Journal of the History of Economic Thought,
Volume 45, Number 3, September 2023

KEYNES, RAMSEY, AND PRAGMATISM: A COMMENT

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This comment makes a response to one of several points made in Bill Gerrrard's (2023) criticisms of Bateman (2021) in particular, this comment clarifies Keynes's use of mathematical expectation in The General Theory *(1936).*

In his response to my essay in the recent symposium celebrating the centenary of John Maynard Keynes's *Treatise on Probability* (Bateman 2021), Bill Gerrard (2023) offers a comprehensive critique of my argument that Keynes was influenced by Frank Ramsey's turn to pragmatism. Gerrard's comments cut both ways: on the one hand, he agrees that Ramsey's turn to pragmatism influenced Keynes but argues that I do not go far enough in articulating the extent of the influence; on the other hand, Gerrard argues that Keynes's embrace of Ramsey's subjective theory of probability has nothing to do with his acceptance of Ramsey's pragmatism. The purpose of this short comment, however, is neither to rehearse the many ways in which I agree with Gerrard nor to elaborate each way in which we disagree.

The purpose of this comment is to address just one of my disagreements with Gerrard and to use this clarification to reiterate Keynes's embrace of pragmatism. The disagreement on which I focus concerns the question of whether Keynes employed mathematical expectation in *The General Theory*. In particular, it stems from my focus on the distinction between the way that expectations about future profit are handled in chapters 11 and 12 of *The General Theory*.

> Ramsey, however, offered Keynes a way forward for his modeling. Nowhere is this more clear than in the way that he models investment in *The General Theory*. On the one hand, Keynes can work out in great detail in Chapter 11 ("The Marginal Efficiency of Capital") the model for rationally optimizing profits, including how investors weigh expected future profits, which are formed by weighting each possible future return by its probability of occurrence; on the other hand, he can step back in Chapter 12 ("The State

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ISSN 1053-8372 print; ISSN 1469-9656 online/23/03000399-402 © The Author(s), 2023. Published by Cambridge University Press on behalf of the History of Economics Society
doi:10.1017/S1053837222000426

https://doi.org/10.1017/S1053837222000426 Published online by Cambridge University Press

> of Long Term Expectations") and declare that investors act on animal spirits, not mathematical expectation. (Bateman 2021, p. 630)

As against this argument, Gerrard states that "there is no mention of mathematical expectation in Chapter 11" (Gerrard 2023, p. 394).

Technically, Gerrard is correct: Keynes does not use the phrase "mathematical expectation" in Chapter 11. To understand that he is doing so, though, one has only to refer to how he argues expectations of future proceeds are appropriately modeled earlier in chapters 3 and 5.[1] In Chapter 3, he states:

> An entrepreneur, who has to reach a practical decision as to his scale of production, does not, of course, entertain a single undoubting expectation of what the sales proceeds of a given amount will be, but several hypothetical expectations held with varying degrees of probability and definiteness. By his expectations of proceeds I mean, therefore, that expectation of proceeds which, if it were held with certainty, would lead to the same behavior as does the bundle of vague and more various possibilities which actually make up his state of expectation when he reaches his decision. (Keynes 1936, p. 24)[2]

In other words, while his models represent entrepreneurs as having single valued expectations, people do not actually expect just one outcome; rather, they see many possible outcomes, each with its own probability, and they form their "expectation" by weighing each of those various outcomes by its respective probability.[3]

But if Keynes's prose is somewhat obscure, the answer to what he meant can be discerned more clearly in the work of his student Robert Bryce, one of the graduate students who sat through his Michaelmas lectures in 1932, 1933, and 1934 in which he developed *The General Theory.* Bryce was invited in June 1935 to present to Friedrich Hayek's graduate seminar at the London School of Economics what research students at Cambridge were learning from Keynes. Bryce wrote and distributed a paper for the occasion, "An Introduction to a Monetary Theory of Production."[4] In the paper, Bryce ([1935] 1979, p. 150) uses "mathematical expectation" to explain how entrepreneurs form the "anticipated future returns" that Keynes discusses in Chapter 11: "Due allowance must be made for risk, i.e., the mathematical expectation of the return must

[1] In Chapter 5 of *The General Theory*, "Expectations as Determining Output and Employment," Keynes refers the reader back to Chapter 3 (the quotation above) for an exposition of "the *method* for arriving at an equivalent of these expectations" (Keynes 1936, p. 46; italics added).

[2] See Backhouse (2010) for an extended discussion about the ways that Keynes's background studying mathematics shaped his theorizing in *The General Theory.* As Backhouse points out, Keynes's contemporaries found his use of mathematics to be "abstruse" and difficult to follow.

[3] It is interesting to note that J. R. Hicks introduces mathematical expectation in *Value and Capital* (1939, p. 125) in very similar language to Keynes's language in the passage quoted above: "Secondly, and perhaps more importantly, people rarely have *precise* expectations at all. They do not expect that the price at which they will be able to sell a particular output in a particular future week will be just so-and-so much; there will be a certain figure, or range of figures, which they consider most probable, but deviations from this most probable value on either side are considered to be more or less possible. This is a complication which deserves very serious attention." Hicks had taught risk at the London School of Economics in 1929 and so was very familiar with the mathematical representation of behavior under conditions of uncertainty.

[4] It is widely accepted that the crucial turning point in the evolution of Keynes's development of *The General Theory* occurred in 1933 when he began to title his Michaelmas lectures "A Monetary Theory of Production." That was also the year that the lectures incorporated expectations for the first time into each principal function in the model. See Bateman (1996).

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be used, and also for uncertainty and the cost of bearing it."[5] Bryce sent the paper to Keynes after he presented it, and Keynes replied that it was "excellently done" and "you have got into it the main elements of my theory" (Keynes 1979, vol. 29, p. 150). Thus, even if one were to argue that Keynes does not use the phrase "mathematical expectation" in Chapter 11 of *The General Theory*, it was clear to him that this is what his students understood him to be doing and he gave his imprimatur to its use in explicating his argument.

Having established this difference with Gerrard, it seems necessary, however, to clarify exactly what I am saying, as well as what I am *not* saying. All I am arguing is that Keynes states in *The General Theory* that one way to model how entrepreneurs form their expectations of future proceeds (and profits) is by imagining that they weigh each possible outcome by the probability of its occurrence and that this weighting gives them a single valued expectation for anticipated proceeds (or anticipated profits). But while Keynes saw this as a "formal" way to model entrepreneurs' expectations, he also saw other ways, and the most well-known of those other ways (presented in Chapter 12) has nothing to do with probabilities or mathematical expectation; entrepreneurs form their expectations interdependently, on a "conventional" basis, using common (popular) narratives about the future profits (and proceeds).[6] However, in arguing that Keynes saw mathematical expectation as an appropriate way to formally model the logic of behavior under uncertainty, I am *not* arguing that he was a proponent of modern decision theory, or that he was an advocate of subjective expected utility theory, or even that he believed that every probability is measurable. Saying that Keynes believed that one way to model the complexity of expectations was to imagine that economic agents see many possible outcomes, and that they weigh these outcomes by their respective probabilities to form their expectations, does not commit him to any of these other positions. Since it is clear that Keynes was still insisting after the publication of *The General Theory* that not *all* probabilities were measurable, there are many unanswered questions about what he meant in his *magnum opus* when he referred to the probabilities that entrepreneurs held of the various possible outcomes.[7] But it is difficult to escape the "easy" answer that mathematical expectations represent the "formal logic" of entrepreneurial expectations, how one would model expectations if they were logically (and mathematically) consistent; while animal spirits and confidence represent the "human logic," or more nearly the way that people actually behave.

This "pragmatic" understanding of chapters 11 and 12 of *The General Theory* reinforces what I say in my original essay when I argue that Keynes's two ways of portraying in *The General Theory* the long-run expectations that drive investment illustrate the influence of Ramsey's pragmatism on him.

> That is, investors do not actually line up each outcome and its probability to make their decisions. Just as Ramsey had demonstrated in "Truth and Probability," you can

[5] Bryce's essay is reproduced in volume 29 of Keynes's *Collected Writings* (Keynes 1979). The passage quoted appears on page 139.

[6] For an extended discussion of the role of conventions in *The General Theory*, see Davis (1994). See also Bateman (1996).

[7] Backhouse (2010, p. 139) goes a long way to providing a framework for answering these questions when he says of Keynes's thinking, "Equations are symbolic rather than algebraic." The quoted phrase is itself the title of one of Keynes's Michaelmas lectures (21 November 1932), as noted in Rymes (1989, p. 77).

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> calculate the probabilities for different outcomes from the bets that a person is willing to make, even if they make the bets for reasons of enthusiasm, fear, or excitement. From a pragmatic perspective, probabilities in human action reflect beliefs and commitments, they are not objective facts (or logical relations). (Bateman 2021, p. 630)

Understanding Keynes as capable of depicting (modeling) the world in multiple ways neither diminishes the importance of his argument nor commits him to any more recent developments in decision theory. All it does is help us to see him as fully engaged in a "pragmatic" economics.[8] In other words, he was capable of modeling "human" logic as well as "formal" logic.

COMPETING INTERESTS

The author declares no competing interests exist.

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[8] Portraying Keynes as capable of this kind of complexity is also consistent with the idea that animates Don Moggridge's biography of Keynes (1992): namely, that he was a working economist who sought to influence how economics is actually done, rather than someone who needs to be "rescued from the economists" (Moggridge 2002). Like Ramsey, Keynes was capable of constructing models that were formally, logically tight but which he believed were neither literally descriptive nor appropriately normative.

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