# "Animal Spirits" was a secondary variable supporting Keynes's interval valued probability and evidential weight of the argument analysis

*by* Turnitin LLC

# "Animal Spirits" was a secondary variable supporting Keynes's interval valued probability and evidential weight of the argument analysis

**Michael Emmett Brady**

Adjunct Lecturer, California State University, Dominguez Hills College of Business Administration and Public Policy Department of Operations Management  1000 East Victoria St Carson,  California  90747 USA

*Corresponding author:** Michael Emmett Brady

Adjunct Lecturer, California State University, Dominguez Hills College of Business Administration and Public Policy Department of Operations Management  1000 East Victoria St Carson,  California  90747 USA

## Abstract

*Proponents  of the animal spirits hypothesis,who argue that animal spirits are the primary point that Keynes was making in the General Theory, such as Marchionatti (1999),  Akerlof  and Shiller (2009),Dow and Dow (2012), and Shiller (2021),  fail to grasp Keynes's lifelong emphasis on (a) imprecise probability, as opposed to the precise probability concept underlying  Benthamite Utilitarian and neoclassical economics and (b)to confuse and conflate confidence with animal spirits in Keynes's discussions on pp.161-163 of the General Theory in chapter 12,which is a non-technical rewrite of Keynes's chapter XXVI, which was based on chapter VI 's evidential weight of the argument, in  Keynes's A Treatise on Probability. Keynes 's point was that the liquidity preference option which Keynes believed was the logical option to choose if faced with ignorance or extreme uncertainty at the micro level, leads to the collapse of the macro economy as spending flows stop.*

*Keynes's Chapter 12 of the General Theory was written especially for economists. Keynes does not discuss animal spirits in the A Treatise on Probability. However, George Boole, upon whom Keynes based his A Treatise on Probability, did discuss the impact of the decision makers feelings and emotions on the mental state of the decision maker. G. Boole (1854, pp.244-245; p.272) was the first to point out that the process of  expectation formation is not merely a purely  mathematical, probabilistic calculation ,but is affected by emotional considerations  which impact  the mental state of the decision maker. The feelings of the decision maker are thus  aspects that impacted in the process of the calculation of the expectation. Since  Keynes did not cover this in his A Treatise on Probability, Keynes took the opportunity in chapter 12 of the General Theory to incorporate Boole's point into his discussions on pp.161-163,differentiating ,just like Boole did before him  ,between exact ,precise probability, made under the assumption of a complete, information set ,so that a complete ordering of all probabilities is possible in the probability space ,which are point estimates ,and inexact ,imprecise  probability,  which are  interval  estimates,  which are  made under  conditions of  partial information, so that  only a partial ordering of the probability space is possible .*

56

## 1. Introduction

The paper is organized in the following manner. Section Two deals with Akerlof and Shiller (2009) and Shiller (2021). Section Three deals with Marchionatti (1999).Section Four deals with Dow and Dow (2012).Section Five concludes the paper.

The primary reason for the misguided reliance and emphasis on animal spirits by economists in general, and by Marchionatti ,Dow and Dow , Akerlof and Shiller ,and Shiller , in particular ,is the basic ,practically unanimous failure to read *the A Treatise on Probability* .This results in a failure to grasp how Keynes based his theory of expectations formation on Boole's imprecise theory of probability using interval valued probability. Interval valued probability, which Keynes calls inexact measurement and approximation ,is termed by Keynes to be reasonable calculation. The standard ,economist approach, based on strict or exact mathematical expectations as advocated by F P Ramsey is called unreasonable .This is covered by Keynes in footnote 3 on p.24, in chapter Four of the General Theory on pp.39-40 and pp.43-44,in chapter 11 on pp.136-139,in chapter 12 on pp.147-150 and pp.161-163,and finally in chapter 17 on pp.239-241 in section 5.

Keynes introduces an important distinction that has been overlooked by economists and philosophers-the distinction between unreasonable expectations calculations and reasonable expectations calculations.

Keynes categorizes mathematical expectations as being unreasonable calculations (see Keynes critique on pp.136-137 of chapter 11 and pp.162-163 of the General Theory) which are not possible to make. Keynes characterizes inexact and imprecise calculation being reasonable. Keynes discussed such calculations in chapter Four of the General Theory on pp.38 -39 and pp.43-44.

The central problem analyzed by Keynes in the General Theory is the collapse of the macro economy caused by an internal shock emanating in the financial markets which is magnified by the behavior of private bankers who continue to make loans available to Keynes's speculators and rentiers ,which represent the " …forces of banking and finance." Keynes's speculators and rentiers are close to Adam Smith's "…imprudent risk takers, prodigals and projectors."

Once the macro economy has collapsed or is close to collapse, the only available solution is confidence increasing policies made by the government/central bank. Keynes had already gone over this on p.158 and pp.199-209 of the General Theory, where Section four of chapter 15 is an introductory version of the complete IS-LM model presented by Keynes on pp.298-2?8 of chapter 21, which is built on chapter 20's expectational D-Z model of expected aggregate demand and expected aggregate supply. The idea that animal spirits can create/lead to a recovery appears nowhere in Keynes's General Theory.

Pace Akerlof and Shiller (2009),there are not five animal spirits for Keynes (Confidence ,Fairness ,Corruption ,Money illusion and Stories(Narratives).For Keynes ,there is only one animal spirit -optimism(pessimism).It plays a secondary ,complementary, supporting role to the Keynesian expectations formation ,based on

precise probability and confidence ,which is based on Keynes's Evidential Weight of the Argument ,V.V is measured by the degree of the completeness of the relevant information as assessed by the decision maker ,which Keynes defined by the variable ,w ,where $0 \leq w \leq 1$ and $w = K/(K+I)$,where K is the amount of absolute Knowledge and I is the amount of absolute Ignorance. Thus, a decision (D) for Keynes is a function of Imprecise probability (IP), Evidential Weight(V), Time(T; short run or long run ) and Animal Spirits (AS ;optimism or pessimism).IP and V come from the A Treatise on Probability, while T and AS come from the General Theory.

Thus,

D=F (IP, V, T, AS), where the relative importance of the variables is based on the order of their appearance in the parentheses.

## 2. Akerlof and Shiller (2009) and Shiller(2021)

Akerlof and Shiller (2009) and Shiller (2021) basically follow the erroneous heterodox, institutionalist ,neo-Keynesian , Post Keynesian belief claim that quantitative methods are useless in an assessment of expectations formation under conditions of uncertainty (partial knowledge and partial ignorance),so that only conventions and animal spirits can explain effectively how decisions are arrived at concerning the future .On the other hand, mainstream economists have ,since the days of J. Bentham, relied only on some form of strict, exact mathematical expectations or rational expectations, which are camouflaged /disguised mathematical expectations, requiring precise, exact ,additive probability. What has been completely overlooked is the Boole - Keynes emphasis on what one can call inexact or imprecise logical expectations. Such expectations are based on imprecise, inexact probability, which is non additive.

Akerlof and Shiller base their entire analysis on one quotation on page 161 of the General Theory. They ignore Keynes's additional discussions on pp.162 and 163 while having no idea about what Keynes means by reasonable calculation. They then proceed to rewrite Keynes's book while leaving out of the discussion entirely Keynes's major theoretical, analytical construction in the General Theory (chapters 13-17), which is the Liquidity Preference Theory of the rate of interest under conditions of uncertainty(situations of partial knowledge and partial ignorance),appears nowhere in the rewritten general theory made by Akerlof and Shiller and Shiller. In the Akerlof and Shiller rewrite, there is no Liquidity preference theory of the rate of interest.

Akerlof and Shiller, as well as all other economists who have written on Keynes's General Theory and animal spirits ,do not understand what Keynes is doing in chapter 12 because they do not know what Keynes was doing in his A Treatise on Probability ,in general, in chapter 6 and ,in particular, chapter 26.Keynes's conventional coefficient ,c , of chapter XXVI is a very simplified version of interval probability .

Keynes's approach to decision making follows directing from Boole's combination of a relational, propositional logic that leads

to an interval valued approach to probability, which Keynes categorizes as being non numerical probability, inexact measurement and approximation. Inexact measurement and approximation is what Keynes argues is used in real world decision making. This is Keynes's reasonable calculation. Therefore, Keynes's quotation, taken out of context by Akerlof and Shiller , states that if the choices available to explain decision making are only (a) animal spirits and (b) precise , quantitative calculations, then ,as Keynes explained on pp.136-137 of the General Theory ,since no one can calculate exact or strict mathematical expectations ,then animal spirits would be the only correct answer from the two options listed .However, animal spirits is NOT the correct answer if the alternative is inexact methods, which is Keynes's reasonable calculation.

Keynes is very clear about what the correct answer is:

"Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits—of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities. Enterprise only pretends to itself to be mainly actuated by the statements in its own prospectus, however candid and sincere. Only a little more than an expedition to the South Pole, is it based on an exact calculation of benefits to come. Thus if the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but a mathematical expectation, enterprise will fade and die; —though fears of loss may have a basis no more reasonable than hopes of profit had before.

It is safe to say that enterprise which depends on hopes stretching into the future benefits the community as a whole. *But individual initiative will only be adequate when reasonable calculation is supplemented and supported by animal spirits, so that the thought of ultimate loss which often overtakes pioneers, as experience undoubtedly tells us and them, is put aside as a healthy man puts aside the expectation of death.*" (Keynes ,1936, pp.161-162; italics and underline added)

Animal spirits can only be a secondary concern, which is supplemental and supports logical expectations and confidence (evidential weight of the argument) . The primary concern for Keynes was always logical expectations formation and the confidence that such expectations were held with, as opposed to mathematical expectations. Akerlof and Shiller do not understand this:

"… John Maynard Keynes sought to explain departures from full employment, and he emphasized the importance of animal spirits. He stressed their fundamental role in businessmen's calculations.

"Our basis of knowledge for estimating the yield ten years hence of a railway, a copper mine, a textile factory, the goodwill of a patent medicine, an Atlantic liner, a building in the City of London amounts to little and sometimes to nothing," he wrote.

If people are so uncertain, how are decisions made? They "can only be taken as a result of animal spirits." They are the result of "a spontaneous urge to action." They are not, as rational economic theory would dictate, "the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities."[2] (Akerlof and Shiller,2012, p.3).

Akerlof and Shiller have attempted to turn a variable of secondary importance to Keynes into a variable of primary importance, overlooking the fact that while Keynes does reject the precise, exact ,additive approach of mathematical expectations, he is ,as was Boole, an advocate of the use of imprecise, inexact, non-additive logical expectations .

The following conclusions are reached:

- Keynes never emphasized the primary importance of animal spirits
- Keynes never stressed their fundamental role in businessmen's calculations.
- "If people are so uncertain, how are decisions made? They can only be taken as a result of animal spirits." ( Akerlof and Shiller ,2009, p.3) is not the answer given by Keynes. The answer given by Keynes is that decisions are NOT made. They are delayed indefinitely. Decision makers put off making a decision under extreme uncertainty by significantly increasing their holdings of liquid assets and refraining from committing any funds(spending)to long run investment projects because they lack confidence .This, of course, is the primary problem that will prevent any recovery from occurring at the macroeconomic level .It can't be remedied by money wage cuts ,which will only further reduce spending in the macro economy and drive the economy even deeper into the hole. If the situation continues to degenerate into one of ignorance, then liquidity preference will become absolute ,as occurred during the Great Depression in the USA in 1932(Keynes ,1936,pp.207-208)
- Neoclassical rational economic man and SEU approaches rely only on Benthamite utilitarian claims that precise probabilities and precise utilities can be calculated exactly. There is no role for questions about the reliability or accuracy of the probability calculations, since subjective probability is defined as the confidence a decision maker has that a certain outcome will occur in the future
- Note that Savage's version of SEU recognized the increasing levels of vagueness that would occur over time the longer the project planned would take to be actually implemented at some time in the future .Therefore ,Savage's version of SEU is restricted to "small worlds" at the microlevel the short run and can't be applied to "large worlds" in the long run or at the macro level, as Savage understood very well what Keynes was talking about .Ramsey made no such reservation in his earlier version of SEU. Ramsey relies completely on mathematical expectations calculations in the same manner as Bentham. Neoclassical economists ignore Savage's restrictions and misapply Savage's theory to the long run, intertemporally over time and at the macrolevel.

Shiller (2021) mistakenly attempts to read into chapter XXVI of the TP a supposed or alleged early discussion of an animal spirits theme that does not exist. This is very similar to F P Ramsey's reading into Keynes's TP axioms that do not exist, but were asserted by Ramsey to be the foundation of Keynes's logical theory of probability:

"The concept of Keynes's animal spirits was brewing for more than a decade in his mind. Keynes, it is worth noting, did not

believe that most uses of the word 'probability' had an objective basis. In his 1921 book *A Treatise on Probability* Keynes invoked some words similar to those quoted above, suggesting that something like animal spirits must play a role in decisions:

If, therefore, the question of right action is under all circumstances a determinate problem, it must be in virtue of an intuitive judgment directed to the situation as a whole, and not in virtue of an arithmetical deduction derived from a series of separate judgments direct to the individual alternatives each treated in isolation. (Keynes 1921, p. 312)."

In the same year, 1921, Frank Knight wrote his *Risk, Uncertainty, and Profit*, which made a similar point: 'We act upon estimates rather than inferences, upon "judgment" or "intuition," not reasoning for the most part' (Knight 1921, p. III.VII.36)." (Shiller,2021,p.2)

The Keynes quote, misunderstood by Shiller, is just another version of Keynes's rejection of mathematical expectations and is followed on pp.313-315 by his analysis of the conventional coefficient of weight and risk, c, which is an easier way to grasp imprecise probability or approximation, as opposed to the much more difficult, mathematical, interval valued approach provided by Keynes in chapters XV and XVII of the TP.

The Knight quote ,misunderstood by Shiller, refers to Knight's failed mathematical attempt at deriving an imprecise approach to probability incorporating a decision weight approach similar to Keynes's c coefficient that would incorporate the confidence a decision maker would have in the estimate of the probability in much the same manner as successfully derived by Keynes in the TP(See Brady (1993) and Brady (1994)).What Knight was trying to derive, but failed ,was Keynes's $[(2w)/(1+w)]$,where w is the completeness of the relevant information and $0 \leq w \leq 1$.(See Brady, 2022(a, b c)).

While Keynes was certainly aware of Boole's discussions of the link between expectations and emotions (Boole,1854, pp.244-245; p.272), he did NOT integrate Boole's insight into his TP. However, by 1936, Keynes had realized its importance, just as he had also realized the importance of the Evidential Weight of the Argument and degree of the completeness of the evidence, concepts that he theoretically understood, but did not fully see where it would be applicable until 1936.

## 3. Marchionatti (1999)

The major drawback in Marchionatti (1999) is, as with Akerlof and Shiller and Shiller, and as we shall see ,is also be the case with Dow and Dow(2012), the failure to have read Keynes's TP and grasped his Boolean inexact, approximation approach to the specification of logical expectations. Like Akerlof and Shiller and Shiller, indeed like all heterodox, institutionalist, neo-Keynesian, and especially Post Keynesians, Keynes is analyzed from the perspective of a dual or binary set of choices. Either expectations are modeled using neoclassical mathematical(rational) expectations or they are modeled as a combination of conventions and animal spirits. In fact, Keynes's actual approach, like Boole's ,is to substitute the Boolean ,imprecise approach to probability which replaces the neoclassical emphasis on exact ,precise additive probability a la Bentham :

"More generally, Keynes asserts that in an uncertain environment the decisions of economic agents about the future depend only in part, if indeed at all, on rational calculation; rather, as he says in a

famous letter to Hugh Townshend, they are based on other 'not rational' motives, 'habit, instinct, preference, desire, will, etc.' (Keynes 1979, p. 294), and 'passions', an old-fashioned term used by Keynes in My early beliefs (1938) speaking in an Humean mood of 'thin rationalism skipping on the crust of lava' (Keynes 1972, p. 447)." (Marchionatti,1999, p.416).

Marchionatti has overlooked Keynes's use of inexact measurement and approximate measures derived from Boole.
Marchionatti's discussions of Keynes's evidential weight of the argument, V, are based on Runde's deeply flawed 1990 paper where V, a logical relation, is treated and analyzed as being a mathematical variable :

"Whereas the probability measures the difference of the favourable and unfavourable evidence, the weight of an argument (V = V (a/h)) measures its sum[5], i.e., the total evidence of a proposition. The weight of an argument is also a measure of the completeness of the evidence. Weight and probability vary according to evidence: as the available evidence increases, so the weight of an argument increases. However, the probability may either increase or decrease, in relation to whether the added knowledge strengthens the favourable or unfavourable evidence:

'new evidence will sometimes decrease the probability of an argument', says Keynes, ..." (Marchionatti,1999, p.419).

Marchionatti overlooked Keynes's clear statement that V measures the sum is a metaphoric statement only, since a logical relation can't measure anything. It is mathematically impossible for V to be a sum. Marchionatti has overlooked, as did Good ,Levi, and Runde(See Brady (2023)) ,that the only measure of V is w, the degree of the completeness of the information ,as stated by Keynes on p.315 of the TP (1921).Marchionatti conflates V and w ,which is defined as V=V(a/h) =w,$0 \leq w \leq 1$.

It is also mathematically impossible for the "..he weight of an argument is also a measure of the completeness of the evidence", as w is the only measure of the completeness of the evidence. The weight of the argument, V, is not a measure of the completeness of the evidence, w. It is the completeness of the evidence, w, that is a measure of the weight of the argument, V.

Marchionatti reveals further erroneous understandings in a footnote:

"The weight of argument is the only doctrine of *A Treatise on Probability* to which Keynes makes explicit reference in The General Theory (see note p. 148). Another explicit reference to A Treatise around the time of The General Theory is in 1938 discussion with Hugh Townshend on liquidity preference. The issue of continuity or change in Keynes' philosophical belief after 1921 is controversial. Without doubt there was a change in interest: Keynes in *The General Theory* is interested not in speculative but in practical rationality; and a change of emphasis: the domain of vague knowledge, non-comparability of probabilities and weights, unknown probabilities, expanded considerably. The dramatic events in the world economy after 1929 probably influenced this intellectual change." (Marchionatti, 1999, p.420).

In fact, the only change was Keynes's recognition of the relative importance of applying his logical relation of the evidential weight of the argument. Marchinatti's "...non comparability of probabilities and weights "only holds if you are talking about precise, exact measures involving single number answers. Probability and weight can be analyzed through the use of Boole's

59

inexact, interval valued approach, as well as by the application of Keynes's conventional coefficient of weight and risk, c.

Based on the above discussions, Marchionatti's conclusion is totally wrong :

"According to Keynes in an uncertain environment it is reasonable that the decisions of economic agents should depend on conventional judgements and animal spirits, in addition and supporting rational calculation. Mainstream theorists have rejected this statement for quite some time now on the assumption that, in the case of genuine uncertainty, rationality will be of little value because outside the realm of rationality only the savage territory of irrationality exists. The theoretical framework of bounded rationality permits reconsideration and support of Keynes' hypothesis: in an uncertain environment reasonability represents an economizing principle manifested in a range of behaviours, while attempts to optimize are often unreliable and expressions of 'pseudo-rationality'.(Marchionatti,1999,pp.434-435).

We can formulate Keynes's actual conclusions based on a careful and complete reading of pp.162-163 of the General Theory in the following manner.

According to Keynes, decision making under uncertainty relies primarily on inexact measurement and approximation to specify logical expectations. Such logical expectations incorporate the confidence a decision maker has in his inexact probability estimate. An easier way to accomplish this is to make use of Keynes's c coefficient.

Under conditions of uncertainty, the use of imprecise probability, inexact measurement, approximation and the c coefficient are primary .Under extreme uncertainty and ignorance ,Keynes acknowledges that the only safe choice for the individual decision maker is to resort to increased liquidity preference .Of course, this then magnifies and amplifies the problem of decreased ,aggregate spending at the macrolevel ,exacerbating the macro problem as more and more individuals choose the best safety first solution at the micro level available, which is becoming more liquid.

The role of conventions and animal spirits is a secondary one which supplements and complements the use of logical expectations and weight(confidence).

For Keynes, there is no role for Marchionatti's "…rational calculation." based on mathematical expectations, which Keynes correctly describes as "pseudo rationality "in his Feb.,1937 article in the Eugenics Review.

Section Four. Dow and Dow (2012)

The Dow and Dow paper suffers from the exact, same problems that exist in Akerlof and Shiller, Shiller, and Marchionatti - ignorance of Keynes's Boolean approaches based on the use of inexact measurement, approximation, imprecise probability and decision weights ,as discussed by Keynes in his A Treatise on Probability, instead of the precise ,neoclassical, mathematical methods based on precise and exact probabilities. Dow and Dow simply make claims by asserting things about the A Treatise on Probability for which no page citations are given. This approach is very similar to the approach of Frank P Ramsey in his 1922 and 1926 reviews of Keynes's A Treatise on Probability:

"By the 1980s mainstream macroeconomic theory had virtually eliminated any reference to the concept of animal spirits because of its classification as irrationality. In 1985 we published an analysis

of animal spirits as the concept had been used by Keynes in the General Theory, and referring back to the Treatise on Probability which laid the philosophical foundations for Keynes's use of the concept. There we argued that animal spirits were a critical element of a framework for decision making under uncertainty which was rational in a broader sense, an argument by which we continue to stand." (Dow and Dow,2011,p.1).

Nowhere in Keynes's A Treatise on Probability is there any.

"…and referring back to the Treatise on Probability which laid the philosophical foundations for Keynes's use of the concept." (Dow and Dow ,2011,p.1).

If they claim otherwise then they must specify in what chapter and which pages Keynes laid the philosophical foundations for the concept of animal spirits in his TP. I can find no such chapter or pages in Keynes's book.

Consider the following claim made by the Dow's about animal spirits which ignores Keynes's emphasis on inexact methods and approximation:

"The reason that the investment decision relies on animal spirits is that rational quantitative calculation alone cannot justify action under uncertainty. This argument, building on Keynes's Treatise on Probability, provides the basis for the broader interpretation of animal spirits in the Post Keynesian literature, one captured by Kregel (1987) in the term 'rational spirits'.[9] Keynes understood the economy as an open, organic system, where creativity and evolutionary change meant that the past was only a limited guide to the future. Creative behaviour and social structures change in ways which cannot be predicted on the basis of quantified probabilities. Far from being predictable, the future has yet to be created (Shackle 1972). In such an environment, which is in general characterized by uncertainty, reason and evidence can only provide a partial justification for decisions. Institutions and social practices evolve to provide a more stable environment for decision-making. But reason and evidence need to be supplemented by other sources of (uncertain) knowledge: conventional knowledge, the knowledge of experts and reliance on past experience (Keynes 1937). Combining these disparate sources of knowledge requires the exercise of judgment.[10] Indeed, in Keynes's framework behaviour which ignores the limitations on calculative rationality would itself be irrational (Kregel 1987). But, given that judgement has recourse to more or less evidence and reason in different circumstances, the mainstream duality of rationality/irrationality no longer applies (or else most judgement must be classed as irrational).

Both Keynes (1921) and Knight (1921) drew a strong distinction between expectations themselves and the degree of confidence with which they are held. " (Dow and Dow,2011, pp.6-7).

None of this type of an appraisal is contained in Keynes's TP Let us consider another claim made about Keynes's TP which it is impossible to verify:

"The reason that the investment decision relies on animal spirits is that rational quantitative calculation alone cannot justify action under uncertainty. This argument, building on Keynes's Treatise on Probability, provides the basis for the broader interpretation of animal spirits in the Post Keynesian literature, one captured by Kregel (1987) in the term 'rational spirits'." (Dow and Dow,2011, p.7). The question that the Dows need to answer is on what pages or chapters does this appear in Keynes's TP?

60

Dow and Dow have completely overlooked, just as they also did in their 1985 paper, Keynes's use of inexact measurement and approximation. What Keynes did in the A Treatise on Probability regarding decision making under uncertainty, was to use and develop Boole's interval valued approach, which automatically results in non-additive probabilities and/or decision weights, so that w is always <1, where

$V=V(a/h) =w ,0 \leq w \leq 1$.

Keynes integrated Boole's interval valued, imprecise approach to probability into the estimation of what I have called logical expectations, as opposed to Benthamite/neoclassical, precise mathematical (rational) expectations.

Keynes uses the terms inexact measurement and approximation in the TP and in the GT. Keynes 's views on measurement in the GT appear on pp.39-40 and 43-44 of chapter Four. They are identical to his discussions in Chapter XV of the TP. Both chapters deal with the issues of measurement.

Dow and Dow completely overlook Keynes's approach in their concluding sentence:

"This is the open, organic world which makes quantitative. probabilities an inappropriate basis for knowledge (Kregel 1987)." (Dow and Dow,2011, p.7).Contrary to Dow and Dow, while it is true that

"…quantitative Probabilities are an inappropriate basis for knowledge'", Keynes's Boolean, imprecise probability deals easily with the Dow's doubtful assertions about an "open, organic world".

## 4. Conclusions

"It is safe to say that enterprise which depends on hopes stretching into the future benefits the community as a whole. *But individual initiative will only be adequate when reasonable calculation is supplemented and supported by animal spirits…. If the fear of a Labour Government or a New Deal depresses enterprise, this need not be the result either of a reasonable calculation or of a plot with political intent; —it is the mere consequence of upsetting the delicate balance of spontaneous optimism... We are merely reminding ourselves that human decisions affecting the future, whether personal or political or economic, cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist…*" (Keynes,1936, p.162; italics added).

Keynes was a lifelong supporter of the application of reasonable expectations calculations using imprecise probability and a lifetime opponent of using unreasonable mathematical expectations. This is very clear from a reading of Keynes's A Treatise on Probability. All of the papers and books that are examined in this paper demonstrate an astounding ignorance, not only of Keynes's Part II discussions of Boole in chapters XIV, XV, XVI, XVII and chapters XX and XXII of Part III of the TP, but also of Keynes's chapter 4 in the GT.

All of the authors frame their analysis regarding Keynes and animal spirits  as a binary or dual conception of animal spirits/conventions versus mathematical or rational expectations, when the correct framework ,looked at with respect to what Keynes actually wrote and not with what is read into both books by economists and philosophers ,is Keynes's imprecise , logical expectations versus the Benthamite Utilitarian, neoclassical

economist concept of precise , mathematical (rational) expectations.

Pace Akerlof and Shiller (2009),there are not five animal spirits for Keynes (Confidence ,Fairness ,Corruption ,Money illusion and Stories(Narratives).For Keynes ,there is only  one animal spirit - optimism(pessimism).It plays a secondary , supporting role to Keynesian Expectations formation ,based on precise probability and Confidence ,which is based on Keynes's Evidential weight of the argument ,which is measured by the degree of the completeness of the relevant information as assessed by the decision maker .

Thus, a decision(D) for Keynes is a function of Imprecise probability (IP),Evidential Weight(V),Time(T; short run or long run ) and Animal Spirits(AS ;optimism or pessimism).IP and EW come from the A Treatise on Probability ,while T and AS come from the General Theory.

Thus ,we can write Keynes's approach to decision making as depending on the four variables listed ,where the importance of each variable is specified by its order of appearance in the parentheses :

D=F (IP, V, T,AS)

It is unclear to me at this time whether or not  economists are capable of actually reading Keynes's *A Treatise on Probability*  or Boole's *The Laws of Thought*(1854).However, if they are not able to do so ,then we will continue to be treated to more and more of the "What did Keynes really mean "  books and articles which have been appearing regularly since 1921 and 1936.In the 21st century ,there are four new " interpretations" of the General  Theory, such as Kay and King's Radical uncertainty, Akerlof and Shiller's Animal Spirits, Shiller's and Bateman's Narrative Economics ,and Bateman and Gerrard's claim that  Keynes was a follower of Ramsey's Pragmatism .

None of these "interpretations" have any textual support in either Keynes's A Treatise on Probability or General Theory. They are all like F P Ramsey's 1922-1926 assertions about the supposed existence of an imaginary "Axiom I" that does not exist in Keynes's A Treatise on Probability.

Hishiyama's point, that the A Treatise on Probability was never read, explains perfectly why F P Ramsey was able to get away with his claim about the supposed existence of an "Axiom I "in Keynes's A treatise on Probability  for over 100 years.

## References

1. Akerlof, G. A. (2007). The missing motivation in. The American Economic Review, 97(1):5-36.
2. Akerlof, G. A., Shiller, R. J. (2009). Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism. Princeton University Press.
3. Arthmar, Rogério and Brady, Michael Emmett.(2018). Journal of Economic Thought and Policy. Boole, Ramsey and the Keynes-Townshend exchanges on subjective probability, vol.2018,no.2, pp. 55-74.
4. Arthmar, Rogério & Brady, Michael Emmett. (2017). Reply to Feduzi, Runde,and Zappia. History of Economic Ideas, Vol. XXV, no.1 ,pp.224-233.
5. Arthmar, Rogério and Brady, Michael Emmett. (2010). An Analysis that Answers F.Y. Edgeworth's Question, put to the Logicians and Philosophers Who Read the

Journal Mind, Concerning the Importance of Evaluating the Role Played by Keynes's Conventional Coefficient of Risk and Weight, C, in Decision Making (June 29). Available at SSRN: https://ssrn.com/abstract=1632318 [12] /dx.doi.org/10.2139/ssrn.1632318.

6. Barnett, V. (2017). Keynes, Animal spirits, and instinct: Reason plus intuition is better than rational. Journal of [1] e History of Economic Thought, 39(3):381-399.

7. Brady, Michael Emmett. (2012). John Maynard Keynes's Upper and Lower Valued Probabilities: A Study of How Statisticians, Philosophers, Logicians, Historians, and Economists Failed to Comprehend Keynes's Breakthrough Application of G. Boole's Interval Approach to Probability in the 20th Century (January 30, 2012). Also, in the International Journal of Applied Economics and Econometrics, Vol. 21, 2013, no. 2, pp. 254-272. Available at SSRN: https://ssrn.com/abstract=1996129 or http://dx.doi.org/10.2139/ssrn.1996129.

8. Brady, Michael Emmett. (2016). Bertrand Russell on Keynes's A Treatise on Probability: What One Would Expect from the Twentieth Century's G[1] atest Philosopher (June 21, 2016). Available at SSRN: https://ssrn.com/abstract=2798509 or http://dx.doi.org/10.2139/ssrn.2798509.

9. Brady, Michael Emmett. (2017). A Comparison – Contrast of the Technical Understanding Exhibited by F.Y. Edgeworth in His Two 1922 Book Reviews of J. M. Keynes's a Treatise on Probability with that of the Keynesian Fundamentalists, Such as Runde, Skidelsky, O'Donnell, Carabelli, Feduzi and Lawson, between 1980 and 2016 – A Problem of Lost Knowledge (March 21, 2017). Available at SSRN: https://ssrn.com/abstract=2938271 or http://dx.doi.org/10.2139/ssrn.2938271.

10. Brady, Michael Emmett. (2017). An Analysis of Edwin B. Wilson's Secret, Second Review of the 'A Treatise on Probability' in 1934: How It Demonstrated That Keynes's Theory of Probability Was an Interval Valued Approach to Probability and Not an Ordinal Theory (January 24, 2017). Also, in Scholedge International Journal of Business & Governance, Vol. 3, No. 8 (2016), pp. 110-121. Available at SSRN: https://ssrn.com/abstract=2905482 or http://dx.doi.org/10.2139/ssrn.2905482.

11. Brady, Michael Emmett. (2017). J M Keynes, 'The State of the News (The Change in the Weight of the Evidence)' and the Weight of the Evidence: From Keynes's

12. December 1933 Student Lectures to Chapter 12 of the General Theory in February 1936 (September 2, 2017). Available at SSRN: https://ssrn.com/abstract=3031314 or http://dx.doi.org/10.2139/ssrn.3031 314.Electronic copy available at: https://ssrn.com/abstract=3274122

13. Brady, Michael Emmett. (2017). J M Keynes's Evidential Weight of the Argument, V(A/H), Which Applies to Arguments, is Different from the Weight of the Evidence, W, which is a Measure of the Completeness of the Information, Data, Evidence, or Knowledge in the Premises, H (August 22, 2017). Available at SSRN: https://ssrn.com/abstract=3024[1]88 or http://dx.doi.org/10.2139/ssrn.3024

14. 388.

15. Brady, Michael Emmett. (2018). The Roles of Keynes's Logical Relations, V(a/h) =w and P(a/h) =alpha, in His Conventional Coefficient of Weight and Risk, c. (April 19, 2018). Available at SSRN: https://ssrn.com/abstract=3165298 or [1] p://dx.doi.org/10.2139/ssrn.3165298.

16. Brady, M. E. (1983). The Foundation of Keynes' Macroeconomics: His Logical Theory of Probability and its Application in the General Theory. U. C. Riverside, Dissertation (July).

17. Brady, M.E. (1986). Reviewing the Reviewers of J.M. Keynes's A Treatise on Probability: How most of them got it all wrong. Unpublished paper. [Published in 2016 as Reviewing the Reviewers of J.M. Keynes's A Treatise on Probability: Ignorance is Bliss. Xlibris Press; Philadelphia, Pennsylvania].

18. _____. (1987). J. M. Keynes' theory of evidential weight: Its relation to information processing theory and application in the General Theory. Synthese, 71, pp.37-60.

19. Brady, Michael E. (1993). J.M. Keynes' theoretical approach to decision making under condition of risk and uncertainty. The British Journal for the Philosophy of Science, 44, pp. 357-76.

20. Brady, Michael Emmett. (1994). On the application of J.M. Keynes's approach to decision making. International [1] udies in the Philosophy of Science ,8, no.1, pp.99-112.

21. Brady, Michael Emmett. (1996). Decision Making Under Risk in the Treatise on Probability: J.M. Keynes' 'Safety First' Approach, History of Economics Review, 25, pp. 204-210, 1996.

22. Brady, Michael Emmett. (1997). Decision Making Under Uncertainty in the Treatise on Probability: Keynes' Mathematical Solution of the 1961 Ellsberg Two Color, Ambiguous Urn Ball Problem in 1921, History of Economics Review, 26, pp. 136-142.

23. _____. (2004a). J. M. Keynes' Theory of Decision Making, Induction, and Analogy. The Role of Interval Valued Probability in His Approach. Xlibris Corporation. (Pennsylvania; Philadelphia)

24. _____. (2004b). Essays on John Maynard Keynes and [1] . Xlibris Corporation. (Pennsylvania; Philadelphia).

25. Brady, Michael Emmett. (2021a). How SIPTA overlooked Keynes's major contributions to imprecise probability and decision making,1999-2019.International Journal of Management Research and Economics, Volume 1,no.3,pp.11-21.

26. Brady, Michael Emmett. (2021b). On the correction of all thirty-five errors contained in Ramsey's 1922 and 1926 reviews of Keynes's Treatise. Journal of Management Information and Decision Sciences, Volume 24, no.6(special issue), pp.1-19.

27. Brady, Michael Emmett. (2022a).On Knight's Inability to mathematically model his third category, "estimates", which involved the confidence a decision maker had in his estimate of a probability in Risk, Uncertainty and Profit, 1921.Journal of Insurance and Financial Management, Vol 6, No. 3,pp.6-80.

28. Brady, Michael Emmett. (2022b). Examining F. Knight's urn ball models show that his unmeasurable, uninsurable uncertainties all involve partial knowledge/partial ignorance: Actuaries can use the POI to partially insure

62

options using a lower bound. Journal of Insurance and Financial Management, Vol 6, No. 1 pp.60-80.

29. Brady, Michael Emmett. (2023). Using Keynes's Non-Probabilistic Coefficient of Evidential Weight, [2w/(1+w)], to Analyze Knightian Uninsurable Uncertainties, Scenario Analysis and Entrepreneurship Studies. Journal of Insurance and Financial Management, Vol 7, No. 4 ,pp.54-65.

30. De Grauwe, P. (2011). Animal spirits and monetary cy. Economic Theory, 47(2-3):423-457.

31. Dow, A and Dow, S. (1985). Animal Spirits and Rationality'. In T Lawson and H Pesaran (eds), Keynes' Economics: Methodological Issues, Croom Helm.

32. Dow, A. and Dow, S. (2011).Animal Spirits Revisited pitalism and Society.Vol.6,no. 2,pp.1-22.

33. Dow, A., Dow, S. (2012). Animal spirits and rationality, Dow, S., Foundations for New Economic Thinking, A ollection of Essays, Palgrave.

34. Hishiyama ,I.(1969). The Logic Of Uncertainty according to J. M.Keynes. Kyoto University Economic iew, 39, no.1 , pp. 22-44.

35. Howitt, P., McAfee, R. P. (1992). Animal spirits. The American Economic Review, 82(3):493-507.

36. Keynes, J. M. (1921). A treatise on probability. London: Macmillan .

37. Keynes, J. M. (1964). The General theory of Employment ,Interest, and Money. Halstead Press; New k.

38. Marchionatti, R. (1999).On Keynes's Animal Spirits.Kyklo ol.52,pp.415-439.

39. Shiller, R. (2021). Animal Spirits and viral popular narratives. Review of Keynesian Economics, Vol. 9 No. 4 (Spring) 2021, pp. 1–10.

40. Townshend H. (1979 [1937]). Letter to Keynes, in Moggridge, D. E. (ed.). CWJMK, XXIX, pp. 236-7.

41. Townshend H. (1979 [1938]). Letter to Keynes. In Moggridge, D. E. (ed.). CWJMK, XXIX, pp. 240-5.

42. Townshend H. (1979 [1938]). Letter to Keynes. In Moggridge , D. E. (ed.). CWJMK, XXIX, pp. 257-8,288-294.

63

# "Animal Spirits" was a secondary variable supporting Keynes's interval valued probability and evidential weight of the argument analysis

**9** Roberto Marchionatti. "On Keynes? Animal Spirits", Kyklos, 1999
Publication
2%

**10** globaljournals.org
Internet Source
2%

**11** isrgpublishers.com
Internet Source
1%

**12** nbn-resolving.org
Internet Source
1%

**13** journals.aserspublishing.eu
Internet Source
1%

**14** vdoc.pub
Internet Source
1%

**15** www.svedbergopen.com
Internet Source
1%

**16** Alexander Dow, Sheila C. Dow. "Animal Spirits Revisited", Capitalism and Society, 2011
Publication
<1%

**17** tel.archives-ouvertes.fr
Internet Source
<1%

**18** Submitted to King's College
Student Paper
<1%

**19** epdf.pub
Internet Source
<1%

**20** userpage.fu-berlin.de
Internet Source
<1 %

**21** www.journals.aserspublishing.eu
Internet Source
<1 %

**22** pure.uva.nl
Internet Source
<1 %

**23** prod-aaudxp-cms-001-app.azurewebsites.net
Internet Source
<1 %

**24** www.softpanorama.org
Internet Source
<1 %

**25** HenryE. Kyburg Jr.. "Belief, Evidence, and Conditioning*", Philosophy of Science, 2006
Publication
<1 %

**26** Brendan Sheehan. "Understanding Keynes' General Theory", Springer Science and Business Media LLC, 2009
Publication
<1 %

**27** Pierre Lemieux. "Somebody in Charge", Springer Science and Business Media LLC, 2011
Publication
<1 %

**28** dokumen.pub
Internet Source
<1 %

**29** socialdemocracy21stcentury.blogspot.com
Internet Source
<1 %

**30** Alberto Feduzi. "On Keynes's conception of the weight of evidence", Journal of Economic Behavior & Organization, 2010
Publication

<1 %

**31** Keynes Philosophy Economics and Politics, 1989.
Publication

<1 %

**32** irispublishers.com
Internet Source

<1 %

**33** "Fundamental Uncertainty", Springer Science and Business Media LLC, 2011
Publication

<1 %

**34** Michael BRADY. "Opinion about the Liquidity Preference Theory. Discussions Concerning Weight and Risk in the Townshend-Keynes Letters of November-December 1938", Theoretical and Practical Research in Economic Fields, 2024
Publication

<1 %

**35** The State of Interpretation of Keynes, 1994.
Publication

<1 %