Global pricing of carbon-transition risk

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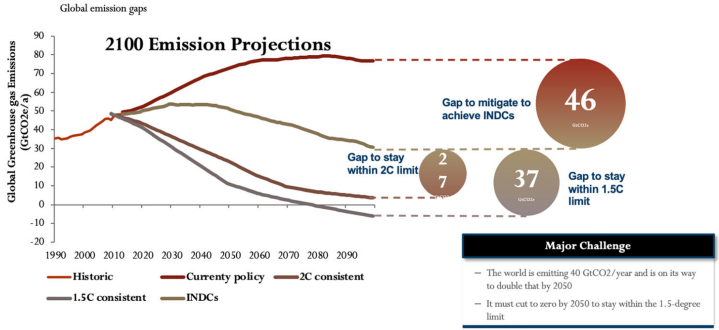
Background: Carbon-transition risk

- To stop global warming, the world must gradually stop using fossil fuels



- Several multilateral agreements and other commitments to reduce carbon emissions have been reached

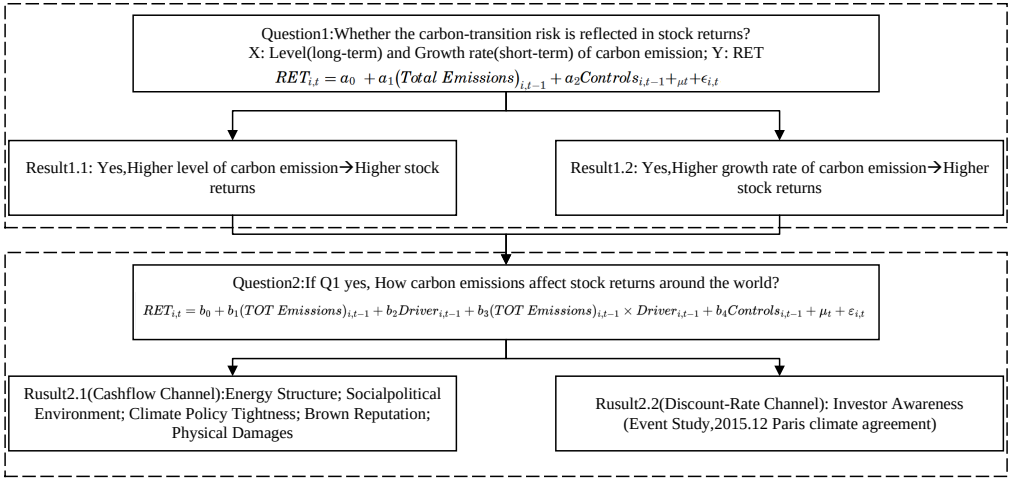
Motivation

- Companies are facing greater carbon-transition risk
  - **Carbon-transition risk**: All the changes companies will be faced with along the expected pathway to carbon net neutrality
- There are only pathy evidence on the pricing of Carbon-transition risk
  - Economics: Frame the issue of mitigation of climate change as a public goods problem(Tax=SCC)
  - Finane: Focus on only one country; Ignore the sources of carbon-transion risk
- $\rightarrow$ Study the pricing of carbon-transition risk using data from over 14,400 companies across 77 countries (2005-2018)

Question

- Q1:whether the carbon-transition risk is reflected in stock returns?
  - How to measure carbon-transition risk?
  - How to test?
- Q2: If yes,How carbon emissions affect stock returns around the world?
  - What factors may drive carbon - transition risk?(From the asset pricing perspective)
  - How to measure these factors?
  - How to test?
- Q3: How carbon-transition risk may be gradually priced in as the underlying economy is transitioning away from fossil fuels?

Design


Question1:Whether the carbon-transition risk is reflected in stock returns?
X: Level(long-term) and Growth rate(short-term) of carbon emission; Y: RET
$RET_{i,t} = a_0 + a_1(Total\ Emissions)_{i,t-1} + a_2 Controls_{i,t-1} + \mu t + \epsilon_{i,t}$
Result1.1: Yes,Higher level of carbon emission→Higher stock returns
Result1.2: Yes,Higher growth rate of carbon emission→Higher stock returns
Question2:If Q1 yes, How carbon emissions affect stock returns around the world?
$RET_{i,t} = b_0 + b_1(TOT\ Emissions)_{i,t-1} + b_2 Driver_{i,t-1} + b_3(TOT\ Emissions)_{i,t-1} \times Driver_{i,t-1} + b_4 Controls_{i,t-1} + \mu_t + \varepsilon_{i,t}$
Rusult2.1(Cashflow Channel):Energy Structure; Socialpolitical Environment; Climate Policy Tightness; Brown Reputation; Physical Damages
Rusult2.2(Discount-Rate Channel): Investor Awareness (Event Study,2015.12 Paris climate agreement)

Specific drivers of carbon-transition risk

Channel	Driver	Varible	Long-term	Short-term
Cashflow	Energy Structure(Technology)	**ELRENEW;ENINT;**ENUSEPC	No	Yes
	Socialpolitical Environment	**RULELAW;VOICE;GINI**	No	Yes
	Climate Policy Tightness	INTPOLICY;**DOMPOLICY**	Yes	No
	Brown Reputation	**SALIENT**	No	Yes
	Physical Damages	CRI	No	No
Discount Rate	Investor Awareness	Paris(Dummy)	Yes	No

Contribution

- Literature on global carbon emissions
  - Prior: Unit of analysis is the **country**
  - Ext: Shed light on carbon emissions across **firms** in 77 countries
- Literature on the carbon premium
  - Prior: Focus on emission intensity; Only a problem for developed countries
  - Ext: Use the level and growth rate of emission; Exist in most areas of the world
- Literature on the different source of the carbon-transition risk
  - Ext: Test several country-level characteristics systematically

Data

- Trucost:Data on Corporate Carbon Emissions
- FactSet:Data on stock returns and corporate balance sheets
  - RET(Y),LOGSIZE，B/M,MOM...
- Country-level variables
  - World Bank: RULELAW;Voice
  - Germanwatch: the global climate policy index and the climate risk index (CRI)
  - Morgan Stanley: MSCI world index data
  - IBES: analyst earnings growth forecasts
- $\rightarrow$ 14468 unique companies from 77 countries

Data:Trucost

- 3 different sources of emissions:
  - Scope 1 emissions: all emissions from fossil fuel used in production
  - Scope 2 emissions: from the purchased heat, steam, and electricity
  - Scope 3 emissions: from the operations and products of the company but occur from sources **not owned or controlled by the company**
- Level(yearly): $S1TOT$; $S2TOT$; $S3TOT$
- Growth-Rate(yearly):$S1CHG$; $S2CHG$; $S3CHG$

Desion

- Q1: Mothly Regression

$$RET_{i,t} = a_0 + a_1(TOT\ Emissions)_{i,t-1} + a_2 Controls_{i,t-1} + \mu_t + \varepsilon_{i,t}$$

- Q2:Interact the country variables with firm-level emissions

$$\begin{aligned} RET_{i,t} = {} & b_0 + b_1(TOT\ Emissions)_{i,t-1} + b_2 Driver_{i,t-1} \\ & + b_3(TOT\ Emissions)_{i,t-1} \times Driver_{i,t-1} \\ & + b_4 Controls_{i,t-1} + \mu_t + \varepsilon_{i,t} \end{aligned}$$

  - *TOT Emissions*:LOGSITOT, LOGS3TOT(Long-term); S1CHG, S3CHG(Short-term)

Q1: Pricing Carbon-Transition Risk throughout the World

$$RET_{i,t} = a_0 + a_1(TOT\ Emissions)_{i,t-1} + a_2 Controls_{i,t-1} + \mu_t + \varepsilon_{i,t}$$ A: Levels

Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)
LOGS1TOT	0.027			0.063***		
	(0.021)			(0.015)		
LOGS2TOT		0.093***			0.113***	
		(0.029)			(0.027)	
LOGS3TOT			0.112***			0.164***
			(0.031)			(0.035)
LOGSIZE	−0.149***	−0.180***	−0.180***	−0.185***	−0.222***	−0.244***
	(0.041)	(0.042)	(0.043)	(0.041)	(0.042)	(0.044)
B/M	0.519**	0.512**	0.522**	0.630**	0.608**	0.597**
	(0.217)	(0.215)	(0.216)	(0.218)	(0.212)	(0.213)
LEVERAGE	−0.426**	−0.431**	−0.362**	−0.373**	−0.402**	−0.386**
	(0.180)	(0.167)	(0.165)	(0.158)	(0.146)	(0.150)
MOM	1.028**	1.035**	1.035**	1.021**	1.030**	1.033**
	(0.365)	(0.366)	(0.364)	(0.370)	(0.370)	(0.369)
INVEST/A	−0.741	−0.693	−0.392	−0.435	−0.275	0.006
	(1.102)	(1.157)	(1.215)	(1.064)	(1.090)	(1.103)
HHI	0.010	0.028	0.097	0.055	0.056	0.102
	(0.119)	(0.117)	(0.114)	(0.125)	(0.121)	(0.127)
LOGPPE	−0.002	−0.024	−0.039	0.009	−0.001	−0.020
	(0.018)	(0.022)	(0.023)	(0.017)	(0.017)	(0.018)
ROE	0.014***	0.013***	0.012***	0.013***	0.013***	0.013***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VOLAT	0.129	−0.052	0.009	0.359	0.309	0.334
	(3.539)	(3.482)	(3.522)	(3.203)	(3.182)	(3.201)
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Q1: Pricing Carbon-Transition Risk throughout the World

$$RET_{i,t} = a_0 + a_1 (TOT\ Emissions)_{i,t\ \ 1} + a_2 Controls_{i,t-1} + \mu_t + \varepsilon_{i,t}$$ Growth in Emissions

Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)
S1CHG	0.437***			0.453***		
	(0.086)			(0.088)		
S2CHG		0.250***			0.255***	
		(0.067)			(0.069)	
S3CHG			1.157***			1.175***
			(0.278)			(0.288)
LOGSIZE	−0.156***	−0.153***	−0.170***	−0.170***	−0.166***	−0.183***
	(0.041)	(0.040)	(0.041)	(0.039)	(0.039)	(0.040)
B/M	0.506**	0.500**	0.537**	0.640**	0.633**	0.672**
	(0.217)	(0.216)	(0.217)	(0.221)	(0.220)	(0.220)
LEVERAGE	−0.459**	−0.444**	−0.492**	−0.393**	−0.379**	−0.421**
	(0.179)	(0.173)	(0.173)	(0.150)	(0.145)	(0.144)
MOM	0.958**	0.974**	0.880**	0.944**	0.961**	0.867**
	(0.362)	(0.363)	(0.350)	(0.368)	(0.369)	(0.356)
INVEST/A	−1.000	−0.870	−1.180	−0.785	−0.690	−0.963
	(1.180)	(1.194)	(1.204)	(1.059)	(1.058)	(1.058)
HHI	−0.046	−0.036	−0.064	−0.033	−0.022	−0.051
	(0.127)	(0.128)	(0.124)	(0.122)	(0.124)	(0.120)
LOGPPE	0.029	0.025	0.041*	0.047**	0.043**	0.060***
	(0.021)	(0.020)	(0.020)	(0.017)	(0.017)	(0.018)
ROE	0.014***	0.014***	0.014***	0.014***	0.014***	0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VOLAT	−0.146	−0.059	−0.175	0.182	0.252	0.169
	(3.602)	(3.619)	(3.670)	(3.258)	(3.274)	(3.308)
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Q2:Carbon-Transition Risk Drivers–Technological Mix

Panel A: Levels												
Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ELRENEW	7.809*	2.588	8.161*	2.322								
	(4.150)	(5.042)	(4.164)	(5.059)								
ENINT					−7.864	2.400	−9.565	5.223				
					(60.851)	(61.263)	(60.818)	(61.358)				
ENUSEPC									−1.386**	−1.427**	−1.442***	−1.411**
									(0.545)	(0.550)	(0.546)	(0.554)
LOGS1TOT	0.006		0.059***		0.030		0.069**		−0.005		0.038*	
	(0.024)		(0.020)		(0.028)		(0.027)		(0.024)		(0.021)	
LOGS2TOT		0.077**		0.132***		0.162***		0.222***		0.085**		0.153***
		(0.030)		(0.034)		(0.052)		(0.053)		(0.039)		(0.041)
*ELRENEW**LOGS1TOT*	0.028		0.010									
	(0.175)		(0.176)									
*ELRENEW**LOGS3TOT*		0.480*		0.518*								
		(0.288)		(0.289)								
*ENINT**LOGS1TOT*					−0.443		−0.209					
					(0.551)		(0.525)					
*ENINT**LOGS3TOT*						−1.198		−1.299				
						(0.844)		(0.840)				
*ENUSEPC**LOGS1TOT*									0.004		0.005	
									(0.005)		(0.005)	
*ENUSEPC**LOGS2TOT*										0.006		0.002
										(0.007)		(0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	438,446	438,918	433,249	433,721	438,488	438,960	433,291	433,763	423,298	423,770	418,233	418,705
R-squared	0.185	0.186	0.187	0.187	0.185	0.185	0.187	0.187	0.190	0.190	0.192	0.192

Q2:Carbon-Transition Risk Drivers–Technological Mix

Panel B: Growth in Emissions

Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ELRENEW	8.254**	8.221**	8.434**	8.389**								
	(3.387)	(3.381)	(3.401)	(3.395)								
ENINT					−25.255	−29.735	−24.552	−29.244				
					(60.766)	(60.556)	(60.724)	(60.459)				
ENUSEPC									−1.397**	−1.385**	−1.446**	−1.431**
									(0.553)	(0.552)	(0.553)	(0.553)
S1CHG	0.597***		0.644***		0.021		0.039		0.313**		0.316**	
	(0.113)		(0.114)		(0.199)		(0.199)		(0.155)		(0.153)	
S3CHG		1.201***		1.294***		0.113		0.158		0.728*		0.760**
		(0.289)		(0.289)		(0.400)		(0.395)		(0.373)		(0.372)
ELRENEW×*S1CHG*	−1.839*		−2.068*									
	(1.087)		(1.089)									
ELRENEW×*S3CHG*		0.005		−0.502								
		(2.671)		(2.675)								
ENINT×*S1CHG*					9.254**		9.562**					
					(4.009)		(4.037)					
ENINT×*S3CHG*						20.786***		21.199***				
						(7.830)		(7.854)				
ENUSEPC×*S1CHG*									0.036		0.044	
									(0.033)		(0.033)	
ENUSEPC×*S3CHG*										0.097		0.107
										(0.083)		(0.082)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	433,851	434,226	428,710	429,085	433,893	434,268	428,752	429,127	418,791	419,166	413,782	414,157
R-squared	0.186	0.186	0.188	0.188	0.186	0.186	0.188	0.188	0.190	0.191	0.192	0.193

Q2:Carbon-Transition Risk Drivers–Sociopolitical Environment

Panel A: Levels

Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RULELAW	−0.677	−0.721	−0.660	−0.705								
	(0.752)	(0.766)	(0.755)	(0.776)								
VOICE					−0.700	−0.676	−0.723	−0.697				
					(0.805)	(0.822)	(0.803)	(0.828)				
GINI									−6.619	−7.181	−6.753	−7.776
									(12.017)	(11.998)	(12.000)	(11.998)
LOGS1TOT	0.026		0.061***		0.031*		0.067***		0.020		0.023	
	(0.017)		(0.015)		(0.017)		(0.014)		(0.081)		(0.081)	
LOGS3TOT		0.108***		0.162***		0.120***		0.173***		0.085		0.081
		(0.025)		(0.028)		(0.024)		(0.027)		(0.115)		(0.115)
*RULELAW*LOGS1TOT*	0.002		0.002									
	(0.009)		(0.009)									
*RULELAW*LOGS3TOT*		0.004		0.003								
		(0.015)		(0.015)								
*VOICE*LOGS1TOT*					−0.005		−0.006					
					(0.011)		(0.011)					
*VOICE*LOGS3TOT*						−0.009		−0.010				
						(0.018)		(0.018)				
*GINI*LOGS1TOT*									0.027		0.124	
									(0.219)		(0.219)	
*GINI*LOGS3TOT*										0.069		0.195
										(0.296)		(0.302)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	746,289	746,929	736,501	737,141	746,289	746,929	736,501	737,141	238,048	238,236	235,027	235,215
R-squared	0.150	0.150	0.151	0.152	0.150	0.150	0.151	0.152	0.195	0.195	0.198	0.198

Q2:Carbon-Transition Risk Drivers–Sociopolitical Environment

Panel B: Growth in Emissions

Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RULELAW	−0.627	−0.606	−0.610	−0.587								
	(0.743)	(0.744)	(0.743)	(0.745)								
VOICE					−0.778	−0.782	−0.806	−0.804				
					(0.811)	(0.815)	(0.811)	(0.816)				
GINI									−7.074	−8.585	−6.232	−7.788
									(12.484)	(12.489)	(12.425)	(12.419)
S1CHG	0.599***		0.613***		0.535***		0.547***		−0.469		−0.402	
	(0.097)		(0.097)		(0.075)		(0.075)		(0.396)		(0.399)	
S3CHG		1.512***		1.524***		1.327***		1.339***		−1.072		−0.887
		(0.226)		(0.228)		(0.179)		(0.180)		(1.024)		(1.020)
*RULELAW*S1CHG*	−0.145**		−0.144**									
	(0.060)		(0.060)									
*RULELAW*S3CHG*		−0.331**		−0.326**								
		(0.151)		(0.150)								
*VOICE*S1CHG*					−0.145***		−0.140***					
					(0.051)		(0.051)					
*VOICE*S3CHG*						−0.275**		−0.266**				
						(0.130)		(0.130)				
*GINI*S1CHG*									2.521**		2.378**	
									(1.075)		(1.084)	
*GINI*S3CHG*										6.030**		5.687**
										(2.677)		(2.675)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	735,150	735,694	725,536	726,080	735,150	735,694	725,536	726,080	236,017	236,159	233,026	233,168
R-squared	0.151	0.152	0.153	0.153	0.151	0.152	0.153	0.153	0.196	0.196	0.199	0.199

Q2:Carbon-Transition Risk Drivers–Climate Policy Tightness

Panel A: Levels

Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INTPOLICY	−0.684	−1.171	−0.624	−1.272				
	(0.387)	(1.009)	(0.384)	(0.983)				
DOMPOLICY					−1.087*	−2.634**	−1.094*	−2.723**
					(0.566)	(1.014)	(0.535)	(0.971)
LOGS1TOT	0.044*		0.083***		0.001		0.037	
	(0.023)		(0.022)		(0.024)		(0.027)	
LOGS3TOT		0.123***		0.171***		0.041		0.088**
		(0.038)		(0.040)		(0.027)		(0.030)
*INTPOLICY*LOGS1TOT*	−0.015		−0.020					
	(0.040)		(0.041)					
*INTPOLICY*LOGS3TOT*		0.027		0.035				
		(0.086)		(0.084)				
*DOMPOLICY*LOGS1TOT*					0.064		0.065	
					(0.050)		(0.048)	
*DOMPOLICY*LOGS3TOT*						0.181**		0.188**
						(0.076)		(0.072)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	551,075	551,642	544,127	544,694	551,075	551,642	544,127	544,694
R-squared	0.153	0.153	0.155	0.155	0.153	0.153	0.154	0.155

Q2:Carbon-Transition Risk Drivers–Climate Policy Tightness

Panel B: Growth in Emissions

Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INTPOLICY	−0.852**	−0.892**	−0.842**	−0.891**				
	(0.314)	(0.302)	(0.316)	(0.306)				
DOMPOLICY					−0.386	−0.430	−0.383	−0.430
					(0.272)	(0.280)	(0.280)	(0.289)
S1CHG	0.570***		0.593***		0.475***		0.492***	
	(0.125)		(0.109)		(0.121)		(0.105)	
S3CHG		1.264**		1.252**		0.984		0.998*
		(0.534)		(0.513)		(0.573)		(0.542)
*INTPOLICY*S1CHG*	−0.175		−0.176					
	(0.186)		(0.170)					
*INTPOLICY*S3CHG*		−0.119		−0.038				
		(0.574)		(0.555)				
*DOMPOLICY*S1CHG*					−0.001		0.011	
					(0.201)		(0.194)	
*DOMPOLICY*S3CHG*						0.364		0.395
						(0.711)		(0.679)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	544,610	545,073	537,766	538,229	544,610	545,073	537,766	538,229
R-squared	0.155	0.155	0.156	0.157	0.154	0.155	0.156	0.157

Q2:Carbon-Transition Risk Drivers–Brown Reputation Risk

Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LOGS1TOT	0.047		0.073**					
	(0.032)		(0.024)					
SALIENT	0.417	0.945	0.331	0.350	0.247	0.202	0.142	0.095
	(0.530)	(0.651)	(0.328)	(0.403)	(0.156)	(0.155)	(0.119)	(0.113)
*SALIENT*LOGS1TOT*	−0.006		−0.006					
	(0.040)		(0.028)					
LOGS3TOT		0.159***		0.176***				
		(0.034)		(0.036)				
*SALIENT*LOGS3TOT*		−0.053		−0.013				
		(0.045)		(0.033)				
S1CHG					0.433**		0.472**	
					(0.191)		(0.200)	
*SALIENT*S1CHG*					0.010		−0.020	
					(0.205)		(0.209)	
S3CHG						0.555		0.601
						(0.404)		(0.412)
*SALIENT*S3CHG*						0.710*		0.671*
						(0.369)		(0.367)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	744,864	745,504	735,109	735,749	733,724	734,268	724,143	724,687
R-squared	0.150	0.150	0.151	0.151	0.151	0.152	0.153	0.153

Q2:Carbon-Transition Risk Drivers–Changes in Investor Awareness

Dependent Variable: *RET*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LOGS1TOT	−0.045		−0.017					
	(0.031)		(0.031)					
LOGS3TOT		0.060		0.119**				
		(0.047)		(0.050)				
S1CHG					0.658***		0.662***	
					(0.158)		(0.157)	
S3CHG						1.864***		1.856***
						(0.344)		(0.350)
*Paris*LOGS1TOT*	0.132***		0.133***					
	(0.048)		(0.048)					
*Paris*LOGS3TOT*		0.098*		0.101*				
		(0.053)		(0.054)				
*Paris*S1CHG*					−0.207		−0.198	
					(0.210)		(0.211)	
*Paris*S3CHG*						−0.716		−0.757
						(0.528)		(0.550)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	301,993	302,309	298,113	298,429	295,469	295,780	291,686	291,997
R-squared	0.061	0.061	0.064	0.064	0.062	0.062	0.065	0.065

New ideas

- From Stock market to Bond market
- Study the interaction effects between different sources of risk
- More accurate measure of those drivers
  - Reputation: Text analysis from social media
  - Physical Damages: Temparature
- Other Drivers