The rising tide lifts some interest rates: climate change, natural disasters, and loan pricing

RCFS Winter Conference

Kunal Sachdeva

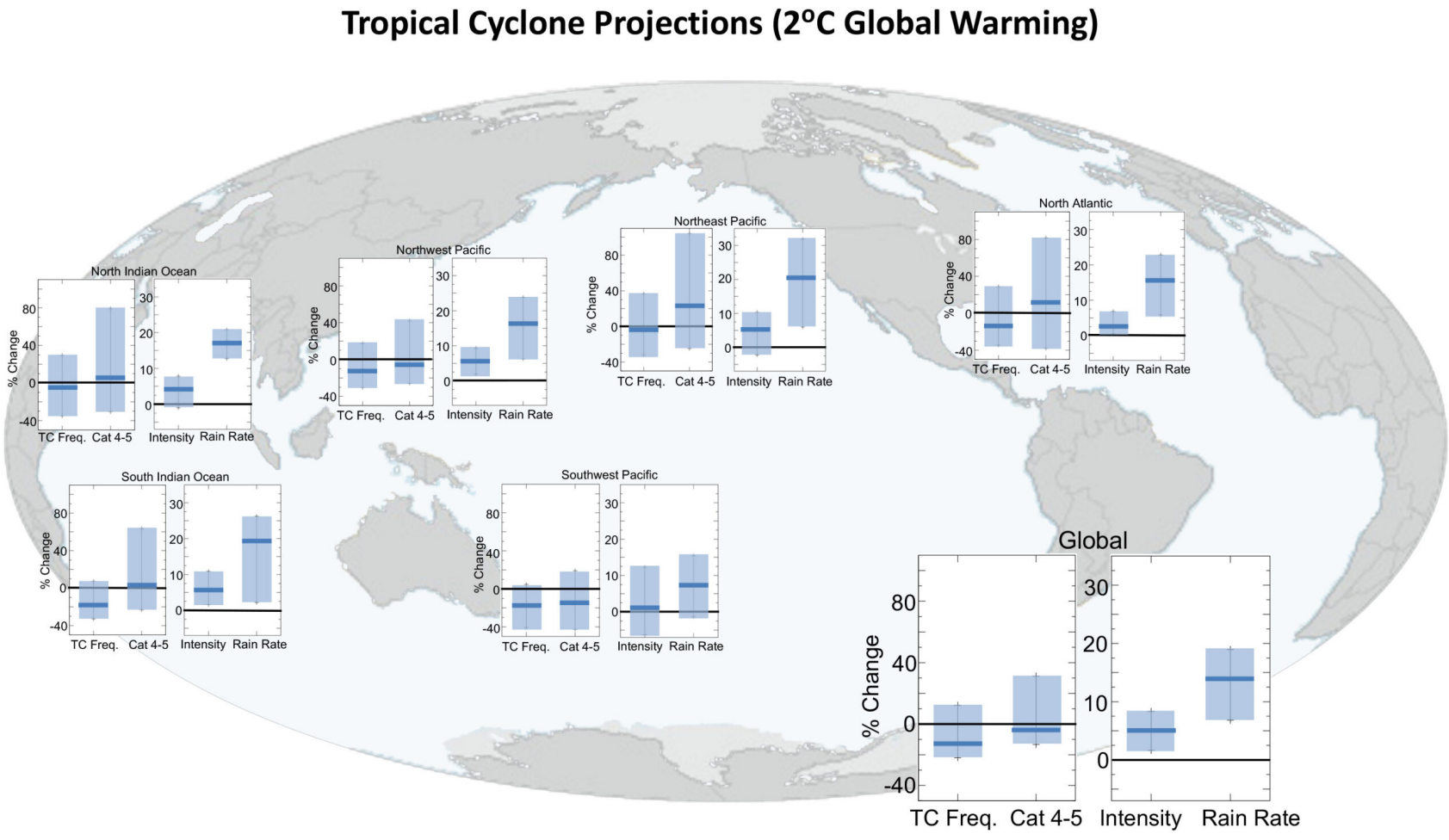
February 19th, 2022

Devastating Effects of Natural Disasters

Hurricane Maria, Puerto Rico, 2017

Climate Change Leading to More Rain, Greater Intensity

NOAA's Geophysical Fluid Dynamics Laboratory



Paper Questions

Climate Change, Natural Disaster, Loan Pricing

The paper asks three related questions:

1. Do extreme weather events, related to climate change, impact the corporate loan market?

2. Do banks overreact to climate change events?

3. How do borrowers react to these changed lending terms?

Empirical Strategy

Focus on at-risk, but unaffected borrowers

Main Empirical Specification

$$\begin{aligned} Spread_{i,m,t} =& \beta_1 Indirect\ hurricane_{i,t} \times Recent\ hurricane_t \\ &+ \beta_2 Indirect\ hurricane_{i,t} + \beta_3 Recent\ hurricane_t + \gamma X_{i,m,t} + \alpha_i + \phi_{m,y} + \epsilon_{i,m,t}. \end{aligned} \tag{1}$$

- **Focus on at-risk, but unaffected borrowers**
  - → Observes changes in loan spreads for borrowers located in disaster-prone areas, but not directly affected by a specific event
  - → *RecentHurricane* – if a hurricane has occurred in the three months preceding the loan
  - → *IndirectHurricane* – Indicator, firms in the top quintile of location-weighted exposure to hurricanes

Summary of Results

Banks are Responding to Perceived Climate Risk

1. **Banks charge higher spreads on loans to indirectly affected borrowers**
   - → Represents about 10% of the unconditional spread charged on loans
   - → Implied probability of default increases by only 1 percentage point (1/5 SD)

2. **Dynamics of the reaction suggest a transient effect on loan pricing**
   - → Yields revert back down within one quarter following an indirect hurricane hit
   - → Paper suggests salience associated with extreme events at the organizational level

3. **Salience exhibited by lenders forces firms to adjust their investment decision**
   - → Reduce their physical capital expenditure by 0.8% (10% sample mean)
   - → Cash holdings relative to liabilities by about 15% relative to the unconditional sample mean

Well Presented Paper

The rising tide lifts some interest rates: climate change, natural disasters, and loan pricing*

Ricardo Correa† Ai He‡ Christoph Herpfer§ Ugur Lel¶

February 9, 2023

Abstract

Banks price physical climate change-related risks after observing natural disasters linked to climate change. We isolate this updating process by identifying loans to borrowers that are generally at risk of, but unaffected by, climate-change related disasters. Spreads of loans for these borrowers spike in the primary and secondary markets following such disasters. Consistent with higher perceived credit risk, banks adjust their internal probabilities of default for at-risk borrowers. However, a larger proportion of the increase in spreads is explained by overreaction due to salience, as the change in spreads is short-lived and amplified by media attention. Importantly, this salience is associated only with disasters linked to climate change, and it has effects on investment decisions at bank-dependent firms.

JEL Classifications: G21, Q51, Q54

Keywords: Banks, climate change, loan pricing, natural disasters

*We thank Brigitte Roth Tran and Mathias Kruttli for helpful suggestions and for sharing the code to map NETS to Compustat. We would also like to thank David Aikman, Mark Carey, Alain Chaboud, Yongqiang Chu, John Cochrane, Nuri Esahin, Erik Gilje, Matthew Gustafson, Kristine Hankins, Victoria Ivashina, Don Morgan, Ryan Lewis, Lilian Ng, Steven Ongena, Matias Ossandon Busch, Toan Phan, Christoph Schiller, Mike Schwert, Roger White, Constantine Yannelis, Yun Zhu, and seminar and conference participants at the NBER Summer Institute, the European Finance Association annual meeting, SFS Cavalcade, the Northern Finance Association annual meeting, the Wharton Conference on Climate and Commodities, the John Hopkins Carey Finance Conference, the Pre-WFA Early Career Women in Finance Conference, Qatar Center for Global Banking and Finance, the FDIC/JFSR Bank Research Conference, the IBEFA Summer Meeting, European Commission Summer School on Sustainable Finance, De Nederlandsche Bank (DNB), UCLA Climate Adaptation Research Symposium, FMA Global Conference in the Middle East, the BOCA Corporate Finance conference, the Midwest Finance Association annual meeting, Paris December Finance Meeting, the Eastern Finance Association meeting, the CEMLA-Dallas Fed financial stability workshop, University of South Carolina (Darla Moore), Emory University (Goizueta), Federal Reserve Board, University of North Carolina at Charlotte (Belk), University of Virginia (Darden), and Southwestern University of Finance and Economics (China). The views in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or any other person associated with the Federal Reserve System. All remaining errors are our own.

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Perspective on the Paper

Paper's strength comprehensive analysis:

1. Anecdotal evidence section
2. Evidence on disasters and climate change section
3. Floods and rates
4. Wildfires and rates
5. Other loan terms
6. Time-varying attention (Google trends + Reuters news)
7. Heterogeneity in hurricanes
8. Placebo tests
9. Winter weather
10. Regional spillovers
11. Borrowers' economic links
12. Bank disaster exposures
13. Seasonality and industry controls
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>> ***Paper's weakness ability to isolate the updating process***

Comment 1 – Measurement

(Salience) or (Salience × Anticipation)

Are banks updating their lending terms based on salience or anticipation as well?

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Let's consider the paper's measure of indirect hurricane

- **County 1** was hit by a hurricane 2 years ago
- **County 2** was hit by a hurricane 1 year ago
- **County 3** is hit by a hurricane today

*Q1: What do we conclude when observing increased spreads for **County 1** and **County 2**?*

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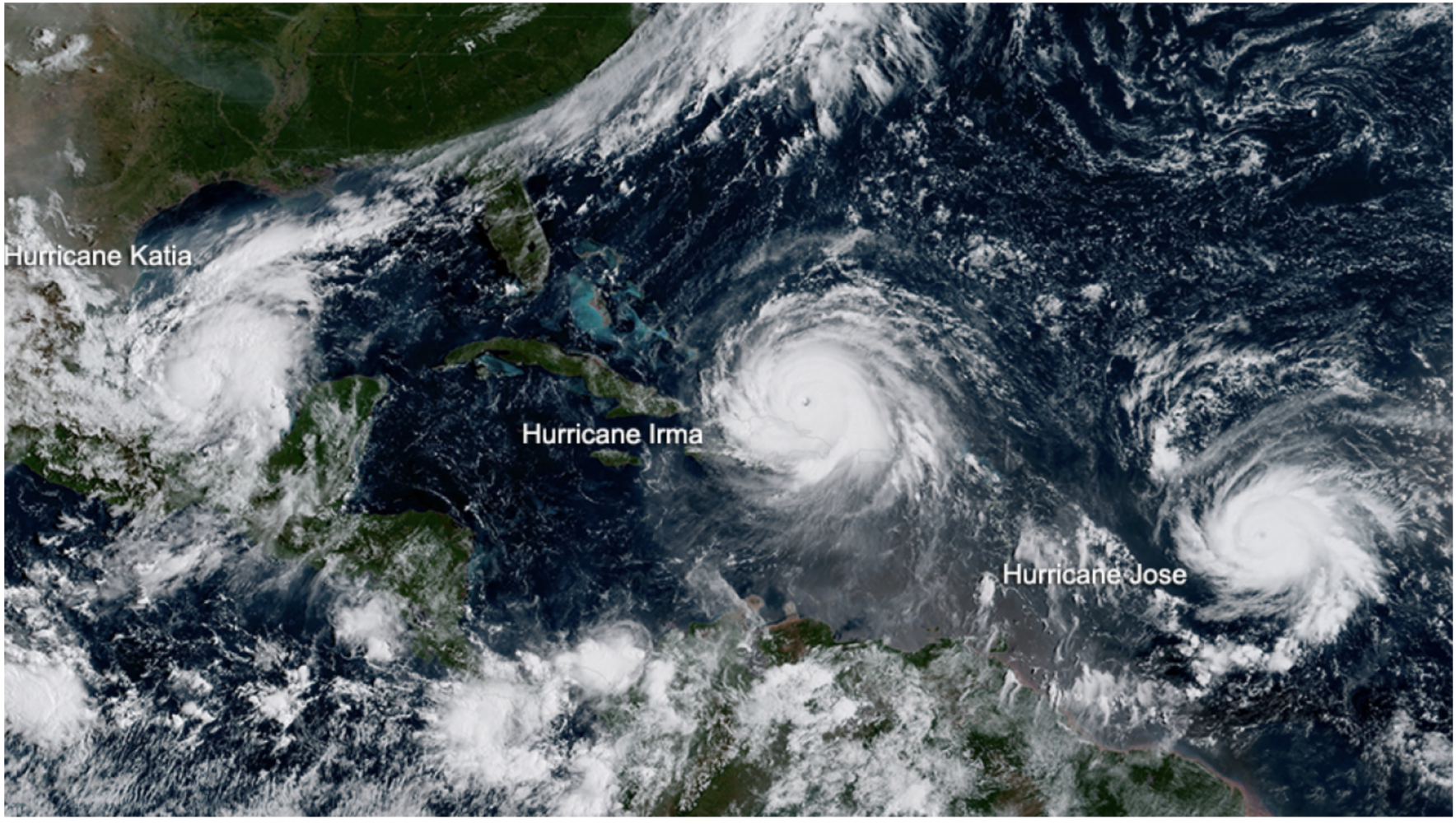
Let's now consider clustering of events

- **County 1** was hit by a hurricane 2 years ago
- **County 2** was hit by a hurricane 1 year ago
- **County 3** is hit by a hurricane today
- **A hurricane is also in the ocean** and it is unclear where it will strike **County 1** or **County 2**...

*Q2: What do we conclude when observing increased spreads for **County 1** and **County 2**?*

Comment 1 – Measurement

(Salience) or (Salience × Anticipation)



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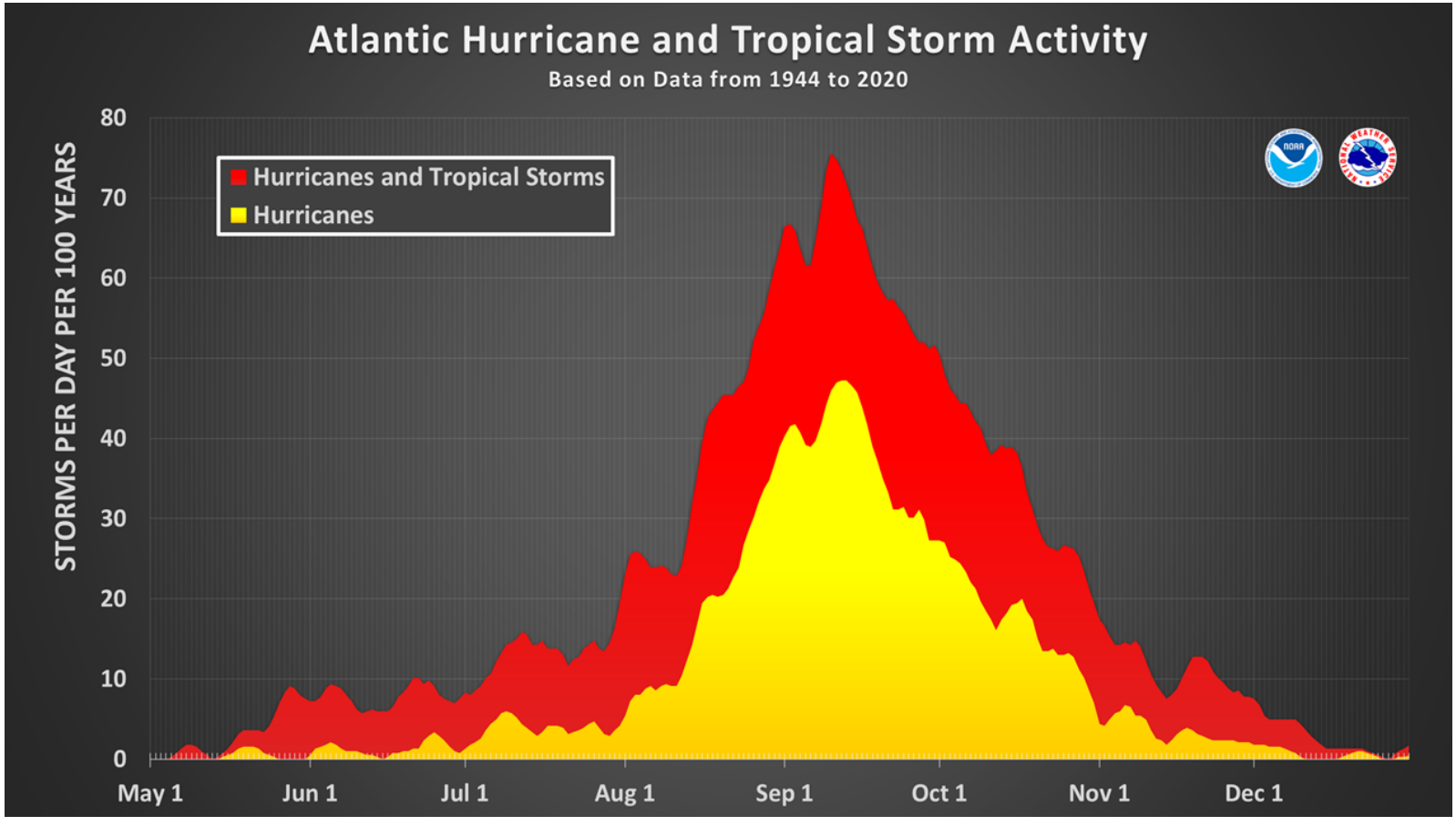

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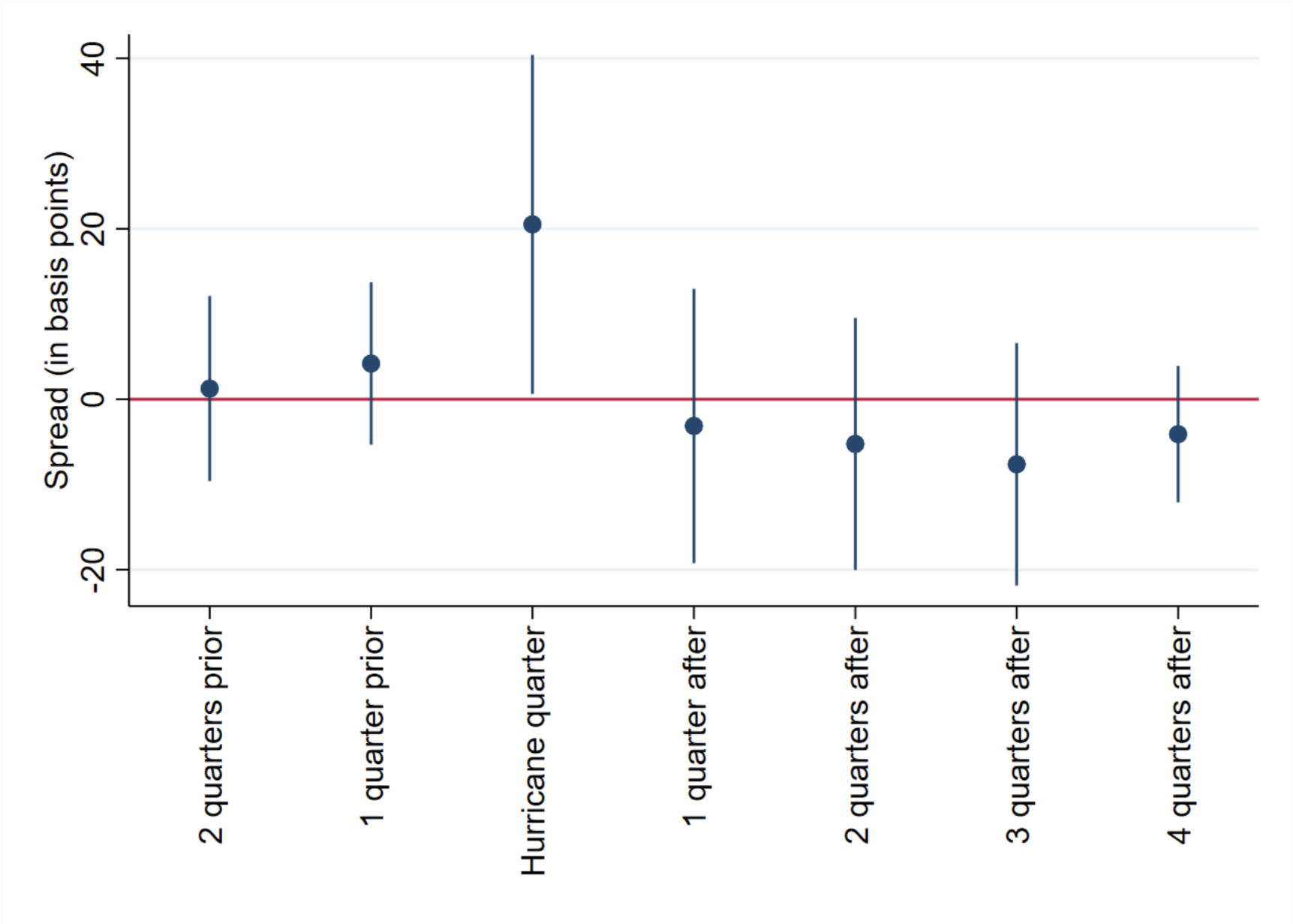

Comment 1 – Measurement

(Salience) or (Salience × Anticipation)

Can the paper more cleanly pin down a bank's response?

Suggestion 1: Restrict the shocks to those where other storms are not forming

- This test will cleanly measure the salience of a recent hurricane and its effects on an at-risk area.

Suggestion 2: Focus on Anticipation of Banks

- Climate risk may already be incorporated, seeing anticipation after a salience shock would be interesting!

Comment 2 – Intensity of At Risk

Comparability of Locations

Can the paper use the intensity of salience at the local level?

Let's consider the paper's measure of indirect hurricane

- A hurricane hits **Harris County, TX** 2 years ago
- A hurricane hits **Miami-Dade County, FL** 1 year ago
- A hurricane hits **Lafayette Parish, LA** today

*Q1: What do we conclude when observing increased spreads for **County 1** and **County 2**?*

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Let's now consider clustering of events

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- A hurricane hits **Miami-Dade County, FL** 1 year ago
- A hurricane shifts directions from **Harris County, TX** and hits **Lafayette Parish, LA** today

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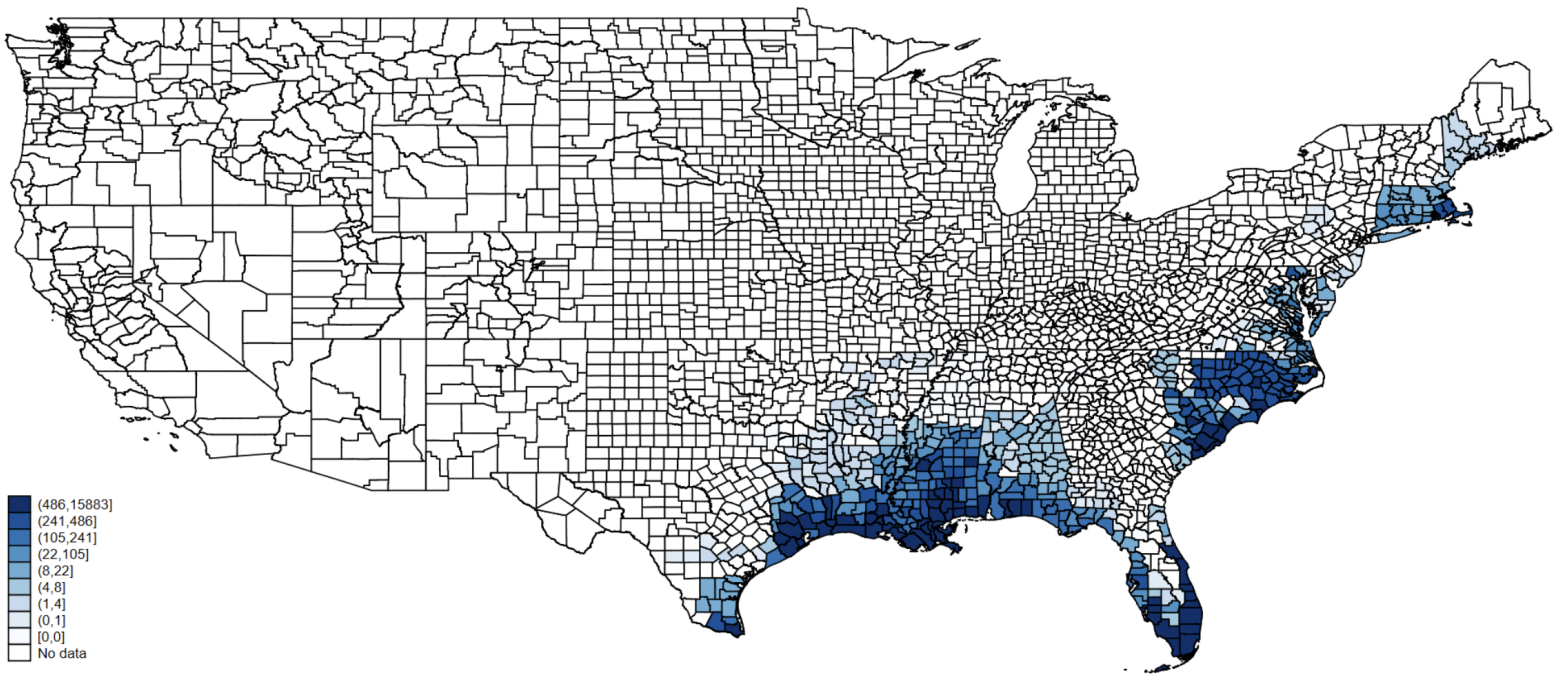

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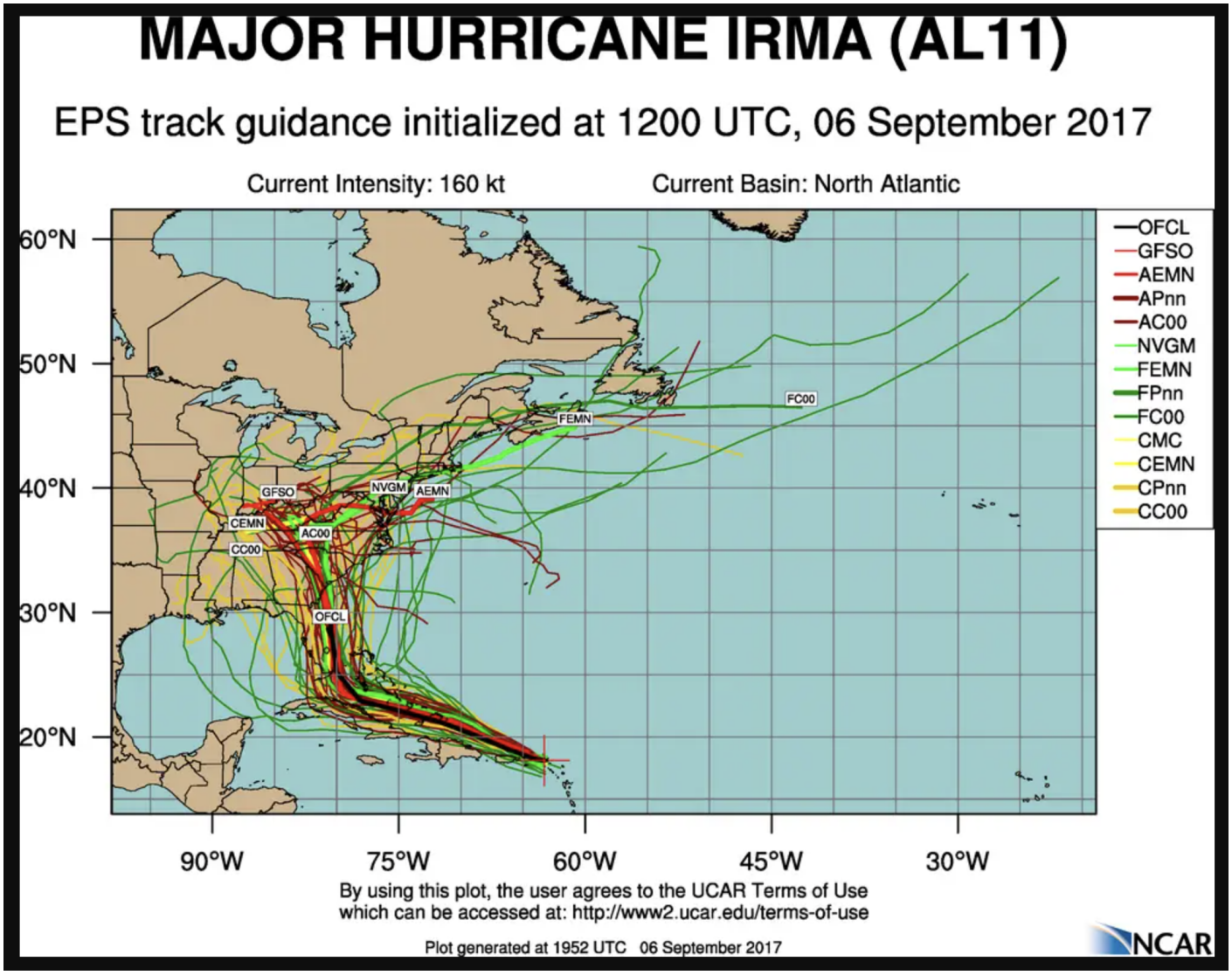

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Suggestion 1: Use the uncertainty in hurricane paths to shock saliency

- Seeing that Florida is shocked is important, but less relevant to me in Houston
- Seeing a hurricane change path last minute and move toward Louisiana makes it more salient for me

  → This suggestion still suffers from the anticipation measurement issue

Comment 3 – Permanent or Transitory

Making sense of the results

Can the paper do a better job of documenting the behavioral bias?

1. **Permanent**
   - → Suggestive banks are updating based on information from hurricane
2. **Transitory** ← **dominant effect**
   - → Consistent with overreaction
   - → Does this mean they learn and forget?

>> *The temporary decrease in prices in the secondary market is hard to interpret*

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Let's take a step back, what information do hurricanes really provide?

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Let's take a step back, what information do hurricanes really provide?

How does this square up with the empirical evidence?

- Paper provides suggestive evidence that these decisions are made at a bank level
- Then, in the following year, the banks forgot about the climate shock
  - → I would think underwriting decisions at the bank level are sticky, formalized

Comment 3 – Permanent or Transitory

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Can the paper do a better job of documenting the behavioral bias?

Suggestion 1: Speak to some bankers and how they decide on loans

- Even some anecdotal evidence of how they decide, and if there is a possible change in pricing matters

Suggestion 2: Look at ex-ante measures of risks

- Inundation maps already exist (plus historical data)
- Do banks update based on this information? How does this interact with the current shock?

Suggestion 3: Study Bank Relationships

- Use length as a proxy, see if those with older relationships have a muted response
- Would be suggestive that banks are updating, but only on a subset of firms

Concluding Remarks

Climate Change, Natural Disasters, and Loan Prices

I really like this paper – The paper provides some of the earliest evidence of how climate change affects lending decisions and its effects on firm decisions.

I would push the paper to think more about isolating the updating effect

Climate change events are having important effects on firms through their loans