40%	+0.20%	Neutral	-0.20%	-0.40%
US	+0.20%	+0.10%	Neutral	-0.10%	-0.20%

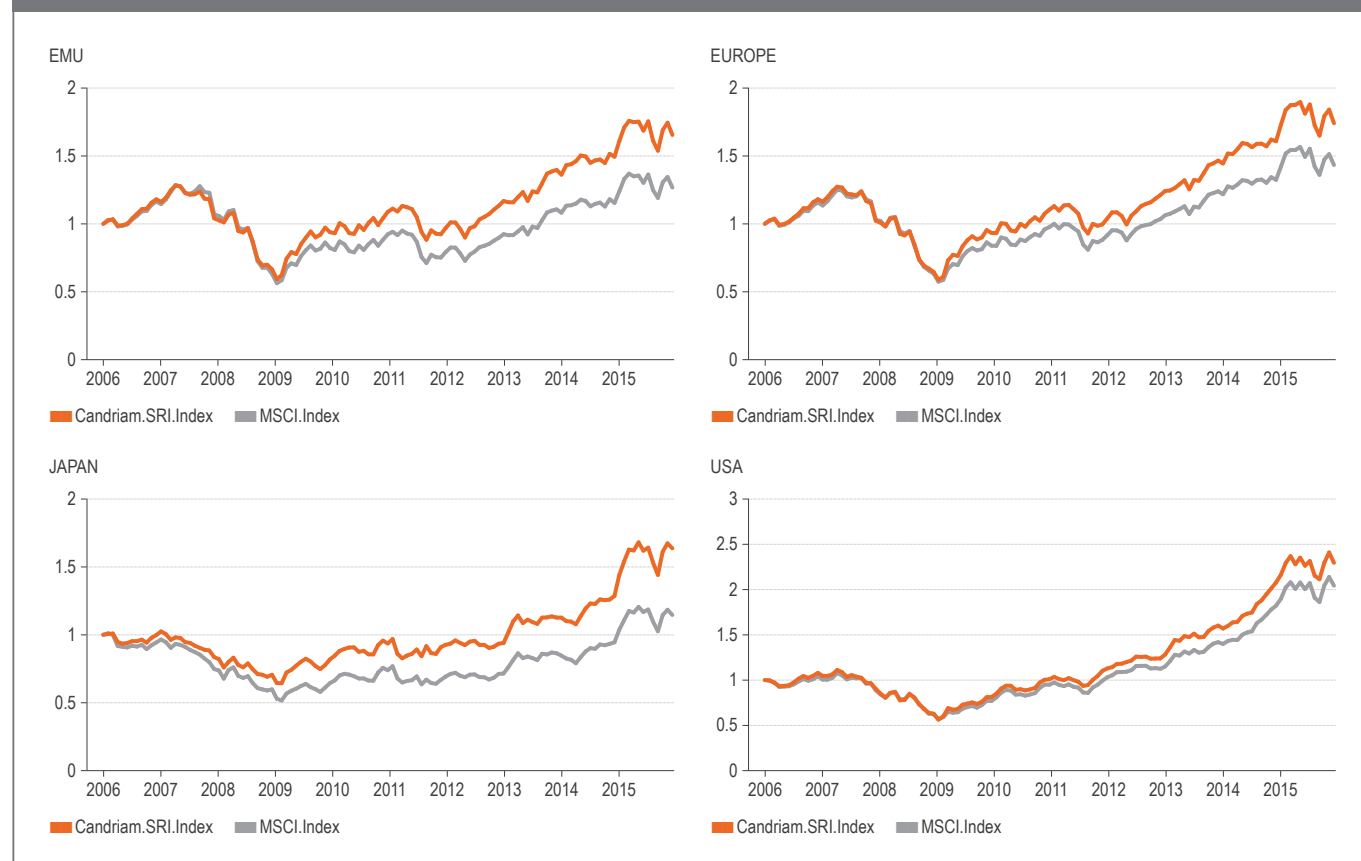
Source: Candriam

The size of the implementation is based on the largeness of the universe. Very large universes such as Europe and the US will have a lower implementation size than universes with a more limited number of constituents (such as EMU and Japan). This being the case, the active risks of the 3 steps in the portfolio construction process remain, to some extent, equivalent.

4.1. Historical Performances

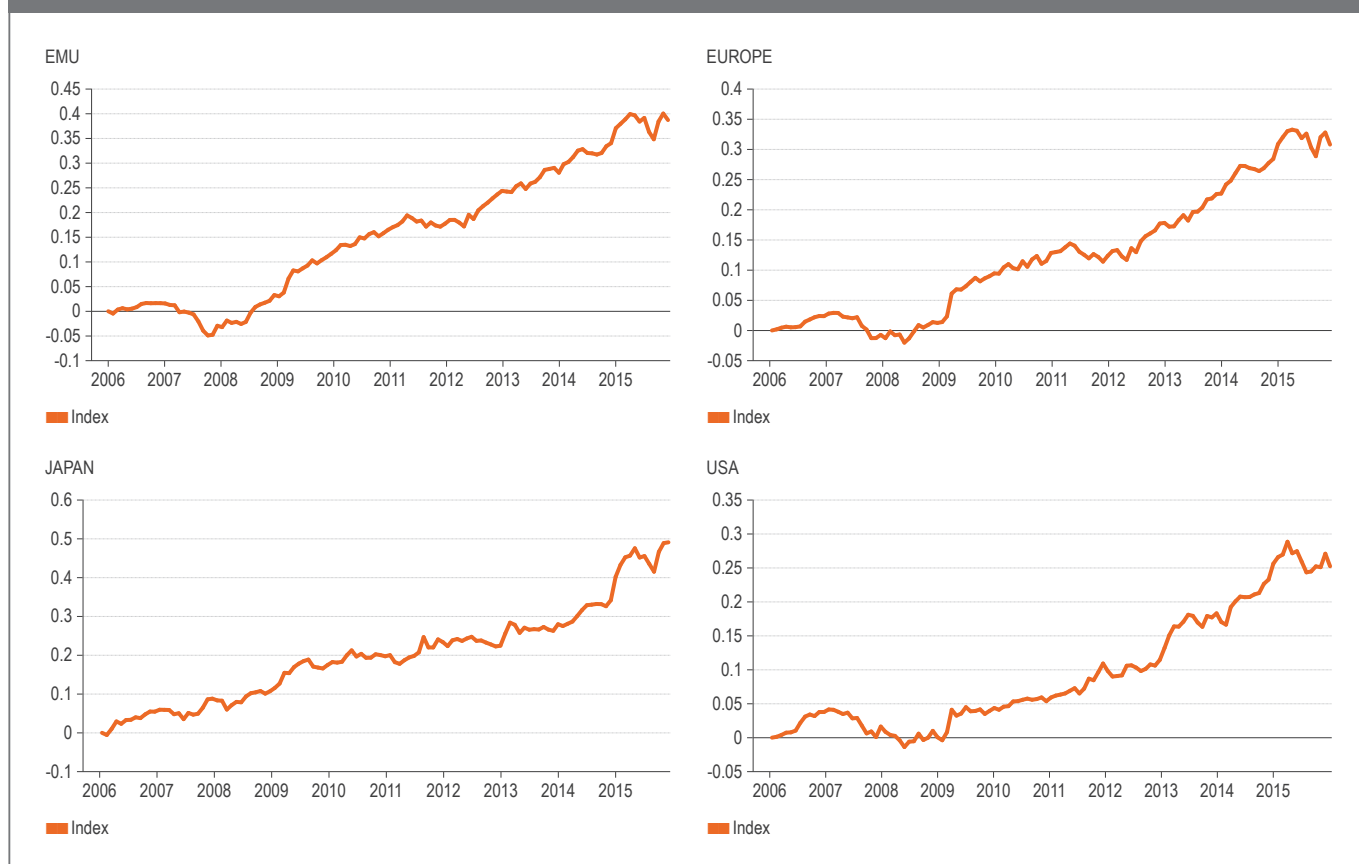
The following charts show the cumulative returns of the final indices from 02/2006 to 12/2015. For each region, the “Smart SRI” portfolio outperforms its traditional market capitalization-weighted index. As shown in figure 7, cumulative excess returns are relatively stable and robust over time.

FIGURE 6: Candriam SRI Index – Cumulative Excess Return



Sources: Candriam, Factset, MSCI

FIGURE 7: Candriam SRI Index – Cumulative Excess Return



Sources: Candriam, Factset, MSCI

Smart SRI Equity investing: Combining ESG criteria with factor investing

The next table shows the different statistics on each Smart SRI Index vs its Regional Market Cap Index. Each SRI Index has a higher annualized return and Sharpe Ratio, with an annualized alpha of 1.22% in the US, around 2% in Europe/EMU and 3.8% in Japan.

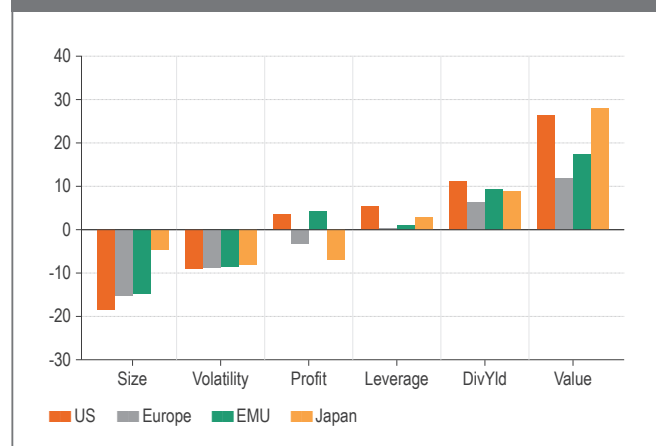
Risk measures indicate similar standard deviations, whereas the downside risk as measured by Historical VaR is lower. The Tracking Error lies between 2.48% and 4.12%, which is relatively low and helps create an Information Ratio between 0.42 and 1.14. Additionally, the upside market capture is clearly higher than the downside market capture.

TABLE 7: SRI Indices – Statistical Table

	SRI Europe	MSCI Europe	SRI EMU	MSCI EMU	SRI Japan	MSCI Japan	SRI USA	MSCI USA
Annualized Return	5.8%	3.73%	5.25%	2.44%	5.14%	1.39%	8.81%	7.53%
Annualized Std Dev	16.09%	15.35%	17.5%	17.73%	14.32%	15.13%	14.24%	13.87%
Annualized Sharpe (Rf=0%)	0.3606	0.2427	0.3002	0.1374	0.3588	0.092	0.6189	0.5432
Maximum Drawdown	53.83%	54.1%	53.78%	56.21%	37.2%	48.91%	49.34%	47.34%
Historical VaR (95%)	-8.28%	-8.55%	-8.47%	-8.8%	-6%	-7.58%	-6.2%	-7.39%
Beta	1.0345		0.9771		0.9105		1.0036	
Beta+	1.1379		1.0619		0.9622		1.0664	
Beta-	0.9886		0.9444		0.8468		1.0024	
Annualized Alpha	1.94%		2.79%		3.8%		1.22%	
Tracking Error	2.58%		2.48%		4.12%		3.02%	
Information Ratio	0.8025		1.1372		0.9095		0.4245	

Sources: Candriam, Factset, MSCI

FIGURE 8: Style exposure



Sources: Candriam, Factset, Bloomberg, Barra

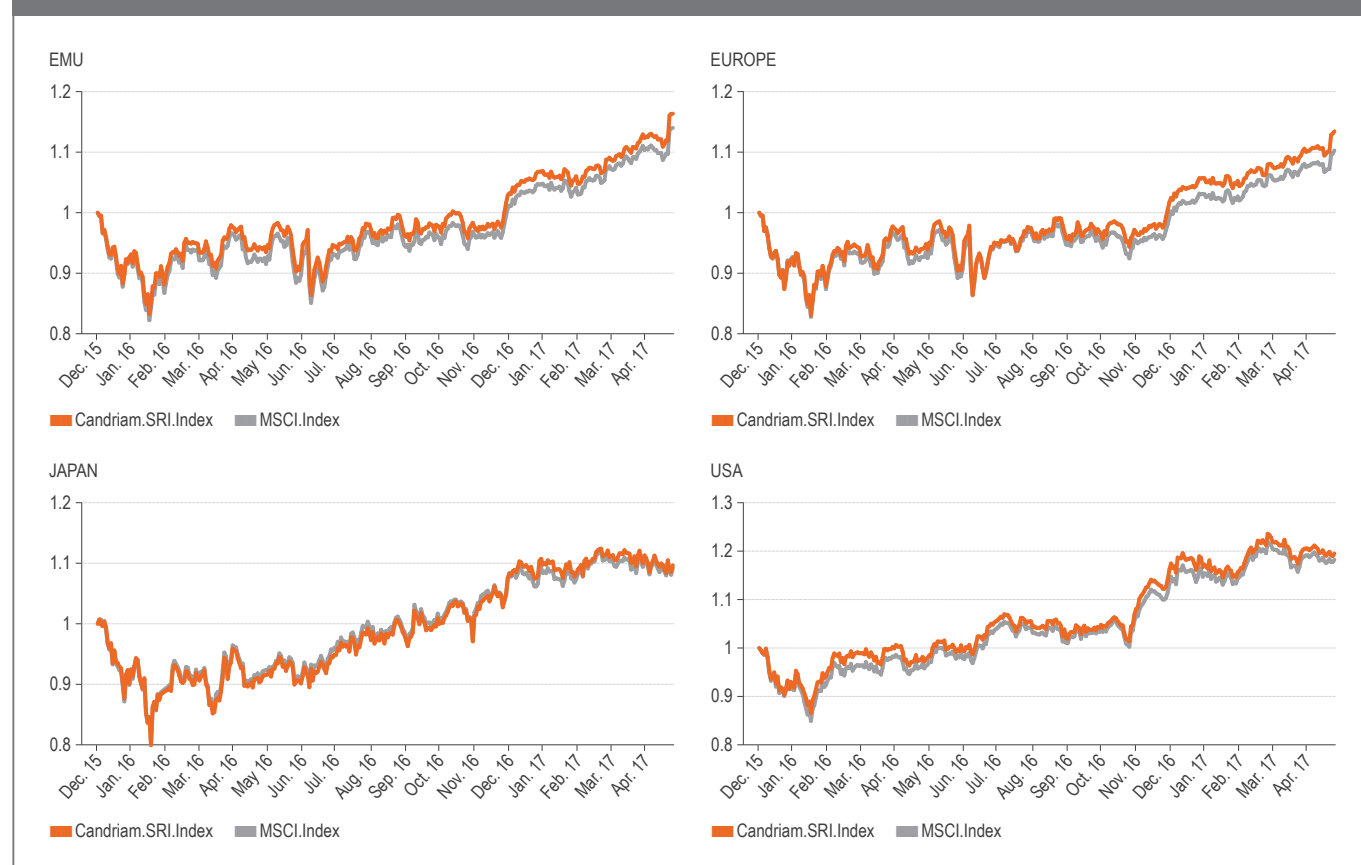
Obviously, given the aforementioned portfolio construction process, the portfolio has certain style biases such as Value, Quality, Low Volatility and Size. The graph below illustrates the average style bias of the indices since the end of 2015.

5. CONCLUSION

Based on the above analysis, Candriam is convinced that this portfolio construction methodology is highly valuable for investors seeking to match or even outperform the broad equity markets, but who cares about Sustainable and Responsible Investing. It shows that both objectives are not mutually exclusive.

Also, the most recent “live” performance of the indices (since the end of 2015, when the backtest ended) confirms the excellent risk-return characteristics. The graph below shows the performance of the index compared to the broad market based on a standard market-capitalization portfolio construction methodology.

FIGURE 9: Candriam SRI Index – Live performance



Sources: Candriam, Factset, MSCI

The Risk and Performance Measures in table 8 also indicate a significant higher Sharpe Ratio, and a strong Information Ratio between 0.51 and 2.21, whereas Max Drawdown and Historical VaR are slightly lower.

TABLE 8: SRI Indices – Statistical Table

	Candriam SRI Index Europe	MSCI Europe	Candriam SRI Index EMU	MSCI EMU	Candriam SRI Index Japan	MSCI Japan	Candriam SRI Index USA	MSCI USA
Annualized Return	9.62%	7.38%	11.66%	10.01%	6.94%	6.62%	13.85%	12.96%
Annualized Std Dev	17.87%	17.36%	17.81%	18.28%	21.21%	21.21%	14.46%	14.66%
Annualized Sharpe (Rf=0%)	0.5384	0.4252	0.6544	0.5478	0.3272	0.3122	0.9575	0.8839
Maximum Drawdown	16.93%	17.21%	16.72%	17.76%	20.58%	20.48%	13.40%	15.06%
Historical VaR (95%)	-1.68%	-1.65%	-1.66%	-1.78%	-2.02%	-1.91%	-1.53%	-1.53%
Annualized Alpha	1.97%		1.75%		0.35%		1.06%	
Tracking Error	1.83%		1.79%		2.42%		1.99%	
Information Ratio	1.2237		0.9185		0.1308		0.4467	

Sources: Candriam, Factset, MSCI

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