Climate Risks and Market Efficiency

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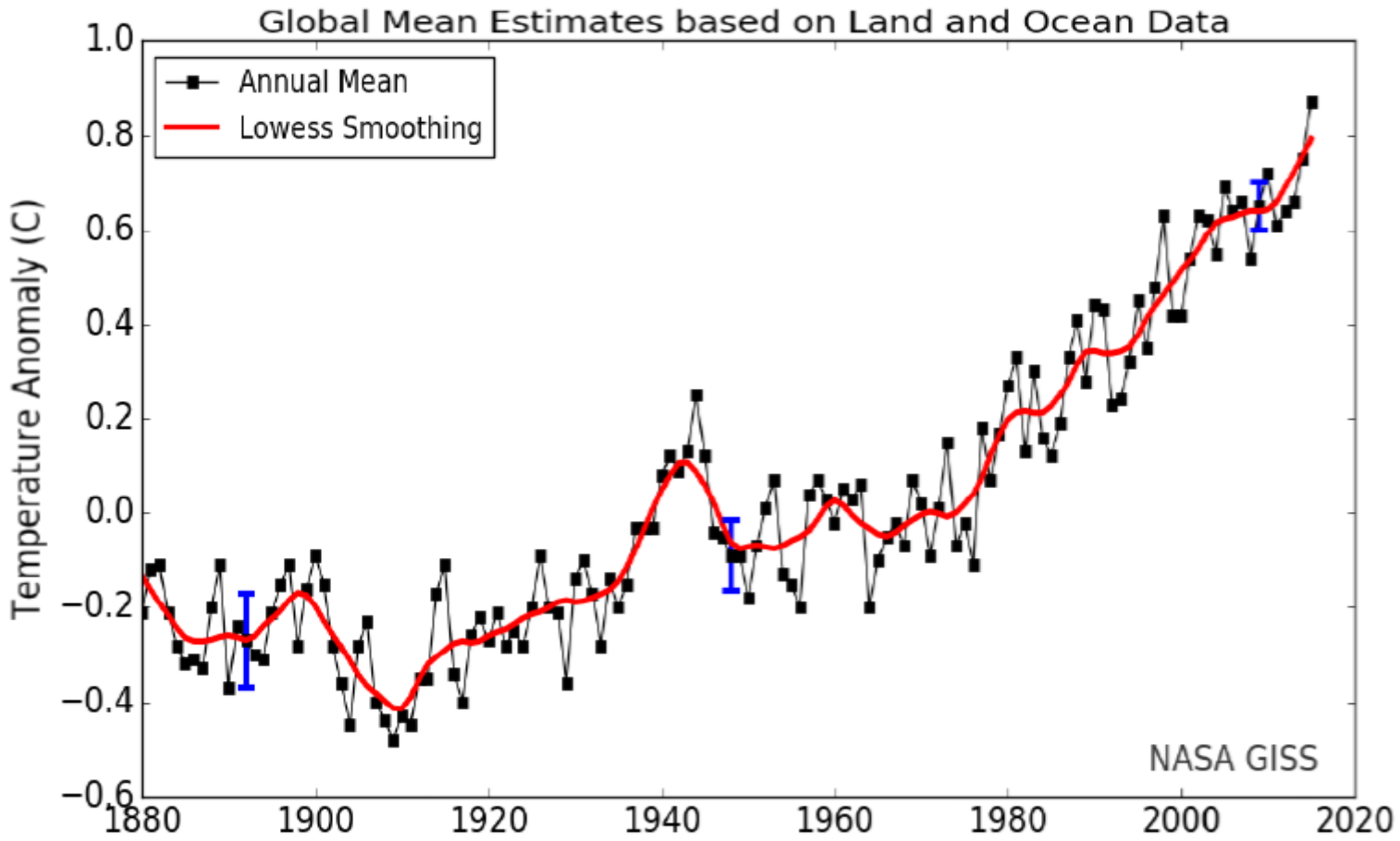
Major comments

- I like this paper!

Global temperature



I like this paper!

- A very important topic
- Interesting findings
- What affects long-run discount rates?
  - Giglio, Maggiori, and Stroebel (2015)
  - Giglio, Maggiori, Stroebel, and Weber (2017)
  - Liu and Wang (2017) – demand curves
  - …
- Careful empirical implementation
- Very well written

Other comments

- I will be critical here (maybe overly so), because
  - I like the paper
  - A very important topic: long-term wellfare of human being and beyond
  - It has significant policy relevance

Small sample problems

- A small cross-section: 31 countries
- Highly persistent independent variable
- In portfolio analysis:
  - 6 countries vs. 6 countries

Quintile 1	Quintile 5
Peru (19 firms)	New Zealand (13 firms)
Israel (20 firms)	Mexico (11 firms)
Japan (77 firms)	Australia (28 firms)
Poland (21 firms)	Canada (15 firms)
Philippines (11 firms)	South Korea (39 firms)

Small sample problems: can we do better?

- Not much
  - A second world? Wait for another 30 years?
  - Parallel trends?
- More transparency in reporting
  - Disaggregate the middle three quintiles
  - Scatterplot? Driven by any single country?
- Other systematic differences between quintile 1 and 5 countries?
  - The placebo test is useful.
  - Matching sample?
  - Any systematic difference in subsidy to drought?

Estimating the trends

- The measure of trends adopted in this paper is b_i from the below equation.

$$PDSI_{i,t} = a_i + b_i t + c_i PDSI_{i,t-1} + \epsilon_{i,t}$$

$$y_t = \beta_0 + \beta_1 t + \alpha y_{t-1} + \varepsilon_t \quad (1)$$

Estimating the trends

$$y_t = \beta_0 + \beta_1 t + \alpha y_{t-1} + \varepsilon_t \quad (1)$$

- This is a standard AR(1) model with a deterministic time trend. We see this very often, at least when we do the Dickey-Fuller unit root test
  - If $b_1 = 0, \alpha < 1$ suggests y_t **is *stationary around a constant***
  - If $b_1 \neq 0, \alpha < 1$ suggests y_t is ***stationary around a linear time trend***
- However, β_1 is not equal to the time trend.

Estimating the trends

$$y_t = \beta_0 + \beta_1 t + \alpha y_{t-1} + \varepsilon_t \quad (1)$$

- An equivalent DGP: the trend plus noise model

$$\begin{cases} y_t = m_t + u_t & (2A) \\ u_t = \rho u_{t-1} + e_t & (2B) \\ m_t = \delta_0 + \delta_1 t & (2C) \end{cases}$$

- Relation between E(1) and E(2)

$\beta_0 = (1-\rho)\delta_0 + \rho\delta_1$ δ_1 measures the trend, not β_1!

$\beta_1 = (1-\rho)\delta_1$

$\alpha = \rho$

$$\delta_1 = \frac{\beta_1}{1-\alpha}$$

Estimating the trends

δ_1 measures the trend, not β_1!

$$\delta_1 = \frac{\beta_1}{1-\alpha}$$

- Good news
  - δ_1 and β_1 are positively correlated
  - The results are robust to some alternative measures
- Bad news
  - α is close to 1.

Estimating the trends

- Are the “estimated time trends” persistent?
  - Compare the pre-1985 period and the post-1985 period?
- Structural breaks?
  - Global warming
  - Ignoring pre-WWII data in trend estimation?

Economic magnitude

- Difference between quintile 1 and 5
  - Annual alpha: 7%
  - ΔROA: 0.35%-0.5% per year
  - Highly persistent
  - Uncorrelated with PB
  - Leverage? …
- Calibration?
  - Gordon growth formula: $\frac{P}{B} = \frac{ROE}{r-g}$?

Economic magnitude

- Three-year cumulative ROA diff-in-diff is around 1%
- 30 years, this is 10%
- How likely that the markets do not understand this?

Economic magnitude

- The contemporaneous effect of shock in drought?
  - profit
  - returns
- Assuming a quadratic loss function, the minimum mean squared error of the 1-step ahead forecast of y_t, is

$$y_{t+1|t} = [\beta_0 + \beta_1(1+t)] + \alpha y_t$$

Policy

- The public-listed sector of FOOD firms is representative?
- Maybe long-run drought has different effects on privately-traded firms (younger and innovative, etc.)
  - Water reservoir etc.
- Data on the overall FOOD/agricultural output at country level?

Others

- What is the best measure of profitability?
  - Returns to equity holders? ROE?
  - Operating profit vs. net income? Subsidy?
- Winsorize returns? Why?
- Change of ROA
  - Fixing the composition of firms
- PDSI does not account for snow or ice (assuming precipitation is immediately available)
  - Change in glacier cannot explain why Peru had negative trend in PDSI

Conclusions: I like this paper!

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