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Book Review

Worst-Case Economics: Extreme Events in Climate and Finance, Frank Ackerman. Anthem Press, New York, NY (USA) (2017). 208 pp. ISBN: 978-1783087075

> "… since our premises are always necessarily more or less false, good theorizing consists to a large extent in avoiding assumptions like these, where a small change in what is posited will seriously affect the conclusions." (William J. Baumol, 1958)

In microeconomics, efficient outcomes are assumed to be achieved under a narrow set of often unrealistic conditions. Conventional economic models that are developed to inform public policy are based on two fundamental frameworks that may be poorly suited to address contemporary challenges such as climate change and financial market volatility. The first framework is marginal analysis—that is, the assumption that the marginal cost of reducing harm or risk is associated with some marginal benefit to society. The second is expected value—that is, the assumption that the anticipated outcome is estimated as the sum of the net benefits of all possible outcomes multiplied by their probabilities—assuming that probability is known. These two frameworks fail to sufficiently consider extreme events, and the effects of non-marginal changes that are of low, but non-zero probability. These failures are the subject of a timely and relevant book by Frank Ackerman, in which he uses examples of extreme events in climate change and financial markets to underscore the misconceptions embedded in economic models that rely on marginal analysis and probability to estimate expected values (*Worst-Case Economics: Extreme Events in Climate and Finance*, Anthem Press, 2017). While climate and finance are not frequently used together to illustrate the shortcomings of theoretical frameworks in economics, Ackerman provides an accessible and insightful treatise on the inadequate treatment of extreme events by neoclassical economics in cost-benefit analysis, and the urgent need to integrate worst-case effects in environmental and financial planning through scenario analysis.

Ackerman begins by exploring the common ground across extreme events in climate and finance, including the fact that both types of extreme events are relatively rare and can involve costly and disastrous consequences. Furthermore, both are the product of myopic decision-making processes, where short-term gains are prioritized at the expense of significant long-term losses. His framework also acknowledges differences in speed, impact, and reversibility of impacts; financial crises are rapid and recurring, and their effects can be reversed, whereas extreme climate events are often slow and accumulative, and their effects may be irreversible. Nevertheless, he argues that mainstream thinking in economics minimizes the importance of both types of extreme events by focusing primarily on the (low) probability of their occurrence. This kind of thinking is a barrier to the development of sensible public policies that reflect the reality of contemporary environmental and financial challenges in a globalized world.

"Economics matters," argues Ackerman (2017, p. 4), as it has "become the language of public policy" because of the perceived superiority of quantitative analysis and intellectual authority provided by economic theories. Ackerman has long been a critic of the pervasive use of cost-benefit analysis in public policy (see for example, Ackerman and Heinzerling, 2004), and in *Worst-Case Economics*, he builds upon previous criticisms in describing how this analytical tool is poorly suited for extreme events and for guiding policies to avoid their worst effects. Contemporary challenges are beset with high levels of uncertainty and value conflict. Decision-making in the context of such "wicked problems" (Rittel and Weber, 1973, p. 160) increasingly involves choices in the absence of quantifiable information that can be used in cost-benefit analysis. Such challenges, in Ackerman's view, call for policies that consider credible worst-case outcomes, based on the precautionary principle, a concept associated with decision-making under conditions of irreversibility and uncertainty.

Ackerman provides a brief history of the evolution of economic thought, a subject that has been marginalized or removed from the curricula of many academic programs in economics. He explains the origins of modern economics in terms of how economic philosophers in the late 1870s borrowed a theoretical framework from physics to create an analogy for an enduring economic theory based on *homo economicus* and an unrealistic environment without concentrations of market power, where change follows a normal distribution. He presents an approachable explanation for how assumptions such as perfect competition and accurately-priced environmental impacts—while convenient for model estimation—are wholly unrealistic, rendering economic models based on these assumptions to be ineffective at informing public policy in the context of extreme events.

The book goes on to introduce an alternative paradigm which acknowledges that extreme events are actually more common than the assumption of a normal distribution allows. Here, Ackerman suggests that the probability of an event is inversely proportional to some exponential factor of the magnitude of that event. This so-called *power law* has profound implications for estimating the likelihood of extreme events, and Ackerman draws upon the differences in paradigms using examples of extreme events from both finance and climate to demonstrate how they reveal dramatically different outcomes.

Ackerman uses this concept to explore the drivers of extreme events in both financial markets and climate. Financial instability, as he argues, is a reflection of strategic behavior among investors and traders and of extreme concentrations of wealth and market power—conditions that most economic models assume are not present. Climate risks are characterized by the uncertain likelihood of numerous large, irreversible damages, which are also largely ignored by most economic models. Standard economic models are inherently optimistic—the default market position is growth, and the risks of climate-induced disruptions are conveniently disregarded.

Ackerman revisits familiar territory in providing critical thought about mainstream economics, including the ethical grounds for estimating the monetary value of a human life, the challenges of estimating the losses from environmental degradation, and considerations of risk aversion. Ultimately, the book calls for more precautionary approaches

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to decision making under uncertainty, in which protective measures are taken in the presence of the threat of harm, even when the nature and magnitude of the threat may not be accurately known. He acknowledges the controversial nature of the precautionary principle, and its incompatibility with the tenets of cost-benefit analysis, which tends to minimize or ignore the effects of low-probability, high-magnitude events. However, in both climate and financial policy, where there may be insufficient data about the worst-case effects, Ackerman argues that scenario analysis based on the precautionary principle may provide a better guide to public policy making than cost-benefit analysis.

In considering the challenges of decision making under uncertainty, Ackerman does not argue that there is no role for economics in climate policy or financial policy. On the contrary, economics can be useful in providing an analytical basis for identifying the most cost-effective strategy for reaching particular goals, such as reducing emissions or controlling speculation. But he provides a convincing argument that the market-based logic of cost-benefit analysis is not a reliable guide to public policy in the context of uncertainty and extreme events. Making decisions without numbers or algorithms may require solutions that are context-dependent and aligned with aversion to uncertain risks.

Worst-Case Economics would be valuable as supplemental reading in a course on finance, climate policy, or risk, and it would also be useful in a course or seminar on alternative paradigms in economics. The material is presented in a manner that is accessible for non-academic audiences as well, and readers will find the comparisons between extreme events in climate and finance to be clever, compelling, and relevant to the contemporary realities of volatility and change.

Although *Worst-Case Economics* will do little to enhance the reputation of economics as the dismal science, the book succeeds at providing an informed critique of conventional economic models and their incompatibility with the unique challenges of extreme events, which are likely to increase in frequency and intensity in the future. The book offers a unique perspective on a frequently overlooked phenomenon—extreme events that are of low probability, but high in terms of potential magnitude—and in doing so, it provides a persuasive call for a new framework to guide public policy that reflects the real possibility of the worst case. The applications and examples from climate change and the volatility of financial markets are useful, illustrative, and relevant to contemporary public policy challenges, particularly in an era of economic globalization and environmental change. In short, this book provides perhaps the best roadmap published to date on how we should understand an unavoidable dimension of contemporary society: the effects of extreme events that are likely—if improbable and uncertain—to occur.

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