
Contents

Foreword	xiii
Fiona FRICK	
Chapter 1. The Financial Materiality of Climate Change: Evidence from a Global Survey	1
Amir AMEL-ZADEH	
1.1. Introduction	1
1.2. Survey design and demographic data	4
1.2.1. Survey design	4
1.2.2. Demographic data.	5
1.3. Survey results	8
1.3.1. Importance of climate change for investment decisions	9
1.3.2. Financial materiality of climate risk.	12
1.3.3. Challenges for the disclosure and use of climate change information	19
1.4. Summary and conclusion	25
1.5. References	26
Chapter 2. Looking Forward with Historical Carbon Data	29
Steffen BIXBY, Alfie BRIXTON and Lukasz POMORSKI	
2.1. Introduction	29
2.2. Data	32
2.3. How stale is historical carbon data?	33
2.4. Are historically brown firms getting greener? Might green firms become browner?	35
2.5. Nowcasting financed emissions using historical data.	38
2.6. Conclusion	43

2.7. Appendix	44
2.7.1. Measures of portfolio greenhouse gas emissions.	46
2.8. References	46
Chapter 3. Portfolio Construction with Climate Risk Measures	49
Théo LE GUENEDAL and Thierry RONCALLI	
3.1. Introduction	49
3.2. Climate risk measures	51
3.2.1. Carbon footprint.	51
3.2.2. Carbon transition pathway	58
3.2.3. Other metrics	62
3.3. Portfolio optimization	63
3.3.1. General framework	63
3.3.2. Portfolio decarbonization.	64
3.3.3. Portfolio alignment	72
3.4. Conclusion	83
3.5. Appendices	84
3.5.1. Appendix 1: Scope 3 emissions	84
3.5.2. Appendix 2: Data	84
3.6. References	85
Chapter 4. Hedging Climate Risks: A Cross-asset Approach	87
Emmanuel JURCZENKO and Jérôme TEILETCHE	
4.1. Introduction	87
4.2. Factor-mimicking portfolios methodology	89
4.2.1. General FMP approach	89
4.2.2. Errors-in-variable estimates	91
4.3. Hedging climate risk factors	94
4.3.1. Setup	94
4.3.2. Climate textual risk factors data	94
4.3.3. Base assets data	97
4.3.4. In-sample hedging results	99
4.3.5. Out-of-sample hedging results.	102
4.4. Conclusion	104
4.5. Appendices	104
4.5.1. Appendix 1: General FMP portfolio optimization program	104
4.5.2. Appendix 2: Principal components instrumental variables FMP estimator	105
4.6. References	107

Chapter 5. A Framework for Achieving Net-Zero-Carbon Alpha Portfolios	109
Sebastian LANCETTI	
5.1. Introduction	109
5.2. Carbon emission in the capital market	111
5.3. Passive approach to zero-carbon portfolios	111
5.4. Active approach to zero-carbon portfolios.	114
5.4.1. Backward-looking data: carbon efficiency	115
5.4.2. Present-time data: “nowcasting” of environmental news	116
5.4.3. Forward-looking data: corporate climate alignment and adaptation plans	116
5.4.4. Case study: sustainable global equity strategy from PanAgora Asset Management.	117
5.5. Carbon offsets	118
5.6. Conclusion	120
5.7. Appendix	121
5.8. References	121
Chapter 6. Active Paris-aligned Equity Investing	123
Katharina SCHWAIGER, Jim SNOW, Viktoria-Sophie WENDT and Andrew ANG	
6.1. Introduction	123
6.2. Standards of Paris-aligned benchmarks	124
6.3. Climate-aware alpha drivers	126
6.3.1. Carbon resource efficiency.	126
6.3.2. Green patents	127
6.3.3. Corporate target setting.	127
6.4. Empirical results	128
6.4.1. Decarbonization pathway	129
6.4.2. Climate-aware alpha	129
6.4.3. Incorporating climate-aware alphas and decarbonization	131
6.4.4. Systematic active Paris-aligned strategies	133
6.5. Conclusion	137
6.6. Appendix: Paris-aligned equity strategy screens	137
6.7. References	139
Chapter 7. Green Alpha	141
Yin LUO	
7.1. Introduction	141
7.2. Research methodology	141
7.2.1. Region classification	142
7.2.2. ESG-specific industry classification.	143
7.2.3. Common style factors	144

7.2.4. Backtesting methodology	145
7.3. MSCI ESG rating	146
7.3.1. MSCI ESG data	146
7.3.2. Data coverage and average rating	147
7.3.3. An overview of MSCI ESG rating methodology	148
7.3.4. ESG pillars, themes and key issues	149
7.4. Characteristics of ESG – a factor perspective	151
7.4.1. The basics	151
7.4.2. Difference across sectors	153
7.4.3. Factor exposure	157
7.5. ESG as stock-selection factors	161
7.5.1. Aggregated ESG rating and the three pillars	161
7.5.2. Revenue, country and industry adjustment	162
7.5.3. Other adjustment	165
7.5.4. ESG momentum	165
7.5.5. Performance of aggregate ESG and three pillar scores	165
7.6. Environmental factors	170
7.6.1. Zooming into clean technology	170
7.6.2. Carbon emissions along the supply chain	174
7.7. ESG signals are additive to traditional stock-selection factors	179
7.7.1. Performance comparison with traditional stock-selection factors	180
7.7.2. Correlation with traditional factors	182
7.7.3. The diversification benefit offered by ESG factors	183
7.8. Conclusion	188
7.9. References	188
Chapter 8. Enhancing Environment-driven Portfolios with Traditional Factors.	191
Guillaume COQUERET, Christian MORGENSTERN, James KELLY, Sascha STIERNEGRIP, Johannes FREY-SKÖTT and Björn ÖSTERBERG	
8.1. Introduction	191
8.2. Framework	193
8.2.1. ESG overlays: the classic overlay	193
8.2.2. The factor embedding – the factor overlay	195
8.3. Empirical tests	197
8.3.1. Data and protocol	197
8.3.2. Baseline results	199
8.3.3. Statistical significance	202
8.3.4. Sector exposure	204
8.3.5. Transfer coefficients	205
8.4. Robustness checks	206
8.4.1. The sample size	206
8.4.2. A more passive benchmark	207

8.5. Conclusion	208
8.6. Appendix: Distribution of variables	209
8.7. References	210
Chapter 9. Enhancing the Accuracy of Firm Valuation with Multiples Using Carbon Emissions	213
Martin NERLINGER	
9.1. Data	218
9.1.1. Carbon data	218
9.1.2. Financial data	219
9.2. Multiple construction methodology	219
9.2.1. Identifying and composing suitable peer group	220
9.2.2. Constructing and aggregating multiples	220
9.2.3. Determining firm valuation errors	222
9.3. Constructing new multiples using carbon data	222
9.4. Constructing peer groups using carbon data	228
9.5. Combining carbon emission multiples and carbon emission enhanced peer groups	233
9.6. Robustness	236
9.7. Recommendation for using carbon emissions for multiples and further research	239
9.8. References	240
Chapter 10. Risk Management Challenges in Sustainability Themed Portfolios: An Application to GHG-constrained Portfolios	245
Ryan M. BROWN, Harindra DE SILVA and David W. KRIDER	
10.1. Introduction	245
10.2. Methodology	248
10.3. Data description	253
10.4. Results	258
10.5. Conclusion and implications	264
10.6. References	265
Chapter 11. Absolutely Sustainable Investing Across Asset Classes with Paris-aligned Benchmarks: An Application to AP2	267
Claes EKMAN, Andreas G.F. HOEPNER, Peter MANNERBJÖRK, Tomas MORSING and Gabija ZDANCEVICIUTE	
11.1. Introduction	267
11.2. The climate benchmarks	269
11.2.1. Minimum benchmark requirements	270
11.2.2. Benchmark decarbonization and inflation adjustment	272
11.3. Absolutely sustainable investing	273

11.4. Case study: implementation of PAB at Andra AP-fonden	274
11.4.1. The Swedish pension system and the AP-funds	274
11.4.2. Development of sustainability integration and benchmarks at AP2.	275
11.4.3. Implementing the EU Paris-aligned Benchmark at AP2	278
11.4.4. Specific aspects	285
11.4.5. Discussion	288
11.5. Conclusion	291
11.6. References	292
Chapter 12. Delegated Philanthropy in Mutual Fund Votes on Climate Change Externalities.	295
Marie BRIÈRE, Sébastien POUGET, Martin SCHMALZ and Loredana URECHE-RANGAU	
12.1. Introduction	295
12.2. Sample, data sources, variables and descriptive statistics.	298
12.2.1. Mutual fund votes	298
12.2.2. Mutual fund characteristics	299
12.2.3. Mutual fund holdings	300
12.2.4. Descriptive statistics	300
12.3. Empirical analysis	302
12.3.1. Impact of the percentage of SRI on the support for climate resolutions	302
12.3.2. Resolutions on other corporate externalities	304
12.3.3. Drivers of support for climate change resolutions	307
12.3.4. Robustness	311
12.4. Conclusion	318
12.5. Appendix: Classification of shareholder resolutions	319
12.6. References	321
Chapter 13. Creditworthiness and Buildings' Energy Efficiency in the Mortgage Market	325
Monica BILLIO, Michele COSTOLA, Loriana PELIZZON, Francesco PORTIOLI, Max RIEDEL and Daniele VERGARI	
13.1. Introduction	325
13.2. Portfolio analysis	327
13.2.1. Energy efficiency	327
13.2.2. Descriptive statistics	330
13.3. Methodology	333
13.3.1. Logit regression	334
13.3.2. Cox proportional hazards model	335
13.4. Results.	337
13.4.1. Estimates from the logit regression	337
13.4.2. Estimates from the Cox regression.	339
13.4.3. Additional findings	343

13.5. Conclusion	343
13.6. Appendix	346
13.7. References	346
Chapter 14. The Thesis for Green Investing and Other ESG through the Looking Glass of China and the US	349
Brad CORNELL and Jason C. HSU	
14.1. Introduction	349
14.2. Who and what does Green investing impact?	350
14.3. Who should set the Green investing agenda?	351
14.3.1. Should Green Initiatives be determined by elected civil servants or by rating services, investment funds and corporate CEOs?	351
14.3.2. The Milton Friedman take on who should drive ESG	351
14.3.3. American ESG in conflict with American democracy?	354
14.3.4. Who drives environmental protection policy and other ESG issues in China?	354
14.3.5. Good intentions but bad skills?	356
14.4. Earning a Green alpha?!	357
14.5. Market efficiency and ESG	361
14.6. Conclusion	362
14.7. References	363
List of Authors	365
Index	369