Keynes's General Theory concept of 'animal spirit's 'relies on G. Boole, not R. Descartes

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Abstract

There is only one main source for Keynes's concept of 'animal spirits' - George Boole. Keynes was intent on incorporating into his decision theory from the A Treatise on Probability the effect of the feelings and emotions on the expectation formation process of a decision maker. Keynes was, of course, the only economist who read Boole's The Laws of Thought.

No economists or philosophers ,involved in writing on Keynes's A Treatise on Probability or the nature of the close connections between the A Treatise on Probability and Keynes's General Theory, have ever read Boole's The Laws of Thought .This is easily demonstrated by the fact that there are no economists or philosophers who have any understanding of the basic fact that Keynes' s relational ,propositional logic, which permeates all 5 Parts of the A Treatise on Probability, is built completely on Boole's earlier relational ,propositional logic and interval valued approach to probability and decision making in The Laws of Thought. One need only read a few of the articles published in the five centenaries /symposiums on Keynes's A Treatise on Probability and Knight's Risk ,Uncertainty and Profit ,published in late 2021 by the Alan Turing Institute(August), Cambridge Journal of Economics(September),Review of Political Economy(October),History of Economic Ideas(November),or the Journal of the History of Economic Thought(December),to realize that there is no mention made anywhere in any article about the close connections that exist between the foundations of Boole's work on probability and decision making and the foundations of Keynes's work on probability and decision making, where Keynes's contribution is an advanced version of Boole's earlier version. The number of citations to Boole's The Laws of Thought in these centenaries /symposiums on Keynes's A Treatise on Probability is zero.

Just as in the General Theory, where Keynes introduces very briefly a minor discussion of animal spirits, in chapter 12 in section 7 on pages 162-163, consisting of two paragraphs, which deal with the emotional impact that the feelings of the decision makers can have on their expectations ,Boole's discussion is limited to three pages ,pages 244-245 and 272,of The Laws of Thought .Boole provides a complete discussion in three paragraphs . Keynes provided two paragraphs of discussion:

"Here then arises the question, whether there exists any principle of transition, in accordance with which the logical and the numerical interpretations of the same symbolical expression shall have an intelligible connexion. And to this question the following considerations afford an answer. 19. Let it be granted that there exists such a feeling as expectation, a feeling of which the object is the occurrence of events, and which admits of differing degrees of intensity. Let it also be granted that this feeling of expectation

accompanies our knowledge of the circumstances under which events are produced, and that it varies with the degree and kind of that knowledge. Then, without assuming, or tacitly implying, that the intensity of the feeling of expectation, viewed as a mental emotion, admits of precise numerical measurement, it is perfectly legitimate to inquire into the possibility of a mode of numerical estimation which shall, at least, satisfy these following conditions, viz., that the numerical value which it assigns shall increase when the known circumstances of an event are felt to justify a stronger expectation, shall diminish when they demand a weaker expectation, and shall remain constant when they obviously require an equal degree of expectation." (Boole,1854, p.272;see also the very important pp. 244-245).

Now it would definitely not make any sense to take Boole's discussion of the emotional effects on the feelings and mental nature of decision makers out of context and assert that the main conclusion that Boole was emphasizing in his discussions of probability and uncertainty in chapters XVI to XXI in The Laws of Thought was 'animal spirits' ,when, in fact, the major point of Boole's book ,as well as Keynes's A Treatise on Probability and General Theory was that in any instance of decision making ,that involved only partial, incomplete and/or missing knowledge (uncertainty), and is lead to the conclusion that only imprecise ,interval valued probabilities alone can be calculated .Of course, this is identical to the major conclusion of Keynes's book, which was that in most cases only inexact measurement and approximation are possible .That meant that exact and definite precise numerical probabilities can't ,in general, be calculated in the form of mathematical expectations where a decision maker can obtain an ".... outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities." (Keynes,1936, p.161).

Keynes's discussion on pp.161-163 of the GT has been badly misinterpreted by all economists and philosophers writing on animal spirits because the opening paragraph on pp.161-162 of section 7 has been taken completely out of context and presented long run decision making as a choice between only two options-either rely on animal spirits or rely on precise mathematical expectations when considering the decision to invest in long lived durable capital goods: "Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation, whether moral or hedonistic or economic. 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..." (Keynes,1936, pp.161-162).

In fact, Keynes actually is an advocate of a third option, imprecise approximation and inexact measurement, which he refers to as reasonable calculation. Keynes integrates reasonable calculation into his section 7 discussion of animal spirits on page 162: "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, p.162). Keynes's final conclusion is that "But individual initiative will only be adequate when reasonable calculation is supplemented and supported by animal spirits..." (Keynes,1936, p.162).

Keynes has relegated animal spirits to a supplemental and complementary position, where the unreasonable use of mathematical expectations has been replaced by the reasonable use of inexact measurement, approximation and imprecise probability.

This conclusion is in accord with Adam Smith's and Thomas Aquinas's conclusions in The Wealth of Nations and Summa Theologica, respectively. (See Brady ,2023,2024 and 2018). The chapter in Keynes's General Theory that deals with measurement is chapter Four. Pages 39-40 and 43-44 of chapter Four reiterate Keynes's conclusions, as presented in the advanced chapter on measurement, chapter 15, of the A Treatise on Probability. Keynes's major goal in section 7 of chapter 12 of the General Theory is to continue his critique of unreasonable calculation (mathematical expectations) and recommendation of reasonable calculation (inexact measurement and approximation) as originally discussed in chapter Four of the General Theory. Nowhere in Keynes's index to the General Theory is there any reference to Descartes or animal spirits. While Keynes was well acquainted with Descartes, as he was with a great many other artists, philosophers and mathematicians, Descartes, like Plato, plays no role at all in either book. Shiller's recent claim that "John Maynard Keynes's (1936) concept of 'animal spirits' or 'spontaneous optimism' as a major driving force in business fluctuations was motivated in part by his and his contemporaries' observations of human reactions to ambiguous situations where probabilities couldn't be quantified. We can add that in such ambiguous situations there is evidence that people let contagious popular narratives and the emotions they generate influence their economic decisions. These popular narratives are typically remote from factual bases, just contagious. Macroeconomic dynamic models must have a theory that is related to models of the transmission of disease in epidemiology. We need to take the contagion of narratives seriously in economic modeling if we are to improve our understanding of animal spirits and their impact on the economy." (Shiller ,2021, p.1)

represents a gross distortion of Keynes's point, which was NOT that expectations can't be quantified, but that the quantification involved and required reasonable, imprecise probability models and not the unreasonable , precise probability models of Benthamite Utilitarian classical , neoclassical ,new classical and new neoclassical economics ,using mathematical expectation

"interpretation of the General Theory that has little, if anything, to do with Keynes's main point, which was that the deficiencies in the degree of confidence a decision maker has in his estimate of probability leads to increasing degrees of liquidity preference which led, in the Great Depression, to absolute liquidity preference. Shiller's interpretation will be considered in another paper. [See Brady (2022)]. The Akerlof -Shiller idea that Keynes's confidence is an animal spirit has absolutely nothing to do with anything published by Keynes in his lifetime.

Keywords: *animal spirits, Boole on emotions and feelings, reasonable calculation, imprecise probability, interval value probability*

Introduction

The paper will be organized in the following manner. Section Two will present Keynes's main conclusions on approximation and inexact measurement, which follow directly from Boole, from chapters XV ,XVI XVII,XX and XXII of his *A Treatise on Probability* (TP,1921) that Keynes ,an advocate of imprecise probability, defended against Tinbergen, an advocate of precise probability, in 1938-1940.Section Three presents Keynes's very similar analysis from chapter XV of the TP in chapter Four of the *General Theory* (GT,1936).Section Four covers Keynes's analysis in section 7 of chapter 12 of the GT. Section Five discusses Boole's conclusion about the role of emotions and feelings in the formation of expectations ,as well as the impact in actual application. Section Six concludes the paper.

Keynes on Inexact measurement and approximation in his TP

Consider the following: "5. It is evident that the cases in which exact numerical measurement is possible are a very limited class, generally dependent

on evidence which warrants a judgment of equiprobability by an application of the Principle of Indifference. The fuller the evidence upon which we rely, the less likely is it to be perfectly symmetrical in its bearing on the various alternatives, and the more likely is it to contain some piece of relevant information favouring one of them. In actual reasoning, therefore, perfectly equal probabilities, and hence exact numerical measures, will occur comparatively seldom." (Keynes, 1921, p.159) However, "The sphere of inexact numerical comparison is not, however, quite so limited. Many probabilities, which are incapable of numerical measurement, can be placed nevertheless between (Keynes's emphasis with italics) numerical limits. And by taking particular non-numerical probabilities as standards a great number of comparisons or approximate measurements become possible. If we can place a probability in an order of magnitude with some standard probability, we can obtain its approximate measure by comparison. This method is frequently adopted in common discourse." (Keynes ,1921, p.160).

This discussion ,first carried out in 1921,is presented again by Keynes in an almost identical fashion a number of times in the GT ,the most extensive being the discussion on pp.161-163 of chapter 12.Thus ,the idea that Keynes was opposed to the use of formal mathematical and statistical analysis in economics is false .However ,Keynes's formal use of mathematical and statistical technique excludes ,for the most part ,the use of precise ,exact ,additive point probability techniques and approaches, and relies instead on imprecise, inexact and nonadditive interval probability techniques and decision weights.

Keynes on inexact measurement and approximation in the GT

Consider the following repetition of his Part II TP discussion in the GT: "The fact that two incommensurable collections of miscellaneous objects cannot in themselves provide the material for a quantitative analysis need not, of course, prevent us from making approximate statistical comparisons, depending on some broad element of judgment rather than of strict calculation, which may possess significance and validity within certain limits. But the proper place for such things as net real output and the general level of prices lies within the field of historical and statistical description, and their purpose should be to satisfy historical or social curiosity, a purpose for which perfect precision—such as our causal analysis requires, whether or not our knowledge of the actual values of the relevant quantities is complete or exact—is neither usual nor necessary."(Keynes, 1936,pp.39-40) and "It is my belief that much unnecessary perplexity can be avoided if we limit ourselves strictly to the two units, money and labour, when we are dealing with the behaviour of the economic system as a whole; reserving the use of units of particular outputs and equipments to the occasions when we are analyzing the output of individual firms or industries in isolation; and the use of vague concepts, such as the quantity of output as a whole, the quantity of capital equipment as a whole and the general level of prices, to the occasions when we are attempting some historical comparison which is within certain (perhaps fairly wide) limits avowedly unprecise and approximate."(Keynes, 1936,pp.43-44).

Again ,Keynes's contrast is between imprecise and inexact measurement as opposed to precise and exact measurement .Keynes's general opposition to the use of exact ,quantitative methods in economics and social sciences is not an admonishment against the use of formal mathematical and statistical methods in general .It is an admonishment against the use of precise point probability approaches based on a claim that decision makers can know for certain the appropriate probability distribution to use in making a decision before any decision is made. Keynes's negative criticism is combined with support for the use of reasonable calculation (imprecise interval probability or decision weights), which he discussed in chapter XXVI on page 315 of the TP. That chapter covered his decision weight approach, which he called a conventional coefficient of weight and risk, c.

It is obvious, to the extremely few readers of Part II of Keynes's TP, that the claim made about Keynes by the Fundamentalist Keynesians (J. Robinson, GLS Shackle -see Coddington (1976), that he was an advocate of Marshall's dictum, that one should burn one's formal mathematical analysis after obtaining the result, and instead, give only a verbal, English prose presentation, has nothing to do with Keynes's actual approach in his TP or GT.

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Keynes's reasonable calculation approach versus the unreasonable neoclassical mathematical (Benthamite Utilitarian) expectation approach

Keynes makes the following points that have been gravely misunderstood by all orthodox and heterodox economists over the last 88 years: "(3) A conventional valuation which is established as the outcome of the mass psychology *of a large number of ignorant individuals* is liable to change violently as the result of a sudden fluctuation of opinion due to factors which do not really make much difference to the prospective yield; since there will be no strong roots of conviction to hold it steady. *In abnormal times in particular*, when the hypothesis of an indefinite continuance of the existing state of affairs is less plausible than usual even though there are no express grounds to anticipate a definite change, the market will be subject to waves of optimistic and pessimistic sentiment, which are unreasoning and yet in a sense legitimate *where no solid basis exists for a reasonable calculation." (*Keynes, 1936,p.154;italics added).

Keynes will spend all of Section VII and VIII of the GT carefully expanding upon, refining and explaining this statement. Here I will note that Keynes considered only three types of decision environments during his lifetime. Those three decision environments were risk (full knowledge), uncertainty (partial knowledge, partial ignorance) and ignorance (no knowledge).

In Section Seven, we find his discussion of individual decision making: "Most, probably, of our decisions to do something positive, the full consequences of which will be drawn 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." (*Keynes, 1936, pp.161-162; italics added) Keynes has thus rejected any role for mathematical expectation, which is based on exact, precise, 1936, pp., numerical probability and is not reasonable because "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.163;italics added).

Keynes goes on to talk about the role of reasonable individual calculation: "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…*" (Keynes,1936, p.162;italics added) and "This means, unfortunately, not only that slumps and depressions are exaggerated in degree, but that economic prosperity is excessively dependent on a political and social atmosphere which is congenial to the average businessman. 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. *In estimating the prospects of investment,* we must have regard, therefore, to the nerves and hysteria and even the digestions and reactions to the weather of those upon whose

spontaneous activity it largely depends." (Keynes ,1936,p.162;italics added).

In Section VIII, Keynes heavily qualifies his original statement on p.154 concerning the role of "A conventional valuation which is established as the outcome of the mass psychology of a large number of ignorant individuals…", as, in the case of ignorance, neither unreasonable or reasonable calculation will have a role: "There are, moreover, certain important factors which somewhat mitigate in practice the effects of our ignorance of the future**.** Owing to the operation of compound interest combined with the likelihood of obsolescence with the passage of time, there are many individual investments of which the prospective yield is legitimately dominated by the returns of the comparatively near future. In buildings the case of the most important class of very long-term investments, namely, the risk can be frequently transferred from the investor to the occupier, or at least shared between them, by means of long-term contracts, the risk being outweighed in the mind of the occupier by the advantages of continuity and security of tenure. In the case of another important class of long-term investments, namely public utilities, a substantial proportion of the prospective yield is practically guaranteed by monopoly privileges coupled with the right to charge such rates as will provide a certain stipulated margin. Finally there is a growing class of investments entered upon by, or at the risk of; public authorities, which are frankly influenced in making the investment by a general presumption of there being prospective social advantages from the investment…" (Keynes,1936, p.163; boldface added)

Orthodox and heterodox economists have failed in correctly assessing Keynes's entire analysis in Section VII in chapter 12 because they deliberately leave out any discussion of Section VIII .This means that Keynes in chapter 12 ,while certainly aware of the condition of ignorance that exists for very long run decisions involving mec calculations about long lived durable capital goods, is primarily concerned with decision making under uncertainty and not decision making under risk or ignorance. A role exists for unreasonable calculation, then, only under conditions of risk, while it is reasonable calculation that must be used in conditions of uncertainty .Note that all heterodox economists have hopelessly confused uncertainty with ignorance, while all orthodox economists, with the exceptions of T. Sargeant and O. Hansen since 2003, simply deny that anything such as uncertainty or ignorance exists.

Boole on the role of emotions and feelings in expectations formation

Boole's discussions of expectations appears throughout chapters XVI to XXI of after these discussions appear on pages 244-245, 251, 255-256, 263, 272, 361 ft, 368-370, and 400. Boole's discussion of the role of confidence in the estimate of a probability appears on pp.381-82,398 and 403. Boole's conclusions are consistent with Smith's, Knight's and Keynes's views.

Boole devotes only three pages to a discussion of the nexus connecting the formation of expectations (cause and effect) to feelings and emotions. It occurs on pp.244-245 and p.272 of LT. Boole's representation of the links is clear and concise: "Here then arises the question, whether there exists any principle of transition, in accordance with which the logical and the numerical interpretations of the same symbolical expression shall have an

intelligible connexion. And to this question the following considerations afford an answer. 19. Let it be granted that *there exists such a feeling as expectation, a feeling* of which the object is the occurrence of events, and which *admits of differing degrees of intensity*. Let it also be granted that *this feeling of expectation accompanies our knowledge of the circumstances under which events are produced, and that it varies with the degree and kind of that knowledge*. Then, *without assuming*, or tacitly implying, that *the intensity of the feeling of expectation, viewed as a mental emotion, admits of precise numerical measurement*, it is perfectly legitimate to inquire *into the possibility of a mode of numerical estimation* which shall, at least, satisfy these following conditions, viz., that the numerical value which it assigns shall increase when the known circumstances of an event are felt to justify a stronger expectation, shall diminish when they demand a weaker expectation, and shall remain constant when they obviously require an equal degree of expectation."(Boole,1854,p.272;italics added).

Boole's discussion above is ,in terms of his general ,overall explanation of the nature of the impact of emotions, superior to Keynes's explanation .However, Keynes's particular explanation ,regarding long lived capital goods is ,in particular ,superior to Boole's in that Keynes's very brief discussion ties the emotional impact on an individual investor to his specific economic decisions involving mec calculations ,which are imprecise ,to shortages in fixed capital provision, which can have severe detrimental impacts on the macroeconomy as a whole.

However, no matter how impressive Boole's discussion is, it is clear that the main point Boole is making in the book is not that there is an emotional impact on expectations due to the feelings of the decision maker .The main point is that, due to incomplete and missing evidence or knowledge ,one has to resort to interval valued probability estimates that will not be precise and exact .The same conclusion was reached by Keynes in the GT. This difference is the main difference between Keynes (Adam Smith) and neoclassical (classical) economists.

Conclusions

Boole's contribution to the issue of the role played by emotions and feelings is unknown simply because his LT has never been read by an economist, with the exception of Keynes. According to Keynes, the use of his conventional coefficient, c, would be a reasonable calculation as would an interval valued estimate. The calculation of cA, derived from the use of the c coefficient, is a reasonable calculation, while the calculation of pA ,derived from the application of his c coefficient ,is an unreasonable calculation, especially when it is applied to anything except the short run and microlevel. See Brady (1993,1994).

This brings us to the need to reexamine similar misrepresentations, as well as the gross misuse of Savage's SEU approach by economists, made about Savage's subjective theory of probability, especially by economists asserting the rational expectations hypothesis, which is misapplied by economists to the long run and macro level. Savage made it clear that his theory could not be applied at the macro level, to the long run, or to intertemporal decision making over time, due to the severe problem of vagueness and the difficulty of eliciting accurately the personal, subjective probabilities of decision makers. Basically, the conditional probabilities that are supposedly being used to update the initial probabilities to posterior probabilities by economists assuming rational expectations are based on imaginary, future data sets that

do not exist except as products of their imagination. Savage's characterization of such pseudo-Bayesian approaches was that they were "utterly ridiculous" and "preposterous" (Savage,1954, p.16). Savage's characterization of such unreasonable calculations is much, much, more pointed and derogatory than Keynes's own very mild and tepid observation: "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." (Keynes,1936,pp.161-162;Keynes's slightly more combative 1937 objection ,that " I accuse the classical economic theory of being itself one of those pretty ,polite techniques …"is still a far way off from Savage's accurate summary of the use of unreasonable calculation on the part of economists, in general).

The literature (see Akerlof , Akerlof and Shiller, Shiller, Barnett, Dow and Dow ,Dow and Hilliard, Matthews, Koppl, Marchionetti ,etc.) On Keynes's tiny discussion on pp.161-162 of animal spirits in his GT makes a gigantic mountain out of a tiny mole hill, as well as ignoring Keynes's advocacy of imprecise probability. Well over 200 articles and 30 books, books of collected essays and book chapters have been published in the last 40 years that are related to this topic. Nowhere before, in or after the GT does Keynes ever mention Descartes when dealing with expectations or decision making; animal spirits and Descartes do not appear in the index to Keynes's General Theory. The use of an imaginary connection between Keynes and Descartes in the GT is very similar to the imaginary connection asserted to exist by heterodox economists (see ,for instance ,Bateman, Davis and Runde)between Keynes and Plato in both the TP and GT .Plato appears nowhere in the index or bibliography of either the TP or the GT.

The idea, that positive or optimistic animal spirits can have some positive impact in mitigating /reducing a Great Depression or a Great Recession, when liquidity preferences are increasing dramatically and possibly absolutely, has no foundation in anything written by Keynes in his lifetime. Keynes saw that the fundamental problem is that it is rational for the individual investor to seek to become more liquid when faced with uncertainty; however, in the aggregate this would lead to a severe shortfall in investment spending that could spiral into a severe depression that would require massive government investment to circumvent.

Expectations, based on reasonable, imprecise probability calculations, followed by confidence considerations, which were a function of evidential weight of the arguments and dealt with the problem of liquidity preference, were the most important concepts for Keynes. 'Animal spirits' follows in last place.

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