Aggregated Risks in Mutual Fund Disclosures

Susan Navarro Smelcer, Anne Tucker & Yusen Xia†

Scholars have roundly criticized compulsory consumer disclosure over the past decade for good reason. Disclosures, whether describing the terms of a loan or the risks of investing, purport to inform consumers. But who actually reads disclosures? We argue that mutual fund disclosures are different. Unlike other consumer-facing disclosures, mutual fund disclosures are dynamic and, therefore, informative. The Securities and Exchange Commission (SEC) requires funds to report changing market conditions that affect a fund's investments. As a result, aggregated risk statements provide information about new and evolving risks over and above insights from any single risk disclosure. But disclosures' utility comes not from their superior ability to inform the ordinary investor. Rather, we propose that fund disclosures' true value lies in what they can tell regulators about funds' perception of market risks in the aggregate. *We evaluate our thesis through an analysis of all U.S. mutual funds' narrative risk disclosures from 2011 through 2022. We leverage social science theories of risk and uncertainty to conceptualize and operationalize the choices funds make in depicting changing market conditions. We locate these risks and uncertainties along a distribution from common and manageable to uncommon and catastrophic. We then assess funds' disclosure of changing market conditions using a "most likely" case design by examining funds' disclosure of increasing inflation, public health crises, and severe weather events resulting from climate change. Each case study presents either a risk—meaning that the universe of bad outcomes is known and can be accounted for—or uncertainty—meaning that the universe of outcomes is unknown and cannot be meaningfully estimated. We find that, in the aggregate, funds reconceptualize and adjust their disclosures in response to external events. Disclosure topics and language move in predictable and statistically significant ways. Changes in disclosure language are, in fact, meaningful. Such a response, when taken as a whole, provides insight into funds' perception of risk. Our findings suggest that quantitative text analysis can help the SEC assess overall fund compliance with disclosure mandates. But it*

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can also help regulators, market participants, and researchers better understand changing risk environments.

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INTRODUCTION

Disclosures, when used as a regulatory tool, purport to inform consumers about credit fees,[1] access to medical records,[2] and even how much iron is in their cereal.[3] Disclosures made by mutual funds[4]—investments that bundle many securities and debt instruments into a single portfolio—teach investors about past performance and the risks associated with the investment.[5]

But scholars widely agree that disclosures miss the mark when it comes to informing consumers and shaping behavior.[6] Consumers are both overwhelmed by information[7] and unlikely to fully read disclosures.[8] At worst, mandatory disclosures may increase consumer confusion,[9] especially when disclosures are poorly designed or written.[10]

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1. Truth in Lending Act (Regulation Z), 12 C.F.R. pt. 1026 (2023).

2. Health Insurance Portability and Accountability Act of 1996, Pub. L. No. 104-191, 110 Stat. 1936 (1996).

3. 21 C.F.R pt. 101 (2023).

4. As we have in other projects, we use the phrase "mutual funds" to describe open-ended investment companies registered with the SEC. *See, e.g.*, Eric D. Roiter, *Disentangling Mutual Fund Governance from Corporate Governance*, 6 HARV. BUS. L. REV. 1, 12 (2016) ("The term 'mutual fund' is a market term. It does not appear in the ICA [Investment Company Act], which instead employs the term 'open-end company,' the distinguishing feature of which is the issuance to investors of 'redeemable securities.'" (footnote omitted) (quoting 15 U.S.C. § 80a-5(a)(1) (1987))). For a detailed description of mutual funds, see Jill E. Fisch, *Rethinking the Regulation of Securities Intermediaries*, 158 U. PA. L. REV. 1961, 1967–75 (2010).

5. SEC, FORM N–1A (2023), https://www.sec.gov/files/form-n-1a.pdf [https://perma.cc/GU3N-EQKX]. Form N-1A has become operationalized pursuant to Rule 239.15A. *See* Form N-1A, Registration Statement of Open-End Management Investment Companies, 17 C.F.R. § 239.15A (2023).

6. *See, e.g.*, Omri Ben-Shahar & Carl E. Schneider, *The Failure of Mandated Disclosure*, 159 U. PA. L. REV. 647 (2011) (exploring how mandated disclosures do not accomplish their purpose); Israel Klein, *Voting on Reporting*, 48 J. CORP. L. 777 (2023) (proposing a new method of approving non-GAAP metrics in company disclosures that could meet shareholder expectations and, consequently, become more clear to all end users).

7. Ben-Shahar & Schneider, *supra* note 6, at 686–87; *see also* Minjing Peng, Zhicheng Xu & Haiyang Huang, *How Does Information Overload Affect Consumers' Online Decision Process? An Event-Related Potentials Study*, FRONTIERS NEUROSCIENCE, Oct. 2021, at 1, 2 (reviewing the literature on the negative effects of "information overload" on consumer decision making).

8. *See* Florencia Marotta-Wurgler, *Will Increased Disclosure Help? Evaluating the Recommendations of the ALI's "Principles of the Law of Software Contracts*,*"* 78 U. CHI. L. REV. 165, 168 (2011) (finding households rarely read end user license agreements); Florencia Marotta-Wurgler & Daniel L. Chen, *Does Contract Disclosure Matter?*, 168 J. INST. & THEORETICAL ECON. 94 (2012) (finding mandatory disclosure rarely increases readership of the terms and conditions of an online sale).

9. James M. Lacko & Janis K. Pappalardo, *The Failure and Promise of Mandated Consumer Mortgage Disclosures: Evidence from Qualitative Interviews and a Controlled Experiment with Mortgage Borrowers*, 100 AM. ECON. REV. 516, 518–19 (2010) (reporting mandated mortgage disclosures "confused" and "actually misled" borrowers).

10. *Id.* at 519 (quantifying findings that a significant number of average consumers could not understand the mortgage disclosure information provided in mandated disclosures).

In this respect, mutual fund disclosures are no different.[11] The SEC primarily regulates mutual funds through registration and disclosure.[12] Among other things, the SEC requires funds to describe the principal risks that could decrease a fund's value.[13] These qualitative descriptions of risk are designed to inform the "average or typical investor."[14] Individuals, however, encounter the same cognitive limitations when they read funds' disclosures as they do in other contexts, such as determining whether to take out a mortgage.

Disclosures' utility, we argue, lies in the aggregation of risk disclosures—not just in an individual's understanding of a disclosure or a single fund's description of risk. Funds are uniquely situated as market aggregators. Funds hold securities and debt across geographic areas and economic sectors.[15] As a result, funds' disclosures can provide meaningful information about how funds conceptualize risk and uncertainty in the face of changing market conditions. Regulators can learn about funds' perceptions of new and evolving market risk by examining patterns and trends across all disclosures over time.

Funds' disclosures are valuable in the aggregate because funds must decide which risks to disclose. Funds update prospectuses at least annually to report their perceptions of *changing market conditions* that impact the fund's investments.[16] This open-ended regulation is distinct from other mandatory requirements, such as the disclosure of the fund's prior performance[17] or fees.[18] Unlike reporting quantitative facts about the fund's past performance or fees, these open-ended regulations require the fund to reveal its

11. *See, e.g.*, Anne M. Tucker & Yusen Xia, *Promise & Peril of Plain English: Mutual Fund Disclosure Readability*, 13 HARV. BUS. L. REV. 59 (2023) (describing how the increasing length of mutual fund prospectuses and their technical language undermine their purpose). On the other hand, mutual fund disclosures may differ from other consumer disclosures because they, like operating company disclosures, have an expertized intermediary audience that reviews the disclosures. Employee retirement plan administrators, on both the public and private sides, and the professional advisors to these plans review and use mutual fund disclosures in decision-making processes. *See, e.g.*, VANGUARD, BEST PRACTICES FOR PLAN FIDUCIARIES 22 (2022) ("Plan fiduciaries should review the prospectus and the fund's performance as they select and monitor plan investments.").

12. *See, e.g.*, Geoffrey A. Manne, *The Hydraulic Theory of Disclosure Regulation and Other Costs of Disclosure*, 58 ALA. L. REV. 473, 479 (2007) (describing the SEC regulatory regime as one primarily built around disclosure).

13. Under item 4(b), "Principal Risks of Investing in the Fund," a fund summarizes principal risks of investing in the fund in a narrative disclosure, "including the risks to which the Fund's portfolio as a whole is subject and the circumstances reasonably likely to affect adversely the Fund's net asset value, yield, and total return." SEC, *supra* note 5, at 11; *see also* W. John McGuire, *Registering Investment Companies Under Form N-1A*, *in* MUTUAL FUNDS TODAY: CURRENT ISSUES AND DEVELOPMENTS, CW009 ALI-CLE, 41–42, 46–48 (2014).

14. SEC, *supra* note 5, at ii.

15. U.S. funds hold approximately $28.6 trillion in assets and 33% of U.S. equities. INV. CO. INST., 2023 INVESTMENT COMPANY FACT BOOK (2023). Funds' broad investment strategies, collectively, give them a unique vantage point of financial markets as a whole. *See id.* at 27 (reporting year-end 2022 figures for all registered investment companies in the United States).

16. DIV. OF INV. MGMT., SEC. & EXCH. COMM'N, No. 2016-02, GUIDANCE UPDATE (2016) [hereinafter GUIDANCE UPDATE].

17. SEC, *supra* note 5, at 12–13.

18. *Id.* at 4.

qualitative perception of risk and uncertainty.[19] Annual reporting requires that funds continuously reevaluate and report changes in perceived risk over time.[20]

Open-ended, qualitative descriptions of new risks move the SEC's regulatory regime beyond mere check-the-box exercises or rote restatements of standardized warnings.[21] Funds' risk assessments reflect real tradeoffs. SEC regulations require funds to selectively identify principal risks and summarily explain those risks to a non-expert audience—the ordinary investor.[22] But mistakes can be costly. Disclosing the wrong risk or, perhaps, incompletely disclosing the right one can expose the fund to potential liability.[23] Provide too gruesome and detailed a description of the risk, and investments may be stifled.[24] As a result, funds' disclosures represent a form of constrained optimization—funds must make a subjective determination about their disclosure and the dynamic market risks most likely to negatively impact the fund.[25]

But this constrained optimization does not occur in a vacuum. Funds can observe other funds' risk estimates and update their own beliefs accordingly. When faced with uncertainty about future returns due to, say, public health crises or climate change, funds can observe how similarly situated funds describe that risk. This iterative feedback loop helps funds conceptualize and operationalize both risk and uncertainty in the market. In short, we argue that funds must make meaningful choices about which risks to disclose and how to disclose them—a task informed by funds' observations of other funds' risk disclosures.

Social science theory supports our argument that aggregated disclosures reveal new information and reflect learning. Other fields, such as law,[26] define risk in terms of

19. *Id.* at 11–12.

20. *See generally* SEC, *supra* note 5 (discussing the various requirements of filing funds).

21. Susan Navarro Smelcer, Anne Tucker & Yusen Xia, *Regulating Dynamic Risk in Changing Market Conditions*, 13 WM. & MARY BUS. L. REV. 775, 788–89 (2022).

22. SEC, *supra* note 5, at 11.

23. Failure to adequately describe risks may leave a fund open to liability for securities fraud under the Securities Exchange Act of 1934 if the "misstatement or omission concealed something from the market that, when disclosed, negatively affected the value of the security." Youngers v. Virtus Inv. Partners Inc., 195 F. Supp. 3d 499, 511 (S.D.N.Y. 2016) (citing Lentell v. Merrill Lynch & Co., 396 F.3d 161, 173 (2d Cir. 2005)). Under the Securities Exchange Act of 1934 and Rule 10b-5, investor-plaintiffs may claim securities fraud if they can "prove (1) a material misrepresentation or omission by the defendant; (2) scienter; (3) a connection between the misrepresentation or omission and the purchase or sale of a security; (4) reliance upon the misrepresentation or omission; (5) economic loss; and (6) loss causation." *Id.* (citing Pac. Inv. Mgmt. Co. v. Mayer Brown LLP, 603 F.3d 144, 151 (2d Cir. 2010)).

24. Keith C. Brown, W. V. Harlow & Laura T. Starks, *Of Tournaments and Temptations: An Analysis of Managerial Incentives in the Mutual Fund Industry*, 51 J. FINANCE 85, 88 (1996) (describing mutual fund managers' incentives to maintain or grow assets under management because such actions are tied to their own compensation); *see also* Eric D. Roiter, *Disentangling Mutual Fund Governance from Corporate Governance*, 6 HARV. BUS. L. REV. 1, 12 (2016) (explaining how the process of fund flow out-shrinks the pool of assets from which the advisor is paid).

25. For a discussion of constrained optimization, see *infra* note 92 and accompanying text.

26. Legal risk assessment, in contrast, usually assigns liability after a bad outcome happens. Proximate cause, for example, answers who created the risk that led to the bad outcome. 3 AM. L. OF TORTS *"Substantial Factor" and "But For" Tests* § 11:2, Westlaw (database updated Mar. 2023) (discussing tests to establish

"probabilities [that] are known, or knowable in the sense that they can be estimated from past data and calculated using the laws of probability."[27] Knowing the probability that an event will occur is a particularly challenging task for funds that operate in a complex financial system, face both idiosyncratic and systemic risks,[28] and navigate an evolving risk environment.[29] Predictable risks can be contrasted with unknowable uncertainties—tail events or shocks like an inflation spike, COVID-19, or a devastating hurricane.

We argue that aggregating disclosures can communicate meaningful information to regulators about funds' changing risk perceptions. Disclosures written simply to appease the SEC and "check the box" would be relatively static and uninformative. If disclosures are simply cut-and-paste jobs from either previous years or other funds, we should see relatively uniform disclosure content. In other words, we would expect statistically insignificant noise or total uniformity in disclosure language in the face of external shocks.

This isn't what we find. Using a new dataset of all narrative risk disclosures made by U.S. mutual funds from 2011 through 2022, we find meaningful and statistically significant changes in disclosure language in response to external events that shape funds' understanding of market risk. In particular, we examine funds' disclosures of three negative events: (1) increasing inflation, (2) public health crises, and (3) severe weather events caused by climate change. Each presents a different type of either a risk—meaning that the universe of bad outcomes is known and can be accounted for—or an uncertainty—meaning that the universe of outcomes is not known and cannot be meaningfully estimated.[30] We locate these risks and uncertainties along a distribution from common and manageable to uncommon and catastrophic.

Inflation is a common risk—it is endemic to financial markets.[31] Funds' breath of experience with inflation means that negative outcomes are well known and hedged

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proximate cause). Additionally, legal risk analysis reflects the collective wisdom of our combined experience, leading judges to conclude that explosives are uncommonly dangerous, but riding a bike is not. *See, e.g.*, Hopkins v. E. I. Du Pont De Nemours & Co., 212 F.2d 623, 625 (3d Cir. 1954) (discussing the extremely dangerous notion of dynamite); Rubin v. United States, No. 02 CV 1660, 2004 WL 57399, at *2 (E.D.N.Y. Jan. 13, 2004) (discussing the low duties owed to bicyclists under tort law because of the routine nature of the activity).

27. Itzhak Gilboa, Andrew W. Postlewaite & David Schmeidler, *Probability and Uncertainty in Economic Modeling*, J. ECON. PERSPS., Summer 2008, at 173, 173.

28. Mutual funds invest and manage huge investment portfolios, operations that have specific risks attached to each choice. These fund-specific risks are called idiosyncratic risks. Jorge A. Chan-Lau & Yinqiu Lu, *Idiosyncratic and Systemic Risk in the European Corporate Sector: A CDO Perspective* 12 (Int'l Monetary Fund [IMF], Working Paper No. 06/107, 2006). Sources of idiosyncratic risk can be positions, cultures of risk taking, inadequate internal processes, and executive compensation, to name a few. *See, e.g.*, Allen N. Berger & John Sedunov, The Life Cycle of Systemic Risk 17–19 (Dec. 17, 2021) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3988373 [https://perma.cc/3L4M-CDLS] (discussing operational and executive incentive risk); Robert A. Jarrow, *Operational Risk*, 32 J. BANKING & FIN. 870, 872 (2008) (discussing the firm specific nature of idiosyncratic risk). Conversely, systemic risk arises from shared market conditions outside of individual institutions. *See* Berger & Sedunov, *supra*, at 2–3 ("[S]ystemic risk affects all types of economic and financial firms and markets.").

29. *See infra* Part III (supporting this claim with data).

30. *See infra* Part II.C.

31. *See infra* Part III.B.1.

against.[32] Public health events, on the other hand, are uncertainties or—in the parlance of risk distribution—"tail" events. Epidemics and pandemics are rare, and the full scope of negative public health events is unknown.[33] Climate change possesses elements of both risk and uncertainty.[34] Climate change-related events were, at one time, much more uncommon.[35] But they have become more predictable over time; climate change has transformed extreme weather events from an uncertainty—something rare and relatively unknown—to a more manageable (or at least anticipated) risk.

In each case, we find that funds' disclosures reflect external events in ways that are consistent with the risk or uncertainty at issue. Funds understand and have extensive experience with inflation risk. Funds holding similar assets disclose inflation risks in similar ways. When inflation spiked in 2021, funds' disclosure of inflation risk increased in both frequency and intensity, with patterns emerging by fund type.[36]

Public health uncertainty disclosure followed a different pattern. Few funds disclosed public health risks prior to 2020. COVID-19's onset, a tail event, prompted a large jump in the proportion of funds naming public health events as a risk to investment value. In 2022, COVID-19-specific disclosures decreased as funds updated their understanding of public health risks. At the same time, *focused* public health disclosures (i.e., non-COVID-19-specific disclosures) increased. Statistically significant differences in disclosure between fund types reflect how funds have learned about public health uncertainty over time.

Climate change occupies a middle ground. Similarly situated funds tend to disclose climate change-related risk in distinguishable ways. But differences among fund types are not as sharp as with funds' inflation risk disclosures. We also see spikes in climate change-related disclosures in 2019, although the frequency and intensity of disclosure language vary across fund types. This jump, perhaps driven by a large number of severe climate events and increasing public concern over climate change, suggests a meaningful pattern of learning and updating as funds observe both external events and others' disclosures.

Additionally, we find an evolutionary pattern emerging from the data. In the face of new or changing risks, funds add *generic* language to describe the risk. This type of disclosure often lacks context or meaningful discussion about the relationship between the fund's investments and the risk. Funds write more detailed or *focused* disclosures as they gain a more sophisticated understanding of a risk. This new knowledge may come from repeated exposure, such as severe weather events, or an unignorable shock, such as COVID-19. As once-rare events become more common, funds can *internalize* the risk by hedging against it or fostering financial innovation, like a new clean water fund or an inflation-adjusted bond.

These empirical patterns support our primary argument that aggregating funds' narrative risk disclosures provide meaningful information, particularly for regulators.

32. *See infra* Part III.B.
33. *See infra* Part III.C.
34. *See infra* Part III.D.1.
35. *See infra* Figure 9 and accompanying text.
36. *See infra* Part III.B.2.

Quantitative analysis of the text has the potential to help the SEC determine whether companies are taking their disclosure obligations seriously. But it can also help regulators, market participants, and researchers better understand how funds conceptualize and operationalize dynamic risk.

This Article proceeds as follows. In Part I, we describe the regulatory environment of funds. We draw a contrast between static regulations, which mandate the disclosure of previously specified information, and dynamic (i.e., open-ended) regulations, which force funds to conceptualize risk and uncertainty. In Part II, we draw on social science theories to provide a framework for thinking about how funds disclose market conditions subject to risk and uncertainty. In Part III, we evaluate how funds disclose inflation, public health, and climate change issues. We explore, in particular, how funds' disclosure patterns reflect risk and uncertainty. We conclude by discussing how quantitative textual analysis of funds' disclosure can help policymakers and researchers better understand and regulate mutual funds.

I. DISCLOSING DYNAMIC RISK

Our central claim is that aggregating risk disclosures provides a unique and meaningful window into funds' changing perception of risks in response to external events. This requires a brief overview of the SEC's regulatory architecture. The SEC relies predominantly on registration and disclosure to regulate mutual funds.[37] Mutual funds must file a registration statement (SEC Form N-1A) to create a new open-ended fund, whenever material changes occur, and at least annually thereafter.[38] Mutual funds provide concrete facts about voting records, taxes, portfolio holdings, fees, and past performance.[39]

37. Manne, *supra* note 12, at 479. Drawing from a combination of legislative and administrative authority derived from the Securities Act of 1933, the Exchange Act of 1934, the Investment Advisors Act of 1940, and the Investment Company Act of 1940, the SEC requires funds to register and disclose various information. *Fast Answers: The Laws that Govern the Securities Industry*, SEC. & EXCH. COMM'N (Oct. 1, 2013), https://www.sec.gov/about/about-securities-laws [https://perma.cc/PHV9-RVSS]. Congress created the SEC to regulate the American securities market and designed it to restore investor confidence in the markets. *Mission*, SEC. & EXCH. COMM'N (Aug. 29, 2023), https://www.sec.gov/about/mission [https://perma.cc/7WCN-CNPB]; *see also* Securities Act of 1933, ch. 38, 48 Stat. 74 (codified as amended at 15 U.S.C. §§ 77a–77aa); Securities Exchange Act of 1934, ch. 404 48 Stat. 881 (codified as amended at 15 U.S.C. §§ 78a–78kk). In 1940, Congress again acted to pass the Investment Company Act and Investment Advisers Act to regulate companies, including investment companies (commonly called mutual funds) and the investment advisers that manage mutual funds. *See* Investment Company Act of 1940, Pub. L. No. 76-768, 54 Stat. 789 (codified as amended at 15 U.S.C. §§ 80a-1 to -64); Investment Advisers Act of 1940, Pub. L. No. 76-768, 54 Stat. 847 (codified as amended at 15 U.S.C. §§ 80b-1 to -21).

38. *See* Form N-1A, Registration Statement of Open-End Management Investment Companies, 17 C.F.R. § 239.15A (2023) (authorizing the SEC to register open-end management investment companies using Form N-1A); McGuire, *supra* note 13, at 41–42, 46–48; Wulf A. Kaal & Bentley J. Anderson, *Unconstrained Mutual Funds and Retail Investor Protection*, 36 REV. BANKING & FIN. L. 817, 830 (2017).

39. Kaal & Anderson, *supra* note 38, at 832. Mutual funds are subject to additional SEC filing requirements, as well as annual and semi-annual financial statements. These regulations are beyond the scope of this Article. *See, e.g.*, Letter from Barry D. Miller, Assoc. Dir. of the Off. of Legal & Disclosure, Sec. & Exch. Comm'n, to Karrie McMillan, Gen. Couns., Inv. Co. Inst. (July 30, 2010) (detailing disclosure obligations beyond the

Funds also provide narrative discussions of the fund's investment strategy and its principal risks—the focus of our study.[40]

With this background in mind, the remainder of this Part outlines our reasons for studying the disclosed information and previews what we might learn from the disclosures. Part A posits that aggregated narrative descriptions of risk are different from other types of easily ignored disclosures because they capture mutual funds' bird's eye view of market changes over time. Part B highlights the choices forced by the SEC's architecture that weigh against concluding risk statements are empty, check-the-box exercises. Part C describes how funds identify and assess risks based on external events and other funds' disclosures.

A. Distinguishing Funds' Disclosures from Other Consumer Disclosures

Disclosure is a preferred regulatory tool—not only by the SEC, but also for many agencies.[41] Disclosure conserves agency resources by pushing compliance burdens on the regulated and responsibility on individual consumers.[42] Consumers, however, notoriously ignore many of these disclosures due to complexity, inundation, and overexposure.[43]

Investors are no different. Both the literature and our shared human experience tell us that the ordinary investor infrequently consults a summary prospectus and even less

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prospectus) [hereinafter ICI Letter]; Enhanced Reporting of Proxy Votes by Registered Management Investment Companies, 87 Fed. Reg. 78770, 78772 (Dec. 12, 2022) (codified at 17 C.F.R. pts. 200, 232, 240, 249, 270, 274) (amending "the scope of voting decisions [investment company] funds must report").

40. The prospectus is a key disclosure; it is comprehensive, annual, and parts are automatically provided to investors. *See* Smelcer, Tucker & Xia, *supra* note 21, at 784–85; Kaal & Anderson, *supra* note 38, at 830; *see also* ICI Letter, *supra* note 39, at 2 ("The [SEC] . . . intended the prospectus disclosure to focus on a fund's principal investment strategies . . . to provide investors with more useful information about the fund's investment approach . . . .").

41. Michael D. Guttentag, *Evolutionary Analysis in Law: On Disclosure Regulation*, 48 ARIZ. ST. L.J. 963, 972–73 (2016) (listing relevant consumer disclosure areas such as health care services, personal finance, political spending, real estate transactions, and securities markets).

42. Ben-Shahar & Schneider, *supra* note 6, at 681.

> [Disclosure] is alluring because it resonates with two fundamental American ideologies. The first is free-market principles. Mandated disclosure may constrain unfettered rapacity and counteracts caveat emptor, but the intervention is soft and leaves everything substantive alone: prices, quality, entry. . . . Second, mandated disclosure serves the autonomy principle. It supposes that people make better decisions for themselves than anyone can make for them and that people are entitled to freedom in making decisions.

Id.

43. Empirical studies find that disclosures may be poorly designed. *See, e.g.*, Lacko & Pappalardo, *supra* note 9, at 516 (describing how federally mandated consumer mortgage disclosures failed to adequately explain the terms of mortgage loans); *see* Marotta-Wurgler, *supra* note 8, at 172 (showing that increasing the accessibility of EULAs does not actually increase readership "in a significant way"); *see generally* Troy A. Paredes, *Blinded by the Light: Information Overload and Its Consequences for Securities Regulation*, 81 WASH. U. L.Q. 417 (2003) (reviewing the literature on the theory of information overload and applying that literature to securities regulation).

frequently understands it.[44] Why force information on consumers and investors if they will simply file it in the trash can, click through and accept, or blindly sign?[45]

Mutual fund disclosures do more than inform individual investors. Aggregating mutual fund risk disclosures allows for identification of collective trends and changes that can, over time, be insightful. These insights are otherwise lost when we focus on a single disclosure or its impact on a single consumer.[46] Mutual fund disclosures are particularly ripe for this type of aggregated information mining for three reasons: (1) mutual fund risk disclosures are the primary source of this type of information about funds, (2) risk narratives are dynamic by design, and (3) they offer a one-of-a-kind view of the state of the market and the rules of the investment game.

First, mutual fund disclosures are the primary source of public information about fund operations, performance, and risks.[47] Mutual funds lack the analyst reports, earnings calls, or loquacious quarterly filings produced by operating companies.[48] Funds' disclosures are one of the few sources of fund-specific information available. As a result, these disclosures do a lot of heavy lifting. They facilitate SEC enforcement, prompt shareholder litigation, and provide the basis upon which investors pick funds.[49] Disclosures are also the sole source of information about how funds perceive market risk.

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44. *See* Tucker & Xia, s*upra* note 11, at 99–100 (arguing that disclosures are generally incomprehensible to the average person); *see also* Alex Edmans, Mirko S. Heinle & Chong Huang, *The Real Costs of Financial Efficiency When Some Information Is Soft*, 20 REV. FINANCE 2151, 2152 (2016) (finding that "increasing financial efficiency can, surprisingly, reduce real efficiency").

45. *See generally* Ben-Shahar & Schneider, *supra* note 6 (describing the ubiquity of mandatory disclosures, cataloging the inefficiencies, identifying unintended consequences, and explaining the procedural barriers and regulatory disincentives to make mandatory disclosures more useful).

46. For example, empirical studies have examined the efficacy of disclosure on individual behaviors in the context of sugar in childrens' cereal and the effects of privacy policies in online health communities. *See generally* Yuanyuan Dang et al., *Privacy Protection in Online Health Communities: Natural Experimental Empirical Study*, J. MED. INTERNET RSCH., May 2020, at 1; Monique Potvin Kent, Cher Cameron & Sarah Philippe, *The Healthfulness and Prominence of Sugar in Child-Targeted Breakfast Cereals in Canada*, 37 HEALTH PROMOTION & CHRONIC DISEASE PREVENTION CAN. 266 (2017).

47. John A. Haslem, *Normative Transparency of Mutual Fund Disclosure*, *in* MUTUAL FUNDS: PORTFOLIO STRUCTURES, ANALYSIS, MANAGEMENT, AND STEWARDSHIP 319, 322 (John A. Haslem ed., 2009).

48. For an overview of public company filing requirements, see *Exchange Act Reporting and Registration*, SEC. & EXCH. COMM'N (Apr. 6, 2023), https://www.sec.gov/education/smallbusiness/goingpublic/exchangeactreporting [https://perma.cc/57SB-M6ND].

49. Fund boards have limited power over the organization and oversee an even smaller slice of operations for funds compared to firms because investment advisors, not boards of directors, hold the power. Anita K. Krug, *Downstream Securities Regulation*, 94 B.U. L. REV. 1589, 1627–29 (2014); Anita K. Krug, *Escaping Entity-Centrism in Financial Services Regulation*, 113 COLUM. L. REV. 2039, 2061 (2013); *see also* Fisch, *supra* note 4, at 2011–12 (describing limited oversight of investment advisors); John A. Haslam, *Why Have Mutual Fund Independent Directors Failed as "Shareholder Watchdogs"?*, J. INVESTING, Spring 2010, at 7, 7–9 (2010) (explaining that independent directors are not able "provide [the] needed fiduciary shareholder protections" on mutual fund boards in the current regulatory scheme). Further, funds' use of daily Net Asset Value pricing, and no takeover market, outsource the disciplining forces of the market almost exclusively to the SEC's disclosure regime. Henry T. C. Hu, *Disclosure Universes and Modes of Information: Banks, Innovation, and Divergent Regulatory Quests*, 31 YALE J. ON REGUL. 565, 585 (2014) (discussing the efficient capital market hypothesis

Mutual fund disclosures are dynamic by design. It is tempting to write off mutual fund disclosures as mere boilerplate.[50] In many cases, they are, but not exclusively so. In Section III, we document sustained, gradual changes in disclosure language in response to increased climate events and attitudes around climate change. We also show the swift changes in disclosure content and language in response to COVID-19, which converted generic public health statements into focused statements of current market and regulatory events in response to the pandemic.[51]

Dynamic disclosures are an intentional feature of the SEC framework. Per SEC regulations, funds disclose present risks and changing market conditions.[52] Further, funds must update their disclosures when conditions change.[53] Looking at any one disclosure in isolation gives us a snapshot of risk, but not the full picture. Aggregating disclosures across funds and over time cobbles together a wide-angle view of market events and changes.

Disclosure evolution and variation evidence mutual funds' perceptions of the threat, much like a consumer confidence index.[54] In the aggregate, risk disclosures reveal how many funds identified a particular risk or cast it off. Disclosures also provide a high-level view of how the risk is described—near and definite, distal but catastrophic, routine and boilerplate, or uncommon and disruptive—as well as changes in those descriptions over time. For example, we find that funds' descriptions of climate change risks have evolved over time as severe weather events, such as 100-year floods, become more common.[55] Funds' generic disclosures that lumped "natural disasters" with other disparate risks in long, laundry list statements have transformed over time into specific statements about climate change risks.[56]

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and SEC disclosure regulations for operating companies). For a discussion of redemption rights in mutual funds and how NAV distinguishes funds from operating company stock ownership, see Anne M. Tucker, *Locked in: The Competitive Disadvantage of Citizen Shareholders*, 125 YALE L.J.F. 163, 165–66 (2015). For a discussion of asset pricing, see Merritt B. Fox, Lawrence R. Glosten & Gabriel V. Rauterberg, *The New Stock Market: Sense and Nonsense,* 65 DUKE L.J. 191, 217, 223 (2015) (describing how fund security pricing is largely insulated from disclosure-based price corrections).

50. Susan Navarro Smelcer, Anne Tucker & Yusen Xia, Beyond the Fine Print: Boilerplate Language in Disclosures (unpublished manuscript) (on file with authors).

51. *See infra* Part III.C.2.

52. For a full discussion of SEC open-ended regulation of mutual fund risk and changing market conditions, see Smelcer, Tucker & Xia, *supra* note 21, at 792–98.

53. *See supra* note 38 and accompanying text.

54. *See Consumer Confidence Index (CCI)*, ORG. FOR ECON. COOP. & DEV. [OECD] https://data.oecd.org/leadind/consumer-confidence-index-cci.htm [https://perma.cc/LP53-YGSJ] (defining and tracking the consumer confidence index and providing aggregated data).

55. *See infra* Part III.D.2.

56. *See id.*

The disclosures can tell us something more nuanced than whether an event is merely happening.[57] By listening to what the most sophisticated investors[58] are forced to say about external risks, we see how external events—like a pandemic—ripple through markets. In other words, aggregated disclosures can signal how funds perceive a risk or are integrating new strategies.[59]

Finally, the investor and the fund contemplate an ongoing relationship in a constantly evolving environment.[60] Individuals commonly view mutual funds as long-term investments. Investors enter the market for the long haul and as a means of retirement planning through vehicles like target date retirement funds.[61] Such investments are also "sticky" by design. For example, defined contribution plans, like a 401(k), add tax incentives to keep money invested.[62] From this perspective, disclosures are a dynamic thread stitching together the fabric of long-term investments. Narrative descriptions of changing market conditions reflect the ongoing investment relationship, rather than being

57. Mutual funds' summaries of market risks may be lagging indicators. The public health community will not look to mutual funds to determine if a pandemic is occurring, and the Federal Reserve is not anxiously watching mutual fund disclosures to determine its next interest rate hike. Although market perception of risk may be a useful data point for understanding market changes, we don't assert that it is the sole indicator.

58. The European Central Bank concluded the following:

> [Recent] growth particularly stands out for investment funds, whose total assets under management have reached almost half of the total size of the banking sector . . . highlighting the ever-growing importance of investment funds in financing today's economy. These changes in the financial system call for the extension of the scope of financial stability analysis and given the highly interconnected nature of financial institutions, it has as well become crucial to improve modelling capabilities for the joint analysis of different financial sectors within a single framework. . . . [That includes] the ability to allow for institution-level contagion even across different sectors.

Matthias Sydow et al., *Shock Amplification in an Interconnected Financial System of Banks and Investment Funds* 2 (Eur. Cent. Bank, Working Paper No. 2581, 2021), https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2581~63c8ffb7dc.en.pdf [https://perma.cc/FN57-E966].

59. David Smith, *The Economics of Mutual Funds*, *in* MUTUAL FUNDS: PORTFOLIO STRUCTURES, ANALYSIS, MANAGEMENT, AND STEWARDSHIP 33, 39 (John A. Haslem ed., 2009). Funds are woven into the financial fabric of markets so they are both sensitive to and accelerators of systemic risks—much like banks. *See* Sydow et al., *supra* note 58, at 8–16 (describing the interrelationship between banks and funds, and the impact that funds have on overall market stability).

60. INV. CO. INST., AMERICAN VIEWS ON DEFINED CONTRIBUTION PLAN, 2022, at 2 (2023) (describing contribution plans that helped investors think about the long-term investment horizon).

61. *See*, OFF. OF INV. EDUC. & ADVOCACY, SEC, MUTUAL FUNDS AND ETFS: A GUIDE FOR INVESTORS 15, https://www.sec.gov/investor/pubs/sec-guide-to-mutual-funds.pdf [https://perma.cc/J5AA-H7ZR] (describing target date funds and long-term investment horizons).

62. INV. CO. INST., *supra* note 60, at 2 (noting the role of tax incentives and structures of defined contribution plans in shaping investment behaviors); *see also* SARAH HOLDEN & DANIEL SCHRASS, INV. CO. INST., DEFINED CONTRIBUTION PLAN PARTICIPANTS ACTIVITY, 2016, at 5 (2017) (collecting data from 29 million employer-based defined contribution retirement accounts in DC, which shows that only 5.6% of participations changed the asset allocation of their contributions and 9.4% rebalanced their existing allocations).

linked to a one-time transaction like a medical procedure. Qualitative descriptions are a cornerstone of the SEC's investor protection regulations.[63]

B. The Regulatory Calculus of Disclosing Dynamic Risk

Funds' disclosures of principal investment risks exist within a regulatory regime that balances transparency and accessibility.[64] Writing summary statements with an eye for ordinary investors advances accessibility.[65] Despite the required brevity for summary statements, omissions and distortions can generate liability.[66] However, overstating risks may scare off investors.[67] Regulatory and market constraints, therefore, shape funds' risk disclosures.

The SEC's disclosure regulations vary from standard "check-the-box"[68] risk phrases (e.g., "You could lose money by investing in the Fund") to principles-based disclosures. [69] Principles-based requirements require funds to identify their primary investment strategies and risks.[70] They also set minimum disclosure conditions and provide flexibility rather than prescribing specific content.[71]

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63. *Questions and Answers About the New "Market Risk" Disclosure Rules*, SEC. & EXCH. COMM'N (July 31, 1997), https://www.sec.gov/divisions/corpfin/guidance/derivfaq.htm#qual [https://perma.cc/557A-6U77] ("Qualitative disclosure about interest rate risk in a non-trading portfolio would include: 1) the nature of the interest rate exposure, 2) how interest rate risks are managed, 3) changes in interest rate exposures or how the interest rate exposures were managed when compared to the conditions that existed during the most recently completed fiscal year, and 4) known trends in interest rates, or anticipated rates in future reporting periods.").

64. *Mutual Fund Prospectus*, SEC. & EXCH. COMM'N, https://www.investor.gov/introduction-investing/investing-basics/glossary/mutual-fund-prospectus [https://perma.cc/H3Z6-JMFW] (describing how summary prospectuses contain "key information about a fund," yet are "just a few pages long").

65. The SEC mandates that funds disclose risks "us[ing] words economically and at a level [ordinary investors] can understand." OFF. OF INV. EDUC. & ASSISTANCE, SEC, A PLAIN ENGLISH HANDBOOK: HOW TO CREATE CLEAR SEC DISCLOSURE DOCUMENTS 5 (1998).

66. Funds face liability under the Securities Act, including section 11 issuer liability for a materially false or incomplete registration statement with mutual funds. 15 U.S.C. § 77k(a)(1)–(3). Funds face liability for selling a security with a materially false or incomplete prospectus. 15 U.S.C. § 77*l*(a)(2). Section 17(a) of the Securities Act prohibits fraudulent conduct in the "offer or sale" of securities, 15 U.S.C. § 77q, and section 10(b) of the Exchange Act and rule 10b-5 prohibit fraud in connection with the "purchase or sale" of securities. *See id.* § 78j(b); 17 C.F.R. § 240.10b-5 (2023). Either the SEC or private parties may bring actions under section 10(b) and rule 10b-5. Herman & MacLean v. Huddleston, 459 U.S. 375, 387 (1983) ("We therefore reject an interpretation of the securities laws that displaces an action under § 10(b).").

67. *See, e.g.*, Jonathan Krakow & Timo Schäfer, Mutual Funds and Risk Disclosure: Information Content of Fund Prospectuses 18 (Jan. 15, 2020) (unpublished manuscript), https://www.efmaefm.org/0EFMAMEETINGS/EFMA%20ANNUAL%20MEETINGS/2021-Leeds/papers/EFMA%202020_stage-1301_question-Full%20Paper_id-351.pdf [https://perma.cc/8E2M-MNW6] (studying the relationship between risk disclosures and performance and examining fund flows).

68. Manne, *supra* note 12, at 479.

69. For example, funds must clearly state that investing entails the risk of losing money. SEC, *supra* note 5, at 11 (requiring all non-Money Market funds "disclose that loss of money is a risk of investing in the Fund").

70. Kaal & Anderson, *supra* note 38, at 819.

71. *Id.* (arguing that dynamic regulation helps regulators adapt to new circumstances); *see also* Smelcer, Tucker & Xia, *supra* note 21, at 792–98 (describing principles-based and open-ended SEC regulations).

This framework requires funds to make choices about which risks to disclose.[72] Registrants must "determine (i) whether certain information is material [or principal], and (ii) how to disclose such information."[73] The SEC provides limited guidance, usually comprising non-exhaustive and illustrative lists of the types of information that should be considered material and therefore disclosed.[74] Funds must exercise discretion in the face of principles-based regulation and choose which risks to disclose and how to describe them.[75]

Open-ended features of SEC regulations require funds to extend disclosure obligations to future, unknown events.[76] Funds have discretion in reporting new risks.[77] In particular, the SEC requires funds to provide information on *changing market conditions* that present new and previously undisclosed risks to the fund's investments.[78] Mandating disclosure *if* something happens in the future acts as a gap-filler or a bridge between what is known today and what the SEC may need to regulate tomorrow.[79]

Changing market conditions may materialize as severe and unexpected outcomes, like the inflation spike in 2022 or the COVID-19 pandemic in 2020. We characterize these extreme or unusual incidents as "tail events" below. [80] Market conditions may also materially change in response to emerging risks or the increasing frequency of a once-rare

72. *See* SEC, *supra* note 5, at pt. ii–iii, 11 (illustrating materiality for funds). Investment risk flows from a given investment strategy. Funds must summarize the *principal* risks associated with a fund's investment strategy in Item 4(b). *Id.* at 11 (Principal Risks of Investing in the Fund). The SEC requires funds to disclose known risks associated with the portfolio and "the circumstances reasonably likely to affect adversely the Fund's net asset value, yield, and total return." *Id*. In this principles-based disclosure, the SEC shapes but does not dictate the precise disclosure. *Id*. at 6. Item 4 (Risk/Return Summary: Investments, Risks, and Performance) focuses on investment strategies and risks of funds. *See also* Smelcer, Tucker & Xia, *supra* note 21, at 792–94 (discussing fund disclosure strategy).

73. *See, e.g.*, Modernization of Regulation S-K Items 101, 103, and 105, 85 Fed. Reg. 63726, 63747 (Oct. 8, 2020) (to be codified at 17 C.F.R. pts. 229, 239, and 240) [hereinafter S-K Final Rules].

74. *See, e.g.*, *id.* at 6347–49 (amending Items "to be more clearly principles-based" judging materiality based on "a variety of factors, including the preferences of investors, the compliance costs of producing the disclosure, and the nature of the information to be disclosed").

75. In November 2020, the SEC proposed amended language to the principal risk section instructions to list risks in order of importance, not in alphabetical order. Tailored Shareholder Reports, Treatment of Annual Prospectus Updates for Existing Investors, and Improved Fee and Risk Disclosure for Mutual Funds and Exchange-Traded Funds; Fee Information in Investment Company Advertisements, 85 Fed. Reg. 70716, 70798 (proposed Nov. 5, 2020) (to be codified at 17 C.F.R. pts. 200, 230, 239, 240, 270, 274). The SEC also proposed that a definition of a "principal" risk means "whether the risk would place more than 10% of the fund's assets at risk ('10% standard') and whether it is reasonably likely that a risk will meet this 10% standard in the future." *Id*. at 70798.

76. Item 303, 17 C.F.R. § 229.303 (2023) (generally requiring uncertainties be disclosed in periodic filings).

77. S-K Final Rules, *supra* note 73, at 63747–49 ("[R]egistrants will have the flexibility to determine whether certain information is material . . . .").

78. Funds must disclose new risks created by previously undisclosed changing market conditions that may negatively and seriously impact funds' investments. GUIDANCE UPDATE, *supra* note 16, at 2. Changing market conditions identify unusual, imminent, or unfolding events that could adversely impact the fund by introducing additional risk. *Id.*

79. Mark Fenwick, Wulf A. Kaal & Erik P.M. Vermeulen, *Regulation Tomorrow: What Happens When Technology Is Faster Than the Law?*, 6 AM. U. BUS. L. REV. 561, 590 (2017).

80. *See infra* Parts III.B and III.C.

event, such as hurricanes or wildfires.[81] Requirements to disclose changing market conditions capture the dynamic nature of such risks.

Funds must meet all the substantive requirements and write disclosures in a way that satisfies the SEC's style expectations. Funds are expected to describe the principal risks in a summary fashion[82] for a non-expert audience.[83] The SEC's writing expectations include using "plain English" and "[s]hort sentences" with "[d]efinite, concrete, everyday words."[84] Funds must use the active voice and avoid "legal jargon or highly technical business terms."[85]

The takeaways are twofold. First, satisfying the SEC's writing conventions requires more than a check-the-box approach to writing a disclosure. Second, the resulting risk statements are not unvarnished expressions of risk. Disclosure language reflects the constraints imposed by the SEC.

Funds can't be too brief or casual in their risk statements. Errors, omissions, and distortions open funds up to SEC enforcement actions or, theoretically, shareholder litigation. For example, in 2022, the SEC charged one fund with violating both the Investment Adviser Act of 1940 and the Investment Company Act after the fund's investment adviser "represented or implied in various statements that all investments in the fund had undergone an ESG [(Environmental, Social, and Governance)] quality review, even though that was not always the case."[86] The investment adviser eventually settled the charges and paid a $1.5 million penalty.[87]

Funds also have incentives not to be too pessimistic when describing investment risks because the investing public, including potential investors and their advisors, receive this information.[88] Both individual investors and retirement plan administrators—who select funds to be included in a 401(k) (or equivalent) menu of funds—see this information[89]

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81. *See id.* (outlining how the increasing frequency of rare events is impacting market conditions).

82. The SEC does not formally impose page limits, but staff describe the "intent" of the regulations as providing a "concise summary of key information, on the order of three or four pages." *Enhanced Disclosure and New Prospectus Delivery Option for Registered Open-End Management Investment Companies*, SEC. & EXCH. COMM'N (Feb. 24, 2009), https://www.sec.gov/rules/final/2009/33-8998-secg.htm [https://perma.cc/JM2R-R8CG]; *but see* Tucker & Xia, s*upra* note 11, at 78 (noting how the average length of the summary prospectus has grown from five pages in 2010 to nearly eight in 2020).

83. SEC, *supra* note 5, at ii ("The plain English requirements of rule 421 under the Securities Act [17 CFR § 230.421] apply to prospectus disclosure in Part A of Form N-1A. The information required by Items 2 through 8 must be provided in plain English under rule 421(d) under the Securities Act.") (alterations in original)).

84. Form and Content of Prospectuses, 17 C.F.R. § 230.421(d)(2)(i)–(ii) (2023).

85. *Id.* § 230.421(d)(2)(iii), (v).

86. Press Release, Sec. & Exch. Comm'n, SEC Charges BNY Mellon Investment Adviser for Misstatements and Omissions Concerning ESG Considerations (May 23, 2022), https://www.sec.gov/news/press-release/2022-86 [https://perma.cc/ZS38-3YZR].

87. *Id.*

88. Brown, Harlow & Starks, *supra* note 24, at 88 (describing mutual fund managers' incentives to maintain or grow assets under management because it is tied to their own compensation).

89. Individual investors may not read the summary prospectus directly, but they may be more likely to read summaries or distillations of the prospectus information as restated in retirement plan menus or fund information on third party websites like Morningstar.

when selecting funds or choosing to stay invested in a fund.[90] Audience awareness and the pressure for sales also shape disclosures.[91]

Risk disclosures emerge from the tension of the competing forces of regulatory compliance, litigation risks, and financial incentives. In essence, funds must engage in a type of constrained optimization—an activity with real consequences for being over- or under-inclusive.[92]

C. Learning from the Crowd

When funds comply with SEC substantive and style requirements,[93] they do not do so in a vacuum. Funds can observe how other similarly situated funds—such as those holding similar assets or adopting similar investment strategies—understand and account for relevant market risks. This learning may affect what funds disclose and how funds describe the possibility of negative events in their disclosures.[94]

Learning through disclosure is likely both a function of the external risk and the regulatory environment in which funds act. Social science theory provides some support for the idea that funds deal with uncertainty by learning both indirectly from other funds' disclosures and directly from external events.[95] Social processes that give rise to the social "construction" or "mediation" of risk may also shape subjective risk estimates.[96] Socially constructed risk arises from our perception of risk, which is based on our knowledge—that is, how much we know about the world—combined with our sociocultural and individual

90. Tucker, *supra* note 49, at 167–69; *see also* Anne M. Tucker, *The Outside Investor: Citizen Shareholders & Corporate Alienation*, 11 U. ST. THOMAS L.J. 99, 106–07 (2013).

91. In a separate interview project with authors of mutual fund disclosures, disclosure drafters report that sales teams weigh in on disclosure content to check for tone and the ability to sell the investment product. Notes on file with author.

92. For a discussion of constrained optimization, see generally PETER B. MORGAN, AN EXPLANATION OF CONSTRAINED OPTIMIZATION FOR ECONOMISTS (2015).

93. *See* SEC, *supra* note 5, at 1–27 (describing information required in a prospectus form).

94. For example, the comparative process likely allows funds to improve their subjective estimates of risk over time through Bayesian updating, a type of learning that allows individuals to improve the accuracy of their prior beliefs based on empirical observations to generate a more accurate posterior belief. *See, e.g.*, Brian T. McCann, *Using Bayesian Updating to Improve Decisions Under Uncertainty*, 63 CAL. MGMT. REV. 26 (2020) (describing the general principles and applications of Bayesian updating).

95. *See, e.g.,* Corrado Monti et al., *On Learning Agent-Based Models from Data*, 13 NATURE: SCI. REPS. 9268 (2023), https://www.nature.com/articles/s41598-023-35536-3 [https://perma.cc/6RB2-MAX9] (employing agent-based models to estimate individuals' abilities to learn the true values of latent variables); BRYAN D. JONES & FRANK R. BAUMGARTNER, THE POLITICS OF ATTENTION: HOW GOVERNMENT PRIORITIZES PROBLEMS (1999) (describing a policy-making environment in which learning occurs but disproportionately to actual signals about policy problems and the true state of the world).

96. JENS O. ZINN, SOCIAL THEORIES OF RISK AND UNCERTAINTY: AN INTRODUCTION 6 (2008) (stating that individuals shape their risk analysis based on social processes).

values.[97] In other words, our perception of risk may not have substantial connection to objective events. Rather, social processes influence our perception of risk.[98]

The indeterminate nature of modern risks produces a "social effect" such that risk definitions are "not dependent on their scientific validity."[99] Socially constructed or mediated risk generates subjective perceptions of risk based on what we, as a society, deem to be "normal." In other words, as society changes through technology or some other force, the idea of normality changes with new knowledge.[100]

Through this lens, other funds' understanding of risk becomes especially important. For example, when do severe hurricanes stop being considered isolated events and start being classified as a generalized climate change–related risk? At what point does a territorial skirmish between two nations morph into ongoing, widespread risk of political violence? Funds are well situated to observe how other funds describe these risks and update their own beliefs about what (and how) market risk should be disclosed.[101]

Funds' abilities to observe and learn are enhanced and, perhaps, encouraged by the regulatory environment governing disclosures.[102] The SEC requires funds to update their risk disclosures at least once a year.[103] Funds must also update their prospectuses as needed

97. Stephen P. Osborne & Sarah-Sophie Flemig, *Conceptualizing Risk and Social Innovation: An Integrated Framework for Risk Governance*, 37 SOC'Y & ECON. 165, 166 (2015) (noting that "risk is studied as a social construct"); *see also* ZINN, *supra* note 96, at 4 (explaining that risk perception is partly based on everyday knowledge and experiences); *see also* MARY DOUGLAS & AARON WILDAVSKY, RISK AND CULTURE: AN ESSAY ON THE SELECTION OF TECHNOLOGICAL AND ENVIRONMENTAL DANGERS 5–9 (1982) (positing a way of analyzing risk based on individual knowledge of the risk and its perceived possibilities which are coalesced with the community to form a cultural consensus of the risk).

98. *See* ZINN, *supra* note 96, at 6–7 (noting that this theory "implies that risk debates might occur and take off without any substantial relation to a 'real' world. Even though these theories do not deny the existence of a material world, they conceptualize risk as brought into being and managed as part of social processes").

99. ULRICH BECK, RISK SOCIETY: TOWARDS A NEW MODERNITY 32 (1992).

100. *See* DOUGLAS & WILDAVSKY, *supra* note 97, at 35 ("Debates about new technology put into question the old perceptions of the natural and normal. The new technology produces new social responsibilities and provokes cultural reassessment. The line around normal dangers has to be revised to sharpen responsible behavior by refocusing blame.").

101. Funds can improve their subjective estimates of risk over time through Bayesian updating. McCann, *supra* note 94, at 29–30; *see also* Seth J. Hill, *Learning Together Slowly: Bayesian Learning About Political Facts*, 79 J. POLITICS 1403, 1403 (2017) (finding that individuals engage in a form of "cautious" Bayesian updating when learning about new political information); *but see, e.g.*, Gary Charness & Dan Levin, *When Optimal Choices Feel Wrong: A Laboratory Study of Bayesian Updating, Complexity, and Affect*, 95 AM. ECON. REV. 1300, 1300 (2005) (reporting that individuals did not engage in Bayesian updating with expected utility maximization (BEU) when BEU is not aligned with reinforcement, a different heuristic for processing information "where one is more likely to pick choices (actions) associated with successful past outcomes than choices associated with less successful outcomes").

102. In a separate interview project with authors of mutual fund disclosures, people report reading and borrowing language from other funds' disclosures as well as informal mechanisms such as industry conferences and conference calls to "learn" about other funds' approaches to and understanding of emerging risks. Notes on file with author.

103. *See supra* note 16 and accompanying text.

with "timely and material information."[104] For example, COVID-19's emergence prompted SEC staff to remind funds of their "general ongoing duty to update prospectuses promptly for material changes in their disclosures."[105] Even after the SEC's prodding, not all funds chose to disclose COVID-19, and of those that did, they described the potential disruptions and losses with a great deal of variety.[106]

Funds' descriptions of COVID-19 risks evolved as funds observed the political, social, and economic reactions to the pandemic and the language used in others' disclosures.[107] Different funds' disclosures shared similar structures and phrases, suggesting the existence of a feedback loop of funds reading and learning from others' disclosures.[108] We discuss this in more detail in Part III.

II. CONCEPTUALIZING RISK AND UNCERTAINTY

Open-ended disclosure requirements force funds to grapple with the nature of risk. Risks may be common and well-known or rare and poorly understood, as discussed in Part A. Some types of risk may be better characterized as uncertainty, meaning that funds cannot be fully aware of all possible negative outcomes. Part B explores this distinction and the resulting boundaries around the language funds use when disclosing "timely and material information." We integrate risk and uncertainty into a normal distribution curve in Part C. Risk as a distribution illustrates the relationship between common risks that are normal and tail events that introduce uncertainty and severe outcomes.

A. Risk as Common and Manageable

Common events provide both experience and understanding. We understand how to protect ourselves from common types of risk and make their impact less severe. Take how we, as a society, have dealt with the risks associated with driving. Driving a car is a dangerous activity that can seriously harm passengers and pedestrians. To help prevent injury and death, we require safety features such as seatbelts and new methods of evaluating vehicle safety through crash tests.[109]

Risks associated with excessive speed or poorly designed cars are *common* risks associated with driving. The experience we gain from frequently encountering these risks allows us, as a society, to put mechanisms in place to moderate overall harm.[110]

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104. Div. of Inv. Mgmt., Sec. & Exch. Comm'n, Staff Statement on Importance of Delivering Timely and Material Information to Investment Company Investors (Apr. 14, 2020), https://www.sec.gov/investment/delivering-timely-material-information [https://perma.cc/P35C-H5TE].

105. *Id.* at n.5.

106. *See infra* Part III.C.

107. *Id.*

108. Smelcer, Tucker & Xia, *supra* note 21, at 808–11.

109. *See* Brian O'Neill, *Preventing Passenger Vehicle Occupant Injuries by Vehicle Design—A Historical Perspective from IIHS*, 10 TRAFFIC INJ. PREVENTION 113, 113 (2009) (discussing successful public health measures).

110. *Newer Cars Are Safer Cars*, NAT'L HIGHWAY TRANSP. & SAFETY ADMIN., https://www.nhtsa.gov/newer-cars-are-safer-cars [https://perma.cc/L2EW-FA8A] (touting continuous improvement in safety features as important elements of promoting vehicle safety).

We have taken similar steps when it comes to financial risks. Take, for example, interest rate risk. Firms commonly face interest rate risk when financing long-dated, fixed-term assets using short-term, floating-point liabilities.[111] For example, Sallie Mae, which provides student loans, simultaneously receives income from outstanding student loans made with a *fixed* interest rate while making new loans at the *prevailing* interest rate.[112] When interest rates increase, this mismatch can create a "gap management" problem.[113] Firms can solve this problem by using interest rate swaps, where firms with opposite interest-rate risk exposures agree to pay the amount of the others' interest.[114] Like speed limits or seatbelts, interest rate swaps help participants ameliorate common but serious risks. Parties describing these risks can do so with some assurance that they understand the risk and the scope of potential harm. Comprehension and mitigation require time and repeated experiences with a risk—conditions lacking with new or evolving risks.

B. Uncertainty as Unknowable and Severe

We have less experience with uncommon risks by definition. This leaves us less able to guard against uncommon risks or ameliorate their dangerous effects. How do we, for example, put safeguards into place to prevent injury and death to motorists driving on a bridge that collapses or a road washed out during a flash flood?[115] These, too, are driving risks—but uncommon ones. Such events are more difficult to guard against or prevent because they are too unpredictable, too idiosyncratic, or too unique to develop adequate and comprehensive safeguards.

Our inability to predict or fully understand rare risks makes them especially dangerous. Take, for instance, severe hurricanes, such as Hurricane Sandy in 2012. Sandy hit the New York metro area particularly hard, directly resulting in at least 117 deaths[116]

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111. James Bicksler & Andrew H. Chen, *An Economic Analysis of Interest Rate Swaps*, 41 J. FINANCE 645, 645 (1986); Russell J. Funk & Daniel Hirschman, *Derivatives and Deregulation: Financial Innovation and the Demise of Glass-Steagall*, 59 ADMIN. SCI. Q. 669, 683 (2014).

112. Bicksler & Chen, *supra* note 111, at 648.

113. *Id.*

114. The California Debt and Investment Advisory Commission published a general overview of interest rate swaps theory:

> Interest rate swap terms typically are set so that the present value of the counterparty payments is at least equal to the present value of the payments to be received. Present value is a way of comparing the value of cash flows now with the value of cash flows in the future. A dollar today is worth more than a dollar in the future because cash flows available today can be invested and grown.
>
> The basic premise to an interest rate swap is that the counterparty choosing to pay the fixed rate and the counterparty choosing to pay the floating rate each assume they will gain some advantage in doing so, depending on the swap rate.

CAL. DEBT & INV. ADVISORY COMM'N, UNDERSTANDING INTEREST RATE SWAP MATH & PRICING 3 (2007).

115. KSBW Staff, *Neighbors Use Zip Line After Bridge Washes Away in California Floods*, WSAZ NEWS CHANNEL 3 (Jan. 16, 2023), https://www.wsaz.com/2023/01/16/neighbors-use-zip-line-after-bridge-washes-away-california-floods [https://perma.cc/N2LE-L3PQ].

116. Mary Casey-Lockyer et al., *Morbidity and Mortality Weekly Report (MMWR): Deaths Associated with Hurricane Sandy—October–November 2012* CTR. FOR DISEASE CONTROL (May 24, 2013), https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6220a1.htm [https://perma.cc/3WTX-MPQ6].

and over $60 billion in property damage.[117] Hurricanes are a common occurrence along the coast in the southeastern United States, but such storms are rarer phenomena in the northeastern United States.[118] As a result, some low-lying areas of New York City are especially vulnerable to storm surges and flooding associated with extremely rare hurricanes.[119] Daniel Zarrilli, NYC Mayor Bill de Blasio's chief climate advisor, reflected,

> Hurricane Sandy wasn't totally unforeseen. In 2007, city officials published a sustainability plan that included some description of the city's vulnerability to coastal storms. There were also plenty of people who remembered hurricanes like Donna in 1960 or various nor'easters from the last few decades, but all of this knowledge and planning took on a bit of an academic feeling. . . . [Sandy] wildly exceeded our imaginations up until that point."[120]

Such rare and extreme events will continue to outstrip our imaginations—especially as anthropogenic climate change continues to increase the probability of storms like Sandy.[121]

Such uncommon events, like hurricanes in the northeastern United States, differ from common risks, like interest rate risk or common car crashes, precisely because they are unexpected and leave their victims unprepared. The very fact that a risk is common means that we have the knowledge and experience to mitigate it. In other words, common risks are less severe by virtue of being familiar and, therefore, managed. We have little protection from uncommon risks that, by definition, "wildly exceed[] our imaginations."[122]

C. Conceptualizing Risk as a Distribution

Seeing common risks as more manageable and uncertain risks as unmanageable and therefore, more severe suggests a relationship between probability and magnitude. We can collapse the familiar dimensions of risk in law—probability and magnitude—into one. Common risks are manageable ones because we have learned how to mitigate them; rare events are unmanageable because we lack the knowledge to effectively deal with them.

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117. Benjamin H. Strauss et al., *Economic Damages from Hurricane Sandy Attributable to Sea Level Rise Caused by Anthropogenic Climate Change*, 12 NATURE COMMC'NS 2720, 2720 (2021).

118. Peg Van Patten, *A Hurricane in New England?*, CLIMATE.GOV (June 6, 2010), https://www.climate.gov/news-features/features/hurricane-new-england [https://perma.cc/WK98-5HAY] ("With a few notable exceptions . . . most hurricanes that swirl northward along the East Coast veer out into the Atlantic without making landfall.").

119. Andra J. Garner et al., *Impact of Climate Change on New York City's Coastal Flood Hazard: Increasing Flood Heights from the Preindustrial to 2300 CE*, 114 PROC. OF THE NAT'L ACAD. OF SCIS. 11861, 11861 (2017) (describing New York City as encompassing "nearly 49.7 million built square meters and 400,000 living within the 100-y[ear floodplain").

120. Kevin Krajick, *Natural Disasters: New York City's Former Top Climate Official on the Lessons of Hurricane Sandy*, STATE OF THE PLANET: COLUM. CLIMATE SCH. (Oct. 20, 2022), https://news.climate.columbia.edu/2022/10/20/new-york-citys-former-top-climate-official-on-the-lessons-of-hurricane-sandy [https://perma.cc/VPQ2-QM3P].

121. *See* Strauss et al., *supra* note 117, at 2725 (claiming that additional exposure and damage of Hurricane Sandy is attributable to climate issues).

122. Krajick, *supra* note 120.

We can analogize risks as reflecting a normal distribution. A normal distribution of risk presents an underlying, non-zero probability of an adverse event occurring.[123] Events with a high probability of occurring are less likely to produce extreme harm because our experience with these risks allows us to ameliorate negative effects. Rare events, on the other hand, are, by definition, difficult to guard against and therefore introduce the potential for more harm. We can have few expectations about an event that happens rarely, let alone meaningful experiences, to adjust our behavior to mitigate risk or negative outcomes.

To illustrate, assume that all driving risks are drawn from a normal distribution. The most common dangers—harm flowing from excessive speed—are most likely to occur. We imagine the frequency of these harms as comprising the center of the distribution—the most likely to occur. However, some risks are "rare, high impact events," such as bridge collapses, which do occasionally occur.[124] We can conceptualize these catastrophic events[125] as "tail events."[126]

Tail events are a familiar concept in finance. Tail events provide a way to conceptualize risk and probability (e.g., how likely is this loan to default).[127] This language is also used to describe "extreme, high-impact events that have a low probability of occurring," like the Great Recession of 2008.[128]

The nature of uncertainty implies that funds may not fully understand what risks are possible. That is, funds cannot fully account for all tail events. These types of events are especially disruptive because there is no antecedent experience that funds can look to structure their expectations about potential risks and harms. Especially severe public health events, such as the dramatic onset of COVID-19, constitute uncertainties for which funds could not adequately assess or disclose risk prior to its onset.[129]

But funds are fully aware of common risks, such as those associated with inflation and, increasingly, climate change. For example, Funds disclose inflation-related risks on a regular basis and develop investment strategies to mitigate these commonly occurring events.[130]

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123. In other words, every risk that mutual funds *could* face lies along this distribution. This distribution is simply a representation to help compare the frequency and severity of risks.

124. Nicholas Barberis, *The Psychology of Tail Events: Progress and Challenges*, 103 AM. ECON. REV. 611, 611 (2013).

125. While it is true that rare events may be "positive," we (and most funds) are most concerned with negative events that may cause substantial damage. *See infra* notes 129–30 and accompanying text.

126. *Id.*

127. *See, e.g.*, Bertrand Candelon & Sessi Tokpavi, *A Nonparametric Test for Granger Causality in Distribution with Application to Financial Contagion*, 34 J. BUS. & ECON. STAT. 240, 250 (2016) ("[O]ur test is designed to check for causality in specific regions of the distribution (center or tails), it can be used to test for the presence of inter-dependence as well as contagion.").

128. Hwai-Chung Ho, Hung Yin-Chen & Henghsiu Tsai, *Non-Parametric Estimation of Conditional Tail Expectation for Long-Horizon Returns*, 31 STATISTICA SINICA 547, 547–48 (2021); *see also* Robert F. Engle & Tianyue Ruan, *Measuring the Probably of a Financial Crisis*, 116 PROC. NAT'L ACAD. SCIENCES 18341, 18341 (2019) (describing financial crises as left-tail events).

129. *See infra* Part III.C.

130. *See infra* Part III.B.

This difference suggests that funds will disclose risk and uncertainty in different ways. As established in Part I, funds must make meaningful choices when disclosing and describing risks.[131] This includes what risks are worth disclosing and how to describe those risks in the face of structural constraints from SEC-style requirements, liability, and financial incentives.[132] Moreover, funds' flexibility in describing these risks means that the funds' language choices matter.[133] We argue, as a result, that the legal lens through which funds express their risk assessments can provide valuable information about changing risk perceptions.

If disclosures reflect funds' understanding of risk and uncertainty, then we would expect funds' language to evolve in discernible and significant ways over time. The socially constructed nature of risk suggests that funds observe objective indicators, such as the inflation rate or the number of new COVID-19 cases worldwide, and other funds' assessment of the potential impact of those objective events.

As funds update their risk perceptions, such as when common risks experience a tail event or when uncertainties migrate into a risk, we would expect to see that reflected in funds' risk disclosures. Funds should increase the frequency and specificity of risk descriptions, such as including more focused and detailed discussions.

In Part III, we explore how funds treat these two broad risk classes in their disclosures. In short, we find that funds' language evolves in meaningful ways, indicating that disclosures (when aggregated) have something to tell us about funds' assessments of risk.

III. COMMUNICATING RISK AND UNCERTAINTY

In this Part, we examine our central claim that aggregated mutual fund disclosures reflect changes in funds' perceptions of market risks. First, we introduce our data and methods before moving to our three "crucial" case studies: (1) inflation, (2) public health, and (3) climate change.[134]

A. Data and Introduction to Descriptive Inference

We assess changes in funds' frequency and expressions of risk over time by analyzing narrative risk disclosures filed from 2011 to 2022 for all registered U.S. mutual funds.[135] To do so, we use the SEC's data sets to access the Investment Strategy and Principal Risks

131. *See* SEC, *supra* note 5, at 31 (outlining funds risk disclosing requirements).

132. *See supra* note 66 and accompanying text (providing examples of SEC requirements that, if violated, expose the firm to potential liability).

133. Tucker & Xia, *supra* note 11, at 41–42 (finding a relationship between readability and length of summary prospectus disclosures and fund performance).

134. Crucial cases are "most likely or least likely to exhibit a certain outcome." Chiara Ruffa, *Case Study Methods: Case Selection and Case Analysis*, *in* THE SAGE HANDBOOK OF RESEARCH METHODS IN POLITICAL SCIENCE AND INTERNATIONAL RELATIONS 1133, 1140 (Luigi Curini & Robert Franzese eds. 2020) (citing JOHN GERRING, CASE STUDY RESEARCH: PRINCIPLES AND PRACTICES 243 (2007)).

135. *See* SUSAN NAVARRO SMELCER, ANNE TUCKER & YUSEN XIA, ONLINE APPENDIX: DISCLOSURE LABELING & KEYWORDS (2023), https://drive.google.com/file/d/15xBdaGr51MEocEJKJHoKTMB-pJI0lW6j/view?usp=sharing [https://perma.cc/3ESE-XW79] (containing additional information about our assessment).

narrative disclosures.[136] Our unit of observation is the fund-year, as identified by a filing's accession number.[137]

Our initial dataset contains 203,540 disclosure filings by funds. This dataset contains two types of duplicates. First, the data contains submissions for multiple series of the same fund. We consider these to be duplicates because different series of the same fund will have identical investment strategies and risks; they differ only in the fees.[138] As a result, the narrative disclosures of different series of the same fund will be identical. Retaining filings for each series would not only create unnecessary duplication, but it would also bias our results towards larger funds. Second, funds may update their prospectuses throughout the year. When a fund files more than one disclosure in a year, we keep the last filing in the calendar year to each fund. The SEC requires a fund to update its prospectus in the event of a material change in its investment strategy or principal risks.[139] Removing all of these duplicates reduces the total number of observations to 144,619, which is reported in Table 1.

We engage in descriptive inference—that is, we seek to use data to describe the qualities of and changes in disclosure language about rare and extreme risks.[140] To do so, we selected three "crucial" cases to evaluate disclosure language in the face of changing risk: (1) inflation, (2) public health, and (3) climate change.[141] Our selected cases are "easy" cases—that is, cases most likely to provide evidence of the hypothesized phenomena. The dangers presented by these events are widespread and well known. All funds face some exposure to inflation risk.[142] Public health crises, such as COVID-19,

136. *See Mutual Fund Prospectus Risk/Return Summary Data Sets: December 2010–September 2023*, SEC. & EXCH. COMM'N (Sept. 30, 2023), https://www.sec.gov/dera/data/mutual-fund-prospectus-risk-return-summary-data-sets

137. The accession number comprises the Central Index Key (CIK) uniquely identifying the entity submitting the filing, the year filed, and "a sequential count of submitted filings from that CIK." *Accessing EDGAR Data*, SEC. & EXCH. COMM'N (Oct. 19, 2023), https://www.sec.gov/os/accessing-edgar-data.

138. *Introduction to Investing: Mutual Fund Classes*, SEC. & EXCH. COMM'N, https://www.investor.gov/introduction-investing/investing-basics/glossary/mutual-fund-classes (last accessed July 6, 2023).

139. Securities Act of 1933 § 10(a)(3), 15 U.S.C. § 77j; Rule 496, 17 C.F.R. § 230.496 (2023); *see also Importance of Delivering Timely and Material Information to Investment Company Investors*, at n.5, SEC. & EXCH. COMM'N: DIV. OF INV. MGMT. (Apr. 14, 2020), https://www.sec.gov/investment/delivering-timely-material-information (explaining that updating prospectuses with material information "is particularly relevant for investment companies that continuously offer their shares, such as open-ended funds").

140. Descriptive inference is defined as "the process of reaching descriptive conclusions on the basis of observed data." HENRY E. BRADY & DAVID COLLIER, RETHINKING SOCIAL INQUIRY: DIVERSE TOOLS, SHARED STANDARDS 325, 333 (2d ed. 2010). This is distinct from causal inference, which "employs data to reach conclusions about why it happened." *Id.*

141. *See supra* note 134 and accompanying text.

142. *See generally* Srinivasan Krishnamurthy, Denis Pelletier & Richard S. Warr, *Inflation and Equity Mutual Fund Flows*, 37 J. FIN. MKTS. 52 (2018) (building on financial literature documents showing inflation's effects on stock returns and extending it to mutual fund flows based on investors' misperceptions of risk).

affected all aspects of market operation.[143] Climate change generates widespread severe weather events with tremendous financial impact.[144]

Using a combination of keyword coding and manual review, we categorized disclosures as describing one of our three case study risks or irrelevant for our review.[145] We conducted our review at the sentence level, and report this for each case study as the top number. Sentence level review allows researchers to code a single disclosure as describing more than one relevant risk. Fund level counts, the bottom number in Table 1, reflect the number of non-duplicate filings that disclose a given case study risk. Leveraging human review and keyword coding, we further categorize each fund level risk discussion as generic, focused, or internalized as a way to describe the different content and degrees of specificity within each case study.[146]

Table 1. Data Overview and Case Study Counts

Data Processing Steps	**N**
Initial number of filings	203,540
Number of filings after duplicates removed	144,619
Disclosure labeling	
Inflation risks	
Sentence level sample size	64,183
Fund level sample size	26,517
Public health risks	
Sentence level sample size	232,489
Fund level sample size	24,054
Climate change health risks	
Sentence level sample size	41,681
Fund level sample size	26,517

Each of the case studies—inflation, public health, and climate change—reflects a different dimension of risk and uncertainty—differences that are evident in funds' disclosures, as shown in Figure 1. Both the frequency and content of funds' disclosures

143. *See, e.g.*, Smelcer, Tucker & Xia, *supra* note 21, at 799–801.

144. See *infra* Figure 9 (showing weather events causing over one billion dollars in damages between 1980–2022).

145. For a description of the labeling process and keywords used, see SMELCER, TUCKER & XIA, *supra* note 135.

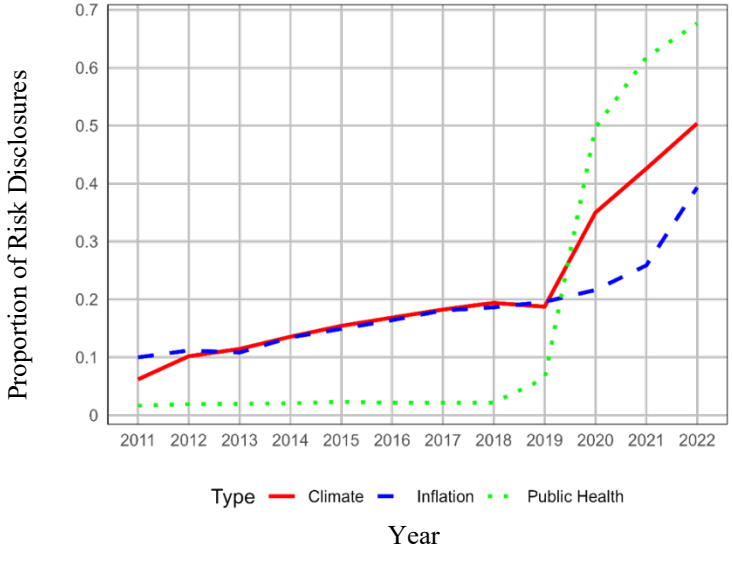
146. *Id.*

change over time and in response to external events.[147] Changes demonstrate that disclosures are, in fact, dynamic. Here, we see that funds implemented the dynamic disclosure requirements imposed by SEC regulations to update disclosures in the face of changing market conditions.[148]

Movement alone isn't necessarily a useful data point. The frequency and content of *uninformative* disclosures would be noisy, messy, and random. We would not expect to observe clear patterns with uninformative disclosures. Alternatively, if disclosures are merely a check-the-box exercise to satisfy regulatory requirements, disclosure frequency and content might be lock-step and uniform. But this is not what the data show.

Our three case studies, which highlight different risks and uncertainties, show that funds do, in fact, disclose inflationary risk, public health, and climate change risks differently. Within each case study, clear patterns emerge regarding which funds disclose the risk and how. As conditions on the ground change, so too do funds' disclosures of these risks—but in different ways that reflect the theories of risk established in Part II. These divergent patterns are illustrated at a high level in Figure 1.

Figure 1. Proportion of Risk Disclosures Discussing Particular Topics
All Funds, 2011–2022[149]



In particular, we observe how funds' perception and treatment of risks evolve over time through the changing content of funds' disclosures. Funds are most likely to disclose

147. Case study disclosures were labeled as generic, focused, or internalized risk statements to assess how disclosure content changes over time. For a description of the labeling process, see SMELCER, TUCKER & XIA, *supra* note 135.

148. GUIDANCE UPDATE, *supra* note 16, at 2.

149. Gathered using appendix material (on file with authors).

unrealized risk with *generic* (boilerplate) language. As risks materialize, Funds replace or update these generic disclosures with more *focused* language as risks begin to materialize. The more focused disclosures tend to describe how risk might impact the fund in obvious or non-obvious ways. Over time, funds supplement more focused disclosure language with statements of *internalized* risk—that is, ways in which the fund has ameliorated or hedged against a particular risk.

We use the remainder of this Part to situate each case study within our risk framework and examine patterns in disclosures' frequency and content. The data make a strong case for studying the risk signals embedded in aggregated mutual fund disclosures.

B. Disclosing Risk: Inflation

Mutual funds disclose inflation risks consistently throughout the sample, and with little change, until the inflation spike in 2021/2022, when more funds disclose the risk and write more focused disclosures. These patterns are consistent with our theory of "common" risks and tail events. After explaining why inflation is a common risk, we proceed to the data. Contrasting inflation disclosures between a low inflation point (2014) and a spike (2021/2022) illustrates how disclosures change when common risks are in a steady state versus experiencing a tail event. The data also show disclosure patterns between different fund types that highlight how funds update risk perceptions during tail events.

1. The Nature of Inflation Risk

Inflation—defined as "the rate of increase in prices over a given period of time"[150]—is a standard element of portfolio risk assessment and hedging.[151] Increases in inflation can cause a fund's real value (the amount a share can purchase) to decrease if the fund's nominal value (the dollar value) does not increase as quickly as inflation.[152] The possibility of inflation is embedded in the nature of money and investing. As a result, inflation risk is a common, knowable, and even probable event. Funds have enough experience with inflation to both predict changes in inflation and hedge against it.[153]

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150. Ceyda Oner, *Inflation: Prices on the Rise*, INT'L MONETARY FUND https://www.imf.org/en/Publications/fandd/issues/Series/Back-to-Basics/Inflation [https://perma.cc/YZ38-4WAT].

151. *See* James Chen*, Risk: What It Means in Investing, How to Measure and Manage It,* INVESTOPEDIA (May 25, 2023)*,* https://www.investopedia.com/terms/r/risk.asp [https://perma.cc/GLV2-GSDL] (describing risk types and how they are measured). See also this standard inflation disclosure from a domestic equity fund in 2014:

> The values of securities held by the portfolio may go up or down sometimes rapidly or unpredictably due to general market conditions, such as real or perceived adverse economic, political, or regulatory conditions, inflation changes in interest or currency rates, lack of liquidity in the bond markets or adverse investor sentiment.

Pioneer Variable Contracts Trust, Registration Statement Under the Securities Act of 1933 (Prospectus materials) 2 (Apr. 30, 2014).

152. Pioneer Variable Contracts Trust, *supra* note 151, at 19.

153. *See* John Y. Campbell, Robert J. Shiller & Luis M. Viceira, *Understanding Inflation-Indexed Bond Markets*, 2009 BROOKING PAPERS ON ECON. ACTIVITY 79, 79 (describing inflation-index bonds as "a truly riskless long-term investment").

Funds also have developed expectations about which types of assets are most vulnerable to inflation. Fixed-income assets—such as corporate or municipal bonds—provide some protection against inflation.[154] Some types of fixed-income investments, such as Treasury Inflation-Protected Securities, are even indexed to it.[155] Funds holding equities, on the other hand, reflect inflationary movement in the performance of the underlying firms.[156]

Funds' collective knowledge of and experience with inflation allows funds to predict changes in inflation better than, say, a tsunami or global pandemic. But unexpected inflationary spikes can occur. Severe unexpected inflation can constitute a tail event—an unusual and extreme occurrence. Inflation rates have jumped around quite a bit between 2010 and 2022.[157] But 2022 represents a historic event.[158] Between 2010 and 2020, inflation rates oscillated between -0.10% and approximately 3.65%.[159] In 2021, the inflation rate hit 4.2% before jumping over 8% in 2022.[160]

154. *See* Margaret Giles, *What to Invest in During High Inflation*, MORNINGSTAR (Jan. 12, 2023), https://www.morningstar.com/articles/1101595/what-to-invest-in-during-high-inflation [https://perma.cc/KKK3-KD32] ("Retirees and pre-retirees who depend on their investments for cash flows may need to seek out inflation protection in fixed-income assets.").

155. *See generally* Campbell, Shiller & Viceira, *supra* note 153 (discussing the concept of inflation-indexed markets).

156. *See* George Steer & Jaren Kerr, *US Stocks Rise as Investors Look To Inflation Data*, FIN. TIMES (Feb. 13, 2023), https://www.ft.com/content/e6c55721-0aa6-41eb-8506-0b2b618ae1b0 [https://perma.cc/77CS-HK8C] (explaining inflationary economic data).

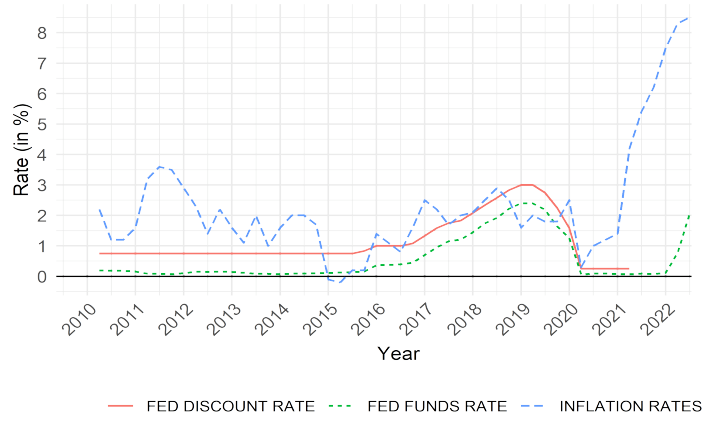
157. *See* Figure 2 (tracking inflation rates between 2010 and 2022). *Compare Inflation Data: Federal Funds Effective Rate*, FED. RSRV. BANK OF ST. LOUIS [hereinafter *FED Data 1*], https://fred.stlouisfed.org/series/DFF#0 [https://perma.cc/NF5U-M7FW] (showing the Federal Funds Effective Rate, Percent, Quarterly, Not Seasonally Adjusted), *with Interest Rate: Discount Rate for the United States*, FED. RSRV. BANK OF ST. LOUIS [hereinafter *FED Data 2*], https://fred.stlouisfed.org/series/INTDSRUSM193N#0 [https://perma.cc/2E8D-76HV] (showing the Discount Rate for United States, Percent per Annum, Quarterly, Not Seasonally Adjusted). Analysis data on file with authors.

158. *See, e.g.*, *Consumer Prices Up 9.1 Percent Over the Year Ended June 2022, Largest Increase in 40 Years*, TED: ECON. DAILY (July 18, 2022), https://www.bls.gov/opub/ted/2022/consumer-prices-up-9-1-percent-over-the-year-ended-june-2022-largest-increase-in-40-years.htm [https://perma.cc/H49T-EB8C] (documenting the historic rise in consumer prices).

159. *Compare FED Data 1*, *supra* note 157, *with FED Data 2*, *supra* note 157.

160. *Compare FED Data 1*, *supra* note 157, *with FED Data 2*, *supra* note 157.

Figure 2. Inflation Rate Changes, 2010–2022[161]



Funds' deep knowledge of inflation risks suggests that disclosures should be well tailored to the inflation risks that funds face. That is, similarly situated funds should disclose inflation risk in similar ways. In the case of a tail event, funds may learn from others with similar portfolios. But funds' prior beliefs about the risks posed by inflation mean that the effect of learning should be more muted than if funds were totally unfamiliar with the risk.[162] Past experience and knowledge, our "priors," shape our openness to new information and the weight given to it.[163] This resonates with our lived experience. In this vein, we expect to see significant differences in the way that different asset classes disclose a tail event, such as the 2022 inflation spike.

2. Communicating Inflation Risk

Aggregated mutual fund disclosures demonstrate a widespread response to the 2021/2022 inflation spike with more disclosures, discernable patterns by fund type, and content changes in disclosures adopting more specific language around inflation.[164]

161. *FED Data 1*, *supra* note 157; *FED Data 2*, *supra* note 157.

162. *See* Paula Parpart, Matt Jones & Bradley C. Love, *Heuristics as Bayesian Inference Under Extreme Priors*, 102 COGNITIVE PSYCH. 127, 128 (2018) (arguing that cognitive shortcuts can be understood as strong or extreme priors, which perform better than full information models under some conditions).

163. *Id.*

164. We did not explore if increased disclosures are explainable by fund family, which we expect has an effect on disclosure content. For example, we would expect that, if a Vanguard fund updates the inflation disclosure, *other* Vanguard funds would as well. We note this as an area of future research that is beyond the scope of this project, and being explored in Smelcer, Tucker & Xia, *supra* note 50.

a. Dynamic Inflation Disclosures

Mutual funds dynamically disclose inflation risk. Their disclosures clearly changed in response to the historic jump in inflation rates between 2021 and 2022.[165] As illustrated in Figure 1, the proportion of disclosures including some inflationary risk grew slowly but steadily between 2011 and 2020.[166] The proportion made a small but statistically significant jump from 0.216 to 0.259 ($p < 0.01$) from 2020 to 2021, with a statistically significant jump following in 2022 to 0.393 ($p < 0.01$).[167]

Comparing 2022—the year that the highest proportion of funds disclosed inflation risk[168]—to 2014 helps illustrate funds' reaction to the external shock. Inflation was sitting relatively stable at around 2% in 2014, roughly the midpoint of the low-inflation era.[169] Only 13% of all funds disclosed inflation risk in 2014.[170] The proportions of funds disclosing inflation risk jumped to 39%, a 193% increase.[171] This difference is comparatively large given overall disclosure rates and statistically significant at $p < 0.00$.

b. Inflation Experience and Disclosures by Fund Type

Funds' knowledge of, and experience with, inflation risk is reflected in variations in disclosure across fund types from 2011 to 2022. Organizations that analyze fund performance generally categorize funds into six overarching asset classes: domestic equity (DE),[172] foreign equity (FE),[173] Fixed Income (FI),[174] Index (I), Money Market (M),[175] and Other (O).[176] We see that funds understand well the inflation risks associated with their asset type and disclose accordingly.

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165. *See supra* Figure 1; *Monthly 12-Month Inflation Rate in the United States from July 2020 to July 2023*, STATISTA, https://www.statista.com/statistics/273418/unadjusted-monthly-inflation-rate-in-the-us [https://perma.cc/D5LH-2C2U].

166. *See supra* Figure 1.

167. *Id.*

168. *Id.*

169. *Id.* To identify 2014 as the midpoint year, we looked at the average inflation rates for the sample period and selected the year in the middle of the low-inflation era. Our approach captures the thinking that in the middle of the low inflation era, funds had already adapted to the low-inflation environment, and because change remained years away, funds had little reason to anticipate an increase in the near-term future.

170. *Id.*

171. *Supra* Figure 1.

172. "Domestic equity" refers to funds that primarily hold stocks from domestic (U.S.) firms. *See CRSP Style Code*, CTR. FOR RSCH. IN SEC. PRICING, https://www.crsp.org/products/documentation/crsp-style-code-0 [https://perma.cc/V7D8-5DCP] (capturing all "Sector (S)", "Cap-based (C)", "Style (Y)", and other (no Level-3 signifier) funds categorized as both "Equity (E)" (Level 1) and "Domestic (D)" (Level 2)).

173. "Foreign equity" refers to funds that primarily hold stock from foreign (non-U.S.) firms. *Id.*

174. "Fixed income" funds invest in municipal, corporate, and U.S. federal bonds. *Id.*

175. "Money Market" funds "are generally defined throughout the world as regulated funds that are restricted to holding short-term, high-quality debt instruments." INV. CO. INST., 2022 INVESTMENT COMPANY FACT BOOK: A REVIEW OF TRENDS AND ACTIVITIES IN THE INVESTMENT COMPANY INDUSTRY 5 (2022).

176. Other funds in the CRSP classification include mortgage-backed securities, currency funds, and miscellaneous strategies like alternative credit, energy MLP funds, and multi-strategy funds. *See CRSP Style Code*, *supra* note 172 (describing fund types). Funds that could not be categorized under one of the six CRSP

We expect to see differences in how different types of funds disclose inflation risks. Domestic and foreign equity funds, for example, should have different risk exposure to inflation[177] than fixed income or money market funds based on portfolio assets and strategies.[178]

This is, in fact, what we see. All fund types respond to the changing inflation landscape by increasing inflation disclosures. But funds in different classes tend to disclose inflation risk at statistically distinct rates.[179] Figure 3 displays these trends.

To sharpen the contrast, we compare inflation disclosure rates by fund type between 2014 and 2022. The proportion of funds disclosing more inflation-related risk increased across all fund types and was statistically significant at $p < 0.05$.[180]

Fund types still retain differences in the proportion of disclosure, even as all fund types increase their inflation disclosures over time. Note that similar fund types (at least concerning inflation) appear to move in tandem. For example, between 2014 and 2022, domestic and foreign equity funds jumped from a 0.07 and 0.13 respective disclosure rate to 0.34 and 0.40 respectively.[181] Fixed income and money market funds respond similarly. The proportion of fixed-income funds disclosing inflation risk jumps from 0.22 in 2014 to 0.44 in 2022; the proportion of money market funds jumps from 0.18 to 0.48 during the same period.[182]

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categories because the data was missing are labeled as "missing" and excluded from fund type analysis in all three case studies. *Id.* "Missing" CRSP classification funds, however, are included in the total data reported, for example, in Table 2. *Id.*

177. *See* IMF, *Countering the Cost-of-Living Crisis*, World Economic Outlook (Oct. 2022) (describing the global effects of inflation).

178. *CRSP Style Code*, *supra* note 172. Note that for inflation disclosure, the difference in inflation disclosure proportions between money market and fixed incomes funds was not statistically significant (p-value = 0.215), meaning these two types of funds disclosed inflation risks at similar levels. *See* discussion *supra* note 158; Valentine Romei & Alan Smith, *Global Inflation Tracker: See How Your Country Compares on Rising Prices*, FIN. TIMES (Jan. 18, 2023), https://www.ft.com/content/088d3368-bb8b-4ff3-9df7-a7680d4d81b2 [https://perma.cc/3RER-FZN9] (tracking global inflation rates). For example, funds holding primarily domestic equities may be more or less affected than funds holding foreign equities, as inflation can vary across countries and geographic areas. *Id.* This was not the case with the 2021/2022 spike but could be in future events. *Id.* The co-movement with foreign and domestic illustrates the global inflation crisis, as opposed to a purely domestic one. *Id.*

179. Fund types disclosed inflation at statistically significant, different rates across all fund types, except for the test between Money Market and FI (p-value = 0.215) and others and foreign equity (p-value = 0.085). SUSAN NAVARRO SMELCER, ANNE TUCKER & YUSEN XIA, AGGREGATED RISKS MUTUAL FUND ANALYTICAL DATA (2023) (on file with authors).

180. *See infra* Figure 3; Table 2.

181. *See infra* Figure 3; Table 2.

182. *See infra* Figure 3; Table 2.

Figure 3. Inflation Risk Disclosure by Asset Class, 2011–2022[183]

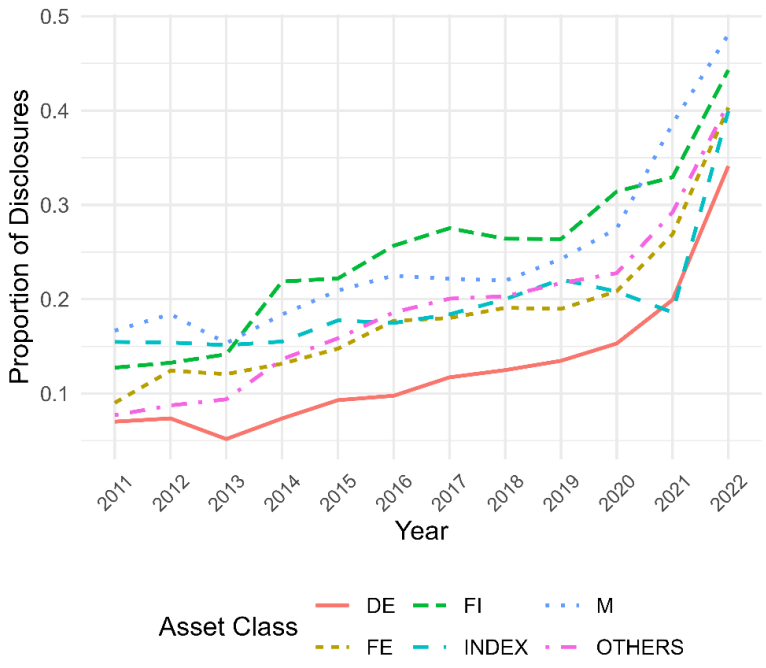


Table 2. Inflation Disclosures 2014 vs. 2022, Totals and Proportions[184]

Year	Totals	DE	FE	FI	Index	M	Other
2014	1646	232	183	179	224	173	303
	0.134	0.074	0.132	0.219	0.155	0.184	0.136
2022	4484	818	423	299	761	325	696
	0.393	0.341	0.403	0.443	0.400	0.481	0.408

But funds' response to the 2022 inflation spike cannot be fully explained by asset class. Overall, the proportion of all funds disclosing inflation risk increased by 25 percentage points between 2014 and 2022.[185] Each fund type experienced a similar increase in disclosure. This absolute change ranged from 22.4 percentage points (FI) to 29.7 percentage points (Other).[186] The range of *relative* increase in inflation disclosure by fund type, on the other hand, was much larger. Inflation disclosure rates doubled in some cases (FI, 102% increase) and more than quadrupled in others (DE, 361% increase).[187]

183. SMELCER, TUCKER & XIA, *supra* note 179.
184. Note that Table 1 excludes disclosures that could not be categorized.
185. *See supra* Figure 3; Table 2.
186. *See supra* Figure 3; Table 2.
187. *See supra* Figure 3; Table 2.

In other words, inflation disclosure rates experienced a similar jump from 2014 to 2022—regardless of where the fund type started. This disparity is consistent with the possibility that funds observe how others interpret risk and update their own beliefs accordingly. As the inflation crisis deepened in 2022, inflation discussions increased. Funds had an opportunity to observe the market reaction to inflation and read each other's disclosures, thus updating inflation risks.

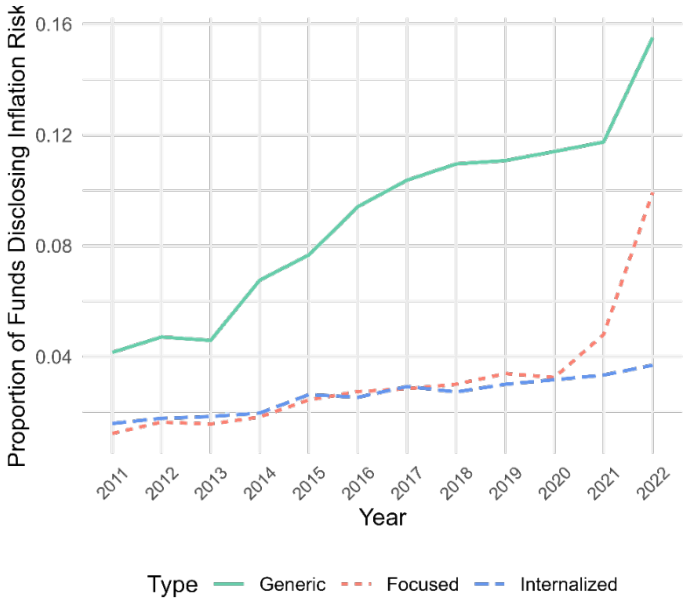
c. Describing Inflation Risk

Our aggregate analysis also indicates that funds responded to the 2022 spike by including more focused—and more informative—discussions of risk. Such focused discussions, by definition, provide more context and information about the relationship between risk and fund performance. In other words, funds were more likely to talk about inflation risk as an independent source of risk—rather than a type of risk particular to an asset class or as a component of a broader market risk. Figure 4 displays changes in the nature of funds' disclosure of inflation risk over time.

We sorted inflation-risk-related language into three categories: generic, focused, and internalized statements of risk. *Generic* statements of inflation risk acknowledge inflation as a component of a broader set of risks, such as general "Market Risk" or "Currency Risk." *Focused* disclosures, on the other hand, provide discussions of inflation risk as a stand-alone risk category. This type of disclosure gives the most complete explanation of inflation risks. Finally, *internalized* risk disclosures reference an inflation-linked investment. Internalized risk disclosures are specific to an investment strategy and describe the ways in which the fund has accounted for or hedged against particular known risks to a defined set of investments. These statements are less of a reflection of external, systemic risks and more tied to the investment strategy, or idiosyncratic risks.[188]

188. *See supra* note 28 and accompanying text.

Figure 4. Type of Inflation Risk Disclosure over Time, 2011–2022[189]



Inflation-risk discussions across the three categories generally increase over time—although this trend is not monotonic.[190] Just as the inflation rate fluctuated during this period, so too did funds' focused discussions of inflation risk. Between 2011 and 2021, a higher proportion of funds included generic inflation risk disclosures—meaning that funds discussed inflation risk as a component of a broader market risk.

But funds' attention clearly shifted to inflation risk during the 2022 spike. Funds that previously disclosed inflation risk as an internalized (strategy-related) risk or as an element of a broader risk (i.e., a generic risk) released more focused inflation risk disclosures. This suggests that funds recognized the primacy of inflation risk to fund performance and responded accordingly. One Transamerica fund, for example, included inflation only as part of a longer list of potential horribles in 2021, including "real or perceived adverse economic or political conditions, tariffs and trade disruptions, inflation, changes in interest rates, lack of liquidity in the bond markets, [and] adverse investor sentiment."[191] After the 2022 spike, Transamerica included a primary discussion of inflation risk: "[t]he value of assets or income from investment may be worth less in the future as inflation decreases the value of money."[192]

189. SMELCER, TUCKER & XIA, *supra* note 179.

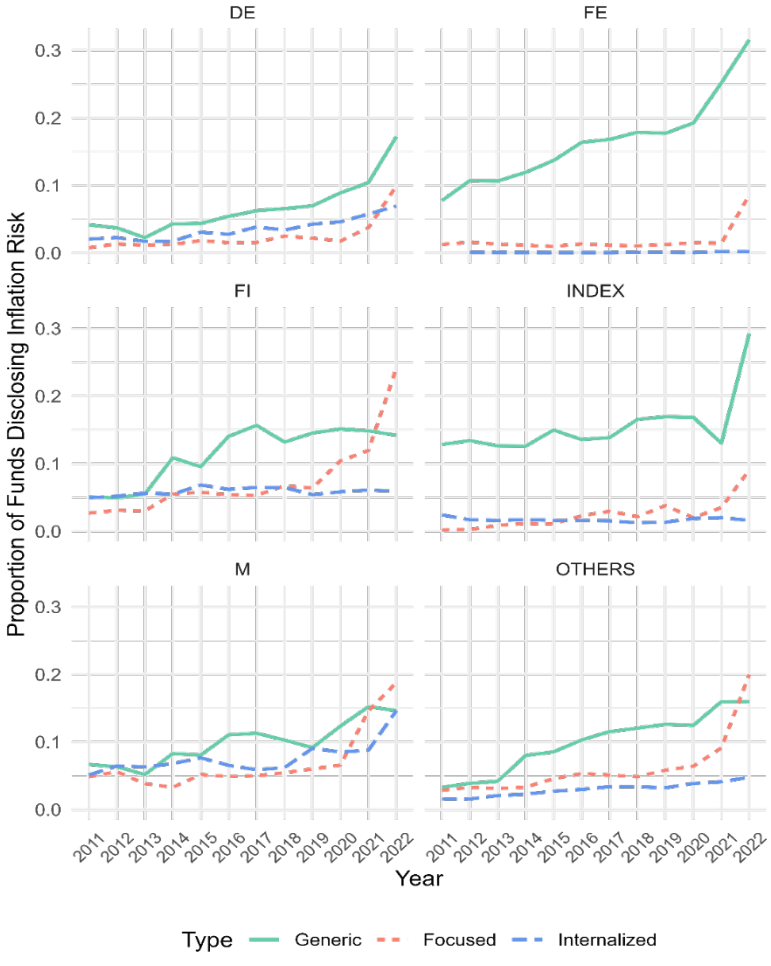
190. *See supra* Figure 4. "Monotonic" describes a relationship between two variables where an increase in one is generally associated with an increase in the other.

191. Transamerica Government Money Market, Summary Prospectus (Form 497K) 3 (Feb. 28, 2021).

192. Transamerica Asset Allocation—Moderate Growth Portfolio, Summary Prospectus (Form 497K) 5 (Mar. 11, 2022).

We observe this uptick in funds' language across fund types. Figure 5 displays time trends for generic, focused, and internalized inflation-risk disclosures by fund type. While internalized and generic inflation risk disclosure patterns vary, the proportion of funds making focused inflation disclosures jumped sharply from 2021 to 2022 across all classes.[193] The extreme materialization of inflation risk produced noticeable increases in the proportion of funds disclosing inflation risk and the specificity of the discussion.

Figure 5. Inflation Risk Disclosure by Asset Class, 2011–2022[194]



193. *See infra* Figure 5.
194. SMELCER, TUCKER & XIA, *supra* note 179.

As part of these disclosures, many funds noted the possibility that the U.S. Federal Reserve would act to curb inflation and identified potential negative effects on the fund's value. Of the 67 addressing potential Fed action, 64 (95.5%) of these discussions occurred in 2022 disclosures.[195] For example, one fund cautioned investors in spring 2022 that "[t]he U.S. Federal Reserve is anticipated to raise interest rates beginning in 2022, in part to address an increase in the annual inflation rate in the U.S."[196]

C. Disclosing Uncertainty: Public Health

In contrast to the risk of inflation (generally common and manageable), public health risks illustrate uncertainties. Funds have less experience with public health crises (at least prior to COVID-19) and lack the ability to gauge and plan for the risk. Aggregated public health disclosures are neither random nor uniform. Rather, we see intuitive patterns in the data, but these patterns differ from inflation risks. Before 2020, few funds disclosed public health as a principal risk, and those that did mostly used tepid, boilerplate language. COVID-19's onset—a tail event—changed how many funds disclosed and how they described public health risks. After the peak of the pandemic, funds updated their understanding of public health risks with fewer COVID-19-specific disclosures but more attention to public health generally as an investment risk. Before turning to the data, we briefly describe public health risks as uncertainties.

1. The Nature of Public Health Uncertainty

Public health events—those severe enough to disrupt markets—introduce uncertainties and lack of familiarity.[197] This stands in contrast to the residual risk of inflation,[198] where spikes occur with some frequency.[199]

Our lived experience with the COVID-19 global pandemic and our unpreparedness for the breadth of the crisis illustrates the inherent uncertainty and the potential severity of a tail event, which created an unimaginable loss of life and economic disruption.[200] Figure 6, which displays the age-standardized death rate per 100,000 standard population due to communicable, maternal, perinatal, and nutritional factors,[201] shows just how unusual COVID-19 was. Globally, the age-adjusted mortality rates have generally fallen since

195. *Id.* The remaining four discussed possible Fed action in 2022 but were filed in 2021. *Id.*

196. Am. Beacon Funds, Prospectus Materials (Form N-1A) 5 (Feb. 28, 2022).

197. Some public health events, such as a particularly severe seasonal flu, are common or even routine and therefore manageable. *See Influenza (Flu)*, CTRS. FOR DISEASE CONTROL & PREVENTION (Aug. 26, 2021), https://www.cdc.gov/flu/professionals/acip/background-epidemiology.htm [https://perma.cc/3V8H-H5AS] (discussing the severity and nature of influenza).

198. Further, inflation directly affects the value of money, whereas a severe public health emergency affects investment values because it poses a dramatic threat to society at large.

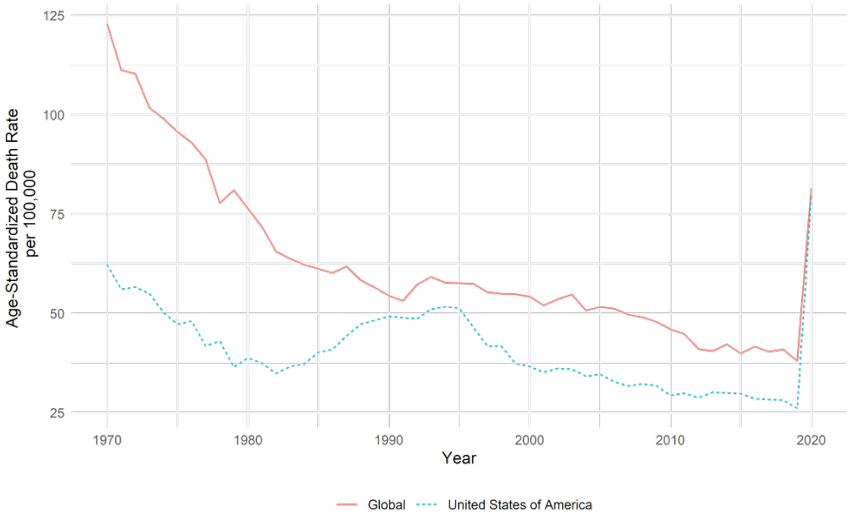
199. Cecilia Rouse, Jeffery Zhang & Ernie Tedeschi, *Historical Parallels to Today's Inflationary Episode*, WHITE HOUSE (July 6, 2022), https://www.whitehouse.gov/cea/written-materials/2021/07/06/historical-parallels-to-todays-inflationary-episode [https://perma.cc/PV45-WQ9A].

200. *See* Smelcer, Tucker & Xia, *supra* note 21, at 799–801.

201. *WHO Mortality Database*, WORLD HEALTH ORGANIZATION [WHO] https://platform.who.int/mortality [https://perma.cc/EN4P-GQ56].

1970.[202] COVID-19 represents a sharp break from the gently negative slope of both global and U.S. age-adjusted death rates since 1995.

Figure 6. Age-Standardized Death Rate per 100,000, 1970–2020[203]



COVID-19 transformed what had previously been common and manageable risks of seasonal flu or contained epidemics into something both rare and severe. The uncommon nature of public health crises also means that funds did not come to the crisis with strong public health priors. Funds had weak information about health risks before COVID-19, and then, like all of us, funds had to learn in real time and in conjunction with one another. The updating process should spur uniformity in terms of what funds disclose as funds learn together. But as the crisis wanes, disclosures should become more fractured in content and frequency, like what we see with inflation, and distinguishable by different fund types.

2. Communicating Public Health Uncertainties

Aggregating mutual fund public health risk statements shows the dynamic nature of disclosures. Between 2011 and 2022, the proportion of funds disclosing public health risk skyrockets across all classes.[204] Funds also update their disclosure language, swapping boilerplate for specific warnings during the pandemic but then relaxing the frequency and intensity of the warnings as the crisis begins to fade.

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202. In the United States specifically, age-adjusted deaths increased in the late 1980s and early 1990s due to the AIDS epidemic. *Current Trends Mortality Attributable to HIV Infection/AIDS—United States, 1981–1990*, 40 MMWR WKLY. 41, CTRS. FOR DISEASE CONTROL & PREVENTION (Jan. 25, 1991), https://www.cdc.gov/mmwr/preview/mmwrhtml/00001880.htm [https://perma.cc/2UT7-Q8AN].

203. SMELCER, TUCKER & XIA, *supra* note 179.

204. *See infra* Figure 7.

a. Dynamic Public Health Disclosures

Describing the uncertain is difficult. This is reflected by the scant public health disclosures prior to 2020—only 2.3% of all funds disclosed public health risks.[205] With less knowledge and understanding of the range of adverse outcomes comes fewer disclosures.

The uncommon nature of public health crises also means that funds have no consistent way to update their beliefs or learn about potentially bad public health outcomes. With little updating or learning, there is little change until a tail event—such as COVID-19—occurs. We see this in the data. Few funds changed their public health disclosure (or lack thereof) before 2019.[206] The relative stability of public health disclosures, pre-2019, contrasts with the year-to-year movement of inflation disclosures.[207]

The severity of the COVID-19 crisis provoked swift and steep changes in the public health disclosure rate. As shown in Figure 7, public health disclosures jumped to 49.6% in 2020 and then to 61.8% in 2021.[208]

Funds' responses to the public health risk changes varied by fund type.[209] When pooled across the period of study, different fund types disclosed public health risks at often statistically distinguishable rates.[210] But not always. For example, domestic and foreign equity funds respond to public health risks similarly, but domestic and foreign equity have statistically insignificant differences compared with fixed income funds.[211] This may be due to the fact that, in some ways, public health events posed more uniform threats across asset classes than inflation.

Despite some statistically significant differences in fund type, we see common responses to the economic shocks caused by COVID-19. We observe—contrary to inflation disclosure patterns—funds' public health disclosure rates remained relatively stable between 2011 and 2019.[212] In 2020, however, the proportion of funds disclosing public health risks converged following the onset of the global pandemic. By 2022, however, we again observe stratification in public health risk disclosure by fund type.[213] This is consistent with the theory that funds update their disclosures, in part, by learning from other funds—just as we observed with inflation disclosures.

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205. Disclosure rates varied between 1.6% and 6.3%—smaller than funds' inflation-risk disclosure rates. *Id.*

206. Prior to the COVID-19 pandemic's onset in 2019, funds' public health disclosure rate increased by 50.005 per year. *Id.* The average increase in inflation disclosure rates (0.011) was double. *Id.* This difference in year-over-year change is statistically significant using a two-tailed t-test with unequal variance: $t = -2.2113 - 9.438, p - value << 0.01$. *Id.*

207. *See infra* Figure 7.

208. *See supra* Figure 1.

209. *See infra* Figure 7.

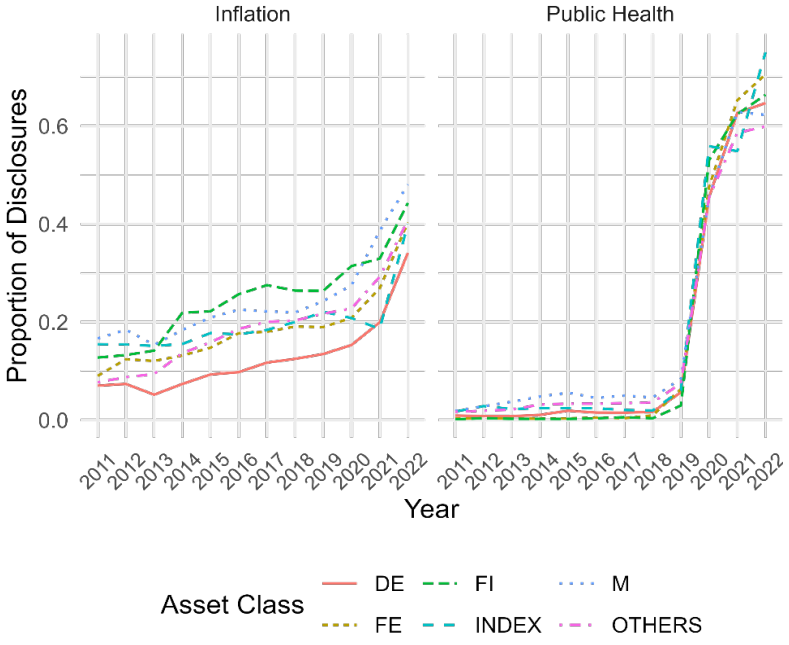
210. For example, the difference in means between domestic equity and index, others, and money market funds is statistically significant at the p <0.005 or higher level.

211. In t-test, the difference in means between domestic equity and fixed income is *p-value* = 0.750, and the p-value for the difference in means between foreign equity and fixed income is 0.572.

212. *See infra* Figure 7.

213. *Id.*

Figure 7. Inflation and Public Health Disclosures by Asset Class, 2011–2022[214]



b. Describing Public Health Risks

Aggregating disclosure *content* reveals a more nuanced story about funds' perception of public health events. Disclosure content, like frequency, demonstrates meaningful changes over time.[215] Funds' disclosures become more specific as funds' knowledge of and experience with public health events grows following the onset of COVID-19.

We explore these changes over time by categorizing funds' disclosure of public health uncertainties as generic, focused, and internalized—as we did with inflation risk disclosure. We add an additional category—*COVID-19-specific*—which captures the subset of focused disclosures specifically discussing the COVID-19 pandemic. We did not find any *internalized* risk disclosures in response to the COVID-19 crisis. In other words, funds did not disclose language describing how funds have hedged against COVID-19-related risk.[216]

214. SMELCER, TUCKER & XIA, *supra* note 179.

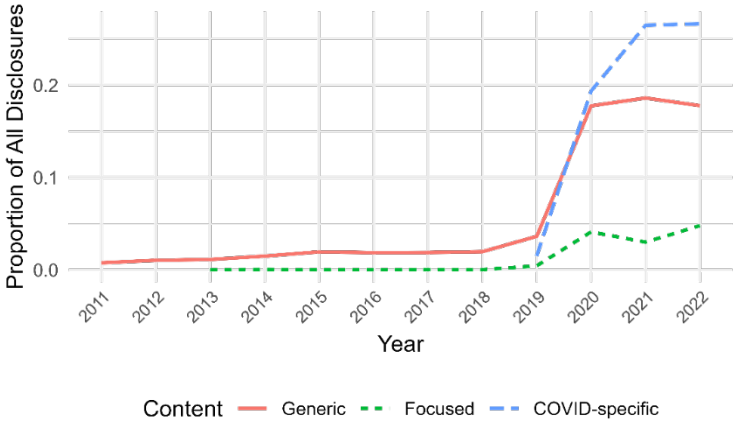
215. *See infra* Figure 8.

216. We define internalized risk disclosures narrowly in the public health context. We conceptualize internalized risk disclosures as investments that hedge against COVID-19 specifically. We did not find any specific investments designed to hedge against the dangers posed by COVID-19 in our review of public health-related risk disclosures. Note that our definitional boundaries exclude more broadly conceived of health care investment funds.

COVID-19, a tail event, created a shock that produced much more specific public health language and more variety among funds. Funds disclosed COVID-19-related risk resulting from a variety of sources, including "quarantines and travel restrictions, workforce displacement and loss in human and other resources"[217] and disruption due to less established supply chains in emerging markets,[218] to name a few.

Before 2020, the small pool of funds discussing public health events mostly made statements with almost no detail about the nature of the public health uncertainty.[219] We categorize these boilerplate recitations as *generic* disclosures. One disclosure, for example, listed "disease" as a potential risk as one of many other factors including "weather, agricultural production, disease, pestilence, technological developments, changes in interest rates, and domestic and foreign political and economic events and policies, including trade, fiscal, monetary and currency exchange policies."[220] In 2022, generic statements shrunk to around 35% of pubic heath disclosures, making way for more Focused statements of public health risk, including COVID-19-Specific risks. Taken together, Focused and COVID-19-Specific health disclosures comprise almost 65% of all public-health disclosures in 2022.[221]

Figure 8. Content as a Proportion of Total Disclosures, 2011–2022[222]



217. Wanger Advisors Trust, Prospectus Materials (Form N-1A) 4 (Apr. 29, 2020).

218. Cohen & Steers Real Assets Fund, Inc., Summary Prospectus (Form 497K) 10 (Apr. 29, 2020).

219. Prior to COVID-19, a few funds disclosed a wider range of public health risks in a more detailed statement that public health factors may lower the value of the fund. For example, one 2014 disclosure referenced the possibility of "a serious health crisis due to high rates of Human Immunodeficiency Virus (HIV)." SPDR Index Shares Funds, Prospectus Materials (Form N-1A) 27 (June 24, 2014). Another fund disclosed in 2018 that the profitability of the healthcare companies in which the fund invested "may be subject to risks related to severe cold and flu seasons, epidemics, or any other widespread illnesses." Pacer Funds Trust, Prospectus Materials (Form N-1A) 25 (Apr. 20, 2018).

220. Calvert VP Volatility Managed Growth Portfolio, Summary Prospectus (Form 497K) 4–5 (Apr. 27, 2017).

221. *See infra* Table 3. This 65% estimate comes from adding COVID-19 and Focused labels together.

222. SMELCER, TUCKER & XIA, *supra* note 179.

Table 3. Content as a Percentage of all Public Health Disclosures, 2011–2022[223]

Year	Total PH Disclosures	Generic	Focused	COVID-19-Specific
2011	175	175 100.00%	0 0.00%	0 0.00%
2012	220	219 99.55%	1 0.45%	0 0.00%
2013	226	224 99.12%	2 0.88%	0 0.00%
2014	250	240 96.00%	9 3.60%	1 0.40%
2015	288	286 99.30%	2 0.70%	0 0.00%
2016	268	266 99.25%	2 0.75%	0 0.00%
2017	268	264 98.50%	4 1.50%	0 0.00%
2018	270	266 98.52%	4 1.49%	0 0.00%
2019	785	491 62.55%	57 7.28%	237 30.20%
2020	5984	2554 42.69%	587 9.81%	2843 47.51%
2021	7608	2887 37.95%	482 6.34%	4239 55.71%
2022	7712	2757 35.75%	732 9.50%	3039 54.75%

COVID-19 caused a dramatic shift in the content of public health disclosures. Nearly half of the disclosures made in 2020 included specific references to COVID-19, the terms "epidemic" or "pandemic," or other key terminology.[224] For example, one 2021 disclosure noted that "[t]he ongoing COVID-19 outbreak and future pandemics could affect the global

223. SMELCER, TUCKER & XIA, *supra* note 179.

224. *See* SMELCER, TUCKER & XIA, *supra* note 135 (explaining the authors' keyword classification).

economy and markets in ways that cannot be foreseen and may exacerbate other types of risks [negatively impacting the value of fund investments]."[225]

Funds' 2022 disclosures suggest that funds have begun to update their overall understanding of public health risks. The rate at which funds COVID-19-specific language decreased slightly from 55.7% in 2021 to 54.8% in 2022.[226] At the same time, *focused* disclosures increased from 6.3% to 9.5%.[227] In other words, the shock of the tail event has begun to fade into a more common and manageable risk.

These disclosure patterns are also consistent with the idea that funds learn about the risk and how to frame it from each other. For example, funds use common phrases to describe public health risks. In 2021, over 2305 disclosures described COVID-19 as "novel," originating from 1726 unique funds representing over 146 different fund families.[228]

D. Disclosing Uncertainty Becoming Risk: Climate Change

Climate change, our third example, sits somewhere between inflation's common risk and public health's past uncertainty. Climate change-related events and impacts, once categorized as tail events, are becoming more predictable as a threat to investments.[229] Turning to the data, we see that funds increased climate change disclosures over time, with more accelerated growth since 2019. Unlike with inflation and public health, we do not have a clear, single external event to explain the growth. Investment funds are changing how climate change risks are described. Issues such as sea level change are now considered investment risks and climate change risks are discussed in increasing depth. We conclude this part by observing a general evolution in climate change disclosures over time. We highlight how funds have replaced generic statements relating to weather with focused discussions of the risk posed to the funds' investments by climate change and internalized statements of investment products designed to mitigate climate change risk.

1. The Nature of Climate Change Uncertainty and Risk

Inflation and public health disclosures allow us to examine not only how funds disclose underlying risk and uncertainty, but also how they respond to tail events. Climate change tells us something different. Funds must disclose extreme weather events that are increasingly frequent and severe—as opposed to rare and severe. We, as a society, have much more experience with once-rare climate change-related events than we did 40 or 50 years ago. As a result, what was once climate change uncertainty is slowly taking on the features of risk.

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225. Thrivent Balanced Income Plus Fund, Summary Prospectus (Form 497K) (Feb. 28, 2022).

226. *See supra* Table 3.

227. *Id.*

228. For another example of learned language, consider this introduction (or a close cousin) of it: "the value of commodities related investments may be affected by changes in overall market movements." It was used by 33 funds representing 6 different fund families. SMELCER, TUCKER & XIA, *supra* note 179.

229. *See supra* notes 205–07 and accompanying text.

Ordinary weather events are within the common experience. Legal documents have incorporated weather as a risk dating back to Roman law, where a tenant would not have to pay rent if crops were destroyed by events outside of the tenant's control, such as floods or insects.[230] The Roman concept of *vis major*,[231] became adopted as "Acts of God" in English civil law, and encompassed floods, storms, fire, earthquakes, and the like.[232]

The perception of weather events has been slowly morphed from a predictably unpredictable event—with the occasional 500-year flood or historically large hurricane—to a series of what once would be considered tail events.[233] Beginning in the 1970s, the scientific community introduced global warming and its potentially adverse environmental effects.[234] This scientific debate branched out over the ensuing 50 years, embedding the risk far beyond the original discussion scope.[235] For example, in 2011, the International Finance Corporation (IFC) published its first report on strategic asset allocation and risks from climate change[236] and issued a follow-up report in 2015.[237] Both asserted that climate change poses real risks to investment portfolios in unqualified terms.[238] The 2015 report categorized the investment risks as those stemming from (a) physical impact on investments because of severe weather events, (b) technological developments of the low-carbon/clean energy sectors, (c) new and chronic weather patterns that decrease resources (like fresh water), and (d) regulatory risks as governments respond to climate change.[239]

Extreme weather events have also become more costly over the past 40 years. Figure 9 displays the number of severe weather events causing over $1 billion in damage from 1980 through 2022 in CPI-adjusted dollars.[240] These events have increased dramatically over time—a trend that appears to have increased exponentially since 2000.[241] Severe storms and tropical cyclones have driven much of this increase.[242] Three major hurricanes,

230. Hermann Loimer, Mag Driur & Michael Guarnieri*, Accidents and Acts of God: A History of the Terms*, 86 AM. J. PUB. HEALTH 101, 104 (1996).

231. This Latin phrase means "superior force." *Vis Major*, BLACK'S LAW DICTIONARY (11th ed. 2019).

232. Loimer, Druir & Guarnieri, *supra* note 230, at 104.

233. Adil Mohommad and Evgenia Pugacheva, *Impact of COVID-19 on Attitudes to Climate Change and Support for Climate Policies*, (Int'l Monetary Fund [IMF], Working Paper, Paper No. 22/23, 2022), https://www.imf.org/-/media/Files/Publications/WP/2022/English/wpiea2022023-print-pdf.ashx [https://perma.cc/VYK4-MZZH].

234. Emily Chasan & Jennifer Rossa, *When "Global Warming" Became "Climate Change,"* BLOOMBERG (Mar. 15, 2016), https://www.bloomberg.com/news/articles/2016-03-15/climate-change-replaces-global-warming-as-preferred-term-for-a-changing-world [https://perma.cc/753E-SEPW].

235. *Id*. (discussing a May 2014 Yale University study finding that scientists now prefer the phrase 'climate change' and discussing Google search trends).

236. *See* MERCER, CLIMATE CHANGE SCENARIOS—IMPLICATIONS FOR STRATEGIC ASSET ALLOCATION 1 (2011) (stating that climate change is a "widely acknowledged" risk to financial markets and asset allocation).

237. MERCER, INVESTING IN A TIME OF CLIMATE CHANGE (2015), https://www.actuarialpost.co.uk/downloads/cat_1/MERCER%20ClimateChangeReport%202015.pdf [https://perma.cc/3WSA-3HTR].

238. MERCER, *supra* note 236, at 1; MERCER, *supra* note 237, at 27.

239. MERCER, *supra* note 237, at 27.

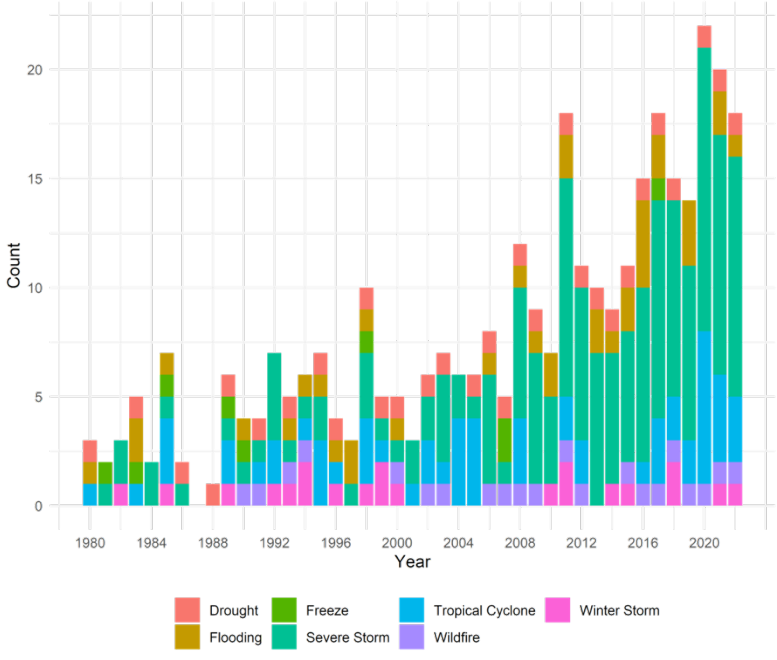
240. *See infra* Figure 9.

241. *Id.*

242. *Id.*

a variety of tornado outbreaks, and severe storms caused a marked jump in severe weather events in 2020.[243]

Figure 9. Weather Events Causing Over $1BN in Damage (CPI-Adjusted), 1980–2022[244]



The general public is somewhat less certain about the existence of anthropogenic climate change, despite both scientific consensus and the reality of increasingly frequent severe weather events. Figure 10 plots the "percentage of Americans who believe Earth's temperature 'has probably been increasing' over the past 100 years."[245] Between 1997 and 2006, 85% of Americans believed that global temperatures were increasing.[246] This proportion dropped to a low of 69% in 2012 before inching back up to 81% in 2020.[247] We see traces of that fractured perception, unlike the undeniable reality of COVID-19, in the data with the gradually sloping disclosure counts in Figure 1.

243. *U.S. Billion-Dollar Weather and Climate Disasters*, NAT'L CTRS. FOR ENV'T INFO., NAT'L OCEANIC & ATMOSPHERIC ADMIN. (2023), https://www.ncei.noaa.gov/access/billions [https://perma.cc/3AVL-M7KY]. Hurricanes Delta (October 2020), Laura (August 2020), and Hanna (July 2020) alone caused an estimated $31.2 billion in damage. *Id.*

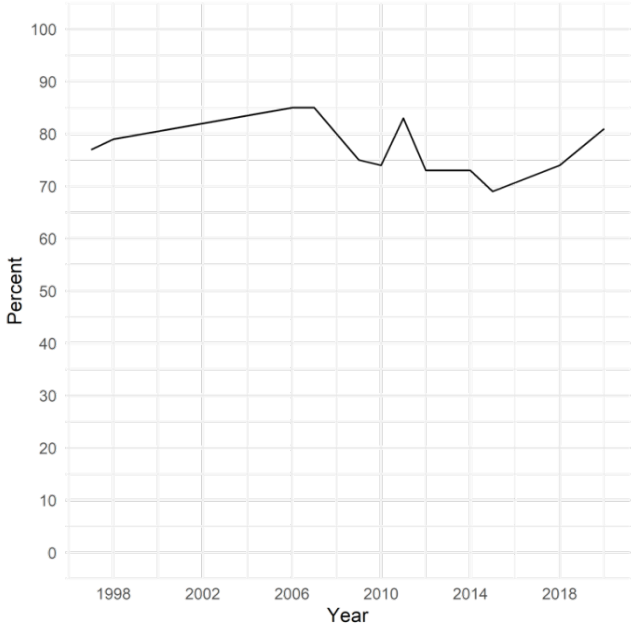
244. *Id.*

245. JON A. KROSNICK & BO MACINNIS, RES. FOR THE FUTURE, CLIMATE INSIGHTS 2020: SURVEYING AMERICAN PUBLIC OPINION ON CLIMATE CHANGE AND THE ENVIRONMENT 1, 6 (2020).

246. *Id.*

247. *Id.*

Figure 10. Percentage of Americans Who Believe Earth's Temperature "Has Probably Been Increasing" Over the Past 100 Years[248]



2. Communicating Climate Change Uncertainty and Risk

Aggregated climate change disclosure data shows funds' increased awareness and perception of climate change risks to investments. Climate change risk disclosures evolve from bland boilerplate to specific statements of climate risk, to specific investment products.

a. Dynamic Climate Change Disclosures

Climate change disclosures resemble inflation and public health disclosures in some important ways. In particular, climate change disclosures appear to be related to asset type.[249] Different fund types disclose climate change risk at statistically distinct rates for the most part.[250] But no particular fund type universally discloses (or fails to disclose) climate change risk.[251]

248. *Id.*

249. *See, e.g.*, Thrivent Mut. Funds: Class A Shares Prospectus (Form N-1A) (Feb. 26, 2021) ("The securities markets may also decline because of factors that affect a particular industry or market sector or due to impacts from . . . natural disasters, or similar events.").

250. All differences in means between fund types were statistically significant at the $p < 0.001$ except for differences between Other and Money Market funds ($p = 0.085$) and Money Market and Fixed Income funds ($p = 0.215$). *See infra* Figure 11.

251. *See infra* Figure 11.

Notably, funds' disclosures spiked in 2020—regardless of fund type. This increase may simply reflect the widespread damage wrought by severe tropical cyclones and severe storms in 2020.[252] 2020 may also reflect a type of social tipping point[253] that bleeds over into fund policy and disclosure content—driven not only by severe weather events[254] but also dire warnings by the IPCC,[255] widely publicized climate action protests,[256] and record temperature highs.[257] Other experts frame COVID-19 as a "focusing event" that "dislodged the status quo."[258] Authors of a 2022 study, reporting survey data of 14,500 individuals across 16 major economies, found that 43% of respondents said they were more worried about climate change after the pandemic.[259] Lockdown policies and the resulting dramatic emissions reductions may have tightened the causal link between human activity and climate change.[260] Whatever the cause of the updating, funds collectively changed their risk perception about climate change.

252. *See supra* Part III.D.1 and accompanying Figure 9 (depicting the frequency of expensive weather events).

253. For a discussion of social tipping points, see generally Sirkku Juhola et al., *Social Tipping Points and Adaptation Limits in the Context of Systemic Risk: Concepts, Models and Governance*, FRONTIERS CLIMATE: CLIMATE RISK MGMT., Sept. 12, 2022, at 1.

254. *See New Timeline of Deadliest California Wildfire Could Guide Lifesaving Research and Action*, NIST (Feb. 8, 2021), https://www.nist.gov/news-events/news/2021/02/new-timeline-deadliest-california-wildfire-could-guide-lifesaving-research [https://perma.cc/8ZFG-4SPS] (describing the 2018 Camp Fire as the "costliest disaster worldwide in 2018" and "the deadliest and most destructive wildfire in California's history" when it occurred).

255. *See Global Warming of 1.5° C: Special Report*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2018), https://www.ipcc.ch/sr15 [https://perma.cc/D7NR-XPK3] (containing links to a larger report warning about the consequences of various global warming metrics and advising for various remedial actions).

256. Vanora Bennett, *2019, the Year the World Woke Up to Climate Change*, EUR. BANK (Nov. 27, 2022), https://www.ebrd.com/news/2019/2019-the-year-the-world-woke-up-to-climate-change.html [https://perma.cc/D3YZ-7JQ8].

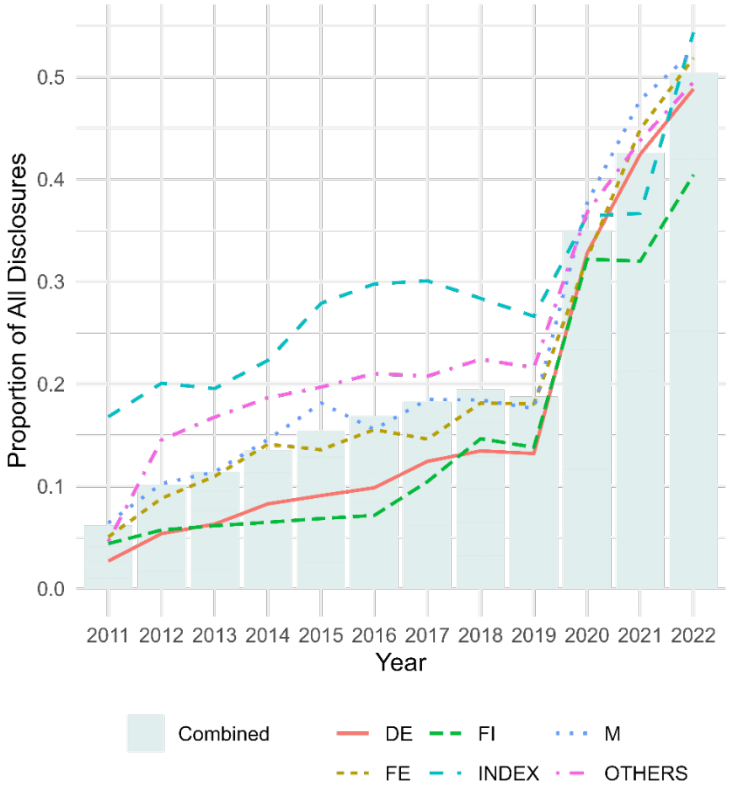
257. *State of the Climate in 2019*, 101 BULL. AM. METEOROLOGICAL SOC'Y, Aug. 1, 2020, at S1, S49 (reporting "record highs in the South (30.6%) and Southwest (38.0%) climate regions").

258. Mohommad & Pugacheva, *supra* note 233, at 6.

259. *Id*.

260. Carol Rasmussen, *Emission Reductions from Pandemic Had Unexpected Effects on Atmosphere*, NASA (Nov. 9, 2021), https://climate.nasa.gov/news/3129/emission-reductions-from-pandemic-had-unexpected-effects-on-atmosphere/#:~:text=The%20COVID%2D19%20pandemic%20and,take%20regulations%20years%20to%20achieve [https://perma.cc/QP5P-R5PP] ("The COVID-19 pandemic and resulting limitations on travel and other economic sectors by countries around the globe drastically decreased air pollution and greenhouse gas emissions within just a few weeks. That sudden change gave scientists an unprecedented view of results that would take regulations years to achieve."); *see also* Abdullah Kaviani Rad et al., *The COVID-19 Crisis and Its Consequences for Global Warming and Climate Change*, *in* COMPUTERS IN EARTH AND ENVIRONMENTAL SCIENCES 377, 378 (1st ed. 2021) (providing evidence of the COVID-19 crisis effects on "air pollution, global warming, climate change, and a transition to a low-carbon economy").

Figure 11. Climate Change Disclosures as a Proportion of All Disclosures, 2011–2022[261]



b. Describing Climate Change Risks to Investments

Changes in disclosure specificity and language also reveal funds' updated risk assessments. As above, we categorize risk discussions into three categories: generic, focused, and internalized. *Generic* climate change disclosures, like generic inflation and public health disclosures, list weather or climate change related risk as one of many. Thrivent Mutual Fund's disclosure for its Balanced Income Plus Fund (2022) provides an exemplar: "The securities markets may also decline because of factors that affect a particular industry or market sector, or due to impacts from domestic or global events, including the spread of infectious illness, public health threats, war, terrorism, natural disasters or similar events."[262]

261. SMELCER, TUCKER & XIA, *supra* note 179.

262. Thrivent Mut. Funds, Summary Prospectus (Form 497K) 2 (Feb. 28, 2021). Another example of generic disclosure language is as follows:

Funds' *focused* disclosures, on the other hand, provide the context missing from generic disclosures. These types of disclosures connect the external risk to the fund's investment. Here, focused disclosures detail how climate change and climate-related events may impact the value of the fund. Take, for example, this focused disclosure by American Beacon Funds:

> Certain issuers, industries, and regions may be adversely affected by the impacts of climate change, including on the demand for and the development of goods and services and related production costs, and the impacts of legislation, regulation and international accords related to climate change, as well as any indirect consequences of regulation or business trends driven by climate change.[263]

Finally, funds may disclose *internalized* risks. Internalized climate change risk may reflect investment in industries designed to ameliorate climate change's effects or risks associated with an investment strategy limiting investment to certain types of environmentally friendly companies. PowerShares MENA Frontier Countries Portfolio's 2011 clean energy risk disclosure provides an example:

> Further, the clean energy industry can be significantly affected by intense competition and legislation resulting in more strict government regulations and enforcement policies and specific expenditures for cleanup efforts and can be subject to risks associated with hazardous materials.[264]

Generic disclosures are the most common—an unsurprising finding. But such disclosures increased dramatically between 2011 and 2022—from 3.59% to 41.1% (371 to 4695).[265] This increase is especially stark between 2019 and 2020 when the percentage of funds issuing generic disclosures jumped from 13.3% to 29.8% (1716 to 3592).[266] Note that the number of billion-dollar events also markedly increased between 2019 and 2020, from 14 to 24—the second-largest year-to-year increase in such events between 1980 and 2022.[267]

Focused risk statements—the second-most common type of disclosure—also increased over this period.[268] But this increase was far less dramatic than the emergence of new generic language. The percentage of disclosures including focused climate change risk

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> The value of the Fund's investments may go up or down due to general market conditions that are not specifically related to the particular issuer, such as real or perceived adverse economic conditions, changes in the general outlook for revenues or corporate earnings, changes in interest or currency rates, regional or global instability, natural or environmental disasters, widespread disease or other public health issues, war, acts of terrorism or adverse investor sentiment generally.

AIM Sector Funds (Invesco Sector Funds), Prospectus Materials (Form N-1A) 2 (Aug. 26, 2021).

263. Am. Beacon Fund, Prospectus Materials (Form N-1A) 6 (Feb. 28, 2022).

264. PowerShares Exch.—Traded Fund Trust II, Prospectus (Form 497) 63–64 (Mar. 3, 2010).

265. *See supra* Figure 11.

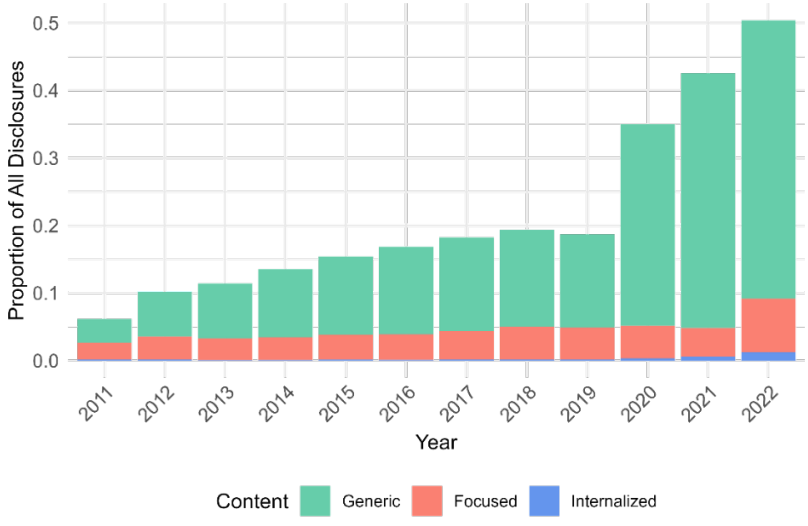
266. *See id.*

267. *See supra* Figure 9.

268. *See infra* Figure 12.

statements increased from 2.13% to 13.49% (227 to 1538) between 2011 and 2022.[269] The most dramatic increase in focused disclosures occurred between 2021 and 2022—lagging the increase in generic language.[270]

Figure 12. Depth of Climate Change Related Discussions, 2011–2022[271]



Internalized risk statements are the least common type of climate change disclosure.[272] Note, however, that these statements have been noticeably increasing over time—from less than 2.07% (220) in 2011 to 4.25% (485) in 2022.[273]

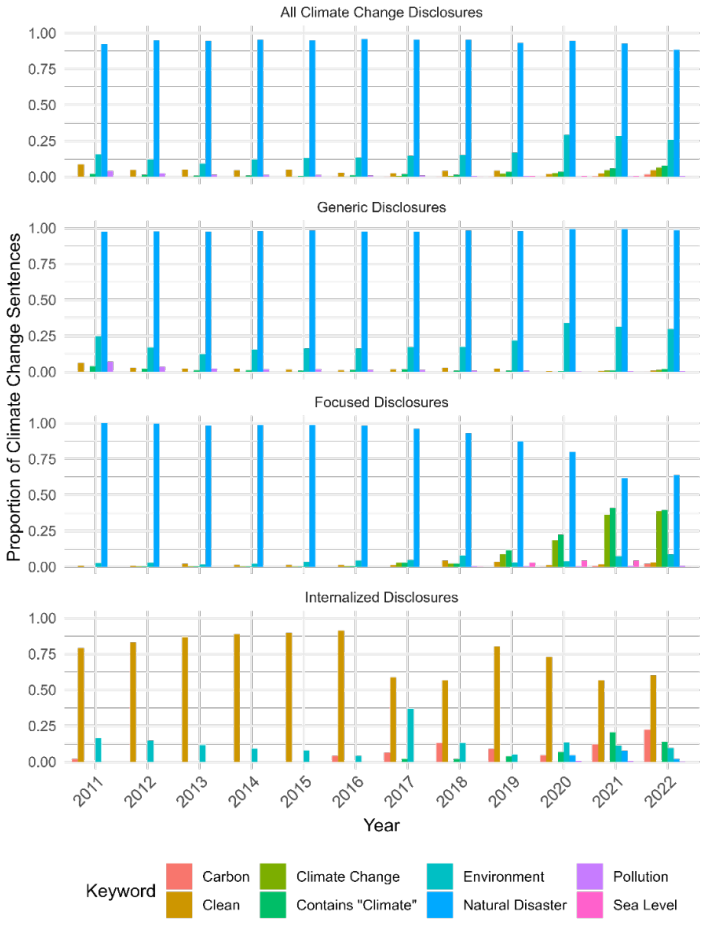
These increases in frequency are accompanied by increasing diversity in the content. Figure 13 displays the proportion of disclosure sentences mentioning climate change, and related concepts and keywords for each disclosure type. Natural disaster discussions dominate generic and focused disclosures.[274] Internalized disclosures, on the other hand, are dominated by discussions of "clean" energy and technology.[275]

Funds disclose a wider variety of climate-related risks, as the previously "tail" events become more common.[276] This is true for all disclosure types. Generic discussions began to encompass not just "natural disaster"—a term perhaps more focused on weather events—but also "environmental" concerns and risks.[277] This more diverse language suggests a broader view of underlying environmental risks.

269. *Id.*
270. *Id.*
271. SMELCER, TUCKER & XIA, *supra* note 179.
272. *See supra* Figure 12.
273. *Id.*
274. *See infra* Figure 13.
275. *Id.*
276. *Id.*
277. *Id.*

Funds also reduced reliance on "natural disaster" language in focused disclosures between 2011 and 2022.[278] Instead, funds began to devote their more specific discussions of risk to a variety of issues, such as "environmental" concerns, "climate change" specifically, and even sea level rise.[279] Notably, this expansion in focused topics occurs around 2019—when overall disclosure frequency also jumps—but before the most significant increase in focused disclosures in 2022.[280] Funds diversified their discussions of focused risk *before* they significantly increased the number of focused disclosures.[281] In other words, the diversity in content is not purely a result of an increase in frequency.

Figure 13. Climate Change Disclosure Keywords by Disclosure Type, 2011–2022[282]



278. *Id.*
279. *See infra* Figure 13.
280. *Id.*
281. *Id.*
282. SMELCER, TUCKER & XIA, *supra* note 179.

We observe a similar diversification of internalized risks over time. Internalized disclosures are dominated by discussions of "clean" energy and technology—but to a lesser extent than generic or focused disclosures that are dominated by "natural disaster."[283] Over time, funds discuss a broader cross-section of topics, including "carbon"-related technologies, "environmental" concerns, and even some consideration of "pollution."[284] Like generic and focused disclosures, funds' internalized risk evolves and matures over time.

E. The Lifecycle of Risk and Uncertainty Through the Lens of Disclosure

The patterns we observe across inflation, public health, and climate change disclosures suggest a distinct pattern in the way that funds conceptualize, operationalize, and communicate probabilistic events that reduce the value of the fund. These events begin as uncertainties. Funds lack the knowledge and experience to assess the full set of negative outcomes, much less their probability. After funds gain some experience, they are better able to conceptualize a fuller universe of possible negative events and even guess probabilities. Finally, as funds gain greater experience with the risk, they begin to devise (and describe) investment strategies to mitigate the now-known risk.

These three "easy" cases for dynamic disclosure provide good examples of how funds' perception of risk evolve across these three stages. The emergence and dominance of generic disclosures appear to be the first phase in the emergence of new risks. These undifferentiated uncertainties take the form of generic disclosures.[285] For example, as funds became more aware of climate change, they began to include it in disclosure statements by tacking general warnings about "natural disasters" onto a laundry list of catastrophic outcomes.[286] Public health disclosures also primarily took the form of generic disclosures prior to COVID-19.[287] Such disclosures identify the risk but fail to provide insight about the nature of the link between the negative external event (i.e., severe storms, disease, etc.) and the funds' investments.[288]

As funds gain more knowledge of and experience with a risk, funds are better able to conceptualize and operationalize this risk in their disclosures. Funds' ability to define and contextualize risks more fully characterizes the second stage of risk evolution. This second stage is reflected in funds' focused discussions of risk—the second-most frequently occurring type of disclosure across the three case studies.[289] The specificity provided in focused disclosures acts as a proxy for risk perception and understanding.

Focused climate change disclosures illustrate this change in risk perception. One fund might limit its expression of climate change risk to a generic statement about the harm of

283. *See supra* Figure 13.

284. *Id.*

285. *Generic* disclosures merely list it among a range of other unrelated risks, like pandemics. This label is similar to the generic disclosures discussed in the inflation and public health data.

286. *See supra* Figure 13.

287. *Id.*

288. *See, e.g.*, Jeremy McClane, *Boilerplate and the Impact of Disclosure in Securities Dealmaking*, 72 VAND. L. REV. 191, 193 (2019) (discussing boilerplate disclosures in SEC filings).

289. *See supra* Figure 1.

"natural disasters." But funds that perceive more adverse climate change-related outcomes are more likely to disclose a standalone statement of natural disaster, extreme weather, or warming climate risks.[290] Such focused disclosures often frame the risk with language such as the following:

> A natural disaster could occur in a geographic region in which the Fund or an Underlying Fund invests, which could adversely affect the economy or the business operations of companies in the specific geographic region, causing an adverse impact on the Fund's investments in, or which are exposed to, the affected region.[291]

Finally, internalized risk disclosures— the least common type of disclosure across all cases—reflect what we think of as the third stage in the evolution of risk disclosures. At this point, funds have some historical precedent for understanding the evolving risk. The risk has emerged as a market opportunity—alternative energy, and emerging technologies tailored to address climate change or investment strategies tailored to ameliorate the inflation risk associated with particular types of assets. For example, funds ameliorate the effects of the climate change risk by hedging against the risk and investing in industries to combat it (or creating new funds invested in that sector).[292]

These three risk case studies demonstrate that mutual fund disclosures change in response to external events, influencing the number of disclosures, the language, and the depth of discussion. Experience with and information about a risk updates a fund's perception of the risk and, eventually, the disclosure. Aggregated disclosures do what no single fund's filing can do—provide a holistic view of funds' changing risk perceptions.

CONCLUSION

Mutual fund data from 2011 through 2022 reveals how risk disclosures change in response to three real-world events: inflation, public health, and climate change. Funds actively incorporate new information about market risks and update their beliefs about the importance of different types of risk. Funds signal those updated beliefs in the frequency, language, and detail of risk disclosures.

We find that, while the content of any one disclosure may not be particularly informative (e.g., "[t]he value of assets or income from investment may be worth less in the future as inflation decreases the value of money"),[293] the *collective* behavior of funds is. Funds' aggregate response to the inflation spike, for example, reflects the severity of the tail event—even if much of the information contained in each individual disclosure borders on banal. Similarly, the breadth and specificity of public health disclosures during the pandemic signal the severity of public health risks to investments. As the pandemic

290. *See supra* Figure 13.

291. iShares Trust, Summary Prospectus (Form 497K) S-6 (Mar. 1, 2021).

292. For a discussion of the recent growth in climate-focused funds, see Hortense Bioy, *Investing in Times of Climate Change 2023*, MORNINGSTAR (May 2, 2023), https://www.morningstar.com/funds/investing-times-climate-change-2023 [https://perma.cc/7P55-3PYP].

293. Pioneer Equity Income Fund, Prospectus Materials (Form N-1A) 19 (Feb. 25, 2022).

waned, funds remained alert to potential public health risks opting for specific risk statements as opposed to pre-pandemic boilerplate. Climate change disclosures also increased in frequency and specificity, with clear language changes over time.

We also find similar evolutionary patterns of disclosures across our three disparate case studies. As new risks emerge or old ones evolve, language is added. This language often lacks context or any meaningful discussion linking the risk to the fund's performance. Such *generic* catch-all statements may be sparse, unchanging, and reflect uncertainty more than a known risk. For example, funds that produced generic or boilerplate descriptions of inflation risk tended to include statements that inflation was a general market risk without linking the nature of the risk to the funds' investments. Generic statements add little in the way of new information about risk perceptions, but merely reflect what is already known—natural disasters or diseases *may* occur, and inflation is a typical market risk.

As funds increase their awareness of the threat by exposure, knowledge, or an unignorable shock to a common risk, funds disclose the risk more frequently and with greater specificity in *focused* statements. More focused statements suggest that the former uncertainty has moved into the realm of a known risk, as seen with COVID-19 and climate change disclosure patterns. With inflation, more focused disclosures coincided with the arrival of the tail event—an inflation spike. Someone may know that inflation is spiking, the climate is changing, or that we are living through a pandemic without reading fund prospectuses, but they may not appreciate the link between external events and their retirements or funds' perceptions of these risks. Here, focused fund disclosures provide the link connecting external events to investment returns. Funds communicate, for example, how COVID-19 can negatively affect investments through disrupted supply chains or how inflation may reduce returns.

Over time, known and common risks become internalized and hedged against fostering financial and market innovation, like new investment products built around climate risk or inflation-adjusted products. These patterns exist even in the face of distinct disclosure rates across fund types.

These data, taken as a whole, allow us to observe the information signals embedded in aggregated disclosure text. Mutual fund disclosures are especially ripe for this kind of aggregated analysis. Disclosures are the primary source for funds' qualitative risk assessments—this information does not exist elsewhere. The risks that funds face are not static but evolving. As discussed above, we see that disclosures move in response to external events, providing a window into how funds identify, evaluate, and incorporate a given risk.

Funds also draft disclosures under a regulatory regime that incentivizes funds to do more than "check-the-box" compliance. Funds must craft a list of risks that pose the greatest threats to fund performance and describe these risks under the specter of litigation and agency enforcement threats. The SEC also requires funds to regularly update their understanding of relevant risks. As a result, funds must exercise judgment in describing these risks. This judgment reveals itself in the observed diversity of disclosure language, which ranges from detailed, stand-alone statements to the most generic boilerplate laundry lists. Aggregated changes in disclosure language over time provide new information about the severity and perceptions of market-wide risk.

Finally, aggregating funds' broad investment strategies provides a bird's-eye view of markets and risks. Taken in the aggregate, mutual funds are sophisticated investors that are able to "see" both idiosyncratic and systemic risk in ways that no single fund can alone. This approach also allows us to see beyond fund type to gain a better and more holistic understanding of evolving risk perceptions. Future research could sharpen our understanding of evolving risk perceptions and the role of narrative disclosures. For example, examining the sequencing of risks (i.e., which risks are listed at the top versus the bottom of a disclosure), whether investment strategy sections also change in response to external events, and the relationship between evolving risk statements and fund flows would deepen the insights to be gleaned from aggregated disclosures.

Our findings have potentially broad implications for regulators, retirement plan administrators, and researchers. For example, analyzing aggregated risk disclosures can provide a framework for SEC evaluation and enforcement of its principles-based disclosure requirements. How can any single examiner know what risks are principal to a given mutual fund? They can't with certainty, but data on disclosure reporting frequency and specificity could frame and contextualize the judgment call. Aggregated disclosure data may also anchor claims that a fund omitted a material risk or defend against it.

As individuals, we may not monitor our investment accounts as diligently as we ought to. But retirement plan administrators do. In fact, plan administrators serve as ERISA fiduciaries who face personal liability for breaches of duty.[294] They select investments to be included in plan menus—a curated selection of funds—from which employees select their individual retirement portfolios.[295] ERISA Plan administrators have the resources and incentives to do what individuals do not: carefully and painstakingly weighing fund information.[296] A recent spate of successful retirement plan litigation and the resulting increased scrutiny of plans have only increased these incentives.[297] Aggregated risk data may inform administrators' own assessments of risk. A plan administrator would be able to weigh climate change considerations or inflation more easily when approaching the

294. Employee Retirement Income Security Act of 1974 (ERISA), Pub. L. 93-406, 88 Stat. 829, (codified as amended in part at 29 U.S.C. ch. 18); *see also* Hughes v. Nw. Univ., 142 S. Ct. 737, 742 (2022) (reversing the Seventh Circuit's grant of an ERISA plan administrator breach of fiduciary duty claim motion to dismiss).

295. *See* VANGUARD, *supra* note 11, at 22–24 (describing fund selection for plan menus and the link to employee selection); *Hughes*, 142 S. Ct. at 738 ("[P]lans are defined-contribution plans governed by the Employee Retirement Income Security Act of 1974 (ERISA), under which each participant chooses an individual investment mix from a menu of options selected by the plan administrators.").

296. *See* VANGUARD, *supra* note 11, at 42 (describing best practices for fund selection in retirement plans); *Retirement Plan Fiduciary Responsibility*, IRS (June 5, 2023), https://www.irs.gov/retirement-plans/retirement-plan-fiduciary-responsibilities [https://perma.cc/78QD-QLBV] (describing professional services for plan administrators).

297. Tibble v. Edison Int'l, 575 U.S. 523, 531 (2015) (remanding a case on the issue of the statute of limitations application to a breach of fiduciary duty claim); *Hughes*, 142 S. Ct. at 742 (remanding the breach of fiduciary duty case on the merits); Vellali v. Yale Univ., No. 16-cv-1345, 2022 WL 13684612, at *24 (D. Conn. Oct. 21, 2022) (granting in part and denying in part defendant's motion for summary judgment on the merits of a fiduciary duty claim); *see also Duke 403(b) Plan Settlement*, DUKE UNIV., https://duke403bsettlement.com [https://perma.cc/NX58-GSGM]; *Columbia 403(b) Plans Settlement*, COLUM. UNIV., https://columbia403bplansettlement.com [https://perma.cc/6KZ3-G5SE]. For a recently approved settlement, see generally Complaint, Brookins v. Ne. Univ., 22-cv-11053 (D. Conn. June 30, 2022).

problem as one of deviation from the mean. Aggregated risk data may also help decide between comparable fund choices. A quantitative analysis of disclosures, for example, may provide insight on whether funds of interest reflect the administrators' risk calculus when benchmarked against broader disclosure trends.[298]

Finally, there is growing attention on the operation, regulation, and implications of mutual funds—seemingly sleeping giants that have reshaped traditional notions of corporate governance and our modern investment landscape. This is particularly true in law and finance,[299] and warranted considering that that over 115 million individual investors own mutual funds, often to save for important life events such as retirement and education savings for children.[300]

298. The authors are not plan administrators but have discussed the plan selection process and the use of data in guiding decisions with current plan fiduciaries.

299. Finance scholarship includes Linlin Ma, Yeuhua Tang & Juan-Pedro Gómez, *Portfolio Manager Compensation in the U.S. Mutual Fund Industry*, 74 J. FINANCE 587, 591 (2019) (testing managerial incentives effects on fund performance empirically); Vikas Agarwal et al., *Mandatory Portfolio Disclosure, Stock Liquidity, and Mutual Fund Performance*, 70 J. FINANCE, 2733–76 (2015) (testing mandatory portfolio disclosure on stock liquidity and fund performance empirically); K.J. Martijn Cremers, Jon A. Fulkerson & Timothy B. Riley, *Challenging the Conventional Wisdom on Active Management: A Review of the Past 20 Years of Academic Literature on Actively Managed Mutual Funds*, 75 FIN. ANALYSTS J., no. 4, 2019, at 8 (reviewing literature on the active versus passive debate). An incomplete list of recent legal scholarship includes John Morley, *Why Do Investment Funds Have Special Securities Regulation?*, *in* RESEARCH HANDBOOK ON THE REGULATION OF MUTUAL FUNDS 9, 17–20 (William Birdthistle & John Morley eds., 2018) (asserting the distinction between investment company and operating company regulation because of the role of fund organization); Henry T.C. Hu & John D. Morley, *A Regulatory Framework for Exchange-Traded Funds*, 91 S. CAL. L. REV. 839 (2018) (reviewing current investment company regulation and proposing regulations specific to ETFs).

300. INV. CO. INST., *supra* note 15, at 34 (reporting 2022 figures).