

The Crisis in the Machine

On economics and climate change

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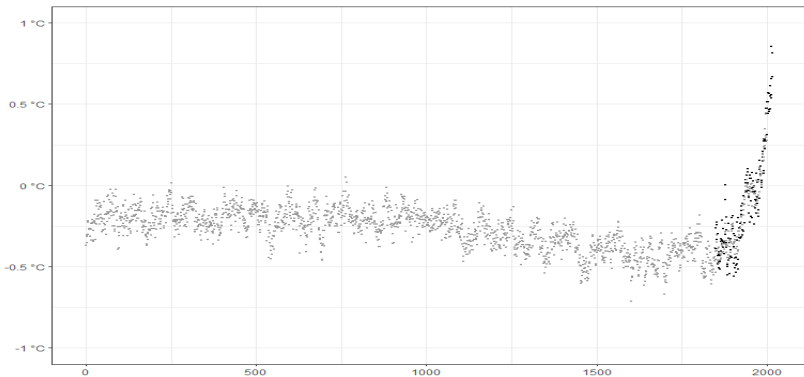
May 24, 2024

Crisis epistemology

“what makes some state of affairs of the world *crisis*-oriented is the automatic assumption of imminence. ... the need to immediately become solutions-oriented in a way believed to differ from how solutions were designed and enacted previously.” (Whyte 2021, 54)

Gloss: a crisis is an (1) unprecedented threat to (2) the present that (3) requires unprecedented solutions.

An unprecedented problem

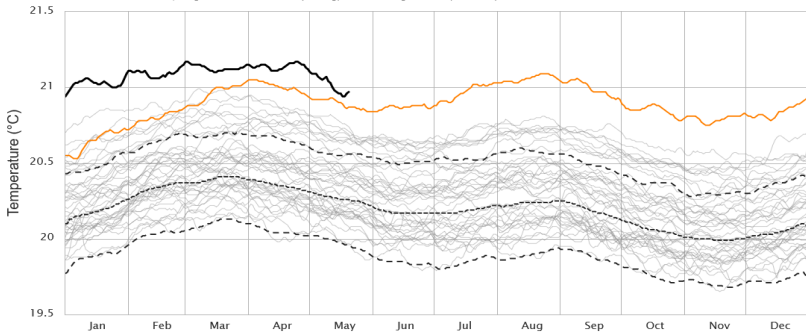


- data from PAGES 2k Consortium (2019).

A threat to the present, part 1

Daily Sea Surface Temperature, World (60°S–60°N, 0–360°E)

Dataset: NOAA OISST V2.1 | Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine



- from <https://climateranalyzer.org>.

A threat to the present, part 2

Geophysical Research Letters

RESEARCH LETTER
10.1029/2023GL10490

Key Points:

- Tropical wet-season temperature (T_W) and onset trends are in phase.
- A simple two-regime model reproduces the 20th-century T_W trend, suggesting an underlying regime “flip” scenario.
- The model predicts an increase of onset in 20th and 21st-century wetting events. T_W is most sensitive to T_{W,off}.

Supporting Information:

Supporting Information may be found in the online version of this article.

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ZHANG ET AL.

10.1029/2023GL10490

Forecasting Tropical Annual Maximum Wet-Bulb Temperature Months in Advance From the Current State of ENSO

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Abstract Based on observations, characterized by high temperature and humidity combinations, challenge tropical wet season. Extreme wet-bulb temperature (T_W) over tropical east and central in the western and central equatorial Indian Ocean and the western Pacific Ocean. Here, we explore the response of the annual maximum of daily maximum T_W (T_{W,max}). We develop a simple linear regression model that captures 80% of variance in tropical mean T_{W,max} and significant response T_{W,max} variations. The model captures wetting trends and 20th and 21st-century El Niño–Southern Oscillation (ENSO) trends, the strong-to-very strong El Niño in the east in 2023, with an El Niño–Southern Oscillation (ENSO) regime shift response and onset T_{W,max} in 2024, 2025, and 2026. Our results suggest a 20% increase in onset T_{W,max} in 2024, 2025, and 2026. Our results suggest a 20% increase in onset T_{W,max} in 2024, 2025, and 2026. Our results suggest a 20% increase in onset T_{W,max} in 2024, 2025, and 2026.

Plain Language Summary The heat and humidity in the tropics can be particularly challenging for people in dry, mountainous, and hilly areas. This combination of heat and moisture is described using a metric called the wet-bulb temperature (T_W). We found that there is a strong link between the onset of the annual maximum T_W in a month and the current state of El Niño–Southern Oscillation (ENSO). We developed a simple linear regression model that captures 80% of the variance in tropical mean T_W and significant response T_{W,max} variations. The model captures wetting trends and 20th and 21st-century ENSO trends, the strong-to-very strong El Niño in the east in 2023, with an ENSO regime shift response and onset T_{W,max} in 2024, 2025, and 2026. Our results suggest a 20% increase in onset T_{W,max} in 2024, 2025, and 2026. Our results suggest a 20% increase in onset T_{W,max} in 2024, 2025, and 2026.

1. Introduction

The tropics, characterized by high temperature and humidity, are highlighted as one of the most vulnerable regions (Parker et al., 2022; Ramanam et al., 2023; Steward & Baker, 2020). This vulnerability is exacerbated by the increasing wetting trend, leading to more frequent and intense heat events. Superimposed on the wetting trend is the 20th-century El Niño–Southern Oscillation (ENSO) El Niño events, triggered by warmer central and eastern equatorial Pacific Ocean temperatures, along with a stronger circulation that amplifies global temperature and precipitation patterns (Trenberth & Hurrell, 1994). These events contribute to more frequent and intense wetting events, including the tropical wet season (Auerbach, 2012; Bretherton et al., 2005; Thompson et al., 2021). In contrast, La Niña events, marked by strong Pacific Ocean temperatures, tend to cause drier and wetter conditions. In light of ongoing global warming, an El Niño event superimposed on the current wetting trend is expected to be particularly challenging, undermining the food and water security and prosperity.

The physical mechanisms underlying long-term trend wetting during El Niño years in the wet tropics are the heat and moisture convergence over the western and central equatorial Indian Ocean and the western Pacific Ocean (Deser & Bretherton, 2017; Chang & Soden, 2003). However, the wet tropics are not the only region where the wetting trend is observed. In the 20th century, the wetting trend is also observed in the 20th and 21st-century El Niño events in the western Pacific (Chang & Soden, 2003; Sun et al., 2023). In the 21st century, the wetting trend is also observed in the 20th and 21st-century El Niño events in the western Pacific (Chang & Soden, 2003; Sun et al., 2023). In the 21st century, the wetting trend is also observed in the 20th and 21st-century El Niño events in the western Pacific (Chang & Soden, 2003; Sun et al., 2023).

Zhang et al. (2024) estimate a 2 in 3 chance that this summer will be the most deadly in India's history.

And the drought that contributed to the Syrian civil war was almost certainly driven in part by climate change. (Hoerling et al. 2012)

A crisis epistemology?

So: climate change is paradigmatically crisis-oriented.

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Sortof.

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Whether climate change is crisis-oriented depends on which discourse we're considering.

Or: there is not one “epistemology” of climate change, but many.

Crisis? What crisis?
Climate change and economics as usual

A very precedented problem

In economics, climate change is a familiar kind of problem. The question is: how much should we “invest” towards addressing climate change?

The basic rule governing such questions comes to us from Frank Ramsey’s work in the 1920s:

$$\text{marginal return} = \text{discount rate} \times \frac{\text{expected future benefit}}{\text{present cost}}$$

A threat to the future

For economists, climate change is primarily a threat to the *future*, not the present.

That is, the present is conceptualized as a time when we *pay*; the future as a time when we *benefit* (by avoiding harms).

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That is, the present is conceptualized as a time when we *pay*; the future as a time when we *benefit* (by avoiding harms).

Much of the debate within climate economics—between, e.g., Nordhaus (2007), Stern (2007), and Weitzman (2007)—is over how to evaluate the harms / benefits given that they're not happening right now.

Familiar solutions

SIGNATORIES INCLUDE

3649

U.S. Economists

4

Former Chairs of the Federal Reserve

28

Nobel Laureate Economists

15

Former Chairs of the Council of Economic
Advisers

THE WALL STREET JOURNAL.

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Economists' Statement on Carbon Dividends

What do the economists think we should do?

Familiar solutions

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What do the economists think we should do?

Tax carbon.

Economics, crisis, and climate change

Recall: a crisis is an (1) unprecedented threat to (2) the present that (3) requires unprecedented solutions.

For economists, climate change is (1) a familiar problem that (2) affects the future (not the present) and (3) calls for moderate rather than radical solutions.

Many epistemologies of climate change

Whyte (2021) focuses on activist framings of climate change. Those are—I agree—largely framings of crisis.

Economists have an entirely different framing, one in which climate change is a serious problem that requires action, but not a “crisis” in Whyte’s sense.

Denialists, silicon valley, insurance companies, etc. are liable to adopt different framings as well.

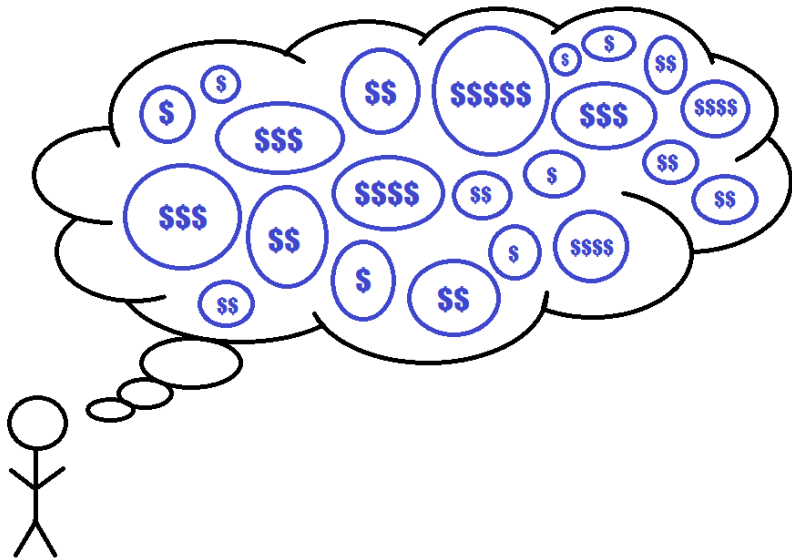
The crisis in the machine

Marginal return redux

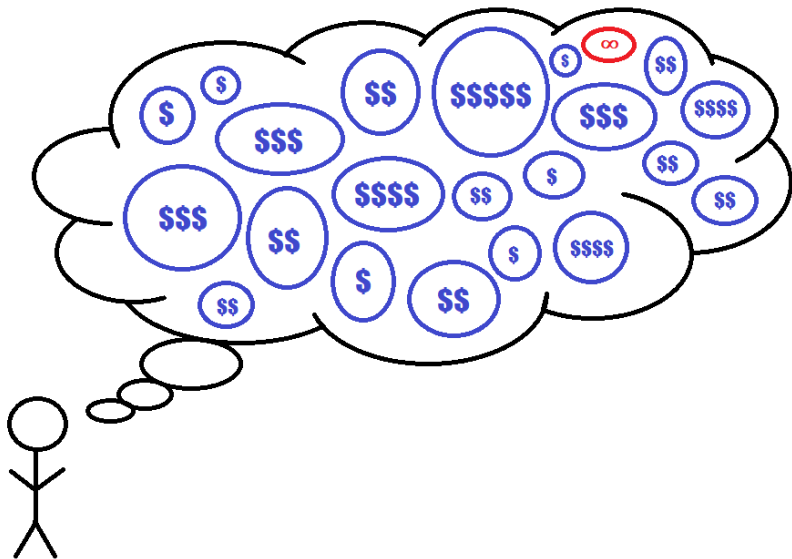
Recall:

$$\text{marginal return} = \text{discount rate} \times \frac{\text{expected future benefit}}{\text{present cost}}$$

Expected future benefit



Expected future benefit



The debate over fat tails

Weitzman (2007) points out that if you include a scenario with infinite value, the “expected future benefit” is also infinite.

The implication is that the standard tools of economics are not well-suited for cases where human extinction is a possibility.

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The implication is that the standard tools of economics are not well-suited for cases where human extinction is a possibility.

The response by economists has largely been critical. Nordhaus (2011) is paradigmatic: the major concern is that Weitzman’s approach doesn’t offer us concrete policy solutions.

The crisis in the machine

Recall: “what makes some state of affairs of the world *crisis*-oriented is the automatic assumption of imminence. ... the need to immediately become **solutions-oriented** in a way believed to differ from how solutions were designed and enacted previously.”
(Whyte 2021, 54)

The crisis in the machine

Recall: “what makes some state of affairs of the world *crisis*-oriented is the automatic assumption of imminence. ... the need to immediately become **solutions-oriented** in a way believed to differ from how solutions were designed and enacted previously.” (Whyte 2021, 54)

At least where it is policy-oriented, economics is is always solutions-oriented. In this sense, “crisis” is built into the framework.

Putting more of a point on it

Economics—at least in its mainstream realization—seems to be institutionally committed to crisis-orientation in Whyte's sense:

The present—our currently way of life—is *always* under threat from economic catastrophe, and this demands that *all* solutions to *any* problem, including problems like COVID-19 and climate change, must be economic.

The question

Is the “crisis-orientation” of economics simply a recognition of the realities of global capitalism?

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Is the “crisis-orientation” of economics simply a recognition of the realities of global capitalism?

Or, conversely, does this ghost in the machine serve to reinforce these realities by rendering impossible certain alternatives?

The end

Thank you!!

- Hoerling, Martin et al. (2012). On the Increased Frequency of Mediterranean Drought. *Journal of Climate* 25.6: 2146–61. DOI: 10.1175/JCLI-D-11-00296.1.
- Nordhaus, William D. (2007). Critical Assumptions in the Stern Review on Climate Change. *Science* 317.5835: 201–2. DOI: 10.1126/science.1137316.
- (2011). The Economics of Tail Events with an Application to Climate Change. *Review of Environmental Economics and Policy* 5.2: 240–57. DOI: 10.1093/reep/rer004.
- PAGES 2k Consortium (2019). Consistent Multidecadal Variability in Global Temperature Reconstructions and Simulations over the Common Era. *Nature Geoscience* 12: 643–49. DOI: 10.1038/s41561-019-0400-0.
- Stern, Nicholas (2007). *The Economics of Climate Change: The Stern Review*. Cambridge: Cambridge University Press.
- Weitzman, Martin L. (2007). A Review of *The Stern Review on the Economics of Climate Change*. *Review of Economics and Statistics* 45: 703–24.
- Whyte, Kyle (2021). Against Crisis Epistemology. In: *Routledge Handbook of Critical Indigenous Studies*. Ed. by Brendan Hokowhitu et al. London: Routledge: 52–64.

Zhang, Yi et al. (2024). Forecasting Tropical Annual Maximum Wet-Bulb Temperatures Months in Advance From the Current State of ENSO. *Geophysical Research Letters* 57.7: e2023GL106990. DOI: 10.1029/2023GL106990.