Pricing and Mispricing of Climate Risks in U.S. Financial Markets

By Toan Phan

There is a rapidly growing research literature studying the effects of climate change risks on financial markets. Recent evidence suggests that markets have started to price climate risks. However, the extent of pricing varies across markets and time, and there is evidence of potential market inefficiencies. This article will highlight some key findings and their policy implications.

How do the risks associated with climate change affect financial markets? This nontrivial and highly relevant question is at the heart of a rapidly growing empirical climate finance research literature. In this article, I will try to quickly (and thus imperfectly) summarize what I think are some key findings from this literature — with a special emphasis on studies of the U.S. markets — and their policy implications.

Risks Specific to Climate Change

The question is nontrivial because the emerging climate risks are different from other existing sources of risks in several dimensions. There is substantial uncertainty about climate projections. For example, there is a high degree of uncertainty about the climate sensitivity parameter, which determines the expected global average temperature increase if atmospheric carbon concentration doubles.

There is also substantial disagreement in climate beliefs. For example, the latest survey data on climate change collected by Yale University suggests that political affiliations are a strong predictor of climate beliefs. Furthermore, it is not clear how present-day financial markets may reflect future climate risks, whose realizations are likely to be decades away.

Asset Pricing of Climate Risks
A first key finding from the literature is that markets for durable assets — such as real estate, stocks and long-term bonds — have started pricing projections of climate risks, but the extent of pricing varies substantially across markets and time.

Several papers have documented that U.S. coastal real estate markets have started to price the exposure to the anticipated increase in future inundation due to sea level rise (SLR). For example, a paper published in 2019 titled "Disaster on the Horizon: The Price Effect of Sea Level Rise" estimated that residential properties exposed to future inundation risk should the average global sea level rise by 6 feet (a projected possibility by 2100) are sold at prices about 7 percent lower than unexposed but otherwise identical properties.¹

It also found that the extent of pricing has intensified, rising as high as 20 percent after 2013 and coinciding with the increased attention to climate risks after upward revisions of SLR projections and after Hurricane Sandy. A related working paper, "Sea Level Rise Exposure and Municipal Bond Yields (PDF)," found that U.S. municipal bond markets have been pricing SLR risk since 2013.

Furthermore, another paper published in 2020 titled "Does Climate Change Affect Real Estate Prices? Only If You Believe in It" documented that the extent of the pricing of SLR risk depends significantly on climate beliefs, ranging from about zero in real estate markets in counties with low beliefs in climate change to about 8 percent in markets in counties with strong climate beliefs.

While physical climate risks (such as increasing inundation risk) have been shown to affect real estate markets, several papers have shown that transition climate risks (such as increasing risk of exposure to environmental regulations among carbon-intensive industries) affect stock prices. For instance, a recently published paper "Do Investors Care About Carbon Risk?" documented that stock market prices take into account the carbon intensiveness of firms, suggesting that investors are demanding compensation for the anticipation of exposure to climate transition risks.

### Inefficient Pricing of Climate Risks

A second key finding is that there is evidence of potentially inefficient pricing of climate risks. The well-cited 2019 stock market study "Climate Risks and Market Efficiency" argued that the efficient market hypothesis does not seem to hold when it comes to pricing climate-related risks. Specifically, the authors exploited the variation in the trends of a drought-severity index of 31 countries with publicly traded food companies. They documented that the stock prices of these companies do not fully reflect their countries' drought trends, implying that the stock prices are "underreacting to climate change risks."²

An extensive study published in 2021 titled "The Effect of Information About Climate Risk on Property Values" estimated that about 3.8 million single-family homes in flood plains are currently overvalued by about $33 billion to $56 billion relative to an efficient flood zone.
discount benchmark. The study also addresses a natural question: If markets are not efficiently pricing climate risks, why not? One potential explanation is incomplete information. The study documented that the flood zone discount is stronger and closer to the efficient benchmark in states that have the most stringent disclosure requirements regarding flood risks in real estate transactions. This finding implies that policies aimed at enhancing the disclosure of exposure to climate-related risks — as discussed recently by the Financial Stability Oversight Council’s report on climate change — could potentially enhance the efficient pricing of climate risks.

Another recent empirical analysis of the mortgage market by the forthcoming paper "Mortgage Finance and Climate Change: Securitization Dynamics in the Aftermath of Natural Disasters" proposed another potential explanation: By exploiting existing institutional arrangements, banks can transfer climate risks to government-sponsored enterprises (GSEs) via securitization and, hence, may have reduced incentive to sufficiently price climate risks in their mortgage loans.\(^3\)

Taken together, the rapidly growing empirical climate finance literature has provided evidence that financial markets have started pricing climate risks. However, the extent of pricing varies across markets and time, and there is evidence of potential market inefficiencies. Economists and policymakers should pay close attention to emerging findings from this literature and their implications.

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\(^1\) For a comparison, the 2021 paper "Climate Change and Long-Run Discount Rates: Evidence from Real Estate" estimated that house prices dropped about 7 percent on average in financial crises in a panel of 20 countries with developed financial markets (including the U.S.) between 1870 and 2013.

\(^2\) These findings are echoed in a recent survey of 861 academic economists, regulators and financial market participants in a recently published paper titled "What Do You Think About Climate Finance?" In this paper, 60 percent of participants stated that they believe stock market prices do not sufficiently reflect climate-related risks.

\(^3\) Specifically, the authors documented that after a billion-dollar hurricane (such as Katrina or Sandy), lenders are significantly more likely to increase the share of mortgages originated and securitized right below the conforming loan limit (that is, mortgages that can be sold to GSEs). The effect is stronger in neighborhoods with lower historical hurricane exposure (where a hurricane provides "new news" about future climate risk) and weaker in flood plains (where flood insurance is required). They also provided evidence of adverse selection into securitization (in the sense that there is a higher probability of foreclosure or delinquency after hurricanes in the conforming loan segment compared to the nonconforming segment). Intuitively, a large
hurricane provides lenders with additional information about a location's exposure to hurricane and flood risks. Lenders can use this information in their underwriting and securitization decisions. In contrast, GSEs do not adjust their rules or fees in response to flood risk info. (They rely on official flood plain maps, which could be outdated.) Thereby, lenders can strategically transfer risky loans to GSEs via securitization.

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