



# EU Climate Benchmarks: Fund Performance and Return Characteristics

Andreas Hoepner, Gabija Zdanceviciute  
University College Dublin (UCD)

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# Research objectives

## What do we do?

Evaluate the performance and risk of EU Climate Benchmark funds

## How do we do it?

Collect a unique dataset

Calculate risk-return metrics

Run Fama French (2015) five-factor model with shock variables

## What do we find?

Climate Benchmark funds show significant improvement on tail risk with little to no significant cost on volatility or downside risk while delivering on decarbonisation objective

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# Research questions

*RQ1: Is there a cost associated with the Climate Benchmark methodology?*

*RQ2: What are the common risk characteristics in Climate Benchmark funds*

*RQ3: Do Climate Benchmark funds deliver decarbonisation?*

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# EU Climate Benchmarks – the Net Zero standard

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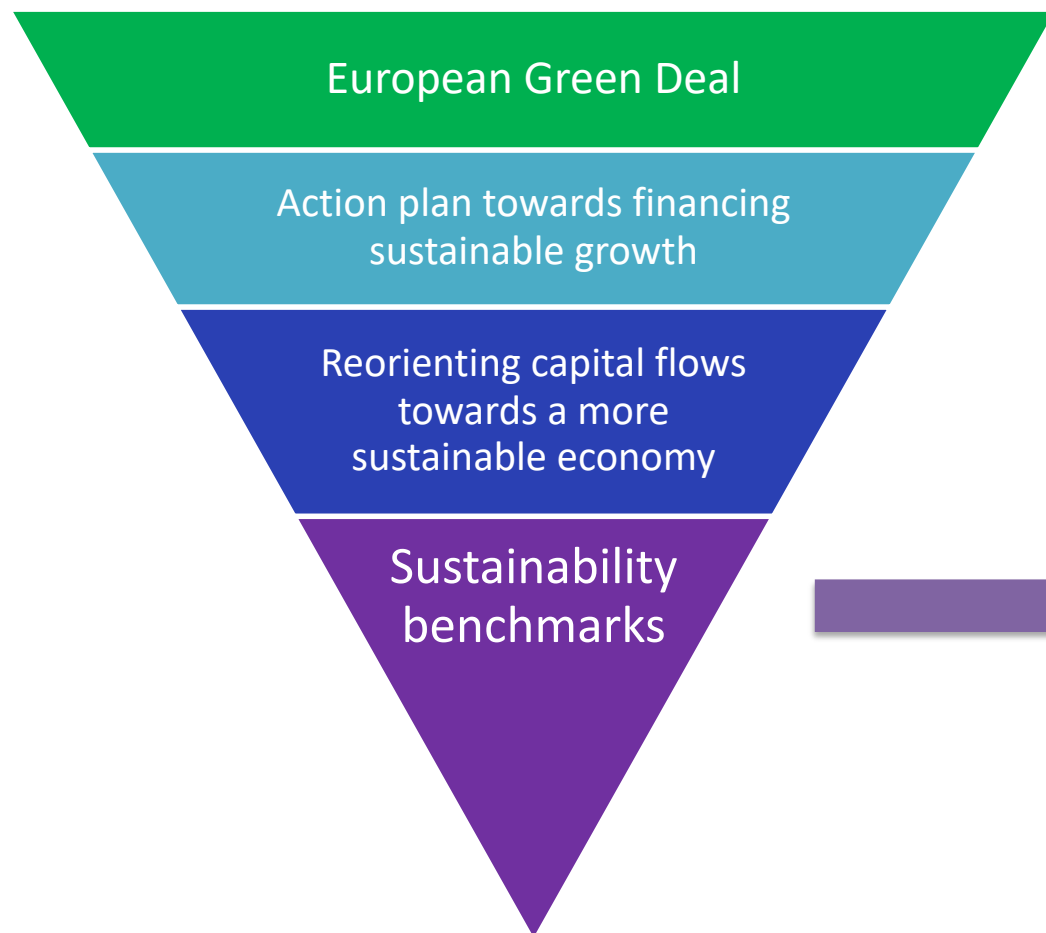


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# Development of the EU Climate Benchmarks



**Regulation (EU) 2020/1818 –**  
Climate Benchmarks

Minimum standards for the EU  
Paris-Aligned and Climate  
Transition Benchmarks

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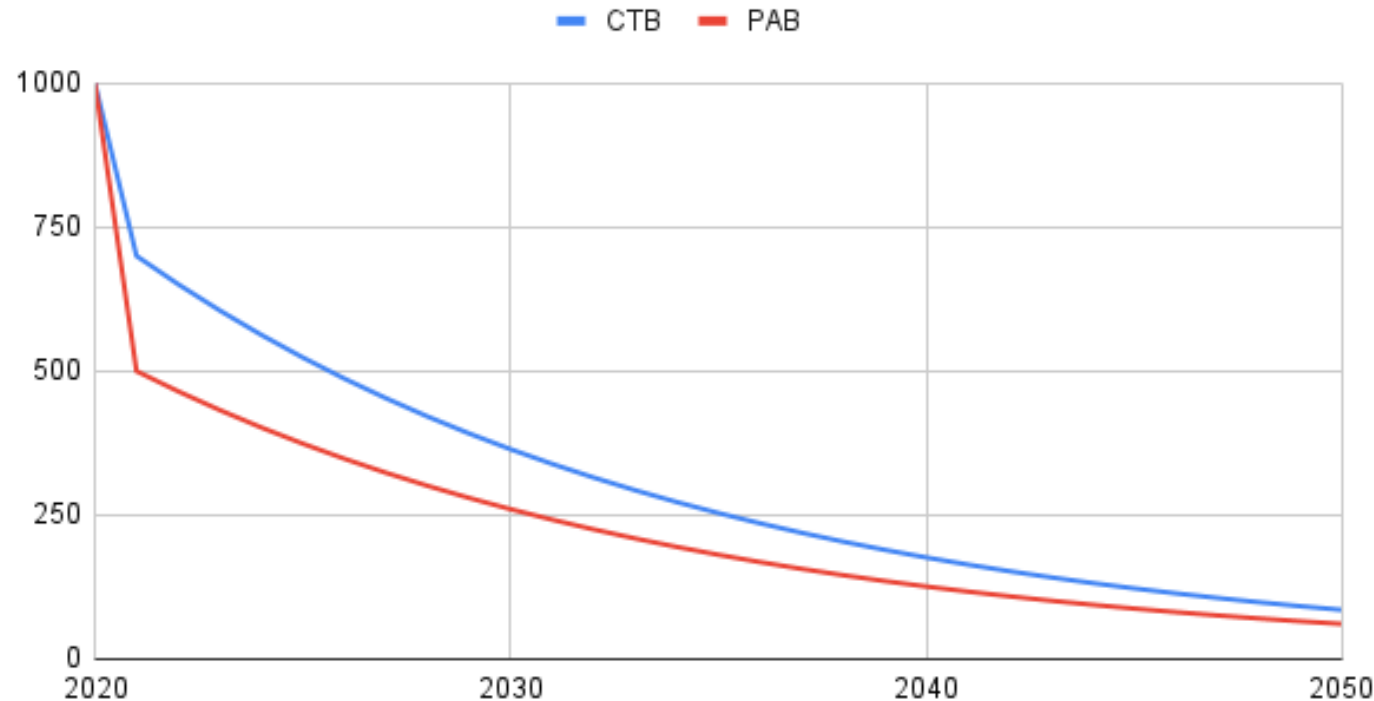
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# Decarbonisation Trajectory

## Decarbonisation Trajectory



Paris-Aligned  
Benchmark (PAB)

Climate Transition  
Benchmark (CTB)

$$\text{Benchmark GHG Intensity} = \sum w_i(t) \frac{GHG_i(t)}{EVIC_i(t)}$$

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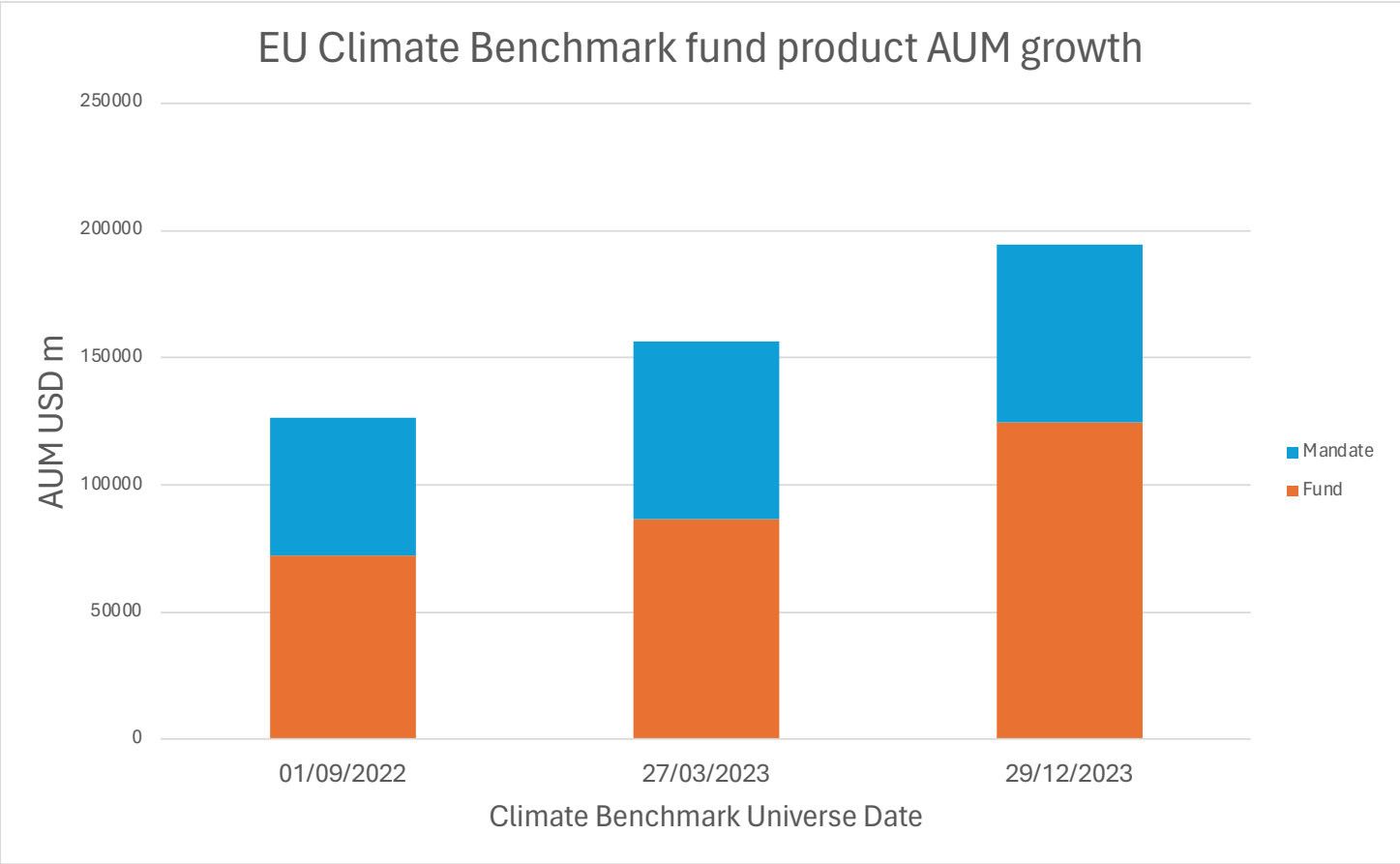
# Minimum Climate Benchmark Standards

Minimum standards	EU CTB	EU PAB
<i>Risk oriented minimum standards</i>		
Minimum Scope 1+2(+3) carbon intensity reduction compared to investable universe	30%	50%
Year-on-year decarbonisation	7%	7%
Scope 3 phase-in	By 2024	By 2024
<b>Baseline Exclusions</b>	Yes Controversial Weapons Tobacco Violators of UNGC or OECD	Yes Controversial Weapons Tobacco Violators of UNGC or OECD
<b>Activity Exclusions</b>	No	Coal (1%+ revenues) Oil (10%+ revenues) Natural Gas (50%+ revenues) Electricity producers with carbon intensity of lifecycle GHG emissions higher than 100g CO2 e/kWh (50%+ revenues)
<b>Significant Harm Exclusions</b>	Violators of DNSH as per EU Taxonomy Article 9 (by 31st Dec 2022)	Violators of DNSH as per EU Taxonomy Article 9
<b>Weight Constraints</b>	"High impact" sector exposure should be no less than that of the underlying investable universe for equity benchmarks.	"High impact" sector exposure should be no less than that of the underlying investable universe for equity benchmarks.

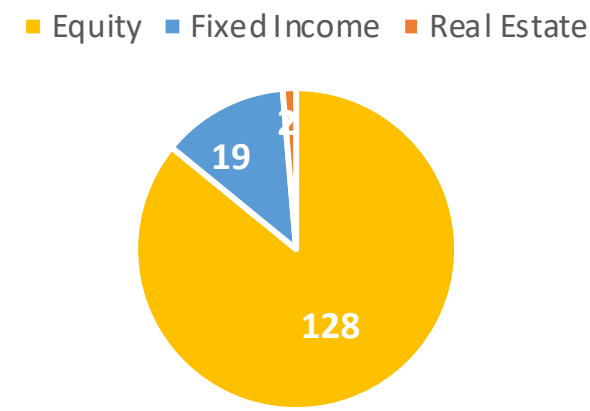
Decarbonisation  
trajectory

Exclusions

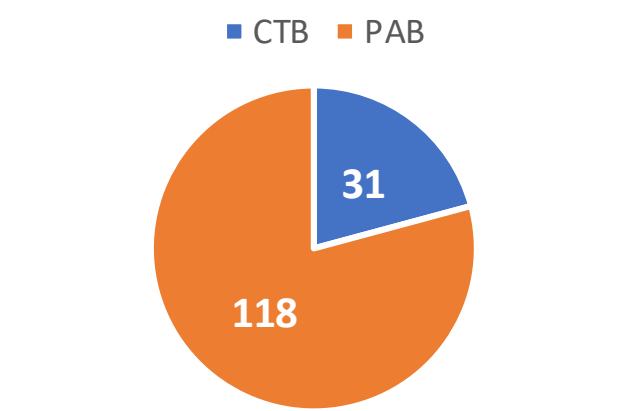
# Climate Benchmark fund market



Asset class fund count (Dec 2023)



PAB vs CTB fund count (Dec 2023)





# Literature and motivation

- Academic literature on EU Climate Benchmarks very sparse
- Satisfying emissions reduction requirements does not lead to poorer financial performance
  - Hodges et al (2021) – PAB performance comparable to the benchmark index
  - Schwaiger et al (2021) and Wang et al (2021) – superior performance against the benchmark index
- None of the studies evaluate existing EU Climate Benchmark products

# Data & Methodology

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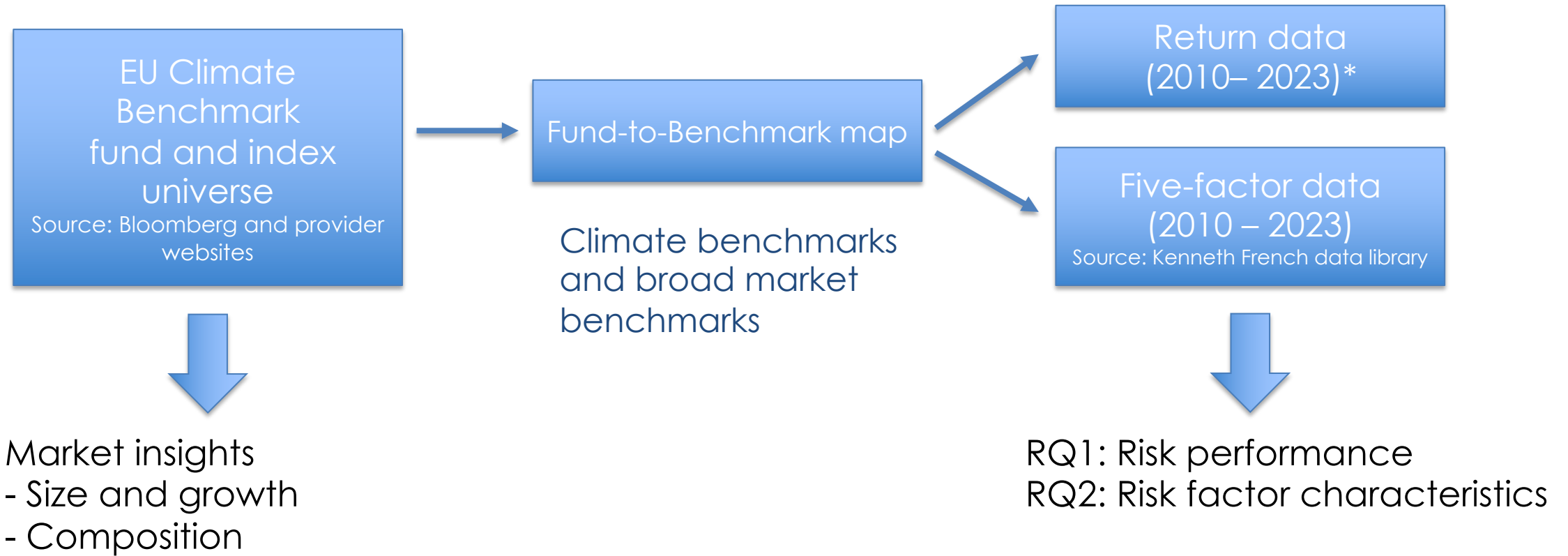


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# Data



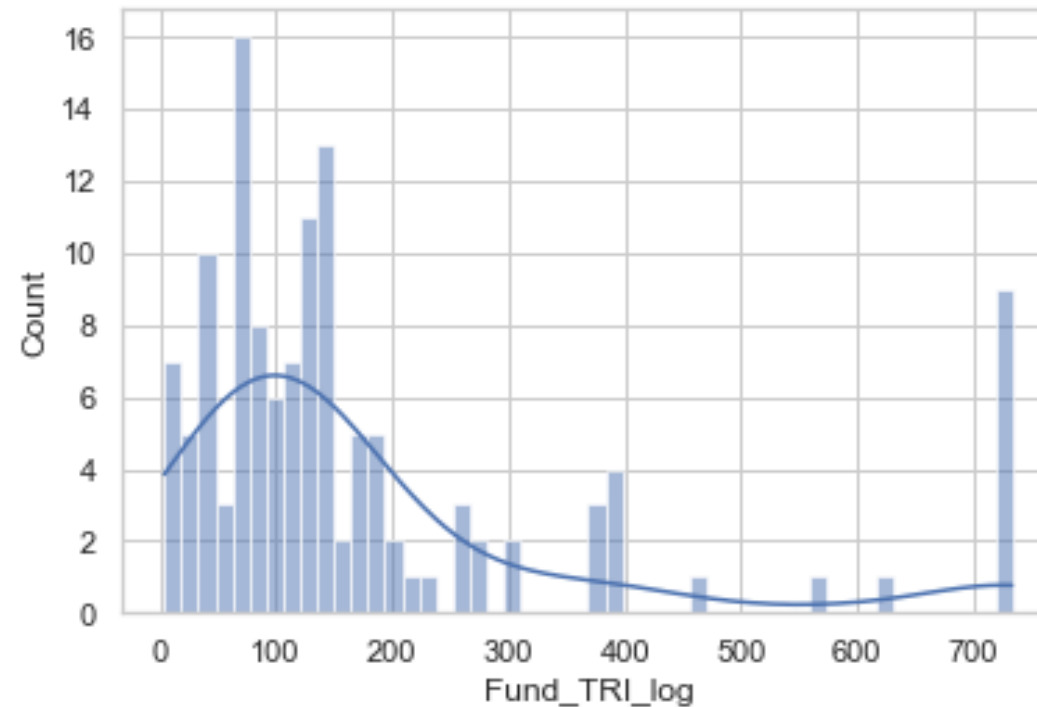
\* Where funds have the backtested data, otherwise from fund launch date

# Data – fund returns

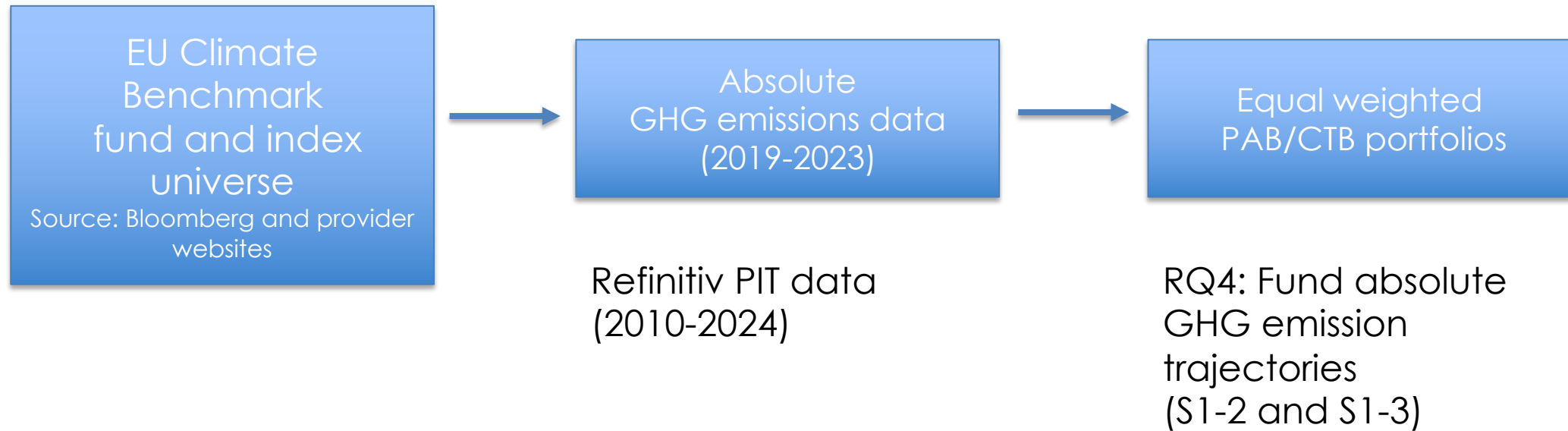
Return data  
(2010 – 2023)

- Equity listed funds
- Regions: Europe, US, Global, Developed, Japan, UK, India
- Data period: Jan 2010 – Dec 2023\*

\* Where funds have the backtested data,  
otherwise from fund launch date



# Data – GHG emissions



# Methods: risk metrics

Evaluation based on paired t-tests

Equal weighted portfolio of funds to aggregate the results

Metric type	Metric
Standard deviation based	Sharpe Ratio Information Ratio (Goodwin, 1998) Tracking Error
Beta based	Jensen Alpha (Jensen, 1968) CAPM Beta Treynor Ratio
Semi-standard deviation based	Sortino Ratio (Sortino and Meer, 1991) Trailing Error
Value at Risk (VaR) based	VaR 95% CVaR 50% CVaR 95% RoVaR 95%

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# Methods: five-factor model

- Fama French (2015) five-factor model-based analysis

$$R_{it} - R_{Ft} = \alpha_i + \beta_i(R_{FF} - R_{Ft}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it}$$

$$R_{it} - R_{Ft} = \alpha_i + \beta_i(R_{PAB} - R_{Ft}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it}$$

$$R_{it} - R_{Ft} = \alpha_i + \beta_i(R_{MKET} - R_{Ft}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it}$$

- Additional shock variables – COVID, Russia-Ukraine war, Oil price

$$R_{it} - R_{Ft} = \alpha_i + \langle \dots \rangle + dc_i Dummy\_COVID_t + dw_i Dummy\_war_t + o_i Oil\_price\_log_t + e_{it}$$

# Results

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# RQ1: Is there a cost associated with the Climate Benchmark methodology?

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# Results: risk metrics vs broad market

Equal weighted PAB vs CTB portfolios

Results measured relative to the broad market benchmark performance

		PAB		CTB	
Metric		Fund	BMK	Fund	BMK
Volatility	Tracking error	1.3%		0.6%	
	CAPM Beta	0.70		0.87	
Downside risk	Trailing error	0.012	0.013	0.005	0.006
Tail risk	VaR 95%	-0.03**	-0.05	-0.04	-0.04
	CVaR 95%	-0.06	-0.09	-0.07	-0.07
	CVaR 50%	-0.0169***	-0.024	-0.017***	-0.0193

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# Results: risk metrics – PAB vs CTB

Equal weighted PAB vs CTB portfolios

Results measured relative to the broad market benchmark performance

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Volatility	Tracking error	1.3%		0.6%	
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	CVaR 95%	-0.06	-0.09	-0.06	-0.07
	CVaR 50%	-0.02	-0.02	-0.02	-0.02

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# RQ2: What are common risk factor characteristics in Climate Benchmark funds?

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# Results: five-factor model

Equal  
weighted  
portfolio

	FF5F		FF5F_Oil		FF5F_Oil_COVID		FF5F_Oil_COVID_Ukraine	
	PAB	CTB	PAB	CTB	PAB	CTB	PAB	CTB
<b>Alpha</b>	0.0009 (0.0009)	0.0010 (0.0009)	0.0008 (0.0008)	0.0009 (0.0008)	0.0005 (0.0008)	0.0007 (0.0008)	0.0007 (0.0008)	0.0009 (0.0008)
<b>Beta</b>	-0.0051 (0.1404)	0.1509 (0.1288)	-0.0090 (0.1267)	0.1382 (0.1222)	-0.0077 (0.1269)	0.1419 (0.1225)	-0.0072 (0.1270)	0.1431 (0.1225)
<b>SMB</b>	0.0797 (0.3896)	0.1693 (0.3225)	0.1161 (0.3620)	0.2151 (0.3070)	0.1037 (0.3615)	0.2117 (0.3074)	0.0971 (0.3620)	0.2068 (0.3056)
<b>HML</b>	0.9626** (0.4131)	0.7904* (0.4070)	1.0187*** (0.3798)	0.6352* (0.3788)	1.0310*** (0.3794)	0.6378* (0.3796)	1.0340*** (0.3799)	0.6401* (0.3788)
<b>CMA</b>	-1.6715*** (0.5823)	-0.7902 (0.5390)	-1.6528*** (0.5288)	-0.5740 (0.5099)	-1.6590*** (0.5287)	-0.5711 (0.5092)	-1.6598*** (0.5293)	-0.5787 (0.5097)
<b>RMW</b>	0.4952 (0.4753)	0.6177 (0.4480)	0.6067 (0.4429)	0.5370 (0.4297)	0.6190 (0.4403)	0.5506 (0.4312)	0.6247 (0.4408)	0.5541 (0.4305)
<b>Oil_price_log</b>			Y	Y	Y	Y	Y	Y
<b>Dummy_COVID</b>					Y	Y	Y	Y
<b>Dummy_Ukraine</b>							Y	Y
<b>R-squared Adj.</b>	0.0056	0.0030	0.0826	0.0725	0.0821	0.0719	0.0811	0.0713
<b>N</b>	730	730	730	730	730	730	730	730

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# Results: five-factor model

Equal  
weighted  
portfolio

	FF5F		FF5F_Oil		FF5F_Oil_COVID		FF5F_Oil_COVID_Ukraine	
	PAB	CTB	PAB	CTB	PAB	CTB	PAB	CTB
<b>Alpha</b>	0.0009 (0.0009)	0.0010 (0.0009)	0.0008 (0.0008)	0.0009 (0.0008)	0.0005 (0.0008)	0.0007 (0.0008)	0.0007 (0.0008)	0.0009 (0.0008)
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<b>Oil_price_log</b>			Y	Y	Y	Y	Y	Y
<b>Dummy_COVID</b>					Y	Y	Y	Y
<b>Dummy_Ukraine</b>							Y	Y
<b>R-squared Adj.</b>	0.0056	0.0030	0.0826	0.0725	0.0821	0.0719	0.0811	0.0713
<b>N</b>	730	730	730	730	730	730	730	730

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# RQ3: Do the Climate Benchmark funds deliver decarbonisation?

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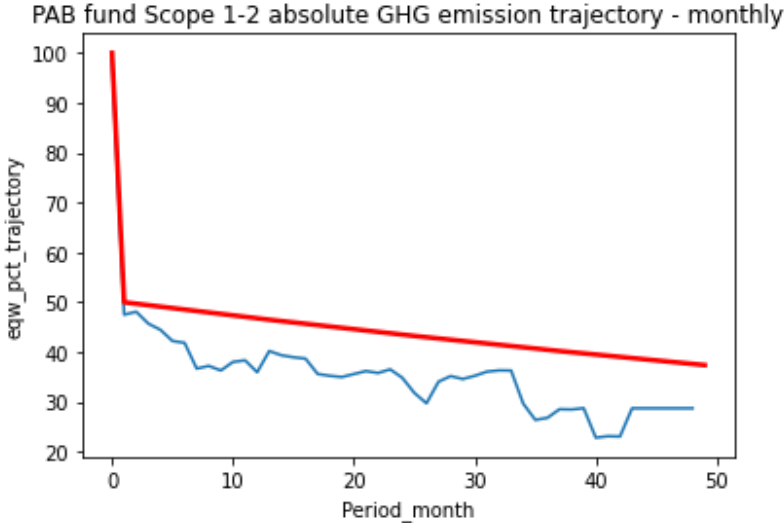
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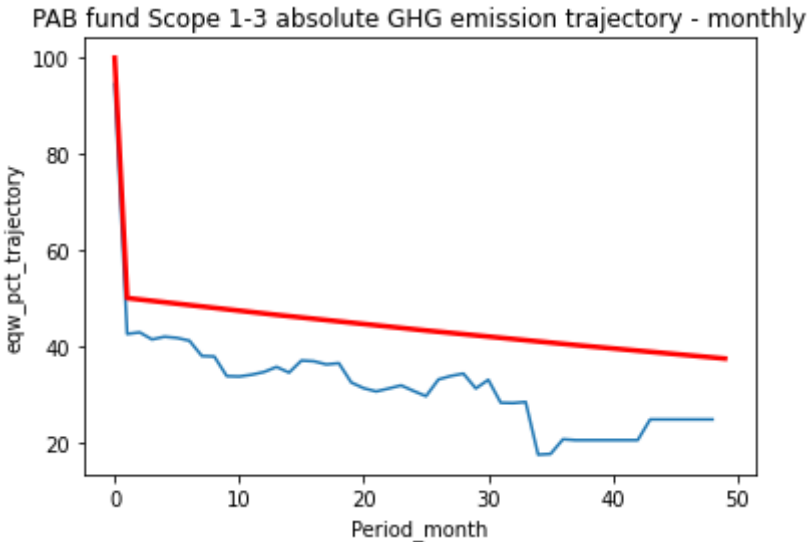
# GHG emissions

## PAB

Absolute  
GHG  
Scope 1-2



Absolute  
GHG  
Scope 1-3



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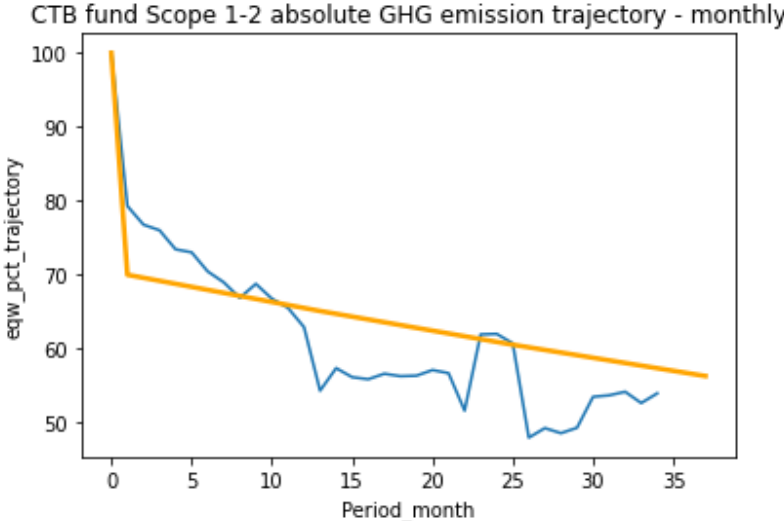
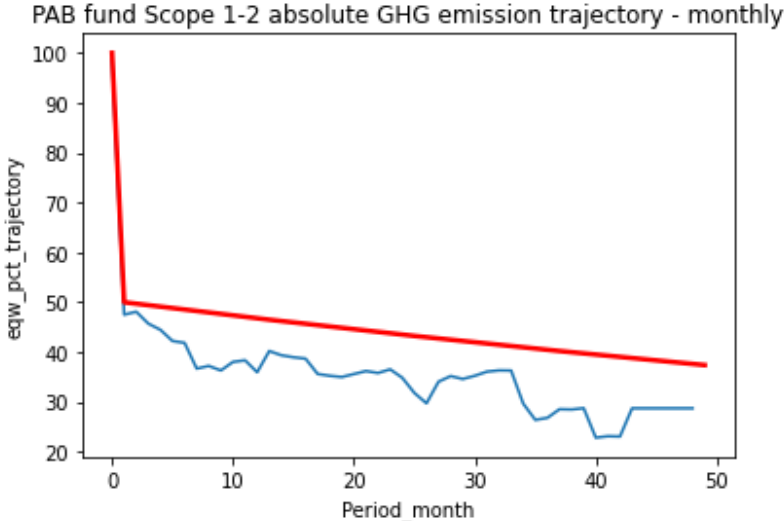


# GHG emissions

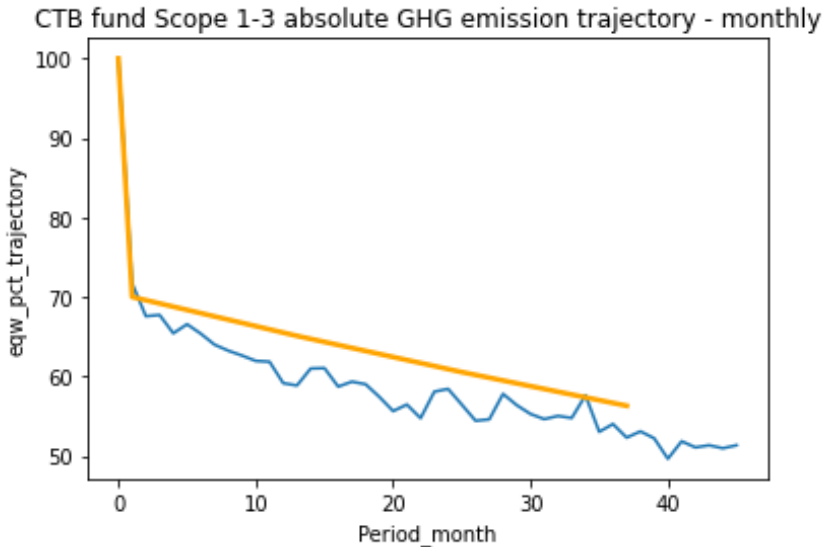
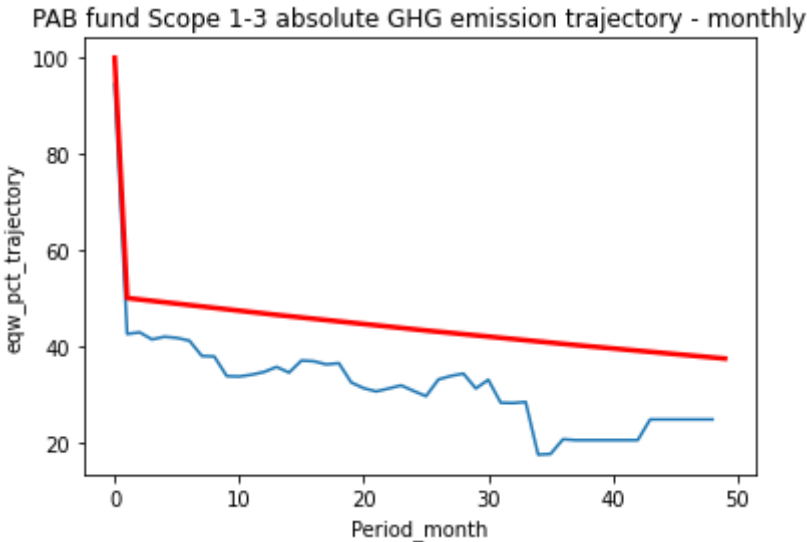
PAB

CTB

Absolute  
GHG  
Scope 1-2



Absolute  
GHG  
Scope 1-3



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# Conclusion

- EU Climate Benchmark funds – growing market segment
- Climate Benchmark funds show significant improvement on tail risk with little to no significant cost on volatility and downside risk
- Evidence of comparable PAB and CTB risk profile
- Evidence of GHG emission reduction objective delivered

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# Thank you

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