

Decarbonising iShares' LQD ETF

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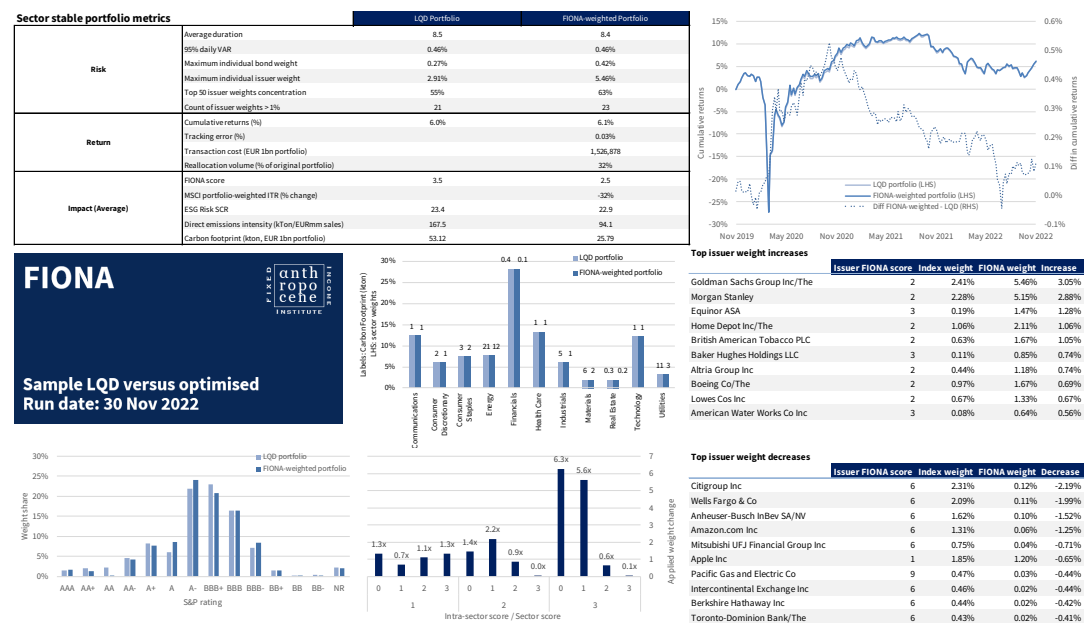
Passive investment dominates public fixed income markets, and over the past few years bond Exchange Traded Funds (ETFs) have grown in popularity as a method to achieve such exposure. Among the most used product in the marketplace is the iShares LQD ETF, with net assets of USD 38.3bn.¹

The LQD ETF sustainability disclosure indicates a high carbon footprint – and an implied temperature rise of over 2.5°C – potentially reducing the appeal to investors aligning with net zero.

By applying the AFII Fixed Income Optimisation for Net zero Alignment (FIONA) framework, we show that the LQD's negative climate footprint can be considerably reduced without a significant impact on its performance. These results are achieved while holding duration and sector exposure relatively neutral. When allowing sector weights to vary, climate results strengthen further.

This analysis advances the proposal that there can be alternative index construction rules and associated passive ETFs that enjoy similar investment profiles as LQD but have a substantially improved climate-alignment.

Figure 1. Portfolio dashboard showing LQD and FIONA-weighted solution. Full details are covered in the next few pages. Source: Bloomberg, iShares, accessed 30 Nov 2022



¹ Source [iShares](https://www.ishares.com), as of 18 Nov 2022, accessed 21 Nov 2022. This note is focused on LQD as the most significant bond ETF, and is intended neither as a recommendation nor a critique of the product and its manager.

Background

Fixed income is a key capital source for funding the climate transition. It is the largest market, slightly larger than global equities,² yet asset owners tend to pay greater attention to their equity investments when considering climate impact.

It is estimated that 60% of emissions are from entities not listed on the equity markets.³ Debt has a much wider reach in terms of influence on governments, and privately-owned-entities.

Investors also have a habit of focusing on active portfolios rather than passive investing, even though nearly a third of debt capital is invested through passive products.⁴ AFII argues that all capital needs to be effectively utilised to accelerate the transition to climate-aligned portfolios.

In this note, we utilise our FIONA framework, which enables investors and issuers to review the climate impact of fixed income portfolios. We apply FIONA to iShares' LQD, one of the largest in the corporate bond market. We analyse its climate impact and apply our portfolio optimisation tools to understand how it could be improved, without negatively affecting risk and returns.

LQD ETF

LQD is a US corporate bond ETF offered by iShares, the ETF manager of BlackRock. It is a passive portfolio, designed to track the Markit iBoxx USD Liquid Investment Grade Index (ticker IBOXIG).⁵ Its inception date was 22 Jul 2022 and has current net assets of USD 38.3bn.⁶ It is an open-ended fund, meaning shares can be created or redeemed depending on market demand. The ETF is available to trade via multiple venues on different exchanges, in accumulation or income distribution classes. This is one of the largest corporate bond ETFs on the market,⁷ enjoying a high degree of liquidity.

Sustainability disclosure using MSCI data gives a weighted average carbon intensity of 146.54t CO₂e / \$M sales, and an implied temperature rise “> 2.5-3°C”.⁸ These are poor climate metrics. Its carbon intensity is over three-times the MSCI USD IG Climate Paris Aligned Corporate Bond Index.⁹ Its self-reported implied temperature rise is well in excess of Paris commitments.

We apply the AFII Fixed Income Optimisation for Net zero Alignment (FIONA) framework to analyse the climate impact of this portfolio and consider parallel portfolios with reduced emissions intensity and improved temperature alignment.

We consider the maximum improvements which are possible while maintaining good historic returns, low tracking error, minimised transaction costs, and limited increases in concentration. We demonstrate that improved climate performance is achievable without loss of return or increases in risk.

² “[Capital Markets Fact Book, 2022](#)”, SIFMA, 12 July 2022.

³ “[Listed Company Emissions](#),” Generation IM, 11 Oct 2021.

⁴ “[Passive likely overtakes active by 2026](#)”, Bloomberg, 11 Mar 2021.

⁵ To be eligible for inclusion bonds must be USD denominated, investment grade rated, and over 3 years in expected remaining life. For full details see “[Markit iBoxx Index Guide](#)”, Markit, Sep 2022.

⁶ Source [iShares](#), as of 18 Nov 2022, accessed 21 Nov 2022.

⁷ Listed as 3rd largest on [etfdb.com](#), accessed 5 Dec 2022.

⁸ Source [iShares](#), as of 21 Sep 2022, accessed 21 Nov 2022.

⁹ 47.4t CO₂e/\$M Sales, source [MSCI](#), accessed 5 Dec 2022.

FIONA system

FIONA has been created to provide analysis and climate-positive enhancements to fixed income portfolios. It builds on earlier work conducted by the Anthropocene Fixed Income Institute on developing carbon-intensity scoring methods and analysing impact on returns.¹⁰ We recognise the limitations on data in this space, and so FIONA has been designed as a data-agnostic framework, to use the best current data, and incorporate new data as it becomes available. We also recognise the difficulties in aligning to both spot and forward-looking climate data, and so consider a portfolio's impact in both scenarios.

FIONA begins by creating a universe of issuers. It completes data sets using statistical methods including penalties for non-disclosure. It assigns sector and intra-sector scores based on algorithmic comparison of environmental metrics within the universe. Figure 2 shows a summary of the issuers in the FIONA universe, and the data we use, all of which are issuer-level metrics.

Scores for sectors and issuers within sectors are 1-3; 1 is the best performing (more climate-aligned) and 3 the poorest (less climate-aligned), and green bonds are assigned a score of 0. The final issuer score is the product of the sector and intra-sector score, giving a range of 0-9. FIONA then applies these issuer level scores to a portfolio of securities, considering individual characteristics such as duration or climate-alignment criteria to generate a portfolio score. This score can then be enhanced subject to risk-based constraints. The portfolio can then be analysed using a dashboard which presents metrics on risk, return and impact.

Figure 2. Summary of FIONA universe and sector rankings. Source: AFII, Bloomberg, accessed 30 Nov 2022.

Sector	Count of Issuers	Emissions Intensity		ESG Rating		Implied Temperature Rise		AFII Sector Rank
		Average	Median	Average	Median	Average	Median	
Technology	151	34	11	18	17	1.8	1.7	1
Communications	186	40	30	20	21	1.7	1.6	1
Health Care	173	25	17	24	24	1.9	2.0	1
Financials	644	26	5	23	24	2.0	1.9	2
Consumer Staples	162	93	61	26	26	2.6	2.4	2
Consumer Discretionary	320	97	34	21	20	2.8	2.6	2
Real Estate	189	209	74	15	16	1.9	1.9	2
Government	221	40	36	10	10	3.8	3.8	2
Industrials	342	320	69	23	24	2.5	2.2	3
Materials	231	749	423	27	28	4.1	3.6	3
Energy	240	719	654	37	39	8.2	10.0	3
Utilities	329	1,912	1,000	30	31	3.9	3.3	3

¹⁰ For our earlier work please see: "[What if...the ECB had decarbonised its portfolio from the start](#)", AFII, 20 Sep 2022; "[Market update: Recent performance of high carbon emitters in CSPP](#)", AFII, 27 Jun 2022; "[Low carbon credit performance 2015-2020](#)", AFII, 27 Jan 2021; "[Credit Alpha and CO2 Reduction: A Portfolio Manager Perspective](#)", Ulf Erlandsson, 19 Apr 2017.

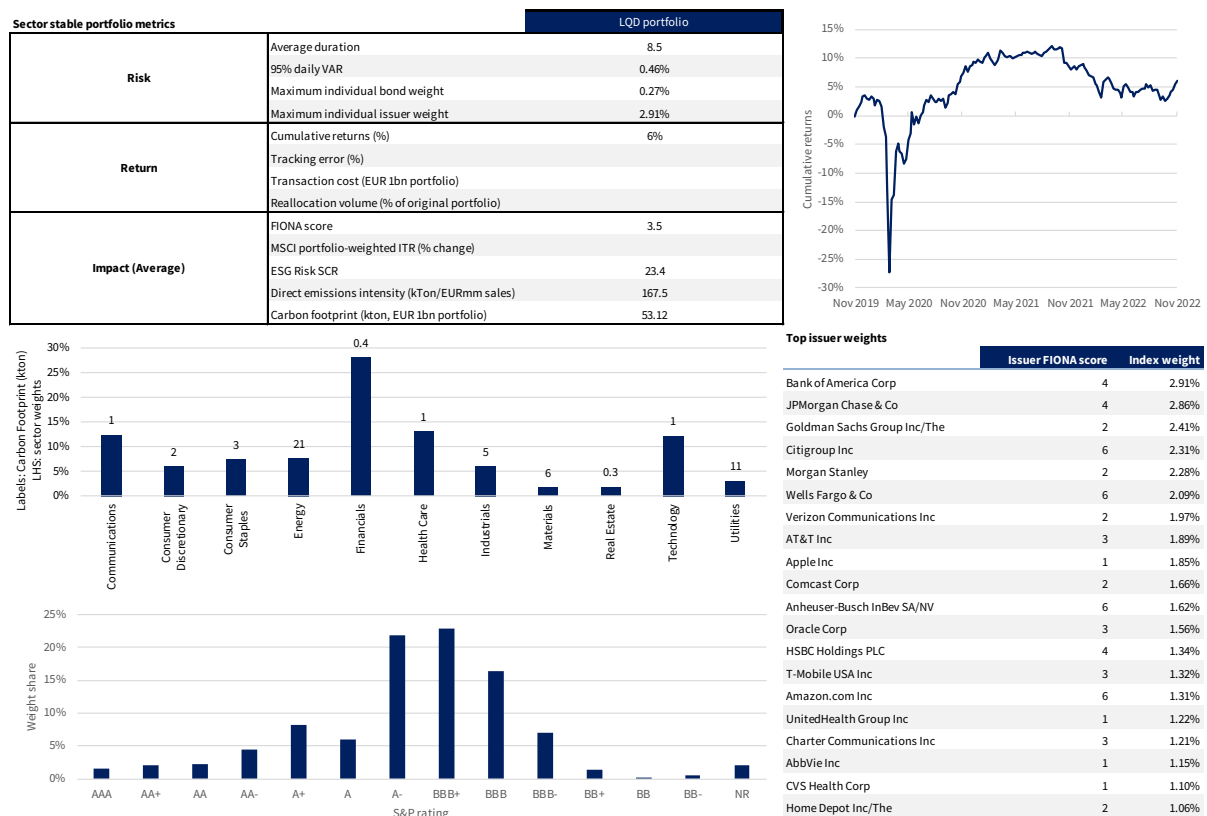
LQD portfolio dashboard

We first present the LQD portfolio using the FIONA dashboard. The dashboard gives metrics categorised as risk, return and impact:

- **Risk metrics** present a view of the portfolio as expected by a traditional manager.
- **Return metrics** analyse historic returns and tracking errors.¹¹
- **Impact metrics** show FIONA score, spot and forward-looking numerical metrics, plus discrete aligned buckets, to aid a manager in identifying their optimised portfolio.¹²

Figure 3 shows the starting dashboard for the LQD portfolio.

Figure 3. LQD portfolio dashboard. Source: Bloomberg, iShares, accessed 30 Nov 2022.



¹¹ Returns are calculated on a weekly basis, using historic mid z-spreads and durations. Where historic data is not available, because the security is recently issued, portfolios are normalised to the remaining securities.

¹² Due to variations in methods of calculating a portfolio level ITR, we present this as a relative change only. We calculate ITR as a portfolio-weight of the issuer levels, and the % change represents a move in this metric compared to 1.5°C.

The direct emissions intensity in our dashboard is slightly higher than in the reported LQD numbers. Converting to a USD denominator adjusts to 159kt compared with 147kt.¹³ (Data is not perfect in this space and an 8% discrepancy is not significant).

Financials is by far the largest sector, with a weighting of 28%, although contributing only 1% of the direct emissions (Figure 4).

Figure 4. LQD sector weights and emissions intensity share. Source: Bloomberg, iShares, accessed 30 Nov 2022.

Using only Scope 1 and Scope 2 emissions can make it hard to understand the carbon impact of Financials, where financed emissions from banks will be included in Scope 3 emissions.

Sector	Sector weight	Total emissions intensity	Emissions intensity weight
Communications	12%	3.3	2%
Consumer Discretionary	6%	3.3	2%
Consumer Staples	7%	4.5	3%
Energy	8%	48.6	29%
Financials	28%	1.9	1%
Health Care	13%	1.8	1%
Industrials	6%	12.4	7%
Materials	2%	11.8	7%
Real Estate	2%	2.0	1%
Technology	12%	2.4	1%
Utilities	3%	75.6	45%
Total	100%	167.5	100%

To ameliorate this issue, we have overlaid our league table analysis¹⁴ of the underwriting fees banks earned from fossil fuel investments to the scoring for this sector. This ensures that any issuer in the worst quartile is ranked 3 or the worst half is ranked at least 2.¹⁵

The dashboard confirms the fund’s sustainability disclosure, that the emissions intensity of this portfolio is multiples of Paris-aligned benchmarks.¹⁶

FIONA simulation

We will now apply FIONA portfolio tools to analyse alternative weightings of this portfolio that deliver better climate-positive performances.

We apply random re-weighting of securities according to FIONA scores and observe how these scores change. The improved portfolio can be compared with the original portfolio against the full set of metrics, to understand the payoff between distinct factors.

In the case studies presented below, 10,000 simulations have been used to identify the improved portfolio. The closest 500 solutions are further analysed (95% percentile, smallest loss function from the proposed solution), to further find an optimal solution.

¹³ 0.7% of the portfolio does not have emissions data available, and so we have used our extrapolated methods which include a penalty.

¹⁴ For full details please see “[Net green/fossil bond syndication league table – Dec 22](#)”, AFII, 8 Dec 2022.

¹⁵ For full details of the scores of the financial issuers in the portfolio, please see Appendix 1.

¹⁶ It is over three-times the emissions intensity of MSCI USD IG Climate Paris Aligned Corporate Bond Index, which is 47.4t CO2e/\$M Sales, source [MSCI](#), accessed 5 Dec 2022.

Case Study 1

Firstly, we try to improve the FIONA score and reduce the MSCI Implied Temperature Rise (ITR) with a minimal tracking error to the original portfolio. We only consider intra-sector reallocations.

Figure 5. Simulations for 10,000 FIONA weighted portfolios. Source: Bloomberg, iShares, accessed 30 Nov 2022.

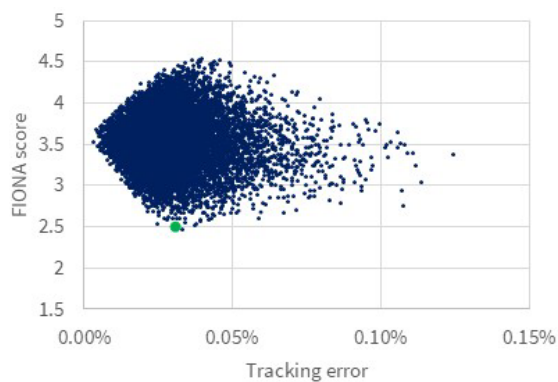


Figure 5 shows the simulations, which demonstrate that decreasing the FIONA score can be done without materially increasing the tracking error. Figure 6 shows the reduction in ITR (compared to a base of 1.5°C) of each simulation compared to its indicative transaction cost. The portfolio chosen to be our solution is highlighted in both Figures in green.

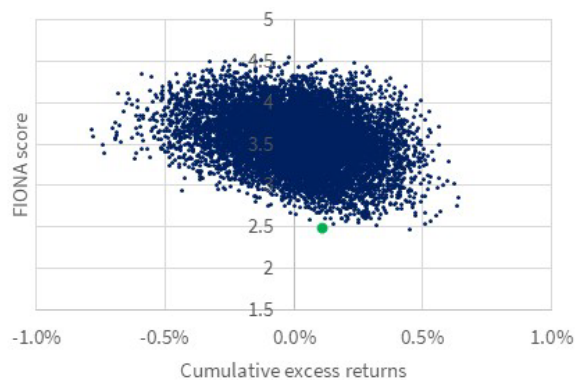


Figure 6. Simulations for 10,000 FIONA weighted portfolios, with indicative transaction costs. Source: Bloomberg, iShares, accessed 30 Nov 2022.

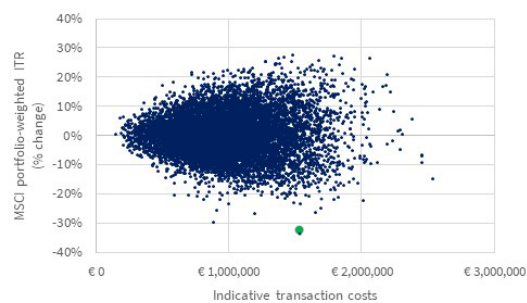


Figure 7 shows the full FIONA dashboard with comparative metrics. Weight changes can be seen in the middle bottom graph; for example, a green bond (score 0) in a poor sector (score 3) has had its weight increased by 6.3x. Within each sector the total weight has remained the same; this graph shows reallocations within sectors. Separate tables are included to highlight the largest increases and decreases; the weight increases are the strongest climate-aligned issuers within a sector, and the weight decreases are the poorer climate-aligned issuers.¹⁷ Several of the largest issuer weight changes are in the financial sector, as this sector had the highest weight to start with. Goldman Sachs, a financial issuer with intra-sector score of 1 and ultimate ranking of 2, ends up with a weight of 5.46%.

The FIONA score has been reduced by 1.0 to 2.5. Emissions intensity has been reduced by 43% to 94 kt/m. MSCI portfolio-weighted ITR over Paris commitment has reduced by 32%. This is alongside a tracking error of only 0.03%.

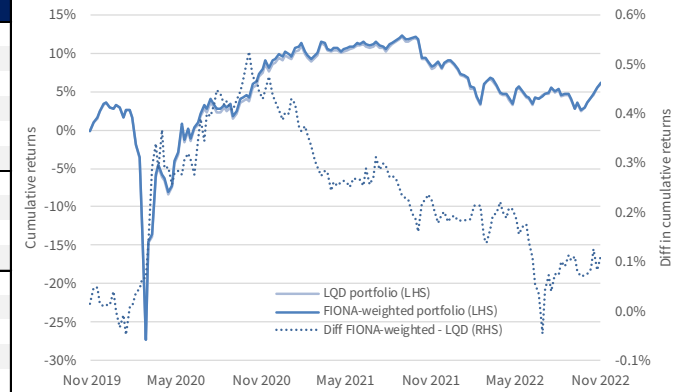
In conclusion, improving the emissions intensity and temperature alignment of the portfolio is possible, and comes at no cost to historic returns.

¹⁷ We observe the counter-intuitive results for 1-ranked sectors where 1-ranked issuers have a decrease in weight and 3-ranked issuers have an increase. Digging deeper, we see that within those sectors on a duration weighted basis, some lower emitters have slightly higher implied temperature rises (highlighting that spot data can sometimes be a poor indicator for forward alignment). Our optimisation works to reduce emissions and ITR and so has increased weight for some higher-emitting issuers in low-emission sectors. In absolute terms this effect is very small; 1-ranked sectors in total contribute only 4% of the total portfolio emissions.

Figure 7. Portfolio dashboard showing LQD and FIONA-weighted solution. Source: Bloomberg, iShares, accessed 30 Nov 2022.

Sector stable portfolio metrics

	LQD Portfolio	FIONA-weighted Portfolio	
Risk	Average duration	8.5	8.4
	95% daily VAR	0.46%	0.46%
	Maximum individual bond weight	0.27%	0.42%
	Maximum individual issuer weight	2.91%	5.46%
	Top 50 issuer weights concentration	55%	63%
	Count of issuer weights > 1%	21	23
Return	Cumulative returns (%)	6.0%	6.1%
	Tracking error (%)		0.03%
	Transaction cost (EUR 1bn portfolio)		1,526,878
	Reallocation volume (% of original portfolio)		32%
Impact (Average)	FIONA score	3.5	2.5
	MSCI portfolio-weighted ITR (% change)		-32%
	ESG Risk SCR	23.4	22.9
	Direct emissions intensity (kTon/EURmm sales)	167.5	94.1
	Carbon footprint (kton, EUR 1bn portfolio)	53.12	25.79

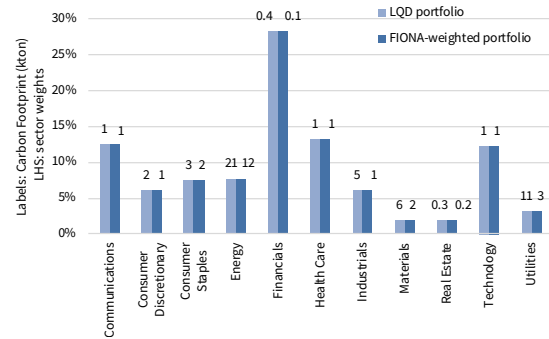


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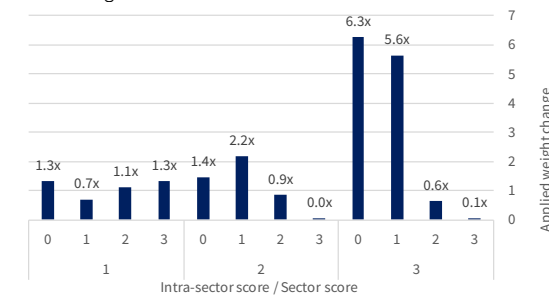
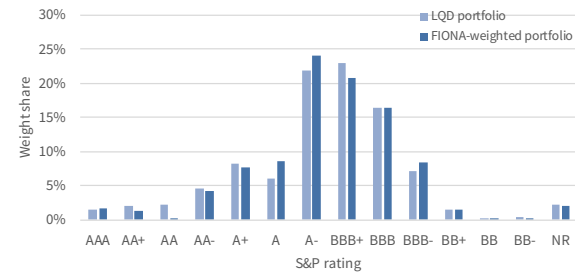
Sample LQD versus optimised

Run date: 30 Nov 2022



Top issuer weight increases

Issuer	FIONA score	Index weight	FIONA weight	Increase
Goldman Sachs Group Inc/The	2	2.41%	5.46%	3.05%
Morgan Stanley	2	2.28%	5.15%	2.88%
Equinor ASA	3	0.19%	1.47%	1.28%
Home Depot Inc/The	2	1.06%	2.11%	1.06%
British American Tobacco PLC	2	0.63%	1.67%	1.05%
Baker Hughes Holdings LLC	3	0.11%	0.85%	0.74%
Altria Group Inc	2	0.44%	1.18%	0.74%
Boeing Co/The	2	0.97%	1.67%	0.69%
Lowes Cos Inc	2	0.67%	1.33%	0.67%
American Water Works Co Inc	3	0.08%	0.64%	0.56%



Top issuer weight decreases

Issuer	FIONA score	Index weight	FIONA weight	Decrease
Citigroup Inc	6	2.31%	0.12%	-2.19%
Wells Fargo & Co	6	2.09%	0.11%	-1.99%
Anheuser-Busch InBev SA/NV	6	1.62%	0.10%	-1.52%
Amazon.com Inc	6	1.31%	0.06%	-1.25%
Mitsubishi UFJ Financial Group Inc	6	0.75%	0.04%	-0.71%
Apple Inc	1	1.85%	1.20%	-0.65%
Pacific Gas and Electric Co	9	0.47%	0.03%	-0.44%
Intercontinental Exchange Inc	6	0.46%	0.02%	-0.44%
Berkshire Hathaway Inc	6	0.44%	0.02%	-0.42%
Toronto-Dominion Bank/The	6	0.43%	0.02%	-0.41%

Case Study 2

In this example the aim is for a higher reduction in the implied temperature rise. To achieve this, weights are re-allocated between sectors, so concentration metrics are carefully monitored.

Figure 8. Simulations for 10,000 FIONA weighted portfolios. Source: Bloomberg, iShares, accessed 30 Nov 2022.

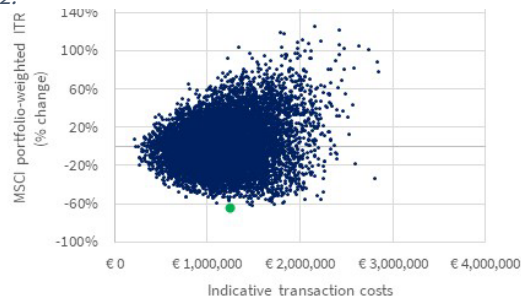


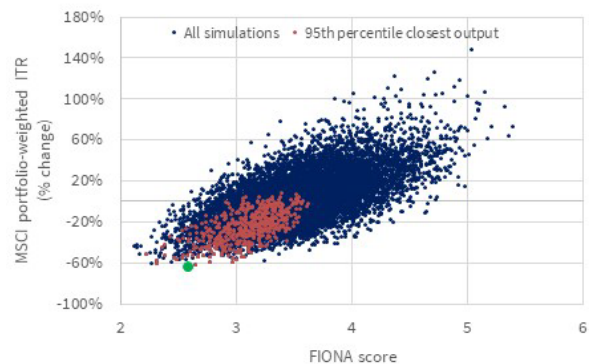
Figure 10 shows the full FIONA dashboard with comparative metrics. Weight changes can be seen in the middle bottom graph; for example, a poor issuer (score 3) in a poor sector (score 3) has had its weight decreased to 0.1x. This graph shows how exposure has been reallocated from poorly ranked sectors (where all weight changes are <1) towards better ranked sectors (where all changes are >1). The table in the middle shows where these reallocations have happened most; there is a substantial reduction in the total weight of energy, utilities and materials sectors, and an increase in communications, technology, and healthcare.

The FIONA score has been reduced by 0.9 to 2.6. Direct emissions intensity has been reduced by nearly 75% to 42.2 kt/m¹⁸. MSCI portfolio-weighted ITR has reduced towards 1.5°C by 65%. This is alongside a larger tracking error of 0.18%, but with no meaningful increase in VAR.

In conclusion, reducing ITR closer to 1.5°C is possible, but requires reallocation between sectors.

Figure 8 shows the simulations, and the portfolio we have chosen to analyse further in green. The graph shows that when freeing up sector weights the portfolio-weighted ITR of the portfolio can be reduced more, albeit by trading a higher percentage of the portfolio, and therefore potentially incurring higher transaction costs. Figure 9 gives a drill-down into the paths closest to the optimal solution.

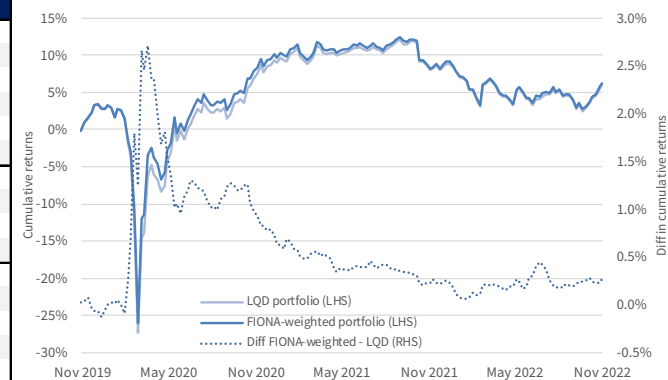
Figure 9. Simulations for 10,000 FIONA weighted portfolios and 500 closest paths to proposed solution. Source: Bloomberg, iShares, accessed 30 Nov 2022.



¹⁸ Which is less than the emissions intensity of MSCI USD IG Climate Paris Aligned Corporate Bond Index at 47.4t CO₂e/\$M Sales, as referenced in footnote 16.

Figure 10. Portfolio dashboard showing LQD and FIONA-weighted solution. Source: Bloomberg, iShares, accessed 30 Nov 2022.

Sector free portfolio metrics		LQD Portfolio	FIONA-weighted Portfolio
Risk	Average duration	8.5	8.8
	95% daily VAR	0.46%	0.47%
	Maximum individual bond weight	0.27%	0.43%
	Maximum individual issuer weight	2.91%	3.51%
	Top 50 issuer weights concentration	59%	65%
	Count of issuer weights > 1%	21	28
Return	Cumulative returns (%)	6.0%	6.3%
	Tracking error (%)		0.18%
	Transaction cost (EUR 1bn portfolio)		1,243,996
	Reallocation volume (% of original portfolio)		24%
Impact (Average)	FIONA score	3.5	2.6
	MSCI portfolio-weighted ITR (% change)		-65%
	ESG Risk SCR	23.4	21.4
	Carbon footprint (kton, EUR 1bn portfolio)	53.12	17.11

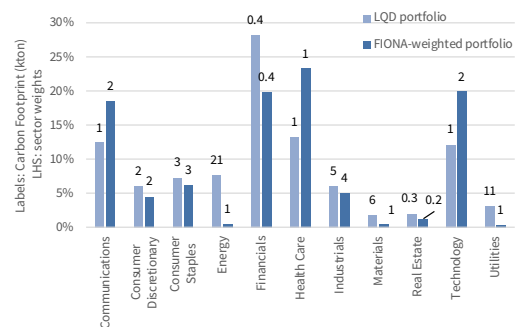


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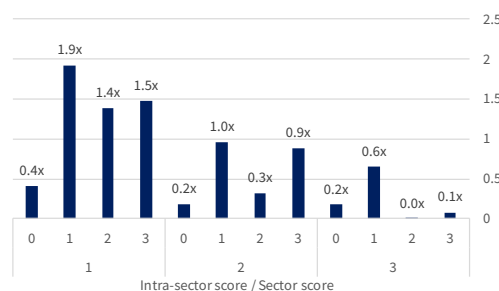
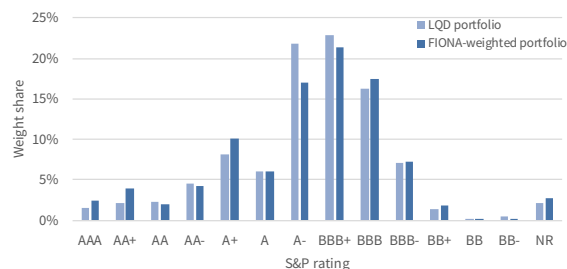
Sample LQD versus optimised

Run date: 30 Nov 2022



Top issuer weight increases

Issuer	FIONA score	Index weight	FIONA weight	Increase
Apple Inc	1	1.85%	3.51%	1.66%
UnitedHealth Group Inc	1	1.22%	2.35%	1.13%
AbbVie Inc	1	1.15%	2.21%	1.06%
CVS Health Corp	1	1.10%	2.11%	1.02%
AT&T Inc	3	1.89%	2.79%	0.91%
Oracle Corp	3	1.56%	2.31%	0.75%
Amgen Inc	1	0.84%	1.57%	0.73%
Bristol-Myers Squibb Co	1	0.70%	1.34%	0.65%
Comcast Corp	2	1.66%	2.30%	0.64%
Cigna Corp	1	0.69%	1.32%	0.64%



Top issuer weight decreases

Issuer	FIONA score	Index weight	FIONA weight	Decrease
Bank of America Corp	4	2.91%	0.92%	-1.99%
JPMorgan Chase & Co	4	2.86%	0.91%	-1.95%
HSBC Holdings PLC	4	1.34%	0.43%	-0.92%
Shell International Finance BV	6	0.70%	0.00%	-0.70%
Exxon Mobil Corp	6	0.63%	0.00%	-0.62%
BP PLC	6	0.62%	0.00%	-0.61%
General Motors Co	4	0.88%	0.27%	-0.61%
Energy Transfer LP	6	0.52%	0.00%	-0.52%
Enterprise Products Partners LP	6	0.51%	0.00%	-0.51%
Pacific Gas and Electric Co	9	0.47%	0.04%	-0.43%

Appendix 1

Financials is the largest sector weighting in the LQD portfolio, and one where direct emissions often do not capture the extent of climate impact of an issuer's activities. We have chosen to integrate AFII's 'The Box' analysis, where we rank financial institutions according to their green and fossil bond underwriting fees.¹⁹

Figure 11 shows the issuers whose scores have been impacted using this analysis.

Figure 11. Financial sector issuers adjusted using 'the Box' analysis. Source: AFII.

Issuer	Portfolio weight	Previous intra-sector score	Updated intra-sector score
Bank of America Corp	2.9%	1	2
JPMorgan Chase & Co	2.9%	1	2
Citigroup Inc	2.3%	1	3
Wells Fargo & Co	2.1%	1	3
Mitsubishi UFJ Financial Group Inc	0.7%	1	3
Barclays PLC	0.6%	1	2
Banco Santander SA	0.5%	1	2
Toronto-Dominion Bank/The	0.4%	1	3
Lloyds Banking Group PLC	0.4%	1	3
Royal Bank of Canada	0.4%	1	3
Mizuho Financial Group Inc	0.3%	2	3
Bank of Nova Scotia/The	0.2%	2	3
Bank of Montreal	0.2%	1	3
Total	14%		

¹⁹ For full details of the methodology, please see "[The Box: algorithmic climate impact for FI markets](#)", AFII, 15 Sep 2021.

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