

Online Appendix to  
**Reevaluating the Carbon Premium:  
Evidence of Green Outperformance**

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**Abstract:** This document provides supplementary materials to the main paper. In particular, the tabulated estimated coefficients on the emissions variables, for panel regressions and portfolio analyses, are now tabulated together with the estimated coefficients on control variables or common risk factors.

**Keywords:** carbon premium, carbon emissions, stock returns, transition risk, climate finance

**JEL subject codes:** G12, G23, G30, D62

**Table O.A.1:** Panel regression results based on the US sample (returns in percentages), including estimated coefficients on control variables.

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel A: US sample, industry-fixed effects not included</b>						
Log missions levels	-0.096 (0.054)*	0.068 (0.056)	-0.177 (0.064)***			
Emissions intensity				0.129 (0.052)**	0.237 (0.061)***	0.107 (0.061)*
Leverage	-0.001 (0.001)	-0.002 (0.001)**	0.0004 (0.001)	-0.001 (0.001)	-0.002 (0.001)***	0.0003 (0.001)
ROE	0.029 (0.006)***	0.018 (0.009)**	0.032 (0.007)***	0.028 (0.007)***	0.019 (0.007)**	0.030 (0.007)***
Sales growth	0.023 (0.006)***	0.028 (0.008)***	0.021 (0.007)***	0.024 (0.006)***	0.028 (0.008)***	0.021 (0.006)***
Momentum	-0.190 (0.068)***	-0.263 (0.098)***	-0.196 (0.067)***	-0.187 (0.067)***	-0.269 (0.098)***	-0.187 (0.067)***
Volatility	0.218 (0.050)***	0.288 (0.072)***	0.207 (0.048)***	0.217 (0.049)***	0.296 (0.072)***	0.202 (0.047)***
Logsize	0.330 (0.082)***	0.220 (0.091)**	0.541 (0.100)***	0.228 (0.059)***	0.281 (0.073)***	0.395 (0.080)***
Book to Market	-1.895 (0.263)***	-2.015 (0.335)***	-2.015 (0.271)***	-2.044 (0.295)***	-2.013 (0.354)***	-2.184 (0.290)***
Invest/A	-1.128 (0.351)***	-0.977 (0.432)**	-1.344 (0.418)***	-1.816 (0.428)***	-0.941 (0.394)**	-2.225 (0.505)***
Constant	-0.208 (1.083)	-1.984 (1.334)	-2.020 (1.358)	0.362 (1.079)	-2.238 (1.338)*	-1.585 (1.356)
Observations	207,436	67,572	139,864	207,436	67,572	139,864
R <sup>2</sup>	0.192	0.344	0.167	0.192	0.345	0.167

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**Table O.A.1:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel B: US sample, industry-fixed effects included</b>						
Log emissions levels	-0.243 (0.071)***	0.023 (0.067)	-0.465 (0.097)***			
Emissions intensity				0.032 (0.087)	0.075 (0.065)	0.041 (0.114)
Leverage	-0.001 (0.001)	-0.003 (0.001)***	0.0003 (0.001)	-0.001 (0.001)*	-0.003 (0.001)***	-0.0004 (0.001)
ROE	0.027 (0.008)***	0.021 (0.008)***	0.030 (0.008)***	0.026 (0.007)***	0.021 (0.008)**	0.028 (0.007)***
Sales growth	0.022 (0.007)***	0.029 (0.009)***	0.020 (0.006)***	0.023 (0.005)***	0.029 (0.008)***	0.020 (0.006)***
Momentum	-0.226 (0.067)***	-0.305 (0.096)***	-0.233 (0.068)***	-0.219 (0.067)***	-0.306 (0.095)***	-0.220 (0.068)***
Volatility	0.253 (0.046)***	0.335 (0.066)***	0.233 (0.044)***	0.255 (0.046)***	0.335 (0.066)***	0.238 (0.044)***
Logsize	0.492 (0.094)***	0.265 (0.123)**	0.801 (0.122)***	0.267 (0.059)***	0.289 (0.095)***	0.422 (0.079)***
Book to Market	-2.486 (0.219)***	-2.612 (0.315)***	-2.408 (0.251)***	-2.768 (0.243)***	-2.585 (0.314)***	-2.856 (0.273)***
Invest/A	-1.811 (0.364)***	-1.064 (0.418)**	-2.214 (0.456)***	-2.160 (0.367)***	-1.035 (0.380)***	-2.668 (0.479)***
Constant	-0.202 (1.195)	-1.404 (1.923)	-2.529 (1.489)*	1.109 (1.081)	-1.558 (1.832)	-0.772 (1.373)
Observations	207,436	67,572	139,864	207,436	67,572	139,864
R <sup>2</sup>	0.195	0.347	0.169	0.194	0.347	0.169

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**Table O.A.1:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel C: US sample, restricted to 2007-2018</b>						
Log emissions levels	-0.227 (0.058)***	-0.036 (0.060)	-0.342 (0.084)***			
Emissions intensity				0.033 (0.076)	0.098 (0.050)*	-0.046 (0.174)
Leverage	-0.001 (0.001)	-0.002 (0.001)**	-0.0003 (0.001)	-0.001 (0.001)**	-0.002 (0.001)**	-0.001 (0.001)
ROE	0.017 (0.006)***	0.008 (0.007)	0.020 (0.006)***	0.017 (0.005)***	0.008 (0.008)	0.019 (0.006)***
Sales growth	0.018 (0.007)***	0.029 (0.010)***	0.016 (0.005)***	0.019 (0.006)***	0.029 (0.009)***	0.016 (0.006)***
Momentum	-0.259 (0.069)***	-0.280 (0.107)***	-0.274 (0.067)***	-0.254 (0.067)***	-0.281 (0.108)***	-0.265 (0.067)***
Volatility	0.241 (0.051)***	0.284 (0.078)***	0.235 (0.050)***	0.243 (0.051)***	0.284 (0.078)***	0.240 (0.051)***
Logsize	0.446 (0.096)***	0.285 (0.123)**	0.635 (0.122)***	0.229 (0.082)***	0.255 (0.106)**	0.345 (0.099)***
Book to Market	-2.357 (0.291)***	-2.720 (0.436)***	-2.308 (0.308)***	-2.606 (0.289)***	-2.782 (0.417)***	-2.633 (0.308)***
Invest/A	-1.661 (0.472)***	-0.648 (0.549)	-2.126 (0.560)***	-1.918 (0.482)***	-0.727 (0.558)	-2.428 (0.576)***
Constant	0.402 (1.497)	-0.484 (2.083)	-1.043 (1.746)	1.725 (1.468)	-0.379 (2.024)	0.441 (1.704)
Observations	121,395	38,992	82,403	121,395	38,992	82,403
R <sup>2</sup>	0.235	0.328	0.216	0.234	0.328	0.215

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**Table O.A.1:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel D: US sample, emissions and accounting data lagged by 6 months</b>						
Log emissions levels	-0.115 (0.072)	0.024 (0.063)	-0.237 (0.097)**			
Emissions intensity				0.046 (0.088)	0.051 (0.069)	0.055 (0.109)
Leverage	0.0001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.00001 (0.001)	-0.001 (0.001)	0.0005 (0.001)
ROE	0.007 (0.008)	0.002 (0.007)	0.009 (0.008)	0.006 (0.007)	0.002 (0.006)	0.008 (0.008)
Sales growth	0.007 (0.006)	0.007 (0.008)	0.005 (0.006)	0.007 (0.006)	0.007 (0.008)	0.006 (0.006)
Momentum	-0.223 (0.058)***	-0.167 (0.085)**	-0.251 (0.061)***	-0.220 (0.058)***	-0.168 (0.085)**	-0.244 (0.061)***
Volatility	0.156 (0.037)***	0.170 (0.049)***	0.157 (0.036)***	0.157 (0.036)***	0.170 (0.050)***	0.160 (0.036)***
Logsize	0.184 (0.102)*	0.069 (0.113)	0.325 (0.147)**	0.078 (0.061)	0.093 (0.090)	0.132 (0.095)
Book to Market	-1.707 (0.350)***	-1.411 (0.440)***	-1.779 (0.388)***	-1.839 (0.372)***	-1.382 (0.441)***	-2.007 (0.420)***
Invest/A	-1.276 (0.424)***	-0.762 (0.452)*	-1.606 (0.552)***	-1.443 (0.439)***	-0.724 (0.425)*	-1.837 (0.585)***
Constant	-5.976 (1.177)***	-3.517 (1.634)**	-7.943 (1.718)***	-5.358 (1.056)***	-3.659 (1.585)**	-7.033 (1.569)***
Observations	193,514	62,267	131,247	193,514	62,267	131,247
R <sup>2</sup>	0.202	0.334	0.180	0.202	0.334	0.180

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**Table O.A.1:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel E: US sample, emissions and accounting data lagged by 6 and 10 months respectively</b>						
Log emissions levels	-0.120 (0.074)	0.013 (0.068)	-0.234 (0.097)**			
Emissions intensity				0.041 (0.094)	0.066 (0.070)	0.045 (0.113)
Leverage	0.0002 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.0001 (0.001)	-0.001 (0.001)	0.001 (0.001)
ROE	0.006 (0.007)	0.001 (0.007)	0.008 (0.008)	0.006 (0.007)	0.001 (0.006)	0.007 (0.008)
Sales growth	0.006 (0.006)	0.006 (0.008)	0.004 (0.006)	0.006 (0.006)	0.006 (0.008)	0.005 (0.006)
Momentum	-0.216 (0.058)***	-0.180 (0.092)*	-0.239 (0.060)***	-0.212 (0.059)***	-0.180 (0.092)*	-0.232 (0.060)***
Volatility	0.152 (0.037)***	0.177 (0.053)***	0.150 (0.035)***	0.153 (0.037)***	0.177 (0.053)***	0.152 (0.035)***
Logsize	0.195 (0.103)*	0.080 (0.116)	0.339 (0.147)**	0.084 (0.064)	0.093 (0.095)	0.148 (0.097)
Book to Market	-1.621 (0.360)***	-1.356 (0.453)***	-1.681 (0.393)***	-1.758 (0.382)***	-1.340 (0.450)***	-1.905 (0.423)***
Invest/A	-1.216 (0.434)***	-0.670 (0.473)	-1.539 (0.564)***	-1.386 (0.446)***	-0.662 (0.433)	-1.760 (0.591)***
Constant	-4.025 (1.199)***	-2.219 (1.660)	-5.841 (1.735)***	-3.381 (1.092)***	-2.311 (1.627)	-4.954 (1.604)***
Observations	185,877	58,704	127,173	185,868	58,700	127,168
R <sup>2</sup>	0.203	0.339	0.181	0.203	0.339	0.181

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**Table O.A.1:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel F: US sample, including UMC factor</b>						
Log emissions levels	-0.227 (0.066)***	-0.005 (0.064)	-0.348 (0.099)***			
Log emissions levels*UMC	0.117 (0.131)	-0.022 (0.120)	0.101 (0.154)			
Emissions intensity				0.089 (0.072)	0.113 (0.060)*	0.079 (0.180)
Emissions intensity*UMC				-0.148 (0.268)	-0.150 (0.247)	-0.335 (0.427)
Leverage	-0.001 (0.001)	-0.002 (0.001)**	-0.0002 (0.001)	-0.001 (0.001)	-0.002 (0.001)***	-0.001 (0.001)
ROE	0.015 (0.005)***	0.009 (0.008)	0.017 (0.006)***	0.015 (0.005)***	0.009 (0.007)	0.016 (0.007)**
Sales growth	0.019 (0.006)***	0.031 (0.011)***	0.017 (0.005)***	0.020 (0.005)***	0.031 (0.010)***	0.017 (0.005)***
Momentum	-0.275 (0.075)***	-0.286 (0.118)**	-0.292 (0.071)***	-0.271 (0.075)***	-0.287 (0.118)**	-0.284 (0.073)***
Volatility	0.249 (0.055)***	0.288 (0.082)***	0.246 (0.053)***	0.252 (0.055)***	0.289 (0.082)***	0.251 (0.054)***
Logsize	0.408 (0.108)***	0.197 (0.130)	0.604 (0.137)***	0.203 (0.093)**	0.192 (0.114)*	0.321 (0.110)***
Book to Market	-2.277 (0.326)***	-2.731 (0.456)***	-2.231 (0.346)***	-2.512 (0.323)***	-2.757 (0.433)***	-2.539 (0.349)***
Invest/A	-1.551 (0.526)***	-0.548 (0.619)	-2.071 (0.625)***	-1.787 (0.536)***	-0.579 (0.640)	-2.353 (0.643)***
Constant	-6.069 (1.785)***	-3.844 (2.258)*	-8.698 (2.037)***	-5.137 (1.686)***	-3.806 (2.118)*	-7.539 (1.914)***
Observations	106,196	34,860	71,336	106,196	34,860	71,336
R <sup>2</sup>	0.245	0.339	0.225	0.244	0.339	0.224

**Notes:** This table presents findings from panel regressions, estimating monthly stock returns in the US market, employing various specifications. The sample period is from February 2007 until January 2023, unless specified otherwise. Panel A showcases the starting point, excluding industry effects. All regressions include time-fixed effects,  $\mu_t$ , and control variables,  $\text{Controls}_{i,t}$ . Panel B extends the analysis by incorporating industry-fixed effects alongside the baseline equation outlined in Panel A. Industry-fixed effects are also included in panels C, D, E and F. Estimated coefficients on time and industry-fixed effects are not presented. In Panel C, the analysis of Panel B is confined to the period 2007-2018 to synchronize with the timeframe of BK. Panel D introduces a lag of six months on emissions data and accounting data. In Panel E, emissions data are lagged by 10 months and accounting data are lagged by 6 months, compared to Panel B. Finally, compared to Panel B, Panel F integrates an interaction term between the UMC factor and emissions, including the UMC factor as formulated by Ardia et al. (2022). Given the limited time frame for which the UMC factor is available, the results in Panel F are based on the sample period from December 2008 until June 2018. Columns (1)-(3) utilize log emissions levels to gauge a firm's environmental performance, while columns (4)-(6) include results based on emissions intensity. Results labeled as 'Reported & estimated' pertain to firms with either reported or vendor-estimated emissions, whereas 'Reported' or 'Estimated' denote findings specific to firms with reported or vendor-estimated emissions, respectively. Standard errors, clustered at the firm and month levels, are reported in parentheses beneath the coefficients in all regressions. Significance levels are indicated by \*\*\*, \*\*, and \* representing 1%, 5%, and 10% significance, respectively.

**Table O.A.2:** Portfolio analysis results based on the US sample (returns in percentages), including estimated coefficients on common risk factors.

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel A: US sample, without FF5 and momentum</b>						
Alpha	1.146 (0.406)***	0.555 (0.224)**	1.087 (0.496)**	0.229 (0.250)	0.270 (0.221)	-0.183 (0.275)
Observations	192	192	192	192	192	192
<b>Panel B: global sample, FF5 and momentum</b>						
Alpha	1.300 (0.381)***	0.549 (0.210)***	1.215 (0.488)**	0.231 (0.221)	0.279 (0.219)	-0.173 (0.306)
RMRF	0.005 (0.072)	0.044 (0.067)	0.034 (0.087)	0.030 (0.053)	0.019 (0.056)	0.030 (0.066)
SMB	0.037 (0.214)	0.039 (0.100)	0.050 (0.274)	0.031 (0.093)	-0.022 (0.111)	0.017 (0.109)
HML	-0.130 (0.145)	-0.112 (0.137)	-0.083 (0.213)	-0.097 (0.105)	-0.012 (0.090)	-0.058 (0.157)
RMW	-0.428 (0.154)***	-0.083 (0.143)	-0.493 (0.203)**	-0.058 (0.114)	0.024 (0.126)	-0.146 (0.127)
CMA	-0.081 (0.255)	-0.034 (0.176)	0.087 (0.453)	-0.052 (0.160)	-0.188 (0.171)	0.079 (0.248)
UMD	-0.038 (0.066)	-0.041 (0.067)	0.049 (0.062)	-0.058 (0.064)	-0.050 (0.062)	0.025 (0.072)
Observations	191	191	191	191	191	191
R <sup>2</sup>	0.046	0.025	0.029	0.026	0.021	0.010
F Statistic	1.494	0.789	0.902	0.826	0.659	0.320

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**Table O.A.2:** (Continued from previous page)

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel C: global sample, FF5 and momentum, 6-month time lag on emissions</b>						
Alpha	1.201 (0.336)***	0.653 (0.210)***	1.207 (0.420)***	0.255 (0.224)	0.226 (0.233)	0.031 (0.295)
RMRF	0.015 (0.075)	0.020 (0.060)	0.012 (0.097)	0.054 (0.052)	0.050 (0.057)	0.041 (0.070)
SMB	-0.001 (0.178)	0.058 (0.094)	-0.108 (0.167)	-0.034 (0.098)	-0.059 (0.112)	-0.127 (0.100)
HML	-0.206 (0.152)	-0.130 (0.129)	-0.163 (0.196)	-0.054 (0.088)	-0.055 (0.107)	0.006 (0.095)
RMW	-0.326 (0.162)**	-0.080 (0.134)	-0.404 (0.225)*	-0.059 (0.106)	-0.009 (0.140)	-0.202 (0.123)
CMA	-0.067 (0.221)	-0.049 (0.169)	-0.007 (0.286)	-0.120 (0.160)	-0.157 (0.194)	-0.031 (0.180)
UMD	-0.088 (0.063)	-0.036 (0.071)	-0.063 (0.073)	-0.039 (0.057)	-0.071 (0.069)	0.0004 (0.085)
Observations	185	185	185	185	185	185
R <sup>2</sup>	0.055	0.026	0.034	0.029	0.032	0.018
Adjusted R <sup>2</sup>	0.023	-0.007	0.001	-0.004	-0.001	-0.016

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**Table O.A.2:** (Continued from previous page)

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel D: global sample, FF5 and momentum, no time lag on emissions</b>						
Alpha	1.121 (0.303)***	0.721 (0.237)***	0.709 (0.374)*	0.455 (0.258)*	0.458 (0.271)*	0.430 (0.280)
UMC	-0.204 (0.872)	-0.487 (0.825)	0.143 (0.935)	-0.940 (0.843)	-0.946 (1.010)	-0.616 (0.841)
RMRF	-0.002 (0.055)	0.057 (0.075)	-0.015 (0.070)	0.030 (0.069)	0.009 (0.082)	-0.015 (0.080)
SMB	-0.241 (0.132)*	0.007 (0.104)	-0.245 (0.162)	-0.005 (0.118)	-0.046 (0.142)	-0.069 (0.114)
HML	-0.178 (0.222)	-0.148 (0.222)	-0.070 (0.209)	-0.112 (0.170)	-0.021 (0.140)	0.062 (0.182)
RMW	-0.451 (0.206)**	-0.179 (0.226)	-0.432 (0.218)**	-0.129 (0.175)	-0.077 (0.167)	-0.219 (0.150)
CMA	0.077 (0.277)	-0.035 (0.228)	-0.017 (0.301)	-0.040 (0.252)	-0.043 (0.280)	-0.037 (0.291)
UMD	-0.039 (0.095)	-0.050 (0.096)	0.029 (0.071)	-0.081 (0.073)	-0.072 (0.073)	0.020 (0.081)
Observations	127	127	127	127	127	127
R <sup>2</sup>	0.050	0.031	0.035	0.033	0.019	0.015
F Statistic	0.898	0.553	0.619	0.582	0.324	0.259

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**Table O.A.2:** (Continued from previous page)

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel E: global sample, FF5 and momentum, 6-month time lag on emissions, including UMC factor</b>						
Alpha	1.016 (0.291)***	0.846 (0.235)***	0.719 (0.337)**	0.471 (0.264)*	0.371 (0.232)	0.364 (0.316)
UMC	-0.190 (0.852)	-0.277 (0.844)	0.014 (0.848)	-1.178 (0.865)	-0.905 (0.957)	-0.323 (0.816)
RMRF	-0.008 (0.062)	0.003 (0.075)	-0.038 (0.068)	0.041 (0.068)	0.031 (0.083)	0.034 (0.086)
SMB	-0.200 (0.129)	0.035 (0.118)	-0.236 (0.121)*	-0.051 (0.127)	-0.029 (0.129)	-0.183 (0.120)
HML	-0.202 (0.221)	-0.181 (0.244)	-0.160 (0.223)	-0.055 (0.169)	-0.044 (0.136)	0.037 (0.156)
RMW	-0.402 (0.197)**	-0.253 (0.248)	-0.493 (0.197)**	-0.150 (0.180)	-0.122 (0.150)	-0.235 (0.147)
CMA	0.101 (0.281)	0.050 (0.268)	0.024 (0.301)	-0.133 (0.255)	-0.071 (0.235)	-0.007 (0.284)
UMD	-0.071 (0.091)	-0.040 (0.091)	-0.030 (0.073)	-0.061 (0.069)	-0.097 (0.082)	-0.029 (0.090)
Observations	127	127	127	127	127	127
R <sup>2</sup>	0.050	0.026	0.060	0.037	0.031	0.027
F Statistic	0.899	0.454	1.084	0.659	0.549	0.471

**Notes:** This table presents the estimated alphas from portfolio analysis on a monthly basis for the US sample. This entails regressing the constructed GMB spread on an intercept, alpha, and in some panels, also on common risk factors. The GMB spread is computed taking a long position in the portfolio consisting of the quintile of greenest firms in a month, measured either by emissions levels or emissions intensity, and a short position in the portfolio consisting of the quintile of the brownest firms in a given month. Emissions levels are measured as CO<sub>2</sub>e emissions and emissions intensity is measured as CO<sub>2</sub>e emissions scaled by revenues. The sample period is from February 2007 until January 2023, unless specified otherwise. Panel A shows the starting point, represented as  $\text{Ret}_t^{\text{GMB}} = \alpha + \epsilon_t$ , with  $t$  in months. In panel A, the portfolios are either value-weighted or equal-weighted. In Panels B through E, the portfolios are value-weighted. In Panel B, we additionally add common risk factors compared to Panel A, including the FF5-factors and the momentum factor. This results in the following specification:  $\text{Ret}_t^{\text{GMB}} = \alpha + \beta_1 \text{RMRF}_t + \beta_2 \text{SMB}_t + \beta_3 \text{HML}_t + \beta_4 \text{RMW}_t + \beta_5 \text{CMW}_t + \beta_6 \text{UMD}_t + \epsilon_t$ . In Panel C, we extend the analysis of Panel B by adding a time lag of 6 months on emissions data. In Panel D, we add the UMC factor as an additional regressor to the regression equation of Panel B. In Panel E, we include both a time lag of 6 months on the emissions measure and add the UMC factor to the regression equation of panel B. Columns (1)-(3) utilize emissions levels to sort stocks into quintiles, while columns (4)-(6) include results based on emissions intensity. Results labeled as 'Reported & estimated' pertain to firms with either reported or vendor-estimated emissions, whereas 'Reported' or 'Estimated' denote findings specific to firms with reported or vendor-estimated emissions, respectively. Newey and West (1986, 1994) standard errors are reported in parentheses beneath the coefficients in all regressions. Significance levels are indicated by \*\*\*, \*\*, and \* representing 1%, 5%, and 10% significance, respectively.

**Table O.A.3:** Panel regression results when including an indicator variable on emissions similar as to Bauer et al. (2022), based on the US sample (returns in percentages), including estimated coefficients on control variables.

	<i>Emissions measure: Emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel A: US sample, without control variables, industry fixed effects: yes</b>						
Indicator: emissions levels	0.190 (0.209)	0.095 (0.125)	0.175 (0.219)			
Indicator: emissions intensity				0.082 (0.112)	0.041 (0.138)	0.011 (0.146)
Constant	1.317 (0.606)**	1.272 (0.594)**	1.337 (0.625)**	1.360 (0.609)**	1.317 (0.596)**	1.380 (0.628)**
Observations	230,002	71,416	158,586	228,247	70,934	157,313
R <sup>2</sup>	0.000	0.000	0.000	0.000	0.000	0.000
<b>Panel B: US sample, industry fixed effects: yes</b>						
Indicator: emissions levels	0.466*** (0.156)	-0.009 (0.171)	0.854*** (0.198)			
Indicator: emissions intensity				-0.141 (0.129)	-0.194 (0.150)	-0.262 (0.178)
Leverage	-0.001 (0.001)	-0.003*** (0.001)	-0.0001 (0.001)	-0.001* (0.001)	-0.003*** (0.001)	-0.0003 (0.001)
ROE	0.026*** (0.008)	0.021*** (0.008)	0.029*** (0.008)	0.026*** (0.007)	0.021*** (0.007)	0.028*** (0.008)
Sales growth	0.023*** (0.006)	0.029*** (0.008)	0.020*** (0.006)	0.023*** (0.006)	0.029*** (0.008)	0.021*** (0.006)
Momentum	-0.222*** (0.067)	-0.305*** (0.095)	-0.227*** (0.067)	-0.220*** (0.068)	-0.306*** (0.096)	-0.221*** (0.068)
Volatility	0.254*** (0.046)	0.335*** (0.066)	0.237*** (0.044)	0.256*** (0.046)	0.335*** (0.066)	0.239*** (0.045)
Logsize	0.355*** (0.067)	0.285*** (0.109)	0.595*** (0.095)	0.267*** (0.059)	0.280*** (0.095)	0.429*** (0.080)
Book to Market	-2.663*** (0.230)	-2.581*** (0.318)	-2.672*** (0.253)	-2.775*** (0.240)	-2.604*** (0.317)	-2.856*** (0.268)
Invest/A	-2.036*** (0.362)	-1.017*** (0.386)	-2.456*** (0.461)	-2.194*** (0.370)	-1.090*** (0.385)	-2.695*** (0.479)
Constant	-0.586 (1.261)	-1.470 (2.144)	-4.081** (1.702)	1.192 (1.092)	-1.340 (1.855)	-0.749 (1.374)
Observations	207,436	67,572	139,864	207,436	67,572	139,864
R <sup>2</sup>	0.194	0.347	0.169	0.194	0.347	0.169

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**Table O.A.3:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel C: US sample, emissions lagged by 6 months, industry fixed effects: yes</b>						
Indicator: emissions levels	0.466*** (0.156)	-0.028 (0.171)	0.791*** (0.190)			
Indicator: emissions intensity				-0.147 (0.136)	-0.227 (0.150)	-0.040 (0.178)
Leverage	-0.001 (0.001)	-0.003*** (0.001)	-0.0001 (0.001)	-0.001* (0.001)	-0.003*** (0.001)	-0.0004 (0.001)
ROE	0.026*** (0.008)	0.021*** (0.008)	0.027*** (0.008)	0.025*** (0.007)	0.021*** (0.008)	0.026*** (0.008)
Sales growth	0.023*** (0.006)	0.027*** (0.009)	0.021*** (0.006)	0.024*** (0.005)	0.027*** (0.009)	0.021*** (0.006)
Momentum	-0.222*** (0.067)	-0.291*** (0.099)	-0.225*** (0.070)	-0.216*** (0.069)	-0.291*** (0.099)	-0.219*** (0.070)
Volatility	0.254*** (0.046)	0.328*** (0.066)	0.253*** (0.045)	0.264*** (0.047)	0.328*** (0.066)	0.254*** (0.046)
Logsize	0.355*** (0.067)	0.279*** (0.106)	0.611*** (0.100)	0.294*** (0.061)	0.277*** (0.094)	0.454*** (0.086)
Book to Market	-2.663*** (0.230)	-2.648*** (0.289)	-2.627*** (0.282)	-2.760*** (0.252)	-2.667*** (0.293)	-2.797*** (0.294)
Invest/A	-2.036*** (0.362)	-1.300*** (0.422)	-2.323*** (0.454)	-2.148*** (0.365)	-1.375*** (0.425)	-2.524*** (0.468)
Constant	-0.586 (1.261)	-6.689*** (2.028)	-15.126*** (1.779)	-8.603*** (1.134)	-6.602*** (1.782)	-12.069*** (1.485)
Observations	207,436	62,205	133,679	195,871	62,199	133,672
R <sup>2</sup>	0.194	0.343	0.176	0.197	0.343	0.175

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**Table O.A.3:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel D: US sample (2010-2021)<sup>1</sup>, emissions lagged by 6 months, industry fixed effects: yes</b>						
Indicator: emissions levels	0.543*** (0.174)	0.136 (0.179)	0.868*** (0.200)			
Indicator: emissions intensity				-0.021 (0.135)	-0.184 (0.165)	0.127 (0.164)
Leverage	-0.001 (0.001)	-0.003*** (0.001)	-0.0002 (0.001)	-0.001** (0.001)	-0.003*** (0.001)	-0.001 (0.001)
ROE	0.021*** (0.008)	0.016* (0.008)	0.023** (0.009)	0.020*** (0.008)	0.016** (0.008)	0.022** (0.008)
Sales growth	0.023*** (0.006)	0.028*** (0.010)	0.022*** (0.007)	0.024*** (0.006)	0.028*** (0.010)	0.022*** (0.007)
Momentum	-0.273*** (0.070)	-0.324*** (0.113)	-0.290*** (0.071)	-0.272*** (0.072)	-0.324*** (0.114)	-0.281*** (0.071)
Volatility	0.284*** (0.051)	0.362*** (0.077)	0.284*** (0.052)	0.293*** (0.054)	0.361*** (0.077)	0.284*** (0.052)
Logsize	0.349*** (0.075)	0.345*** (0.117)	0.586*** (0.114)	0.277*** (0.068)	0.309*** (0.105)	0.408*** (0.100)
Book to Market	-2.756*** (0.229)	-2.796*** (0.301)	-2.831*** (0.294)	-2.926*** (0.254)	-2.864*** (0.301)	-3.030*** (0.311)
Invest/A	-1.874*** (0.375)	-0.856** (0.416)	-2.226*** (0.487)	-1.975*** (0.385)	-1.009** (0.432)	-2.455*** (0.499)
Constant	-2.624 (1.600)	-10.785*** (2.270)	-15.145*** (2.080)	-9.455*** (1.358)	-10.049*** (1.997)	-11.886*** (1.797)
Observations	171,696	51,169	109,220	160,376	51,163	109,213
R <sup>2</sup>	0.178	0.336	0.158	0.181	0.336	0.158

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<sup>1</sup>The sample that Bauer et al. (2022) employ, spans from 2010 until 2021. To compare results, we limit our sample to the same time frame.

**Table O.A.3:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel E: US sample, including control variables, emissions and accounting data lagged by 6 months</b>						
Indicator: emissions levels	0.170 (0.164)	0.018 (0.163)	0.213 (0.215)			
Indicator: emissions intensity				-0.023 (0.121)	-0.122 (0.136)	0.030 (0.176)
Leverage	0.00002 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.00002 (0.001)	-0.001 (0.001)	0.0005 (0.001)
ROE	0.006 (0.007)	0.002 (0.007)	0.008 (0.008)	0.006 (0.007)	0.002 (0.007)	0.008 (0.008)
Sales growth	0.007 (0.006)	0.007 (0.008)	0.006 (0.006)	0.007 (0.006)	0.007 (0.008)	0.006 (0.006)
Momentum	-0.220*** (0.058)	-0.168** (0.085)	-0.245*** (0.061)	-0.219*** (0.058)	-0.168** (0.085)	-0.244*** (0.061)
Volatility	0.157*** (0.037)	0.170*** (0.050)	0.160*** (0.036)	0.157*** (0.037)	0.169*** (0.050)	0.160*** (0.036)
Logsize	0.109 (0.073)	0.096 (0.098)	0.175 (0.118)	0.077 (0.062)	0.087 (0.091)	0.130 (0.096)
Book to Market	-1.804*** (0.363)	-1.371*** (0.444)	-1.966*** (0.404)	-1.842*** (0.371)	-1.392*** (0.440)	-2.012*** (0.416)
Invest/A	-1.392*** (0.432)	-0.701 (0.431)	-1.784*** (0.563)	-1.443*** (0.437)	-0.758* (0.432)	-1.835*** (0.583)
Constant	-5.964*** (1.244)	-3.706** (1.763)	-7.854*** (1.992)	-5.335*** (1.058)	-3.516** (1.593)	-7.021*** (1.567)
Observations	193,514	62,267	131,247	193,514	62,267	131,247
R <sup>2</sup>	0.202	0.334	0.180	0.202	0.334	0.180

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**Table O.A.3:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel F: US sample, including control variables, emissions and accounting data lagged by 6 and 10 months resp.</b>						
Indicator: emissions intensity	0.170 (0.164)	0.060 (0.171)	0.207 (0.211)			
Indicator: emissions intensity				-0.096 (0.125)	-0.125 (0.146)	-0.089 (0.177)
Leverage	0.00002 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.0001 (0.001)	-0.001 (0.001)	0.001 (0.001)
ROE	0.006 (0.007)	0.001 (0.007)	0.008 (0.007)	0.006 (0.007)	0.001 (0.007)	0.007 (0.008)
Sales growth	0.007 (0.006)	0.005 (0.008)	0.005 (0.006)	0.006 (0.006)	0.006 (0.008)	0.005 (0.006)
Momentum	-0.220*** (0.058)	-0.180* (0.092)	-0.233*** (0.060)	-0.212*** (0.059)	-0.180* (0.092)	-0.232*** (0.060)
Volatility	0.157*** (0.037)	0.177*** (0.053)	0.153*** (0.035)	0.153*** (0.036)	0.176*** (0.053)	0.153*** (0.035)
Logsize	0.109 (0.073)	0.104 (0.100)	0.190 (0.120)	0.084 (0.064)	0.086 (0.095)	0.151 (0.097)
Book to Market	-1.804*** (0.363)	-1.320*** (0.454)	-1.865*** (0.405)	-1.763*** (0.381)	-1.351*** (0.451)	-1.907*** (0.418)
Invest/A	-1.392*** (0.432)	-0.613 (0.445)	-1.709*** (0.572)	-1.404*** (0.447)	-0.691 (0.439)	-1.769*** (0.594)
Constant	-5.964*** (1.244)	-2.533 (1.758)	-5.756*** (2.024)	-3.321*** (1.091)	-2.154 (1.637)	-4.943*** (1.601)
Observations	193,514	58,704	127,173	185,868	58,700	127,168
R <sup>2</sup>	0.202	0.339	0.181	0.203	0.339	0.181

**Notes:** This table presents findings from estimating monthly stocks returns in the US market, employing panel regressions and accounting for emissions through an indicator variable. The sample period is from February 2007 until January 2023, unless specified otherwise. In all specifications, an indicator variable indicates if a stock is in the the green portfolio (+1), or in the brown portfolio (-1), or somewhere in between (0), based on quintile portfolio sorts using either emissions levels or intensity, similar as to Bauer et al. (2022). Emissions levels are measured as CO<sub>2</sub>e emissions and emissions intensity is measured as CO<sub>2</sub>e emissions scaled by revenues. Panel A is based on regressing stock returns on the indicator variable and an intercept. Panel B showcases the findings when accounting for firms-specific characteristics and fixed effects. Panel C additionally includes the indicator variable based on emissions lagged by 6 months. Compared to panel C, the time frame is restricted to 2010-2021 in panel D. Columns (1)-(3) utilize emissions levels to sort stocks into quintiles, while columns (4)-(6) include results based on emissions intensity. Results labeled as 'Reported & estimated' pertain to firms with either reported or vendor-estimated emissions, whereas 'Reported' or 'Estimated' denote findings specific to firms with reported or vendor-estimated emissions, respectively. In all regressions, standard errors are reported in parentheses beneath the coefficients. In all regressions, \*\*\*, \* and \* denote significance at the 1%, 5% and 10% levels, respectively.



**Table O.A.4:** Panel regression results based on the global sample (returns in percentages), including estimated coefficients on control variables.

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel A: global sample, industry-fixed effects not included</b>						
Log emissions levels	-0.029 (0.029)	0.023 (0.027)	-0.083 (0.033)**			
Emissions intensity				0.0005 (0.001)	0.003 (0.003)	0.0002 (0.001)
Leverage	-0.0004 (0.001)	-0.001 (0.001)	0.0002 (0.001)	-0.0003 (0.001)	-0.001 (0.0005)	0.0002 (0.001)
ROE	0.029 (0.006)***	0.030 (0.005)***	0.030 (0.006)***	0.029 (0.006)***	0.030 (0.005)***	0.029 (0.006)***
Sales growth	0.023 (0.004)***	0.022 (0.005)***	0.022 (0.004)***	0.024 (0.004)***	0.022 (0.005)***	0.022 (0.004)***
Momentum	-0.143 (0.055)***	-0.148 (0.068)**	-0.155 (0.050)***	-0.142 (0.055)***	-0.149 (0.068)**	-0.153 (0.050)***
Volatility	0.173 (0.038)***	0.176 (0.044)***	0.172 (0.036)***	0.173 (0.037)***	0.177 (0.044)***	0.171 (0.036)***
Logsize	0.245 (0.052)***	0.164 (0.050)***	0.456 (0.070)***	0.217 (0.042)***	0.185 (0.041)***	0.393 (0.062)***
Book to Market	-1.328 (0.158)***	-1.103 (0.157)***	-1.579 (0.162)***	-1.365 (0.176)***	-1.075 (0.171)***	-1.659 (0.174)***
Invest/A	-1.526 (0.236)***	-1.584 (0.288)***	-1.411 (0.308)***	-1.724 (0.276)***	-1.409 (0.276)***	-1.846 (0.356)***
Constant	-1.008 (0.786)	-1.189 (0.764)	-3.175 (1.040)***	-0.872 (0.785)	-1.251 (0.760)*	-3.059 (1.039)***
Observations	722,227	385,433	336,794	722,227	385,433	336,794
R <sup>2</sup>	0.198	0.273	0.159	0.198	0.273	0.159

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**Table O.A.4:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel B: global sample, industry-fixed effects included</b>						
Log emissions levels	-0.106 (0.029)***	-0.024 (0.029)	-0.234 (0.040)***			
Emissions intensity				0.0003 (0.001)	0.002 (0.004)	0.0002 (0.001)
Leverage	-0.0004 (0.0004)	-0.001 (0.0004)*	0.0003 (0.0005)	-0.001 (0.0004)	-0.001 (0.0004)*	-0.0001 (0.0005)
ROE	0.029 (0.005)***	0.031 (0.005)***	0.030 (0.005)***	0.029 (0.005)***	0.031 (0.005)***	0.028 (0.006)***
Sales growth	0.023 (0.003)***	0.022 (0.004)***	0.022 (0.004)***	0.023 (0.003)***	0.022 (0.005)***	0.022 (0.004)***
Momentum	-0.156 (0.054)***	-0.165 (0.067)**	-0.171 (0.049)***	-0.153 (0.054)***	-0.164 (0.067)**	-0.165 (0.049)***
Volatility	0.180 (0.036)***	0.184 (0.042)***	0.178 (0.035)***	0.181 (0.036)***	0.184 (0.042)***	0.181 (0.035)***
Logsize	0.310 (0.053)***	0.203 (0.054)***	0.583 (0.075)***	0.208 (0.043)***	0.180 (0.040)***	0.392 (0.062)***
Book to Market	-1.480 (0.119)***	-1.261 (0.129)***	-1.728 (0.145)***	-1.599 (0.134)***	-1.290 (0.141)***	-1.942 (0.152)***
Invest/A	-1.791 (0.226)***	-1.840 (0.288)***	-1.800 (0.311)***	-2.049 (0.207)***	-1.918 (0.250)***	-2.104 (0.317)***
Constant	-1.006 (0.866)	-1.128 (0.854)	-3.464 (1.151)***	-0.365 (0.831)	-0.983 (0.790)	-2.598 (1.115)**
Observations	722,227	385,433	336,794	722,227	385,433	336,794
R <sup>2</sup>	0.198	0.274	0.161	0.198	0.274	0.160

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**Table O.A.4:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel C: global sample, restricted to 2007-2018</b>						
Log emissions levels	-0.101 (0.024)***	-0.044 (0.027)*	-0.168 (0.035)***			
Emissions intensity				-0.004 (0.007)	-0.009 (0.014)	-0.003 (0.008)
Leverage	-0.001 (0.0004)	-0.001 (0.001)*	0.00003 (0.0005)	-0.001 (0.0004)*	-0.001 (0.0005)**	-0.0002 (0.001)
ROE	0.024 (0.004)***	0.026 (0.004)***	0.023 (0.005)***	0.024 (0.004)***	0.027 (0.004)***	0.022 (0.005)***
Sales growth	0.019 (0.003)***	0.018 (0.004)***	0.018 (0.004)***	0.019 (0.003)***	0.018 (0.004)***	0.018 (0.004)***
Momentum	-0.167 (0.055)***	-0.199 (0.063)***	-0.162 (0.056)***	-0.165 (0.055)***	-0.199 (0.063)***	-0.158 (0.056)***
Volatility	0.180 (0.037)***	0.200 (0.042)***	0.171 (0.037)***	0.180 (0.037)***	0.199 (0.042)***	0.173 (0.037)***
Logsize	0.330 (0.058)***	0.257 (0.057)***	0.499 (0.081)***	0.229 (0.055)***	0.213 (0.047)***	0.353 (0.071)***
Book to Market	-1.672 (0.139)***	-1.590 (0.159)***	-1.774 (0.170)***	-1.777 (0.146)***	-1.636 (0.161)***	-1.917 (0.172)***
Invest/A	-2.014 (0.290)***	-2.184 (0.336)***	-1.963 (0.389)***	-2.234 (0.282)***	-2.317 (0.321)***	-2.174 (0.386)***
Constant	-1.070 (1.080)	-1.514 (0.910)*	-2.449 (1.335)*	-0.410 (1.089)	-1.227 (0.893)	-1.711 (1.314)
Observations	413,455	206,490	206,965	413,455	206,490	206,965
R <sup>2</sup>	0.215	0.271	0.189	0.215	0.271	0.189

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**Table O.A.4:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel D: global sample, emissions and accounting data lagged by 6 months</b>						
Log emissions levels	-0.040 (0.032)	0.014 (0.031)	-0.128 (0.042)***			
Total emissions intensity				-0.0002 (0.001)	-0.002 (0.005)	0.0002 (0.001)
Leverage	0.0002 (0.0004)	-0.0001 (0.0004)	0.001 (0.001)	0.0001 (0.0004)	-0.0001 (0.0004)	0.001 (0.001)
ROE	0.016 (0.005)***	0.017 (0.005)***	0.015 (0.006)***	0.016 (0.005)***	0.017 (0.005)***	0.014 (0.006)**
Sales growth	0.010 (0.003)***	0.010 (0.005)**	0.010 (0.003)***	0.010 (0.003)***	0.010 (0.005)**	0.010 (0.004)***
Momentum	-0.167 (0.043)***	-0.165 (0.054)***	-0.183 (0.042)***	-0.166 (0.043)***	-0.165 (0.054)***	-0.180 (0.042)***
Volatility	0.106 (0.029)***	0.112 (0.035)***	0.103 (0.028)***	0.107 (0.028)***	0.112 (0.035)***	0.104 (0.028)***
Logsize	0.096 (0.057)*	0.041 (0.055)	0.234 (0.086)***	0.057 (0.043)	0.054 (0.038)	0.128 (0.068)*
Book to Market	-0.984 (0.156)***	-0.834 (0.159)***	-1.158 (0.198)***	-1.028 (0.172)***	-0.817 (0.171)***	-1.275 (0.210)***
Invest/A	-1.491 (0.263)***	-1.558 (0.288)***	-1.473 (0.362)***	-1.587 (0.260)***	-1.515 (0.264)***	-1.637 (0.373)***
Constant	-4.518 (0.842)***	-3.906 (0.788)***	-6.043 (1.197)***	-4.274 (0.790)***	-3.989 (0.708)***	-5.561 (1.142)***
Observations	671,349	354,800	316,549	671,349	354,800	316,549
R <sup>2</sup>	0.198	0.267	0.164	0.198	0.267	0.164

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**Table O.A.4:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel E: global sample, emissions and accounting data lagged by 6 and 10 months respectively</b>						
Log emissions levels	-0.022 (0.034)	0.016 (0.033)	-0.094 (0.042)**			
Emissions intensity				-0.0004 (0.001)	-0.001 (0.004)	-0.0001 (0.001)
Leverage	0.0002 (0.0004)	-0.0002 (0.0004)	0.001 (0.001)	0.0002 (0.0004)	-0.0002 (0.0004)	0.001 (0.001)
ROE	0.015 (0.005)***	0.015 (0.005)***	0.015 (0.006)***	0.015 (0.005)***	0.015 (0.005)***	0.015 (0.006)***
Sales growth	0.008 (0.003)**	0.008 (0.005)*	0.007 (0.003)**	0.009 (0.004)**	0.008 (0.005)*	0.008 (0.003)**
Momentum	-0.165 (0.044)***	-0.164 (0.056)***	-0.179 (0.041)***	-0.164 (0.044)***	-0.165 (0.056)***	-0.177 (0.041)***
Volatility	0.103 (0.029)***	0.108 (0.036)***	0.101 (0.028)***	0.103 (0.029)***	0.108 (0.036)***	0.102 (0.028)***
Logsize	0.092 (0.060)	0.043 (0.056)	0.227 (0.088)***	0.071 (0.044)	0.058 (0.039)	0.150 (0.069)**
Book to Market	-0.911 (0.157)***	-0.780 (0.159)***	-1.065 (0.197)***	-0.935 (0.176)***	-0.761 (0.173)***	-1.148 (0.209)***
Invest/A	-1.445 (0.255)***	-1.427 (0.287)***	-1.490 (0.354)***	-1.497 (0.251)***	-1.374 (0.264)***	-1.609 (0.362)***
Constant	-5.409 (0.864)***	-4.262 (0.796)***	-7.349 (1.216)***	-5.274 (0.807)***	-4.358 (0.714)***	-7.000 (1.158)***
Observations	639,513	334,069	305,444	639,493	334,056	305,437
R <sup>2</sup>	0.201	0.271	0.166	0.201	0.271	0.166

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**Table O.A.4:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel F: global sample, including UMC factor</b>						
Log emissions levels	-0.095 (0.027)***	-0.031 (0.030)	-0.182 (0.039)***			
Log emissions levels*UMC	0.113 (0.078)	0.043 (0.082)	0.146 (0.090)			
Emissions intensity				-0.006 (0.008)	-0.017 (0.019)	-0.002 (0.010)
Emissions intensity*UMC				0.025 (0.037)	0.024 (0.063)	0.024 (0.042)
Leverage	-0.001 (0.0004)*	-0.001 (0.001)*	0.00004 (0.001)	-0.001 (0.001)	-0.001 (0.001)*	-0.0002 (0.001)
ROE	0.022 (0.004)***	0.025 (0.004)***	0.021 (0.006)***	0.022 (0.004)***	0.025 (0.004)***	0.020 (0.005)***
Sales growth	0.018 (0.003)***	0.016 (0.004)***	0.018 (0.004)***	0.018 (0.003)***	0.016 (0.004)***	0.018 (0.004)***
Momentum	-0.152 (0.059)***	-0.167 (0.067)**	-0.155 (0.058)***	-0.150 (0.058)**	-0.167 (0.067)**	-0.150 (0.059)**
Volatility	0.165 (0.040)***	0.185 (0.046)***	0.157 (0.040)***	0.166 (0.040)***	0.185 (0.046)***	0.158 (0.040)***
Logsize	0.276 (0.056)***	0.202 (0.054)***	0.417 (0.078)***	0.191 (0.053)***	0.176 (0.050)***	0.257 (0.068)***
Book to Market	-1.544 (0.167)***	-1.421 (0.180)***	-1.659 (0.186)***	-1.628 (0.170)***	-1.448 (0.179)***	-1.802 (0.186)***
Invest/A	-1.968 (0.302)***	-2.227 (0.362)***	-1.902 (0.420)***	-2.152 (0.293)***	-2.310 (0.349)***	-2.119 (0.417)***
Constant	-7.589 (1.041)***	-7.025 (0.954)***	-9.120 (1.282)***	-7.285 (1.022)***	-6.952 (0.960)***	-8.451 (1.207)***
Observations	367,346	183,779	183,567	367,346	183,779	183,567
R <sup>2</sup>	0.224	0.278	0.198	0.224	0.278	0.198

**Notes:** This table presents findings from panel regressions, estimating monthly stock returns in the global market, employing various specifications. The sample period is from February 2007 until January 2023, unless specified otherwise. Panel A showcases the starting point, excluding industry effects. All regressions include time-fixed effects,  $\mu_t$ , country fixed effects,  $\text{country}_{i,t}$ , and control variables,  $\text{Controls}_{i,t}$ . For an overview of included control variables, refer to Table C.6 in the main paper. Panel B extends the analysis by incorporating industry-fixed effects alongside the baseline equation outlined in Panel A. Industry-fixed effects are also included in panels C, D, E and F. Estimated coefficients on time and industry-fixed effects are not presented. In Panel C, the analysis of Panel B is confined to the period 2007-2018 to synchronize with the timeframe of BK. Panel D introduces a lag of six months on emissions data and accounting data. In Panel E, emissions data are lagged by 10 months and accounting data are lagged by 6 months, compared to Panel B. Finally, compared to Panel B, Panel F integrates an interaction term between the UMC factor and emissions, including the UMC factor as formulated by Ardia et al. (2022). Given the limited time frame for which the UMC factor is available, the results in Panel F are based on the sample period from December 2008 until June 2018. Columns (1)-(3) utilize log emissions levels to gauge a firm's environmental performance, while columns (4)-(6) include results based on emissions intensity. Results labeled as 'Reported & estimated' pertain to firms with either reported or vendor-estimated emissions, whereas 'Reported' or 'Estimated' denote findings specific to firms with reported or vendor-estimated emissions, respectively. Standard errors, clustered at the firm and month levels, are reported in parentheses beneath the coefficients in all regressions. Significance levels are indicated by \*\*\*, \*\*, and \* representing 1%, 5%, and 10% significance, respectively.

**Table O.A.5:** Portfolio analysis results based on the global sample (returns in percentages), including estimated coefficients on common risk factors.

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel A: global sample, without FF5 and momentum (results for value-weighting only)</b>						
Alpha	0.551 (0.242)**	0.303 (0.254)	0.702 (0.326)**	-0.088 (0.218)	-0.119 (0.229)	-0.138 (0.241)
Observations	192	192	192	192	192	192
<b>Panel B: global sample, FF5 and momentum</b>						
Alpha	0.524 (0.247)**	0.302 (0.256)	0.749 (0.366)**	-0.079 (0.229)	-0.095 (0.272)	-0.141 (0.229)
RMRF	0.033 (0.037)	0.026 (0.039)	-0.013 (0.060)	0.001 (0.039)	-0.001 (0.036)	-0.043 (0.057)
SMB	-0.075 (0.085)	-0.049 (0.061)	0.097 (0.194)	-0.057 (0.068)	-0.088 (0.072)	0.121 (0.114)
HML	-0.093 (0.067)	-0.029 (0.085)	0.084 (0.105)	0.011 (0.063)	0.052 (0.094)	-0.025 (0.113)
RMW	-0.024 (0.101)	-0.017 (0.082)	-0.104 (0.161)	0.007 (0.083)	0.013 (0.098)	0.018 (0.124)
CMA	0.035 (0.115)	-0.077 (0.105)	0.042 (0.196)	-0.031 (0.124)	-0.099 (0.139)	0.156 (0.193)
UMD	-0.047 (0.054)	-0.090 (0.085)	0.034 (0.039)	-0.058 (0.080)	-0.082 (0.123)	0.002 (0.046)
Observations	192	192	192	192	192	192
R <sup>2</sup>	0.021	0.039	0.015	0.013	0.025	0.019
F Statistic	0.653	1.252	0.455	0.394	0.788	0.601

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**Table O.A.5:** (Continued from previous page)

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel C: global sample, FF5 and momentum, 6-month time lag on emissions</b>						
Alpha	0.560 (0.236)**	0.240 (0.238)	0.774 (0.340)**	-0.063 (0.212)	-0.098 (0.237)	-0.069 (0.236)
RMRF	0.036 (0.041)	0.029 (0.037)	-0.052 (0.061)	0.022 (0.042)	0.015 (0.040)	-0.012 (0.054)
SMB	-0.096 (0.084)	-0.073 (0.055)	0.002 (0.152)	-0.098 (0.068)	-0.135 (0.078)*	0.030 (0.087)
HML	-0.085 (0.074)	-0.015 (0.083)	0.031 (0.099)	0.015 (0.056)	0.035 (0.073)	0.021 (0.098)
RMW	-0.026 (0.108)	-0.024 (0.083)	-0.068 (0.148)	-0.019 (0.080)	-0.037 (0.092)	0.016 (0.105)
CMA	-0.004 (0.122)	-0.116 (0.113)	0.014 (0.163)	-0.056 (0.123)	-0.113 (0.134)	0.088 (0.161)
UMD	-0.052 (0.048)	-0.083 (0.072)	-0.040 (0.042)	-0.069 (0.073)	-0.095 (0.088)	-0.053 (0.057)
Observations	186	186	186	186	186	186
R <sup>2</sup>	0.028	0.045	0.007	0.024	0.039	0.016
F Statistic	0.854	1.393	0.209	0.729	1.203	0.472

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**Table O.A.5:** (Continued from previous page)

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel D: global sample, FF5 and momentum, no time lag on emissions, including UMC factor</b>						
Alpha	0.646 (0.140)***	0.421 (0.228)*	0.474 (0.343)	0.226 (0.235)	0.205 (0.269)	0.277 (0.246)
UMC	-0.199 (0.423)	0.009 (0.751)	-0.332 (0.477)	-0.586 (0.604)	-0.704 (0.794)	-0.339 (0.768)
RMRF	0.031 (0.037)	0.031 (0.062)	0.031 (0.045)	0.026 (0.067)	0.020 (0.070)	0.005 (0.070)
SMB	-0.171 (0.064)***	-0.113 (0.071)	-0.234 (0.129)*	-0.096 (0.081)	-0.095 (0.088)	-0.042 (0.124)
HML	-0.044 (0.055)	0.093 (0.099)	0.061 (0.143)	0.028 (0.093)	0.109 (0.121)	-0.019 (0.102)
RMW	-0.029 (0.100)	0.009 (0.153)	-0.107 (0.198)	-0.001 (0.137)	0.039 (0.165)	-0.025 (0.192)
CMA	-0.052 (0.096)	-0.130 (0.101)	-0.024 (0.209)	0.005 (0.181)	-0.093 (0.206)	0.145 (0.185)
UMD	-0.075 (0.050)	-0.116 (0.078)	0.034 (0.052)	-0.102 (0.067)	-0.155 (0.090)*	0.016 (0.047)
Observations	127	127	127	127	127	127
R <sup>2</sup>	0.084	0.098	0.036	0.048	0.090	0.008
F Statistic	1.559	1.843*	0.635	0.857	1.690	0.130

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**Table O.A.5:** (Continued from previous page)

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel E: global sample, FF5 and momentum, 6-month time lag on emissions, including UMC factor</b>						
Alpha	0.589 (0.163)***	0.311 (0.215)	0.460 (0.260)*	0.136 (0.249)	0.147 (0.271)	0.091 (0.295)
UMC	-0.370 (0.485)	0.019 (0.721)	-0.183 (0.658)	-0.602 (0.635)	-0.910 (0.803)	-0.104 (0.592)
RMRF	0.041 (0.048)	0.025 (0.065)	0.023 (0.052)	0.045 (0.073)	0.028 (0.071)	0.057 (0.080)
SMB	-0.180 (0.071)**	-0.120 (0.068)*	-0.243 (0.112)**	-0.103 (0.082)	-0.133 (0.093)	-0.058 (0.089)
HML	-0.036 (0.063)	0.156 (0.097)	-0.046 (0.117)	0.060 (0.105)	0.152 (0.126)	-0.041 (0.102)
RMW	-0.044 (0.105)	0.011 (0.158)	-0.123 (0.183)	-0.0002 (0.143)	-0.001 (0.154)	0.051 (0.194)
CMA	-0.031 (0.109)	-0.199 (0.089)**	0.003 (0.198)	-0.053 (0.194)	-0.122 (0.204)	0.091 (0.212)
UMD	-0.077 (0.045)*	-0.100 (0.064)	-0.015 (0.044)	-0.104 (0.067)	-0.129 (0.080)	-0.069 (0.055)
Observations	127	127	127	127	127	127
R <sup>2</sup>	0.081	0.103	0.045	0.057	0.086	0.020
F Statistic	1.505	1.958*	0.794	1.019	1.597	0.348

**Notes:** This table presents the estimated alphas from portfolio analysis on a monthly basis for the global sample. This entails regressing the constructed GMB spread on an intercept, alpha, and in some panels, also on common risk factors. The GMB spread is computed taking a long position in the portfolio consisting of the quintile of greenest firms in a month, measured either by emissions levels or emissions intensity, and a short position in the portfolio consisting of the quintile of the brownest firms in a given month. Emissions levels are measured as CO<sub>2</sub>e emissions and emissions intensity is measured as CO<sub>2</sub>e emissions scaled by revenues. The sample period is from February 2007 until January 2023, unless specified otherwise. Panel A shows the starting point, represented as  $Ret_t^{GMB} = \alpha + \epsilon_t$ , with  $t$  in months. In panel A, the portfolios are either value-weighted or equal-weighted. In Panels B through E, the portfolios are value-weighted. In Panel B, we additionally add common risk factors compared to Panel A. In Panel C, we extend the analysis of Panel B by adding a time lag of 6 months on emissions data. In Panel D, we add the UMC factor as an additional regressor to the regression equation of Panel B. In Panel E, we include both a time lag of 6 months on the emissions measure and add the UMC factor to the regression equation of panel B. Columns (1)-(3) utilize emissions levels to sort stocks into quintiles, while columns (4)-(6) include results based on emissions intensity. Results labeled as ‘Reported & estimated’ pertain to firms with either reported or vendor-estimated emissions, whereas ‘Reported’ or ‘Estimated’ denote findings specific to firms with reported or vendor-estimated emissions, respectively. Newey and West (1986, 1994) standard errors are reported in parentheses beneath the coefficients in all regressions. Significance levels are indicated by \*\*\*, \*\*, and \* representing 1%, 5%, and 10% significance, respectively.

**Table O.A.6:** Panel regression results based on the US sample with uncleaned emissions data (returns in percentages), including estimated coefficients on control variables.

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel A: US sample, uncleaned, industry-fixed effects not included</b>						
Log emissions levels	-0.096 (0.052)*	0.052 (0.051)	-0.179 (0.064)***			
Emissions intensity				0.080 (0.046)*	0.146 (0.069)**	0.059 (0.045)
Leverage	-0.001 (0.001)	-0.002 (0.001)**	0.0001 (0.001)	-0.001 (0.001)	-0.002 (0.001)**	0.00001 (0.001)
ROE	0.028 (0.006)***	0.018 (0.007)***	0.032 (0.007)***	0.027 (0.007)***	0.019 (0.008)**	0.029 (0.008)***
Sales growth	0.020 (0.006)***	0.022 (0.009)**	0.019 (0.007)***	0.021 (0.006)***	0.021 (0.009)**	0.020 (0.007)***
Momentum	-0.170 (0.068)**	-0.221 (0.101)**	-0.180 (0.067)***	-0.167 (0.068)**	-0.224 (0.100)**	-0.171 (0.067)**
Volatility	0.214 (0.050)***	0.270 (0.071)***	0.205 (0.047)***	0.213 (0.050)***	0.275 (0.071)***	0.201 (0.047)***
Logsize	0.335 (0.076)***	0.216 (0.084)***	0.539 (0.096)***	0.234 (0.057)***	0.266 (0.066)***	0.390 (0.077)***
Book to Market	-1.765 (0.256)***	-1.761 (0.320)***	-1.899 (0.257)***	-1.909 (0.290)***	-1.740 (0.336)***	-2.076 (0.279)***
Invest/A	-1.020 (0.347)***	-1.143 (0.440)***	-1.059 (0.403)***	-1.682 (0.438)***	-1.051 (0.441)**	-1.969 (0.500)***
Constant	-0.355 (1.051)	-1.929 (1.235)	-1.908 (1.312)	0.184 (1.066)	-2.213 (1.234)*	-1.444 (1.314)
Observations	224,325	75,657	147,802	224,325	75,657	147,802
R <sup>2</sup>	0.194	0.338	0.167	0.194	0.338	0.167

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**Table O.A.6:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel B: US sample, uncleaned, industry-fixed effects included</b>						
Log emissions levels	-0.213 (0.057)***	0.0001 (0.053)	-0.402 (0.083)***			
Emissions intensity				0.016 (0.059)	0.020 (0.057)	0.028 (0.089)
Leverage	-0.001 (0.001)*	-0.002 (0.001)**	-0.00001 (0.001)	-0.001 (0.001)**	-0.002 (0.001)***	-0.001 (0.001)
ROE	0.026 (0.007)***	0.021 (0.007)***	0.029 (0.007)***	0.026 (0.007)***	0.021 (0.007)***	0.027 (0.007)***
Sales growth	0.020 (0.005)***	0.022 (0.009)**	0.018 (0.006)***	0.021 (0.006)***	0.022 (0.010)**	0.019 (0.005)***
Momentum	-0.202 (0.068)***	-0.259 (0.099)***	-0.213 (0.066)***	-0.197 (0.067)***	-0.259 (0.099)***	-0.202 (0.066)***
Volatility	0.249 (0.046)***	0.325 (0.068)***	0.230 (0.044)***	0.251 (0.046)***	0.325 (0.068)***	0.235 (0.044)***
Logsize	0.467 (0.082)***	0.286 (0.107)***	0.735 (0.108)***	0.268 (0.055)***	0.287 (0.081)***	0.409 (0.076)***
Book to Market	-2.286 (0.205)***	-2.200 (0.320)***	-2.299 (0.240)***	-2.537 (0.226)***	-2.201 (0.324)***	-2.694 (0.254)***
Invest/A	-1.610 (0.359)***	-1.219 (0.435)***	-1.890 (0.427)***	-2.000 (0.353)***	-1.226 (0.394)***	-2.383 (0.443)***
Constant	-0.285 (1.118)	-2.033 (1.747)	-2.056 (1.396)	0.875 (1.038)	-2.054 (1.650)	-0.573 (1.321)
Observations	224,325	75,657	147,802	224,325	75,657	147,802
R <sup>2</sup>	0.196	0.340	0.169	0.195	0.340	0.169

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**Table O.A.6:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel C: US sample, uncleaned, restricted to 2007-2018</b>						
Log emissions levels	-0.190 (0.048)***	-0.026 (0.050)	-0.300 (0.077)***			
Emissions intensity				0.005 (0.057)	0.015 (0.075)	-0.036 (0.162)
Leverage	-0.001 (0.001)*	-0.002 (0.001)*	-0.0003 (0.001)	-0.001 (0.001)*	-0.002 (0.001)*	-0.001 (0.001)
ROE	0.017 (0.004)***	0.010 (0.008)	0.019 (0.006)***	0.016 (0.004)***	0.010 (0.007)	0.018 (0.006)***
Sales growth	0.016 (0.006)***	0.022 (0.009)**	0.015 (0.005)***	0.017 (0.005)***	0.023 (0.008)***	0.015 (0.005)***
Momentum	-0.248 (0.069)***	-0.264 (0.108)**	-0.263 (0.068)***	-0.243 (0.069)***	-0.264 (0.108)**	-0.255 (0.070)***
Volatility	0.239 (0.049)***	0.288 (0.076)***	0.232 (0.046)***	0.241 (0.049)***	0.287 (0.077)***	0.237 (0.046)***
Logsize	0.419 (0.091)***	0.330 (0.111)***	0.595 (0.115)***	0.233 (0.078)***	0.304 (0.092)***	0.340 (0.095)***
Book to Market	-2.312 (0.274)***	-2.488 (0.408)***	-2.295 (0.298)***	-2.519 (0.273)***	-2.524 (0.395)***	-2.577 (0.297)***
Invest/A	-1.596 (0.459)***	-0.803 (0.588)	-1.998 (0.542)***	-1.875 (0.460)***	-0.865 (0.580)	-2.340 (0.552)***
Constant	0.414 (1.432)	-1.856 (1.911)	-0.707 (1.667)	1.562 (1.395)	-1.713 (1.826)	0.588 (1.635)
Observations	131,733	43,978	87,049	131,733	43,978	87,049
R <sup>2</sup>	0.232	0.311	0.215	0.231	0.311	0.214

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**Table O.A.6:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel D: US sample, uncleaned, emissions and accounting data lagged by 6 months</b>						
Log emissions levels	-0.106 (0.056)*	0.002 (0.051)	-0.200 (0.083)**			
Emissions intensity				0.034 (0.059)	0.080 (0.055)	0.009 (0.079)
Leverage	-0.0001 (0.001)	-0.001 (0.001)	0.0003 (0.001)	-0.0003 (0.001)	-0.001 (0.001)	0.0001 (0.001)
ROE	0.007 (0.007)	0.004 (0.006)	0.009 (0.007)	0.007 (0.007)	0.004 (0.005)	0.008 (0.008)
Sales growth	0.007 (0.005)	0.007 (0.008)	0.006 (0.006)	0.008 (0.005)	0.007 (0.008)	0.006 (0.006)
Momentum	-0.207 (0.059)***	-0.153 (0.093)*	-0.236 (0.062)***	-0.204 (0.060)***	-0.153 (0.093)*	-0.230 (0.061)***
Volatility	0.159 (0.036)***	0.178 (0.051)***	0.158 (0.036)***	0.159 (0.037)***	0.178 (0.051)***	0.160 (0.036)***
Logsize	0.186 (0.087)**	0.099 (0.097)	0.292 (0.130)**	0.088 (0.059)	0.105 (0.074)	0.129 (0.091)
Book to Market	-1.437 (0.330)***	-1.102 (0.443)**	-1.558 (0.354)***	-1.562 (0.346)***	-1.105 (0.445)**	-1.757 (0.377)***
Invest/A	-1.040 (0.401)***	-0.829 (0.484)*	-1.152 (0.495)**	-1.235 (0.405)***	-0.852 (0.447)*	-1.397 (0.522)***
Constant	-3.107 (1.095)***	-4.646 (1.373)***	-7.870 (1.612)***	-2.534 (1.017)**	-4.744 (1.309)***	-7.116 (1.514)***
Observations	208,046	69,428	137,752	208,046	69,428	137,752
R <sup>2</sup>	0.208	0.330	0.186	0.208	0.330	0.186

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**Table O.A.6:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel E: US sample, uncleaned, emissions data and accounting data lagged by 6 and 10 months respectively</b>						
Log emissions levels	-0.115 (0.058)**	-0.012 (0.054)	-0.191 (0.084)**			
Emissions intensity				0.027 (0.062)	0.071 (0.056)	0.006 (0.083)
Leverage	-0.0001 (0.001)	-0.001 (0.001)	0.0004 (0.001)	-0.0002 (0.001)	-0.001 (0.001)	0.0001 (0.001)
ROE	0.007 (0.007)	0.003 (0.007)	0.008 (0.008)	0.007 (0.007)	0.003 (0.007)	0.007 (0.008)
Sales growth	0.006 (0.005)	0.005 (0.008)	0.005 (0.005)	0.007 (0.005)	0.005 (0.008)	0.006 (0.005)
Momentum	-0.205 (0.060)***	-0.167 (0.098)*	-0.228 (0.060)***	-0.202 (0.061)***	-0.167 (0.098)*	-0.222 (0.061)***
Volatility	0.156 (0.037)***	0.186 (0.054)***	0.152 (0.036)***	0.157 (0.037)***	0.186 (0.054)***	0.154 (0.036)***
Logsize	0.199 (0.090)**	0.118 (0.099)	0.292 (0.130)**	0.092 (0.062)	0.110 (0.082)	0.137 (0.093)
Book to Market	-1.369 (0.341)***	-1.102 (0.456)**	-1.458 (0.371)***	-1.504 (0.355)***	-1.121 (0.453)**	-1.647 (0.390)***
Invest/A	-0.967 (0.412)**	-0.838 (0.528)	-1.094 (0.513)**	-1.174 (0.413)***	-0.896 (0.481)*	-1.322 (0.532)**
Constant	-4.412 (1.123)***	-3.046 (1.444)**	-5.571 (1.622)***	-3.790 (1.050)***	-3.054 (1.406)**	-4.863 (1.542)***
Observations	199,925	65,588	133,469	199,917	65,584	133,465
R <sup>2</sup>	0.210	0.336	0.187	0.210	0.336	0.186

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**Table O.A.6:** (Continued from previous page)

	<i>Emissions measure: Log emissions levels</i>			<i>Emissions measure: Emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel F: US sample, uncleaned, including UMC factor</b>						
Log emissions levels	-0.077 (0.025)***	-0.024 (0.028)	-0.146 (0.036)***			
Log emissions levels*UMC	0.109 (0.075)	0.038 (0.074)	0.144 (0.088)			
Emissions intensity				-0.006 (0.010)	-0.012 (0.019)	-0.002 (0.012)
Emissions intensity*UMC				0.025 (0.040)	-0.003 (0.067)	0.029 (0.045)
Leverage	-0.001 (0.0004)	-0.001 (0.001)	-0.00005 (0.001)	-0.001 (0.0004)	-0.001 (0.001)	-0.0002 (0.001)
ROE	0.021 (0.004)***	0.025 (0.004)***	0.020 (0.005)***	0.021 (0.004)***	0.025 (0.004)***	0.019 (0.005)***
Sales growth	0.016 (0.003)***	0.014 (0.004)***	0.017 (0.003)***	0.016 (0.003)***	0.014 (0.004)***	0.017 (0.003)***
Momentum	-0.138 (0.059)**	-0.150 (0.068)**	-0.142 (0.060)**	-0.137 (0.060)**	-0.150 (0.068)**	-0.138 (0.060)**
Volatility	0.162 (0.040)***	0.177 (0.046)***	0.156 (0.040)***	0.162 (0.040)***	0.177 (0.046)***	0.156 (0.040)***
Logsize	0.255 (0.054)***	0.192 (0.053)***	0.391 (0.074)***	0.188 (0.052)***	0.171 (0.048)***	0.264 (0.066)***
Book to Market	-1.477 (0.161)***	-1.336 (0.166)***	-1.597 (0.182)***	-1.543 (0.164)***	-1.356 (0.165)***	-1.716 (0.183)***
Invest/A	-1.948 (0.293)***	-2.202 (0.361)***	-1.860 (0.402)***	-2.117 (0.284)***	-2.270 (0.342)***	-2.079 (0.395)***
Constant	0.706 (1.220)	1.333 (1.311)	-0.765 (1.351)	1.950 (1.146)*	1.779 (1.132)	0.994 (1.280)
Observations	398,097	202,052	195,521	398,097	202,052	195,521
R <sup>2</sup>	0.223	0.273	0.198	0.223	0.273	0.197

**Notes:** This table presents findings from panel regressions, estimating monthly stock returns in the US market for the dataset with uncleaned emissions, employing various specifications. The sample period is from February 2007 until January 2023, unless specified otherwise. Panel A showcases the starting point, excluding industry effects. All regressions include time-fixed effects,  $\mu_t$ , and control variables,  $\text{Controls}_{i,t}$ . For an overview of included control variables, refer to Table C.6 in the main paper. Panel B extends the analysis by incorporating industry-fixed effects alongside the baseline equation outlined in Panel A. Industry-fixed effects are also included in panels C, D, E and F. Estimated coefficients on time and industry-fixed effects are not presented. In Panel C, the analysis of Panel B is confined to the period 2007-2018 to synchronize with the timeframe of BK. Panel D introduces a lag of six months on emissions data and accounting data. In Panel E, emissions data are lagged by 10 months and accounting data are lagged by 6 months, compared to Panel B. Finally, compared to Panel B, Panel F integrates an interaction term between the UMC factor and emissions, including the UMC factor as formulated by Ardia et al. (2022). Given the limited time frame for which the UMC factor is available, the results in Panel F are based on the sample period from February 2007 until June 2018. Columns (1)-(3) utilize log emissions levels to gauge a firm's environmental performance, while columns (4)-(6) include results based on emissions intensity. Results labeled as 'Reported & estimated' pertain to firms with either reported or vendor-estimated emissions, whereas 'Reported' or 'Estimated' denote findings specific to firms with reported or vendor-estimated emissions, respectively. Standard errors, clustered at the firm and month levels, are reported in parentheses beneath the coefficients in all regressions. Significance levels are indicated by \*\*\*, \*\*, and \* representing 1%, 5%, and 10% significance, respectively.



**Table O.A.7:** Portfolio analysis results based on the US sample with uncleaned emissions data (returns in percentages), including estimated coefficients on common risk factors.

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel A: US sample, uncleaned, without FF5 and momentum</b>						
Alpha	1.017 (0.378)***	0.400 (0.245)	1.032 (0.436)**	0.166 (0.246)	0.148 (0.238)	-0.170 (0.288)
Observations	191	191	191	191	191	191
<b>Panel B: US sample, uncleaned, FF5 and momentum</b>						
Alpha	1.140 (0.354)***	0.385 (0.250)	1.116 (0.442)**	0.164 (0.236)	0.174 (0.224)	-0.165 (0.303)
RMRF	0.004 (0.077)	0.077 (0.060)	0.023 (0.076)	0.045 (0.052)	0.028 (0.058)	0.052 (0.068)
SMB	0.034 (0.203)	-0.021 (0.095)	0.011 (0.244)	0.016 (0.088)	-0.078 (0.115)	0.015 (0.120)
HML	-0.088 (0.153)	-0.043 (0.085)	0.039 (0.197)	-0.099 (0.103)	0.067 (0.090)	-0.126 (0.153)
RMW	-0.316 (0.180)*	-0.099 (0.134)	-0.249 (0.185)	-0.083 (0.083)	0.017 (0.109)	-0.228 (0.140)
CMA	-0.111 (0.260)	-0.037 (0.129)	-0.073 (0.408)	-0.025 (0.158)	-0.227 (0.170)	0.175 (0.244)
UMD	-0.033 (0.067)	-0.026 (0.076)	0.048 (0.063)	-0.071 (0.075)	-0.076 (0.080)	0.010 (0.076)
Observations	191	191	191	191	191	191
R <sup>2</sup>	0.031	0.020	0.010	0.028	0.027	0.025
F Statistic	0.983	0.619	0.299	0.876	0.837	0.778

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**Table O.A.7:** (Continued from previous page)

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel C: US sample, uncleaned, FF5 and momentum, 6-month time lag on emissions</b>						
Alpha	1.183 (0.341) <sup>***</sup>	0.634 (0.227) <sup>***</sup>	1.182 (0.426) <sup>***</sup>	0.214 (0.235)	0.154 (0.241)	0.038 (0.290)
RMRF	0.006 (0.072)	0.025 (0.061)	0.010 (0.073)	0.053 (0.053)	0.033 (0.060)	0.063 (0.073)
SMB	0.029 (0.175)	0.005 (0.109)	-0.082 (0.181)	-0.056 (0.107)	-0.125 (0.124)	-0.093 (0.117)
HML	-0.131 (0.135)	-0.104 (0.116)	-0.052 (0.203)	-0.075 (0.095)	-0.014 (0.106)	-0.063 (0.094)
RMW	-0.255 (0.150) <sup>*</sup>	-0.113 (0.146)	-0.212 (0.177)	-0.120 (0.103)	-0.029 (0.140)	-0.237 (0.128) <sup>*</sup>
CMA	-0.116 (0.212)	-0.036 (0.161)	-0.106 (0.327)	-0.072 (0.160)	-0.171 (0.191)	0.085 (0.185)
UMD	-0.081 (0.066)	-0.060 (0.077)	-0.055 (0.070)	-0.059 (0.068)	-0.089 (0.077)	-0.003 (0.082)
Observations	185	185	185	185	185	185
R <sup>2</sup>	0.039	0.021	0.014	0.031	0.030	0.023
F Statistic	1.210	0.625	0.409	0.933	0.908	0.686

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**Table O.A.7:** (Continued from previous page)

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel D: US sample, uncleaned, FF5 and momentum, no time lag on emissions, including UMC factor</b>						
Alpha	1.015 (0.304)***	0.470 (0.275)*	0.659 (0.365)*	0.360 (0.270)	0.279 (0.268)	0.418 (0.304)
UMC	-0.459 (0.952)	-0.607 (0.774)	-0.014 (0.925)	-1.156 (0.678)*	-1.642 (1.028)	-0.514 (0.879)
RMRF	-0.0004 (0.063)	0.123 (0.107)	-0.019 (0.073)	0.061 (0.080)	0.069 (0.095)	-0.017 (0.084)
SMB	-0.241 (0.137)*	-0.106 (0.097)	-0.276 (0.154)*	-0.041 (0.102)	-0.111 (0.149)	-0.096 (0.121)
HML	-0.146 (0.234)	0.035 (0.143)	-0.031 (0.214)	-0.067 (0.220)	0.137 (0.150)	0.089 (0.177)
RMW	-0.403 (0.230)*	-0.087 (0.215)	-0.392 (0.214)*	-0.087 (0.120)	0.043 (0.175)	-0.206 (0.159)
CMA	0.100 (0.299)	-0.010 (0.201)	-0.023 (0.311)	-0.007 (0.298)	-0.057 (0.286)	-0.077 (0.288)
UMD	-0.035 (0.089)	-0.020 (0.103)	0.038 (0.067)	-0.086 (0.102)	-0.088 (0.081)	0.015 (0.088)
Observations	127	127	127	127	127	127
R <sup>2</sup>	0.041	0.032	0.037	0.034	0.050	0.015
F Statistic	0.721	0.568	0.653	0.593	0.898	0.251

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**Table O.A.7:** (Continued from previous page)

	<i>Sorting based on emissions levels</i>			<i>Sorting based on emissions intensity</i>		
	(1) Reported & estimated	(2) Reported	(3) Estimated	(4) Reported & estimated	(5) Reported	(6) Estimated
<b>Panel E: US sample, uncleaned, FF5 and momentum, 6-month time lag on emissions, including UMC factor</b>						
Alpha	1.048 (0.289)***	0.759 (0.257)***	0.763 (0.350)**	0.441 (0.276)	0.315 (0.287)	0.383 (0.326)
UMC	-0.232 (0.954)	-0.444 (1.028)	-0.336 (0.838)	-1.386 (0.937)	-1.408 (1.075)	-0.290 (0.847)
RMRF	-0.013 (0.065)	0.012 (0.078)	-0.048 (0.072)	0.042 (0.072)	0.029 (0.086)	0.032 (0.091)
SMB	-0.159 (0.136)	-0.044 (0.138)	-0.219 (0.116)*	-0.096 (0.139)	-0.125 (0.167)	-0.172 (0.136)
HML	-0.133 (0.217)	-0.088 (0.225)	-0.127 (0.220)	-0.057 (0.201)	0.036 (0.157)	0.072 (0.161)
RMW	-0.350 (0.221)	-0.246 (0.251)	-0.452 (0.187)**	-0.202 (0.212)	-0.109 (0.228)	-0.188 (0.154)
CMA	0.023 (0.288)	0.012 (0.283)	0.003 (0.302)	-0.112 (0.271)	-0.059 (0.275)	-0.065 (0.294)
UMD	-0.074 (0.094)	-0.066 (0.096)	-0.044 (0.070)	-0.079 (0.082)	-0.111 (0.084)	-0.009 (0.093)
Observations	127	127	127	127	127	127
R <sup>2</sup>	0.035	0.021	0.052	0.044	0.041	0.019
F Statistic	0.610	0.360	0.931	0.782	0.735	0.335

**Notes:** This table presents the estimated alphas from portfolio analysis on a monthly basis for the US sample, based on uncleaned emissions data. This entails regressing the constructed GMB spread on an intercept, alpha, and in some panels, also on common risk factors. The GMB spread is computed taking a long position in the portfolio consisting of the quintile of greenest firms in a month, measured either by emissions levels or emissions intensity, and a short position in the portfolio consisting of the quintile of the brownest firms in a given month. Emissions levels are measured as CO<sub>2</sub>e emissions and emissions intensity is measured as CO<sub>2</sub>e emissions scaled by revenues. The sample period is from February 2007 until January 2023, unless specified otherwise. Panel A shows the starting point, represented as  $Ret_t^{GMB} = \alpha + \epsilon_t$ , with  $t$  in months. In panel A, the portfolios are either value-weighted or equal-weighted. In Panels B through E, the portfolios are value-weighted. In Panel B, we additionally add common risk factors compared to Panel A, including the FF5-factors and the momentum factor. This results in the following specification:  $Ret_t^{GMB} = \alpha + \beta_1 RMRF_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMW_t + \beta_6 UMD_t + \epsilon_t$ . In Panel C, we extend the analysis of Panel B by adding a time lag of 6 months on emissions data. In Panel D, we add the UMC factor as an additional regressor to the regression equation of Panel B. In Panel E, we include both a time lag of 6 months on the emissions measure and add the UMC factor to the regression equation of panel B. Columns (1)-(3) utilize emissions levels to sort stocks into quintiles, while columns (4)-(6) include results based on emissions intensity. Results labeled as ‘Reported & estimated’ pertain to firms with either reported or vendor-estimated emissions, whereas ‘Reported’ or ‘Estimated’ denote findings specific to firms with reported or vendor-estimated emissions, respectively. Newey and West (1986, 1994) standard errors are reported in parentheses beneath the coefficients in all regressions. Significance levels are indicated by \*\*\*, \*\*, and \* representing 1%, 5%, and 10% significance, respectively.

**Table O.A.8:** Overview of data amendments based on comparing emissions in successive years for each firm in the dataset, classified based on a number of error types.

<b>Firm</b>	<b>Estimated or reported</b>	<b>Error or suspicion thereof</b>	<b>Period</b>	<b>Source</b>
<b>Wrong unit of measurement<sup>2</sup></b>				
Rio Tinto Ltd.	Reported	Values were reported in megatons by firm and not amended to tons by LSEG Workspace.	FY 2021 - 2022 <sup>3</sup>	<i>Scope 1, 2 and 3 Emissions Calculation Methodology 2021</i>
Hamburger Hafen und Logistik AG	Reported	Values were reported in megatons by company and not amended to tons by LSEG Workspace.	FY 2018 - 2020	<i>Annual report of 2019, Annual report of 2021</i>
Lawson Inc.	Reported	Values were reported in thousands of tons by company and not amended to tons by LSEG Workspace.	FY 2019	<i>ESG data on official website</i>
Edreams Odigeo	Reported	Values were reported in kg by company and not amended to tons by LSEG Workspace.	FY 2019 - 2020	<i>Integrated annual report of 2021, Integrated annual report of 2023</i>
GMexico Transportes S.A.B. de C.V.	Reported	Values were reported in megatons by company and not amended to tons by LSEG Workspace.	FY 2022	<i>Sustainable development report 2022</i>
Altri SGPS	Reported	Values in FY 2018 were reported in kg by company but are amended by LSEG Workspace to megatons instead of tons. Values are removed however given emissions only include CO <sub>2</sub> emissions and equivalent gases are not considered.	FY 2018	<i>Sustainability report 2018</i>
Sberbank of Russia	Reported	Values were reported in tons by company but LSEG Workspace did not include a factor of thousand.	FY 2019 and 2021	<i>Sustainability report of 2022</i>
Origin Property	Reported	Values were reported in kilo tons by company and not amended to tons by LSEG Workspace	FY 2021	<i>Sustainability report 2022</i>
Albemarle Co.	Reported	Values were reported in thousands of tons by company but not amended to tons by LSEG Workspace.	FY 2021 - 2022	<i>Sustainability report 2021, Sustainability report 2022</i>
Brandywine Realty Trust	Reported	Values were reported in kilo tons by company but not amended to tons by LSEG Workspace.	FY 2019 - 2022	<i>CSR Report 2023</i>
Cabot Co.	Reported	Values were reported in million tons by company but not amended to tons by LSEG Workspace.	FY 2020	<i>Sustainability Report 2023</i>

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<sup>2</sup>In case we identify a wrong unit of measurement, we amend these cases in the data, by changing the variables ‘Total CO<sub>2</sub> Equivalent Emissions’ and ‘Estimated Total CO<sub>2</sub> Equivalent Emissions’ accordingly. If possible, we also amend the scope 1 and scope 2 reported values.

<sup>3</sup>In case an amendment is made to the reported emissions values, we report the years for which an amendment is made.

**Table O.A.8:** (Continued from previous page)

<b>Firm</b>	<b>Estimated vs reported</b>	<b>Error in reported value</b>	<b>Period</b>	<b>Source</b>
<b>Suspicious cases with lack of information<sup>4</sup></b>				
China Foods Ltd.	Estimated and reported <sup>5</sup>	Reported and estimated values range from order 4 to order 7 in some periods. No information available in reports. All observations are removed.	FY 2009 - 2022 <sup>6</sup>	na <sup>7</sup>
Brookfield Co.	Estimated and reported	Reported and estimated values range from order 3 to 6. Only values between FY 2018-2022 harmonize with reports. Any observation before FY 2018 are removed.	FY 2007 - 2022	<i>Annual report of 2020</i>
Beijing Oriental Yuhong Waterproof Technology	Estimated and reported	Reported values are of order 5 in FY 2022 while estimated values are of order 9 in FY 2022. No information available in reports. All observations are removed.	FY 2019 - 2022	na
China National Nuclear Power Co.	Estimated and reported	Estimated values range from order 7 to order 8 between FY 2017 - 2022, while reported values are of order 4 in FY 2022. No information available in reports. All observations are removed.	FY 2017 - 2022	na
Xiamen Intretech Inc.	Estimated and reported	Estimated values in FY 2019-2020 are of order 4 while reported values are of order 7 in 2021. No information available in reports. All observations are removed.	FY 2019 - 2022	na
Interconnection Electric SA ESP	Estimated and reported	Estimated values in FY 2010-2013 are of order 6 while reported values are of order 3 in FY 2014-2022. Only information available in reports for FY 2019-2020. Values for these years should be a factor 1000 larger than reported, Although the exact values do not match reports. However, we cannot rectify most years. All observations are removed.	FY 2010 - 2020	<i>Annual Sustainability report 2020</i>
Sino-Ocean Group Holding	Estimated and reported	Estimated values are of order 7 in FY 2010-2013 while reported values are of order 4 in FY 2014-2016 and of order 5 in 2017-2022. Values do not match with reports. All observations are removed.	FY 2010 - 2020	<i>Sustainability reports 2015-2022</i>
PT Jasa Marga (Persero) Tbk	Estimated and reported	Reported values change from order 2 to order 8, from FY 2018 to 2019. Values in FY 2020-2022 are equal to values in report. Reported values in Sustainable report 2019 are not in line with values in FY 2017,2018 and 2019. All observations before FY 2020 are removed.	FY 2012 - 2019	Sustainable report 2019, Sustainable report 2022
Vodafone Idea Ltd.	Estimated and reported	Both reported and estimated values range from order 0 to order 5 in FY 2010-2022. Annual report of 2023 shows that values are reported in millions of tons, however, none of the reported values, despite the difference in measurement unit, align with the reports. All observations are removed.	FY 2010 - 2022	<i>Annual report of 2023 and 2015</i>

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<sup>4</sup>In several cases, emissions values cannot be found back in reports of the company under consideration or the values reported do not match in any way with the values found in reports. Then, we remove all observations on the concerning company or part of the observations, in case some values can be rectified.

<sup>5</sup>We denote the values to be 'Estimated and reported' in case some of the values that are being scrutinized were estimated while other were reported.

<sup>6</sup>In case all observations on a company are removed, we report the entire time period for which information is available on emissions for the company under consideration.

<sup>7</sup>Fiscal Year is shortened as 'FY'. In case no source is found, we indicate this with 'na'.

**Table O.A.8:** (Continued from previous page)

<b>Firm</b>	<b>Estimated vs reported</b>	<b>Error in reported value</b>	<b>Period</b>	<b>Source</b>
Mediobanca Banca di Credito Financial	Estimated and reported	Estimated values in FY 2007-2010 are of order 3 or 4 while reported in values in FY 2011-2012 are of order 1. Reported values range from order 2 in FY 2014 to order 4 in FY 2022. Reported values in FY 2016-2022 match with reports. Other values cannot be rectified and are removed.	FY 2007 - 2015	<i>CSR Reports, 2016 - 2022</i>
Aker ASA	Estimated and reported	Estimated and reported values range from order 3 to order 8. All observations are removed given that this company exists out of multiple sub companies, and this seems to affect emissions in some years. It remains unclear which emissions are included in which years.	FY 2017 - 2022	<i>Sustainability report 2021, Sustainability report 2022</i>
Rubnaya Metallurgicheskaya Kompaniya PAO	Estimated and reported	Estimated values in FY 2008-2016 range from order 5 to 7, while reported values in FY 2017 - 2021 range from order 3 to 4. Reported values are not in line with reports and unclear if scope 3 emissions are included. Values in reported are in millions of tons. All observations are removed.	FY 2008 - 2022	<i>Environment report 2020</i>
Alibaba Group	Reported and Estimated	All values are of order 5 or 6 except in FY 2019. Reported values are in line with reports, but value for FY 2019 cannot be found. All observations for FY 2019 are removed.	FY 2019	<i>2021 Alibaba Group ESG Report, 2023 Alibaba Group Carbon Neutrality Action Report</i>
Intelligencecheck	Reported and Estimated	Estimated values in FY 2017 are of order 1, reported values in FY 2019 are of order 5. No information available in reports. All observations are removed.	FY 2017 - 2022	na
Semtech Co.	Estimated and reported	Reported values are of order 0 in FY 2016 - 2021 but of order 4 in FY 2022. Reported values in FY 2022 align with report. No information available for other years. Observations before FY 2022 are removed.	FY 2016 - 2021	<i>Sustainability report 2023</i>

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