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FutureProof Responses to FHFA RFI on Climate and Natural Disaster Risk

We would like to thank the Federal Housing Finance Agency (FHFA) for issuing this RFI. We commend FHFA on taking this step to address this issue, which we believe carries crucial implications for both economic and environmental resiliency.

FutureProof Technologies is a team of Ph.D. economists, Ph.D. finance scholars, Ph.D. climate scientists, and data scientists. We have been performing research on the impact of climate and climate change on residential mortgage performance and the attendant risks to the GSEs. We are finding financially significant impacts. As a result of this work, we are in a position to provide our views on a number of the questions posed by FHFA in the RFI:

1. *How should FHFA define climate and natural disaster risk?*

- We believe that FHFA should **define climate and natural disaster risk**, with respect to the regulated entities, based on the **financial risk to the regulated entities' bond portfolios**.
- As background, there are a number of tools in the market today:
    - First, a large body of research and commercially-available products provide information on physical climate risk, i.e. on the **frequency and severity** of physical climate risks.
    - Second, a number of commercially available tools project **damages** to property or insurance losses.
- However, existing tools typically **do not project financial implications to bonds specifically**, for example on the **present value of the cash flows on mortgages, probability of default, loss given default**.
    - These metrics are more relevant to the financial management of the regulated entities than either the pure hazard assessment or the property damage assessment.
    - Financial projections for bonds specifically are necessary to manage risk appropriately.

2. *What are the climate and natural disaster risks to the regulated entities, including long- and short-term risks, and how might such risks change over time? To what extent, if any, could such risks now or in the future impede the ability of each regulated entity to operate in a safe and sound manner, fulfill its statutory mission, or foster liquid, efficient, competitive, and resilient national housing finance markets?*

- Our research shows that implications of climate for the expectation of the present value of cash flows can be **100 or more basis points** *today* as an average within geographic areas, particularly on or near the Gulf Coast and other areas particularly affected by weather and climate change risk.
- **Tail risk**, as measured by probable maximum losses (PMLs), can be even **larger**.

- Such risks now or in the future will impede the ability of the regulated entities to operate in a safe and sound manner.
    - In fact, the **regulated entities are the *most* at-risk entities**, as measured by the total value at risk, with respect to the financial implications of climate risk for residential and commercial mortgages.
    - These risks will only **increase in the future**.

3. *What methodologies, datasets, variables, assumptions, future climate scenarios, and measurement tools are used to measure and monitor climate risk to the national housing finance markets? Describe any gaps in available data that limit the ability to measure such risks. How could such data gaps be resolved?*

22. *What data or housing market information would be beneficial for FHFA to make available, to the extent permitted by privacy considerations, to researchers and other interested parties to support the assessment of climate and natural disaster risk to the regulated entities or the national housing finance markets?*

With regard to questions 3 and 22:

- A **catastrophe model** must be developed specifically projecting the **implications of climate for residential mortgage debt** -- such as the impact on probability of default, loss given default, probability of delinquency, and aggregating these together to derive the implications for the present value of the cash flows.
- At FutureProof we have estimated **vulnerability curves** for mortgages that project the financial impact of weather disasters on mortgage portfolios specifically, including on the present value of mortgage cash flows, and on the component **probability of default, loss given default, and probability of delinquency**.
    - These estimates **rely directly on microeconomic dat**a, including from the regulated entities, relating defaults and other mortgage outcomes to the incidence of climate disasters, by comparing areas affected and unaffected by these disasters.
    - These are then combined with a hazard model, projecting the probabilities of climate disasters and their implications for damages, to derive the **implications for cash flows**, defaults, and other outcomes.
- An important gap in the data relates to the difficulty of obtaining **address-level data** on mortgage outcomes.
    - Such data would allow a much better assessment of how climate risk or damage at the property level relates to mortgage outcomes on the loan backed by that property.
    - These data should be **made available to relevant parties in a secure manner**, perhaps along the lines of similar secure data access structures set up by the IRS, U.S. Department of the Treasury, or U.S. Census Bureau.

7. How should FHFA evaluate the adequacy of a regulated entity's ability to assess and manage the impacts of climate and natural disaster risk, particularly in light of the significant uncertainties and data limitations?

- To address the significant uncertainties and data limitations that FHFA notes, it is necessary to develop projections of **probability distributions of financial risks**.
- To do so, it will be necessary to rely on a **catastrophe model for debt**, as discussed above.

9. How should FHFA prioritize the various climate and natural disaster risks to the regulated entities?

- We find that **floods and hurricanes** are currently the primary sources of climate-linked delinquency and default.
- Earthquakes also pose significant risk, but this risk is largely static over time.
- In general, **risks that are less well insured** are more prone to cause defaults relating to natural disasters.
    - This implies the possibility that other climate hazards, such as wildfires, may pose a greater risk of climate-linked delinquency or default in the future -- both due to potential increases in frequency and severity linked to climate change, and due to the potential uninsurability of such risks in certain geographies in the present and/or future.

11. *What risks to the regulated entities' critical service providers and other third parties—including but not limited to mortgage servicers and insurers—should FHFA consider when assessing each regulated entity's management of climate and natural disaster risk?*

- **Mortgage servicers** can face **liquidity crunches** after natural disasters.
- These liquidity crunches can be expected to intensify as the frequency and severity of natural disasters increases in the future under climate change.
- Mortgage servicers could be encouraged to mitigate such risks, for example through purchase of **insurance, catastrophe bonds,** and/or **derivatives**.
    - The Sierra Bond, a parametric product that insured against earthquake-linked default risk to a mortgage servicer, is an initial example of such a financial instrument.

13. Should FHFA implement a stress testing, scenario analysis, or similar program to assess the regulated entities' climate and natural disaster risk? If so, what factors should FHFA consider in defining the purposes, design, and scenarios of any such programs?

17. What, if any, additional periodic or episodic reporting requirements for the regulated entities should FHFA consider to improve the publicly available information on the regulated entities' management of climate and natural disaster risk?

25. What, if any, other enhancements should FHFA consider to its supervision and regulation of each regulated entity's management of climate and natural disaster risk? Other enhancements could include but need not be limited to: (i) regulatory capital requirements or other loss-absorbing capacity requirements that ensure each regulated entity has the capacity to absorb impacts of climate and natural disaster risk; (ii) disclosure requirements to provide shareholders, creditors, CRT or other investors, and other counterparties with appropriate information about a regulated entity's climate and natural disaster risk; and (iii) changes to FHFA's supervisory program to enhance examination of or reporting on each regulated entity's infrastructure and processes for identifying, assessing, mitigating, and monitoring the regulated entity's management of climate and natural disaster risk.

26. To what extent, if any, should FHFA support efforts to develop standards of classification and data reporting on climate and natural disaster risk to the financial performance of companies, such as those by the Sustainability Accounting Standards Board, domestic and foreign government agencies, or others?

With regard to questions 13, 17, 25, and 26:

Given the **substantial impacts** of climate on the financial position of the regulated entities, we believe that FHFA should:

- Implement **stress testing** to assess the regulated entities' climate risk.
- Institute **regulatory capital requirements** relating to climate risk.
- Institute **disclosure requirements** for climate risk.
    - Where possible, such disclosure should be required to be made in *financial terms*, such as impacts on the present value of cash flows or components thereof.
- Require **enhanced reporting** on regulated entities' management of climate risk.
- Support efforts to **develop standards of data reporting** on climate risk
- In all of these cases, disclosure and financial risk management such as stress testing or capital requirements should be **based on metrics that are expressed in financial terms such as average annual losses, probable maximum losses**, and the like.
- Collectively, these steps would allow FHFA to evaluate the adequacy of the regulated entities' ability to assess and manage the impacts of climate risk.

14. Are there alternative risk mitigation strategies, including but not limited to insurance or insurance-based financial instruments, that could transfer risk from the regulated entities' portfolios or products or assist with the market pricing of climate and natural disaster risks?

- As noted above, the Sierra Bond is an initial example of a financial instrument that helps to insure natural disaster risk.
- Although the Sierra Bond covered earthquake, such instruments have not yet been developed to help **insure climate risks such as flood or hurricane.**
- We believe there is **demand in the market** for additional such financial instruments, which could **insure banks, servicers, and others**.
- Such products could help in reducing risk to these entities, and could also potentially help comply with future regulatory requirements to hold sufficient capital against climate risk (please see our answers to questions 13, 17, 25, and 26 above).

15. How might the regulated entities support their housing finance missions while minimizing the impact of climate and natural disaster risk?

- It is estimated that fewer than 10% of American homeowners are insured against floods.
- FutureProof has found that across geographic areas, **the default and basis point impacts of flood disasters tend to be larger when borrowers are less well insured** (controlling for the magnitude of the flood itself, as well as other factors).
- Studies show that even many borrowers for federally-backed mortgages in the FEMA flood plain, who are required to purchase flood insurance as a condition of obtaining the mortgage, are prone to drop this flood coverage after initially obtaining the mortgage.
- FHFA should **require the regulated entities to institute stronger monitoring mechanisms to ensure that borrowers in flood plains maintain their flood insurance coverage**.
- Equally important, FHFA should ensure that the **regulated entities require lenders to consider the financial implications of climate factors in their underwriting** for federally-backed loans.

18. *Policies to manage climate and natural disaster risk could increase the cost of housing, making it more difficult for lower income households in some areas to obtain affordable housing. Are there policies the regulated entities could pursue to mitigate such adverse effects for lower income households in vulnerable areas without undermining efforts to manage climate and natural disaster risk?*

19. Minority borrowers exhibit higher rates of delinquencies for longer durations following natural disasters. Are there policies the regulated entities could pursue to mitigate such adverse effects for minority borrowers exposed to climate and natural disaster risk?

21. What specific issues or topics should FHFA consider for future research on climate and natural disaster risk to the regulated entities and the national housing finance markets?

With regard to questions 18, 19, and 21:

- We strongly agree that an important consideration is the impact of potential policy measures on different groups, including disadvantaged groups.
- An initial step would be a **study of how large the correlation is** between the impacts of climate on bond losses, and measures of disadvantage.
- A more precise understanding of this correlation can form the basis for a policy approach that successfully mitigates adverse effects for lower income households in vulnerable areas.

20. What type of organizational structures should FHFA and the regulated entities consider adopting for themselves to support the management of climate and natural disaster risk?

- Forming a **working group** relating to climate issues is a good way to begin.
- A next step for FHFA and the regulated entities could be to create additional positions focused on **operationalizing the financial management of climate risk**.

23. What factors should FHFA consider in determining whether to formally participate in or informally partner with organizations or groups focused on climate and natural disaster risk management?

- FHFA should consider whether groups are able to **project financial implications to bonds specifically**, for example on the present value of the cash flows on mortgages, probability of default, loss given default.
    - These metrics are more relevant to the financial management of the regulated entities than either the pure hazard assessment or the property damage assessment.
- Similarly, FHFA should consider whether organizations have developed a **catastrophe model for debt.**

24. Are there existing or potential government agencies or programs that FHFA could partner with to enhance the Agency's supervision and regulation of climate and natural disaster risk to the regulated entities?

- Building on our answer to question 15 above with regard to monitoring flood insurance coverage, FHFA could work to **ensure stronger flood insurance coverage requirements**. This could involve interagency work, including with **NFIP**.
- This could, among other things, include **stronger monitoring mechanisms to ensure that borrowers in flood plains maintain their flood insurance coverage**.

FutureProof is happy to serve as a resource for FHFA as FHFA and the regulated entities grapple with these issues. Thank you for the opportunity to submit our responses, and for FHFA's work on these important matters.