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WEATHERING CLIMATE CHANGE

Opportunities and risks in an
altered investment landscape





CHAPTER 3

HOW ARE MARKETS PRICING IN CLIMATE RISK?

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Until recently, climate risk was a distant externality, largely uncaptured by market mechanisms and only partially reflected in asset prices. However, this is changing. Climate risk will increasingly be reflected in market prices, leading to a potentially dramatic repricing across asset classes, sectors, companies and individual securities.⁵⁴ Indeed, it is no longer a matter of *if* this repricing will occur. Rather, the real question is whether the transition will be an orderly one ushered in by government measures and gradual market adjustments, or an abrupt, sharp decline in market sentiment triggered by a series of climate “Minsky moments.” Regardless of the trajectory, the implications for investors’ portfolios will be very significant.

This chapter answers three questions that get to the heart of how (and how abruptly) assets will be repriced as climate risk alters the behavior of market participants:

- What aspects of climate change are already reflected in market prices? What aspects are not?
- Why have prices in some markets so far not reflected climate risk?
- What catalysts might cause markets to reprice assets, either gradually or abruptly?

1. What aspects of climate change are mostly priced into asset markets?

A range of climate transition risks have already begun to be reflected in market prices for impacted sectors such as energy, utilities and transportation:

Carbon Emissions Trading

European Union (EU) policies designed to quantify the costs of carbon-intensive goods or services have forced markets to account for future transition risks in today’s pricing.⁵⁵ After the EU introduced the world’s first international emissions trading system (ETS) in 2005, markets began to more efficiently price in transition risk. For example, following the start of Phase 2 in January 2008, European utility equities saw a significant repricing, losing substantial

market capitalization. This contributed to Europe’s two largest utility companies, E.ON SE and RWE Aktiengesellschaft, losing roughly 90% of their value between 2008 and 2016.

Coal

Globally, there has been a similar repricing of coal. In developed markets, coal demand has been declining due in large part to a range of climate-related policies and pricing competition from less carbon-intensive sources such as natural gas and renewables. Even China, which currently accounts for roughly half of the world’s coal consumption, aims to have demand peak by 2030, driven by its pledge to be carbon neutral by 2060.⁵⁶ As a result, global coal assets are losing value. It should come as no surprise that coal companies trade at the lowest EV/EBITDA and second lowest average trailing P/E of any industry globally (after money center banks).⁵⁷

Certainly government policy has played a key role in facilitating climate-related repricing. However, in some cases asset markets fail to effectively price in easily observable physical climate risk.

Coastal residential mortgages and municipal debt are examples of assets exposed to obvious climate-driven physical risks. Yet these risks do not appear to be fully recognized by markets. Often structural features of these markets impede market pricing of these risks.

US Municipal Debt

The city of Miami faces significant risk of flooding from sea level rise: according to one estimate, roughly \$8.7 billion in residential property alone is at risk of being permanently inundated in Miami-Dade County by 2050.⁵⁸ This presents serious problems for the local government, as it generates 35% of its annual operating budget from property taxes.⁵⁹ Yet, even with this evident risk, investors continue to buy local municipal debt with seemingly no climate discount. Of course, US municipal debt pricing is far more complex than simply looking at climate risk, but it stands to reason the pricing of Miami's long-term debt should reflect at least some of the tangible climate risk.

There are several reasons why US municipal bond markets do not reflect climate risk. First, well over half of US municipal bonds are held by local retail investors for whom the tax advantages outweigh any long-term climate risk.⁶⁰ Second, there is an implicit safety net since the federal government has routinely extended financial assistance to states and municipalities that suffer natural disasters through Federal Emergency Management Agency (FEMA) aid, helping to close the resulting budget shortfalls. Third, while municipal bond disclosures are only now beginning to include climate change risks, many are still backward looking. This means local governments are only required to disclose material risks from events that have already occurred; future climate risk may not fall into this category.

Residential Mortgages

Real estate prices along coasts appear to be reflecting climate risk.⁶¹ However, the market for US residential mortgages often fails to incorporate well-understood climate risks. Mortgage rates do not differ much across states, and where they do, they do not track climate risk. Coastal states such as Florida, Virginia and Maryland – with some of the highest climate risk – also have among the lowest average mortgage rates.⁶² While some of the additional risk is accounted for in mandatory flood insurance, many US flood maps are outdated and do not reflect current climate and flood realities. For example, new research by First Street Foundation suggests 14.6 million homes in the US are now at risk from a 100-year flood, almost double what current US federal government maps show.⁶³

Furthermore, structural factors in the US residential mortgage market distort pricing of climate risk. Most important among them is that banks can offload their conforming mortgage risk to government-sponsored enterprises (GSEs) such as Fannie Mae and Freddie Mac. Since they typically do not retain the 30-year loans they underwrite, banks originating mortgages have little incentive to account for flood risk in mortgage pricing. For their part, the GSEs depend on outdated flood maps and end up bearing much physical climate risk embedded in the collateral by guaranteeing the mortgages in their securitizations.⁶⁴ Investors are largely indifferent to the climate risk embedded in mortgage-backed securities, given the implicit guarantee by the GSEs.

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2. Why have other markets not internalized climate risk in asset pricing?

While the previous examples highlight how unique market dynamics discourage markets from pricing in climate change, there are several other factors that apply broadly across markets. In general, these are driven by the unique characteristics of climate change, which are challenging to quantify and predict.

First, investors face the “tragedy of the horizon.”⁶⁵ The most catastrophic impact of climate change will be felt beyond the typical horizon of most market participants – imposing a cost on future generations that current actors are not particularly keen to internalize now.

Second, a lack of clarity around the timing and location of extreme climate events has created a lack of urgency. For example, there is compelling evidence major hurricanes in the Gulf of Mexico will be more frequent, but there is no way of knowing where they may meet land, or when. This lack of specificity has

led many investors to ignore climate risks altogether or treat them as extreme tail events.

Third, predicting tipping points is notoriously difficult. Climate change is a slow-burning issue with nearly indiscernible impacts on a year-to-year basis but potential for exponential growth once tipping points are reached. Decades of research in cognitive psychology show that humans have difficulty responding to nonlinear relationships.⁶⁶ Before a tipping point is realized, most markets simply ignore the mounting risk. These types of risks are especially vexing for markets to price and they typically require a tipping point event that leads to an abrupt repricing all at once. Before a tipping point is realized, most markets simply ignore the mounting risk. For climate change, such an event might be a series of devastating weather events or a truly global agreement on carbon pricing.

Climate change is a slow-burning issue with indiscernible impacts on a year-to-year basis but potential for exponential growth once tipping points are reached.

Fourth, investors are accustomed to the idea of “mean reversion.” However, climate change will be different. There will be no reverting back to “normal.” As a result, investors rarely consider systemic impacts that do not stabilize over time and have a hard time capturing the full impact of climate change.

Fifth, a lack of universality and consistency in carbon pricing policies has led to “carbon leakage.” That is, carbon emissions are simply outsourced from a jurisdiction with high carbon prices to one with low or no prices. According to a recent study, this kind of regulatory arbitrage accounts for roughly 25% of global emissions, as many countries simply import embedded carbon rather than produce it themselves.⁶⁷ This kind of regulatory arbitrage enables firms and markets to bypass regulations intended to price carbon more efficiently.

3. What are some potential catalysts for markets to more fully price in climate risk?

Of course, markets that fail to price in an obvious risk can remain “overvalued” for years. Investors too far in front of discounting climate change might find they miss out on years of strong returns before any repricing occurs. As John Maynard Keynes famously remarked, “Markets can stay irrational longer than you can stay solvent.”

However, there are several compelling reasons why future markets will not continue to undershoot the price of climate risk. A range of factors will push markets to recognize and acknowledge climate risks and the externalities of carbon emissions. They can provide signals to investors around how and why markets might begin more effectively accounting for climate risk.

When climate change is perceived to have reached a tipping point

There have been enough obvious climate change-driven anomalies and disasters that market participants can no longer ignore them. The 2020 Atlantic hurricane season, for example, has produced more named storms than any prior season.⁶⁸ The 2018 California wildfires led to the financial downfall of that state’s largest utility company, while the historic 2020 wildfires scorched more than 4 million acres, doubling the previous record.⁶⁹ Meanwhile, in Australia, the brushfires that ravaged that country over the past year consumed more than 83 million acres.⁷⁰ It’s all further evidence that climate change can’t be ignored – because it’s already here.

Better disclosure and analytics drive a data revolution

According to a PGIM survey of global CIOs, more than 40% do not currently incorporate climate change into their investment process. Availability of reliable modeling around the market impact of climate was the most cited hurdle. Fortunately, climate analytics and modelling are finally emerging from academic articles and becoming more accessible for investors. Indeed, the last few years have seen the beginning of what could be called a “data revolution” around



climate risk. Currently, climate data is challenged by a lack of consistency, quality and granularity. While still in its early stages, this trend allows investors to better quantify climate risk and differentiate between firms within an industry. This kind of relative valuation tends to lead to a gradual repricing of assets.

Financial data vendors are beginning to build more climate data into their offerings as well. Bloomberg, for example, now has a wide range of climate-related metrics and analysis accessible to investors on its terminal.⁷¹ The major credit rating agencies have acquired or partnered with climate data specialist firms and are increasingly incorporating climate analytics into their methodologies as well. More sophisticated analysis coming from specialized firms that marry scientific expertise with investment know-how is becoming available to investors as well.

There is another important aspect to the data revolution – investors are clamoring for more uniform and regular data disclosure from their portfolio companies. The process is clearly underway, and investor initiatives that push for standardized climate-related disclosures such as the Task Force on Climate-Related Financial Disclosures are accelerating it. With mounting regulatory and public pressure on firms to track and disclose basic carbon emission metrics and footprints, the amount of usable data for analysis is growing rapidly. As quality climate metrics and data become more available, specialized firms and data platforms will allow investors to more easily integrate climate risk into their investment process. As a result, climate risk will begin to feed into capital allocation decisions and will be increasingly reflected in market pricing.

Policy and regulatory initiatives drive market-pricing of carbon

As discussed, Europe's ETS led to a significant repricing of European utilities. Clearly, this type of government action can play a key role in altering the economics of carbon-intensive assets. Such changes in policy and regulatory regimes can be catalysts for a broader market repricing. As more jurisdictions adopt comparable policy initiatives, a more complete repricing of transition risk is likely to occur globally.

Climate risk is feeding into capital allocation decisions and will be increasingly reflected in market pricing.

Momentum is building, with nearly a quarter of all greenhouse gas (GHG) emissions already covered under a carbon pricing initiative. Of all the schemes, China's ETS is likely to have the largest impact. China leveraged its experience with regional carbon markets and implemented the world's largest national program last year. China's new ETS is expected to cover roughly 1,700 companies from the power sector, accounting for about 30% of national emissions, and will likely lead to some degree of carbon repricing on a global scale.⁷²

Central banks and financial regulators may also alter the cost of credit to at-risk industries. The Bank of England, for example, has already announced that it would be setting up climate stress tests for UK lenders and insurers. The idea would be to test how these

companies would fare with more frequent extreme weather events such as severe storms and floods, as well as the implications of suddenly stranded carbon-intensive assets.⁷³ Even before the tests have been run, this has prompted calls for similar stress tests for other European banks and insurers.⁷⁴

These types of stress tests are just the beginning. From the US Federal Reserve to the Bank of England, to the Reserve Bank of Australia and the Bank of Japan, major central banks are embracing the idea that climate change is a material and systemic risk to the financial system.

Shifting preferences of investors and consumers can be a catalyst for the repricing of climate risk.

Shifting sentiment of investors and consumers

Changes in the preferences of investors and consumers can also catalyze repricing of climate risk. In the case of investors, more than \$40 trillion is currently invested in ESG strategies globally.⁷⁵ While not all of that is geared towards the “E” component, it is nevertheless telling that some investors already consider climate-related risks and carbon emissions to be material and relevant for them. Even central banks who are becoming a larger part of global bond markets are getting involved. Expectations are growing for the ECB to slash its bond purchases of fossil fuel companies and other heavy carbon emitters.⁷⁶ In order to compete for capital, firms must respond to changing investors’ preferences or risk relying on a shrinking pool of potential investors and facing a higher cost of capital.

Sharp changes in customer preferences can also drive a repricing of firms or industries that contribute to climate risk. For example, when Europeans altered

their travel patterns in 2019 due to greater awareness of global carbon emissions, it led to episodes of “flight-shaming” which caused a highly unusual 9% decline in demand for domestic flights from the prior year in Sweden.⁷⁷ As climate change becomes more tangible, there are likely to be more such episodes of collective consumer action.

At a minimum, they represent reputational risk to firms not responsive to the shifting preferences of their customers.

Corporate climate liability

Another potential avenue for the repricing of carbon-based assets is through the courts. To date, no legal challenges against carbon-emitting companies have succeeded in their attempts to seek damages for harm done to the climate – but this is a relatively new field. Of the roughly 1,500 climate cases filed, the vast majority were in the last decade.⁷⁸ And with new lines of attack constantly being explored, it’s plausible that at some point one of them will succeed. Oil and gas companies are at particular risk from these challenges, which have been brought forward in the US by cities, states and even concerned children.⁷⁹

As was the case with the tobacco industry, all it would take is one successful court challenge for a legal precedent to be set outlining liability for fossil fuel extractors and carbon emitters. This would force investors to reconsider valuations of companies that own or use carbon-intensive assets.

Another avenue by which climate-driven repricing might occur is through the legal interpretation of materiality. This recently was center stage in Australia, where a group of government bond investors sued the Australian government for failing to disclose material investment risks from climate change.⁸⁰ Likewise, in the US, there has been growing demand from investors for more expansive climate-related corporate disclosures. This could have a significant impact on how courts view materiality.

The potential for a “climate Minsky moment”

The factors mentioned above are likely to spur gradual or partial repricing of climate-related risks. Policies take years to materialize, legal cases are drawn out and typically build off one another, and new data gets introduced bit by bit. In the absence of these gentle nudges that unfold over time, markets may see abrupt, and disorderly price changes. Former Bank of England Governor Mark Carney referred to a domino-like scenario of markets repricing all at once in short order as a “climate Minsky moment.” In such a scenario, all markets price in climate-related events regardless of how far out in the future the risk may be.

This could come in the form of one massive transformative event. According to one estimate, a climate-inspired Minsky moment could lead to global financial losses of up to \$20 trillion.⁸¹ However, there need not be a universal abrupt repricing for global markets. There could also be a series of localized ones that impact different realms at different times. It seems more likely different regions and sectors of the market will face localized episodes of sharp repricing, brought on by the sudden realization and internalization of

a specific aspect of climate risk. This has arguably already begun.

Markets will play an important role in the economic transition brought about by climate change. This will require wholesale repricing of carbon-intensive assets as well as those that are vulnerable to physical risks. Whether through gradual repricing or abrupt Minsky moments, markets will eventually be forced to more fully price in risks. This has significant implications for investors, regardless of their personal views on climate change. If most market participants believe climate risk is increasing, market pricing will adjust, impacting the holdings of climate activists and skeptics alike. This process is already underway.

As investors monitor markets for these price changes, they will need to begin positioning their portfolios to avoid any pitfalls while also taking advantage of the resulting opportunities. We lay out the most critical and contrarian asset classes and portfolio-wide implications in Chapters 4 and 5, respectively.

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