2023 MOSKOWITZ PRIZE WINNER
RESEARCH BRIEF

ABOUT THE PRIZE

The Moskowitz Prize recognizes research that exhibits empirical excellence and the potential to inform responsible business and investing practices in the real world.

Biodiversity Risk

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Biodiversity risk has been challenging to measure, making its impacts on firms and financial markets difficult to evaluate. This study quantifies biodiversity risks and its exposures on multiple dimensions, highlighting its effects on equities prices and documenting its differences from climate risks.

SUMMARY OF FINDINGS

How does biodiversity risk differ from climate risk, and can biodiversity risk be quantified? How do investors and others view this risk? Do current asset prices reflect biodiversity risk?

Minimal research has addressed these questions to date, given challenges quantifying biodiversity loss and its related risks. The authors develop multiple measures of biodiversity risk and related business exposures—using surveys, news coverage, and analysis of 10-K statements—revealing multiple key findings:

- Financial practitioners, academics and regulators believe that biodiversity risks have at least moderate impacts on business.
- Sectors with high exposure to biodiversity risk include energy and utilities, while software and semiconductor businesses face less risk
- Biodiversity risk exposure has been at least partially priced into equities in the past decade
- Biodiversity and climate risks can affect each other but are independent phenomena and should be treated separately in research and practice

The authors consider the practical implications of these findings for multiple stakeholders and make their biodiversity-related measures available for public use.

Nature and Impact of Biodiversity Risk

A growing body of research links climate change to changes in economies and asset values. But it's also important to understand how *biodiversity loss* affects economic risk. The authors work toward answering this question, defining biodiversity as earth's collective total of genes, species, and ecosystems, reflecting the variety of life forms critical to human survival and well-being (as used in food, medicine, others).

Damages caused by loss of ecosystem services alone have been estimated as high as $20 trillion/year. Other risks include those associated with transitions to more regulation-based protections, which can also have large effects on economic activity and asset values.

Yet biodiversity risk has received limited research attention, due in part to challenges measuring this variable. The authors take an innovative approach to surmount this barrier, developing several measures of biodiversity risk and businesses' exposure to it, along with capturing investors' and others' views about these risks.

Perceptions & News Coverage of Biodiversity Risk

To first understand perceptions of biodiversity risk, the authors led a global survey among investment professionals, regulators, and academics. They find the majority believe biodiversity risks have at least moderate financial impact on US businesses—70% of respondents endorsed this view.

The authors also examined news coverage of biodiversity and climate risk through analysis of *New York Times* stories from 2000 to 2022. The results show that periods with more bad news about

biodiversity (e.g., Trump administration modifications of Endangered Species Act) do not necessarily co-occur with times of negative climate news (e.g., large-scale flooding). This finding supports the independence of biodiversity and climate risks, and reinforces studying them separately.

Industry Exposure and Equity Prices

Industry exposure to biodiversity risk varies by businesses' dependence on natural capital and how much companies impact the environment. The authors quantify risk exposure partly through examination of firm's 10-K statements, such as energy companies' disclosure of risks related to drilling and pharmaceutical businesses' reliance on biodiversity for drug research and manufacturing.

The authors combine exposure measures based on 10-K statements with others such as information on biodiversity fund portfolio holdings and from expert surveys to create a composite measure of industry-level exposure to biodiversity risk. They find, logically, that sectors with the highest biodiversity-risk exposure include utilities, energy, and real estate. In contrast, those with minimal exposure are revealed to be the software, semiconductor, and communication-services industries.

To understand whether equity prices reflect biodiversity risk exposure, the authors created a portfolio of long positions (which benefit when stock prices rise) for industries with lower exposure and short positions (which benefit when stock prices fall) for those with high exposure. They find significant positive correlations between the portfolio returns and news of biodiversity-related innovation, suggesting biodiversity exposure risk has been at least partially priced in for equities over the past 10 years. Despite evidence for such partial pricing, the study's survey participants perceive current equity-related pricing of biodiversity risks to be inadequate.

Biodiversity vs. Climate Risks

While separate concepts, climate change and biodiversity risks can affect each other, such as the impact of warmer weather and droughts on farm crops. To differentiate climate and biodiversity risks, the authors show that their aggregate biodiversity risk index behaves differently from climate risk indices of similar construction. They also show only a weak correlation between climate and biodiversity exposures within a given industry, and that portfolios built to hedge one type of risk (climate or biodiversity) do not hedge well for the other.

Overall, the authors present an innovative approach to studying and quantifying biodiversity loss and associated risks, including impacts on specific business sectors. Researchers and others can use the biodiversity measures to advance collective understanding of this natural phenomenon critical to human life and well-being.

KEY DATA

- Survey of finance researchers, professionals, and public sector employees in Q12023 (biodiversity risk perceptions)
- NYT biodiversity and climate news (press coverage of biodiversity and climate developments)
- Google biodiversity-related searches
- Business 10-Ks; biodiversity-fund holdings (biodiversity risk exposure)
- Data available at www.biodiversityrisk.org

PRACTICAL IMPLICATIONS

- *Researchers* can use the new measures of biodiversity and associated risks to form and test hypotheses related to biodiversity-loss impacts in multiple domains including economics, business, and human welfare.
- *Investors* can use the findings to better understand how biodiversity risk affects current and future business performance and, consequently, take better-informed positions on industries and specific equities.

QUESTIONS FOR FUTURE RESEARCH

On types of biodiversity risk:
How do different types of biodiversity risk (e.g., species versus ecosystem diversity) impact key economic/financial areas such as equity pricing?

On biodiversity and climate risks:
What are specific dimensions and elements of the interaction between biodiversity and climate risks? When do these covary in predictable ways and what are potential explanations?