Do Fund Managers Misestimate Climatic Disaster Risk?

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Research Question

- Do Fund Managers Overreact to Climatic Disaster Risk?

Why interesting and important?

- Increasing concern about the impact of climate change risks on capital markets.
  - How does climate change affect financial markets?
  - Climate risk needs to be better reflected in prices.
  - Limited empirical research on how climate risk affects asset pricing.
- Can fund investors accurately assess the impact of climate risks on their portfolio holdings?
  - Funds are the marginal price-setting traders.
  - Misestimation may impair stock price efficiency, returns, and lead to inefficient capital allocation.

Contributions

- Literature on behavioral biases
  - Prior: hubris, overconfidence, and optimism[1]
  - This paper: salience bias
- Literature on how climate risk affects asset pricing
  - Prior:
    - firms exhibit biases when assessing climate risk(Dessiant and Matray,2017)
    - market prices accurately reflect temperature fluctuations risk(Bansal et al., 2016)
  - This paper
    - Fund Managers overreact to large climatic disasters.
    - Innovatively proposing the DID model.

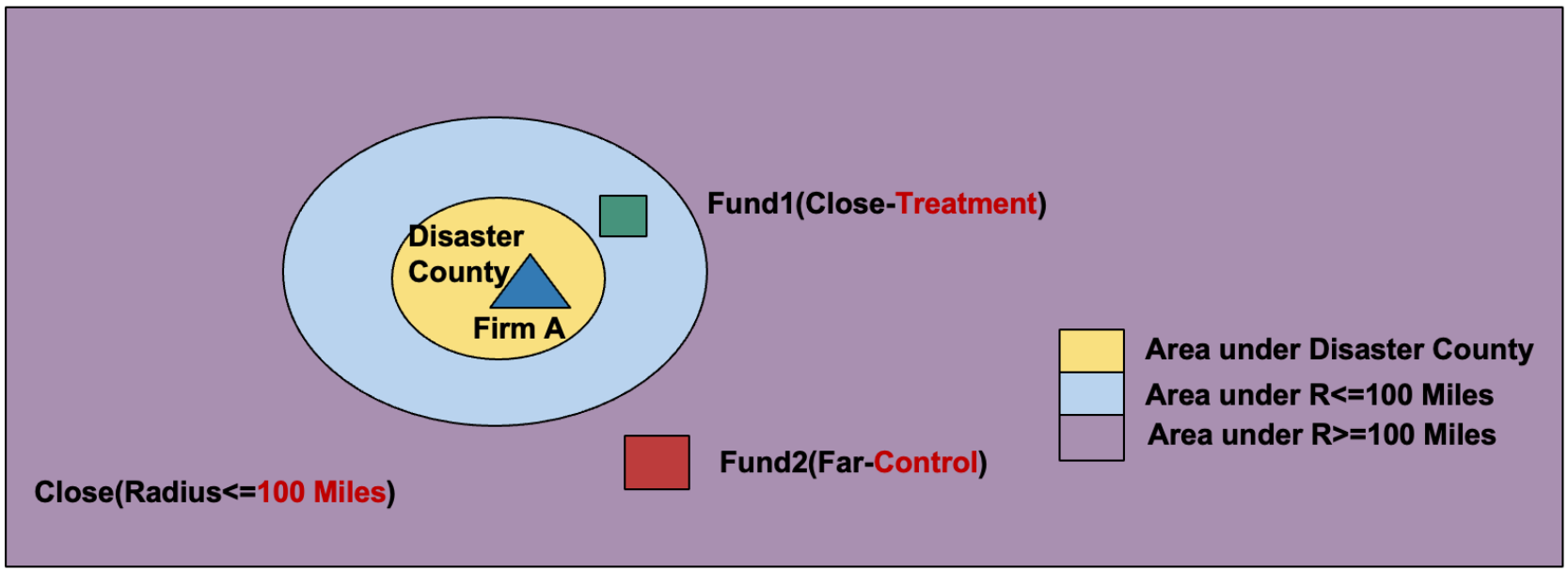
[1] Landier, A., Thesmar, D., 2009. Financial contracting with optimistic entrepreneurs. Review of Financial Studies 22, 117–150.

Hypotheses

- **H1:** Mutual fund managers underweight stocks of companies affected by climatic disasters in their portfolios.
- **H2A: Information Hypothesis**
  - If managers underweight disaster zone stocks based on superior information, those stocks should underperform in the future (Coval and Moskowitz, 2001).
- **H2B: Salience Hypothesis**
  - If managers underweight disaster zone stocks due to salience bias, these stocks should not underperform (Tversky and Kahneman, 1973).

Research Design: DID Model

- **Disaster zone:** Counties directly hit by climatic disasters(less than 100 miles).
- Exogenous shock: the distance of funds from disaster zone.
- Treatment group: Funds located close to the disaster zone (Fund 1).
- Control group: Funds located farther away (Fund 2).



Research Design: DID Model

- Compares the portfolio decisions of the treatment group to the control group.

$$WEIGHT_{mst} = \beta_0 + \beta_1 CLOSE_{ms} + \beta_2 POST_t + \beta_3 (CLOSE_{ms} \times POST_t) + X_{s,t-1} + X_{m,t-1} + \mu_m + \delta_t + \epsilon_{mst}, \quad (1)$$

- POSTt equals 1 for the disaster quarter (Q) and Q+1, Q+2), and 0 for Q−2, Q−1.
- CLOSEms equals 1 if the mutual fund is treatment group.

Research Design: DID Model

- The underweighting by CLOSEms funds is given by

$$\beta_2+\beta_3=E(WEIGHT|POST=1,CLOSE=1)-E(WEIGHT|POST=0,CLOSE=1),$$

- The underweighting by FAR funds is given by

$$\beta_2=E(WEIGHT|POST=1,CLOSE=0)-E(WEIGHT|POST=0,CLOSE=0).$$

- Negative β_3 coefficient: treatment funds decrease their portfolio investments in disaster zone stocks more than distant funds do.

Data

- Sample: 3,268 unique funds, with 1,700 located within 100 miles of the disaster zone.

Figure2: Summary statistics: Mutual funds

B. Treatment versus control funds

	Treatment (close)	Control (far)	Diff	*p*-value
Fund size	979	1,088	−109	.00
Fund age	12.91	13.70	−.79	.00
Manager experience	7.66	7.53	.13	.13
Expense ratio	.013	.012	.01	.00
Turnover ratio	.81	.86	.05	.00

Part 1: Do portfolio managers overreact?

- Funds close to the disaster zone reduce portfolio weights on disaster zone stocks by approximately 0.09%.

Table 3: Portfolio response to climatic disasters

	(1)	(2)	(3)
Close_{ms}	.405	.066	.086
	(.000)	(.000)	(.000)
Post_t	−.021	−.041	−.040
	(.000)	(.000)	(.000)
$\text{Close}_{ms} \times POST_t$	−.089	−.045	−.046
	(.000)	(.000)	(.000)
$\text{Debt/assets}_{s,t-1}$			.009
			(.321)
$\text{LBM}_{s,t-1}$			.055
			(.000)
$\text{Lsize}_{s,t-1}$			.228
			(.000)

Part 1: Temporal dynamics(Equal pre-trends)

- When does the differential response of close funds
- How long does this differential response last

Table 4: Dynamics of portfolio response to disasters

	(1)	(2)
$\text{Close}_{ms} \times \text{Post}[0,2]$	−.089	−.046
	(.000)	(.000)
$\text{Close}_{ms} \times \text{Post}[3,4]$	−.079	−.042
	(.000)	(.001)
$\text{Close}_{ms} \times \text{Post}[5,6]$	−.048	−.005
	(.053)	(.736)
Close_{ms}	.405	.078
	(.000)	(.000)
$\text{Close}_{ms} \times \text{Pre}[-4,-3]$	.005	.012
	(.743)	(.233)

Part1: Do managers learn?

- Managers become less affected by salience with disaster experience, exhibiting less overreaction over time.
- The coefficient's magnitude decreases and becomes statistically insignificant.

Table 5: Portfolio response based on prior disaster experience of fund manager

Disaster experience quartile	First	Second	Third	Fourth
	(1)	(2)	(3)	(4)
Close_{ms}	.130	.101	−.026	.063
	(.002)	(.008)	(.424)	(.078)
Post_t	−.068	−.051	−.040	−.030
	(.000)	(.000)	(.000)	(.000)
$\text{Close}_{ms} \times POST_t$	−.052	−.063	−.027	−.022
	(.023)	(.004)	(.148)	(.196)
$\text{Debt/assets}_{s,t-1}$	.047	.034	−.031	−.001
	(.041)	(.115)	(.152)	(.970)

Alternative explanations 1: Mechanically driven by stock price drops?

- A decline in stock prices automatically results in a reduction of portfolio weights.
- Funds closer to disaster zones reduce their holdings of affected stocks more than those farther away.

Table 6: Portfolio response to disasters

	Shares		Traded value ($ millions)	
	(1)	(2)	(3)	(4)
Close_{ms}	.031	.022	.091	.059
	(.124)	(.005)	(.125)	(.177)
Post_T	−.011	−.016	−1.519	−1.569
	(.000)	(.000)	(.000)	(.000)
Close_{ms} x $POST_T$	−.010	−.009	−.283	−.222
	(.041)	(.014)	(.007)	(.000)
$\text{Debt/assets}_{s,t-1}$		−.029		−.042
		(.000)		(.141)

AE 2: Related to a particular fund characteristic?

- The overreaction occurs across small and large funds, young and old funds, and among managers of all experience levels.

Table 7: Fund characteristics and portfolio response to disasters

	Concentration		Number of stocks		Fund size		Fund age		Manager experience	
	Above	Below	Below	Above	Above	Below	Above	Below	Above	Below
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Close_{ms}	.122	.025	.103	.039	.101	.072	.067	.094	.063	.097
	(.000)	(.030)	(.000)	(.029)	(.000)	(.003)	(.001)	(.000)	(.004)	(.000)
Post_t	−.064	−.024	−.062	−.023	−.047	−.037	−.039	−.045	−.048	−.041
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Close_{ms} x Post_t	−.074	−.014	−.053	−.028	−.038	−.059	−.059	−.045	−.046	−.051
	(.000)	(.049)	(.000)	(.001)	(.003)	(.000)	(.000)	(.000)	(.001)	(.000)

AE 3: Are fund managers catering to the withdrawal requests of investors?

- The local bias of individual investors may induce a preference for local mutual funds.
- The coefficient estimates are significant and similar in magnitude across all subsamples.

Table 8: Socioeconomic clienteles and portfolio response to major disasters

	Unemployment rate		Prop poor		Prop Elderly		Prop black		Prop Hispanics	
	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Close_{ms}$	.108	.070	.089	.111	.129	.068	.086	.106	.087	.104
	(.000)	(.003)	(.000)	(.000)	(.000)	(.001)	(.000)	(.000)	(.000)	(.000)
$Post_t$	−.046	−.035	−.041	−.045	−.035	−.054	−.039	−.045	−.045	−.039
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
$Close_{ms}$ x $Post_t$	−.060	−.028	−.055	−.039	−.038	−.052	−.042	−.073	−.052	−.047
	(.000)	(.051)	(.000)	(.024)	(.018)	(.000)	(.000)	(.000)	(.000)	(.001)
Property damage (per capita)	−.000	.000	−.000	.000	.000	.000	.000	.000	.000	.000

Part 2: Rational or driven by salience?

- Close funds did not underweight neighboring zone firms.
- DISASTERst equals 1 for firms in the disaster zone, 0 for firms in near-disaster zone.

Table 9: Portfolio response to climatic disasters

	A. Pre- versus post-				*B. Difference-in-difference-in-differences*			
	Disaster		Near-disaster					
	Close	Far	Close	Far				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Post_t$	−.097	−.042	−.051	−.046	−.047	−.047	−.047	−.047
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
$Close_{ms}$					.008	.008	.008	.008
					(.391)	(.391)	(.391)	(.391)
$Disaster_{st}$					−.007	−.007	−.007	−.007
					(.008)	(.008)	(.008)	(.008)
$Close_{ms} \times Disaster_{st}$					.064	.064	.064	.064
					(.000)	(.000)	(.000)	(.000)
$Post_t \times Disaster_{st}$					.006	.006	.006	.006
					(.000)	(.000)	(.000)	(.000)
$Close_{ms} \times Post_{ms}$					.003	.003	.003	.003
					(.515)	(.515)	(.515)	(.515)
$Close_{ms} \times Post_{ms} \times DISASTER_{st}$					−.050	−.050	−.050	−.050
					(.000)	(.000)	(.000)	(.000)

Part 2: Impact on profitability

- Salience: there is no drop in the performance of disaster zone stocks.

Table 10: Impact of disasters on firms' performance

	$ROA_{s,t}$		Sales $growth_{s,t}$	
	(1)	(2)	(3)	(4)
$Post_t$	.002	−.002	2.123	2.860
	(.459)	(.190)	(.303)	(.319)
$Disaster_{st}$	−.010	.001	.352	2.036
	(.359)	(.089)	(.250)	(.315)
$Post_t \times Disaster_s$	−.003	−.001	−2.312	−2.838
	(.230)	(.244)	(.295)	(.316)

Part 2: Impact on stock returns

- Salience: underweighted firms don't underperform later.
- Tercile 1: the most underweighted portfolio; Tercile 3: the most overweighted portfolio.

$$\Delta W_{Q0,i} = \frac{\sum_{k=1}^{N}(W_{Q0,k(i)} - (W_{Q-1,k(i)} + W_{Q-2,k(i)})/2)}{N},$$

Table 11: Underweighting and stock returns

A. Close

Tercile	Year-1	Event qtr	Year+1	Year+2
1	1.141	−7.890	11.122	2.051
	(.695)	(.003)	(.214)	(.273)
2	−.782	−1.946	.148	2.393
	(.811)	(.257)	(.955)	(.377)
3	19.339	9.025	−.267	−2.633
	(.010)	(.001)	(.945)	(.390)
1-3	−18.198	−16.914	11.389	4.684
	(.028)	(.000)	(.062)	(.031)

Part 2: Impact on stock returns

- Greater return reversal associated with the 1-3 portfolio traded by close funds during the post-event years.

Table 11: Underweighting and stock returns

B. Far				
Tercile	Year-1	Event qtr	Year+1	Year+2
1	1.355	−11.738	7.712	−1.124
	(.155)	(.001)	(.364)	(.501)
2	−1.064	−2.053	−1.764	3.843
	(.001)	(.088)	(.568)	(.106)
3	2.011	1.453	1.625	2.384
	(.009)	(.003)	(.733)	(.457)
1-3	−18.656	−22.191	6.088	−3.508
	(.018)	(.001)	(.130)	(.217)
C. Close - far				
Tercile	Year-1	Event qtr	Year+1	Year+2
1	−.214	3.849	3.410	3.175
	(.938)	(.036)	(.003)	(.051)
2	9.282	.107	1.912	−1.450
	(.031)	(.899)	(.016)	(.240)
3	−.672	−1.428	−1.892	−5.017
	(.682)	(.079)	(.323)	(.047)
1-3	.458	5.277	5.302	8.193
	(.714)	(.032)	(.023)	(.028)

Conclusion

- Funds closer to the disaster zone reduce their portfolio holdings of firms located in the disaster area.
- The bias in their trading response is transitory and vanishes with time and distance.
- Climatic disaster risk misestimation is costly to the fund investors as it adversely affects portfolio returns.sustainability ratings.

讨论

- 问题
  - 文章为什么不用多时点 did，更符合气候灾害发生时间多时点的事实。
  - 文章题目为基金是否错估（可能高估或低估），但在研究问题时却只是在讨论是否高估。
- 未来研究
  - 利用气候政策变化等外生冲击研究基金经理、公司是否会高估政策风险。
  - 地理距离的远近可以作为外生冲击，例如文化、制度距离是否同样可以研究。
  - 是否有工具可以修正这种过度反应，例如利用 chatgpt 提取媒体报道灾害信息。

Thank you!