

The global impact of climate change on risk preferences by Wesley Howden and Remy Levin

Comments by Nicolas Treich

16 June 2022 – Energy & climate conference TSE

Important contribution

- Probably the first paper to demonstrate the impact of climate change on risk preferences
- Impressive paper, impressive data, impressive empirical strategy etc.
- Well written, well motivated, well referenced etc.
- Important welfare and policy implications

Basic model structure

Utility and risk. The agent is a subjective expected utility maximizer. Following in the footsteps of the background risk literature, we think of the agent as possessing two utility functions. The *background utility function* u is the agent's period utility defined over both foreground and background risks. u takes \tilde{y}_t , \tilde{x}_t , and w as its arguments, additively, and \tilde{c}_t non-additively:

$$u(w, \tilde{x}_t, \tilde{y}_t, \tilde{c}_t) = u(w + \tilde{x}_t + \tilde{y}_t, \tilde{c}_t)$$

The *foreground utility function* v_t represents the agent's utility over the foreground risk alone, conditional on their expectations about the background risk:

$$v_t(w, \tilde{x}_t) = \mathbb{E}_{\tilde{y}, \tilde{c}} u(w, \tilde{x}_t, \tilde{y}_t, \tilde{c}_t | B_t(y, c))$$

A minor terminology remark

- Is it really a change in « risk preferences », or rather a change in « risk taking »?
- That is, $u(.)$ is the utility function in this EU model = risk preferences
 - In this model, as usual, $u(.)$ does not change
 - $v(.)$ is the indirect utility function, and is changing when the background risks change

Another minor remark: Background risk

- A background risk is usually defined as an exogenous, uninsurable, risk (as in the model)
- Are climate risks always background risks?
 - People can partly adapt their exposure to climate risk (i.e., the risk then is endogenous)
 - People rely on (informal) insurance mechanisms (e.g., farmers in developing countries)

Background risk (correlation)

- The two background risks can be correlated in the model
- But it is assumed that the background risks and the foreground risk are independent
- This independence assumption may not hold in real life
- Overall, the leading example used in the paper (i.e., planting choice) may not fit perfectly

Higher order risk preferences

- « Standard assumptions on higher order risk preferences »
 - Fourth derivative of utility, bivariate Ross risk vulnerability, cross-prudence, cross-temperance, correlation aversion...
- Difficult for me to see where this really plays a role; see next slide
- Correlation aversion over $u(w,c)$ is equivalent to a negative cross derivative $u_{wc} < 0$ (Richard 1975)
 - True for instance if health risk is commensurable with wealth $u(w,c) = u(w+f(c))$ with $f' > 0$ under u concave
 - But take the « fairly standard » qaly-inspired $u(w,c) = f(c)u(w)$ with $f' > 0$ (Bleichrodt and Quiggin 1999) then $u_{wc} > 0$ (Rey and Rochet 2004, Finkelstein et al. 2013)

Main theory result:

2.1 Results

Levin and Vidart (2022) prove the following result for the univariate model with a single source of background income risk:

Proposition 1. *Let A, B be positive constants. Assume m is large. Then, $\forall w$:*

$$r_2(w) - r_1(w) \approx -A(\bar{y}_2 - \bar{y}_1) + B(s_2^2 - s_1^2) \quad (3)$$

- Levin and Vidart (2022)'s utility function is univariate, while in this paper, utility is bivariate
 - It is not clear to me how this formula (3) can be extended to the bivariate utility model. Is there something missing in the current version?
- Moreover, what's the nature of the approximation here?
 - With first- or second-order approximations, higher order utility terms are usually irrelevant
- Moreover, not clear to me how bivariate utility is accounted in welfare analysis in Section 6 (when EDE is constructed)