THE ROLE OF RATIONALITY AND THE
INDUCTIVE METHOD OF THEORY CONSTRUCTION
IN KEYNES'S PHILOSOPHY AND ECONOMICS

by

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B.A., Fort Lewis College, 1984

A thesis submitted to the
Faculty of the Graduate School of the
University of Colorado at Denver in partial fulfillment
of the requirements for the degree of
Master of Arts
Department of Economics
1991
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The Role of Rationality and The Inductive Method of Theory Construction in Keynes's Philosophy and Economics.

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This paper is concerned with the question of the continuity over the course of Keynes's career in his theory of probability. The continuity hypothesis argues that Keynes consistently held to the theory of probability outlined in The Treatise on Probability. This theory maintains that probability is the degree of rational belief. The discontinuity hypothesis argues that Keynes shifted from the theory put forward in The Treatise on Probability to a sceptical, pure subjectivist theory, which denies that beliefs can be rational.

The argument of this paper is that Keynes's early theory of probability, as expressed in The Treatise on Probability, logically corresponds with what I refer to as the inductive method of theory construction, a method that seeks to justify inductions via grounds in reason. The inductive method seeks to construct an inductive theory which can be used as a criterion against which the validity of commonly held beliefs can be judged. By contrast, the sceptical
subjectivist philosophy logically corresponds with the hypothetical-deductive method of theory construction, a method that introduces functional relations via assumption and applies deductive logic to derive conclusions that are logically consistent with the assumed functions.

The paper provides evidence that Keynes's main critic, Frank Ramsey, failed to address Keynes's argument directly. Instead, Ramsey, failing to understand Keynes's theory, attacked a strawman representation. This invalid criticism is the basis of Bradley Bateman's discontinuity hypothesis. The paper shows how Bateman's position is undermined by Ramsey's failure to address Keynes's theory directly.

The thesis of the paper is that in constructing his economic theory in *The General Theory of Employment, interest and Money* Keynes employs the inductive method of theory construction. Using this inductive theory as a criterion, Keynes judges the validity of commonly held economic beliefs. This thesis is demonstrated with evidence from Keynes's theory of effective demand. This demonstration provides evidence that favors the continuity hypothesis rather than the discontinuity hypothesis.

This abstract accurately represents the content of the candidate's thesis. I recommend its publication.

Signed

Suzanne Helburn
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CHAPTER 1
INTRODUCTION

There are essentially three lines of research into Keynes's methodology. The first concerns how to characterize Keynes's philosophical positions; the second concerns the continuity or change in these positions over Keynes's career; the third concerns implications for interpreting Keynes's economic theory of conclusions reached along these first two lines of research (O'Donnell 1989, 253-54).

The focal point of the present paper will be the issue of continuity in Keynes's theory of probability, as expressed in his main philosophical work *The Treatise on Probability* (TP will refer to *The Treatise on Probability* from here on). This question of continuity or discontinuity in Keynes's philosophical position is interesting in itself. However, the real justification for studying the issue is that the conclusions may influence our evaluation of alternative interpretations of Keynes's economic theory.

The main controversy over the continuity of Keynes's theory of probability is connected with his comments on the work of Frank Ramsey. Ramsey, a younger contemporary of Keynes at Cambridge, was a
critic of Keynes's theory of probability. In his essay on Ramsey, Keynes concedes that Ramsey is right on some points of criticism. A large number of philosophers and economists took Keynes's concessions to Ramsey to be a repudiation by Keynes of the views he had expressed in the *TP*. Good, Jefferys, Hicks, Lindly, Schumpeter and Braithwaite all expressed the view that Keynes had recanted his earlier position (O'Donnell 1989, 140).

Briefly, Keynes's theory of probability builds on the Classical conception of probability as the degree of rational belief. The Classical conception was modelled on the cognitive circumstances of games of perfect chance, i.e. dice, cards, etc. In the *TP* Keynes attempts to generalize this conception to include other types of inferences, especially those associated with empirical science and practical reason. He does this by arguing that the processes whereby we reason from limited data to rational conclusions is the same in each of these diverse fields, even though the types of conclusions reached may be qualitatively different. These common processes, to be outlined below, constitute the grounds for Keynes's general, or unified, theory of probability.

Ramsey, by contrast, is a modern day sceptic. Ramsey flatly denied that our inductions have any objective validity. Ramsey argued that the only aspect of our beliefs which have objective validity are beliefs based on deductive logic. Consistent with this
position, Ramsey discusses probability as the degree of actual belief. In Ramsey’s theory any belief is as subjectively valid as any other. A belief is rational if it is internally consistent with the system of beliefs held by the individual.

Rod O’Donnell and Anna Carabelli are contemporary proponents of the continuity hypothesis, the view that in his later career, and especially in writing The General Theory of Employment, Interest and Money (GT will refer to The General Theory of Employment, Interest and Money from here on). They argue that Keynes consistently maintained, and applied, his early theory of probability. O’Donnell argues that the TP outlines a general theory of logic, one within which the formal certainty of deductive logic appears as a special case. Keynes’s general theory accounts for the process of reasoning from limited information to non demonstrable conclusions (O’Donnell 1989, 37). O’Donnell views this general theory of logic as "... essentially concerned with normative decision theory" (O’Donnell 1989, 37). He argues that Keynes’s GT employs a generalized version of the decision theory outlined in the TP (O’Donnell 1989, 267).

Carabelli’s argument seems to differ from O’Donnell’s in the emphasis it places on Keynes’s methodology rather than on Keynes’s hard-core beliefs about society. O’Donnell’s argument depends heavily on his premise that Keynes assumes that economic agents
are rational, subject to constraints imposed by their cognitive circumstances (O'Donnell 1989, 269-72). Carabelli's argument does not depend on whether Keynes did or did not make this assumption.

Carabelli's argument emphasizes Keynes's conception of probability as, fundamentally, a cognitive problem (Carabelli 1988, 15). She correctly points out that Keynes's theory of probability is concerned with grounds in reason, not cause in events (Carabelli 1988, 91-92). She argues that Keynes opposed the hypothetical-deductive method (Carabelli 1988, 233). Keynes' method, consistent with the philosophical position expressed in the TP, involved "... the resumption of the pre-eighteenth-century use of the concept of probability" (Carabelli 1988, 234). On this conception "probability" refers to opinion, belief that is supported by grounds in reason, or reasons to believe. She argues that this conception is not opposed to empirical science or the classical conception of probability. Rather, "... probable opinion was viewed as ruling science itself" (Carabelli 1988, 234).

My own argument builds on Carabelli's emphasis on methodology. My argument is that the continuity issue can only be decided by inquiring into the method of theory construction actually employed by Keynes. Keynes's theory of probability maintains that by outlining adequate grounds in reason we can reason from limited information to rational conclusions. The
method of theory construction that logically corresponds with this position is the inductive method. This method entails introducing inductions into theory via a detailed outline of the grounds in reason for believing in the induction. This method is not consistent with Ramsey's scepticism, since on Ramsey's view our inductions are not objectively valid. From the point of view of Ramsey's philosophy, attempting to justify induction with grounds in reason is an exercise in futility.

Ramsey's philosophical scepticism logically corresponds with the hypothetical-deductive method of theory construction. This method introduces functional relations not as inferences, but as assumptions. By assuming the existence of a function we are not claiming that it actually exists. We are saying, in effect "if it exists, then ..." The objective criterion applied in the hypothetical deductive method is the internal consistency criterion. The conclusions derived from assumptions must be consistent with those assumptions. This method is consistent with Ramsey's scepticism, and with scepticism in general, because it does not explicitly rely on any direct judgement regarding the objective validity of the functional relations being introduced into theory. The sole emphasis is placed on the criterion or internal consistency, which is an application of deductive logic.

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My thesis is that the best evidence favoring the continuity thesis is that Keynes employs the inductive method of theory construction in developing his general theory of the economy. This thesis will demonstrate conclusively, I believe, that Keynes consistently rejected scepticism in applying his own philosophical alternative. It is Keynes's method to introduce inductions by providing adequate grounds in reason to justify belief in the induction. This method is consistent with Keynes's own general conception of logic, as expressed in the *TP*. It is not consistent with the hypothetical-deductive method, based on scepticism regarding the objective validity of inductions.

The structure of this paper is as follows. Chapter 2 provides the reader with the background necessary to place the continuity issue in perspective. The first section outlines the history of probability theory, as well as Keynes's place in it. The second section describes Keynes's theory of probability in more detail. This section is broken down into three subheadings: general features of Keynes's theory, specific features of Keynes's theory, and Keynes's concept of the weight of the argument.

Chapter 3 discusses the discontinuity hypothesis and its roots in Ramsey's criticism of Keynes. The first section outlines the details of Bradley Bateman's thesis. Bateman is a contemporary proponent of the discontinuity hypothesis. The second
section provides my critique of Ramsey’s criticism of Keynes. Bateman’s argument builds on Ramsey’s criticism. Thus my critique of Ramsey applies to Bateman as well.

Chapter 4 fully develops my thesis. This chapter is concerned with the inductive method and Keynes’s application of this method in the GT. The first section outlines the correspondence of the inductive method to Keynes’s philosophical account of probability in the TP. It also contrasts this correspondence with the correspondence of the hypothetical-deductive method to a sceptical subjectivist position such as Ramsey’s. The second section outlines Keynes’s application of the inductive method in the GT. This section is broken down into three subheadings: the marginal propensity to consume, the marginal efficiency of capital, and the interest rate.

Chapter 5, the last chapter, outlines my conclusions.
CHAPTER 2
BACKGROUND

This chapter begins by describing the background against which the debate over the continuity of Keynes's philosophical position can be placed in perspective. The chapter is not about the continuity issue itself. Rather it starts by outlining the historical development of the field of probability theory.

The chapter builds on this background by giving a more detailed account at Keynes's theory of probability. The first section discusses the classical theory and the frequency theory of probability. It also discusses the relation of Keynes's theory, as a general theory of probability, to these theories. The second section discusses Keynes's theory of probability in more detail. This section is broken down into three subheadings. The first discusses general features of Keynes's theory of probability, including his conception of probability as a general theory of logic. The second discusses more specific features of Keynes's conception of probability, including the role of direct judgments. The third, and final heading discusses Keynes's concept of the weight of the argument. In this final section I discuss how
the accumulation of evidence factors into Keynes's conception of rational belief.

Overview of Philosophical Issues of Probabilistic Induction

In order to understand Keynes's contribution to the theory of probability it is essential to distinguish clearly between the probability calculus itself and the philosophical issue of what a probability actually is. There is very little controversy over the probability calculus itself. Philosophers and mathematicians widely agree on the axiomatic basis and actual calculations involved. The procedures for calculating expected values, for example, given some set of expectations concerning a range of outcomes is not a point of controversy.

The great controversy in probability theory centers on the philosophical account of what a probability actually is. This debate touches the probability calculus itself in an indirect way only. Keynes argues that the probability calculus is not generally applicable. Thus, it is the applicability of the calculus, and not the mechanical operation itself, which he challenges.

Probabilistic knowledge arises in connection with the distinction between universally valid theory and non universal, or probabilistic theory.
Universally valid theory expresses a relation of certainty. For Keynes, a relation of certainty is a special case of probabilistic knowledge, the case where the probability equals one or zero.

The philosophical problem of describing just what type of knowledge probabilistic knowledge actually is can be viewed as analogous to the general problem of induction. Two fundamental problems arise. First, probabilistic knowledge does not constitute certain knowledge of any particular event. Second, the conviction that probabilities represent a type of knowledge tacitly assumes some degree of uniformity in the universe. That is, it assumes that the evidence we have at hand, "data we collected simply in our region of space and time" (O'Hear 1989, 149), is not some sort of deviant sample. This raises a question which is essentially the general problem of induction, namely what rational basis exists for human generalizations upon limited data? As O'Hear points out, the question "What is a probability?" can be viewed as the probabilistic analogue of the general problem of induction (O'Hear 1989, 149).

Philosophers of science, such as O'Hear, have distinguished two fundamentally different philosophical approaches to probability, the subjective and the objective. As we will see below, there is a substantial problem of terminology between the use of these terms in the literature on Keynes' method and the use of them by philosophers. The term "subjectivist"
theory of probability is used by philosophers to refer to any of the various theories which are based on the general outline of the so-called classical theory or probability. The origin of the classical conception of probability is usually traced to Laplace's "Philosophical Essay on Probability" written in 1814 (O'Hear 1989, 156).

The basic outline of the classical theory is as follows. Probabilities are conceived of as logical relations between propositions. As such, they express the degree of rational belief on given evidence. On the classical view, these judgments of probability apply only when the principle of non-sufficient reason holds true. This principle says that if there is no reason to believe that any one of the possible mutually exhaustive, mutually exclusive alternatives is more likely than any other, that is if all possibilities are judged equiprobable, then it is rational to believe that the probability of any particular event is the ratio of that event to the total number of possible outcomes.

Carabelli and O'Donnell both point out that Keynes' theory of probability comes under the classical umbrella, sometimes referred to as the logical theory. The primary, alternative to the "subjectivist" position is the "objectivist" approach. Philosophers have used the term "objectivist" theory to refer to any of the various philosophical approaches which view probability
as basically an empirical phenomenon. The best known of these theories is the so-called frequency theory of probability. On this view, probability is nothing more or less than an empirically observed frequency. As such it is a posteriori, and the "true probability" is not usually known --only its approximation. A similar theory is Popper's propensity theory of probability (O'Hear 1989, 169), according to which a probability is a propensity which exists in the structure of the conditions which generate observed events.

O'Donnell suggests that larger connections between probability theory and more general philosophical traditions are recognizable. He suggests that "broadly speaking, empiricism tends to align with the frequency theory, rationalism with the logical and pragmatism with the subjective" (O'Donnell 1989, 24).

The semantic problem alluded to above can now be made clear to the reader. In the controversy over the continuity issue in Keynes's thought, as it applies to his theory of probability, Carabelli and O'Donnell have sought to distinguish sharply Keynes's unique reconstruction of the classical outline from Frank Ramsey's extreme subjectivism. In so doing they have referred to Ramsey's approach as the "subjectivist" theory. But this is the same rubric which philosophers have applied to the classical outline, and both Carabelli and O'Donnell agree that Keynes's theory clearly comes under the classical heading.

Carabelli and O'Donnell wish to emphasize the
objectiveness of Keynes's conception of probability. Hence, they choose not to apply the term "subjectivist" to Keynes. Although this practice may have been strategic the reader should be aware of the semantic differences which exist so that no confusion arises in placing Keynes' theory of probability in the context of the historical development of the philosophical debate over the meaning of probability judgments. As we will see in chapter 2 below, Keynes argues that although our knowledge is subjective in origin, what is probable becomes fixed, and is "independent of our opinion" (Keynes TP 1971-89, 4).

In his paper "Keynes's Changing Conception of Probability" Brad Bateman has employed an interesting lexicon for classifying these distinctions (Bateman 1987, 99). According to this semantic scheme there are two types of probabilities in probability theory. The first is aleatory, stemming from the Latin word alea, meaning a dice game. The second is epistemic, stemming from the Greek word episteme, meaning knowledge.

Bateman employs the further dichotomy between objective and subjective theories. He uses the term objective to describe theories of unique probabilities which "have the same value for all individuals with the same information" (Bateman 1987, 100). In other words the term "objective" is applied to any theory under the classical umbrella, because under this conception probability is the degree of rational belief. By
contrast, he uses the term "subjective" to describe theories which take probability to be the actual degree of psychological belief.

Bateman is a contemporary proponent of the view that Keynes recanted his early probability theory before writing The General Theory. Bateman argues that Keynes altered his theory of probability in response to two factors: (1) the criticism of Frank Ramsey; (2) progress in the physical sciences in discovering stable long-run statistical frequencies. In his essay "Truth and Probability" Ramsey advocates what I refer to as a dichotomized theory of probability, one which focuses on psychological belief, but also provides a role for a separate class of empirical probabilities. Bateman argues that Keynes not only shifted to a radically subjective theory, but that he also adopted Ramsey's dichotomy by allowing for a special class of empirical probabilities which are not based on psychological factors.

The criticisms of Ramsey and Bateman have also been levelled by Braithwaite in the preface to the TP (Keynes TP, 1971-89 xvii). These criticisms seem to come under two headings: (1) Rational individuals need not always agree on the appropriate degree of belief. Hence a unique rational degree of belief may not exist. (2) Many types of probability judgments are based on empirical data, and, according to Braithwaite, the nature of these data presents "insuperable difficulties" for a logical theory of probability;
hence Keynes's grave error, according to Braithwaite, is that he supposes that his conception of probability applies to every field in which the term is used.

Bateman argues that Keynes's early probability theory, as expressed in the TP is an objective epistemic theory, and that in his later career Keynes adopted a subjective epistemic theory which allowed for objective aleatory probabilities in the case of highly stable empirical frequencies. This helps to clarify the distinction between Keynes's theory and Ramsey's theory, because it points out that "epistemic" is not necessarily synonymous with "subjective" as philosophers have sometimes supposed.

However, Bateman's use of these terms is, in my opinion, deeply misleading. The pre-Keynesian classical conception of probability as the degree of rational belief explicitly excludes so-called practical wisdom. The classical theorists modelled their conception of probability on the cognitive circumstances of games of perfect chance, such as dice, etc. In other words the objective epistemic approach (classical approach) was designed as a theory of aleatory probabilities, where aleatory refers to the cognitive conditions related to games of perfect chance, namely relations characterized by exhaustive, mutually exclusive outcomes which are produced under the principle of non-sufficient reason.

The frequency theory developed in opposition
to the classical theory as an explanation of probabilities which were identified with knowledge of empirical frequencies. I suspect that the frequency theory owes its emergence to the growth of empirical science in the nineteenth and twentieth centuries.

Bateman's use of the aleatory/epistemic distinction, thus, confronts the reader with a false dilemma, the necessity of dichotomizing aleatory and epistemic probabilities as fundamentally dissimilar phenomena. The objective epistemic approach is a theory of aleatory probabilities. Thus Bateman's association of the term "aleatory" with empirical frequency conflates the classical approach with the frequency approach and is, therefore, highly misleading.

Prior to the TP the field of probability theory was dichotomized. The classical theory of aleatory probabilities and the frequency theory of empirical probabilities stood in opposition to each other. Neither of these theories gave an account of the colloquial use of the term "probability" as it applied in the realm of practical reason. TP is fundamentally, an attempt to provide the grounds in reason for a unified theory of probability, one in which aleatory probabilities, empirical probabilities, and practical judgments all appear as applications of the same processes of human reasoning.

In this general theory of probability aleatory probabilities and empirical probabilities
(some of which may qualify as aleatory-empirical probabilities) appear as special cases which may be subsumed under Keynes’s general approach. I will say more about Keynes’s theory of probability below, but for now I wish to stress that prior to the TP the logical grounds for a unified theory had not been developed.

Thus it is not a valid criticism of the classical school that it is not an adequate explanation of empirical probabilities. Nor is it a valid criticism of the frequency school that not all frequencies qualify as aleatory probabilities. Furthermore, it is not a valid criticism of either approach that they do not adequately account for practical reason. These theories make no pretense to being general theories. They are, instead, valid explanations of highly restricted classes of probabilities. The only sense in which these theories make a false pretense to generality is in using a widely understood term, namely "probability," in a highly restricted sense.

Keynes’s significance in the history of probability theory should now be clear to the reader. Keynes provided the logical grounds, to be discussed at length below, for a general theory of probability. Judging from the kinds of criticisms that have been levelled against Keynes, it seems fair to say that this significance has not been widely understood.
Braithwaite’s criticism, for instance, that Keynes’s conception of probability, as the degree of rational belief, is not appropriate as an explanation for empirical frequencies is not a valid criticism of Keynes’s general theory of probability. Ironically it is not even a valid criticism of the pre-Keynesian classical theory, for the reason given above, namely that the classical theory makes no pretense to being an explanation of anything but the degree of rational belief in the case of aleatory probabilities. A valid criticism of Keynes’s framework must seek to invalidate the logical grounds established by Keynes for the unification of theories in the field. What Ramsey, Braithwaite and Bateman all seem to object to is the application of the classical conception of probability to empirical science.

But which of the logical grounds for unification, to be outlined below, have been falsely applied to empirical science? Keynes’s critics have not invalidated the empirical application of even one of the principles outlined in Keynes’s underlying argument.

Bateman argues that Keynes himself came to believe that his early theory of probability was inadequate as an explanation of empirical probabilities, and that he switched to a dichotomized theory (Bateman 1987, 104-5). It should be recognized, however, that this dichotomized approach is an ad hoc approach to the problem. Hence this putative shift
represents a movement from a general theory to an ad hoc association of theories.

It is widely agreed that general theories are preferable to ad hoc combinations of theories whenever the logical grounds for unification exist. This judgment in favor of unified theories is so universal that the only real point of controversy in any particular field concerns the validity of the grounds in reason given for the unification. False generalizations are the consequence of unification of theories on the basis of invalid grounds in reason. Hence ad hoc combinations of theories are superior only if there are no known grounds upon which to base valid generalizations.

It follows that Bateman's thesis requires more explanation than he has provided. After working for nearly two decades on a book which establishes the grounds in reason for a unified theory of probability, what possible motive could Keynes have had to switch to an ad hoc combination of theories when the application of not a single principle in his theory had been successfully challenged in any of the fields with which he was concerned? In fact, no reasonable motive exists. Keynes's critics have never managed to address his argument directly.

To sum up, the controversy in the debate over probability theory centers on the philosophical question of what, fundamentally, a probability actually
is. The discussion is greatly complicated by semantic problems which plague the field. Apprehending Keynes's contribution in this field is especially difficult since he was engaged in unifying theories concerning which various analysts have used the same terms to mean different things. The situation is made worse when analysts, such as Bateman, adopt semantic outlines which are based on theoretical misconceptions. Bateman's epistemic/aleatory dichotomy is an example. Finally, Keynes's critics have levelled criticisms of his probability theory which are not valid, due to their failure to address the substance of his argument directly.

Keynes's Theory

General Features of Keynes's Theory of Probability

In the previous section I mentioned that Keynes adopts, to some extent, the general outline of the classical theory of probability. In this section I will discuss the unique features of Keynes's general conception of probability. We will see that although Keynes utilizes the classical framework, his theory of probability makes demonstrative reasoning, the logic of implication, a special case of a more general logic which includes non demonstrative reasoning, i.e. probabilistic inferences, as the typical case. The principle of non-sufficient reason is transformed into the principle of indifference, where non-sufficient
reason is construed as the degree of ignorance, and indifference is construed as a judgment, a type of knowledge.

The TP was much more than a technical work on minor problems with the classical theory of probability. Keynes was attempting to create a generalized theory of logic, one which he sharply contrasted with the traditional logic of implication.

As soon as we have passed from the logic of implication and the categories of truth and falsehood to the logic of probability and the categories of knowledge, ignorance, and rational belief, we are paying attention to a new logical relation in which, although it is logical, we were not previously interested (Keynes TP 1971-89, 8).

This new logical relation is concerned with probabilistic inference. This logic of probability is to be contrasted with the syllogism and the logic of implication. The logical relations which Keynes is interested in are the arguments employed in the actual, everyday exercise of reason.

In the ordinary curse of thought and argument, we are constantly assuming that knowledge of one statement, while not proving the truth of the second, yields nevertheless some ground for believing it. We assert that we ought on the evidence to prefer such and such a belief. We claim rational grounds for assertions which are not conclusively demonstrated (Keynes TP 1971-89, 5).

Keynes insists that these non-conclusive rational judgments belong to the general theory of logic.
If logic investigates the general principles of valid thought, the study of arguments, to which it is rational to attach some weight, is as much a part of it as the study of those which are demonstrable (Keynes TP 1971-89, 3).

Keynes’s probabilities are not abstract relations of implication. Rather they are logical relations between propositions which are readily expressed and comprehended in common language. Keynes uses the notation \( x/h \) to represent the probability relation, where \( x \) is the conclusion given evidence \( h \). Further these relations are relevant to practical experience as the rational basis for action.

To believe one thing in preference to another, as distinct from believing the first true or more probable and the second false or less probable, must have reference to action and must be a loose way of expressing the propriety of acting on one hypothesis rather than another. We might put it, therefore, that the probable is the hypothesis on which it is rational for us to act (Keynes TP 1971-89, 339).

Thus the degree of rational belief is the degree of probability, and this probability judgment is always relevant because it is inextricably bound up with practical actions, otherwise we would not be concerned to form probabilities (rational arguments) in the first place. The degree of rational belief, in this sense, should not be confused with the degree of truth. "... it is not rational for us to believe that the probable is true; it is only rational ... to believe it in preference to alternative beliefs" (Keynes TP 1971-89, 339).

Keynes distinguished between "degrees of
certainty" and "degrees of truth." Probability deals with degrees of certainty. Keynes felt that all too often philosophers confused certainty and the truth (Carabelli 1988, 21). On the same basis, they confuse "degrees of rationality" with "degrees of truth." A person may rationally believe something which is in fact false. Similarly people may believe all sorts of irrational things which turn out to be true (for other reasons).

An example may help to clarify this point. The geocentric view of our universe was useful, and, in some sense, good enough, for the ancient astronomers. Moreover, on the weight of the theoretical and empirical evidence at their disposal, it was "rational" for them to have believed that the earth was the center of the universe. This belief was rational even though false.

Alternatively, one may believe something will happen based on preposterous reasoning. It may nevertheless come true. The truth of the proposition does not justify the preposterous grounds for believing in it.

This distinction between truth and degrees of rational belief provides a good point of transition to one of the fundamental features of Keynes' conception of probability, a feature mentioned in the last chapter, namely the sense in which Keynes' probabilities are objective. Keynes' probabilities are
Relative in the sense that they change when our evidence, our theoretical and empirical knowledge, changes. Although Keynes points out that probabilities are "subjective," to this extent, he goes on to say that:

"... in the sense important to logic, probability is not subjective. It is not, that is to say, subject to human caprice. A proposition is not probable because we think it is so. When once the facts are given which determine our knowledge, what is probable or improbable in these circumstances has been fixed objectively, and is independent of our opinion. The theory of probability is logical, therefore, because it is concerned with the degree of belief which it is rational to entertain in given conditions, and is not merely [sic] with the actual beliefs of particular individuals, which may or may not be rational (Keynes (TP 1971-89, 4).

This quote contains several important points. First, although probabilities change over time, since rational belief at one moment in history may be irrational at another time, they are objective and independent of individual opinion at any point in time, once the changing elements of knowledge become "fixed." This is, no doubt, the reason why Carabelli and O'Donnell contrast Keynes with what they call the subjectivists. Although they recognize the subjective elements of Keynes' theory of probability, they correctly point out that for Keynes probabilities are objective logical phenomena.

In my opinion, O'Donnell goes too far, however, in emphasizing the objective element in Keynes' probability theory. He remarks that "Logical
relations are viewed as objective because they are grounded in an external immutable realm which timeless transcends mere individual opinion" (O'Donnell 1989, 37-38). It seems to me that O'Donnell has something like Plato's eternal forms in mind here.

Carabelli's discussion of objectivity in Keynes's theory of probability is more closely in tune with Keynes's own discussion. In Carabelli's interpretation emphasis is placed on probability as a cognitive problem. She discusses Keynes's subjectivity in connection with the distinction between objective probability and chance and subjective probability and chance. The concept of objective chance is associated with what Keynes calls *causa essendi*. By contrast, the concept of subjective chance is clearly associated with what Keynes calls *causa cognoscendi* (Carabelli 1988, 95).

Carabelli points out that Keynes derived the latter distinction from the jargon of the Scholasticism of the Middle Ages (Carabelli 1988, 91). She quotes from Keynes's manuscript notes under the title Induction, Causation and Hypothesis on the subject of "Ground and Cause" as follows:

Ground or reason is that upon which judgment is based as an act of thought. Every relation of causation is a ground. Still there is a difference of aspect between ground and cause; the latter is the *causa essendi*, the cause why a thing is what it is; the former is the *causa cognoscendi* -the cause of our knowledge of the event. A statement of a law may be a ground, never a cause, though the law may involve causal relations and lay down what
causes are followed by what effects (Carabelli 1988, 92).

Carabelli points out that Keynes considered it a fundamental mistake to confuse causal dependence with dependence for knowledge. Dependence (and independence) for knowledge (and for probability) is a concept which builds on the distinction between \textit{causa essendi} and \textit{causa cognoscendi}. \textit{Causa essendi} is not observable, not an object of direct knowledge. By contrast, \textit{causa cognoscendi} is discernible as an object of direct knowledge. She shows that Keynes considered probabilistic knowledge to be based on knowledge of the dependence of arguments, not dependence of events.

The dependence of arguments is based on judgments of relevance or irrelevance and on judgments of preference or indifference. Hence the notions of "subjective chance" and "subjective cause," as Keynes calls them, the notions which underlie Keynes's conception of probability, are to be apprehended as purely cognitive phenomena. Consequently, probability is "relative" in the sense that it is subject to change with changing knowledge. As we noted previously, however, this does not imply that probabilities are subject to personal whims and opinions. Rather, they are "subjective" in the regard that they are "relative" to a person's relevant information. Keynes wrote that "the method of this treatise has been to regard subjective probability as fundamental and to treat all other relevant conceptions as derivative from this"
As with O'Donnell, Carabelli's object is to distinguish Keynes's subjectivism from Ramsey's subjectivism. Ramsey's project was to show that expectations are always capable of numerical expression, and therefore always subject to the mathematical theory of chance. By contrast, Keynes identified probability with the degree of rational belief, not necessarily the degree of actual belief. Both Carabelli and O'Donnell, distinguish clearly between the aspect of subjectivism in Keynes's theory of probability as compared to Ramsey's. In fact, it is their main thesis that this distinction not only existed but also persisted throughout Keynes's career.

Specific Features of Keynes's Theory of Probability

Carabelli has pointed out that Keynes was against both "naturalism" and "deductivism" (Carabelli 1988, 233). He felt that the complexity of human experience could not be reduced to mechanical laws. Further, he rejected the notion of demonstrative certainty based on perfect knowledge of universally valid theory. Hence, while Keynes's generalized theory of logic included both rational and empirical elements, it is a mistake to classify Keynes as either a rationalist or an empiricist. While he used both rational and empirical elements in his philosophy, he was critical of both of these philosophical alternatives.
I agree with Carabelli's view of Keynes's attitude toward rationalism and empiricism. Further, in the same way that Keynes utilized empirical and rational elements in his philosophy while maintaining a critical attitude towards both empiricism and rationalism, Keynes adopts the outline of classical theory of probability without accepting many of its fundamental conclusions. As Carabelli says, in the classical view "probability was redeemed from opinion only to the extent to which the former was to be distinguished from the latter" (Carabelli 1988, 234). For Keynes, on the other hand, the aleatory probabilities of the classical theory were a special class of probabilities. This special class, usually associated with games of perfect chance, is always numerical.

In Keynes's theory of probability opinions may be based on rational argument. The processes followed in reasoning from premises to rational, non-demonstrable conclusions are not unique to the determination of aleatory probabilities. Keynes's theory maintains that, in general, probabilities need not be numerical.

To understand the cases where probabilities are numerical we have to understand Keynes's principle of indifference. This principle is Keynes's reconstruction of the classical principle of non-sufficient reason. According to the latter principle, the probability calculus applies only if there is no
known reason to believe that all possible outcomes are not equiprobable. In other words, in the absence of some positive knowledge to the contrary it is rational to assume equiprobability. The fundamental criticism of this principle, a criticism which Keynes remedies in his reformulation, is that the principle of non-sufficient reason supposes that we can base our knowledge of probabilities on what amounts to ignorance. Our ignorance in the application of the principle of non-sufficient reason is our lack of knowledge concerning the reasons why equiprobability might not apply in a particular case.

Keynes agrees with this criticism (Keynes TP 1971-89, 92-93), and he resolves the problem by reformulating the principle of non-sufficient reason into the principle of indifference. This reformulation calls into play the hidden element of direct judgment or intuition. Keynes argues that direct judgments are required in order to decide what evidence should be included as a reason for believing in a proposition and whether this reason justifies an assumption of equiprobability. These direct judgments take two forms — judgments of relevance, or irrelevance and judgments of preference, or indifference.

Judgments of relevance are used to determine whether a particular piece of evidence is relevant to the proposition under consideration. If probabilities have the same conclusion but different evidence, then
relevance is determined by asking whether the probabilities are equal or unequal. For example, suppose that one set of evidence contains the other. That is $x/h$ and $x/hh_1$, where $x$ is the conclusion and $h$ and $h_1$ are pieces of evidence. Now, if $x/h > x/hh_1$, it follows that $h_1$ is unfavorably relevant, and if $x/h < x/hh_1$, $h_1$ is favorably relevant to the argument (O'Donnell 1989, 56).

The second type of direct judgment involved in the application of the principle of indifference is a judgment of preference, or indifference. This judgment involves a comparison of alternative conclusions on the same evidence. That is $x/h = y/h$ results from judgment of indifference, where $x$ and $y$ are alternative conclusions. What this equality expresses is a judgment of indifference between alternative conclusions based on the same evidence. By contrast, a judgment of inequality is a judgment of preference. That is, $x/h > y/h$ expresses a judgment a preference for conclusion $x$ over conclusion $y$, given evidence $h$. A judgment of preference refers to the preference for one conclusion, as more probable, over the alternative, less probable conclusions (Keynes TP 1971-89, 58-59).

The probability calculus applies only if the alternative outcomes are mutually exhaustive and mutually exclusive, and if a judgment of indifferences applies on given evidence. But, where the given cognitive circumstances are such that outcomes are
open-ended and/or not independent of one another, the probability calculus does not apply, and probabilities are non-numerical. Obviously, these criteria severely restrict the application of the probability calculus.

Non-numerical probabilities may, nevertheless, be compared in some circumstances. Keynes outlines three types of non-numerical comparisons: probabilities with identical premises but overlapping conclusions; probabilities with identical conclusions but overlapping evidence; probabilities with different conclusions but overlapping evidence.

In discussing non-numerical comparisons Keynes utilizes the distinction between practical certainty and logical certainty "since its contradictory is not impossible" (Keynes TP 1971-89, 177). Keynes gives the example of the probability that the sun will rise tomorrow as an illustration of practical certainty taken as a standard.

This method is frequently adopted in common discourse. When we ask how probable something is, we often put our question in the form - Is it more or less probable than so and so? - where "so and so" is some comparable and better known probability. We may thus obtain information in cases where it would be impossible to ascribe any number to the probability in question.

Darwin was giving a numerical limit to a non-numerical probability when he said of a conversation with Lyell that he thought it no more likely that he should be right in nearly all points than that he should toss up a penny and get heads twenty times running (Keynes TP 1971-89, 177).

Keynes goes on to point out that approximate
comparisons with non-numerical probabilities may also be possible.

Some other types of probabilities may not even be numerically measurable. Keynes mentions, for example, relations concerning beauty and utility, especially aggregate utility (O’Donnell 1989, 62). In both of these cases the principle of organic unity applies (the value of the whole is independent of the sum of the parts). For example, in planning the architecture of a city-scape, we cannot add the beauty of each individual structure to calculate the total beauty of the city as a whole. The elements of harmony, variety, and symmetry have no meaning on an atomistic level. Nevertheless, we may rationally judge the probable esthetic impact of an individual design on the visual character of the community as a whole.

Similarly, we may rationally believe, for example, that policies which improve the well-being (utility) of individuals may produce "spill-over benefits" for the community as a whole. Classic examples include education and immunization. We may be justified in extending this principle to a wide variety of policies. Furthermore, it may be necessary to assess these policies as a whole, rather than individually.

In both of these examples we may call into question the validity of numerical representations of probability relations involving these phenomena. We need merely inquire into the meaning of the underlying
phenomena, beauty and utility, to see that both cardinal and ordinal representations are dubious. Nevertheless, any reasonable person may be able to form probability judgments regarding beauty and general well-being when called on to judge (or perhaps to create) material objects or social policies.

The Weight of the Argument
As noted above, Carabelli has publicized the distinction in Keynes's early notes between causa essendi and causa cognoscendi. Basically, causa essendi is conceived of as a cause that exists in nature, a cause in itself. Causa cognoscendi is a "cause" in reason, what Keynes calls a ground or reason upon which judgments are based (Carabelli 1988, 91-92). Similarly, Keynes distinguishes between causal dependence (or independence) and dependence (or independence) for knowledge. He also used the terms "dependence of events" and "dependence of arguments." These terms build on the distinction between causa essendi and causacognoscendi.

This distinction is at the base of Keynes's conception of probability. Objective probability and objective chance are based on dependence or independence of events. As such, they are not observable and they are not objects of direct knowledge. By contrast, subjective probability and subjective chance are based on dependence or
independence of arguments. As such, they are objects of direct knowledge (Carabelli 1988, 95). With regard to this distinction, Keynes wrote, "The method of this treatise has been to regard subjective probability as fundamental" (Keynes TP 1971-89, 312).

It is tempting to conclude from these distinctions that Keynes was some form of philosophical dualist. In fact, however, his philosophy broke down the traditional mind v. matter dualism. While Keynes was very careful not to conflate concepts of cognitive phenomena with concepts of natural phenomena (or "things in themselves" as philosophers might say), he nevertheless maintained a philosophical position in which dependence in events may impact dependence for knowledge.

Keynes's concept of the weight of the argument, or the weight of the evidence, provides a link between "the real world" and the world of cognitive circumstance. This connection is indirect in that we cannot directly observe dependence of events. Our evidence is always cognitive by its very nature. The very fact that we collect data of certain types, and attempt to measure frequencies according to statistical and professional conventions, reflects a judgment of relevance (or irrelevance). Hence, statistics which appear to be "pure" empirical entities ultimately entail cognitive entities, judgments of relevance which may be included as a constituent in the body of evidence which has been judged relevant to a
particular argument.

Keynes felt that our preference for one argument (probability) over another is, in part, a function of the weight of the evidence. Probability and weight are not the same thing. The probability of a relation is the balance of favorable and unfavorable reasons within the body of evidence. As the relevant evidence expands, probability may rise or fall depending on whether the balance of reasons is favorable or unfavorable, but the weight of the argument always increases. "The weight, to speak metaphorically, measures the sum of the favorable and unfavorable evidence, The probability measures the difference" (Keynes TP 1971-89, 84).

In Keynes’s conception of the degree of rational belief our ability to form a judgment of preference (or indifference) concerning alternative probabilistic hypotheses entails the use of both probability and weight. Other things equal, we tend to prefer a well founded argument based on a large "amount" of evidence, as compared to a sketchy argument based on slight knowledge. Thus, judgments of preference are defined by both weight and probability.
This chapter begins with an outline of Bateman's version of the discontinuity hypothesis. Recall that Bateman is a contemporary proponent of the view that Keynes recanted his early theory of probability in favor of Frank Ramsey's sceptical-subjectivist theory. The second section gives my critique of Ramsey's criticism of Keynes. This critique is also a critique of Bateman because Bateman's argument builds on Ramsey's criticism. In this critique I argue that Keynes's critics have failed to address his theory directly.

Bateman's Thesis

Bateman argues that Keynes shifted under the influence of Frank Ramsey's criticism from an objective epistemic theory to a subjective epistemic theory. Bateman's argument builds on Ramsey's criticism of Keynes (Bateman 1987, 105-9). I would like, therefore, to preface my outline of Bateman's argument with a discussion of Ramsey's criticism, of Keynes. This outline will lead into my review of Bateman's position.
Ramsey’s essay "Truth and Probability" was written in 1926 and published posthumously in The Foundations of Mathematics (1931). In this essay Ramsey was highly critical of Keynes’s theory of probability. Ramsey’s criticisms can be grouped under two headings. First, empirical frequencies are not adequately described by the classical conception of probability as a degree of belief. Ramsey argues that when scientists use the term probability they are using the term in a way that is synonymous with "frequency." He believes that this use of the term is fundamentally dissimilar from the colloquial use of the term meaning "degree of belief."

Second, Ramsey argues that the basis, or origin, of probabilities is, undeniably subjective.

... no one estimating a degree of probability simply contemplates the two propositions supposed to be related by it; he always considers inter alia his own actual or hypothetical degree of belief (Ramsey 1931, 163).

Thus, in Ramsey’s theory, probabilities, meaning degrees of belief, or the colloquial sense of the term, are ultimately subjective. Regarding Keynes’s objective probabilities Ramsey writes:

I do not perceive them, and if I am to be persuaded that they exist it must be by argument; moreover I shrewdly suspect that others do not perceive them either, because they are able to come to so very little agreement as to given propositions. All we appear to know about them are certain general propositions, the laws of addition and multiplication . . . (Ramsey 1931, 161-62).
Thus Ramsey denies the existence of objective relations of probability. He argues that there is "very little agreement" regarding the rational degree of belief which relates most propositions, and he mentions the calculus of probabilities as the only objective element about which there is much general agreement.

Ramsey interprets Keynes's theory of probability, as expressed in the TP, as follows:

Mr. Keynes starts from the supposition that we make probable inferences for which we claim objective validity; we proceed from full belief in one proposition to partial belief in another, and we claim that this procedure is objectively right, so that if another man in similar circumstances entertained a different degree of belief, he would be wrong in doing so. Mr. Keynes accounts for this by supposing that between any two propositions, taken as premise and conclusion, there holds one and only one relation of a certain sort called probability relations; and that if, in any given case, the relation is that of degree A, from full belief in the premise, we should, if we were rational, proceed to a belief of degree A in the conclusion (Ramsey 1931, 160).

Bateman adopts Ramsey's interpretation of Keynes's conception of probability in proposing the distinction between objective and subjective epistemic theories.

An objective theory is one in which the probabilities are unique and have the same value for all individuals with the same information. In contrast, a subjective theory of probability is one in which the probabilities take whatever value is assigned by the individual using them. In a subjective theory, two individuals with identical information could assign different values to the probability of the same proposition without either being
mistaken . . . In an objective theory, such a result would be impossible, or would indicate a mistake on the part of one of the individuals; there is only one true value for the probability of a proposition in an objective theory (Bateman 1987, 100).

In this connection, Ramsey objects strongly to Keynes's conception of beliefs as objectively rational. Ramsey insists that our theory of probability should be definable in terms of ordinary logic, meaning, I think, deductive logic (Ramsey 1931, 163-66). He argues that what is needed is "... a purely psychological method of measuring belief" (Ramsey 1931, 166).

Having rejected Keynes's notion of probability as rational belief, Ramsey reintroduces the element of "rationality" via the internal consistency criterion. A particular belief is rational, on Ramsey's account, as long as it is not inconsistent with other beliefs held by the same person.

Bateman uses the example of an election. He argues that in Ramsey's theory "... two or more individuals could maintain different degrees of belief concerning an incumbent president's reelection (given the same information) but that the dissimilarity in their evaluations of this probability (or likelihood) would not imply that either one of them was irrational or mistaken" (Bateman 1987, 106). In other words, Ramsey's view allows for rational individuals to hold different opinions, since they may have different
systems of belief. Clearly, Ramsey and Bateman see this as a major improvement over Keynes’s theory.

**Criticism of Ramsey’s (and Bateman’s) Interpretation of Keynes’s Theory of Probability**

There are many points in Ramsey’s criticism to be addressed. I will start with Ramsey’s most fundamental criticism, that degrees of belief are really subjective, and that rational individuals may rationally disagree, given the same information.

Ramsey characterizes Keynes’s probabilities as unique and objective. However, in the TP and also in the GT Keynes explains that adequate grounds in reason may not always exist upon which to base a unique probability judgment.

If the barometer is high, but the clouds are black . . . it will be rational to allow caprice to determine us and waste no time on the debate (Keynes TP 1971-89, 32).

The significance of this quote is that it provides us with an example of cognitive circumstances under which a unique probability judgment is not possible. Consequently, rational individuals may rationally maintain different opinions without being objectively irrational. A similar reference can be observed in Keynes’s discussion of speculation in the GT. He points out that "waves of optimistic and pessimistic sentiment" in mass psychology are "unreasoning and yet in a sense legitimate where no solid basis exists for a
reasonable calculation" (Keynes TP 1971-89, 154).
Keynes points out that the cognitive circumstances associated with speculation follow from the objectives of financial investors, namely to "beat the gun" and to anticipate what "average opinion expects average opinion to be" (Keynes TP 1971-89, 155).

When we consider how in both the TP and the GT Keynes accounts for cognitive circumstances under which grounds in reason adequate to define a unique degree of rational belief may not exist, it seems that Ramsey, and Bateman, have criticized a strawman version of Keynes's own argument. Bateman's example of expectations concerning the outcome of an election carries on this misrepresentation. The cognitive circumstances underlying the outcome of an election do not permit the existence of a unique rational degree of belief.

Consider a different example instead. Suppose that I go to a medical doctor with a bacterial infection. A unique set of drugs will exist from which the doctor may legitimately prescribe. This set may or may not constitute, in some sense, the true solution to the problem, but it is the rational solution. The determination of this solution is quite independent of the psychological disposition of the doctor. Given the state of medical knowledge, the rational choice in this case is objective. This point is not vitiated by other subjective factors, such as the politics of the medical
profession. The rational choice is determined by science, the efficacy of the institutional mechanisms whereby scientific knowledge is delivered is a separate issue.

We could have just as easily chosen other examples from the medical field which do not permit a unique rational decision, due to the inadequacy of our grounds in reason. For example, there may be medical conditions concerning which there is widespread disagreement, or concerning which very little is known. However, even in these cases it maybe rational to take some action based on flimsy analogies and best guesses, depending on the probable consequences of inaction.

Thus, at the outset it becomes clear that Ramsey is not attacking Keynes's theory of probability, but rather he is attacking his own misrepresentation of Keynes's conception of probability. This is a serious logical fallacy, referred to by philosophers as the "strawman" fallacy. This essentially vitiates Ramsey's argument. The problem with Ramsey's argument as a whole, however, is worse than just this.

Ramsey's fundamental criticism of Keynes is that objective probability relations do not really exist. He argues, as we saw above, that probabilities are ultimately subjective in origin. In his view probabilities cannot even come into existence except thru the subjective viewpoint of individual people.

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Hence subjective expectations are probabilities in Ramsey’s theory.

Bateman argues that Keynes conceded this crucial point to Ramsey. The controversy centers on Keynes’s comments on Ramsey. Keynes’s response appeared in the *New Statesman and Nation* October 1931 (Keynes 1971-89, *Essays in Biography*, 388-89). Bateman quotes Keynes from this response as follows:

Ramsey argues, as against the view which I had put forward, that probability is concerned not with objective relations between propositions but (in some sense) with degrees of belief, and he succeeds in showing that the calculus of probabilities simply amounts to a set of rules for insuring that the system of degrees of belief which we hold shall be a consistent system. Thus the calculus of probabilities belongs to formal logic. But the basis of our degrees of belief — or the a priori probabilities as they used to be called is part of our human outfit, perhaps given us merely by natural selection, analogous to our perceptions and our memories rather than to formal logic. So far I yield to Ramsey — I think he is right (Keynes 1971-89, X:338-9).

Bateman interprets this passage to indicate that Keynes had switched from an objective epistemic theory to a subjective epistemic theory. I disagree with Bateman on this matter. My reasoning is that in the *TP* Keynes acknowledges that probabilities are subjective in origin, while maintaining that they are not subjective in validity:

While it is important, in establishing a control of direct judgment by general principles, not to conceal its presence, yet the fact that we ultimately depend on an intuition need not lead us to suppose that our conclusions have, therefore, no
basis in reason, or that they are as subjective in validity as they are in origin (Keynes TP 1971-89, 76).

My point in offering this quotation is to demonstrate that Keynes’s objective epistemic theory is not incompatible, as Bateman supposes, with his agreement with Ramsey on the subjectivity of "a priori" probabilities. Keynes’s theory of probability is not concerned with the (subjective) origin of probabilities. Rather, it is concerned, almost exclusively, with the objective validity of propositions.

Ramsey’s argument that probabilities are subjective in origin is not a valid criticism of Keynes’s claim that they are objective in validity. These are two separate issues, and Ramsey has made no attempt to show why the subjective origin of probabilities necessarily implies subjective validity.

Ramsey could have denied the objective validity of probabilities on other grounds. However, in Ramsey’s theory expectations are probabilities, and there is no difference between the context of origin and that of validity. Any view is as subjectively valid as any other, on Ramsey’s account. The consistency of an argument is the only criterion defining its rationality.

Ramsey’s argument that probabilities are subjective in origin, a point to which Keynes "yields," would have to demonstrate that the subjective origin of probabilities necessarily implies their subjective
validity, in order for the argument to constitute a criticism of Keynes's theory of the objective validity of probabilities. Thus in criticizing Keynes, Ramsey adopts his own frame of reference, not Keynes's.

To reiterate, in the TP Keynes sharply distinguishes between the subjective origin and the objective validity of propositions. In his comment on Ramsey Keynes "yields" to the point that probabilities are subjective in origin. Bateman infers, falsely, that this implies that Keynes recanted his theory of the objective validity of probabilities. My point is that the conclusion that Keynes recanted his theory of the objective validity of propositions does not necessarily follow from Keynes's admission that probabilities are subjective in origin. This conclusion logically requires more argument than has been given.

Bateman has not demonstrated the reasons to believe in this connection. He should (1) provide a logical argument to support the connection between the subjective origin and subjective validity of propositions, and (2) provide reasons to believe that Keynes accepted this argument. In fact he has done neither. Both Ramsey and Bateman have assumed the very point they should have argued, with injury to the logical validity of their arguments.

Building on Ramsey's error, Bateman carries the argument a step further by suggesting that Keynes
entirely rejected the concept of rationality. Bateman quotes Keynes’s response to Ramsey as follows:

... in attempting to distinguish "rational" degrees of belief from belief in general he was not yet, I think, quite successful. It is not getting to the bottom of the principle of induction merely to say that it is a useful mental habit (Keynes 1971-89, X:339).

Bateman interprets this comment to mean that Keynes was even more subjectivist than Ramsey. He interprets Keynes to be saying that subjective beliefs are not rational, even if they are consistent.

... in Ramsey’s argument the rationality of probabilities is strictly a function of their consistency. Keynes was willing to accept that people form subjective probabilities in the course of their everyday decision making, but he was not willing to accept that such probabilities were rational (Bateman 1987, 108).

Unfortunately Bateman does not reason through to the methodological implications of this interpretation. Keynes’s theory of objective validity of probabilities serves as a logical foundation for a method based on direct judgment. Ramsey’s theory, by contrast, denies that direct judgments have any objective validity. In Ramsey’s view the only objectively valid judgments we can make are indirect, namely judgments of consistency. By contrast, the view Bateman ascribes to Keynes is one in which neither direct nor indirect judgments are objectively valid.

What methodology would correspond with this pure subjectivism? Bateman is not clear about this. Virtually every philosophical position has some
criterion of judgment, some value against which we may measure the success of an argument.

In the absence of any objective criterion, we are left, I suspect, with a pure subjectivism in which any argument no matter how absurd, is as subjectively valid as any other. In this regard Bateman's interpretation is really quite indefensible. If Keynes rejected even the minimal requirement of internal consistency, on the ground that no objective criterion of evaluation exists, then he would have to admit that internally inconsistent arguments are as subjectively valid as consistent ones.

It is worth noting that Ramsey's conception of rationality is the one element in Ramsey's argument that Keynes chose to focus his criticism on. Keynes could have refuted Ramsey on many points. As we noted in section one, below, Ramsey ignores the grounds for unification of the field, provided by Keynes, in asserting the need for a dichotomized theory of probability. Ramsey proceeds to misrepresent Keynes's theory by outlining a strawman version which he proposes to supersede. Finally, Ramsey begs the question by failing to distinguish between the origin and validity of arguments. Ramsey argues that probabilities are subjective in origin, and he assumes that this undermines Keynes's position.

In short, Ramsey's argument was vulnerable to refutation on many points. Keynes chose, however, to dispute Ramsey on a single point, namely the failure of
Ramsey’s theory to distinguish rational belief from belief in general. This move was, I believe, strategic on Keynes’s part. It focuses our attention on the fundamental difference between Keynes’s theory and Ramsey’s.
CHAPTER 4

THE INDUCTIVE METHOD OF THEORY CONSTRUCTION AND APPLICATIONS OF THIS METHOD TO THE GENERAL THEORY

This chapter begins by describing the inductive method of theory construction. It contrasts the inductive method with the hypothetical-deductive method. I argue that the inductive method corresponds to Keynes's philosophical position, as expressed in the TP. Whereas the hypothetical-deductive method corresponds to a sceptical-subjectivist philosophy, such as Ramsey's. I use this distinction as the basis for my argument that the relevant evidence required to determine the validity of the continuity hypothesis is methodological evidence. Forming a rational opinion on the continuity issue requires us to determine whether Keynes employed the inductive method or the hypothetical-deductive method in his later theoretical work in economics.

The second section looks at Keynes's general theory of the economy directly. I argue that Keynes introduces each of the elements of his theory of effective demand via the inductive method of argument. The marginal propensity to consume, the marginal efficiency of capital and the theory of the interest rate are all introduced and rationized as inductions. The hypothetical-deductive method is not used as a
starting point.

**The Inductive Method of Theory Construction**

A subtle point is that Keynes does not integrate rationality as an *element* into the analytical structure of his theory. Rationality does not appear in the form of some analytical device which entails a rationality assumption. Rather, rationality, as a standard of judgment, enters Keynes's theory via his *method* of argumentation. Let me explain this point.

Recall that Keynes distinguishes between cause in events and cause in reason. Cause in events is unobservable. Therefore, cause in events can never justify induction. However, cause in reason, or ground, is directly observable. Thus, if an inference is to be justified (rational) then it must be on the basis of adequate grounds in reason.

The inductive *method* of argument, then, introduces inductions into theory by outlining the grounds in reason for a degree of belief in the induction. A rational *argument* is one which is adequately grounded in reason. An argument which follows the inductive method may or may not constitute a rational argument, depending on the adequacy of the grounds specified. The inductive method of argument can be contrasted with the hypothetical-deductive method, the dominant form of argumentation employed in neo-Classical economics.
All too often we forget that when we specify a functional relationship between two or more variables we are, essentially, introducing an induction. We are supposing that a relationship which holds true currently, and may have held true in the past, will continue to hold true in the future. A fundamental question is what justifies this induction?

The hypothetical-deductive method avoids this question by introducing functions by way of assumption. When we assume the existence of a function in the initial steps of our theory, we are not claiming that the functional relationship actually exists in the world of experience. Rather we are saying "if this function exists, then . . ." In a sense this method dodges the difficult issue of justification because hypothetical functions do not have to be justified, since we are not claiming that they actually exist.

From a Keynesian point of view, however, the hypothetical-deductive method does not really succeed in dodging the problem of justification. The reason is that it is not rational to clutter economic theory with functions which we have no reason to believe correspond with actual experience. But, as soon as we recognize the notion of any correspondence with the world of experience, we have passed, however subtly, from our hypothetical world back into the realm of induction. In which case the hypothetical-deductive method has led us, full circle, back to the original problem of
justification. Unfortunately, by the time this full circle in the learning process has been completed, the student has long since forgot to question the validity of the original assumption.

In the TP Keynes argues that the rationale behind a rational argument is argument based on pure induction and analogy. 'Pure induction' refers to arguments regarding the number of instances in which we have observed an apparent correspondence. 'Analogy' refers to arguments regarding the likeness of instances. Statistical inquiry based on past data constitutes a sophisticated form of pure induction. Keynes argued that pure induction alone cannot justify our inductions.

Scientific method, indeed is mainly devoted to discovering means of ... heightening the known analogy that we may dispense as far as possible with the methods of pure induction ... In an advanced science it is the last resort, -the least satisfactory of methods. but sometimes it must be our first resort, the method upon which we depend in the dawn of knowledge ... (Keynes TP 1971-89, 267-68).

Keynes argued that "some element of analogy must ... lie at the base of every inductive argument" (Keynes TP, 247), because some degree of resemblance must appear in our intuition for us to start counting instances in the first place. However, Keynes argued that pure induction, in turn, enables us to reevaluate our arguments from analogy, thus strengthening the confidence that we have in our argument.

... argument from induction must always involve some element of analogy, and, on
the other hand, few arguments from analogy can afford to ignore altogether the strengthening influence of pure induction (Keynes TP 1971-89, 283).

Thus, the inductive method of theory construction requires us to ground our inductions logically by outlining the known analogies, or continuing factors, which underlie, or justify, our belief in the inductions. Further, it requires us to strengthen the argument, to the best of our ability, by introducing relevant facts from experience, including statistical data.

The important point is that Keynes uses the inductive method in the GT, not the hypothetical deductive method. The hypothetical deductive method corresponds logically with a philosophical position such as Ramsey’s, because Ramsey’s theory does not suppose that our beliefs are rationally grounded. From Ramsey’s point of view, the specification of grounds in reason given to justify an argument is an exercise in futility. This follows from the observation that in Ramsey’s theory all beliefs are subjectively valid.

This constitutes, I believe, a strong reason favoring the continuity hypothesis, and opposing the discontinuity hypothesis. If Keynes had adopted a philosophy such as Ramsey’s, we could reasonably expect that, consistent with this view, Keynes would have adopted something like the hypothetical-deductive method in the GT. Whereas if Keynes had retained his basic philosophical view, then, we should expect him to
provide the grounds in reason for the inductions employed in his economic theory.

A further methodological consequence of the continuity hypothesis follows from the observation that successful use of the inductive method establishes a rational argument, and interlocking rational arguments establish a rational theory. This rational theory, once outlined, establishes a criterion of judgment, which allows us to form direct judgments about beliefs in general. It allows us to formulate direct judgments about alternative theoretical constructions and maxims of common wisdom regarding economic issues. These judgments are, in a sense, as much a part of the theory as the pure theory itself, since our whole reason for constructing rational theory is to allow ourselves to formulate rational judgments.

To summarize, I believe that support for the continuity position is found in Keynes's use of the TP as the foundation of Keynes's method of theory construction in the GT. Keynes's method of argument itself constitutes the key piece of evidence required to formulate a rational opinion regarding the continuity issue.

**Applications to Keynes's General Theory of the Economy**

There are three inferred functions which form the descriptive, superstructure of the theory of
effective demand: the marginal propensity to consume, the marginal efficiency of capital, and the interest rate function. These three function together define the rate of aggregate expenditure. Most interpretations of Keynes' economics focus on this descriptive superstructure. However, as I will show in what follows below, the method Keynes followed was to focus on the cognitive grounds which explain the behavior of these functions.

The Marginal Propensity to Consume

The concept of the marginal propensity to consume is descriptive in the sense that it merely describes outwardly observable empirical phenomena. Keynes's method in The General Theory is not merely to assume this functional relation offering no justification for the assumption; rather, he introduces the function and then devotes the bulk of his analysis to the grounds which outline the reasons to believe the function exists. He argues that consumption depends on the level of income and on objective circumstances and subjective "psychological propensities and habits." He is careful in this regard not to make false divisions.

The motives to spending interact and the attempt to classify them runs the danger of false division. Nevertheless, it will clear our minds to consider them separately under two broad heads which we shall call the subjective factors and the objective factors. The subjective factors include those psychological characteristics of
human nature and those social practices and institutions which, though not unalterable, are unlikely to undergo a material change over a short period of time except in abnormal or revolutionary circumstance (Keynes GT 1971-89, 91).

He goes on to outline the essential objective factors as changes in the real wages, disposable income, real wealth, the discount rate, fiscal policy, and expected income. He concludes that the consumption function is a fairly stable function based on the observation that these objective facts are not normally unstable (Keynes GT 1971-89, 95).

It is interesting to note that Keynes includes what he calls the "fundamental psychological law" of consumer spending behavior under the heading of "objective factors."

The fundamental psychological law, upon which we are entitled to depend with great confidence both a priori from our detailed knowledge of human nature and from the detailed facts of experience, is that men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase income (Keynes GT 1971-89, 96).

These "permanent psychological propensities" arise in connection with the observation that "a man’s habitual standard of life usually has first claim on his income." My point in focusing attention on the fundamental psychological law of consumption is that this law is logically grounded. Recall that a ground is a cognitive phenomenon, which lays down the operation of a cause. Keynes is explicit in saying that this fundamental law is consistent with both our a
priori "detailed knowledge of human nature" and our "detailed facts of experience."

Keynes uses the analysis of these objective factors to analyze conventions of "financial prudence."

He points out that since employment is a function of net income, it is also a function of net investment. He argues that various types of hoarding constitute a drag on effective demand by having an unfavorable impact on the amount of consumption, and therefore employment, that any particular level of investment will support (Keynes GT 1971-89, 98-99). On this basis he criticizes the so-called "principles of 'sound' finance," according to which public and private sinking funds are established in order to replace depreciating capital.

The larger are these financial "provisions for the future" the larger is the amount of new investment spending required to "absorb" these funds. Absorption in this case means maintain the level of effective demand.

... when the financial provision exceeds the actual expenditure on current upkeep, the practical results of this in its effect on employment are not always appreciated. For the amount of the excess neither directly gives rise to current investment nor is available to pay for consumption. It has, therefore, to be balanced by new investment, the demand for which has arisen quite independently of the current wastage of old equipment against which the financial provision is being made; with the result that the new investment available to provide current income is correspondingly diminished and a more intense demand for new investment is necessary to make
possible a given level of employment (Keynes GT 1971-89, 99).

In this passage Keynes argues that sinking funds in excess of replacement investment constitute a drag on the level of effective demand.

The individual entrepreneur or governmental bureaucrat may honestly believe that by following principles of sound finance and establishing a sinking fund, the contributions to which exceed current replace/upkeep outlays, some provision is made for the future. It is true that by acting on this principle the bureaucrat has fulfilled a duty which is prescribed by the institution, and, moreover, it is "legitimate," under the bureaucrat's cognitive circumstances, for the bureaucrat to believe that this provisioning for the future fulfills some duty to society as a whole.

However, this maxim of "sound finance," a form of conventionally prescribed behavior, creates a fallacy of composition. The paradox of thrift arises in connection with the fallacy of composition. An individual economic agent can accumulate financial wealth by hording, but society as a whole cannot. The only way for society to increase its (real and financial) wealth is to finance investment. When individual economic agents hoard the volume of consumption and employment is adversely impacted. Consequently the wealth of society is not increased, and may even be reduced. "We cannot, as a community, provide for future consumption by financial expedients
but only by current physical output" (Keynes GT 1971-89, 104).

There is a strong sense in which the subjectively "rational" beliefs held by the entrepreneur or government bureaucrat concerning the duty to establish a "surplus" sinking fund is, from a social point of view, objectively irrational. It is clear from Keynes’s analysis that he is applying direct judgment, or a criterion of judgment, which goes beyond subjective individual belief to look at what is rational from a social point of view.

Keynes also mentions eight subjective factors as the motives which determine individual consumption expenditure (and saving) and four motives which determine consumption spending in the industrial sector. The method implicitly assumes that economic agents are predisposed to consume, unless there is some motive to refrain from consumption expenditure. Hence, the motives mentioned by Keynes are motives to hoard. The eight individual motives are precaution, foresight, calculation, improvement, independence, enterprise, pride and avarice. Keynes points out that these motives imply their opposites, enjoyment, shortsightedness, generosity, miscalculation, ostentation and extravagance. Similarly, the industrial motives which influence consumption spending are motives to hoard, namely the motives of enterprise, liquidity, improvement and financial prudence (Keynes GT 1971-89, 107-89).
Keynes's method in *The General Theory* is to assume that these factors are, for practical purposes constant. "We shall . . . take as given the main background of subjective motives to saving and to consumption respectively" (Keynes GT 1971-89, 110). However, Keynes is not assuming that these factors are actually constant. He notes that "the strength of all these motives will vary enormously according to the institutions and organization of the economic society" (Keynes GT 1971-89, 109). However, he justifies the assumption by suggesting that "... the main background of subjective and social incentives changes slowly . . ." (Keynes GT 1971-89, 110).

It is significant, from the viewpoint taken in this paper, that Keynes does not dismiss the "subjective" motives to hoard, and their influence on consumption spending, by his assumption that they are constant within a given society over a short period of time. The bulk of Keynes's discussion of these subjective factors centers on people's false beliefs about the relation of moral virtue to aggregate saving.

Keynes' discussion of aggregate saving is mainly constructive, in the sense that it outlines an inductive theory regarding aggregate saving. However, throughout the discussion, Keynes emphasizes that moral vice and virtue play no part in the determination of aggregate saving. Without having to tie his comments
to a criticism of any particular theory of saving and its overtones about the virtue of sacrifice, or abstinence, Keynes's discussion debunks the moral overtones of all such theories, whether they are formal systems, such as the classical doctrine, or informal views about the thriftiness of a culture, such as the common views of the capitalists and entrepreneurs.

Keynes argues that "aggregate saving is governed by investment" (Keynes GT 1971-89, 110). He points out that an increase in the interest rate will not produce greater saving. A rise in the interest rate, given the marginal efficiency of capital, will adversely impact investment. Income will thus fall until the rate of hoarding has been "decreased in the same measure as investment" (Keynes GT 1971-89, 110-11). He points out that "... saving and spending will both decrease" as a consequence of the increase in the rate of interest (Keynes GT 1971-89, 111). The converse holds true in the case of a fall in the rate of interest. Keynes goes onto say that financial virtue, that is abstinence, is to be seen as a social vice.

The more virtuous we are, the more determinedly thrifty, the more obstinately orthodox in our national and personal finance, the more our incomes will have to fall when interest rises relatively to the marginal efficiency of capital (Keynes GT 1971-89, 111).

Thus, after all, the actual rates of aggregate saving do not depend on Precaution,
Foresight, Calculation, Improvement, Independence, Enterprise, Pride or Avarice. Virtue and vice place no part. "It all depends on how far the rate of interest is favorable to investment, after taking account of the marginal efficiency of capital" (Keynes GT 1971-89, 111-12).

My main point regarding the continuity issue is that Keynes's method here is to construct an inductive theory of saving and use it as a standard, or criterion, against which to compare the value of common beliefs held by economists and by the public. Keynes rejects the commonly held belief that aggregate saving is in any way determined by the moral stamina of the public in abstaining from consumption. This method of forming direct judgments regarding the value of arguments is not consistent with Ramsey's philosophical view. It is, however, consistent with Keynes's position, as expressed in the TP.

Marginal Efficiency of Capital

Keynes integrates uncertainty into the fabric of his economic theory via the concept of expectations. It is not always realized that the theory of effective demand integrates uncertainty in this way. Keynes says that effective demand is the value of the aggregate demand function at the point of its intersection with the aggregate supply function, where aggregate demand is defined as the aggregate
revenues which entrepreneur's expect (Keynes GT 1971-89, 25). Later he says that "the effective demand is simply the aggregate income (or proceeds) which the entrepreneurs expect to receive . . . from the current employment which they decide to give" (Keynes GT 1971-89, 55). He argues that

... the volume of employment is uniquely correlated with the volume of effective demand measured in wage units, and that the effective demand, being the sum of the expected consumption and the expected investment, cannot change, if the propensity to consume, the schedule of the marginal efficiency of capital and the rate of interest are all unchanged. If, without any change in these factors, the entrepreneurs were to increase employment as a whole, their proceeds will necessarily fall short of their supply-price (Keynes GT 1971-89, 260-61).

Notice that the MPC, the MEC, and the interest rate together define the rate of actual expenditure. By contrast, the effective demand is the rate of expected expenditure associated with a particular level of employment. It is tempting to conclude that a particular level of expected demand becomes "effective" because it becomes "actual" when the entrepreneurs act on their expectations by increasing or decreasing the current level of employment. However, as we can see from the last sentence in the previous quote, an increase in employment without any increase in demand causes (actual) aggregate demand to fall below the current supply price. In other words, given some level of
actual aggregate demand, an increase in employment currently increases the supply price of output, thus causing losses.

What then is the explanation for why actual and effective demand may differ? The explanation stems from the integration of uncertainty, and uncertainty entails the passage of time. An increase in employment today increases aggregate supply prices today, but the stimulus to demand resulting from the new employment occurs gradually over time, not right away. However, effective demand is the expected current receipts from consumption and investment. Expected future receipts enter the picture only as a determinant of current investment demand via the marginal efficiency of capital. Thus, an increase in employment creates demand equal to the increase in the aggregate supply price associated with it only if expected future returns increase the MEC, resulting in an increase in current investment, or if MPC increases or the rate of interest decreases.

Effective demand is "effective" not because it is "actual," but rather because it is the level of demand which effectively determines the level of employment. Although effective demand (expected current returns) may deviate from actual demand (actual current returns), there is a connection between the two. Keynes wrote

The actually realized results of the production and sale of output will only be
relevant to employment in so far as they cause a modification of subsequent expectations (Keynes GT 1971-89, 47).

... in practice the process of revision of short-term expectations is a gradual and continuous one, carried on largely in the light of realized results; so that expected and realized results run into and overlap one another in their influence (GT, 50).

Short-term expectations are clearly distinguished from long-term expectations. Short-term expectations are concerned with the receipts which an entrepreneur expects to get from "finished" output at the time that the commitment to production is undertaken. By contrast, long-term expectations are the expectations held by entrepreneurs concerning future returns associated with purchasing, or constructing, additional capital equipment (Keynes GT 1971-89, 46-47).

Keynes argues that the long-term expectations are liable to sudden revision. He says that"... the factor of current long-term expectations cannot be even approximately eliminated or replaced by realized results" (Keynes GT 1971-89, 51). Thus, long-term expectations are not anchored by realized results in the same way that short-term expectations are, and, consequently they may be subject to dramatic, sudden change, rather than to gradual change.

The level of actual demand, i.e. the realized results, thus plays an important role in determining effective demand (and thus employment). Income, of course, appears as a function of investment, and
investment is determined by the interaction of the schedual of the marginal efficiency of capital and the interest rate. Keynes defines the marginal efficiency of capital as "being equal to that rate of discount which would make the present value of the series of annuities given by the returns expected from the capital-asset during its life just equal to its supply price" (Keynes GT 1971-89, 135). Thus, the level of employment is, ultimately, a function of the state of entrepreneur's long term expectations.

This last point can be seen by noticing that in the GT Keynes defines aggregate demand as the expected current proceeds from consumption and investment. Thus equilibrium, the equality of aggregate supply and aggregate demand, merely requires entrepreneurs to adjust the volume of employment so as to match supply costs against expected revenues (Keynes GT 1971-89, 25). The connection between long term expectations and employment is brought about by the connection between actually realized results and short term expectations. Long term expectations, ultimately, determine investment in Keynes's theory. Actual investment, in turn, is one component of actual demand. Since short term expectations, which determine employment, are anchored to actual results, long term expectations determine employment via the MEC.

It follows that there is a different equilibrium corresponding to the different states of expectations. In other words, the position of the
aggregate demand function depends, ultimately, on the state of long term expectations. Full employment corresponds to a particular state of short term expectations, which are a function of long term expectations. Full employment, then, corresponds to a particular (optimistic) state of long term expectations.

Keynes argues that the Classical theory assumes . . . that the aggregate demand price (or proceeds) always accommodates itself to the aggregate supply price . . . If this were true, competition between entrepreneurs would always lead to an expansion of employment up to the point at which the supply of output as a whole ceases to be elastic . . . this amounts to the same thing as full employment (Keynes GT 1971-89, 26).

What this means in terms of expectations is that the classical theory tacitly assumes that entrepreneurs believe (expect) that if they increase the supply price of output by offering additional employment, the current proceeds from output will increase by the same amount. Or, in other words, the expected current proceeds (effective demand) passively responds to, or is determined by, the supply price of output.

In Keynes’s theory the causal sequence is the reverse of that of the classical theory. Entrepreneurs will not normally increase the volume of employment unless expected revenues increase. Aggregate demand, in Keynes’s theory, determines the volume of employment. The state of (optimistic) expectations
that corresponds with full employment appears as a special case. In general, long term expectations need not be such as to produce full employment.

In my opinion Keynes’s economic theory neither assumes that demand expectations are objectively rational, nor that entrepreneurs are always rational. As I have already argued, this position is not inconsistent with the continuity hypothesis regarding Keynes’s philosophical position. My point is that continuity is most clearly seen in Keynes’s method of argument, specifically his application of direct judgments based on grounds in reason.

To see this point, notice that if Keynes had become a philosophical subjectivist, in the sense argued by Bateman, he would have had no reason, based on his philosophical viewpoint, to critique Say’s law. Say’s law is, of course, a belief, one held by the classical economist and tacitly ascribed by them to entrepreneurs. This belief entails a particular view of causality, namely that supply prices determine expected revenues.

Consistent with the continuity hypothesis, and inconsistent with the discontinuity hypothesis, Keynes’s method is to refute Say’s law directly, via practical reason. Keynes argues that the causal train moves in the opposite direction, with expected proceeds determining the volume of employment entrepreneurs offer. Whether or not we consider Keynes’s theory to be either true or rational, it is clear that Keynes is -68-
attempting a rational analysis of the Classical theory, and of Say’s law. His method is to construct a rational alternative and use it as a criterion upon which to base direct judgments regarding the Classical theory.

It is important to think clearly on this point. The continuity issue does not depend on whether Keynes did or did not conclude that rational business expectations are possible, or that entrepreneurs are rational. Further, if it could be shown that Keynes’s economic theory is not true in some aspect, or that it contains logical inconsistencies, these errors would have no bearing on the continuity issue. This issue rests ultimately, as I have argued, on the consistency of the inductive method of argument employed by Keynes in the GT with his theory of probability, outlined in the TP.

The Interest Rate

Throughout Keynes’s theory his argument is logically valid in its application of aggregate reasoning. He is concerned with avoiding fallacies of composition. An obvious and simple point is that the conclusion in a proposition which commits the fallacy of composition does not follow logically from the
premise. Propositions which are based on fallacies of composition are objectively illogical.

Individuals may hold beliefs (expectations) about the social implications of their actions which tacitly assume that what holds true on the individual level necessarily holds true for society as a whole. These beliefs may be based on fallacies of composition. In this case they are objectively invalid. In this section, we will see, for example, that individual decisions to hoard cash cannot possibly provide the means for future consumption for society as a whole. As individuals, on the other hand, we can, obviously, provide for our own future consumption via hoarding. A commonly held belief may be that hoarding is in some respect virtuous, in that abstaining from consumption increases the future consumption available to society as a whole. Keynes shows that this view is based on a fallacy of composition.

The important point relating to the continuity hypothesis is that in this method of analysis Keynes is applying a criterion of judgment. Specifically, he is distinguishing between rational beliefs and beliefs in general. Beliefs in general do not always take into account fallacies of composition. As I will argue below, this distinction is the essential distinguishing characteristic of Keynes's theory of probability. This distinguishing characteristic logically correspond with the inductive method of argumentation. By contrast, it is
inconsistent with Ramsey's theory, according to which all propositions are subjectively valid.

Keynes's theory of the rate of interest is logically grounded in valid aggregate reasoning. Keynes argues that the interest rate is determined by liquidity preferences, given the quantity of money, and not by thriftiness per se. He proceeds to outline the psychological and business incentives to liquidity.

What I wish to point out is that what Keynes is doing in constructing his theory of interest is establishing a framework which is logically valid from the point of view of the economy as a whole. Having accomplished this, he proceeds to outline the continuing factors that operate to determine liquidity preference. These continuing factors constitute the grounds in reason which justify the induction that we refer to as the liquidity preference function.

Keynes's theory of the rate of interest starts with the notion that

The schedule of the marginal efficiency of capital may be said to govern the terms on which loanable funds are demanded for the purpose of new investment; whilst the rate of interest governs the terms on which funds are currently being supplied (Keynes GT 1971-89, 165).

He argues, in this connection, that the mistake of prevailing theory is that it supposes the availability of funds to depend on time-preference, to the neglect of liquidity preference.

Keynes argues that on the individual level,
once the decision to abstain from consumption has been made, a second decision is required, namely a decision regarding in what form command over future consumption should be held (Keynes GT 1971-89, 167). He argues that interest cannot possibly be the reward for saving, since the return on cash hoards is zero. Rather, the rate of interest is the reward for parting with liquidity.

For Keynes the rate of interest is not the price which brings the desire to invest into equilibrium with the willingness to abstain from consumption. It is, instead, the price which equilibrates the demand for liquidity with the available quantity of cash. Keynes argues that "the amount of hoarding must equal the quantity of money (or - on some definitions - the quantity of money minus what is required to satisfy the transactions-motive)" (Keynes GT 1971-89, 174).

In this view the "thriftiness" of the public has nothing to do with the quantity of hoards. Its only effect is on the interest rate.

All that the propensity of the public towards hoarding can achieve is to determine the rate of interest at which the aggregate desire to hoard becomes equal to the available cash (Keynes GT 1971-89, 174).

The main fallacy in what Keynes refers to as the Classical theory of interest is that it assumes
that the interest rate is the price that equilibrates
the demand for investment funds associated with the MEC
with the willingness to abstain from consumption. The
fallacy arises in connection with the assumption that
saving is an independent function of the rate of
interest, given the level of income. Keynes's point is
that the Classical theory supposes that the interest
rate is determined at the intersection of the
investment function and the saving function. The formal
error, according to Keynes, is that a shift in the
investment function will impact the level of income.
Thus the assumption that income is constant is not
logically consistent with the independence of the
saving and investment functions.

In contrast with this theory Keynes argues
that "saving and investment are determinates of the
system, not the determinants. They are the twin
results of the system's determinants, namely, the
propensity to consume, the schedule of the marginal
efficiency of capital and the rate of interest" (GT
1971-89, 183). Thus the amount of hoarding is
determined by the level of economic activity, not by
the propensity to hoard. Whereas liquidity preference,
not the amount of hoarding, determines the interest
rate.

Keynes uses this theory to formulate rational
beliefs regarding problems of practical importance,
such as unemployment and under production.

... the economic principle, on which the
practical advice of economists has been almost invariably based, has assumed, in effect, that, cet. per., a decrease in spending will tend to lower the rate of interest and an increase in investment will raise it. But if what these two quantities determines is, not the rate of interest, but the aggregate volume of employment, then our outlook on the mechanism of the economic system will be profoundly changed. A decreased readiness to spend will be looked on in quite a different light if, instead of being regarded as a factor which will, cet. per., increase investment, it is seen as a factor which will, cet. per., diminish employment (Keynes GT 1971-89, 185).

The simple point here relating to the continuity of Keynes's philosophy is that Keynes's method is to construct an inductive theory and then use it as a standard against which he compares alternative beliefs. In this case he is concerned with practical beliefs regarding policy issues. Keynes argues that the probable impact of policies designed to reduce consumption will be to reduce employment and investment, not to increase investment as the classical economists suppose. The important point is that this method of argument is not consistent with Ramsey's subjectivism, while it is logically consistent with Keynes's theory of probability as outlined in the TP.
In this paper I have argued that Keynes's place in the history of probability theory has not been widely recognized. In *The Treatise on Probability* Keynes provides the grounds in reason for a general theory of probability, one which incorporates the aleatory probabilities of the classical theory and the empirical probabilities of the frequency school, along with the practical probabilities of common reason, as special cases of his generalized conception of probability as the degree of rational belief. Keynes considered his theory of probability to be a general theory of logic. As such he considered it to be a guide to the formation of rational judgments concerning practical actions.

I have argued also that Keynes's critics have never addressed his argument directly. Ramsey, for example, has argued that (1) empirical probabilities and probabilities of practical reason are not comparable; (2) rational individuals may rationally disagree; (3) probabilities are subjective in origin. What I have shown is that Keynes's theory does not depend in any way on (1) the comparability of probabilities; (2) the
existence of adequate grounds in reason for a unique degree of rational belief under all cognitive circumstances; (3) the objective origin of intuitions.

This point, that Keynes's critics have not addressed his argument directly, provides a strong reason to reject Bateman's interpretation of Keynes's remarks about Ramsey's theory. Bateman's argument rests on his belief that Keynes gave in to Ramsey. He accepts Ramsey's criticism, and he argues that Keynes himself also accepted Ramsey's criticism. However, Ramsey's argument against Keynes's theory was not valid. Thus Bateman has not demonstrated the reasons to believe that Keynes's remarks about Ramsey's theory should be interpreted as recanting the theory of probability set forth by Keynes in TP. In order to demonstrate his position Bateman should (1) provide a logical argument to support the necessary connection between the subjective origin and subjective validity of propositions, and (2) provide reasons to believe that Keynes accepted this argument. What I have shown, in contrast with Bateman's position, is that in the TP and in his comments on Ramsey, Keynes maintains the distinction between the subjective origin and the objective validity of propositions.

Finally, I have argued that Keynes's philosophy, as expressed in the TP, logically corresponds to the inductive method. In this connection I point out that using the inductive method Keynes constructs an inductive theory, and this theory
functions as a criterion against which actual beliefs may be compared. Questions concerning Keynes's hard core of beliefs, beliefs that are embodied in his rationality assumption, are less important.

My argument is similar to Anna Carabelli's argument in its emphasis on the central role in Keynes's philosophy of his distinction between ground and cause, or causa cognoscendi and causa essendi. The difference between her argument and mine is that I have pointed out that Keynes's philosophical position is logically consistent with the inductive method of theory construction, and Ramsey's philosophical position is logically consistent with the hypothetical-deductive method. However, we both emphasize the importance of methodological evidence.

My argument differs from O'Donnell's position in that O'Donnell emphasizes the importance of what he believes to be Keynes's underlying rationality assumption. In contrast with O'Donnell, I have argued that the continuity issue should be decided primarily on the basis of methodological evidence.

I applied this notion to Keynes's theory of effective demand, as expressed in the GT. I demonstrated that in introducing each of the elements of the theory of effective demand, namely the marginal propensity to consume, the marginal efficiency of capital and the liquidity preference function, Keynes employed the inductive method of argument. Keynes uses
this inductive theory as a criterion against which he compares commonly held beliefs. This demonstration provides evidence favoring the continuity hypothesis rather than the discontinuity hypothesis.

My research provides an interesting point of departure for further research on Keynes's method. Several questions are of interest. First, what connections exist between Keynes's theory of probability and his ethical philosophy? Keynes's initial interest in probability theory came from his interest in ethics. Keynes realized that an adequate ethical theory was impossible without an adequate theory of probability. Perhaps understanding Keynes's theory of probability will help us to better grasp Keynes's theory of moral action.

Second, it would be interesting to research Keynes's theory of value. There may be a large sense in which Keynes's ethical philosophy, a philosophy that utilizes his theory of probability, provides us with a theory of value. An interesting question is whether or not Keynes's philosophy provides some basis for distinguishing between market value and social value.
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