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How Sea Level Rise Exposure Is Priced into Municipal Bonds.

Experts at Wharton and elsewhere have created a model that improves upon conventional approaches to understand how investors perceive the impact of climate risk on local economies. One important aspect of climate risk is sea level rise (SLR) — which is estimated to be as high as 8.2 feet by 2100 over 2000 levels — and how it affects coastal communities. In their paper titled "[Sea Level Rise Exposure and Municipal Bond Yields](#)," the experts used municipal bond prices as a proxy to estimate the impact of SLR risks.

"The way risk is priced into municipal bond prices is driven more by uncertainty over SLR risk than by the current values of assets – in this case, homes," said Wharton finance professor Michael Schwert, who co-authored the paper with Yale School of Management finance professor Paul Goldsmith-Pinkham, Penn State finance professor Matthew T. Gustafson and University of Colorado, Boulder, finance professor Ryan C. Lewis. For example, two houses that are across the street from each other may have different prices if one has more SLR exposure than the other, but that exposure is not reflected at the school-district level, he explained. "District-level house prices are unresponsive to SLR exposure and do not affect the estimates of the SLR premium in bonds," the paper stated.

"The municipal bond market is an ideal setting for assessing investors' expectations of the impact of climate risk on local economies," the paper stated. "This is because the sources of repayment for municipal bonds are tied to local economic conditions, especially so for the school district bonds that comprise our sample, which are commonly backed by local real estate taxes." The SLR exposure premium is larger for bonds whose school districts rely more on local property taxes for budgetary needs, the paper noted.

The researchers selected school district bonds to study the effects of SLR exposure; their sample covered nearly 60,000 bonds issued by 1,508 school districts between 2001 and 2017. Municipal bond markets began pricing in SLR risk around 2011, and by 2013, they found "a statistically significant" SLR exposure premium in municipal bond yields. "The rising premium – after 2013 – suggests that investors are taking account of these risks," said Schwert. "Given that the scientists seem to be getting more pessimistic [about climate risks], I would expect these pricing effects to persist and perhaps grow."

The researchers found that the increase in expected default losses attributable to SLR risk is low, but the economic impact is "non-trivial." They estimated that impact as equivalent to a reduction of 2.4% to 5.6% in the present value of local government cash flows.

Rating agencies were yet to begin factoring in SLR risks for municipal bonds as of 2017, although they have [indicated](#) that they would do so, Schwert said. "They'll probably end up having to downgrade some issuers in the future." But bond prices provide "more statistical power" in tracking SLR risk premiums than credit ratings, he noted. Furthermore, the research did not find an economically large increase in bond yields on account of SLR risk (0.05% annually). "It's not clear

that this is a threshold that would cause a rating downgrade,” he added.

Takeaways for Policymakers

Schwert said their study could help in the cost-benefit analysis of remediation measures by coastal communities exposed to SLR risk such as building seawalls. Those communities would be able to reduce their borrowing costs if climate remediation efforts could reduce uncertainty about the economic impact of SLR, he added.

Scientific evidence on SLR risks suggests that local governments in coastal communities would face an increasing burden in financing their remediation efforts, Schwert continued. “This would be a call for more state-level economic support for these communities or risk-sharing,” he said.

Schwert said that while SLR is only one aspect of climate risk, their research could be applied to other scenarios, too, such as wildfires. “As long as you have access to bond yields and a clear measure of geographic exposure to whatever risk you’re interested in [analyzing], this approach would be useful,” he added.

Wharton

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