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Article

Carbon Risk in European Equity Returns

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Online-Appendix zu

„Carbon Risk in European Equity Returns“

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Appendices

Appendix A: Data Preparation

Following the online appendix by Schmidt et al. (2019), I report my applied screens in tabular form below. Table 19 contains short descriptions of the static screens in panel A and of the dynamic screens in panel B.

Table 19: Description of static and dynamic screens for data cleaning.

Panel A. Description of static data screens.		
Screen	Description	Datastream Item
1	Delete all non-equity instruments (TYPE $\neq$ "EQ").	Type of instrument (TYPE)
2	Delete all non-major listings (MAJOR = "N"), e.g., preferred shares.	Major security flag (MAJOR)
3	Delete firms not incorporated in the European markets covered by the STOXX Europe Total Market Index.	Geography group name (GEOGN)
4	Search company name for suspicious key words (see Ince & Porter, 2006). Examples are "REIT" and "PREF." (for preferred stock).	Name (NAME)
5	Remove duplicates based on ISIN.	ISIN (ISIN)
6	Delete firms not traded on European stock exchanges.	Exchange code (EXMNEM)

Panel B. Description of dynamic data screens.		
Screen	Description	Datastream Item
1	I download unpadding price time series and additionally set observations missing in case of zero returns.	Return
2	Replace returns calculated based on Datastream's total return index with self-calculated total returns if return difference is larger than 0.5% in absolute terms to account for incorrect returns due to decimalization (Ince & Porter, 2006).	Total return index (RI), Closing price (P), Dividend (DDE)
3	Set return to missing if it is greater than 300%. Threshold is heuristically determined by Ince and Porter (2006).	Return
4	Remove pennystocks, i.e., set observation to missing if stock price is less than \$1 at the end of the previous month.	Closing price (P)
5	Calculate market value as product of unadjusted price and number of shares outstanding. I use this measure to fill data gaps and replace Datastream's market value if the difference between the measures exceeds \$500,000.	Market capitalization (MV), Unadjusted price (UP), Number of shares (NOSH)

Appendix B: Alternative Factor Specifications

Table 20: 4-factor model and 5-factor model with IND_SCOPE12 and CMD for carbon intensity-sorted quintile portfolios from 07/2010 to 06/2020.

Panel A. 4-factor model								
Quintile	MKT	HML	SMB	MOM		Alpha	Adj. R^2	ΔR^2
Clean	1.072*** (31.34)	-0.338*** (-6.75)	0.018 (-0.25)	0.066 (1.34)		0.094 (0.72)	93.68	
2	0.985*** (40.87)	-0.293*** (-6.12)	-0.096* (-1.81)	-0.032 (-0.83)		0.138 (1.45)	95.89	
3	0.929*** (33.10)	-0.337*** (-5.81)	-0.242*** (-3.79)	0.076* (1.70)		-0.058 (-0.51)	94.13	
4	1.022*** (39.74)	-0.345*** (-5.17)	-0.204*** (-2.68)	0.003 (0.06)		-0.087 (-0.69)	92.96	
Dirty	1.036*** (37.92)	0.229*** (3.17)	-0.091 (-1.23)	0.014 (0.25)		-0.188 (-1.43)	93.10	

Panel B. 5-factor model with IND_SCOPE12.								
Quintile	MKT	HML	SMB	MOM	IND_SCOPE12	Alpha	Adj. R^2	ΔR^2
Clean	1.079*** (36.72)	-0.274*** (-5.69)	-0.017 (-0.29)	0.048 (1.10)	0.635*** (4.79)	0.008 (0.06)	94.60	0.92***
2	0.987*** (40.02)	-0.276*** (-5.84)	-0.096* (-1.80)	-0.036 (-0.93)	0.163* (1.75)	0.115 (1.21)	95.93	0.04*
3	0.928*** (33.84)	-0.350*** (-5.78)	-0.242*** (-3.83)	0.080* (1.79)	-0.134 (-1.13)	-0.040 (-0.34)	94.13	0
4	1.017*** (40.38)	-0.390*** (-5.72)	-0.204*** (-2.75)	0.016 (0.29)	-0.450*** (-3.61)	-0.026 (-0.21)	93.42	0.46***
Dirty	1.029*** (36.27)	0.170** (2.24)	-0.091 (-1.26)	0.030 (0.58)	-0.593*** (-3.20)	-0.107 (-0.82)	93.74	0.64***

Panel C. 5-factor model with CMD.								
Quintile	MKT	HML	SMB	MOM	CMD	Alpha	Adj. R^2	ΔR^2
Clean	1.083*** (32.71)	-0.216*** (-4.15)	-0.056 (-0.92)	0.074 (1.62)	0.343*** (6.00)	-0.022 (-0.18)	94.86	1.18***
2	0.994*** (47.06)	-0.194*** (-4.26)	-0.127*** (-2.89)	-0.025 (-0.68)	0.277*** (4.62)	0.045 (0.50)	96.79	0.90***
3	0.929*** (33.31)	-0.339*** (-5.54)	-0.242*** (-3.77)	0.076* (1.70)	-0.005 (-0.10)	-0.057 (-0.49)	94.07	-0.06
4	1.008*** (41.42)	-0.497*** (-6.89)	-0.156** (-2.40)	-0.006 (-0.15)	-0.428*** (-5.71)	0.057 (0.51)	94.97	2.01***
Dirty	1.014*** (49.25)	-0.008 (-0.15)	-0.015 (-0.31)	-0.001 (-0.02)	-0.668*** (-12.46)	0.037 (0.40)	96.88	3.78***

Note. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; t-statistics in parentheses; heteroskedasticity robust standard errors used. The last column reports the significance of the heteroskedasticity consistent F-test for nested models.

Appendix C: Single Stock Factor Beta Significance

Table 21: Significance levels of the factor betas for rated stocks.

Panel A. Single stock regressions for the period 07/2010 to 06/2015.						
Significance	10%		5%		1%	
<i>N</i> = 605	Abs.	%	Abs.	%	Abs.	%
MKT	592	97.85	589	97.36	567	93.72
HML	195	32.23	141	23.31	67	11.07
SMB	187	30.91	132	21.82	66	10.91
MOM	72	11.90	41	6.78	10	1.65
SCOPE12	153	25.29	103	17.02	56	9.26

Panel B. Single stock regressions for the period 07/2015 to 06/2020.						
Significance	10%		5%		1%	
<i>N</i> = 604	Abs.	%	Abs.	%	Abs.	%
MKT	589	97.52	574	95.03	547	90.56
HML	170	28.15	125	20.70	59	9.77
SMB	236	39.07	179	29.64	102	16.89
MOM	158	26.16	103	17.05	38	6.29
SCOPE12	132	21.85	92	15.23	40	6.62

Note. Heteroskedasticity robust standard errors used.

Table 22: Significance levels of the factor betas for unrated stocks.

Panel A. Single stock regressions for the period 07/2010 to 06/2015.						
Significance	10%		5%		1%	
<i>N</i> = 263	Abs.	%	Abs.	%	Abs.	%
MKT	255	96.96	253	96.20	239	90.87
HML	56	21.29	38	14.45	15	5.70
SMB	130	49.43	98	37.26	49	18.63
MOM	38	14.45	20	7.60	5	1.90
SCOPE12	48	18.25	34	12.93	9	3.42

Panel B. Single stock regressions for the period 07/2015 to 06/2020.						
Significance	10%		5%		1%	
<i>N</i> = 293	Abs.	%	Abs.	%	Abs.	%
MKT	274	93.52	272	92.83	248	84.64
HML	50	17.06	31	10.58	12	4.10
SMB	137	46.76	99	33.79	52	17.75
MOM	40	13.65	25	8.53	9	3.07
SCOPE12	50	17.06	25	8.53	7	2.39

Note. Heteroskedasticity robust standard errors used.

Appendix D: Canonical Correlations

Table 23: Canonical correlations with asymptotic principal components and significance of factor candidates for the period 07/2010 to 06/2015 ($N = 868$).

Panel A. Canonical correlations.						
Canonical variate	Canonical correlation	F-stat	df1	df2	p-value	
1	0.915***	4.331	50	208.6	0	
2	0.692***	2.250	36	174.1	0	
3	0.629**	1.759	24	136.9	0.02	
4	0.459	1.016	14	96	0.44	
5	0.198	0.333	6	49	0.92	

Panel B. Significance of factor candidates.						
	MKT	SMB	HML	MOM	SCOPE12	
Mean absolute t-stat	3.507	1.942	2.440	1.129	2.253	
Mean absolute t-stat (significant corr.)	5.140	1.823	3.362	1.464	3.571	

Note. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; t-statistics in panel B are calculated with heteroskedasticity robust standard errors.

Table 24: Canonical correlations with asymptotic principal components and significance of factor candidates for the period 07/2015 to 06/2020 ($N = 897$).

Panel A. Canonical correlations.						
Canonical variate	Canonical correlation	F-stat	df1	df2	p-value	
1	0.894***	4.496	50	208.6	0	
2	0.788***	2.840	36	174.1	0	
3	0.634**	1.710	24	136.9	0.03	
4	0.379	0.897	14	96	0.56	
5	0.295	0.778	6	49	0.59	

Panel B. Significance of factor candidates.						
	MKT	SMB	HML	MOM	SCOPE12	
Mean absolute t-stat	3.150	1.796	1.513	1.833	2.061	
Mean absolute t-stat (significant corr.)	4.647	2.623	1.394	2.225	2.546	

Note. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; t-statistics in panel B are calculated with heteroskedasticity robust standard errors.

Appendix E: Performance of Exposure Portfolios

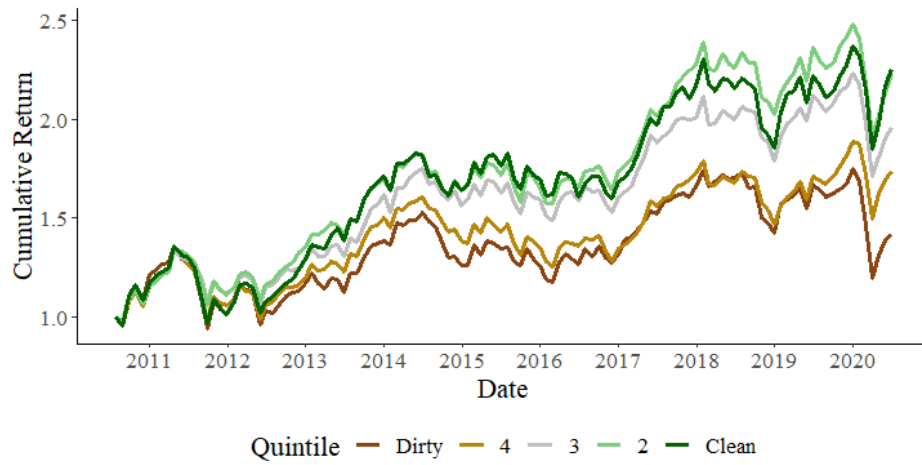


Figure 3: Cumulative returns of the industry- and SCOPE12 exposure-sorted, value-weighted quintile portfolios for all stocks in the period from 07/2010 to 06/2020.

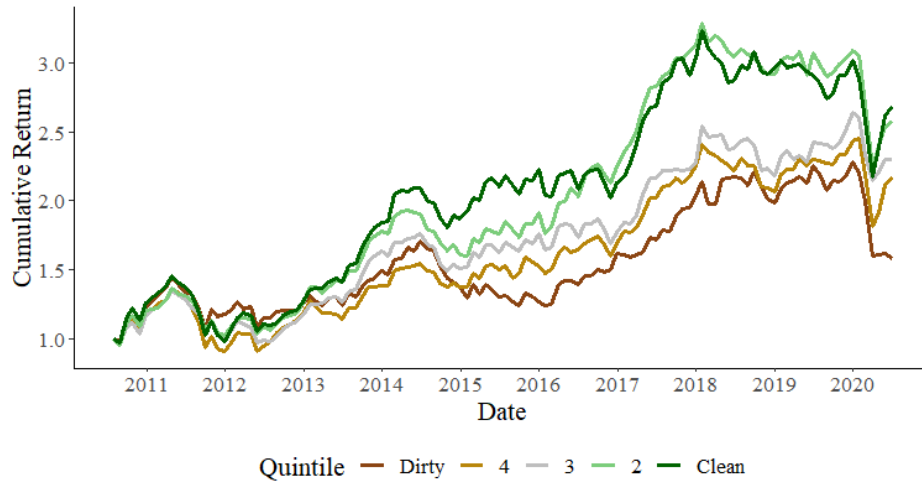


Figure 4: Cumulative returns of the SCOPE12 exposure-sorted, value-weighted quintile portfolios for unrated stocks in the period from 07/2010 to 06/2020.