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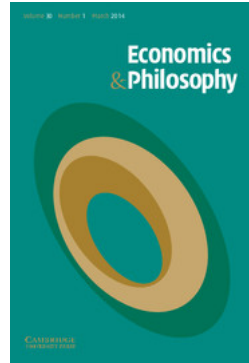
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KEYNESIAN UNCERTAINTY AND THE WEIGHT OF ARGUMENTS

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In Chapter 12 of the *General Theory,* on "The State of Long-Term Expectation," Keynes writes: "It would be foolish, in forming our expectations, to attach great weight to matters which are very uncertain" (CW VII, p. 148).[1] In a footnote to this sentence, Keynes points out that by "very uncertain" he does not mean the same as "very improbable" and refers to the chapter on "The Weight of Arguments" in his earlier *Treatise on Probability* (CW VIII, pp. 77–85). The purpose of this article, in the first place, is to provide an account of, and to sort out the relations between, Keynes's views on probability, uncertainty, and the weight of arguments.

That Keynes's views on uncertainty are central to his economics has long been recognized. Only recently, however, have economists begun seriously to investigate Keynes's later views in the light of his earlier work on probability. A detailed interpretation of Keynesian uncertainty appears in Lawson (1985), for example, and related issues are discussed in Bateman (1987) and the essays in Lawson and Pesaran (1985). As yet, weight has not received more than passing attention. The second and main purpose of this article, therefore, is to provide an account of weight.

Where weight is mentioned by economists, it is usually associated with Keynes's remarks on investor confidence. But there is little agreement on matters other than this connection. It has been suggested that weight is, or should be, regarded as a psychological propensity (Garner,

1. "CW VII" refers to the Royal Economic Society's *Collected Works of J. M. Keynes,* volume VII. The notation CW followed by the respective volume will be used throughout.

1983, pp. 85–86; Stohs, 1983, p. 89), that it is an "objective" measure (Hoogduin, 1985), and that it may be dependent "on the subjectivity of individual differences" (Kregel, 1987, p. 526). And although weight is commonly regarded as "a measurement of the absolute amounts of relevant evidence which is embodied in the premises of the argument" (Stohs, 1980, p. 377; Arrow, 1951, p. 416; Shackle, 1979, pp. 128–33), it is also described as the degree of completeness of the information, or equivalently, as the balance of the relevant knowledge and the relevant ignorance, on which a probability estimate is based (Lawson 1987, p. 953; 1988, p. 49). Finally, there is the question whether Keynes's views remained consistent between the *Treatise* and his later work in economics. Vicarelli (1985, pp. 159–60) suggests that Ramsey's (1926) critique of the *Treatise* served as the catalyst for Keynes's later emphasis on weight. By contrast, other authors, such as Dow and Dow (1985, p. 52), Minsky (1975, pp. 64–67), and Meltzer (1981, pp. 57–58), stress the continuity in Keynes's thought.

To some extent then, what follows is an exercise in the history of thought. Yet weight also appears in more modern contexts, in the philosophy of science (Cohen, 1985; Levi, 1967, pp. 139–52), for example, in decision theory (Gärdenfors and Sahlin, 1982), and in economics (Anand, 1988).[2] These papers are of interest to economists, since they suggest possibilities for a constructive treatment of uncertainty in decision-making, an enterprise that has become widely regarded as all but futile in economics (see Coddington, 1982; Lucas, 1981, p. 224). It is hoped that some of what follows may also contribute to this end.

I begin with an account of probability and an interpretation of what constitutes certainty in the framework of the *Treatise*. The discussion of probability is necessary for two reasons. In the first place, the notion of probability enters in the definition of relevance, which is in turn required to define weight. In the second place, it is necessary to establish what the connection between probability and certainty is before these can be counterposed against uncertainty. Criteria for relevance are discussed next, followed by the weight of arguments. The connection between Keynes's views on uncertainty, weight and confidence is considered, and that between weight and the subjective expected utility approach. The concluding section consists of a summary of the argument.

KEYNES'S THEORY OF PROBABILITY

Keynes's *Treatise on Probability*, along with the work of Jeffreys (1939) and, later, Carnap (1950), is part of the logical tradition in the theory of

2. Weight also makes a peripheral appearance in Levi's (1966, 1972) exposition of Shackle's (1961) notion of potential surprise. Levi suggests that the need to gather additional evidence in determining a probability may be viewed as an increasing function of potential surprise.

probability. According to this tradition, probability is conceived as a logical relation between a conclusion and certain evidence. Keynes refers to this relation as the *probability relation*. While every proposition is either true or false, its *probability* depends on its particular relationship with an actual or hypothetical body of knowledge. In Keynes's notation, this may be written as:

$$x/h = p \tag{1}$$

where h is a set of premises, x the conclusion, and p the degree of rational belief that the probability relation between x and h justifies. If the relationship between x and h is tautologous $p = 1$; if it is contradictory $p = 0$. The probability of any conclusion is always relative to a particular set of evidential propositions. This means that the acquisition of new evidence h_1 does not alter or affect the validity of the probability relation between x and h, but gives rise to a new one x/hh_1.

The relation (1) is a "secondary proposition" and constitutes a statement about the "primary proposition" x. Keynes distinguishes between knowledge that is obtained by direct acquaintance and knowledge that is obtained indirectly through probability relations. When evidence favorable to x is obtained, the probability of x is increased. In this case, indirect knowledge is obtained *by argument*. Direct knowledge, on the other hand, is obtained "as the result of contemplating objects of acquaintance" (CW VIII, p. 12). An important example of direct knowledge is the secondary proposition (1): "When we know something by argument this must be through direct acquaintance with some logical relation between the conclusion and the premise" (CW VIII, p. 15).

For Keynes (CW VIII, p. 11), knowledge of a primary proposition corresponds to certainty of rational belief in, *and* the truth of, that proposition. Certainty of rational belief in a proposition x requires either that we know x directly, or that we know a set of propositions h, and some secondary proposition asserting a certainty relation between x and h. In this case, we have knowledge *of* the proposition x. Rational belief in x of a degree lower than certainty requires that we know a set of propositions h, as well as some secondary proposition that asserts a probability relation between x and h. Here we have knowledge *about* the primary proposition x (CW VIII, pp. 15–16).

Unlike the relative frequency theory of probability, in which probability is interpreted as a property of the physical world, Keynes treats probability as a property of the way individuals think about the world. As a degree of belief, this property is subjective to the extent that information and reasoning powers vary between persons. But it is not subjective, according to Keynes, in the sense that the probability bestowed on a proposition given the evidence may be subject to human

caprice. The probability of a conclusion given the evidence is *objective* and corresponds to the degree of belief it is *rational* to hold.

RELEVANT AND IRRELEVANT EVIDENCE

When we calculate the probability of a proposition x, we try to take into account as much information as possible. The information available to us will depend on our particular circumstances at the time that estimate is made. However, not all of this information need be *relevant* to x, and it is only relevant information we wish to consider. In this section, I shall discuss Keynes's criteria for relevance. This discussion will provide the basis for the definitions of weight that appear in the following section.

In Chapter 4 of the *Treatise*, Keynes (CW VIII, pp. 58–59) distinguishes between two types of probability relation, the magnitude of which may be compared. In the first case, probabilities may be compared on the basis of common evidence. This may be written as x/h compared with y/h. Keynes refers to comparisons of this type as judgments of *preference* or, where $x/h = y/h$, as judgments of *indifference*.

In the second case, probabilities may be compared on the basis of the difference an addition of relevant evidence makes to the probability of a given conclusion. Keynes refers to these as judgments of *relevance* (where x/h is compared with x/h_1h) or *irrelevance* (where $x/h = x/h_1h$). The rule that there must be no ground for preferring one alternative to another is an appeal to judgments of irrelevance.

Keynes gives two definitions of irrelevance. According to the first, "simple" definition, h_1 is irrelevant to x/h if $x/h_1h = x/h$. On this definition, however, it is possible that the addition of h_1 to the premises of x/h does not lead to a change in the probability, but is still in some sense relevant. Keynes, in Chapter 6 of the *Treatise*, recognizes this possibility: "If we are to be able to treat 'weight' and 'relevance' as correlative terms, we must regard evidence as relevant, part of which is favourable and part unfavourable, even if, taken as a whole, it leaves the probability unchanged" (CW VIII, p. 78).

The situation Keynes appears to have in mind is where $x/hh_1h_2 = x/h$, even though $x/hh_1 \neq x/h$ and $x/hh_2 \neq x/h$. In terms of the "simple" definition of relevance, this would mean that, although h_1 and h_2 are relevant to x/h when added separately, they are irrelevant in combination. Keynes (CW VIII, p. 59) accordingly proposes a "stricter" definition of relevance, which amounts to the following: h_1 is irrelevant to x/h if there is no proposition h_2 that can be derived from hh_1 but not from h alone, such that $x/h_2h \neq x/h$. If h_1 is not irrelevant by this criterion, then h_1 is relevant to x/h. And if h_1 is relevant to x/h, then h_1h_2 is also relevant to x/h. Keynes thus allows for one kind of situation in which the addition of a piece of relevant evidence does not change the prob-

ability: a piece of evidence is relevant if it, *or some proposition that it implies*, has the capacity to change the probability when added to the premises of a probability relation. Evidence that is irrelevant in the strict sense is also irrelevant in the simpler sense.

For the purposes of what follows, however, I shall ignore the special case in which the accretion of relevant evidence leaves the probability unchanged. This will allow us to continue the discussion in terms of the traditional "simple" definition of relevance and to avoid certain difficulties associated with the strict definition.[3] From this point onward then, I shall proceed on the basis that h_1 is relevant to x/h if $x/h \neq x/hh_1$. We are now in a position to use "relevance " to define the weight of a probability argument.

WEIGHT

Keynes alludes to weight in at least three ways in the *Treatise*. A clear statement of the first version of weight (henceforth weight$_1$) is the following: "One argument has more weight than another if it is based on a greater amount of relevant evidence" (CW VIII, p. 84). One way this statement might be written is $V(x/hh_1) > V(x/h)$ where h_1 is relevant to x/h, and V represents weight. Where an argument has more weight than another, according to Keynes (CW VIII, p. 77), "we have a more substantial basis upon which to rest our conclusion." Keynes claims the weights of two arguments can always be compared with respect to more or less, "where the conclusion of the two arguments is the same, and the relevant evidence in the one includes and exceeds the evidence in the other" (CW VIII, p. 77).

It is clear from this statement that weight has nothing to do with the logical relation between x and hh_1 on the one hand, and x and h on the other. These relations are the probability arguments, or secondary propositions, which Keynes regards as direct and therefore *certain*

3. Keynes's $x/hh_1h_2 = x/h$ result where h_1h_2 is relevant to x/h, is achieved by assuming what is in effect a two-step accretion of evidence. Both h_1 and h_2 are relevant to x/h in isolation (on the simple definition), but in conjunction the one offsets the impact of the other. Where certain *indivisible* evidence h_1 only *confirms* a probability, however, it would be adjudged as irrelevant. Suppose, for example, that h_1 is indivisible and can itself assume a range of values, say between 0 and 1. For most values of h_1, $x/hh_1 \neq x/h$ and h_1 will be relevant to x/h. For low values of h_1, perhaps, it may be that $x/hh_1 < x/h$, and for high values, that $x/hh_1 > x/h$. Then, by continuity, there will be some value of h_1, which, when combined with x/h, gives $x/hh_1 = x/h$. This particular value of h_1 would be irrelevant on Keynes's definition, and may lead to the sometimes paradoxical conclusion that our degree of belief should be unaffected, irrespective of whether or not h_1 is taken into account. (See, for example, Popper's [1959, pp. 407–8] Paradox of Ideal Evidence.) Further criticisms of Keynes's strict definition of relevance, but which space does not allow us to pursue here, appear in Carnap (1950, p. 420) and Gärdenfors (1978).

knowledge. Although the weight of certain arguments can be *compared*, such comparisons do not affect the probability of x on h or x on hh_1. The addition of h_1 to the premises of x/h, may lead to $x/hh_1 > x/h$ or $x/hh_1 < x/h$, depending on whether h_1 is favorable or unfavorable to x. In both cases, however, the addition of h_1 to x/h will lead to an increase in weight. From the way Keynes defines weight it is not necessary that the respective probabilities be known for x/hh_1 and x/h to be compared in terms of weight.[4]

A somewhat different conception of weight appears at the beginning of Chapter 6 of the *Treatise*, where weight is described as the *balance* of the absolute amounts of relevant knowledge and relevant ignorance on which a probability is based:

> The magnitude of the probability of an argument . . . depends upon a balance between what may be termed the favourable and the unfavourable evidence; a new piece of evidence which leaves the balance unchanged, also leaves the probability of the argument unchanged. But it seems that there may be another respect in which some kind of quantitative comparison between arguments is possible. This comparison turns upon a balance, not between the favourable and the unfavourable evidence, but between the *absolute* amounts of relevant knowledge and of relevant ignorance respectively. (CW VIII, p. 77)

If relevant knowledge and relevant ignorance are represented by K_r and I_r, then weight might be represented as

$$V(x/h) = K_r/I_r \qquad\qquad (2)$$

Finally, Keynes refers to weight as the degree of completeness of information on which the probability is based. Toward the end of the *Treatise*, he writes:

> In the present connection the question comes to this – if two probabilites are equal in degree, ought we, in choosing our course of action, to prefer that one which is based on a greater body of knowledge? . . . The question appears to me to be highly perplexing, and it is difficult to say much that is useful about it. But the *degree of completeness of the information on which a probability is based* does seem to be relevant, as well as the actual magnitude of the probability, in making practical decisions. Bernoulli's maxim, that

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4. A comparison of this sort could be made if we assume some hypothetical value for
   x/h and then check whether or not the addition of h_1 to x/h would change that value.
   If so, it is possible to conclude that h_1 is relevant to x/h without our knowing the value
   of x/h.

in reckoning a probability we must take into account all the infor-
mation which we have, even when reinforced by Locke's maxim
that we must get all the information we can, does not completely
seem to meet the case. If, for one alternative, the available infor-
mation is necessarily small, that does not seem to be a consideration
which ought to be left out of the account altogether. (CW VIII, pp.
345–46; emphasis added)

This passage shows traces of weight$_1$, in Keynes's references to "the
greater body of knowledge" and the available information being "nec-
essarily small." For present purposes, however, the important phrase
is Keynes's reference to the "degree of completeness of the information"
on which the probability is based, a phrase he repeats two pages further
on. If "knowledge" and "information" (and "evidence") are taken as
synonymous terms, as Keynes appears to do, the degree of completeness
of the information on which a probability is based might be expressed
as follows:

$$V(x/h) = K_r/(K_r + I_r) \qquad (3)$$

which reduces to:

$$1/(w + 1) \qquad (4)$$

where $w = I_r/K_r$.

Equation (4) clearly moves in the same way as (2). Accordingly, we
may restrict our attention to one of either (2) or (3). Since (3) has more
intuitive appeal, I shall henceforth take the second notion of weight
(weight$_2$) to be "the degree of completeness of the information on which
a probability is based." As before, when the amount of relevant knowl-
edge increases, the probability of the proposition may either rise or fall,
depending on whether the evidence is favorable or unfavorable. Either
way, however, and given that I_r does not increase by more than K_r, the
weight of the new probability will be greater than it was before.

Keynes appears to concentrate on the more straightforward notion
of weight$_1$ in his formal discussion of its properties, and does not give
a separate account of weight$_2$. Accordingly, in what remains of this
section, I attempt to provide an outline of what I understand by the
second notion of weight. From the onset, I must make it clear that what
follows does not depend on some theoretical ideal of total knowledge
of the evidence relevant to a proposition. I assume, however, that just
as our knowledge of the evidence that enters into the premises of an
argument depends on our individual circumstances, so does our igno-

rance of factors that we might otherwise have considered relevant. What matters is not the level of that ignorance per se, however, but how this level will be affected with the acquisition of additional information. The nature of weight$_2$ clearly hinges on the meaning of the terms in (3). "Relevant knowledge" has already been discussed. I now consider what could be meant by "relevant ignorance."

On Keynes's strict definition, a piece of evidence is relevant if that evidence is capable of changing the probability when it is added to the premises of an argument. One way "relevant ignorance" could possibly make sense, on this account, is if it were to affect the probability in the same way. It is clear, however, that it cannot. It is relevant *knowledge*, be this favorable or unfavorable, that enters the premises of a probability argument, not ignorance. However, Keynes's reference to *relevant* ignorance seems to presuppose that it can at least be distinguished from ignorance that is not relevant. It would seem to follow that at least something must be known about "relevant" ignorance for this to be the case. The question is whether it is possible to talk sensibly of knowing something about our ignorance, or, to be more precise, of knowing something about changes of the *extent* of our ignorance, on some or other proposition.

I argue that in practice we do often know of, or at least are able to identify, factors of which we are to a large extent ignorant, but which are relevant to our probability estimates. Consider, for example, the proposition *r* that it will rain two days hence. On the basis of the evidence, namely, certain propositions we take to be true, we may be able to arrive at the probability of *r*. These evidential propositions take the form of "direct knowledge" in Keynes's account. In practice, we may use certain historical data in the belief that it is the best available, or rely on recent weather forecasts and meteorological reports. We are nevertheless aware of the *possibility*, in these situations, that better data may be available, or that it may have been an apprentice weatherperson who has been making the reports in recent weeks. And by the same token, we are aware that there are usually relevant factors that we have omitted altogether. It is in these senses, I maintain, that we may speak of "relevant ignorance."

At this stage it is useful to compare weight$_1$ and weight$_2$. In terms of weight$_1$, new evidence "will sometimes decrease the probability of an argument, but it will always increase its weight" (CW VIII, p. 77). The surprising feature of weight$_2$ is that the same conclusion need not follow. New evidence, in other words, may lead to a *decrease* in weight. To see this, it will be helpful to refer again to (3): If I_r does not increase by more than K_r, it is clear that weight$_2$ will increase with every increase in K_r. But it is surely possible, in principle, that we may sometimes learn something that leads us to drastically reassess I_r, to revise it upward by

more than any increase in K_r. In this case, the accretion of evidence will lead to a *decrease* in weight.

The possibility that weight may decrease with the acquisition of more evidence does not appear in the *Treatise;* indeed, it contradicts many of Keynes's other statements. Nevertheless, a hint of the idea appears in Keynes's remarks that "we may say that the weight is increased when the number of alternatives is reduced, although the ratio of the number of favorable to the number of unfavorable alternatives may not have been disturbed" and " . . . we may say that the weight of the probability is increased, as the field of possibility is contracted" (CW VIII, p. 84). Presumably, in both of these cases, there is new evidence to suggest that "the number of alternatives is reduced" or that "the field. of possibility is contracted." These examples seem to bear the consequence that if new evidence is acquired to the effect that there are more alternatives or a larger field of possibility than previously imagined, then weight can fall despite our knowledge increasing. In other words, we may have enlarged our perception of relevant ignorance, which suggests that weight would then fall with the acquisition of that evidence.

Weight$_1$ and weight$_2$ differ in so far as weight$_2$ is defined in terms of relevant ignorance. This difference is important, since it makes it possible for weight$_2$ to fall with the accretion of relevant evidence. Failing this, we would have to forego the direct, and intuitive, link between changes in weight and confidence: we would be precluded from saying, quite reasonably, that we have acquired new evidence that reduces our confidence in a previous estimate. In summary, if the acquisition of more information is to provide a more substantial basis on which to rest our conclusion, and if confidence is to bear a direct relation to changes in weight, we should concentrate on the degree of *completeness* of the relevant information, or weight$_2$. Of course we can never say how complete our information is at any point, or to what extent we should pursue attempts to make our knowledge more complete (CW VIII, p. 83). Nevertheless, it is sometimes possible to say that the information in respect of one conclusion is more complete than that in respect of another, or, when we gain more information about a conclusion, that our information is more complete than it was before.

UNCERTAINTY, CONFIDENCE, AND WEIGHT

It has already been noted that weight appears in Keynes's economic writing in his account of investment decision-making in the *General Theory.* I have also suggested that weight$_2$ is the measure to use, if, as Keynes does, it is to be linked to investor confidence. Before we examine this link in more detail, it is worth noting that it is already discernible in Keynes's writing roughly 25 years earlier, in his 1910 *New Quarterly*

article on Great Britain's Foreign Investments (written at the time he was working on the *Treatise*):

> Since the risk of which we must take into account is the subjective risk, the feeling, that is to say, in the mind of the investor, its magnitude very largely depends upon the amount of relevant information regarding the investment that is easily accessible to him. What would be a risky investment for the ignorant speculator may be exceptionally safe for the well-informed expert. The amount of risk to any investor principally depends, in fact, upon *the degree of his ignorance* respecting the circumstances and prospects of the investment he is considering. (CW XV, p. 46; emphasis added)

Although weight is not explicitly mentioned here, the flavor of what I have called weight$_2$ is clearly apparent.

It is necessary, at this point, to consider the relation between uncertainty and weight. Unfortunately, Keynes does not define uncertainty in the *Treatise*. Lawson (1985, pp. 913–14), however, on the basis of the correspondence between certainty and knowledge, proposes a plausible account of what uncertainty might mean in terms of the framework of the *Treatise*. Lawson's thesis is straightforward: if certainty corresponds to knowledge about a probability relation, then uncertainty must correspond to the *absence* of such knowledge.

Keynes mentions two situations in which knowledge of a secondary proposition may be absent. The first of these is the case in which it is impossible, even in principle, to arrive at direct knowledge of a secondary proposition: "[t]here is no probability at all." In the second case, a probability relation may be *unknown*, even though it may exist and be knowable in principle. This does not mean that the probability relation would become known if more evidence were available, merely that we lack the skill to determine what the probability is (CW VIII, pp. 34–35; see also Meeks, 1978, p. 24). Keynes thus admits that the true probability may be known to some when it is not known to everyone, but adds that "this admission must not be allowed to carry us too far." Unknown probabilities are not prominent elsewhere in the *Treatise*.

So far then, it has been argued that, on Keynes's account in the *Treatise*, uncertainty corresponds to the situation in which knowledge of the probability relation is absent. I now turn to the question of weight.

An assessment of the role and importance of weight in the *Treatise* is no easy task, not least because Keynes himself betrays some hesitancy on this matter. At the beginning of the chapter on weight, for example, he remarks that the "question to be raised in this chapter is somewhat novel; after much consideration I remain uncertain as to how much importance to attach to it" (CW VIII, p. 77). The earlier discussion suggests a possible reason for Keynes's uneasiness: the *Treatise*, as Keynes never tires of reminding his reader, is primarily concerned with *relational*

probabilities, namely, with the probability of some or other event relative to certain *given* evidence. Keynes's consideration of weight constitutes a departure from this question, since it leaves the realm of the logic of the relation between conclusion and evidence for that of a comparison of secondary propositions on the basis of the extent of their evidential underpinnings.

Nevertheless, an unambiguous statement on the role of weight appears in Chapter 26 of the *Treatise*, on "The Application of Probability to Conduct." Here Keynes (CW VIII, p. 339) points out that "the probability of a hypothesis is only one of the things to be determined and taken account of before acting on it." Keynes mentions two factors besides weight. The first of these is the ethical problem of which of two courses of action to pursue when the first option would lead to greater good than the second, but where the probability of the second is higher than that of the first. The second factor is "risk," which Keynes (CW VIII, p. 346) describes in terms of whether or not the undesirability of an option should increase more than in proportion to its uncertainty.[5] (In view of Keynes's later statements, it appears that a case could be made that "risk," as well as weight, should enter into the state of confidence. This issue will not be pursued here.)

Where probabilities are used as a guide to conduct, we are likely to be interested not only in the logical relation between conclusion and evidence, but also in the degree of completeness of the evidence. It is here that weight enters: "If, for one alternative, the available information is necessarily small, that does not seem to be a consideration which ought to be left out of the account altogether" (CW VIII, p. 346). The nature of the relation between "the available information" and the evidential propositions in a probability argument is a complex issue, and cannot be considered here (but see CW VIII, Chapter 2; Lawson, 1985, 1987). In most practical situations, however, any evidence we use as premises in probability estimates will involve certain assumptions. Where we want to determine the probability that it will rain two days hence, for example, we assume that the historical data is correct, that the weatherperson is competent, and so on. Doubt may then enter, not as regards the probability relation itself, but as regards its usefulness in *application.* In other words, it may be possible to have (certain) knowledge *about* or perhaps even *of* a probability *given* the evidence *h*. The problem, *in practice*, is that this evidence may itself be incomplete or dubious, and make the probability an unreliable guide to decision.

I now turn to the role of uncertainty and weight in Chapter 12 of the *General Theory*.[6] Here, and in line with the earlier account of uncer-

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5. Here Keynes uses the word "risk" in a way somewhat different from his 1910 article.
6. See also Carabelli (1986, pp. 76–81), O'Donnell (1982, pp. 58–65), Rutherford (1984, p. 379), Shackle (1974, p. 41), Weintraub (1975), and the works cited in the introduction.

tainty, Keynes argues that knowledge of prospective yields on invest-
ments is usually not obtainable.[7] Yet he also suggests that investors make
"probable" forecasts, although he is somewhat ambiguous on what pre-
cise form these forecasts take (see Stohs, 1980, 1983; Garner, 1983).
Whatever Keynes may have intended here, the important point is that
the knowledge that forms the basis of actual investment decisions is
usually small. In situations of this kind, Keynes suggests, it is better to
be guided by facts about which we are relatively more confident, even
if these be less decisively relevant to the issue than others (CW VII, p.
148). These "facts" enter by way of investors falling back on the con-
vention of "assuming that the existing state of affairs will continue in-
definitely, except in so far as [they] have specific reasons to expect a
change" (CW VII, p. 152).

As long as this convention is maintained, in Keynes's view, it is
compatible with a large degree of continuity and stability. But it may
break down: "it is not surprising that a convention, in an absolute view
of things so arbitrary, should have its weak points. It is its precariousness
which creates no small part of our contemporary problem of securing
sufficient investment" (CW VII, p. 153). The problem is that although
the adoption of conventions is, given their circumstances, a reasonable
course of action for investors to take, they are aware that "the actual
results of an investment over a long term of years seldom agree with
the initial expectation" (CW VII, p. 152). Since they "expect large changes
but are very uncertain as to what precise form these changes will take,
. . . [their] confidence will be weak" (CW VII, p. 148). Their forecasts,
and hence the state of long-term expectation, are accordingly prone to
sharp and sudden revision with changes in the "news."[8]

To the extent that Keynes is concerned with the conduct of investors,
the above account is consistent with Chapter 26 of the *Treatise*. Keynes
(CW VII, pp. 148–49) distinguishes between the most probable forecast
we can make and our confidence in that forecast, and appears to link
low weight with low confidence. Weight also arises in his discussion of
liquidity preference. Although the liquidity premium is to some extent
similar to the risk premium, according to Keynes, it is also partly dif-
ferent. Again, this difference corresponds "to the best estimates we can
make of probabilities and the confidence with which we make them"
(CW VII, p. 240). Similar sentiments are expressed in a letter to Hugh
Townshend, written after the publication of the *General Theory*:

> I am rather inclined to associate risk premium with probability
> strictly speaking, and liquidity premium with what in my *Treatise
> on Probability* I called 'weight'. An essential distinction is that a risk

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7. See also Keynes's famous remarks on this issue in his 1937 *QJE* defense of the *General
Theory* (CW XIV, pp. 113–14).
8. The relation between uncertainty and the instability of beliefs is more fully considered
in Runde (1989).

premium is expected to be rewarded on the average by an increased
return at the end of the period. A liquidity premium, on the other
hand, is not even expected to be so rewarded. It is a payment, not
for the expectation of increased tangible income at the end of the
period, but for an increased sense of comfort and confidence during
the period. (CW XXIX, pp. 293–94)

Confidence and weight are not the same thing, however. Neither
is weight a psychological or subjective propensity. The greater the weight
of evidence in respect of a forecast the more substantial the basis on
which to rest our conclusion, and presumably, the more confident we
will be that the forecast is an appropriate guide to action. It seems
sensible to regard increases in weight as leading to increases in confi-
dence, and vice versa. If this direct relation is to be maintained, I have
argued, the appropriate conception is weight as some measure of the
degree of completeness of the information on which a decision is based.

KEYNES, WEIGHT, AND THE SUBJECTIVE EXPECTED UTILITY MODEL

Keynes's complaint (CW VII, pp. 148–49) that "economists have not
analysed [the state of confidence] carefully and have been content, as a
rule, to discuss it in general terms," is perhaps as true today as it was
in his day. This neglect may be attributed, at least in part, to the current
dominance of the Subjective Expected Utility (SEU) model in the Eco-
nomics of Uncertainty (see Machina, 1987; Schoemaker, 1982). According
to the SEU approach, preferences over "lotteries" are determined in
terms of a probability-weighted average of the utilities over outcomes
(see, for example, Hey, 1979, pp. 26–37). The basic decision rule is that
the lottery that offers the highest expected value should be chosen. To
the extent that it is assumed that the probabilities employed *are* the
relevant ones, the SEU approach avoids questions regarding the weight
of those probabilities, or their reliability as a guide to conduct.[9] Indeed,
Deaton and Meullbauer (1980, pp. 380–81) go so far as to suggest that
the SEU approach renders irrelevant most discussion of the distinction
between risk and uncertainty.

As it happens, however, it is not overly difficult to introduce a
weightlike measure into the SEU framework, nor to provide a justifi-
cation for doing so. Consider the following example of Miss Julie, who
is invited to bet on the outcome of three tennis matches:

As regards match A, she is very well informed about the two
players – she knows everything about the results of their earlier

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9. The SEU model is usually associated with the subjective notion of probability of De
Finetti (1964) and Savage (1954). For some subjectivist views on the logical conception
of probability, see De Finetti (1985) and Savage (1964). Ellsberg (1961) provided a seminal
critique of the SEU model when the relevant probabilities are not known, or "ambig-
uous."

matches, she has watched them play several times, she is familiar with their present physical condition and the setting of the match, etc. Given all this information, Miss Julie predicts that it will be a very even match and that a mere chance will determine the winner. In match B, she knows nothing whatsoever about the relative strength of the contestants (she has not even heard their names before) and she has no other information that is relevant for predicting the winner of the match. Match C is similar to match B except that Miss Julie happened to hear that one of the contestants is an excellent tennis player, although she does not know anything about which player it is, and that the second player is an amateur so that everybody considers the outcome of the match a foregone conclusion. (Gärdenfors and Sahlin, 1982, pp. 361–62)

On this information, Miss Julie would give each of the players a 50–50 chance of winning. In terms of the SEU approach, this would imply that she should accept a bet at equal odds on one of the players in one of the matches if and only if she is willing to accept a similar bet on the other matches. Gärdenfors and Sahlin reject this conclusion and suggest instead that it would be rational for Miss Julie to accept a bet on match A, but reject bets on matches B or C, since match A provides a more *reliable* bet than the others. They conclude that the amount and quality of information is an important aspect in decision-making and introduce this aspect into the SEU framework by way of a weightlike measure of the *epistemic reliability* of the available information.[10]

No doubt there are many ways in which the orthodox framework could fruitfully be extended to incorporate a measure of the confidence with which probability assessments are regarded, perhaps with other applications of a weightlike measure (see, for example, Einhorn and Hogarth, 1987). Yet one suspects that Keynes would have had little sympathy with the way in which the SEU model is put to work in the Economics of Uncertainty nowadays, even if modified or extended in some such way. For Keynes, the class of cases in which degrees of probability are numerically measurable is "strictly limited" (CW VIII, p. 344; and see Watt, 1989), a belief that goes some way toward explaining his emphasis on the need to base economic theory on propositions that

10. Instead of representing the knowledge of the decision-maker in a given situation with a unique probability measure, Gärdenfors and Sahlin endow their agent with a *class* of "epistemically possible" probability distributions. The decision procedure consists of two stages. At the first stage, the class of possible probability distributions is restricted to a subset that satisfies some minimum level of "epistemic reliability." At the second stage, for each alternative and each of the restricted set of probability distributions, the expected utility is calculated in the normal way. The alternative that yields the highest minimal expected utility is chosen.

reflect the actual rather than the ideal in decision-making. In his 1937 *QJE* article, Keynes writes:

> [T]he theory we devise in the study of how we behave in the market place should not itself submit to market-place idols [such as the Benthamite calculus]. I accuse the classical economic theory of being itself one of these pretty, polite techniques which tries to deal with the present by abstracting from the fact that we know very little about the future. (CW XIV, p. 115)

The implication in this paper, quite clearly, is that the Benthamite route is a deceptive one, a theme that is echoed in his 1937 Galton Lecture to the Eugenics Society:

> Though it was . . . an ingredient in the complacency of the nine-teenth century that . . . they accepted an extraordinary contraption of the Benthamite School, by which all possible consequences of alternative courses of action were supposed to have attached to them, first a number expressing their comparative advantage, and secondly another number expressing the probability of their fol-lowing from the course of action in question; so that multiplying together the numbers attached to all the possible consequences of a given action and adding the results, we could discover what to do. In this way a mythical system of probable knowledge was employed to reduce the future to the same calculable status as the present. No one has ever acted on this theory. But even today I believe that our thought is sometimes influenced by such pseudo-rationalistic notions. (CW XIV, p. 124)

It should not be surprising, therefore, that Keynes's treatment of "rational" behavior in his economic writing is based on something other than the maximization of expected utility. Unlike most modern econo-mists, Keynes regards the economic motive as only one among many (see Bateman, 1988; Lawson, 1989b) and one, moreover, that may use-fully be supplemented by such "irrational" factors as "animal spirits," "whim," and the like. And, to a degree much greater than is currently fashionable, Keynes's analysis and conclusions are informed by the par-ticular social and economic contexts in which decision-makers find them-selves, the implications of the different time horizons associated with different kinds of forecasts (Runde, 1989), and his emphasis on the conventional component in decision-making (see Lawson, 1989a).

CONCLUSION

Keynes refers to weight in at least three ways in the *Treatise*. It was shown that these three versions of weight boil down to two distinct conceptions: weight as the amount of evidence on which a probability is based (weight$_1$) and weight as the degree of completeness of the

information, or equivalently, as the balance of the absolute amounts of relevant knowledge and relevant ignorance, on which a probability is based (weight$_2$). Most interpretations of Keynesian weight appear to focus on weight$_1$.

Weight$_2$ differs from weight$_1$ in so far as it is defined in terms of "relevant ignorance." This notion introduces the possibility that weight$_2$ may decrease with the acquisition of new evidence, if such evidence leads to a sufficiently large reassessment of "relevant ignorance." This conclusion is necessary if weight is to retain its intuitive meaning. For if new information indicates that our knowledge is less complete than we had thought before, it would surely be difficult to speak of that information "providing a more substantial basis on which we rest our conclusion." It was argued that if weight is to bear a direct relation to the confidence we have in a probability, then weight$_2$ is the appropriate conception.

In the *Treatise*, knowledge of a probability relation constitutes direct *certain* knowledge. On this view, uncertainty was taken to correspond to the situation in which such knowledge is absent, either because the probability relation does not exist, or because we do not have the mental capacity to arrive at the relation between conclusion and evidence. It is this lack of knowledge that seems to be reflected in statements such as "[w]e simply do not know" (CW XIV, p. 113), in Keynes's later work.

The notion of weight introduces uncertainty of a second and different kind. In the *Treatise*, weight is regarded as a complement to probabilities when they are used in practice, as a measure of the completeness of the evidence on which they are based, and thereby, of the extent to which we may feel justified in being guided by them. In the *General Theory*, the importance of weight lies in its connection with confidence, and particularly, *investor* confidence. It is the lack of investor confidence that, in Keynes's view, results in the precarious nature of long-term expectations. And it is this precariousness that goes some way toward explaining what, for Keynes, is the most serious deficiency of the capitalist system: "our contemporary problem of securing sufficient investment" (CW VII, p. 153).

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