Ethics and Modeling: Putting Ramsey Model-Based Climate Change Assessments in Perspective

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"All models are wrong; some are useful."
- George Box

This post begins for ClimateEthics an examination of ethical and other issues raised by prominent climate change assessments.

Introduction

The Ramsey model is a prominent tool for climate change assessments. It is used in the *Stern Review* and the work of William Nordhaus, among others. As with all models, it is wrong: It contains inaccuracies in its descriptions of the world. Some of these inaccuracies, including the model's treatment of spatial distribution and its representation of human welfare, have important consequences for climate change assessment.

The model's underlying ethics is also of great importance to climate change assessment. The two dominant approaches to defining the model's ethics yield carbon tax rate recommendations which differ by a factor of ten. One approach, called the descriptive approach, contains serious flaws. All Ramsey model assessments use a limited class of ethical frameworks which values human welfare and nothing else. Those who don't support such frameworks might dismiss assessments using the model out of hand.

This paper explains these important nuances of the Ramsey model to help put in perspective the climate change assessments which use the model. The paper is based on an award-winning forthcoming essay on the Ramsey model (Baum 2007) and is part of ongoing analysis of the ethics used in climate change assessments.

Overview of the Ramsey model

The Ramsey model is designed to assess, given a chosen ethical framework, how much we should save for future consumption instead of consuming now. Climate change assessments using the Ramsey model treat mitigation as an act of saving for future consumption and estimate the optimal level of mitigation.

The model's ethics are consequentialist, claiming we should do whatever leads to the best outcome, thus dismissing considerations of rights or procedure. The model further defines the best outcome in terms of human welfare, thus dismissing considerations of nonhuman animal welfare or ecosystem fitness. Finally, the model allows for future welfare to be discounted, i.e. valued less. This welfare discounting is distinct from, but

often confused with, the discounting of money. Welfare discounting in effect says that the later you were born, the less your life is worth.

The model thus strives to assess how to maximize the total welfare of all people, with welfare possibly discounted over time. However, the world is too complex for this to be done with perfect accuracy. The next sections describe two important inaccuracies in the model: clustering inaccuracy and inaccuracy in welfare representation.

Clustering inaccuracy in the Ramsey model

Today's world contains about 6.5 billion people. Climate change affects and/or is affected by virtually all of us as well as countless future people. No model can account for each of us individually. Thus, global models such as the Ramsey model must cluster groups of people into combined entities, even though this introduces inaccuracies.

Many climate change assessments based on the Ramsey model cluster everyone living at the same time. This clustering ignores the great inequality that exists around the world. Other Ramsey model versions handle different spatial regions but use "Negishi weights" which devalue the welfare of lower-income regions in order to avoid recommending large wealth transfers from today's rich to today's poor. However, some have instead recommend exactly such transfers.

Ramsey model climate change assessments also tend to use clusters lasting about 10 to 25 years. This practice does lead to inaccuracies but seems not to pose dilemmas as strong as spatial clustering.

Inaccuracies in the Ramsey model's welfare representation

The Ramsey model approximates human welfare with a mathematical function of monetary consumption. This function, called the isoelastic function, captures the intuition that a dollar is worth more to a poor person than to a rich person. However, the approximation leaves out all other aspects of what makes our lives go well.

One omitted aspect of welfare is ecosystem services, which includes everything from waste decomposition to scenic beauty. Including ecosystem services may increase recommended carbon tax rates by about a factor of three and also suggests that broader penalties for ecosystem service degradation (such as deforestation) may be a positive addition to our climate change mitigation portfolio.

The isoelastic function also omits several important aspects of human psychology. One aspect, relative wellbeing, describes how our welfare is influenced by the consumption of others via envy and showing off. A second aspect, hedonic adaptation, describes how we adapt to new situations, causing our changes in welfare to be only temporary. Both aspects suggest that the isoelastic function overestimates consumption's contribution to our welfare. This result also raises recommended carbon tax rates and suggests additional mitigation strategies such as smart growth city planning.

Defining the Ramsey model's ethics

The Ramsey model uses a class of ethical frameworks valuing human welfare, which may be discounted over time. Within this class, two parameters define the model's ethics. One, the welfare discount rate, defines how (if at all) welfare is judged to change value over time. The other, the elasticity parameter, defines the isoelastic function, i.e. how much more a dollar is worth to a poor person than to a rich person.

There are two main approaches to defining these model parameters. The prescriptive approach (favored by Stern) strives to value all welfare equally (as in the classical ethical theory of utilitarianism). It thus chooses a welfare discount rate of zero and aims for an accurate elasticity parameter. The descriptive approach (favored by Nordhaus) strives to use society's aggregate values. It does this by matching the model parameters to market observations. The prescriptive approach leads to recommended carbon tax rates that are about ten times higher than those of the descriptive approach.

The descriptive approach contains several serious flaws. First, market behavior involves people trading off present benefits for future benefits to *themselves*, whereas climate change mitigation involves people trading off present benefits for future benefits to *others*. Second, society's aggregate values do not match the Ramsey model's narrow welfare-based ethical framework. Finally, the approach only considers the values of present humans, even though non-humans and future humans are also affected by climate change. These flaws call into question the meaningfulness of the descriptive approach.

The Ramsey model in perspective

Despite the Ramsey model's inaccuracies and the descriptive approach's flaws, Ramsey model-based climate change assessments do provide some insight into the climate change issue. In particular, both the prescriptive approach and the descriptive approach recommend carbon tax rates that are higher than what is currently in place. These recommendations thus bolster the consensus in favor of increased mitigation.

However, given the Ramsey model's shortcomings, assessments using it need not be the final word on climate change policy. Policies other than carbon taxes may often be superior according to the Ramsey model's ethics or to other ethics. Furthermore, the values embedded in the Ramsey model are not universally held. Thus, it helps to keep assessments using the Ramsey model in perspective.

References

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