Back to the grind: Low carbon credit performance

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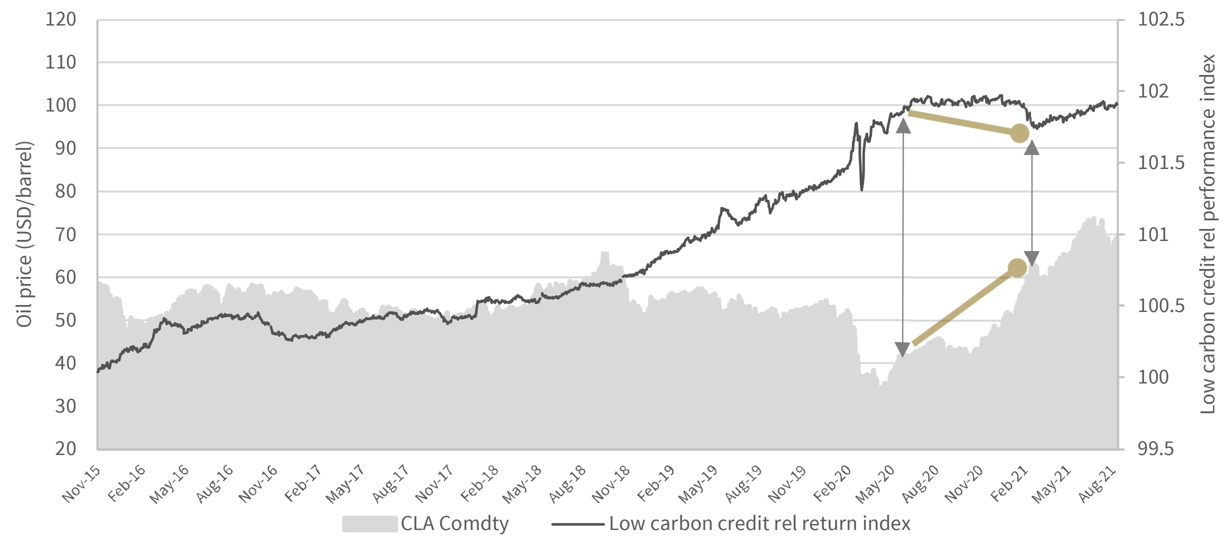
Low carbon credit relative returns have recovered after an extensive oil price rally between 2020Q2 and 2021Q1, see Figure 1. We see this as indicative of only extremely strong price dynamics in fossils being able to counteract a secular decarbonization trend: when such fossil price dynamics subside, low carbon credit appears to continue outperforming.[1]

Over the six years for which there is data, the low carbon index has outperformed by 1.9% in return terms or 32 basis points of returns per year (with no down years). This may seem small in the context of other investment return prospects, but for a benchmarked real money manager, this would be considered sizable. The annualized Sharpe ratio is 1.42.

Figure 1. Relative return of the S&P500 IG carbon efficient re-weighted bond index versus its standard equivalent, duration and spread beta neutral and oil prices. Arrows indicate the start and end points of the 2020-21 low carbon credit relative underperformance vis-à-vis the corresponding oil price rally. Source: S&P, AFII calculations, Bloomberg.



The low carbon relative performance index is constructed by using an identical set of issuers (based on the S&P IG corporate bond index) but reweighting portfolio weights using the ECOBAR methodology and a duration and spread beta neutral weighting scheme. The S&P bond indices are available: carbon-efficient and traditional index. We provide an detailed description of model and methodology below.

[1] A closer look at relative performance of oil vs low carbon credit, please refer to "The oil rally and low carbon credit performance", AFII, 21 Apr, 2021.

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Background: Bond index low-carbon tilting using ECOBAR[2]

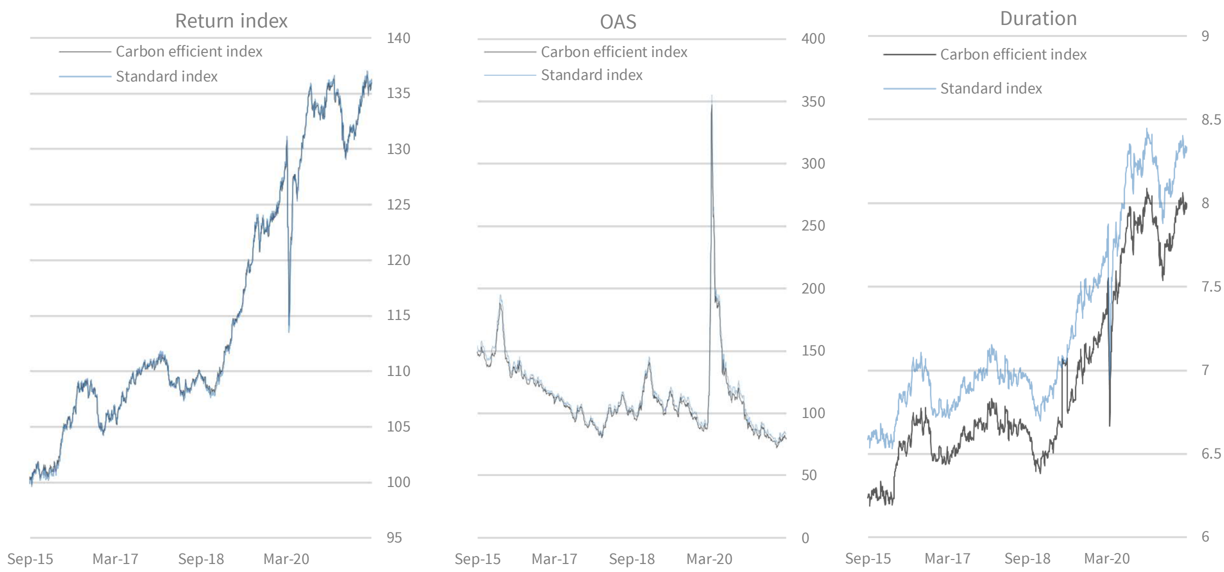
The S&P500 Bond Investment Grade Carbon Efficient Index, based on the ECOBAR[3] methodology, went live in November, 2018. The description of the index and the standard benchmark index is available through these links: carbon-efficient and traditional index. The carbon efficient index operates both through re-weighting between sectors as well as within sectors.

The ECOBAR system is generally less restrictive and more flexible than exclusion-based ESG strategies, for example allowing traders to increase positive impact (scoring) through shorting underperformers and adjusting for term-structure effects in credit. ECOBAR scoring posits an exponential increase in scores for high-carbon emitters, something followed for example in Bank of International Settlement/Ehlers et al (2020)[4], which also develops a 10-graded stylized rating framework in the same spirit as ECOBAR's 0-9 ordinal scoring.

The index implementation adjusts weights on individual index positions by +/-35% relative to the standard index to account for higher/lower carbon intensity and ECOBAR related scores.

The S&P carbon-efficient indices are based on TruCost's carbon measurement methodology, as S&P acquired TruCost in 2016. Earlier implementations of carbon-efficient versions of S&P indexes on the equity side is described for example in Andersson (2016)[5], where a low-carbon efficient version of the S&P500 equity index is shown to have very similar properties as the standard version, specifically a low tracking error.

Figure 2. S&P500 Broad investment grade bond indices, 2015-2020. Source: S&P Dow Jones Indices and AFII calculations.



[2] This was originally published in "Low carbon credit performance 2015-2020", Anthropocene Fixed Income Institute, 27 Jan 2021.

[3] A description of ECOBAR is available in the appendix. See also Erlandsson, U. (2017), "*Credit alpha and CO2 reduction – A portfolio manager perspective*". Available at SSRN: https://ssrn.com/abstract=2987772 or http://dx.doi.org/10.2139/ssrn.2987772.

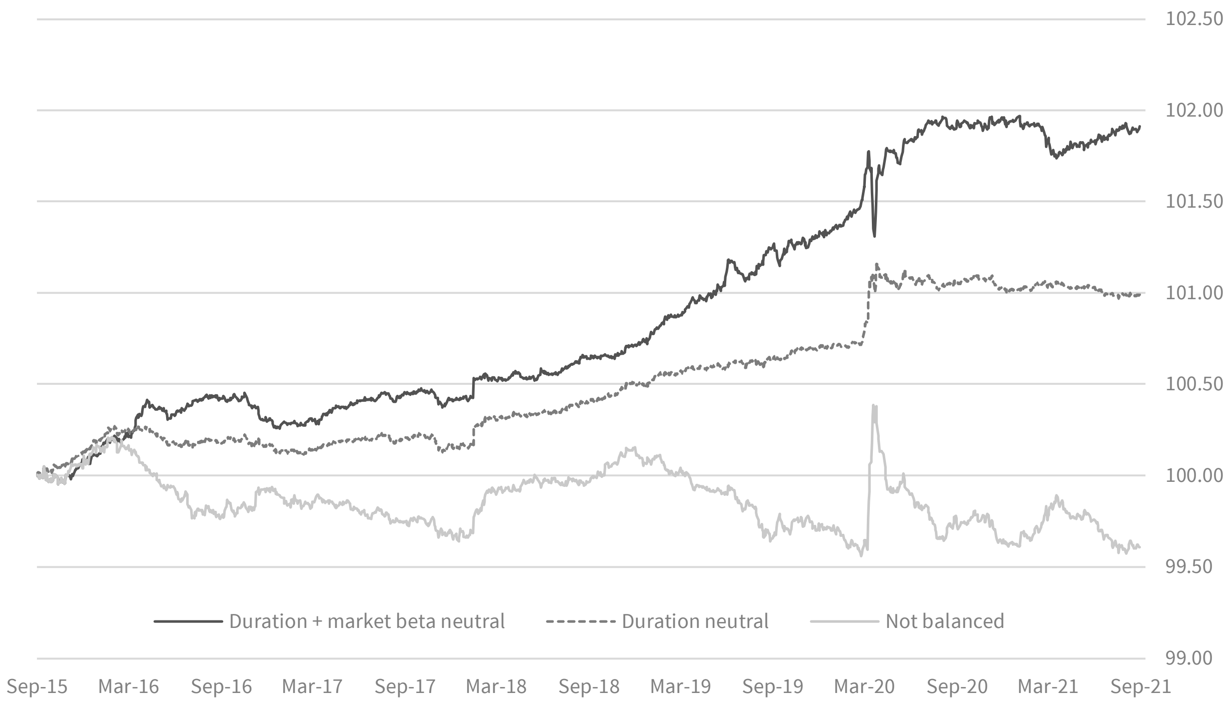
[4] See BIS Quarterly Review (September, 2020), https://www.bis.org/publ/qtrpdf/r_qt2009c.htm.

[5] See Andersson, M.; Bolton, P. and Samama, F. (2016), "*Hedging climate risks",* Financial Analyst Journal 72:3. AP4 implemented a low-carbon version of the S&P500 index in its passive global equity mandate.

We plot the indexes in Figure 2. As can be seen, the carbon-efficient index has been tracking the broad index very closely in return and spread terms. Total returns have averaged around 6% per annum during this time. By construction (see appendix), duration has been higher in the standard index. Note that the main construction rules, such as issuer and security selection are identical for the indices, and the differentiations only happens through adjustment of portfolio weights. Hence, once we adjust for the differences in market beta and duration, we can attain a relevant apples-for-apples comparison of bond portfolios for benchmarked investors.

In Figure 3, we plot the cumulative return differences between the carbon-efficient index and the traditional one, where the gray line shows the unadjusted indexes where the market beta effect is not taken into account, either in terms of duration or in terms of spread. By this baseline metric, the two indices have traded almost flat to each other over the time-period.

Figure 3. Relative performance of carbon-efficient vs traditional index with various adjustments for (unintended) market exposures. Source: S&P Dow Jones Indices and AFII calculations.



As mentioned, the traditional index has a slightly longer duration, on average 4.6% higher than the carbon-efficient version. This mean that on a non-adjusted basis, the traditional index would outperform when rates are falling. Over the sample, 10yr US Treasuries have fallen from 2% to 1% in yield. We would thus expect the standard index to have outperformed.

On spread, the traditional index has an option adjusted spread (OAS) on average 2.7% above the carbon-efficient index. This means that the traditional index carries slightly higher credit risk ("beta") and should outperform, on a non-adjusted basis, in bullish environments when spreads are declining or even just moving sideways. As shown in the middle panel of Figure 2, OAS spreads have remained approximately flat over the sample period, albeit with large variations.

To adjust the two indices to be interest rate and market beta-neutral, we adjust relative returns through the following expression

$$R_t^{L/S} = R_t^{CO} - \frac{D_{t-1}^{CO}}{D_{t-1}^{*}} \cdot \frac{S_{t-1}^{CO}}{S_{t-1}^{*}} \cdot R_t^{*}$$

where $R_t^{L/S}$ is the relative (long-short) return, D is the duration of the carbon-efficient CO index or the traditional $*$ index, and S is the OAS spread. All numbers are calculated using real rebalancing rules based on monthly rebalancing data, so that $t-1$ refers to the value of the last trading day of the previous month. This is line with traditional month end rebalancing in fixed income portfolios.

$R_t^{L/S}$ is a simply the excess return (return over benchmark) series for an investor who would run the carbon-efficient index rather than the traditional index on a market neutral basis[6], and is the "Duration + market beta neutral" return index series shown as a solid black line in Figure 3. As we can see, with the market adjustments, the ECOBAR based index has been consistently outperforming over the past four years. The correction/neutralization of market beta and duration increases this outperformance materially: interest rates and credit spreads have been declining during this period of time. The magnitude of the duration and spread components appear similar.

Recent volatility has naturally crept into the indices. We observe large relative swings between the carbon efficient and standard index during March, 2020, when general covid-19 volatility was accentuated by the relative underperformance (and then snap-back) of the oil sector in relation to the OPEC oil glut that hit the market from March 9 and onwards. Although the excess return in the low carbon index seems fairly consistent, we note that there are prolonged periods of neutral performance, such as between Mar-16 and Mar-18, indicating that a certain degree of patience is required in order to monetize outperformance.

The correlation between the outperformance of the full DTS adjusted carbon efficient index and the standard index return is around 0.5 (0.45 for up until Dec-19 and 0.56 for the full sample). For the duration-adjusted (no market beta) carbon efficient index it is -0.16 (-0.11). The higher positive correlation for the DTS index can be explained by alpha being proportional to underlying volatility which in turn is proportional to underlying expected returns, see Ben Dor et al. (2007)[7].

The carbon-efficient index has an average outperformance over the traditional index of 36bp per annum over the period, roughly equating to 5.5bp of spread. To put this into context, Barclays (2019)[8] finds a 3.5%-4.5% cumulative outperformance for ESG leaders in corporate bonds over 2010-17, translating into an annual outperformance of 50-64bp for ESG leaders. The Barclays study is similar in design to our approach, with one important caveat: it runs on back-tests rather than out-of-sample. In that context, we believe the 36bp we find stack up well vis-à-vis the Barclays numbers that translate to 50-65bp per annum outperformance. In annualized terms, our long-short strategy generates a 1.51 Sharpe ratio over the sample.

[6] This weighting scheme standard market practice, see for example, Rennison, G.; Erlandsson, U. and Ghosh, A. (2008), "*Systematic CDS index trading handbook*" Barclays Capital Research.

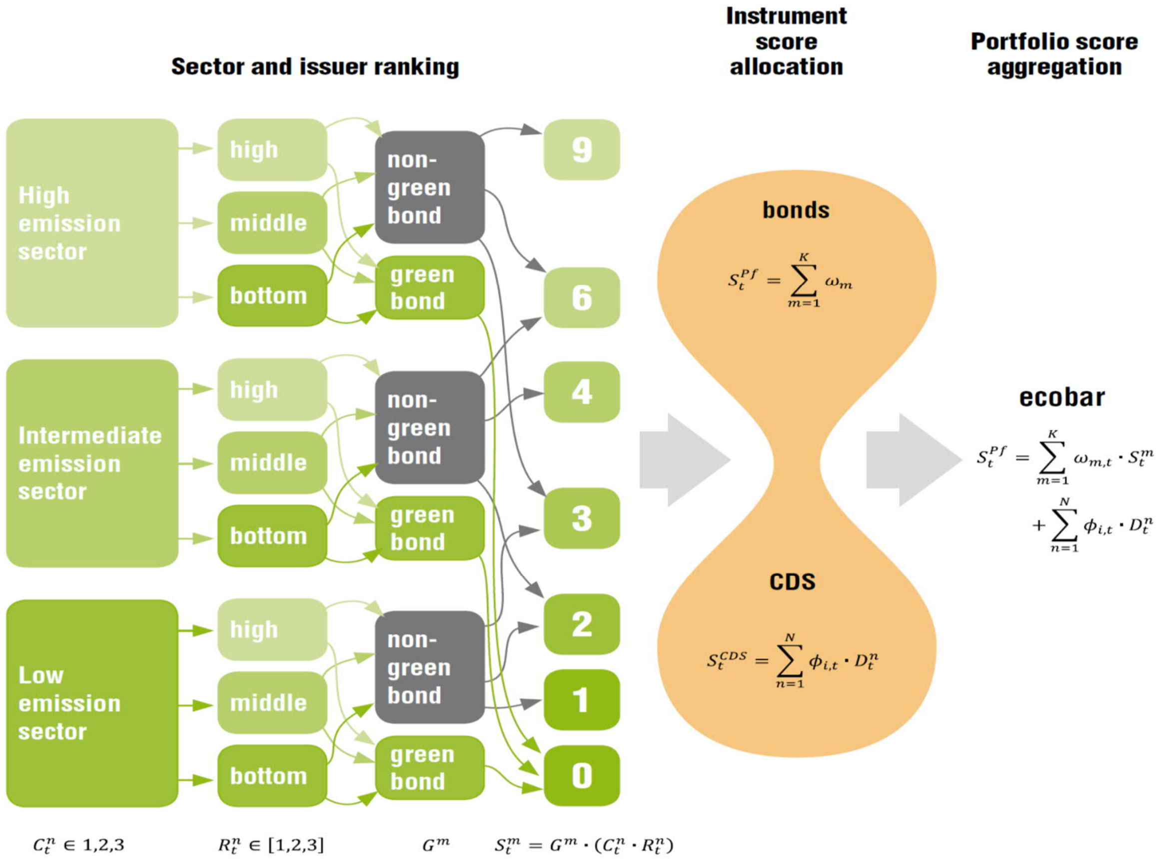
[7] Ben Dor, A.; Dynkin, L.; Hyman, J.; Houweling, P.; van Leeuwen, E. and Penninga, O. (2007), "*Dts (Duration Times Spread)*", Journal of Portfolio Management 07:W, Available at SSRN: https://ssrn.com/abstract=956825

8 Polbennikov, S., A. Desclée, L. Dynkin and A. Maitra (2016). "*ESG ratings and performance of corporate bonds*", Journal of Fixed Income, 26(1):21-41.

Appendix

ECOBAR[9] is a system to quantify climate metrics in complex fixed income portfolios. The paper behind the methodology suggest ways to quantitatively answer questions such as “how do I weigh the climate impact of a 2yr bond vs a 10yr bond?”, “what is the impact of a short/underweight position in a brown bond vs a long/overweight position in a green bond?”. It is designed to provide a non-constraining ways for portfolio managers to trade alpha and credit conviction while simultaneously apply climate sensitivities.

Figure 4. ECOBAR scoring system, reprinted with permission from Creditflux Magazine (July, 2017).



The basics of the ECOBAR scoring system is to rank credit issuers based on their carbon-intensity. Ranking is conducted between sectors, giving a company within a certain sector a score *C* in the range 1, 2, 3, where a 3 would be given to a company within a high carbon sector. Furthermore, every company gets a with-in score *R*, based on their carbon-intensity relative to other companies in the sector. Again, this ranges between 1 and 3 with a 3 being assigned to a company with high relative carbon intensity.

To produce the full ECOBAR score for the issuer, you finally multiply *C* and *R*, to get a score in the range 1…9. At the portfolio level, all positions are then summed up multiplying the absolute duration-contribution of the position to the total portfolio duration by each issuer’s ECOBAR score. Green bonds score a 0 in this setting.

[9] A 15 minute video presentation of the paper and model from the GRASFI 2019 conference is available through this link.

Short/underweight positions are generated through inversion of the score, e.g. a short position on a dirty energy producer with (long) ECOBAR score 9 inverts to a score of 1. This incentivizes portfolio managers to reduce carbon intensity not only through moving long-risk elements into lower-carbon sectors and issues, but also to use the short side of their portfolios.

Figure 5 shows how the ECOBAR methodology is analogously reflected in index reweighting in the S&P index. The matrix representation is an alternative way to think about the ECOBAR score. For example, the ECOBAR score of 9 is equivalent to the north-west partition of the matrix (scores 3 and 3). The number -35% in that cell relates to the carbon-efficient index adjusting the weight to 65% of the market-value weight in the standard index.

Figure 6 finally shows the duration-adjustments in the S&P index that shortens the carbon efficient index versus the standard index. This is not driven by the ECOBAR model but has been an exogenous index creation decisions. The "duration-neutral" index series in Figure 3 shows the relative performance of the carbon efficient index normalizing back the adjustments made in Figure 6.

Figure 5. Mapping S&P carbon-efficient index weighting factors and ECOBAR equivalent scores. Source: S&P Dow Jones Indices and the author.

			Sector Ranking Adjustment Factor		
	Quantile Adjustment Factor / ECOBAR C&R scores		High-carbon	Mid-Carbon	Low-Carbon
			3	2	1
Issuer Ranking	High-carbon	3	-35% (9)	-25% (6)	15% (3)
	Mid-Carbon	2	-25% (6)	0% (4)	25% (2)
	Low-Carbon	1	-15% (3)	25% (2)	35% (0/1)

Figure 6. Non-ECOBAR duration adjustments in the carbon efficient vs standard index. Source: S&P Dow Jones Indices.

Effective Duration (years)	Category	Duration Adjustment Factor
0-3.5	Short	10%
3.5-7.0	Standard	5%
7.0-15.0	Intermediate	-5%
15.0+	Long	-10%

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