A DIFFERENT VIEW ON EURO SOVEREIGN BOND INVESTING
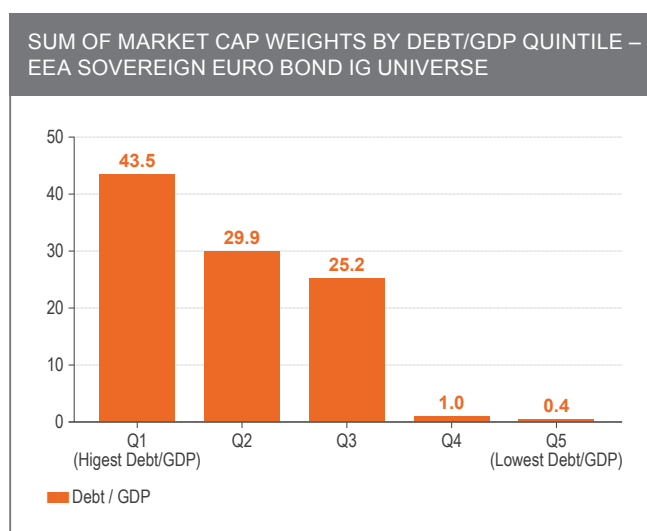
Koen Van de Maele, CFA & Maxime Moro

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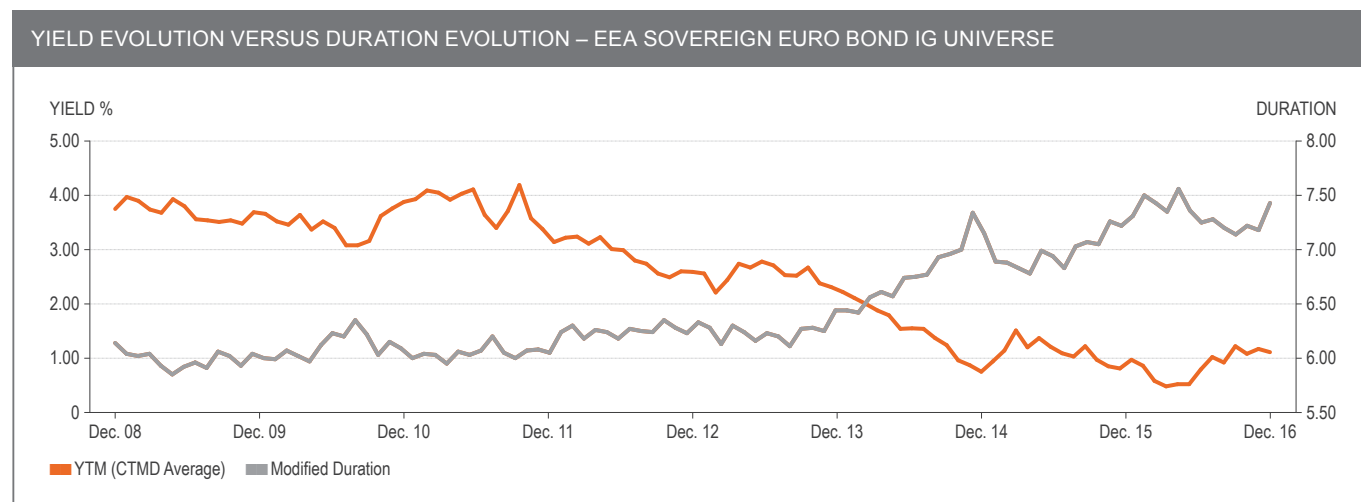
1. INTRODUCTION

Traditional bond indices, based on the market capitalization of issuers' outstanding debt, are widely used in the investment management industry. However, intuitively, it can be understood that this way of constructing bond portfolios is flawed. The greater the debt issued by a company or country, the higher the weight in such standard indices. This means that highly indebted issuers will mechanically be overrepresented, while rational investors would prefer to mitigate their exposure to such issuers. Additionally, the average duration of market capitalization indices is purely determined by the debtors. When interest rates are low, issuers tend to issue debt with long maturities and inversely when interest rates are high. However, such behaviour translates into a high duration of market capitalization indices when rates are low, and inversely. This is clearly not an optimal choice from a bond investor's point of view! The following graphs illustrate the disadvantages of classical bond indices that are based on market capitalization of all outstanding debt.

SUM OF MARKET CAP WEIGHTS BY DEBT/GDP QUINTILE – EEA SOVEREIGN EURO BOND IG UNIVERSE

Sources: Candriam, BofAML (Market cap), IMF (Debt/GDP)

YIELD EVOLUTION VERSUS DURATION EVOLUTION – EEA SOVEREIGN EURO BOND IG UNIVERSE

YIELD %

DURATION

[Chart: Line graph showing YTM (CTMD Average) in orange and Modified Duration in grey from Dec. 08 to Dec. 16. Left axis YIELD % from 0 to 5.00; right axis DURATION from 5.50 to 8.00. X-axis labeled Dec. 08, Dec. 09, Dec. 10, Dec. 11, Dec. 12, Dec. 13, Dec. 14, Dec. 15, Dec. 16]

■ YTM (CTMD Average)   ■ Modified Duration

Sources: Candriam, BofAML & Factset

This paper proposes an alternative way of investing in euro sovereign bonds. First, the universe is extended to all European sovereign bonds issued in euro. Hence countries such as Poland and Sweden, which also issue euro-denominated government bonds, are included in the analysis. Secondly, it is suggested that countries that don't pass Candriam's SRI Sovereign analysis be eliminated. Lastly, the eligible countries are weighted according to fundamental criteria combined with factor tilts. Although Factor Investing has not been very common in bond markets, an increasing number of academic studies indicate its value in the Fixed Income space. All simulations start in December 2008 and end in December 2015. The out-of-sample return characteristics since the start of 2016 are shown in the last section and are available on Bloomberg (SOLCASBE Index).

2. EURO SOVEREIGN UNIVERSE EXTENSION

Most euro government bond indices are limited to countries that are members of the Eurozone. However, non-Eurozone countries such as Poland and Sweden also regularly issue sovereign bonds in euro. Similar to the standard euro corporate bond indices, where all issuers are integrated irrespective of their origin, we propose to open the universe to all European countries. The table below lists the number of bonds of all euro-denominated sovereign bonds issued by European countries. The performance of a market capitalization-based index with this universe expansion is also shown.
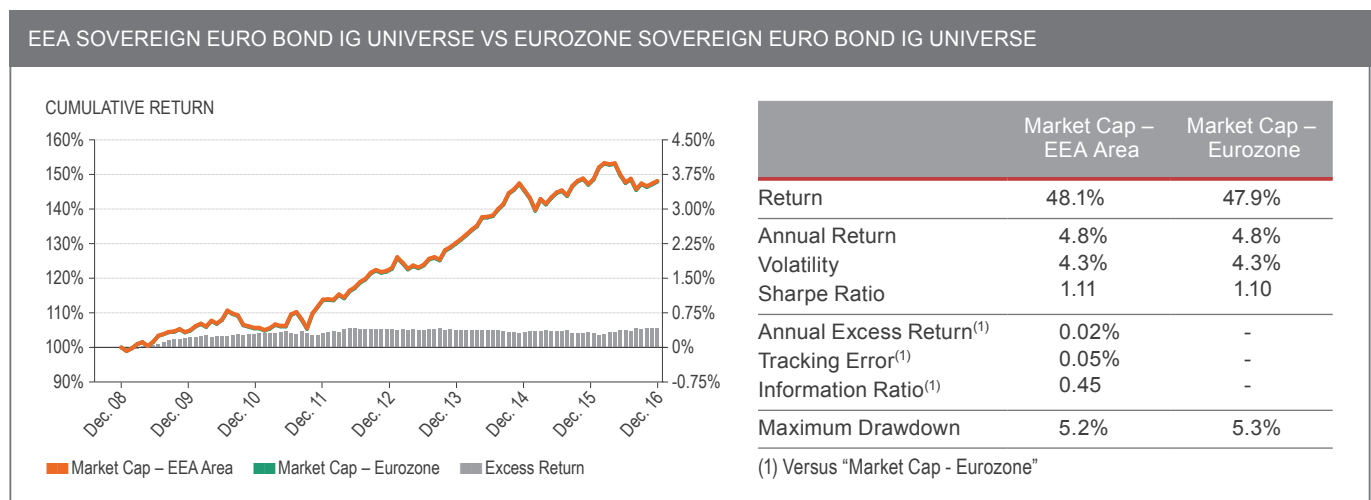
Description of the extended universe:

- EEA country:
  - Eurozone Members
  - European Union Members (Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden, United Kingdom)
  - European Free Trade Association (Iceland, Liechtenstein, Norway)
- Investment Grade
- Countries which issue bonds in Euro (with amount outstanding greater than 1€bn, not Inflation-Linked, Not with variable coupon, Time to maturity > 1 year)

Latest universe (June 2017)

Country	Extended Universe	Area	Investment Grade	Number of bonds Issued in € (> 1€bn)
Austria		Eurozone	Yes	24
Belgium		Eurozone	Yes	26
Finland		Eurozone	Yes	17
France		Eurozone	Yes	47
Germany		Eurozone	Yes	49
Ireland		Eurozone	Yes	13
Italy		Eurozone	Yes	71
Latvia		Eurozone	Yes	2
Lithuania		Eurozone	Yes	2
Luxembourg	Yes	Eurozone	Yes	4
Netherlands		Eurozone	Yes	20
Slovakia		Eurozone	Yes	15
Slovenia		Eurozone	Yes	13
Spain		Eurozone	Yes	39
Bulgaria		EU	Yes	4
Czech Republic		EU	Yes	3
Poland		EU	Yes	14
Romania		EU	Yes	7
Sweden		EU	Yes	2
Estonia		Eurozone	Yes	
Malta		Eurozone	Yes	
Denmark		EU	Yes	
Hungary	No	EU	Yes	0
United Kingdom		EU	Yes	
Iceland		EFTA	Yes	
Liechtenstein		EFTA	Yes	
Norway		EFTA	Yes	
Cyprus		Eurozone		3
Greece		Eurozone	No	26
Portugal		Eurozone		14
Croatia		EU		3

Source: Bloomberg

Performance of the extended universe

EEA SOVEREIGN EURO BOND IG UNIVERSE VS EUROZONE SOVEREIGN EURO BOND IG UNIVERSE

CUMULATIVE RETURN

Legend: Market Cap – EEA Area, Market Cap – Eurozone, Excess Return

	Market Cap – EEA Area	Market Cap – Eurozone
Return	48.1%	47.9%
Annual Return	4.8%	4.8%
Volatility	4.3%	4.3%
Sharpe Ratio	1.11	1.10
Annual Excess Return[1]	0.02%	-
Tracking Error[1]	0.05%	-
Information Ratio[1]	0.45	-
Maximum Drawdown	5.2%	5.3%

(1) Versus "Market Cap - Eurozone"

Sources: Candriam, Bloomberg, Factset

3. SRI COUNTRY ANALYSIS

Candriam has developed an in-depth SRI methodology for countries. This analysis is based on 4 pillars: Human Capital, Natural Capital, Social Capital and Economic Sustainability. Additional screening verifies whether or not a country is respecting the minimum standards in terms of corruption and democracy indicators. This analysis translates into Candriam's SRI country analysis, which is published on www.candriam.com. On the date of publication, Greece and Turkey were the only European countries excluded from the Candriam SRI country universe.

25%
HUMAN CAPITAL

- Labor
- Health
- KnowtGo

25%
NATURAL CAPITAL

- Total environmental impact
- Transportation policy
- Non GG atmospheric emissions
- Energy & climate change
- Ecosystems & biodiversity
- Water consumptions & emissions
- Raw materials & wastes
- Exposure to natural hazards & management

25%
SOCIAL CAPITAL

- Democracy
- Corruption & Rule of law
- Governance
- Fairness
- Peace

MINIMUM STANDARD SCREENING BASED ON

CORRUPTION & DEMOCRACY INDICATORS

25%
ECONOMIC SUSTAINABILITY

- Indebtedness
- Economic activity
- Budget deficit
- Health of the financial system
- International competitiveness
- Economic positioning
- Foreign dependency

4. PORTFOLIO CONSTRUCTION

As an alternative to the classic market capitalization index approach, individual bond weightings are determined via a 2-step process. First, a fundamental weighting that reflects the importance of the country based on standard economic measures is determined. Country weightings are then tilted to reflect Value, Low Volatility and Quality factors. Below, we outline each of these steps, illustrating their impact on risks and returns.

4.1. Fundamental Weighting

A country's importance within the global economy can be measured in different ways. Candriam believes that the creation of wealth (GDP) and the country's workforce (population) should be integrated to provide a meaningful assessment of that country's importance. Hence, GDP and population are taken to determine a fair initial weighting for all countries (using an equally weighted average). In order to maintain a sufficient level of diversification, we invest in the whole curve of the country. The graphs below show the performance of this methodology and the risk versus traditional market cap-weighted indices.

FUNDAMENTAL WEIGHT VS. TRADITIONAL MARKET CAP WEIGHT

	Fundamental	Market Cap – EAA Area
Return	50.0%	48.1%
Annual Return	4.9%	4.8%
Volatility	3.7%	4.3%
Sharpe Ratio	1.34	1.11
Annual Excess Return[1]	0.18%	0.02%
Tracking Error[1]	0.84%	0.05%
Information Ratio[1]	0.21	0.45
Maximum Drawdown	4.5%	5.2%

(1) Versus "Market Cap - Eurozone"
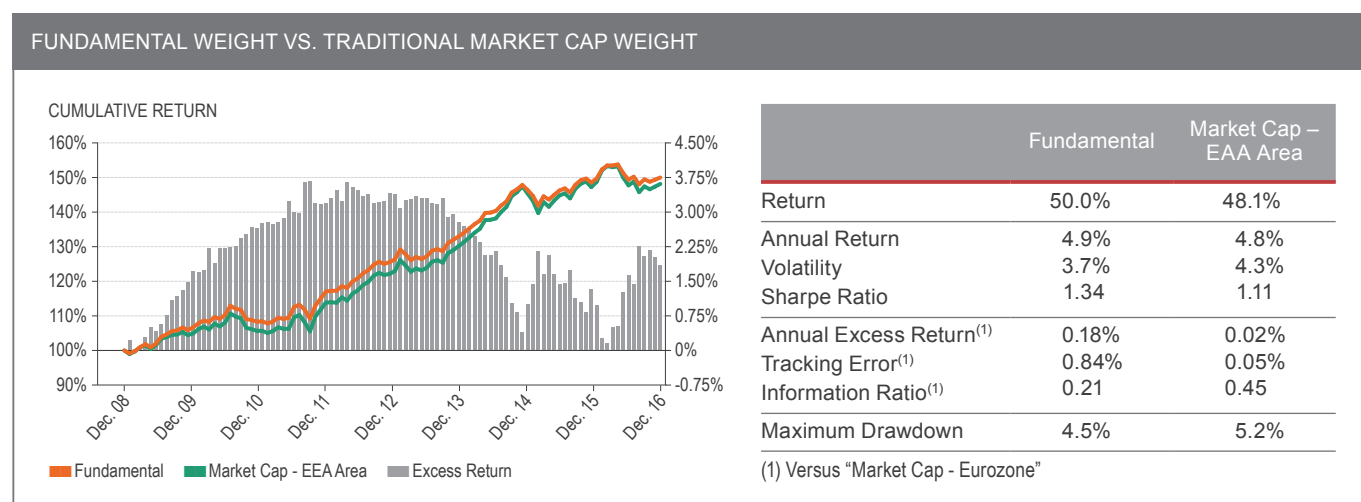
Sources: Candriam, BofAML & Factset (Prices Data), IMF (Economical Data)

4.2. Factor Investing

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). Although most research covers the equity markets, smart beta within bond investing is starting to gain traction.

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 Low Volatility, Value and Quality.

A different view on euro sovereign bond investing

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

- Low Volatility: Modified Duration of the country (weighted average of Duration by amount outstanding).
- Value: Fair value of the YTM, calculated with a cross-sectional regression based on modified duration and debt/GDP ratio. When the observed YTM of a country is higher than the estimated YTM, it represents high value.
- Quality: Combination of the Real GDP Growth of the country and the net lending(+)/borrowing (-) balance.

To illustrate the added value of the 3 aforementioned factors, portfolios were created for each of the individual factors. The starting point of each portfolio is the fundamental weight (based, as explained above, on GDP and population). All countries in the extended universe are classified in quintiles at factor level. Tilts are applied by quintile to the fundamental weights and then rebased to 100%:

- +10% for the best quintile group of countries (equally split over all countries in the first quintile);
- +5% for the second-best quintile;
- Neutral for third quintile;
- -5% for the second-worst quintile;
- -10% for the worst quintile.

The graphs below show the performance and the risk of these 3 methodologies versus the fundamental weight:

FUNDAMENTAL WEIGHT + LOW VOLATILITY DRIFT VS. FUNDAMENTAL WEIGHT

CUMULATIVE RETURN

	Fundamental + Low Vol Drift	Fundamental
Return	51.8%	50.0%
Annual Return	5.1%	4.9%
Volatility	3.5%	3.7%
Sharpe Ratio	1.46	1.34
Annual Excess Return[1]	0.33%	0.18%
Tracking Error[1]	1.13%	0.84%
Information Ratio[1]	0.29	0.21
Maximum Drawdown	4.1%	4.5%

(1) Versus "Market Cap - Eurozone"
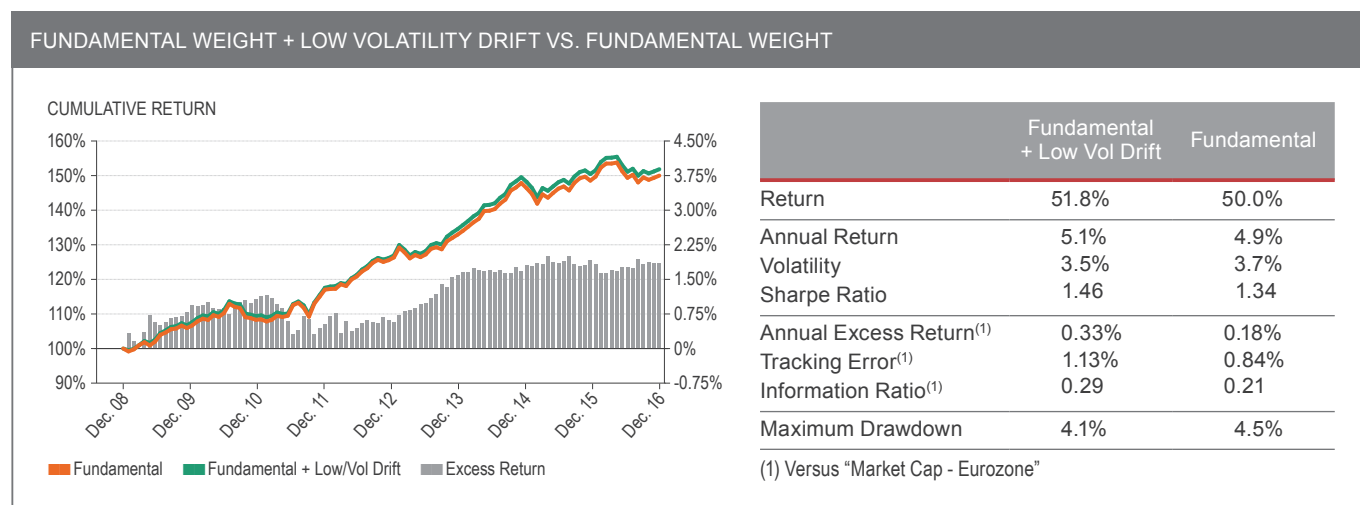
Sources: Candriam, BofAML & Factset (Prices Data), IMF (Economical Data)

A different view on euro sovereign bond investing

FUNDAMENTAL WEIGHT + VALUE DRIFT VS. FUNDAMENTAL WEIGHT

CUMULATIVE RETURN

Legend: Fundamental — Fundamental + Value Drift — Excess Return
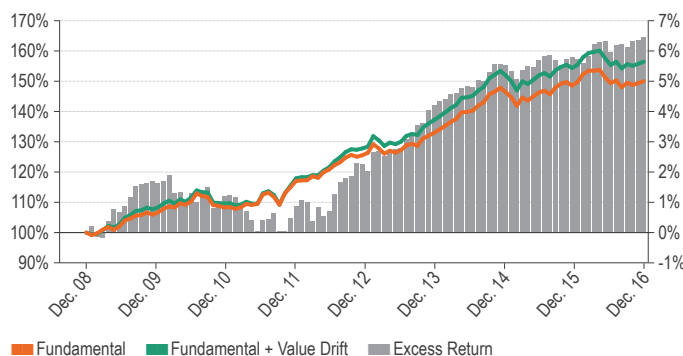
	Fundamental + Value Drift	Fundamental
Return	56.5%	50.0%
Annual Return	5.5%	4.9%
Volatility	3.9%	3.7%
Sharpe Ratio	1.41	1.34
Annual Excess Return[1]	0.70%	0.18%
Tracking Error[1]	1.15%	0.84%
Information Ratio[1]	0.61	0.21
Maximum Drawdown	4.3%	4.5%

(1) Versus "Market Cap - Eurozone"

Sources: Candriam, BofAML & Factset (Prices Data), IMF (Economical Data)

FUNDAMENTAL WEIGHT + QUALITY DRIFT VS. FUNDAMENTAL WEIGHT

CUMULATIVE RETURN

Legend: Fundamental — Fundamental + Quality Drift — Excess Return
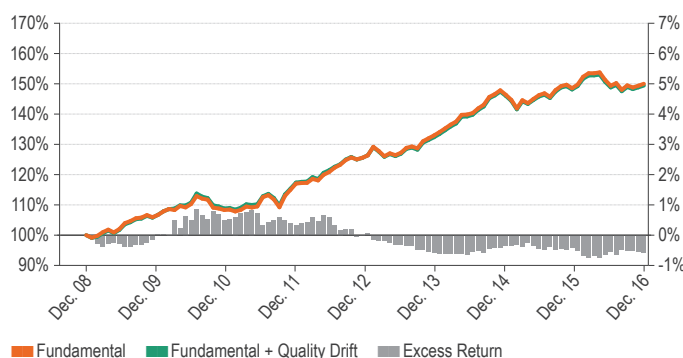
	Fundamental + Quality Drift	Fundamental
Return	49.4%	50.0%
Annual Return	4.9%	4.9%
Volatility	3.6%	3.7%
Sharpe Ratio	1.36	1.34
Annual Excess Return[1]	0.13%	0.18%
Tracking Error[1]	1.05%	0.84%
Information Ratio[1]	0.12	0.21
Maximum Drawdown	4.7%	4.5%

(1) Versus "Market Cap - Eurozone"

Sources: Candriam, BofAML & Factset (Prices Data), IMF (Economical Data)

CORRELATIONS

	Fundamental	Fundam. + Low Vol	Fundam. + Value	Fundam. + Quality
Fundamental	100.0%	99.5%	98.2%	99.4%
Fundam. + Low Vol		100.0%	99.1%	98.8%
Fundam. + Value			100.0%	96.5%
Fundam. + Quality				100.0%

Sources: Candriam, BofAML & Factset (Prices Data), IMF (Economical Data)

Regarding Low Volatility and the Value factor, we can observe a better Return/Risk ratio than the fundamental weight. The Quality factor has similar Return/Risk ratios to the fundamental weight but brings further diversification, as illustrated in the correlation matrix.

5. 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 fundamental weights. To this end, the following tilts are applied by quintile to the fundamental weights and then rebased to 100% (methodology identical to that used before to test the single factor strategy).

Composite Quintile Group / Tilt:

- +10% for the best quintile group of countries;
- +5% for the second-best quintile;
- Neutral for third quintile;
- -5% for the second-worst quintile;
- -10% for the worst quintile.

Historical Performance

The graphs and table below illustrate the performance of the combined methodology. The combined multi-factor methodology outperforms the equivalent market capitalization index in terms both of return and of risk. Also, the Sharpe Ratio and Historical Maximum Drawdown are better than the market-capitalization index.

MULTI-FACTOR VS. TRADITIONAL MARKET CAP WEIGHT

CUMULATIVE RETURN

■ Multi-Factor   ■ Market Cap - Eurozone   ■ Excess Return

	Multi-Factor	Market Cap – Eurozone
Return	54.1%	47.9%
Annual Return	5.3%	4.8%
Volatility	3.6%	4.3%
Sharpe Ratio	1.47	1.10
Annual Excess Return[1]	0.52%	-
Tracking Error[1]	1.16%	-
Information Ratio[1]	0.45	-
Maximum Drawdown	4.0%	5.2%

(1) Versus "Market Cap - Eurozone"
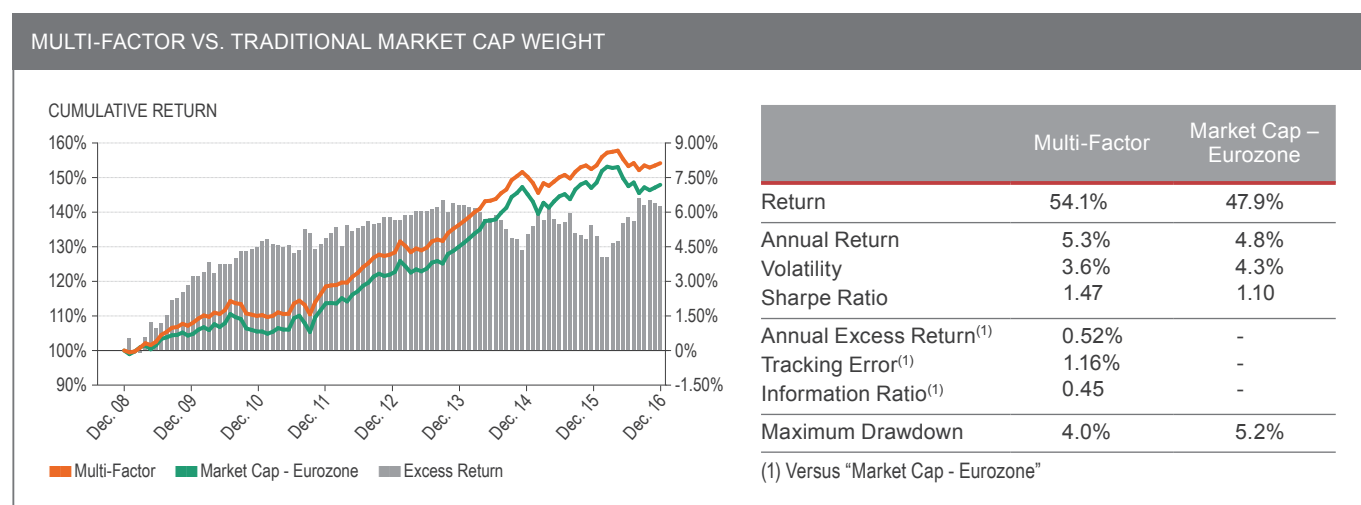
Sources: Candriam, BofAML & Factset (Prices Data), IMF (Economical Data)

Statistical Returns Table

	Market Cap – Eurozone	Market Cap – EAA Area	Fundamental	Fundam. + Low Vol	Fundam. + Value	Fundam. + Quality	Multi-Factor
Return	47.9%	48.1%	50.0%	51.8%	56.5%	49.4%	54.1%
Annual Return	4.8%	4.8%	4.9%	5.1%	5.5%	4.9%	5.3%
Volatility	4.3%	4.3%	3.7%	3.5%	3.9%	3.6%	3.6%
Sharpe Ratio	1.1	1.11	1.34	1.46	1.41	1.36	1.47
Annual Excess Return	-	0.02%	0.18%	0.33%	0.70%	0.13%	0.52%
Tracking Error	-	0.05%	0.84%	1.13%	1.15%	1.05%	1.16%
Information Ratio	-	0.45	0.21	0.29	0.61	0.12	0.45
Maximum Drawdown	5.2%	5.2%	4.5%	4.1%	4.3%	4.7%	4.0%

Sources: Candriam, BofAML & Factset (Prices Data), IMF (Economical Data)

The graphs below illustrate the evolution of duration, Yield-to-Maturity and rolling volatility of the simulation.
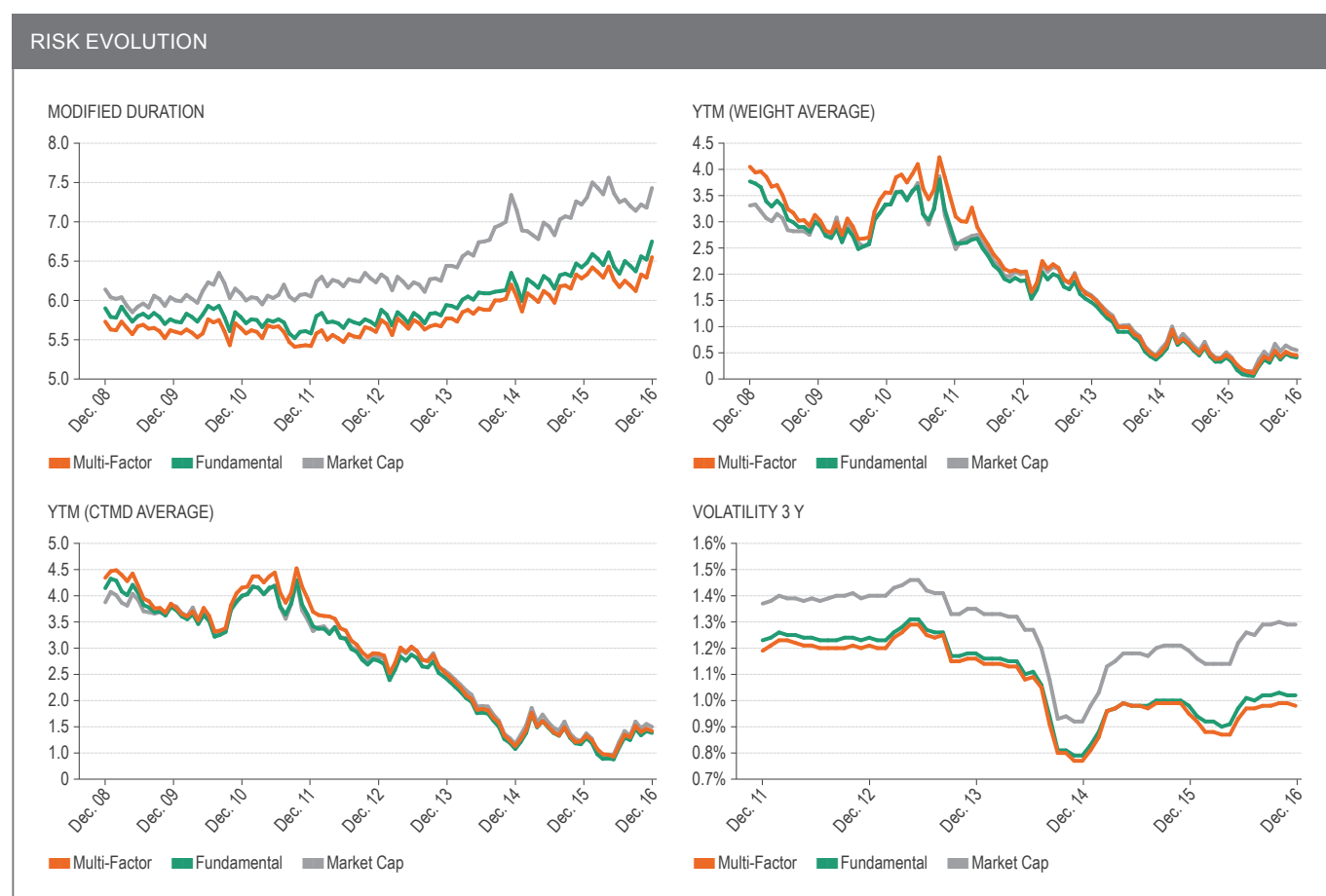
Sources: Candriam, BofAML & Factset (Prices Data), IMF (Economical Data)

6. CONCLUSION

Based on the above analysis, Candriam is convinced that this portfolio construction methodology is highly valuable for bond investors seeking to match or even outperform the broad EUR government bond market.

Also, the most recent "live" performance of the index (since the end of 2015, when the backtest ended) confirms the excellent risk-adjusted characteristics. The graphs below show the performance of the index compared to the broad EUR government bond market based on a standard market-capitalization portfolio construction methodology since January 2016 (excluding the first day, to exclude the impact of the initial transactions).
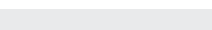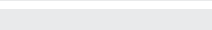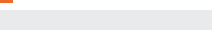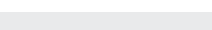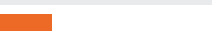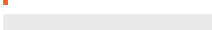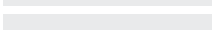
The Risk and Performance Measures also indicate a higher Sharpe Ratio, whereas Maximum Drawdown is reduced.

SOLCAN FACTORS SUS. SOV € BOND INDEX VS BOFA ML € GOVENMENT INDEX

CUMULATIVE RETURN

SolCan factors Sus. Sov € Bond Index — Market Cap — Excess Return

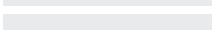|	SolCan Factors Sus. Sov €	Market Cap – EAA Area	BofA ML € Gov. (Bench)
Return	2.58%	2.36%	2.45%
Annual Return	1.83%	1.68%	1.74%
Volatility	2.46%	3.55%	3.65%
Sharpe Ratio	0.74	0.47	0.48
Annual Excess Return	0.09%	-0.06%	-
Tracking Error	1.26%	0.48%	-
Information Ratio	0.07	-0.13	-
Maximum Drawdown	4.0%	5.6%	5.9%

Sources : Candriam, Bloomberg

A different view on euro sovereign bond investing

The graph below illustrates the differences in country weights of this methodology compared to standard market capitalization indices. At the time of publication, for example, the proposed portfolio methodology has an increased allocation into Poland, Romania and Germany, while having a lower risk in Italy, France and Belgium.

	ABSOLUTE WEIGHTS			RELATIVE WEIGHTS VS BENCH
Country of risk	SolCan Factors Sustainable Sov. €	Market Cap – EEA Area	BofA ML € Gov. (Bench)	SolCan Factors Sustainable Sov. €
Germany	23%	17.5%	17.8%	5.2%
Italy	16.4%	23.2%	23.9%	-7.5%
France	15.7%	24.5%	24.2%	-8.4%
Spain	10.9%	13.4%	13.8%	-2.9%
Poland	10.3%	0.6%		10.3%
Romania	6.7%	0.2%		6.7%
Czech Republic	3%	0.2%		3%
Netherlands	2.7%	5.6%	5.5%	-2.8%
Ireland	2.7%	2%	2%	0.7%
Sweden	2%	0.1%		2%
Latvia	1.4%	0.04%	0.04%	1.4%
Austria	1.4%	3.6%	3.7%	-2.4%
Luxembourg	1.3%	0.1%	0.1%	1.2%
Bulgaria	1.1%	0.1%		1.1%
Belgium	0.8%	6.4%	6.3%	-5.5%
Lithuania	0.5%	0.04%	0.04%	0.5%
Finland		1.5%	1.6%	-1.6%
Slovakia		0.6%	0.6%	-0.6%
Slovenia		0.4%	0.4%	-0.4%
Sum	**100.0%**	**100.0%**	**100.0%**	**0.0%**
Out of Bench	**23.1%**	**1.2%**		**13.1%**

Sources: Candriam, Bloomberg

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