



mass frenzy, a precipitating factor such as declining per capita incomes or sudden external interference, as well as perpetuating factors such as extreme self-righteousness on the part of leaderships. This coincidence implies that the linear relationship assumed by Krueger might not be entirely appropriate.

In the third chapter Krueger is at his analytical and neutral best. He describes with equal ease and skill the clashing opinions of the two schools of thought on the consequences of terrorism — the “small impact school,” which stresses that the impact of terrorism on human capital and therefore long-run output is negligible, and the “large impact school,” which emphasizes factors such as lower demand as well as historical evidence of GDP downturns in regions affected by terrorism. Krueger also presents a very good and comprehensive summary of the psychological causes of terrorism and uses the psychological data pertaining to the aftermath of the September 11 attacks to argue that this effect is indeed considerable. A sketchy outline of studies on political effects follows; Krueger is not to blame for this sketchiness as the cupboard itself is quite bare.

The greatest strength of the book is the ability of Krueger to marshal a large number of facts, figures, and studies to substantiate his arguments. In certain sections one detects an overemphasis; there are a large number of examples that say the same thing and might leave the intelligent reader feeling bored at the end. The discussion on poor statistical reporting on terrorism by US official agencies seems slightly misplaced and it would probably have been advisable to stick to the main theme of the book. However, Krueger’s style is arresting and even the possible methodological flaws, as pointed out earlier, might escape the attention of everybody but the most discerning of readers; he has this uncanny ability to light up seemingly insipid data and dense studies and communicate the essence of these to the layman.

I am quite sure that this book will be very widely read; it builds on recent literature by both Krueger and a young breed of scholars who have used technical sophistication to disprove the expected positive effect of poverty and ignorance on terrorism. However, one cannot be very sure about the causes of a complex phenomenon such as terrorism, particularly given that the suitability of econometric tools for analyzing this phenomenon rests on shaky foundations. A counter view to this engaging book might be the need of the hour.

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Imperfect Knowledge Economics: Exchange Rates and Risk. By Roman Frydman and Michael D. Goldberg. Princeton University Press, Princeton, 2007. 340pp., \$55.00. ISBN: 0-691-12160-5.

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In *Imperfect Knowledge Economics* (IKE), Roman Frydman (New York University) and Michael D. Goldberg (University of New Hampshire) challenge economists to think about why we rely so heavily on fully predetermined models that specify the precise mechanisms through which market outcomes occur. The authors argue persuasively that when we combine fully predetermined models with

rational-expectations (RE) equilibrium theory, we fail to capture micro-level forecasting strategies. This is because we assume that agents use the fully predetermined model (the very model in which these agents exist) to formulate their expectations. Doing so renders RE-equilibrium models inconsistent in the sense that agent forecasting strategies are derived from the fully predetermined aggregate model and, as such, lack plausible micro-foundations. In reality, decision makers in a modern capitalist economy formulate their expectations based on their imperfect knowledge of how the aggregate economy works and, as Keynes would have it, their animal spirits. Both are shaped by the mutable social contexts (politics, policies, histories, and institutions) in which decision makers operate. In essence, the clarity with which agents view the aggregate economy is inconsistent with the opacity that confronts them at the micro-level. According to the authors, behavioral approaches fare no better because they too build on fully predetermined models that irrational agents disregard in ways that the models specify precisely.

In this valuable new book, Frydman and Goldberg advocate for partially predetermined models, in which aggregate outcomes reflect decision makers' imperfect knowledge about the mechanisms through which market outcomes occur. And, perhaps most provocatively, they argue that, in a world of imperfect knowledge, these partially predetermined models (although not their conventional fully predetermined counterparts) are internally consistent — because decision makers in a world of imperfect knowledge do not adhere persistently to a single fully predetermined model, they do not commit systematic errors. Technically speaking, partially predetermined models resemble, in many respects, conventional models: for example, they specify mathematically individual preferences, constraints, and forecasts of future market outcomes, and they rely on optimization theory. However, they only partially and qualitatively specify how these elements in the model change over time; and these specifications, often inspired by cross-disciplinary research into human behavior, seek to capture the changing social contexts in which these decision makers formulate their forecasts. For example, to model how an individual revises her forecast of market price in the context of a simple linear demand and supply analysis, the authors impose the forecast-revision restriction that the “individual's forecast [of market price] moves in the same direction as the market price but is less than one for one” (p. 83); such a specification may be inspired by, say, conservatism — a psychological phenomenon where subjects are slow to change their forecasts in the presence of new information. Because many forecast paths are consistent with this qualitative restriction, the IKE approach yields qualitatively informative, although not quantitatively precise forecasts. Perhaps the most intuitively pleasing characteristic of the IKE approach is that change in these models is not fully reversible: if the economy is *played backwards* it will not necessarily arrive at its starting point, thanks to the partially predetermined restrictions that, over time, will likely change how individuals formulate their forecasts.

The authors expound in great (and, at times, very technical although instructive) detail on the theoretical nuances of the IKE approach, particularly as it applies to asset-market models; appendices with technical expositions abound. Nonetheless, the authors also delve substantially into the empirical world, and so provide a useful balance of theory and practice. Most notably, they apply the IKE approach to two popular anomalies in foreign exchange markets — the so-called forward-discount anomaly (whereby the one-period-ahead change in the spot exchange rate and the forward premium are negatively correlated), and the so-called disconnect between



exchange rates and macroeconomic fundamentals (and the concomitant long swings of the former away from purchasing power parity). In doing so, they convincingly demonstrate how an IKE approach to modeling the exchange rate (in the context of endogenous prospect theory) can explain (although, in keeping with the IKE approach, not predict precisely) these seemingly anomalous exchange rate behaviors.

While this book broadens our thinking about how we might improve extant theoretical and empirical models of asset prices, its most important and lasting contribution may be that it gets readers thinking about the nature of knowledge and how best to represent it in our models. Although the authors recognize this epistemological element of their work, readers may wish for a somewhat expanded discussion in this regard. In any case, amidst the overwhelming popularity of fully predetermined models of the modern capitalist economy, this important book gives contemporary voice to the relatively unexplored other side of the story.

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