and specified by a mathematical rule. In this specific setting, Fisher's well-known quantity relation may be applied to gauge these exchange rate movements. Bolt and Van Oordt (2016) argue that as a cryptocurrency becomes more established, the exchange rate will become less sensitive to the impact of shocks to speculators' beliefs. This result undermines the common belief that excessive exchange-rate volatility will prohibit widespread usage of cryptocurrency in the long run.

The last chapter of the book deals with the future of Bitcoin. It is not so much a "manifesto," but rather an evaluation of the pros and cons of Bitcoin and blockchain technology. In the authors' view, decentralization plays a crucial role. Using blockchain, one may "move from a state-controlled centralized process to one without any intermediaries." Obviously, this goes back to Satoshi Nakamoto's original idea to create a mechanism to "make payments over a communications channel without a trusted party" (Nakamoto 2008). However, decentralization potentially makes Bitcoin "highly disruptive" and governments have started to regulate (or even ban) it. But the effectiveness of regulation may well be questioned, especially in view of the large cross-border dimension of Bitcoin. Government regulation gets easily stuck in national boundaries.

This book provides an outstanding treatment of a complex phenomenon—the rise of cryptocurrency technologies. To really understand Bitcoin and blockchain technology, one needs to understand how it operates at a technical level. The authors take the reader by the hand by providing numerous examples throughout the book and online materials complementing the text. This also makes it very suitable as a textbook for students. The foreword by Jeremy Clark is excellent; it sets the perfect stage starting from simple barter trade and credit cards to the earlier failures in setting up digital cash and the compromises that Bitcoin had to make in its design.

The authors conclude that "one of the best thing about decentralization is that it's a great platform for experimentation and learning." There is now ample proof of work: various governments and central banks across the globe—the People's Bank of China in particular—have not only investigated cryptocurrencies, but are also developing their own central bank digital currencies. After reading this book, it comes as no surprise that they'll use blockchain technology to issue these currencies.

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## B History of Economic Thought, Methodology, and Heterodox Approaches

*Milton Friedman: Contributions to Economics and Public Policy*. Edited by Robert A. Cord and J. Daniel Hammond. Oxford and New York: Oxford University Press, 2016. Pp. xxv, 860. $185.00. ISBN 978–0–19–870432–4, cloth. *JEL 2017–0036*

Gary Becker, at a 2007 AEA reception for a documentary on Milton Friedman, gave a brief informal testimonial to his teacher, colleague, and friend. He told of sharing a cab, during which Friedman discussed economics with the cab driver. When they reached their destination, Friedman was slow to leave the cab, wanting to raise a few more ideas with the driver. Friedman was all about the ideas, and not at all about the status of the person discussing the ideas.

His curiosity and exuberance are evident in the scope of topics covered in the forty chapters, and over 800 pages, of Robert Cord and Daniel Hammond's edited volume *Milton Friedman: Contributions to Economics and Public Policy*. The chapters are organized into five broad topics: five chapters in "Part 1—Reflections on Friedman"; fourteen chapters in "Part 2—Monetary Theory and Policy"; eight chapters in

"Part 3—Consumption Theory, Fiscal Policy, and Public Policy"; four chapters in "Part 4—Methodology"; and nine chapters in "Part 5—Friedman and Other Economists."

Two of the authors, Robert Lucas and Arnold Harberger, were not only students, but also younger colleagues of Friedman's. Several others, such as Gregory Chow, Eugene Lerner, Robert Auerbach, Richard Selden, and Gerald Dwyer were students of Friedman's. Those who studied under Friedman widely praise him as a teacher and advisor. Lucas (pp. 8–10) and Harberger (pp. 22–3) report that in his classes, Friedman emphasized the use of basic price theory to solve practical problems and puzzles, but did not emphasize reverence for authorities or the literature.

Besides Harberger's, few of the chapters are primarily biographical. But several authors mention episodes that hint at Friedman's values and personality. In an "Appendix on Loyalty" (p. 163), Selden reports that Friedman suddenly left a seminar at Cornell early, to return to Columbia, after he heard that a Columbia economist had secretly moved up Anna Schwartz's dissertation defense to occur in Friedman's absence so the economist could sabotage her receipt of the PhD.

Robert Auerbach tells an engaging story on how his driving a cab led to his becoming a student of Friedman (pp. 422–23). Auerbach was studying economics at Roosevelt University and supporting himself as a cab driver when one of his fares turned out to be a professor of economics at Chicago, who told him to enroll in a Friedman class. When the department told Friedman to eject Auerbach from the class because the latter could not pay the tuition, Friedman told him to keep attending.

Some of the chapter authors are members of the Chicago School, and some others mainly defend and praise Friedman, but this is no hagiography. Other chapter authors are mainly critical, including Thomas Paley (p. 632) who argues that John Maynard Keynes got more of macro right than Friedman, Roger Garrison (pp. 723–24) who argues that the neo-Austrians got more of macro right than Friedman, and Peter J. Boettke and Rosolino A. Candela (p. 728) who argue that James Buchanan got more of modern classical liberalism right than Friedman. The many chapters that broadly discuss Friedman's monetarism mainly agree that it was influential, but disagree on how far, and in which ways, the profession has advanced beyond it. Even those authors who mainly praise Friedman find issues to raise: Robert Lucas (p. 11) cannot understand what Friedman saw in Alfred Marshall, and Gregory Chow (pp. 40–41) believes that Friedman overestimated the importance of political freedom in underpinning economic freedom.

The book is edited by historians of economic thought Robert Cord and Daniel Hammond, each of whom also contributes a useful chapter to their volume. Hammond writes on Friedman's intellectual synergy with George Stigler, and Cord on Friedman's and Paul Samuelson's specific forecasts in macroeconomics, finding that Samuelson had a better record.

Some chapters focus on who and what most influenced Friedman. For instance, Robert Hetzel (p. 301) and Lawrence Boland (pp. 541–542) argue, for very different reasons, that Karl Popper's falsificationism had *less* influence on Friedman's methodology than is usually thought, and Gerald Dwyer argues that Jimmie Savage's Bayesianism had *more* influence on Friedman's methodology than is usually thought. Dwyer (pp. 578–79) argues that Friedman's Bayesianism, where statistics serve to change personal probabilities, helps explain why he seldom performed strict hypothesis testing on a limited data set, and often reported simple statistics from a wide variety of data sets. James R. Lothian (p. 183) alternatively argues that Friedman's preference for analysis that was cruder, but that made use of a wider variety of data sets, arose during World War II, when he used multiple regression analysis to identify two promising new metal alloys for use in aircraft engines. Based on his regression analysis, Friedman predicted that at high temperatures, the promising new alloys would last hundreds of hours before they ruptured. When the new alloys were tested in the lab, they ruptured after about four hours.

Two of Friedman's important contributions that are most commonly cited as having stood the test of time, and as still having something to say to us today, are *A Theory of the Consumption Function* and *A Monetary History of the United States* (the latter with Anna Schwartz). Lucas (p. 13), Lothian (p. 184), and Neil Ericsson et al.

(p. 96) write that *A Theory of the Consumption Function* is an exemplar of how to do good research in economics, and John Seater (p. 399) says that the main results of the theory are still sound.

Lucas (p. 15), Michael Bordo (pp. 149–51), and Lothian (p. 188) argue that the data and narrative in *A Monetary History of the United States* are also still very useful to macroeconomists and policy makers. Many have pondered, praised, and acted upon the key message of chapter 7 of the *History*, that the Great Depression was longer and deeper because the government contracted the money supply (Bordo, p. 143).

One important question in *Milton Friedman* arises from the chapters on Friedman's policy advocacy. It is common advice to "pick your fights," avoiding those that will generate too much ill will. But I remember hearing Friedman urge us to more often speak out on controversial issues, saying that the costs of doing so were lower than we feared. Friedman practiced what he preached, courageously speaking out on issues that most would expediently avoid. At the start of his career, the publication of his dissertation was delayed three years because he dared criticize the AMA for promoting special-interest occupational licensing in medicine (Harberger, p. 20; and Morris Kleiner, pp. 492–93). He criticized the military draft (John Singleton, pp. 499–519) and the war on drugs (Mark Thornton, pp. 464–79). He criticized the Federal Reserve (Barnett, p. 267), an organization that few economists dare criticize, mindful of the dinners, conferences, and jobs that the Fed provides so many economists. He even dared criticize the National Science Foundation for funding economics (Meltzer, p. 84), drawing fire from his distinguished—and usually admiring—students, Robert Lucas (1981) and Zvi Griliches (1994). Despite taking many courageous stands, Friedman flourished. Was that because the costs were lower than we feared, or because Friedman's intelligence and energy were enough to overcome costs that were indeed high?

*Milton Friedman* contains important additions to the growing corpus of works about his life and ideas, which we can usefully ponder as we wait for an intellectual biography of Milton Friedman that is as definitive, as is Thomas McCraw's of Joseph Schumpeter. Scholars owe Cord and Hammond a debt for pulling together an impressive, diverse collection of chapters that will be useful for decades to come in understanding the ideas and impact of one of our time's leading economists. The book will be most useful to historians and methodologists of economic thought. But since Friedman usually thought about fundamental issues in a clear, plausible, and creative way, his thoughts also are often of continuing interest to those who are still grappling with the same issues. How much does money really matter? What should the Fed do? Who benefits from free trade? If only Friedman had been a little slower in leaving this orb, our discussions would be clearer, more thought provoking, and more fruitful (and our cab drivers would be better economists).

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## C Mathematical and Quantitative Methods

*The Econometric Analysis of Recurrent Events in Macroeconomics and Finance*. By Don Harding and Adrian Pagan. Econometric and Tinbergen Institutes Lectures. Princeton and Oxford: Princeton University Press, 2016. Pp. xiii, 215. $49.50. ISBN 978–0–691–16708–4, cloth. *JEL 2016–1695*

In the aftermath of the global financial crisis, interest in analyzing recurrent economic phenomena such as recessions or episodes of tight credit conditions revived significantly. Against