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Introduction

Economic climate models are highly sensitive to discount rates and the normative assumptions that underlie them [1,2,3]. Stern [1] introduced a positive utility discount rate (also called the “pure rate of time preference”) to account for human extinction. The principle defended in this poster generalizes Stern’s motivation, explaining how his utility discount rate is a simplifying application of standard expected value.

Definitions

In order to evaluate climate policies in a standard cost-benefit manner, a common tool are *integrated assessment models* which combine simplified climate physics with simplified macroeconomics.

Consider an integrated assessment model incorporating standard social rate of time preference form of the *Ramsey Rule*, that is:

$$SDR = \delta + \eta g,$$

where *SDR* is the *social discount rate for consumption*, δ is the *utility discount rate*, η is the *elasticity of marginal utility of consumption*, and g is the per capita growth rate of consumption [4]. The Ramsey model assumes decision-making under certainty, but this principle extends the Ramsey model by adding a special class of shocks which are made under risk via utility discounting.

I define a *model-independent shock* as a shock that is (a) exogenous to the model under consideration, and (b) such that, if it occurred, the welfare stream that followed the shock would be the same between the policies under consideration (including inaction).

The first condition (a) is required because model-independent shocks are *additions* to the model. Intuitively, (b) indicates that the shock prevents or blocks the policy from have the expected or intended effects.

I define a *model-dependent effect* to be any modeled effect which is not a model-independent shock.

Principle

Suppose that the sum of the (subjective) probabilities of model-independent shock(s) at t is $P_t(\text{Shock})$. Then it is permissible to discount the value of any model-dependent effect at t with a discount factor $(1 - P_t(\text{Shock}))$.

Example

Suppose the probability of human extinction at period t is 0.5% in discrete time with an outcome value α , that there are no other relevant model-independent shocks (equivalently, that our subjective probability of any others is 0%), and that we are pairwise considering policies A and B , which generate a_t and b_t welfare at t . The principle suggests that, instead of $(0.005)(\alpha) + (0.995)(a_t)$ as our value of A at t and $(0.005)(\alpha) + (0.995)(b_t)$ as our value of B at t , we can consider discount the value of A to be $(0.995)(a_t)$ at t and the value of B to be $(0.995)(b_t)$ at t .

One advantage of this approach is that, as long as the outcome value of the shocks are equal, we do not need to determine their precise value. This approach may thus be simpler than explicitly incorporating such shocks into a given model.

Discussion

The justification of the principle is that, given different policies, the model-independent shocks are constructed to have the same value regardless of the policy chosen. Therefore, they can be removed without loss of relevant decision-making information. The remaining model-dependent effects are thus discounted by the factor that remains once the probability of model-independent events are removed. The model can otherwise be construed as decision-making under certainty.

An advantage of adopting this principle is that it allows cost-benefit analyses to limit paradoxes involved with evaluating indefinite streams of welfare. If these probability factors grow in a predictable manner or can be approximated in this manner, then more streams will converge to a finite value.

This principle requires probability estimates of model-independent shocks; in turn, such estimates require analysis of the potential classes of such shocks. Such research is necessarily speculative and challenging, but demands further attention.

A Sidebar on Broome’s Objection

Broome’s [4,5] objection to temporal discounting is that it introduces temporal relativity, and that such relativity is absurd. Since discounting is only with respect to future persons, he claims that a model that includes discounts can (correctly) value a future individual less than an individual after that individual would (correctly) value them.

Broome’s example is people who die in war. Individuals prior to Caesar’s wars (call them Early Individuals) would judge the utility lost in the World Wars as less bad than Caesar’s wars since the discount rate would lead to heavily discounting the harms from the World Wars due to their large temporal distance. But to us (Later Individuals), this seems absurd. Surely the World Wars are many times more harmful than Caesar’s wars. So the relativism of discounting is problematic.

But the difficulties compound, Broome continues. The Early Individuals could be *aware* that the World Wars would be so much larger and that they would view the Early Individuals’ judgment as absurd. So the relativism is genuine; there is no factual information that differs—just temporal placement.

But how do we explain our Later Individual judgments about the World Wars’ greater disutility when compared to Caesar’s wars? This principle discounts *because of risk*. Being the type of creatures that we are, we do not have uncertainty about how our decisions affect the past. So it is irrational for us to discount the utility of events we are certain of; they are not subject to risk. When Broome claims there is no factual difference between the Early Individuals and the Later Individuals, he is begging the question. For the Later Individuals, the past *is* a fact, whereas for Early Individuals the future is only conjecture, which they can assign probabilities to as best they can.

So the relativism is not surprising or problematic at all: it is united in the epistemic capabilities of the different agents. The Later Individuals count past lives equally, since they are unaffected by the policies of Later Individuals; the Early Individuals discount in line with their risk over how and whether their actions will affect those yet to come.

Reference

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- [6] Broome, J. 2012. *Climate Matters: Ethics in a Warming World*. Norton, New York.