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BROWN ASSETS FOR THE PRUDENT INVESTOR

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Abstract

Most commentary on climate-themed investment treats climate change as a one-way risk to brown assets from a hoped-for transition to a low-carbon economy. But the converse holds as well. Brown assets could turn out to be highly valuable if the world fails to transition out of the high-carbon economy. This is true both because sentiment for green assets may cause brown assets to be underpriced (generating higher expected returns) and because brown assets may provide a valuable hedge against the costs of climate change in a world that failed to transition to a low-carbon economy. Given the lack of progress to date toward transition to a low-carbon economy, we argue that institutional investors subject to fiduciary duties of prudent investment (including the duty to diversify) cannot yet justify divestment from brown assets.

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Introduction

On September 9, 2021, Harvard University President Larry Bacow announced that Harvard's endowment would no longer make "direct investments in companies that explore for or develop further reserves of fossil fuels."[2] President Bacow stated that Harvard does not believe such investments are "prudent."[3] Instead, Harvard's endowment manager "is building a portfolio of investments in funds that support the transition to a green economy."[4]

Harvard's decision is in line with much current thinking about the implications of climate change for investment decisions. BlackRock's[5] Larry Fink has argued for investments in "companies with a well-articulated long-term strategy, and a clear plan to address the transition to net zero."[6] The premise behind such arguments is simple: efforts to mitigate the harmful effects of climate change will push the economy away from one with high-carbon intensity to one with low-carbon intensity, which in turn will reward investors in low-carbon ("green") assets and punish investors in high-carbon ("brown") assets. By investing in green assets and divesting from brown assets, investors can reach the best of all goals: doing well by doing good.

But what if this premise is wrong? What if efforts to mitigate the harmful effects of climate change are inadequate to push the economy away from its high-carbon state to a low-carbon state? While an unpopular thing to say, the possibility that the world will fail to contain climate change is not remote. Climate change is real,[7] but a move to a low-carbon economy is mostly absent on anything like the scale needed. Optimism about a future transition to a low-carbon economy[8] rests on two assumptions. First is the assumption that as-yet-unavailable breakthrough technologies will render fossil fuels uneconomic. Second is the assumption that nations will cooperate to implement and enforce carbon mitigation efforts.[9] Both assumptions are far from the current reality. Neither may occur in the future. As to the first, as-yet-unavailable breakthrough technologies may never materialize. The most important green technologies are, so

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[2] Letter from Larry Bacow, President, Harvard Univ., Climate Change: Update on Harvard Action (Sept. 9, 2021), https://www.harvard.edu/president/news/2021/climate-change-update-on-harvard-action/.

[3] *Id*.

[4] *Id*.

[5] BlackRock is the world's largest asset manager. *See* Dawn Lim, *BlackRock Closes In on the Once Unthinkable, $10 Trillion in Assets*, WALL ST. J. (July 14, 2021), https://on.wsj.com/3IswhJQ (reporting BlackRock's assets under management of $9.5 trillion, "cementing its dominance as the world's largest money manager").

[6] Letter from Larry Fink, Chairman and Chief Exec. Officer, Blackrock, Inc., to CEOs (2021), https://www.blackrock.com/corporate/investor-relations/2021-larry-fink-ceo-letter.

[7] We recognize that views differ. Our analysis is applicable to the range of views across commentators. Several recent books present different views of climate science and what it may imply about the future. *See, e.g.*, STEVEN E. KOONIN, UNSETTLED? WHAT CLIMATE SCIENCE TELLS US, WHAT IT DOESN'T, AND WHY IT MATTERS (2021); MICHAEL E. MANN, THE NEW CLIMATE WAR: THE FIGHT TO TAKE BACK OUR PLANET (2021); BILL GATES, HOW TO AVOID A CLIMATE DISASTER: THE SOLUTIONS WE HAVE AND THE BREAKTHROUGHS WE NEED (2021); DAVID WALLACE-WELLS, THE UNINHABITABLE EARTH: LIFE AFTER WARMING (2019).

[8] As one example of optimism in commentary, consider Howard Covington & Raj Thamotheram, *How Should Investors Manage Climate-Change Risk?*, 7 ROTMAN INT'L J. PENSION MGMT. 42, 43 (2014) ("Given appropriate and moderate policy nudges and continuing economic and social stability, it is overwhelmingly likely that the global economy will substantially decarbonize during this century.").

[9] *See* Morgan Bazillian et al., *How the Energy Transition Will Reshape Geopolitics*, 569 NATURE 29, 31 (2019) (discussing the dependence of climate scenarios on political action or inaction, as well as technological advances).

far, difficult to scale and some are highly dependent on relatively scarce minerals or uncertain future engineering advances.[10] As to the second, the costs of a low-carbon transition to the largest carbon producers (China, the United States, India, and Russia)[11] are extremely high,[12] calling into question whether they will bear those costs.[13] To date, little international cooperation has occurred beyond unenforceable pledges to do better by distant dates.[14] International cooperation on the level needed to address climate change is also unprecedented in all of human history. It is unlikely that nations will delink cooperation on climate from areas where their

[10] One issue is the inability to scale battery technology without advances that reduce the need for lithium-ion batteries. *See, e.g.*, Robert F. Service, *Zinc Aims to Beat Lithium Batteries at Storing Energy*, 372 SCIENCE 890, 890 (2021) ("[L]ithium, a relatively rare metal that's only mined in a handful of countries, is too scarce and expensive to back up the world's utility grids."); Matthew Li & Jun Lu, *Cobalt in Lithium-ion Batteries*, 367 SCIENCE 979, 979 (2020) (discussing the use of cobalt in lithium-ion batteries and observing that "[c]ompared to the other transition metals, cobalt is less abundant and more expensive and also presents political and ethical issues because of the way it is mined in Africa"). Many technological challenges also exist with the use of wind energy. *See, e.g.*, Paul Veers et al., *Grand Challenges in the Science of Wind Energy*, 366 SCIENCE 1, 1 (2019) ("Moreover, as deployment of variable-output wind and solar generation infrastructure increases, new challenges surface related to the adequacy of generation capacity on a long term basis and short-term balancing of the systems—both of which are critical to maintaining future grid system stability and reliability."). Hydrogen—a potential source of clean energy—also faces large technological hurdles. *See*, *e.g.*, Hiroko Tabuchi, *For Many, Hydrogen Is the Fuel of the Future. New Research Raises Doubts*, N.Y. TIMES (Aug. 12, 2021), https://nyti.ms/3fKVGSJ; Vanessa Dezem, *Why Hydrogen is the Hottest Thing in Green Energy*, BLOOMBERG (June 18, 2021), https://bloom.bg/33Gfzry (discussing the technological hurdles).

[11] At the national level, four nations—China, USA, India, and Russia—accounted for a majority of worldwide carbon emissions in 2019. *Carbon Emissions Data*, *in* BLOOMBERG TERMINAL (Bloomberg Professional Services, accessed June 24, 2021). An excellent source describing 2018 emissions at the national level is Jeff Tollefson, *The Hard Truths of Climate Change – by the Numbers*, 573 NATURE 324 (2019).

[12] A recent analysis by researchers at BloombergNEF estimates that "[g]overnments and companies will need to invest at least $92 trillion by 2050 in order to cut emissions fast enough to prevent the worst effects of climate change." Will Mathis, *Greening Energy to Fight Climate Threat May Cost $92 Trillion*, BLOOMBERG (July 21, 2021), https://bloom.bg/3nLS9rK. A recent study estimated that it would cost China about 3–6% of its gross domestic product to reach the targets in the Paris Agreement. *See* Hongbo Duan et al., *Assessing China's Efforts to Pursue the 1.5°C Warming Limit*, 372 SCIENCE 378, 378 (2021). India, a top three carbon producer by total emissions (though not on a per capita basis) has recently pulled back from engaging on climate change within existing frameworks. *See* Jess Shankleman et al., *India Ditches Key Climate Meeting After Disrupting G-20*, BLOOMBERG (July 27, 2021), https://bloom.bg/3KD7e8w (reporting on India's decision not to attend United Nations talks on climate commitments).

[13] *See* Jeffrey J. Rachlinski, *The Psychology of Global Climate Change*, 2000 U. ILL. L. REV. 299, 303 (2000) ("[E]ven if a consensus emerges that the problem requires costly solutions, other psychological phenomena suggest that people will still be unwilling to undertake such solutions. People become attached to their current level of prosperity; they feel entitled to what they have, which makes any solution that requires significant cutbacks in the economic status quo unacceptable."). Twenty years after its publication, Professor Rachlinski's statement remains persuasive.

[14] *See, e.g.*, William Nordhaus, *Projections and Uncertainties About Climate Change in an Era of Minimal Climate Policies*, 10 AM. ECON. J.: ECON. POL'Y 333, 333 (2018) ("Up to now, nations have adopted minimal policies to slow climate change. Moreover, there has been no major improvement in emissions trends as of the latest data."). There is no shortage of pledges, which are in a boom. *See, e.g.*, Nathaniel Bullard, *The Corporate Climate Pledges Are as High as an Elephant's Eye*, BLOOMBERG (July 8, 2021), https://bloom.bg/3nRvJoK (reporting on the number of companies issuing climate pledges).

national interests conflict.[15] These uncertainties require us to confront an obvious possibility: climate mitigation efforts may fail, including the hoped-for transition to a low-carbon economy.

This Article cautions institutional investors to give attention to this unpopular possibility. Institutional investors are not paid to be excessively optimistic; most are paid to make investment decisions that deliver increases in wealth at a chosen level of risk. If the world fails to contain climate change, it may be brown assets—those that contribute most to carbon emissions, such as fossil fuel exploration and production companies—that continue to have high returns. While climate-themed investment strategies treat climate change as a one-way influence on brown assets that generates "risks to cash flows arising from a possible transition to a low-carbon economy,"[16] that viewpoint ignores the converse possibility. If green assets—renewable energy companies and those that make products dependent on renewable energy—will thrive in a successful low-carbon transition, brown assets may continue to thrive if that hoped-for transition fails. When the authors of one review write that "coal companies are more exposed to transition risks,"[17] they leave unsaid the fact that if the transition fails, those coal companies may do quite well, better, possibly, than green companies.

This possibility is not mere speculation. In the calendar year from January 1, 2021 to December 31, 2021, the energy sector of the S&P 500 Index outperformed the rest of the S&P 500 by more than two-to-one in terms of average return.[18] The average return to firms in the energy sector was 64.8%, while the average return to firms outside that sector was 28.7%.[19] For firms in the broader Russell 3000 Index over the same time period, firms in the energy sector outperformed the rest of the index by more than two-to-one in terms of average return.[20] The average return to firms in the energy sector was 74.4%, while the return to firms outside that sector was 25.5%.[21] The average return to the coal and consumable fuels subindustry of the energy sector was even higher, with an average one-year return of 139.9%.[22] A headline on

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[15] *See, e.g.*, Sha Hua, *John Kerry Seeks China's Climate Cooperation, Gets an Earful on Fraying Ties*, WALL ST. J. (Sept. 2, 2021), https://on.wsj.com/33VzPVU (describing China's requirement to link cooperation on climate mitigation with all aspects of the U.S.-China relationship).

[16] Stefano Giglio et al., *Climate Finance*, 13 ANN. REV. FIN. ECONS. 15, 17 (2021); *see also* Philipp Krueger et al., *The Importance of Climate Risks for Institutional Investors*, 33 REV. FIN. STUD. 1067, 1067–68 (2020) ("Climate risks have potentially large effects on investors' portfolio companies. Some companies face direct costs related to changes in the climate, originating from extreme weather events or a general rise in sea levels. Examples include insurance companies' exposures to higher losses from insured properties in coastal areas and food producers' exposures to sustained drought spells. Other companies can be negatively affected from policies and regulations implemented to combat climate change. Fossil fuel firms, for instance, can be adversely affected by carbon pricing or limits on carbon emissions. Technological innovations related to climate change also threaten the business models of some portfolio firms that operate in traditional industries. For example, electric or fuel-cell-powered vehicles could disrupt traditional car manufacturers. These risks to portfolio companies, which can broadly be categorized into physical, regulatory, and technological climate risks, have the potential to adversely affect the outcomes for many investment management clients, pension beneficiaries, and shareholders of institutional investors. At the same time, climate change also provides investment opportunities for the portfolio companies and their institutional investors, for instance, in the areas of renewable energy or energy storage.").

[17] Giglio et al., *supra* note 16.

[18] S&P 500 INDEX (S&P Dow Jones Indices, June 2021) (data on file with authors).

[19] *Id.*

[20] RUSSELL 3000 INDEX (FTSE Russell, June 2021) (data on file with authors).

[21] *Id.*

[22] *Id.*

September 20, 2021 from Dow Jones Newswires was telling: *Coal Shares Surge But Many Investors Must Just Watch*.[23]

Given the possibility that the world may fail to transition to a low-carbon economy, financial economics has a simple directive for prudent investors: do not shun investment in brown assets, since those assets may have high returns if the transition to a low-carbon economy fails. Brown assets are unpopular because they contribute disproportionately to climate change,[24] but institutional investor fiduciaries may not avoid brown assets for that reason. To the contrary, institutional investor fiduciaries can avoid investment in brown assets only if they reasonably believe that doing so will deliver better risk-return profiles to their beneficiaries and that belief is the motive for avoiding brown assets.[25]

We explain here why most institutional investor fiduciaries cannot clear this hurdle. We start in Part I by stating the obvious: a low-carbon economy is a possible scenario for the future, but only one possibility among several. Roughly speaking, we characterize the future as having either a low-carbon economy or a high-carbon economy, and, in each of those two scenarios, either green assets outperform brown assets or brown assets outperform green assets.

In Part II, we use a simple model to explain how the return performance of green and brown assets can depend on whether the future brings a low-carbon economy or a high-carbon economy. Our model points out why green assets can earn higher expected returns than brown assets so long as (rational or irrational) green sentiment—a preference for green assets because they are not brown assets—does not drive the price of green assets up too much. But brown assets do not have lower expected returns because they might be stranded. To the contrary, and consistent with basic financial theory, brown assets can have lower expected returns than green assets because brown assets are a hedge against aspects of the bad, high-carbon state. Green assets are like riskier, high-beta stocks in the Capital Asset Pricing Model ("CAPM") and brown assets are like less risky, low-beta stocks. If there is considerable green sentiment,[26] then the expected returns of green assets can fall below brown assets. This can result in poor future

[23] Dan Molinski, DOW JONES INST. NEWS (Sept. 20, 2021) (on file with authors) ("Coal demand is surging, as is its price and coal-company shares. But many investors are being forced to just watch from the sidelines because of green-investing bylaws.").

[24] Of course, they do so only in response to consumer demand. As the United States Court of Appeals for the Second Circuit recently observed, "every single person who uses gas and electricity—whether in travelling by bus, cab, Uber, or jitney, or in receiving home deliveries via FedEx, Amazon, or UPS—contributes to global warming . . . ." City of N.Y. v. Chevron Corp., 993 F.3d 81, 86 (2d Cir. 2021).

[25] *See* Max M. Schanzenbach & Robert H. Sitkoff, *Reconciling Fiduciary Duty and Social Conscience: The Law and Economics of ESG Investing by a Trustee*, 72 STAN. L. REV. 381, 385–86 (2020) (ESG "investing is permissible for a trustee of a pension, charity, or trust subject to American trust fiduciary law if: (1) the trustee reasonably concludes that the ESG investment program will benefit the beneficiary directly by improving risk-adjusted return; and (2) the trustee's exclusive motive for adopting the ESG investment program is to obtain this direct benefit."); *see also* Bernard S. Sharfman, *ESG Investing Under ERISA*, 38 YALE J. ON REG. ONLINE BULL. 112, 114 (2020) ("Risk-return ESG, on the other hand, focuses only on using ESG factors as a means of optimizing the financial analysis of an investment and does not conflict with the fiduciary duties of ERISA plan managers."). We focus on the United States, but similar concerns have been expressed in other countries, including Japan. *See* Leo Lewis, *Ex-chair of world's biggest pension fund sounds caution on ESG*, FIN. TIMES (July 22, 2021), https://on.ft.com/358VsCF.

[26] There appears to be. One recent paper does an excellent job analyzing likely overvaluation in the electric vehicle industry. *See* ROB ARNOTT ET AL., RSCH. AFFILIATES, BIG MARKET DELUSION: ELECTRIC VEHICLES (2021), https://www.researchaffiliates.com/content/dam/ra/documents/826-big-market-delusion-electric-vehicles.pdf.

returns to ESG strategies even if the low-carbon economy manifests, and disastrous returns in the high-carbon state.

In Part III, we connect the possibility of climate-mitigation failure to the fiduciary duties of institutional investors. A fiduciary may take on considerable legal risk in avoiding brown assets. Prudence requires a fiduciary to prepare for probable states of the world.[27] Like it or not, one probable state of the world is continued reliance on fossil fuels as a result of a failure to either develop as-yet-unavailable breakthrough technologies that render fossil fuels uneconomic or to achieve the unprecedented international cooperation that drastically limits the use of fossil fuels. The lack of progress to date means that state of the world is not remote. Fiduciaries with a responsibility to build wealth for their beneficiaries cannot pretend otherwise. Nor can they end-run beneficiaries' interests by asserting that beneficiaries might prefer "prosocial" policies that cost them financial returns.[28] Such proposals are inconsistent with existing law[29] and assume away a variety of other social implications, including the national security and economic security implications of ceding fossil fuel production to foreign adversaries. Even if the law allows the subordination of financial returns—and, for most all institutional investment governed by laws of the United States, it does not[30]—there would be no reliable way to do so in a way that leaves beneficiaries better off. In any event, most investors are in it for the money.[31] Hopes and aspirations aside, a prudent institutional investor acting on behalf of beneficiaries should continue to consider investment in brown assets in the cold-eyed way that beneficiaries have the legal right to expect and enforce.[32]

I. (At Least) Four Carbon Scenarios

It is extremely difficult to provide convincing probabilistic assessments for different climate-change scenarios because the probabilities of those scenarios depend on whether the global economy transitions from a high-carbon economy to a low-carbon economy.[33] To date, the world has made little progress in that regard. Despite the slowdown in economic activity during the COVID-19 pandemic, for example, 2020 still tied 2016 as the warmest year globally on record,

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[27] *See, e.g.*, John H. Langbein, *The Uniform Prudent Investor Act and the Future of Trust Investing*, 81 IOWA L. REV. 641, 649–50 (1996)(discussing trustees' duty to invest in accordance with reasonable risk-return objectives).

[28] We focus on the proposal outlined in Oliver Hart & Luigi Zingales, *Companies Should Maximize Shareholder Welfare Not Market Value*, 2 J.L. FIN. & ACCT. 247, 263–71 (2017).

[29] *See, e.g.*, William Sanders, *Resolving the Conflict Between Fiduciary Duties and Socially Responsible Investing*, 35 PACE L. REV. 535, 579 (2014).

[30] *Id.*

[31] *See, e.g.*, Paul Brest et al., *How Investors Can (and Can't) Create Social Value*, 44 J. CORP. L. 205, 206 (2019) ("Most investors throughout the world have a single goal: to earn the highest risk-adjusted financial returns. They would not accept a lower financial return from an investment that also produced social benefits.").

[32] As one commentator puts it in discussing socially responsible investing by fiduciaries, "Beneath all the history, law, and rhetoric lies one simple principle: Those entrusted with managing other people's money must remember whose money it is and act accordingly." Sanders, *supra* note 29, at 579.

[33] *See, e.g.*, Zeke Hausfather & Glen P. Peters, *Emissions – the 'Business as Usual' Story is Misleading*, 577 NATURE 618, 618–20 (2020) (discussing the need for probabilistic assessments of different climate-change scenarios and acknowledging the dependence of those probabilities on mitigation policies).

continuing the marked trend upward in temperature versus preindustrial times.[34] According to the International Energy Agency, carbon emissions fell in 2020 but are expected to near 2018–2019 peaks again in 2021[35] and hit a new peak by 2023.[36] Coal prices are at a decade high as of July 2021,[37] and U.S. coal production in 2021 is set to outpace every prior year since 1990.[38]

Investors considering investments in brown and green assets face, in the simplest terms, two big questions. First, will advances in green technologies, government restrictions on carbon emissions, or both move the economy from a high-carbon state to a low-carbon state? Second, how will green assets perform relative to brown assets in those two states of the world? The following table lays out four basic possibilities:

	Low-Carbon Economy	High-Carbon Economy
Green Assets Earn Higher Returns than Brown Assets	A low-carbon economy where green assets earn higher returns than brown assets	A high-carbon economy where green assets earn higher returns than brown assets
Brown Assets Earn Higher Returns than Green Assets	A low-carbon economy where brown assets earn higher returns than green assets	A high-carbon economy where brown assets earn higher returns than green assets

The world of Larry Fink's vision—and that of most ESG product sellers and environmental advocates—is the upper-left-hand corner:

	Low-Carbon Economy	High-Carbon Economy
Green Assets Earn Higher Returns than Brown Assets	A low-carbon economy where green assets earn higher returns than brown assets	A high-carbon economy where green assets earn higher returns than brown assets
Brown Assets Earn Higher Returns than Green Assets	A low-carbon economy where brown assets earn higher returns than green assets	A high-carbon economy where brown assets earn higher returns than green assets

This world is most likely if breakthroughs in green technology render fossil fuels mostly uneconomic or if national governments cooperate to drastically limit carbon emissions. This is

[34] *See* Paul Voosen, *Global Temperatures in 2020 Tied Record Highs*, 371 SCIENCE 334, 334 (2021) (reporting global temperature measurements for 2020).

[35] *See* INT'L ENERGY AGENCY, GLOBAL ENERGY REVIEW 2021, at 11 (2021), https://iea.blob.core.windows.net/assets/d0031107-401d-4a2f-a48b-9eed19457335/GlobalEnergyReview2021.pdf.

[36] *See* Akshat Rathi, *Emissions Could Hit New Record by 2023 Without More Green Spending*, BLOOMBERG (July 20, 2021), https://bloom.bg/3426bOU.

[37] *See* Neil Hume, *Thermal coal prices soar as demand for electricity rebounds*, FIN. TIMES (July 23, 2021), https://on.ft.com/3AqX8Dm.

[38] *See* Will Wade, *Coal Output in U.S. Seen Rising Most Since 1990 on Global Demand*, BLOOMBERG (July 8, 2021), https://bloom.bg/3r1muVj.

the world that much pro-ESG commentary assumes will be our future, one where there has been the hoped-for, huge reduction in uncaptured carbon emissions.

Another possibility is explored in some climate finance and climate economics models.[39] In those models the economy is run on brown technologies, and this makes climate disasters more likely.[40] When climate disasters occur in those models, people turn to green technologies to mitigate the harm.[41] This is a high-carbon economy where those green assets do better after climate disasters, as in the upper-right-hand corner. In our view, this scenario plays little role in current climate debates.

	Low-Carbon Economy	High-Carbon Economy
Green Assets Earn Higher Returns than Brown Assets	A low-carbon economy where green assets earn higher returns than brown assets	A high-carbon economy where green assets earn higher returns than brown assets
Brown Assets Earn Higher Returns than Green Assets	A low-carbon economy where brown assets earn higher returns than green assets	A high-carbon economy where brown assets earn higher returns than green assets

An even more rarely considered possibility—set out in the lower-left-hand corner—is that a transition to a low-carbon economy occurs, but it is one where carbon-capture technologies are the green breakthrough. In that scenario, brown assets outperform green assets other than carbon-capture technologies because brown asset use exists in a low-carbon economy via carbon capture.

	Low-Carbon Economy	High-Carbon Economy
Green Assets Earn Higher Returns than Brown Assets	A low-carbon economy where green assets earn higher returns than brown assets	A high-carbon economy where green assets earn higher returns than brown assets
Brown Assets Earn Higher Returns than Green Assets	A low-carbon economy where brown assets earn higher returns than green assets	A high-carbon economy where brown assets earn higher returns than green assets

William D. Nordhaus briefly addressed this possibility in his pathbreaking 1977 paper, but he considered the possibility of "us[ing] natural or industrial processes to clean out the carbon dioxide from the atmosphere *ex post*" to be "science fiction."[42] Nonetheless, since all as-yet-

[39] *See* Giglio et al., *supra* note 16.
[40] *See id*. at 18–21.
[41] *Id*. at 17–21.
[42] William D. Nordhaus, *Economic Growth and Climate: The Carbon Dioxide Problem*, 67 AM. ECON. REV. 341, 343 (1977).

unavailable green breakthroughs are speculative, the possibility of an advance in carbon-capture technologies that leaves brown assets in use remains a possible scenario.[43]

The lower-right-hand corner is the state of the world we might call business as usual, a continuation of existing fossil fuel use in a high carbon economy.

	Low-Carbon Economy	High-Carbon Economy
Green Assets Earn Higher Returns than Brown Assets	A low-carbon economy where green assets earn higher returns than brown assets	A high-carbon economy where green assets earn higher returns than brown assets
Brown Assets Earn Higher Returns than Green Assets	A low-carbon economy where brown assets earn higher returns than green assets	A high-carbon economy where brown assets earn higher returns than green assets

The possibility of this last scenario motivates our Article. We believe existing commentary is focused on the upper-left-hand state of the world, the low-carbon economy where green assets earn higher returns than brown assets. In our modeling below, we contrast that world with the one in the lower-right-hand corner, the high-carbon economy (business as usual) where brown assets earn higher returns than green assets.

	Low-Carbon Economy	High-Carbon Economy
Green Assets Earn Higher Returns than Brown Assets	A low-carbon economy where green assets earn higher returns than brown assets	A high-carbon economy where green assets earn higher returns than brown assets
Brown Assets Earn Higher Returns than Green Assets	A low-carbon economy where brown assets earn higher returns than green assets	A high-carbon economy where brown assets earn higher returns than green assets

II. Asset Pricing Implications of a Possible High-Carbon Economy

A. Intuition

The fact that we do not know whether there will be a transition to a low-carbon economy matters for asset pricing and thus for the investment decisions of fiduciaries. The model we present below is meant to facilitate discussion; it does not represent a full theory of asset pricing in the world of climate change. The essence of the model is uncertainty about the state of the global economy at a future date and, in particular, whether the global economy will be in a low-

[43] For a discussion of advances in carbon-capture technology, see Robert F. Service, *Carbon Capture Marches Toward Practical Use*, 371 SCIENCE 1300 (2021).

carbon state or a high-carbon state.[44] Our approach is consistent with the way real-world regulators are analyzing climate change and its effects on regulated entities. For example, the Bank of England's program to stress test lenders and insurers for the effects of climate change posits three scenarios.[45] The first assumes that "governments and companies take action this year to reduce carbon-dioxide emissions to net-zero by 2050, limiting global warming to a 1.8 degrees Celsius temperature rise relative to preindustrial levels."[46] The second assumes that "policy action is delayed until 2031 and the transition from a fossil-fuel dependent economy to the widespread use of renewable energy is 'more sudden and disorderly.'"[47] "Under the third scenario, no action is taken to mitigate climate change beyond the steps already taken, and increased greenhouse-gas emissions in the atmosphere cause temperature levels to rise by 3.3 degrees Celsius."[48] Our approach essentially combines the first two scenarios into one "low-carbon" scenario, with the third scenario as our "high-carbon" scenario.

Before formalizing our model, we first present the basic intuition we hope to convey. There are two dates that can be thought of as now and the future. The future is the time when we will know whether or not we have shifted to a low-carbon economy or stayed in a high-carbon economy. We consider a green asset and a brown asset. We assume that the green asset will have higher payoffs in the low-carbon state than in the high-carbon state, while we assume that the brown asset will have higher payoffs in the high-carbon state than in the low-carbon state. There is a probability of being in the low-carbon state and a corresponding probability of being in the high-carbon state.

In general, we think of everything as endogenous and determined simultaneously. That is, at time zero, investors have a certain amount of capital, and they invest it in green and brown assets. While we do not model it explicitly, we are thinking here of a world where the amount invested in green firms could drive up the probability of the low-carbon transition. This is a reason why some investors might willingly overvalue green assets relative to future payoffs, a rational form of green sentiment in the sense that it need not reflect irrational optimism about the transition probability but rest on the desire to move that probability higher.[49]

We are also thinking of a world where firms can offer cash flows to investors that differ in the two states of the world, low-carbon and high-carbon. That is, firms can make investments—such as continued oil exploration—that will pay off far better if the transition fails. The equilibrium of this illustrative model is a set of cash flows for the green asset in the low-carbon economy and the high-carbon economy, a set of cash flows for the brown asset in the low-carbon economy and the high-carbon economy, a probability of transition to the low-carbon economy

[44] We set aside, for the most part, the unanswerable question of whether the low-carbon economy is a booming one or a bad one, and we do the same for high-carbon economies. Instead, we look at a model with just two states, a low-carbon economy and a high-carbon economy. It may be helpful for some to think of this as a model averaged over uncertainty about the general state of the economy.

[45] Simon Clark, *Big Banks Face Climate-Change Tests*, WALL ST. J., (June 8, 2021), https://on.wsj.com/3rK56TU.

[46] *Id*. The U.S. Federal Reserve is considering similar tests. Rich Miller, *Powell Says Fed Likely to Require Banks to Test for Climate Risk*, BLOOMBERG (July 15, 2021), https://bloom.bg/3AqC13G.

[47] Clark, *supra* note 45.

[48] *Id*.

[49] *Cf*. Ľuboš Pástor et al., *Sustainable Investing in Equilibrium*, 142 J. FIN. ECON. 550, 550 (2021) (presenting a model where "green assets have lower expected returns because investors enjoy holding them").

(which, when subtracted from one gives the probability of remaining in the high-carbon economy), and a set of prices for the green and brown asset that reflect investor preferences.

To model the effect of investor preferences on asset prices, we use the concept of state prices.[50] State prices reflect the willingness of an investor to pay for $1 (if using U.S. currency) in a given state of the world.[51] When, as here, states of the world are mutually exclusive, the state prices add up to one. They are, in this sense, sometimes referred to as "pseudoprobabilities." They are not true probabilities because they depend not only on the true probabilities but also on the value to investors of $1 in one state versus another. Bad states of the world typically are those where wealth is lower. We assume that the high-carbon economy is the relatively bad state. This may seem obvious, and to a large extent it is, but we mean bad in a particular sense: we assume that the marginal utility of income is higher in the high-carbon state than in the low-carbon state, all else equal, because money can help alleviate the other bad qualities of the high-carbon state, such as by paying for needed repairs, relocations, and access to clean water and cleaner air, for example.

If there is no green sentiment (rational or irrational) that otherwise drives up the value of the green asset, then the assumptions we have made so far lead to the green asset having higher expected returns than the brown asset. The intuition behind these results is the same as behind other financial economic models of risk and return. In CAPM, for example, money is worth more to investors in states of the world where their other assets are doing poorly and less in the state of the world where their assets are doing well.[52] For that reason, high-beta stocks—beta being a (scaled) measure of the covariance of an asset's returns with the rest of the market—must have higher expected returns to entice investment since they pay off when other assets are already doing well. Low-beta stocks—those with payoffs that covary less with the rest of the market—are more valuable to an investor because they hedge states of the world where other payoffs are scant, that is, when the investors' other assets are doing poorly. That is why low-beta stocks are priced to have lower expected returns than high-beta stocks: the high-beta stocks do relatively poorly when other assets are already doing poorly. An asset that does relatively well when other assets are doing poorly—as with a low-beta stock in the CAPM—is less risky because, by doing relatively better in the bad state of the world, it provides a hedge against losses in the bad state.

Here, the green asset is riskier in the same sense that high-beta stocks are riskier in the CAPM: the green asset pays off best in a state of the world—the good, low-carbon state—where the marginal utility of income is lower than in the bad state. Brown assets are less risky in the sense that—although their use may have caused the bad state—they pay off better than the green

[50] The methodology originates with the state-price securities of Kenneth J. Arrow, *The Role of Securities in the Optimal Allocation of Risk-Bearing*, 31 REV. ECON. STUD. 91 (1964) and GERARD DEBREU, THEORY OF VALUE (1959). Their innovation has been called "one of the most important theoretical advances in the economics of investment under uncertainty." Yacine Ait-Sahalia & Andrew W. Lo, *Nonparametric Estimation of State-Price Densities Implicit in Financial Asset Prices*, 53 J. FIN. 499, 499 (1998).

[51] *See, e.g.*, René Garcia et al., *Viewpoint: Option Prices, Preferences, and State Variables*, 38 CAN. J. ECON. 1, 10 (2005) ("[State-based] security prices tell us, as a function of the possible states of nature, how much investors are ready to pay in order to get one dollar at a given future date contingent upon the realization of a particular state of nature.").

[52] *See* William F. Sharpe, *Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk*, 19 J. FIN. 425 (1964).

assets when times are bad, that is, when the marginal utility of income is relatively high. Once we account for the possibility that green assets can be valued for their greenness—whether because of rational desire to increase the probability of a low-carbon economy or from irrational optimism about the probability of the low-carbon transition or a combination of both—green assets may no longer earn a higher expected return than brown assets. Of course, realized returns in the two states are driven by our assumption that green assets have higher payoffs in the low-carbon state than in the high-carbon state, and vice versa for brown assets.

A caveat on our model: we focus here on the possibility that green assets do better in the low-carbon state and brown assets do better in the high-carbon state. While we believe that is the most relevant comparison for most investors, it is important to note that whether climate-themed investments will have good or bad returns always depends on the payoffs to those assets, the probability that the world moves to a low-carbon economy, and the prices that investors are paying for both green and brown assets today given their preferences. An asset's impact on climate change does not determine its expected returns. Expected returns depend, as always, on payoffs, probabilities, and preferences. With that in mind, we turn now to our model.

B. A Simple Model

We can now move to the model. There are two dates, times $t = 0$ and $t = 1$. There are two types of assets, a green asset, G, and a brown asset, B. There are two, mutually exclusive states of the world, one of which will occur at time $t = 1$. H is the state of the world associated with a high-carbon economy, essentially a continuation of current reliance on fossil fuels for a large part of global energy needs, and L is the state of the world associated with a low-carbon economy of much less fossil fuel use, whether occurring because of breakthrough green technologies, government policies, or both. At time $t = 0$, the state of the world at time $t = 1$ is unknown. The probability of the low-carbon state is $prob(L)$, while the probability of the high-carbon state is $prob(H) = (1 - prob(\text{L}))$. $V(G|L)$ is the value at time $t = 1$ of the green asset in state L, and other asset-state combinations at time $t = 1$ are denoted accordingly as $V(G|H)$, $V(B|L)$, and $V(B|H)$. The green asset in the low-carbon state is worth more than the green asset in the high-carbon state, that is, $V(G|L) > V(G|H)$, while the brown asset in the high-carbon state is worth more than the brown asset in the low-carbon state, that is, $V(B|H) > V(B|L)$.

The price of an asset at time $t = 0$, $P(.)$, is given by the weighted average of the values of the asset in each state of the world at time $t = 1$, where the weights are the state prices, with s_L being the state price for the low-carbon state and $s_H = (1 - s_L)$ being the state price for the high-carbon state.[53] State prices reflect a change of measure from actual probabilities to those that reflect not only probabilistic uncertainty but also the preferences of investors over states of the world, including their level of risk aversion and their marginal utilities in different states of the world.

In equilibrium, there is a green asset that delivers $V^*(G|L)$ in the low-carbon state (the * superscript denotes the equilibrium values of the variables we have defined above) and $V^*(G|H)$ in the high-carbon state (where $V^*(G|L) > V^*(G|H)$), a brown asset that delivers $V^*(B|L)$ in the

[53] This is the standard use of state prices in financial economics. *See, e.g.*, John Y. Campbell, *Asset Pricing at the Millennium*, 55 J. FIN. 1515, 1516 (2000) ("A state price exists for each state of nature at each date, and the market price of any financial asset is just the sum of its possible future payoffs, weighted by the appropriate state prices.").

low-carbon state and $V^*(B|H)$ in the high-carbon state, (where $V^*(B|L) < V^*(B|H)$), probabilities $prob^*(L)$ and $prob^*(H) = 1 - prob^*(L)$, and state prices s^*_L and $s^*_H = 1 - s^*_L$. The asset prices are thus given by

$$P^*(G) = s^*_L V^*(G|L) + s^*_H V^*(G|H)$$

for the green asset and

$$P^*(B) = s^*_L V^*(B|L) + s^*_H V^*(B|H)$$

for the brown asset. That is, the asset values are the possible future values in the two states weighed by the state prices of those two states. The expected return on the assets at time $t = 0$ is the expected value of the asset—using actual probabilities—divided by asset price. The expected value of the green asset is

$$E[V^*(G)] = prob^*(L)V^*(G|L) + prob^*(H)V^*(G|H)$$

while the expected value of the brown asset is

$$E[V^*(B)] = prob^*(L)V^*(B|L) + prob^*(H)V^*(B|H).$$

The expected (gross) return of the green asset is then $E[r^*_G] = E[V^*(G)] / P^*(G)$, while the expected return of the brown asset is $E[r^*_B] = E[V^*(B)] / P^*(B)$.

Given our assumption that the brown asset has higher payoffs in the high-carbon state than in the low-carbon state, the brown asset is akin to a low-beta stock in the CAPM. In the CAPM, low beta stocks are valuable because they are impacted less in market downturns. As such, they are valuable to investors who bid them up, lowering their expected returns relative to high beta stocks that pay off better when times are already good (when the market portfolio has higher returns). In our approach, the high-carbon state is a bad state for economic wellbeing, akin to a market downturn in the CAPM. Because of the high cost of damage in the high-carbon state, that state is the bad state and cash flows in the high-carbon state are more valuable to investors than cash flows in the low-carbon state that does not bring such costs.

In terms of state pricing, this means that the state price of the high-carbon state is higher than its probability.[54] That is, $s^*_H > prob^*(H)$. It is straightforward to show that when $s^*_H > prob^*(H)$, the expected return to the green asset is higher than the expected return to the brown asset. That is, $s^*_H > prob^*(H) \Leftrightarrow E[r^*_G] > E[r^*_B]$.[55] The expected return to the green asset is higher than the expected return to the brown asset when the state price of the high-carbon economy is higher than its probability, reflecting the fact that investors are averse to the high-carbon state, *B*, and will pay more for cash flows in that state than in the good state, *L*.

Realized returns, by contrast to expected returns, depend on which state manifests at time $t = 1$ and are driven by our assumption that the return to the green asset is negative in the high-carbon state and positive in the low-carbon state, with the opposite holding for the brown asset.

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[54] This is how state prices reflect marginal utilities of different states. *See, e.g.*, Leonid Kogan et al., *The Price Impact and Survival of Irrational Traders*, 61 J. FIN. 195, 199 (2006) ("Given that the marginal utility of the other traders in these states is very high, the state prices for these states are also high . . . .").

[55] $E[r^*_G] > E[r^*_B] \Leftrightarrow E[V^*(G)] / P^*(G) > E[V^*(B)] / P^*(B) \Leftrightarrow P^*(B) / P^*(G) > E[V^*(B)] / E[V^*(G)] \Leftrightarrow (s^*_L V^*(B|L) + (1 - s^*_L)V^*(B|H)) / (s^*_L V^*(G|L) + (1 - s^*_L)V^*(G|H)) > (prob^*(L)V^*(B|L) + (1 - prob^*(L))V^*(B|H)) / ((prob^*(L)V^*(G|L) + (1 - prob^*(L))V^*(G|H)) \Leftrightarrow s^*_L < prob^*(L)$ or, equivalently, $s^*_H > prob^*(H)$.

If the low-carbon state occurs, then the realized return to the green asset is larger than the realized return to the brown asset. The green asset generates a payoff at time $t = 1$ of $V^*(G|L)$ in the low-carbon state, which is strictly greater than its price, $P^*(G)$,[56] while the brown asset generates $V^*(B|L)$ in the low-carbon state, which is strictly less than its price, $P^*(B)$.[57] If the high-carbon state occurs instead, then the realized return to the brown asset is larger than the realized return to the green asset. Now, the brown asset generates a payoff at time t = 1 of $V^*(B|H)$ in the high-carbon state, which is strictly greater than its price, $P^*(B)$,[58] while the green asset generates $V^*(G|H)$ in the high-carbon state, which is strictly less than its price, $P^*(G)$.[59] To the extent that Environmental, Social, and Governance ("ESG") products offer investors higher expected returns from green investment than from brown investment, the simple fact that green assets are in a sense riskier than brown assets provides a solid foundation for that possibility.

The results above illustrate how the hedging value of the brown asset can drive its price up and its expected return down, with the opposite true for the green asset. In this sense, we are considering investors whose investments can impact the probability of the green transition but who then price those assets based only on their rational preferences for income in the low- and high-carbon states. If instead investors develop a taste for investing in the green asset, then this acts as a push toward a state preference for payoffs in the low-carbon economy irrespective of the true probability. A taste for investing in the green asset could be rational, irrational, or a combination of both. It is rational if, although investors understand that they are bidding up the prices of green assets and lowering their expected returns, they do so because they believe that by providing lower cost capital for green assets, they make a low-carbon transition more probable. Those investors derive enough extra utility from being a green investor—being, one might say, a part of the solution and not a part of the problem—that they are better off even though they will receive lower returns in the low-carbon state than without green sentiment and even though they will receive worse returns in the high-carbon state on their green assets, if that state occurs.[60]

Green sentiment is irrational if investors, perhaps because of widespread embrace of ESG investing, believe that they are getting higher expected returns from investing in green assets without realizing that they have overpriced those assets relative to brown assets, driving down the expected returns to green assets. Those investors do not believe that they are buying green assets at distorted prices. Such investors attach a high price to the low-carbon state because they believe the probability of the low-carbon transition is higher than $prob^*(L)$. Their optimism

[56] The green asset receives $V^*(G|L) - s^*_L V^*(G|L) - (1 - s^*_L)V^*(G|H) = (1 - s^*_L)(V^*(G|L) - V^*(G|H))$, which is strictly positive since $(1 - s^*_L)$ is strictly positive and $V^*(G|L) - V^*(G|H)$ is strictly positive.

[57] The brown asset receives $V^*(B|L) - s^*_L V^*(B|L) - (1 - s^*_L)V^*(B|H) = (1 - s^*_L)(V^*(B|L) - V^*(B|H))$, which is strictly negative since $(1 - s^*_L)$ is strictly positive and $V^*(B|L) - V^*(B|H)$ is strictly negative.

[58] The brown asset receives $V^*(B|H) - s^*_L V^*(B|L) - (1 - s^*_L)V^*(B|H) = s^*_L(V^*(B|H) - V^*(B|L))$, which is strictly positive since s^*_L is strictly positive and $V^*(B|H) - V^*(B|L)$ is strictly positive.

[59] The green asset receives $V^*(G|H) - s^*_L V^*(G|L) - (1 - s^*_L)V^*(G|H) = s^*_L(V^*(G|H) - V^*(G|L))$, which is strictly negative since s^*_L is strictly positive and $V^*(G|H) - V^*(G|L)$ is strictly negative.

[60] *Cf.* Tiziano De Angelis et al., Climate Impact Investing 2 (July 1, 2021) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3562534 (modeling green investors who raise the cost of capital for high emissions firms).

makes them invest as if they are risk seekers who want to bet on the low-carbon transition and bet as if the probability of that transition is higher than it is.[61]

Whatever the cause, and survey evidence suggests both might be at play,[62] if the taste for green investment is strong enough, it can lead to the state price of the low-carbon economy being higher than its probability, correspondingly leaving the state price of the high-carbon state lower than its probability. In that case, the expected return to the brown asset will be higher than the expected return to the green asset.[63] That is, if the sentiment for green investing renders $s^*_L > prob^*(L)$, then $E[r^*_G] < E[r^*_B]$.[64] Realized returns depend on which state manifests. If the low-carbon-economy state occurs, then the realized return to the green asset is larger than the realized return to the brown asset, but since the new state price of the low-carbon economy is higher than it was before, the realized negative return to the brown asset is less negative than without green sentiment[65] and the realized return to the green asset is less positive than without green sentiment.[66] Similarly, realized returns in the high-carbon state are more negative for the green asset than without green sentiment[67] and more positive for the brown asset.[68]

C. Discussion

If it seems paradoxical that brown assets can be less risky than green assets when the climate worsens, it is important to remember that this is because we do not assume that the transition to a low-carbon economy is a sure thing. If it were, then the fate of brown assets would be easy to predict. Fossil fuel use would decline dramatically, and brown firms would do poorly. This is the scenario on which most commentary and research is focused. But climate change is not a heads-I-win-tails-you-lose prospect for green investors. If the low-carbon transition fails, then fossil fuel use likely will remain high.

The simple model allows us to reinterpret existing empirical evidence on realized returns to green and brown investing, evidence that otherwise appears inconsistent with one or more

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[61] For an explanation of how optimism makes a risk-averse investor act as if they are risk-seeking, see J.B. Heaton, *Managerial Optimism: New Observations on the Unifying Theory*, 25 EUR. FIN. MGMT. 1150, 1158–63 (2019).

[62] Cheryl Winokur Munk, *The New Math of Socially Responsible Investing*, WALL ST. J. (June 27, 2021), https://on.wsj.com/32rNgwu ("A notable 47% of respondents in the Schroders 2020 Global Investor Study say they are attracted to sustainable investments because of their environmental impact, while another 42% base their attraction to sustainable funds on the likelihood they will provide higher returns.").

[63] *Cf.* Pástor et al., *supra* note 49, at 551 (presenting a formal model of green sentiment and its effect on asset returns).

[64] $E[r^*_G] < E[r^*_B] \Leftrightarrow E[V^*(G)]/P^*(G) < E[V^*(B)]/P^*(B) \Leftrightarrow P^*(B)/P^*(G) < E[V^*(B)] / E[V^*(G)] \Leftrightarrow (s^*_L V^*(B|L) + s^*_H V^*(B|H)) / (s^*_L V^*(G|L) + s^*_H V^*(G|H)) < (prob^*(L)V^*(B|L) + prob^*(H)V^*(B|H)) / (prob^*(L)V^*(G|L) + prob^*(H)V^*(G|H)) \Longrightarrow s^*_L > prob^*(L)$.

[65] From above, the realized payoff to the brown asset in the low-carbon state is $V^*(B|L) - P^*(B) = (1 - s^*_L)(V^*(B|L) - V^*(B|H))$. Since s^*_L has increased while $V^*(B|L) < V^*(G|H)$, this payoff has increased.

[66] From above, the realized payoff to the green asset in the low-carbon state is $V^*(G|L) - P^*(G) = (1 - s^*_L)(V^*(G|L) - V^*(G|H))$. Since s^*_L has increased while $V^*(G|L) > V^*(G|H)$, this payoff has decreased.

[67] From above, the realized payoff to the green asset in the high-carbon state is $V^*(G|H) - P^*(G) = s^*_L(V^*(G|H) - V^*(G|L)$. Since s^*_L has increased while $V^*(G|H) < V^*(G|L)$, this payoff has decreased.

[68] From above, the realized payoff to the brown asset in the high-carbon state is $V^*(B|H) - P^*(B) = s^*_L(V^*(B|H) - V^*(B|L))$. Since s^*_L has increased while $V^*(B|H) > V^*(B|L)$, this payoff has decreased.

existing models. Existing empirical evidence on the returns to green and brown assets is ambiguous. This is unsurprising since ESG investing at large scale is a recent phenomenon. As with almost all asset pricing research, researchers face an empirical difficulty testing theories set out in terms of expected returns when only average, realized returns are observable. When researchers study average, realized returns, it is always uncertain whether the realized price reflected one of the possible price realizations that investors anticipated at the probability they assigned it, or whether that price reflected a change in the underlying probability distribution. This problem is especially hard when the data window used for estimation is short, because such repricing shocks are more likely to have a large impact in shorter time windows. ESG investing on the climate dimension has potentially introduced just such a pricing shock in the last decade or so.

Some research finds that stocks that do well on ESG measures have earned higher average returns than stocks that do not do well on ESG measures.[69] Other studies find the opposite—brown assets have performed better—and some have interpreted those results as evidence that brown firms are riskier and must therefore earn compensating returns.[70] Our approach cautions against both interpretations. Existing empirical results on returns to ESG strategies are consistent with overpricing such as would occur if there was sentiment for green investing, [71] while higher returns to brown assets are consistent with the demand for hedging assets that we highlight in our model. That is, investors may be bidding up the price of brown assets to reflect a lower expected return in the future. Overall, there simply isn't enough data yet to determine what impact the prospect of severe climate change and ESG investment is having on green and brown assets and to distinguish between the various hypotheses for recent returns to green and brown assets.

III. Implications for Institutional Investor Fiduciaries

A. Imprudent Avoidance of Brown Assets

Investors turn to an increasingly concentrated set of institutional investors[72] to protect and build wealth. Many of those investors are entitled to the benefits of fiduciary duties. One important source of federal fiduciary duties is the Employee Retirement Income Security Act of

[69] *See, e.g.*, Ľuboš Pástor et al., *Dissecting Green Returns* 2 (Nat'l Bureau of Econ. Rsch., Working Paper No. 28940, 2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3886729 (finding that climate-concern shocks generate abnormal returns for green assets).

[70] *See* Patrick Bolton & Marcin Kacperczyk, *Global Pricing of Carbon-Transition Risk* 3–5 (Nat'l Bureau of Econ. Rsch., Working Paper No. 28510, 2021), http://www.nber.org/papers/w28510 (reporting higher average returns for stocks of firms with higher emissions); Patrick Bolton & Marcin Kacperczyk, *Do Investors Care About Carbon Risk?*, 142 J. FIN. ECON. 517, 517 (2021) (same).

[71] Some institutional investors have warned of this possibility. *See, e.g.*, Emi Urabe et al., *Beware of "ESG Bubble," Says Ex-Chair of World's Biggest Pension*, BLOOMBERG (June 28, 2021), https://bloom.bg/3GXqyLM.

[72] *See* John C. Coates, *The Future of Corporate Governance Part I: The Problem of Twelve* 19 (Harv. Pub. L., Working Paper Paper No. 19-07, 2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3247337 ("A small number of unelected agents, operating largely behind closed doors, are increasingly important to the lives of millions who barely know of the existence much less the identity or inclinations of those agents.").

1974 ("ERISA").[73] State trust law contains fiduciary duties,[74] as does the federal Investment Advisers Act of 1940.[75] ERISA requires its fiduciaries to discharge their duties: (1) "for the exclusive purpose of providing benefits to [plan] participants;"[76] (2) "with the care, skill, prudence, and diligence under the circumstances then prevailing that a prudent man acting in a like capacity and familiar with such matters would use in the conduct of an enterprise of a like character and with like aims;"[77] and (3) "by diversifying the investments of the plan so as to minimize the risk of large losses, unless under the circumstances it is clearly prudent not to do so."[78] The United States Supreme Court has characterized ERISA's requirements for the management of defined-benefit plans (those where the plan sponsor controls investment decisions) as "a regulatory phalanx."[79] Duties with respect to defined contribution plans (those where plan sponsors present investment options from which beneficiaries can choose) differ, but even then "fiduciaries must engage in a reasoned decision-making process for investigating the merits of each investment option and ensure that each one remains in the best interest of plan participants."[80]

Commitments to avoid brown assets are investment decisions that a fiduciary must evaluate on the merits[81] and continue to revisit to ensure that disinvestment (or reduced investment) in brown assets are in beneficiaries' interests.[82] There are good reasons to think that avoiding

[73] Pub. L. No. 93-406, 88 Stat. 829 (codified as amended at 29 U.S.C. § 1001 et seq.); *see also* Remy Grosbard, *The Duty to Inform in the Post-Dudenhoeffer World of ERISA*, 117 COLUM. L. REV. 79, 114 (2017) (discussing fiduciary duties under ERISA).

[74] *See* RESTATEMENT (THIRD) OF TRUSTS § 77 (AM. L. INST. 2007) ("The trustee has a duty to administer the trust as a prudent person would, in light of the purposes, terms, and other circumstances of the trust."). A good summary of the prudent investor rule is Max M. Schanzenbach & Robert H. Sitkoff, *Reconciling Fiduciary Duty and Social Conscience: The Law and Economics of ESG Investing by A Trustee*, 72 STAN. L. REV. 381, 426–30 (2020).

[75] 15 U.S.C. §§ 80b-1 to 80b-21; *see* Commission Interpretation Regarding Standard of Conduct for Investment Advisers, 84 Fed. Reg. 33,669, 33,6671 (July 12, 2019) ("An investment adviser's fiduciary duty under the Advisers Act comprises a duty of care and a duty of loyalty."); Transamerica Mortg. Advisors, Inc. (TAMA) v. Lewis, 444 U.S. 11, 17 (1979) ("[T]he [Investment Advisers] Act's legislative history leaves no doubt that Congress intended to impose enforceable fiduciary obligations.").

[76] 29 U.S.C. § 1104(a)(1)(A)(i).

[77] *Id*. § 1104(a)(1)(B).

[78] *Id*. § 1104(a)(1)(C).

[79] Thole v. U.S. Bank N.A., 140 S. Ct. 1615, 1621 (2020).

[80] Schweitzer v. Inv. Comm. of Phillips 66 Sav. Plan, 960 F.3d 190, 197 (5th Cir. 2020) (internal alteration, quotation, and citation omitted).

[81] *See* Sweda v. Univ. of Pa., 923 F.3d 320, 329 (3d Cir. 2019) ("a court assesses a fiduciary's performance by looking at process rather than results, focusing on a fiduciary's conduct in arriving at a decision and asking whether a fiduciary employed the appropriate methods to investigate and determine the merits of a particular investment." (internal alteration, quotation, and citation omitted)); Pfeil v. State St. Bank & Tr. Co., 806 F.3d 377, 384 (6th Cir. 2015) ("The test for determining whether a fiduciary has satisfied his duty of prudence is whether the individual trustees, at the time they engaged in the challenged transactions, employed the appropriate methods to investigate the merits of the investment and to structure the investment." (quoting Hunter v. Caliber Sys., Inc., 220 F.3d 702, 723 (6th Cir. 2000))).

[82] *See, e.g.*, Tatum v. RJR Pension Inv. Comm., 761 F.3d 346, 358 (4th Cir. 2014) ("The duty of prudence also requires fiduciaries to monitor the prudence of their investment decisions to ensure that they remain in the best interest of plan participants." (citing DiFelice v. U.S. Airways, Inc., 497 F.3d 410, 423 (4th Cir. 2007))); *cf*. Tibble v. Edison Int'l, 575 U.S. 523, 530 (2015) ("In short, under trust law, a fiduciary normally has a continuing duty of

brown assets may not survive that scrutiny. The lesson of modern portfolio theory is that additional assets that are not redundant with other assets are almost always valuable in creating portfolios with better risk-return tradeoffs.[83] We have explained above why brown assets are hedges for a failed effort to transition to a low-carbon economy. In a high-carbon economy, brown assets may have higher returns than green assets. Avoiding brown assets on a large scale now may be imprudent given the sluggish rate of progress on the climate-change problem.[84] Doing so could violate ERISA's diversification requirement "to minimize the risk of large losses, unless under the circumstances it is clearly prudent not to do so."[85] There is no empirical evidence that could justify, on its own, avoidance of brown assets on purely financial grounds.[86] As we have described above, empirical evidence on ESG performance is ambiguous at best, and much of it is consistent with better performance by brown assets, albeit over short time horizons.

Fiduciaries sued in the future for avoiding brown assets may face difficulty in justifying their decisions, especially where brown assets are traded in relatively efficient markets. A recent Supreme Court case observes that "where a stock is publicly traded, allegations that a fiduciary should have recognized from publicly available information alone that the market was over- or undervaluing the stock are implausible as a general rule, at least in the absence of special

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some kind to monitor investments and remove imprudent ones. A plaintiff may allege that a fiduciary breached the duty of prudence by failing to properly monitor investments and remove imprudent ones.").

[83] Trust law's acceptance of the duty to diversify has arguably been its most important advance. Professor Gordon's analysis remains the best. *See* Jeffrey N. Gordon, *The Puzzling Persistence of the Constrained Prudent Man Rule*, 62 N.Y.U. L. REV. 52, 98 (1987) ("A court that accepts portfolio theory is likely to regard diversification as mandatory except upon a showing of special insight by the trustee or some other unusual circumstances. Portfolio theory's claim is not merely that diversification avoids the risk of loss, but that it increases expected return at the chosen risk level.").

[84] ERISA fiduciaries' "investment decisions also must account for changed circumstances, and a trustee who simply ignores changed circumstances that have increased the risk of loss to the trust's beneficiaries is imprudent." Pension Benefit Guar. Corp. *ex rel*. Saint Vincent Cath. Med. Ctrs. Ret. Plan v. Morgan Stanley Inv. Mgmt. Inc., 712 F.3d 705, 717 (2d Cir. 2013) (internal alteration, quotation, and citation omitted). Thus, progress or lack thereof on the issue of climate change must be accounted for in an ERISA fiduciary's investment decisions.

[85] 29 U.S.C. § 1104(a)(1)(C); *see also* RESTATEMENT (THIRD) OF TRUSTS: PRUDENT INVESTOR RULE § 227(b) (AM. L. INST. 1992) ("In making and implementing investment decisions, the trustee has a duty to diversify the investments of the trust unless, under the circumstances, it is prudent not to do so."); *cf*. Ian Ayres & Edward Fox, *Alpha Duties: The Search for Excess Returns and Appropriate Fiduciary Duties*, 97 TEX. L. REV. 445, 490 (2019) ("Although the [Uniform Prudent Investor Act] does not necessarily set up a formal shifting of the burden of persuasion or of going forward, the text of the rule, at a minimum, makes it incumbent on the trustee to make a showing that her decision was reasonable, if she fails to diversify."). For a review of the Uniform Prudent Investor Act, including discussion of its diversification requirement see Langbein, *supra* note 27.

[86] *Cf*. Susan N. Gary, *Values and Value: University Endowments, Fiduciary Duties, and ESG Investing*, 42 J. COLL. & U.L. 247, 282 (2016) ("While some studies found outperformance using ESG factors and comparison of fund performance with benchmarks provides information about the performance of the fund, any attempts to draw conclusions must be done carefully. The difference in performance between an SRI fund and a conventional fund may relate to any of a number of variables, including the skill of the fund manager, investment style, time period, and decisions about when to be in cash and when to be in the market."). There is considerable overstatement in much commentary on fiduciary duties and impact investment. *See, e.g*., Casey C. Clark & Andy Kirkpatrick, *Impact Investing Under the Uniform Prudent Investor Act*, PROB. & PROP., March/April 2018, at 32, 34 ("From a return perspective, however, an academic case is developing that a company with a high ESG rating is more efficient and successful over time than a similar company with a low ESG rating.").

circumstances."[87] While the broader case law may protect fiduciaries from the argument that they invested in overvalued green stocks,[88] the converse is that efficient market pricing of brown stocks pushes against a fiduciary's speculation that the market is ignoring the very well-known risks of climate change.[89]

Institutional investor fiduciaries must also be careful about embracing the interested analyses of groups committed solely to combating climate change. For example, the United Nations Environment Programme Finance Initiative asserts in a recent report that "[t]he fiduciary duties of investors require them to . . . [e]ncourage high standards of ESG performance in the companies or other entities in which they invest [and] [u]nderstand and incorporate beneficiaries' and savers' sustainability-related preferences, regardless of whether these preferences are financially material."[90] This is a dangerously (from the perspective of legal liability) incorrect statement of fiduciary law in the United States.

B. Shareholder Welfare Maximization is Not the Law

It is no answer to the risk of legal liability to argue that institutional investor fiduciaries should avoid brown assets because their investors may want them to do so whatever the financial consequences. The ancestors of this argument are prior arguments in favor of corporate social responsibility and social impact investing premised on the idea that shareholders (or at least everyone but them) prefer such policies to shareholder wealth maximization.[91] While it is obvious that corporate managers "have always had some legal discretion (implicit or explicit) to

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[87] Fifth Third Bancorp v. Dudenhoeffer, 573 U.S. 409, 426 (2014).

[88] *See generally* Sanders, *supra* note 29 (discussing the evolving legal doctrines surrounding the tension between fiduciary duties and socially responsible investing).

[89] Courts are likely to reject arguments that U.S. public equity markets mispriced brown assets over any significant period of time. *Cf*. Madison Condon, *Market Myopia's Climate Bubble*, UTAH L. REV. (forthcoming) (arguing that climate risk is incorrectly priced in public securities markets). Such a view would be inconsistent with both *Dudenhoeffer* and the United States Supreme Court's fraud-on-the-market jurisprudence that started with *Basic Inc. v. Levinson*, 485 U.S. 224 (1988). *See, e.g.*, Halliburton Co. v. Erica P. John Fund, Inc., 573 U.S. 258, 272 (2014) ("Halliburton has not identified the kind of fundamental shift in economic theory that could justify overruling a precedent on the ground that it misunderstood, or has since been overtaken by, economic realities.").

[90] U.N. ENV'T PROGRAMME FIN. INITIATIVE & PRINCIPLES FOR RESPONSIBLE INV., FIDUCIARY DUTY IN THE 21ST CENTURY: FINAL REPORT 8 (2019), https://www.unepfi.org/wordpress/wp-content/uploads/2019/10/Fiduciary-duty-21st-century-final-report.pdf.

[91] *Cf*. Henry Hansmann & Reiner Kraakman, *The End of History for Corporate Law*, 89 GEO. L.J. 439, 444 (2001) ("In the United States, there existed an important strain of normative thought from the 1930s through the 1960s that extolled the virtues of granting substantial discretion to the managers of large business corporations. Merrick Dodd and John Kenneth Galbraith, for example, were conspicuously identified with this position, and Adolph Berle came to it late in life. At the core of this view was the belief that professional corporate managers could serve as disinterested technocratic fiduciaries who would guide business corporations to perform in ways that would serve the general public interest. The corporate social responsibility literature of the 1950s can be seen as an embodiment of these views."); Lucian Arye Bebchuk, *Federalism and the Corporation: The Desirable Limits on State Competition in Corporate Law*, 105 HARV. L. REV. 1435, 1491 (1992) ("A classic question in the theory of corporate law is whether a corporation's managers should ever exercise their discretion to further the interests of constituencies other than providers of capital. This question has often been debated under the rubric of corporate social responsibility. Corporate social responsibility may include attention to constituencies such as workers, communities, and consumers, and to goals such as preservation of the environment.").

sacrifice corporate profits in the public interest,"[92] that discretion has been limited to fairly de minimis amounts.[93]

We reject appeal to the nonfinancial interests of beneficiaries mostly because it is not the law, and ours is a cautionary message to institutional investors about the real-world consequences of avoiding brown assets. Policy proposals for what fiduciary duties ought to be will provide no comfort to a fiduciary if, for example, an ERISA plan participant or beneficiary brings an action on behalf of the plan for breach of the duty to invest prudently, including by prudent diversification across brown and green assets. There have long been calls to create or interpret fiduciary duties to require corporate directors to take environmental harm into account even when that would not benefit shareholders, but that has never yet been the law.[94]

But beyond the problem that we are dealing with fiduciary duties as they exist and not the aspirational fiduciary duties of commentary, it is highly unlikely that an institutional investor fiduciary can even identify the "prosocial" views of their investors.[95] While we have no objection to the theoretical exercise of considering what shareholder welfare maximization might involve if that were the rule of investment corporate law—though it certainly is not—the problem with such theories is that they may encourage investment fiduciaries to believe that they can identify what shareholders want, other than money. They cannot.

Perhaps some shareholders want to avoid brown firms. If so, in many cases, they can do so on their own. But where an investment fiduciary is managing assets of dispersed shareholders and plan participants—as does, for example, BlackRock—there is no reason to believe that any such fiduciary could identify and aggregate investor preferences in any coherent manner. In this sense, our view is like Professor Sean J. Griffith's with respect to institutional investor voting.[96] He argues that the institutional investors running mutual funds should usually abstain from voting on environmental proposals since, in part, they cannot "assume a common purpose on the part of their investors."[97] Professor Griffith argues that mutual funds should vote with management on such issues.[98] We do not need to go that far, but we agree with Professor Griffith that mutual funds should acknowledge that their voting may not match their investors' beliefs.[99]

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[92] Einer Elhauge, *Sacrificing Corporate Profits in the Public Interest*, 80 N.Y.U. L. REV. 733, 738 (2005).

[93] *See, e.g.*, *In re* Trados Inc. S'holder Litig., 73 A.3d 17, 36 (Del. Ch. 2013) ("It is, of course, accepted that a corporation may take steps, such as giving charitable contributions or paying higher wages, that do not maximize profits currently. They may do so, however, because such activities are rationalized as producing greater profits over the long-term." (quoting Leo E. Strine, Jr., *Our Continuing Struggle with the Idea that For-Profit Corporations Seek Profit*, 47 WAKE FOREST L. REV. 135, 147 n.34 (2012))).

[94] *See, e.g.*, Diane Saxe, *The Fiduciary Duty of Corporate Directors to Protect the Environment for Future Generations*, 1 ENV. VALUES 243, 245–46 (1992) (calling for the recognition of a fiduciary duty to avoid risks to the environment).

[95] *But see* Oliver Hart & Luigi Zingales, *Companies Should Maximize Shareholder Welfare Not Market Value*, 2 J.L., FIN. & ACCT. 247, 247 (2017) (arguing for welfare maximization on behalf of "prosocial" shareholders).

[96] Sean J. Griffith, *Opt-in Stewardship: Toward an Optimal Delegation of Mutual Fund Voting Authority*, 98 TEX. L. REV. 983, 990 (2020).

[97] *Id.*

[98] *Id.*

[99] *Id.* A recent and cogent criticism of institutional-investor pushes for ESG disclosures is Paul G. Mahoney & Julia D. Mahoney, *The New Separation of Ownership and Control: Institutional Investors and ESG*, 2 COLUM. BUS. L. REV. 840 (2021).

Any attempt to reflect the welfare preferences of diverse shareholders is a theoretical exercise that hits difficult hurdles in real-world application.[100]

Moreover, there is much more to the non-financial future than working to avoid climate change. A high-carbon economy will be bad enough without adding national security and economic security concerns that will arise if, for example, the United States greatly reduces its ability to explore, produce, and refine fossil fuels in a world of potentially hostile nations that made no such moves. It is widely recognized that national oil companies are unlikely to pull back from production.[101] A recent report from Bloomberg asserts that Saudi Energy Minister Prince Abdulaziz bin Salman vowed in a private meeting in June 2021 that "[w]e are still going to be the last man standing, and every molecule of hydrocarbon will come out."[102] Russia is spending more than $10 billion to build a new rail system to transport coal from Russia to China,[103] presumably in advance of the construction of two hundred newly planned coal-fired power stations.[104] All this raises the prospect, as editorialists at The Wall Street Journal assert, that "banishing fossil fuels in the U.S. won't eliminate carbon emissions, which will be produced somewhere else. So will the jobs, economic growth and geopolitical leverage."[105] One need not accept that view in full to recognize that it is a possibility that could impact investor utility beyond green sentiment.

Conclusion

No matter how serious a social problem is—and climate change is an extremely serious social problem—the immense weight of investment law is on the side of maximizing risk-adjusted financial returns. While some large institutional investors have called on all companies to embrace a transition to a low-carbon economy, such a transition will occur only with the invention of scalable, as-yet-unavailable breakthrough technologies that render fossil fuels uneconomic; a level of cooperation among nations that has no historical precedent; or both. The

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[100] *Cf*. Eugene F. Fama, *Contract Costs, Stakeholder Capitalism, and ESG* 5 (Chicago Booth Sch. of Bus., Rsch. Paper No. 20-46, 2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3722179 ("Even with a one-dimension max shareholder wealth rule, manager decisions are subject to uncertain outcomes that make evaluating and compensating managers difficult. In a multidimension max welfare regime, the contract problem is more complicated. How do we write and enforce a payoff function in which managers are evaluated on wealth along with multiple dimensions of welfare, with the likelihood of randomness in outcomes on all dimensions?").

[101] *See, e.g*., Rachel Adams-Heard et al., *The Retreat of Exxon and the Oil Majors Won't Stop Fossil Fuel*, BLOOMBERG (June 9, 2021), https://bloom.bg/3tNPjGf.

[102] Javier Blas, *The Saudi Prince of Oil Prices Vows to Drill "Every Last Molecule"*, BLOOMBERG (July 22, 2021), https://bloom.bg/3GV1XqQ.

[103] Yuliya Fedorinova & Aine Quinn, *Putin Is Betting Coal Still Has a Future*, BLOOMBERG (May 30, 2021), https://bloom.bg/3AlPQ3D.

[104] Smriti Mallapaty, *How China could be carbon neutral by mid-century*, 586 NATURE 482, 483 (2020); *see also* Michael Standaert, *Despite Pledges to Cut Emissions, China Goes on a Coal Spree*, YALE ENV'T 360 (March 24, 2021), https://e360.yale.edu/features/despite-pledges-to-cut-emissions-china-goes-on-a-coal-spree ("Coal remains at the heart of China's flourishing economy. In 2019, 58 percent of the country's total energy consumption came from coal, which helps explain why China accounts for 28 percent of all global CO2 emissions. And China continues to build coal-fired power plants at a rate that outpaces the rest of the world combined. In 2020, China brought 38.4 gigawatts of new coal-fired power into operation, more than three times what was brought on line everywhere else.").

[105] Editorial, *America's Energy Gift to Dictators*, WALL ST. J. (June 9, 2021), https://on.wsj.com/3AoGnsg.

possibility of a transition to a low-carbon economy is a hopeful one, but institutional investors are not hired to think wishfully on behalf of their beneficiaries. Investment fiduciaries have an obligation to deal with the world as it is—including its uncertainties—and not the world as they (and we) hope it will be.

Failure to confront—on behalf of their beneficiaries—the real possibility that the world will not successfully transition to a low-carbon economy creates considerable legal and reputational liability for institutional investor fiduciaries. While deeply unpopular, preparation for a bad, high-carbon state of the world is important for their beneficiaries. A low-carbon economy is not a sure thing. Investors left unprepared for a future high-carbon world are likely to have little sympathy for investment advisers who oversold a low-carbon future. As courts have stated with respect to ERISA fiduciaries, "[g]ood faith does not provide a defense to a claim of a breach of these fiduciary duties; a pure heart and an empty head are not enough."[106]

[106] DiFelice v. U.S. Airways, Inc., 497 F.3d 410, 418 (4th Cir. 2007) (internal quotations and citations omitted).