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Efficient Low Carbon Portfolio Proposal

Summary

Responding to requirement of pension fund industry that reduces the carbon footprint of equity portfolio, our tram proposes a **lower carbon portfolio framework**, of which empirically examined carbon efficiency and improved financial performance.

Market Condition

The influence of climate change has been deeply and globally embedded in our societies and financial systems. All individuals and institutions are called on to commit to rise in global mean temperature to less than 2 degrees centigrade above pre-industrial levels as per the 2015 Paris Agreement on climate change. The pension fund industry contributes to the goal by lowering level of carbon intensity in portfolio.

Benchmark

As an essential component of S&P 500, **consumer staple sector**, epitomizing most non-energy intensive industries, is chosen to be an equally-weighted benchmark without carbon exposure, to which our proposed lower carbon portfolio is tracking. carbon footprint will be measured in terms of CO2 emissions, using scope 1 and scope 2 estimates as a proxy for the global footprint of a company.

Portfolio Profile

For purpose of better implementing environmental performance and ideally delivering an elevation of risk and financial performance, the proposed lower carbon portfolio of consumer staple sector is constructed by using efficient technique and rebalancing, one applying two non-mutually exclusive carbon footprint strategies: positive screening and optimization. Finally, the **recommended carbon-efficient portfolio** is tested feasible as following:

- All selected stocks have carbon intensity **smaller than the mean of the benchmark's carbon intensity**
- Using exponential weighted moving average covariance for covariance matrix: **optimal risk-return**
- **Equally-weighted** and quarterly rebalanced: lower trading costs
- Existing **trade-off** of portfolio in this sector between shrinking the carbon emission per unit revenue and increasing the tracking error with respect to benchmark
- **Reduced carbon footprint**, **improved Sharpe ratio**, lowered volatility and maximum drawdown to the extent permitted by tracking error

Lower Carbon Index Tracking Portfolio

Design, Construction, Comparison

Introduction

While Intergovernmental Panel on Climate Change (IPCC) estimated from recasts between 2 and 4-degrees Celsius rise by 2100, Moody's Analytics says climate change could cost $69 trillion by 2100. Against that global warming pressure and sustainable investing urgency, growing number of investors are recognizing that the risks and opportunities from climate change systemically shifts the concentrations of their investment strategies.

In respond to their demand and current climate policies, Low Carbon Indices target on the ambition to reduce the carbon footprint and achieve efficient risk-return profile are highly required by both individuals and institutions. The key challenge is that highlight the environmental benefit by lower the intensity will damage the financial benefit by lowering its tracking ability. Whether being green is rewarded in the market requires further evaluation.

Fully aware of risks and opportunities from the environmental side and financial side, three distinct portfolio formation decarbonization strategies under five risk optimization methodologies are implemented to construct the most efficient Low Carbon index within a non-energy intensive industry, targeting at both the goal of lower carbon emission as well as the ideal risk-return performance. The best portfolio, excluding stocks with carbon intensity higher than average that of benchmark (all stocks in the consumer staple sector), achieves a better Sharpe ratio and comparably lower tracking error with respect to benchmark.

Portfolio Design

The eligible securities of the target Low Carbon index (benchmark) are the constituents of the Consumer Staples sector in the S&P500 universe that have data from the whole testing period, defined from December 15, 1989 to December 10, 2019.

Target Index Series

Existing constituents that are not managed with ESG principles and reported the footprint data have been removed from the benchmark portfolio. Remaining constituents of the benchmark index follow the UN Global Compact (UNGC) strictly.

Considering both the environmental side and financial side of the portfolio, the trade-off between lower carbon footprint and higher tracking error is considered for selecting the most efficient low carbon portfolio. Tracking error of the portfolio is calculated with respect to the equally-weighted sector benchmark. The carbon footprints are measured in terms of carbon emissions.

Target Carbon emissions

Focus on the exposure and contribution of the climate change, the Task Force on Climate-Related Financial Disclosures (TCFD) categorized the Greenhouse gas emission into 3 groups.

- Scope 1: direct emissions from owned or controlled sources
- Scope 2: indirect emissions from the generation of purchased energy sources
- Scope 3: emissions outside the boundaries of operational control of a firm

Carbon footprint is defined as the total carbon emissions (scope 1&2&3) divided by the market value. And the intensity is calculated by the average of operational carbon emissions (scope 1&2) divided by the firm revenues.

Because of the insufficient of the calculation protocols and publicly available corporate reporting of Scope 3, TCFD recommend not to rely on the emission of the Scope 3. Besides, compared with the carbon footprint, the carbon intensity is less volatile than the carbon footprint. And the figure below illustrates the strong positive correlation between the carbon footprint and carbon intensity, calculated as 0.7005. Thus, our research collects Scope 1 and Scope 2 carbon emissions data from company public documents as a proxy for estimating the footprint of a company.

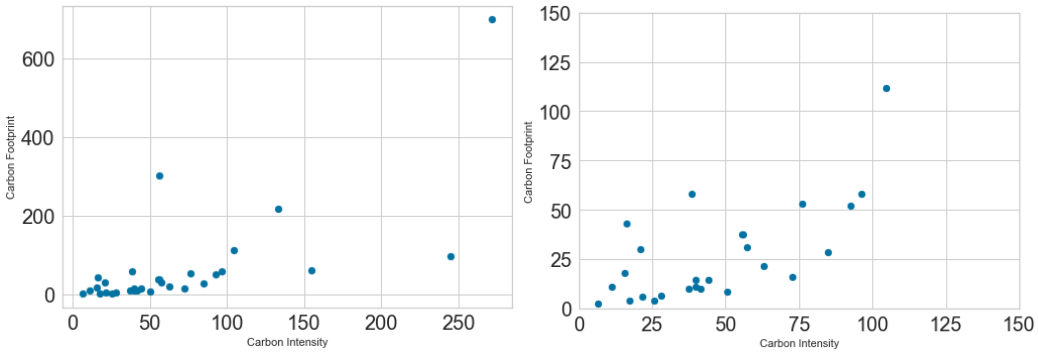

Figure 1&2: Correlation (carbon intensity, carbon footprint)

Methodology description

For supporting the ambition to reduce the carbon footprint and achieve portfolio efficiency, the Low Carbon index tracking portfolio is constructed using the screening selection method in combination with the risk optimization strategy.

Positively screening, the companies that have better performance in the carbon footprint are included in the index. Besides, noticed the fact that reducing the carbon footprint will increases the tracking error of the portfolio, which tends to lower the return of the index, three portfolios are constructed under various footprint target level to analyze the different scenarios. Negatively screening, the companies with no footprint data released have already been removed.

In addition to the purpose of substantial carbon footprint reduction, the Low Carbon on index tracking portfolio is also expected to achieve excellent risk-adjusted performance with respect to the benchmark. Hence, by adjusting the constituents' weights, efficient portfolio construction technique is conducted for

generating an improvement in the portfolio performance, denoted as equally-weighted (EW), minimum variance (MV), maximum diversification (MD), risk parity (RP), and maximum Sharpe ratio (MSR).

Carbon reduction strategy design and implementation

Benchmark Portfolio: construction and performance

The benchmark portfolio is constructed by all firms in the consumer staple sector. We implement the equally weighted benchmark portfolio rebalanced on a quarterly basis regardless of carbon emission exposure. Considering weight allocated in the stocks that will be applied future in our research, the efficient frontier uncovers the risk-return profile of 5 covariance matrix methods, say sample covariance, constant correlation coefficient covariance, exponential weighted moving average covariance, exponential weighted moving average constant correlation coefficient and factor covariance. Optimizely tested (Fig 3), exponential weighted moving average (EWMA) stands out and will be used in our benchmark rebalanced portfolio.

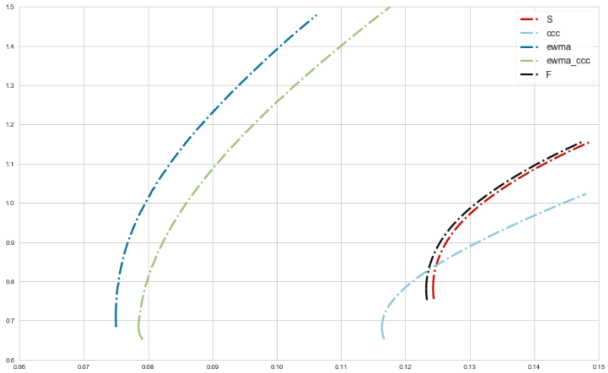

Figure 3: Efficient Frontier of selected sector

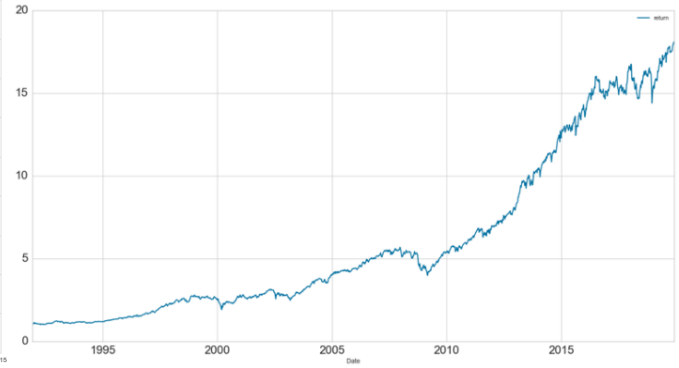

Figure 4: Cumulative log return of benchmark; 1989-2019

To shrink the gap, the log scaled of cumulative return is prone to be more reasonable when it comes to weekly data for our empirical analysis (Fig 4). As per the nature of an equally weighted method, the benchmark portfolio shows stable and fairly low trading cost and weights during the whole simple period (Fig 5&6).

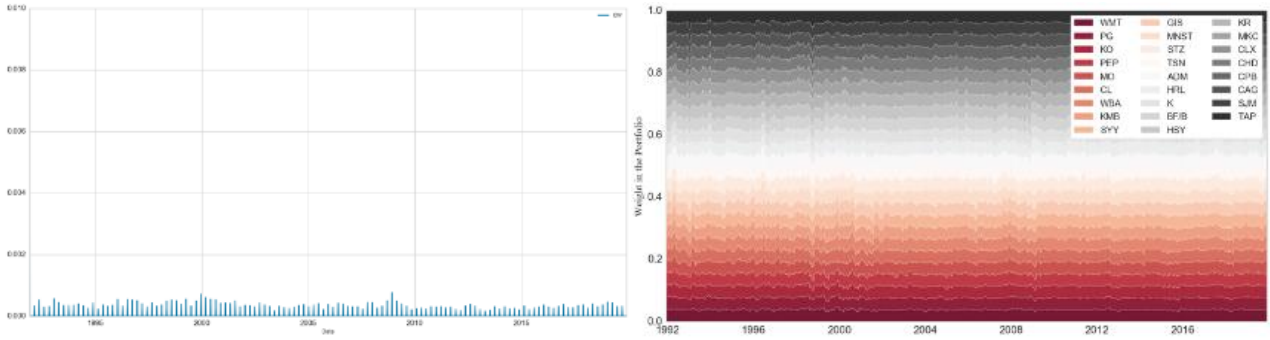

Figure 5 & 6: Trading cost and weights of benchmark; 1989-2019

Within the sector, 25 firms present the annualized Sharpe ratio of 0.8286 with maximum drawdown of 32.62 in the sample period of past 30 years (Table1).

	Sharpe ratio	Annualized excess return	Annualized volatility	Maximum drawdown
Benchmark	0.8286	0.1029	0.1242	-0.3262

Table1: Benchmark performance; 1989-2019

Lower carbon portfolio selection

Some widely-accepted methods of carbon-efficient portfolio selection are tested feasible in practical, one intending to pick out well-performed companies with regard to ESG factors, and another referring to excluding the firms perceived to deliver harmful products: anti-personnel mines, cluster munitions or tobacco for instance, and to behave non-environmentally friendly: high risk of continued serious violations of fundamental ethical norms or depriving equity investors of voting rights, etc.

Illustrated above, the positive and negative screening methods are both applied to construct the Low Carbon Index tracking portfolio.

- Positive screening

Selecting positively for the index, the remaining companies are sorted by their carbon intensity levels. Starting from the company with the lowest figure, targeting them for inclusion from the top down, the company is included to the index if its carbon intensity was lower than the mean of the sector's carbon intensity. Considering the trade-off between the carbon footprint and tracking error, two more portfolios are implemented to test how the tighten and relaxation standard towards the carbon intensity influence the performance of the portfolio.

In comparison with the previous one, portfolios target at the median, mean added by one standard deviation of the sector's carbon intensity are conducted. After the selection, 15 companies included in the first portfolio, and 21, 11 companies are contained in portfolio 2 and 3. The constituents of the three portfolios are attaches in the appendix.

  - Portfolio 1: carbon intensity smaller than the mean of the sector's carbon intensity
  - Portfolio 2: carbon intensity smaller than the mean adding one standard deviation of the sector's carbon intensity
  - Portfolio 3: carbon intensity smaller than the median of the sector's carbon intensity

- Negative screening

Negatively screening, the companies with no footprint data released are removed from the benchmark index.

Lower carbon portfolio optimization: out-of-sample back test

On top of a rolling sample of two-year sample period and EWMA covariance matrix, a quarterly rebalanced buy-and-hold strategy for selected carbon-efficient portfolios is optimized and estimated so as

to capture the best performer in the aspect of comparably higher Sharpe ratio, lower tracking error and downside risk, considering best weighting in the meanwhile.

For portfolio 1 exhibited below, including 15 firms with lower carbon intensity than the average level of the whole sector, trading costs of EW and RP is considerably low as the weights of the two changing less frequently. Since our carbon-efficient selected portfolios are improved within the sector, the firms have been facing similar systemic risk, contributing to the semblable weight profile and continuous low costs. The explicit high trading costs and volatile rebalanced weights of the MD, MSR, MV may have the portfolio partially lose the dynamic benefit from risk-adjusted optimization.

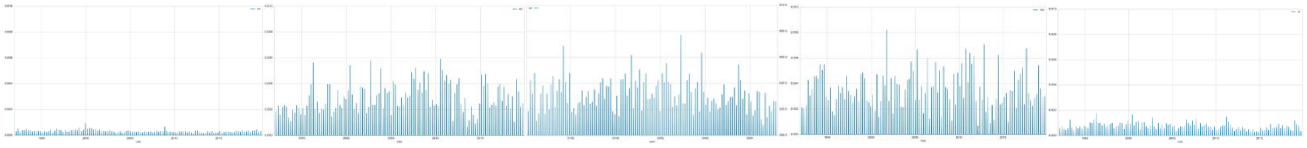

Figure 7 - 11: Trading cost of Portfolio 1[EW, MD, MSR, MV, RP]; 1989-2019

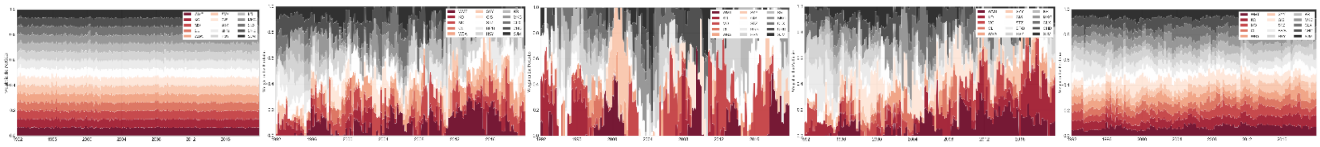

Figure 12 -16: Weight of Portfolio 1[EW, MD, MSR, MV, RP]; 1989-2019

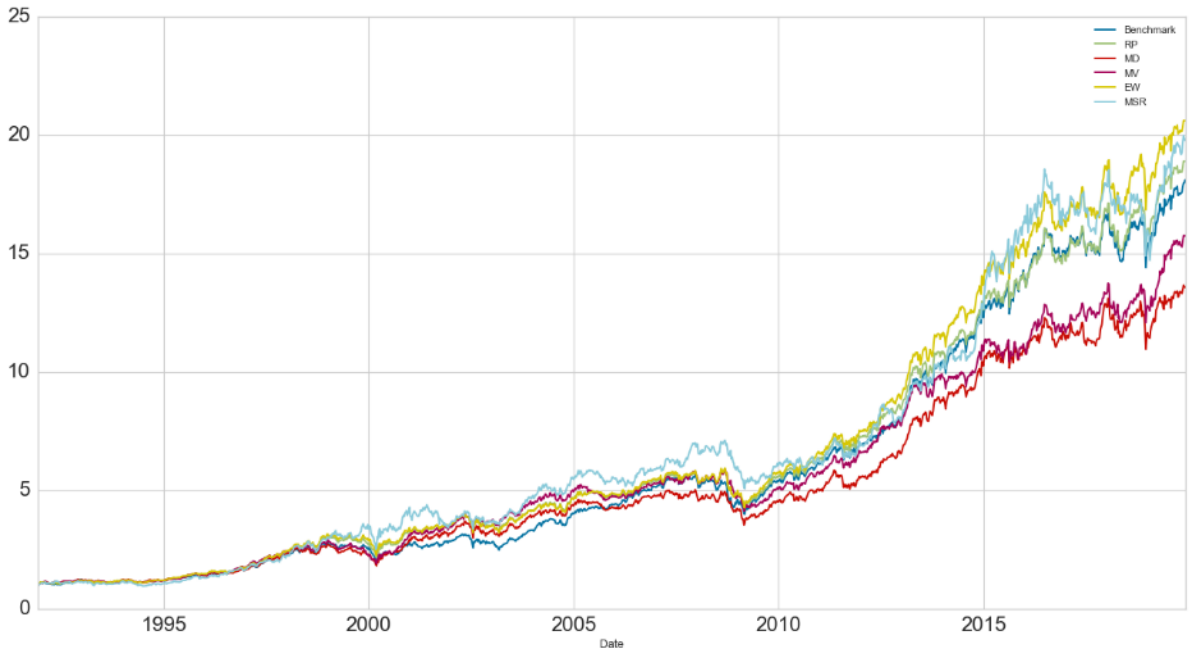

Figure 17: Log cumulative performance of Portfolio1 & benchmark; 1989-2019

Portfolios that applied EW, MSR, RP methods of optimization outperform the benchmark portfolio in the long run while EW is displayed the best (showed in Figure 17). Consistent with the long-term return, Sharpe ratios of EW tested optimal, followed by RP with the same tracking error (stated in Table 2). Lower

performance and higher volatility of MD, MV and MSR is derived from influential and volatile in rebalancing along with continuously dynamic weights, on the contrary of EW and RP that benefit from lower trading cost and lower tracking error. On behalf of best-in-method, EW optimizes the portfolio 1 in terms of improved Sharpe ratio, decreased downside risk and reduced volatility.

Portfolio 1: < Mean	RP	MD	MV	EW	MSR
Tracking error	0.0414	0.0666	0.0706	0.0414	0.1058
Sharpe ratio	0.8354	0.6998	0.7631	0.8431	0.6653
Annulized excess return	0.1044	0.0926	0.0980	0.1075	0.1061
Annulized volatility	0.1250	0.1324	0.1284	0.1275	0.1594
Maximum drawdown	-0.3049	-0.3437	-0.3548	-0.2955	-0.3158

Table 2: Five Optimization performance of portfolio 1; 1989-2019

Portfolio 2 is supposed to have a loose carbon intensity tolerance, comprising 21 firms with lower carbon intensity than average level of the whole sector plus one standard deviation.

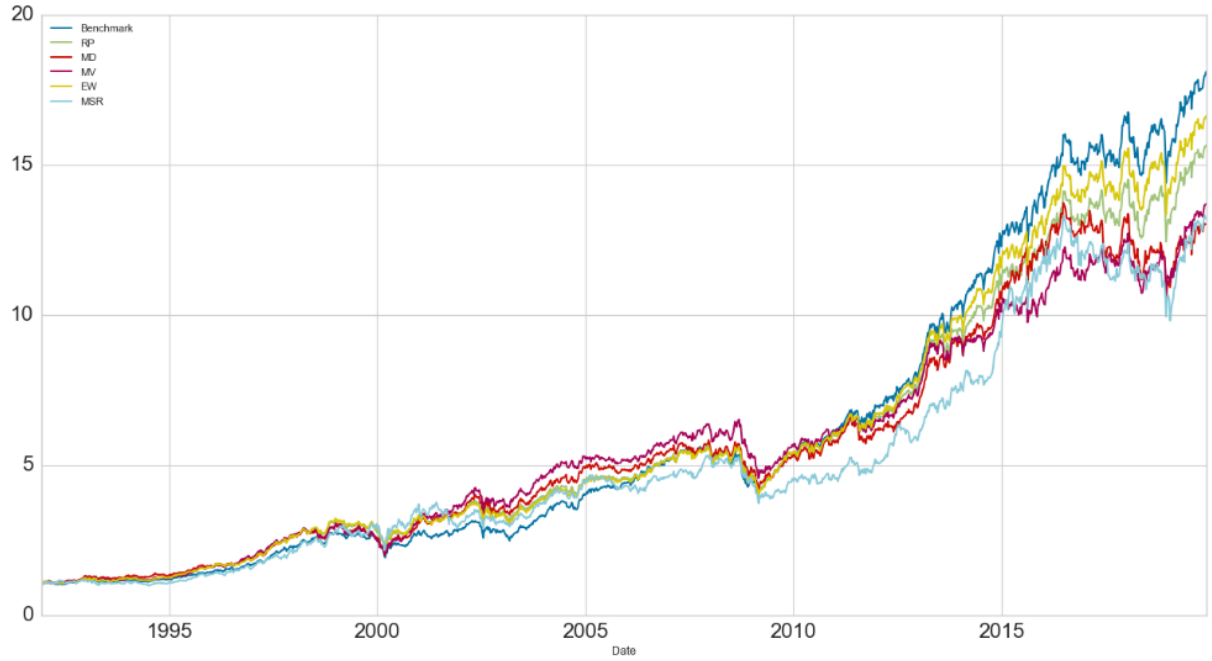

Figure 18: Log cumulative performance of Portfolio2 & benchmark; 1989-2019

Unexpectedly, none of the five optimization methods assists the long-term performance of portfolio 2 to beat benchmark successfully, as drawn above especially after 2011, meaning that portfolio 2 fails to improve financial benefit on the basis of lower carbon intensity. Compared internally, EW and RP present higher Sharp ratio and lower maximum drawdown. The tracking errors of all, however, are reported decrease in contrast to those of portfolio1.

Portfolio 2: < Mean + 1 std	RP	MD	MV	EW	MSR
Tracking error	0.0331	0.0652	0.0648	0.0331	0.0989
Sharpe ratio	0.7890	0.6905	0.7382	0.7936	0.6008
Annulized excess return	0.0978	0.0912	0.0930	0.0999	0.0917
Annulized volatility	0.1239	0.1321	0.1260	0.1259	0.1526
Maximum drawdown	-0.3347	-0.3605	-0.3587	-0.3261	-0.3119

Table 3: Five Optimization methods performance of portfolio 2; 1989-2019

Fully aware of the trade-off between portfolio tracking error and carbon intensity, we intend to test possibility of having environment benefit and financial benefit in both hands by applying the third portfolio with a stricter environmental tolerance reducing to 11 firms with lower carbon intensity than median level of the whole sector.

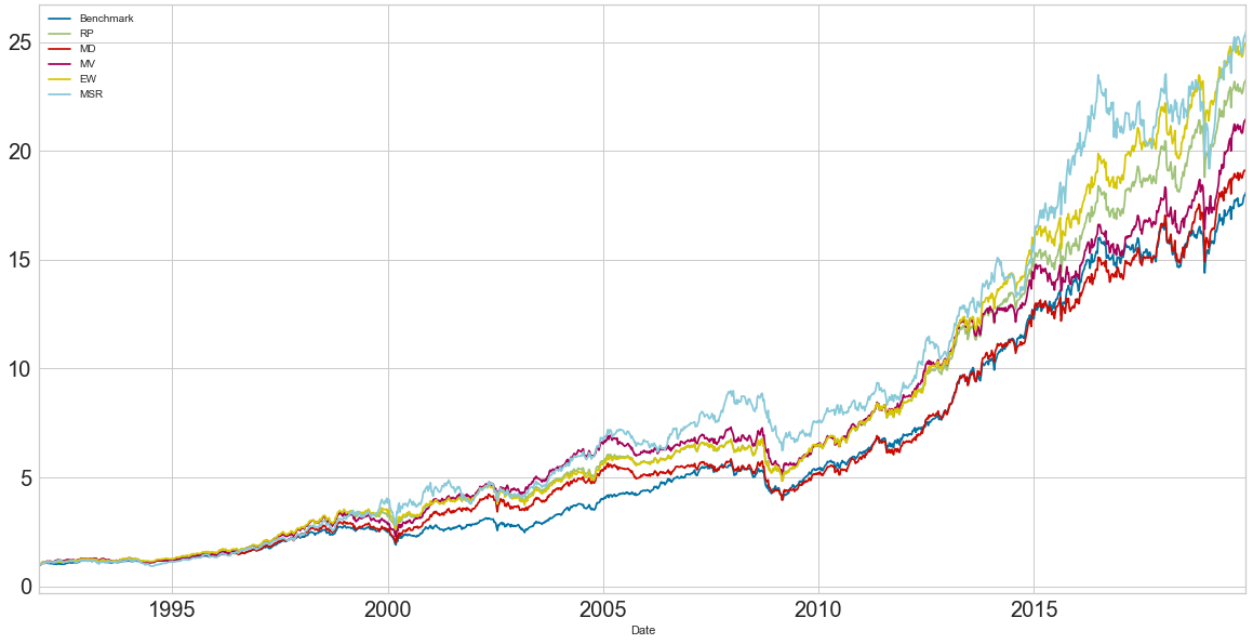

Figure 19: Log cumulative performance of Portfolio3 & benchmark; 1989-2019

Regardless of trading costs, all methods help the portfolio 3 achieve the triumph over benchmark, notably MSR, EW and RP (plotted in Figure 19). Taking the volatile weights and high trading cost of MSR into account, it is remarkable that RP and EW improved more in term of Sharpe ratio and moderation of downside risk under the circumstance of much lower carbon emission per unit though the tracking errors are therefore enlarged correspondingly as expected (found in Table 4). In the case of same tracking error and carbon efficiency, the EW is optimal to boost the performance.

Portfolio 3: < Median	RP	MD	MV	EW	MSR
Tracking error	0.0515	0.0715	0.0738	0.0515	0.1110
Sharpe ratio	0.8605	0.7728	0.8214	0.8624	0.7092
Annulized excess return	0.1119	0.1048	0.1090	0.1143	0.1151
Annulized volatility	0.1230	0.1357	0.1327	0.1326	0.1623
Maximum drawdown	-0.2974	-0.336614	-0.3348	-0.2975	-0.3184

Table 4: five optimization methods performance of portfolio 3; 1989-2019

Lower carbon portfolios: performance and carbon improvement

As outlined in the back-test methodology, the portfolio constructed by equally-weighted weighting method capture the optimal performance in terms of higher Sharpe ratio, lower tracking error and downside risk.

While the three portfolios under different carbon levels have gaps in their behavior, with various level of carbon intensity and tacking error in respect to the benchmark. Considering both the environmental values and profitability of the portfolio, the trade-off between lower carbon footprint and higher tracking error is considered for selecting the most efficient low carbon portfolio.

Opt：EW	Benchmark	Portfolio 1: < Mean	Portfolio 2: < Mean + 1 std	Portfolio 3: < Median
Number of securities	25	15	21	11
Tracking error		**0.0414**	**0.0331**	**0.0515**
Annulized excess return	0.1029	0.1075	0.0999	0.1143
Annulized volatility	0.1242	0.1275	0.1259	0.1326
Carbon Improvement				
Sharpe ratio	0.8286	**+ 1.75%**	- 4.22%	+ 4.22%
Carbon intensity	66.91	**- 47.17%**	- 29.71%	- 59.75%
Carbon footprint	66.87	**- 62.93%**	- 54.40%	- 84.48%
Maximum drawdown	-0.3262	**+ 9.44%**	+ 0.07%	+ 0.07%

Table 5: Performance and carbon improvement of 3 selected portfolios; 1989-2019

As displayed in Table5, under the moderate carbon restriction, the carbon intensity of the first portfolio is close to half of the benchmark. Meanwhile this portfolio captured a higher Sharpe ratio for the compensation of the tracking error, noted as 0.0414. While compared with the first portfolio, portfolio2, which adopted looser constraints by increasing the select limitation of the carbon intensity, obtained lower tracking error and lower Sharpe ratio correspondingly. Thus, when less focused on the ESG values, the smaller tracking risk they take.

Conversely, when the selection constraint gets more stringent, the companies with lower carbon intensity are included in portfolio, notably the protfolio3. The reduction of the sector portfolio carbon footprint followed the ESG values closely. And Table 5 displayed the tracking error of the portfolio3 goes up which suggests the portfolio manager have to bear higher risk at the meantime.

Figure 20 revealed the trade-off between the environmental benefit and the financial benefit by displaying the footprints and tracking errors of the three portfolios. From the three scenarios, reducing the carbon footprint will increase the tracking error of the portfolio in respect to the equally-weighted sector benchmark, which means highlight the environmental benefit by lower the intensity will damage the financial benefit by lowering the tracking ability.

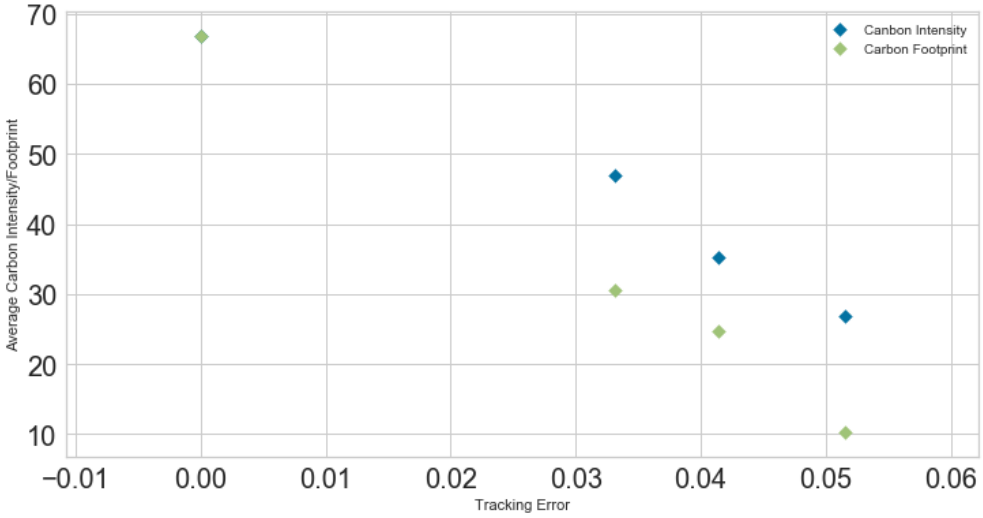

Figure 20: Trade off (tracking error, carbon intensity/footprint)

Lower carbon portfolio determination

Examined by both the optimization weighting methods and the portfolio improvements, portfolio2 failed to exceed the benchmark and was not obviously effective in modifying the maximum Drawdown (+0.07%). Portfolio 1 and 3 demonstrated the tradeoff of the two sides. They both outperformed the benchmark, regarding the higher Sharpe ratio. Referring the trade-off, Portfolio1 sacrificed the environmental side and gain a relatively smaller tracking error, while Portfolio3 satisfied a higher ambition to reduce the carbon footprint and held the higher tracking error at the meantime.

In all, Portfolio1 performed better in lowering the Maximum drawdown (+9.44%), decreased 62.93% of the carbon footprint and enhanced the Sharpe ratio in respect to the benchmark, we propose the portfolio1 under equally-weighted optimization method as the efficient low carbon portfolio for the consumer staple sector.

Evaluation and further expansion

In addition to this Low Carbon portfolio mentioned above, various Low Carbon Target Indices are designed and provided across the market in responding to the sustainable investing principle. Take the four following main providers for example.

FTSE ESG Low Carbon Emissions Select Index target on 50% reduction of the carbon emissions by applying the exclusions in accordance with UNGC principles, with industry and country neutral. The S&P

500 ESG Index targeted 75% of the S&P 500's market and constructed by excluding the violation-UNGC companies and companies with low ESG scores relative to their industry peers.

The MSCI Global Low Carbon Target Indices are designed to achieve a target level of tracking error while minimizing the carbon exposure, by positively screening and overweighting companies with low carbon footprints, with sector, country and regional unbiased.

Target at multi-factor indices, Low Carbon fiduciary option is introduced by Scientific Beta, a subsidiary of the EDHEC-Risk Institute. By positively screening that targets at the companies with the highest carbon intensity and negative screening that excludes companies with strong coal involvement, this option delivered ESG Incorporation Philosophy successfully.

Similar as the Low Carbon fiduciary option, our Low carbon portfolio applied both the positively and negatively screening methodology. And the target index proposed by FTSE Russel, S&P Global and MSCI Global can be constructed on any market index with sector, country and regional unbiased relative to their Parent Indices. Considered the multi-factor indices, Low Carbon fiduciary option applied not only to the parent universe benchmarks but also to the multi-factor investment strategies.

Compared with the four indices, further constraints are expected to be conducted for improving our portfolio. Low carbon index tracking portfolio proposed above focused on the specific sector, and neglected the weight constraints of country and regional within the portfolio. Besides, setting a tracking error constraint relative to the parent index is helpful for the index to secure the financial benefit when minimizing the carbon exposure. Considering the trading cost, the one-way turnover of the index is supposed to constrained to a specific level at each index review.

Academic research

To understand better how the screening selection method and the carbon reduction methodology performed in academic research, we investigate two recent literatures towards low-carbon investment which take the idea and methodology we applied above into consideration.

The tradeoff between environmental performance and financial performance are tested by empirically investigating the risk-return relationship of low-carbon investment and characteristics of carbon efficient firms (Soh et al. 2018). Specifically, the carbon efficient-minus-inefficient (EMI) portfolio they constructed earned abnormal returns of 3.5-4.5% per year since 2010 by "long carbon-efficient firms and short carbon-inefficient firms" strategy.

Besides, considered the various ambition to reduce the carbon emission, several decarbonization strategies are constructed by longing the low carbon low carbon intensity sectors, industries, or firms under different levels (Alex Cheema-Fox et al. 2019). This paper illustrated that lowered carbon emissions more aggressively performed better, and the results are more pronounced in Europe relative to the US.

Conclusion

Considering the possible financial impacts of climate change, investors consider to transfer the “low carbon” a core factor in their portfolios. Responding to the investors demand and current climate policies, the Low Carbon index tracking portfolio is delivered by taking into consideration the ambition to reduce the carbon footprint and achieve portfolio efficiency.

Both the positively and negatively screening methods are applied in constructing the Low carbon portfolio. We started from the moderate carbon reduction standard, and extended to the looser and tighter selection degrees. Besides, equally-weighted weighting method is tested to be the most efficient portfolio construction technique for improving the risk-return performance. Thus, three best-performed portfolios are obtained under EW weighting methodology, with various reduction levels. They indicated that the higher target to reduce the carbon footprint, the higher tracking error at the meantime.

Through comparison, the Low Carbon index tracking portfolio (picked all stocks that have lower carbon intensity than average that of the benchmark) within consumer staple sector, which we highly recommend, delivers as an efficient strategy that is ideally balancing the environmental benefit and the financial benefit, say lowering the Maximum drawdown, decreasing the carbon footprint and enhancing the Sharpe ratio in respect to the benchmark.

Appendix (security tickers and prices after exclusion; data of heads and tails)

Date	WMT	PG	KO	PEP	MO	CL	WBA	KMB	SYY	GIS	MNST	STZ	TSN
05/12/1989	9096.68	431.61	638.95	1104.31	1999.16	419.21	3150.31	1587.82	2065.56	943.56	1500	31.34	15093.89
12/12/1989	9096.68	449.74	655.44	1136.98	2015.38	426.8	3231.55	1593.28	1980.91	924.63	1500	30.97	14037.32
19/12/1989	8839.71	444.79	647.2	1089.06	1903.41	414.99	3069.07	1565.99	2014.77	908.85	1500	29.48	14112.79
26/12/1989	8916.8	447.27	622.46	1091.24	1885.73	414.99	3222.52	1571.45	2099.42	904.11	1500	29.48	14339.2
02/01/1990	9687.71	464.56	643.07	1119.55	2015.38	430.17	3457.21	1634.2	2217.94	921.47	1500	29.85	15169.36
09/01/1990	9405.04	453.03	633.8	1086.88	1897.52	415.83	3258.63	1596	2074.02	904.6	1600	30.97	15093.89
16/01/1990	9173.77	456.87	601.85	1041.14	1856.27	412.46	3114.2	1538.71	1963.97	872.81	1600	32.84	14565.61
23/01/1990	8711.23	438.63	585.36	1021.54	1779.66	395.11	3023.93	1478.69	1975.84	847.37	1550	33.21	14942.96
30/01/1990	8634.14	416.24	546.2	980.15	1744.3	361.13	2915.61	1418.67	1916.48	845.78	1500	33.58	14414.67
06/02/1990	8557.05	431.99	566.81	1034.61	1803.23	386.62	3041.99	1429.58	1908	852.14	1550	35.45	14716.55
08/10/2019	293529	13198.99	13713.33	29217.02	109919.4	14350.76	91208.69	31890.45	78199.75	16195.21	2414039	10732.29	191422.8
15/10/2019	298397	12791.88	13695.41	29023.29	113661.8	13887.83	95454.88	31136.86	79722	16178.77	2431751	11142.28	199300.6
22/10/2019	298521.8	13420.71	13782.44	29093.55	121277.7	13703.06	96864.44	30092.53	79641.38	15418.27	2416631	11145.11	188424
29/10/2019	292455.5	13576.69	13669.82	28970.07	121382.4	13878.8	98527.81	30920.55	79752.25	15228.14	2425703	10928.22	195849.6
05/11/2019	296724.4	13060.42	13416.44	28529.39	121042.1	13478.29	107177.7	30322.79	80730.13	15569.16	2439527	10856.87	194992.8
12/11/2019	297373.4	13101.06	13234.72	28097.22	123005	13617.24	109821.7	30550.73	80951.94	15801.54	2522904	10451.1	211533.8
19/11/2019	299295.7	13337.23	13585.36	28648.61	122821.8	13723.5	108390.1	30920.55	80941.81	15967.52	2529816	10287.94	215484.5
26/11/2019	297548.3	13429.5	13795.23	28889.17	128815	13852.23	105179.9	31299.68	81304.75	16085.22	2576473	10464.18	213485.3
03/12/2019	296250.1	13505.29	13872.78	28838.08	131118.1	13752.11	104051	31639.25	81960	16190.84	2548393	10488.63	212687.3
10/12/2019	298751.9	13650.28	13865.05	29213.73	130987.3	13880.84	103027.9	31899.05	83200	16067.11	2657257	10286.23	211874.3

Date	ADM	HRL	K	BF/B	HSY	KR	MKC	CLX	CHD	CPB	CAG	SJM	TAP
05/12/1989	2514.73	2576.37	1818.75	1550.45	1867.04	1256.63	462.27	404.74	1741.32	1218.93	5334.9	2269.21	196.95
12/12/1989	2378.8	2557	1879.72	1606.16	1942.82	1288.85	485.16	398.8	1741.32	1206.98	5334.9	2232.37	194.66
19/12/1989	2351.61	2586.06	1832.3	1578.3	1956.6	1213.67	469.14	376.25	1741.32	1302.58	5141.78	2151.33	175.19
26/12/1989	2433.17	2595.74	1832.3	1573.66	1942.82	1213.67	471.14	388.12	1729.14	1266.73	5238.34	2132.91	174.05
02/01/1990	2501.14	2692.6	1856.01	1640.97	1997.94	1321.07	471.14	408.3	1802.21	1320.51	5552.16	2180.8	187.79
09/01/1990	2405.99	2615.12	1801.82	1606.16	1901.49	1331.81	445.86	389.31	1668.26	1215.55	5310.76	2155.01	194.66
16/01/1990	2405.99	2508.88	1825.53	1510.99	1860.15	1224.41	409.09	378.62	1583.02	1194.54	5214.2	2147.64	184.35
23/01/1990	2174.9	2518.61	1747.63	1446.01	1825.7	1127.75	409.09	367.3	1534.31	1164.52	5021.08	2088.7	174.05
30/01/1990	2068.93	2353.29	1737.47	1346.2	1701.69	1095.53	367.72	350.55	1461.25	1113.5	4639.23	1930.3	159.16
06/02/1990	2136.99	2343.57	1703.6	1378.7	1743.03	1106.27	363.12	370.89	1534.31	1146.51	4469.2	1974.5	180.92
08/10/2019	18243.46	93670.06	15364.64	66792.5	67314.5	20883.9	22687.66	12821.77	132385.8	9992.43	50991.1	26645.66	4470.94
15/10/2019	19160.39	89169.19	15387	68159.13	65703.63	20755.82	21919.79	12685.68	127364.6	10032.67	49510.19	26992.72	4579.2
22/10/2019	19269.66	88579	15424.27	70013.88	64501.89	21216.88	21851.71	12705.37	129778.9	10260.83	50040.38	26849.37	4790.87
29/10/2019	19721	89256.5	15620.55	69927.13	61874.43	21029.04	22113.12	12883.4	128851.7	10006.84	50259.79	27183.86	4418.43
05/11/2019	20414.63	90961.19	15782.05	70643	60427.18	23761.19	21650.22	12742.89	117689.8	10006.84	50875.73	27020.39	4393.38
12/11/2019	20542.91	91310.88	15893.86	69753.56	61529.85	23052.54	21936.13	12529.98	117304.9	9983.16	50820.46	26439.44	4255.23
19/11/2019	20466.89	93409	16229.27	71738.5	63558.59	23077.95	22595.09	12629.11	120944.7	10366.3	54026.69	26413.57	4234.23
26/11/2019	20477.37	96774.69	16271.51	74634.5	64772.83	23223.95	22999.44	12773.93	121997.9	10138.14	53547.58	27184.54	4125.16
03/12/2019	20558.8	99528.38	16454.04	72345.88	64430.76	23524.56	23259.48	12753.24	121330.9	10241.46	52699.97	26933.47	4093.31
10/12/2019	21076.12	99659.56	16702.16	69052	64690.56	23936.82	23330.28	13139.41	121734.6	10415.8	53842.41	26897.96	4183.99

Benchmark portfolio stocks of Consumer staple sector (25 stocks)

Portfolio 2 (21 stocks)

Portfolio 1 (15 stocks)

Portfolio 3 (11 stocks)