

VI. UNCERTAINTY

1. Uncertainty and Acting

THE uncertainty of the future is already implied in the very notion of action. That man acts and that the future is uncertain are by no means two independent matters. They are only two different modes of establishing one thing.

We may assume that the outcome of all events and changes is uniquely determined by eternal unchangeable laws governing becoming and development in the whole universe. We may consider the necessary connection and interdependence of all phenomena, i.e., their causal concatenation, as the fundamental and ultimate fact. We may entirely discard the notion of undetermined chance. But however that may be, or appear to the mind of a perfect intelligence, the fact remains that to acting man the future is hidden. If man knew the future, he would not have to choose and would not act. He would be like an automaton, reacting to stimuli without any will of his own.

Some philosophers are prepared to explode the notion of man's will as an illusion and self-deception because man must unwittingly behave according to the inevitable laws of causality. They may be right or wrong from the point of view of the prime mover or the cause of itself. However, from the human point of view action is the ultimate thing. We do not assert that man is "free" in choosing and acting. We merely establish the fact that he chooses and acts and that we are at a loss to use the methods of the natural sciences for answering the question why he acts this way and not otherwise.

Natural science does not render the future predictable. It makes it possible to foretell the results to be obtained by definite actions. But it leaves unpredictable two spheres: that of insufficiently known natural phenomena and that of human acts of choice. Our ignorance with regard to these two spheres taints all human actions with uncertainty. Apodictic certainty is only within the orbit of the deductive system of aprioristic theory. The most that can be attained with regard to reality is probability.

It is not the task of praxeology to investigate whether or not it is permissible to consider as certain some of the theorems of the empirical

natural sciences. This problem is without practical importance for praxeological considerations. At any rate, the theorems of physics and chemistry have such a high degree of probability that we are entitled to call them certain for all practical purposes. We can practically forecast the working of a machine constructed according to the rules of scientific technology. But the construction of a machine is only a part in a broader program that aims at supplying the consumers with the machine's products. Whether this was or was not the most appropriate plan depends on the development of future conditions which at the time of the plan's execution cannot be forecast with certainty. Thus the degree of certainty with regard to the technological outcome of the machine's construction, whatever it may be, does not remove the uncertainty inherent in the whole action. Future needs and valuations, the reaction of men to changes in conditions, future scientific and technological knowledge, future ideologies and policies can never be foretold with more than a greater or smaller degree of probability. Every action refers to an unknown future. It is in this sense always a risky speculation.

The problems of truth and certainty concern the general theory of human knowledge. The problem of probability, on the other hand, is a primary concern of praxeology.

2. The Meaning of Probability

The treatment of probability has been confused by the mathematicians. From the beginning there was an ambiguity in dealing with the calculus of probability. When the Cehvalier de Mere consulted Pascal on the problems involved in the games of dice, the great mathematician should have frankly told his friend the truth, namely, that mathematics cannot be of any use to the gambler in a game of pure chance. Instead he wrapped his answer in the symbolic language of mathematics. What could easily be explained in a few sentences of mundane speech was expressed in a terminology which is unfamiliar to the immense majority and therefore regarded with reverential awe. People suspected that the puzzling formulas contain some important revelations, hidden to the uninitiated; they got the impression that a scientific method of gambling exists and that the esoteric teachings of mathematics provide a key for winning. The heavenly mystic Pascal unintentionally became the patron saint of gambling. The textbooks of the calculus of probability gratuitously propagandize for the gambling casinos precisely because they are sealed books to the layman.

No less havoc was spread by the equivocations of the calculus of

probability in the field of scientific research. The history of every branch of knowledge records instances of the misapplication of the calculus of probability which, as John Stuart Mill observed, made it “the real opprobrium of mathematics.”¹

The problem of probable inference is much bigger than those problems which constitute the field of the calculus of probability. Only preoccupation with the mathematical treatment could result in the prejudice that probability always means frequency.

A further error confused the problem of probability with the problem of inductive reasoning as applied by the natural sciences. The attempt to substitute a universal theory of probability for the category of causality characterizes an abortive mode of philosophizing, very fashionable only a few years ago.

A statement is probable if our knowledge concerning its content is deficient. We do not know everything which would be required for a definite decision between true and not true. But, on the other hand, we do know something about it; we are in a position to say more than simply *non liquet* or *ignoramus*.

There are two entirely different instances of probability; we may call them class probability (or frequency probability) and case probability (or the specific understanding of the sciences of human action). The field for the application of the former is the field of the natural sciences, entirely ruled by causality; the field for the application of the latter is the field of the sciences of human action, entirely ruled by teleology.

3. Class Probability

Class probability means: We know or assume to know, with regard to the problem concerned, everything about the behavior of a whole class of events or phenomena; but about the actual singular events or phenomena we know nothing but that they are elements of this class.

We know, for instance, that there are ninety tickets in a lottery and that five of them will be drawn. Thus we know all about the behavior of the whole class of tickets. But with regard to the singular tickets we do not know anything but that they are elements of this class of tickets.

We have a complete table of mortality for a definite period of the past in a definite area. If we assume that with regard to mortality no changes will occur, we may say that we know everything about the mortality of the whole population in question. But with regard to the life expectancy of the individ-

1. John Stuart Mill, *A System of Logic Ratiocinative and Inductive* (new impression, London, 1936), p. 353.

uals we do not know anything but that they are members of this class of people.

For this defective knowledge the calculus of probability provides a presentation in symbols of the mathematical terminology. It neither expands nor deepens nor complements our knowledge. It translates it into mathematical language. Its calculations repeat in algebraic formulas what we knew beforehand. They do not lead to results that would tell us anything about the actual singular events. And, of course, they do not add anything to our knowledge concerning the behavior of the whole class, as this knowledge was already perfect—or was considered perfect—at the very outset of our consideration of the matter.

It is a serious mistake to believe that the calculus of probability provides the gambler with any information which could remove or lessen the risk of gambling. It is, contrary to popular fallacies, quite useless for the gambler, as is any other mode of logical or mathematical reasoning. It is the characteristic mark of gambling that it deals with the unknown, with pure chance. The gambler's hopes for success are not based on substantial considerations. The nonsuperstitious gambler thinks: "There is a slight chance [or, in other words: 'it is not impossible'] that I may win; I am ready to put up the stake required. I know very well that in putting it up I am behaving like a fool. But the biggest fools have the most luck. Anyway!"

Cool reasoning must show the gambler that he does not improve his chances by buying two tickets instead of one of a lottery in which the total amount of the winnings is smaller than the proceeds from the sale of all tickets. If he were to buy all the tickets, he would certainly lose a part of his outlay. Yet every lottery customer is firmly convinced that it is better to buy more tickets than less. The habitués of the casinos and slot machines never stop. They do not give a thought to the fact that, because the ruling odds favor the banker over the player, the outcome will the more certainly result in a loss for them the longer they continue to play. The lure of gambling consists precisely in its unpredictability and its adventurous vicissitudes.

Let us assume that ten tickets, each bearing the name of a different man, are put into a box. One ticket will be drawn, and the man whose name it bears will be liable to pay 100 dollars. Then an insurer can promise to the loser full indemnification if he is in a position to insure each of the ten for a premium of ten dollars. He will collect 100 dollars and will have to pay the same amount to one of the ten. But if he were to insure one only of them at a rate fixed by the calculus, he would embark

not upon an insurance business, but upon gambling. He would substitute himself for the insured. He would collect ten dollars and would get the chance either of keeping it or of losing that ten dollars and ninety dollars more.

If a man promises to pay at the death of another man a definite sum and charges for this promise the amount adequate to the life expectancy as determined by the calculus of probability, he is not an insurer but a gambler. Insurance, whether conducted according to business principles or according to the principle of mutuality, requires the insurance of a whole class or what can reasonably be considered as such. Its basic idea is pooling and distribution of risks, not the calculus of probability. The mathematical operation that it requires are the four elementary operations of arithmetic. The calculus of probability is mere by-play.

This is clearly evidenced by the fact that the elimination of hazardous risk by pooling can also be effected without any recourse to actuarial methods. Everybody practices it in his daily life. Every businessman includes in his normal cost accounting the compensation for losses which regularly occur in the conduct of affairs. "Regularly" means in this context: The amount of these losses is known as far as the whole class of the various items is concerned. The fruit dealer may know, for instance, that one of every fifty apples will rot in this stock; but he does not know to which individual apple this will happen. He deals with such losses as with any other item in the bill of costs.

The definition of the essence of class probability as given above is the only logically satisfactory one. It avoids the crude circularity implied in all definitions referring to the equiprobability of possible events. In stating that we know nothing about actual singular events except that they are elements of a class the behavior of which is fully known, this vicious circle is disposed of. Moreover, it is superfluous to add a further condition called the absence of any regularity in the sequence of the singular events.

The characteristic mark of insurance is that it deals with the whole class of events. As we pretend to know everything about the behavior of the whole class, there seems to be no specific risk involved in the conduct of the business.

Neither is there any specific risk in the business of the keeper of a gambling bank or in the enterprise of a lottery. From the point of view of the lottery enterprise the outcome is predictable, provided that all tickets have been sold. If some tickets remain unsold, the enterpriser is in the same

position with regard to them as every buyer of a ticket is with regard to the tickets he bought.

4. Case Probability

Case probability means: We know, with regard to a particular event, some of the factors which determine its outcome; but there are other determining factors about which we know nothing.

Case probability has nothing in common with class probability but the incompleteness of our knowledge. In every other regard the two are entirely different.

There are, of course, many instances in which men try to forecast particular future event on the basis of their knowledge about the behavior of the class. A doctor may determine the chances for the full recovery of his patient if he knows that 70 per cent of those afflicted with the same disease recover. If he expresses his judgment correctly, he will not say more than that the probability of recovery is 0.7, that is, that out of ten patients not more than three on the average die. All such predictions about external events, i.e., events in the field of the natural sciences, are of this character. They are in fact not forecasts about the issue of the case in question, but statements about the frequency of the various possible outcomes. They are based either on statistical information or simply on the rough estimate of the frequency derived from nonstatistical experience.

So far as such types of probable statements are concerned, we are not faced with case probability. In fact we do not know anything about the case in question except that it is an instance of a class the behavior of which we know or think we know.

A surgeon tells a patient who considers submitting himself to an operation that thirty out of every hundred undergoing such an operation die. If the patient asks whether this number of deaths is already full, he has misunderstood the sense of the doctor's statement. He has fallen prey to the error known as the "gambler's fallacy." Like the roulette player who concludes from a run of ten red in succession that the probability of the next turn being black is now greater than it was before the run, he confuses case probability with class probability.

All medical prognoses, when based only on general physiological knowledge, deal with class probability. A doctor who hears that a man he does not know has been seized by a definite illness will, on the basis of his general medical experience, say: His chances for recovery are 7 to 3.

If the doctor himself treats the patient, he may have a different opinion. The patient is a young, vigorous man; he was in good health before he was taken with the illness. In such cases, the doctor may think, the mortality figures are lower; the chances for this patient are not 7:3, but 9:1. The logical approach remains the same, although it may be based not on a collection of statistical data, but simply on a more or less exact resume of the doctor's own experience with previous cases. What the doctor knows is always only the behavior of classes. In our instance the class is the class of young, vigorous men seized by the illness in question.

Case probability is a particular feature of our dealing with problems of human action. Here any reference to frequency is inappropriate, as our statements always deal with unique events which as such—i.e., with regard to the problem in question—are not members of any class. We can form a class "American presidential elections." This class concept may prove useful or even necessary for various kinds of reasoning, as, for instance, for a treatment of the matter from the viewpoint of constitutional law. But if we are dealing with the election of 1944—either, before the election, with its future outcome or, after the election, with an analysis of the factors which determined the outcome—we are grappling with an individual, unique, and nonrepeatable case. The case is characterized by its unique merits, it is a class by itself. All the marks which make it permissible to subsume it under any class are irrelevant for the problem in question.

Two football teams, the Blues and the Yellows, will play tomorrow. In the past the Blues have always defeated the Yellows. This knowledge is not knowledge about a class of events. If we were to consider it as such, we would have to conclude that the Blues are always victorious and that the Yellows are always defeated. We would not be uncertain with regard to the outcome of the game. We would know for certain that the Blues will win again. The mere fact that we consider our forecast about tomorrow's game as only probable shows that we do not argue this way.

On the other hand, we believe that the fact that the Blues were victorious in the past is not immaterial with regard to the outcome of tomorrow's game. We consider it as a favorable prognosis for the repeated success of the Blues. If we were to argue correctly according to the reasoning appropriate to class probability, we would not attach any importance to this fact. If we were not to resist the erroneous conclusion of the "gambler's fallacy," we would, on the contrary, argue that tomorrow's game will result in the success of the Yellows.

If we risk some money on the chance of one team's victory, the lawyers would qualify our action as a bet. They would call it gambling if class probability were involved.

Everything that outside the field of class probability is commonly implied in the term probability refers to the peculiar mode of reasoning involved in dealing with historical uniqueness or individuality, the specific understanding of the historical sciences.

Understanding is always based on incomplete knowledge. We may believe we know the motives of the acting men, the ends they are aiming at, and the means they plan to apply for the attainment of these ends. We have a definite opinion with regard to the effects to be expected from the operation of these factors. But this knowledge is defective. We cannot exclude beforehand the possibility that we have erred in the appraisal of their influence or have failed to take into consideration some factors whose interference we did not foresee at all, or not in a correct way.

Gambling, engineering, and speculating are three different modes of dealing with the future.

The gambler knows nothing about the event on which the outcome of his gambling depends. All that he knows is the frequency of a favorable outcome of a series of such events, knowledge which is useless for his undertaking. He trusts to good luck, that is his only plan.

Life itself is exposed to many risks. At any moment it is endangered by disastrous accidents which cannot be controlled, or at least not sufficiently. Every man banks on good luck. He counts upon not being struck by lightning and not being bitten by a viper. There is an element of gambling in human life. Man can remove some of the chrematistic consequences of such disasters and accidents by taking out insurance policies. In doing so he banks upon the opposite chances. On the part of the insured the insurance is gambling. His premiums were spent in vain if the disaster does not occur.² With regard to noncontrollable natural events man is always in the position of a gambler.

The engineer, on the other hand, knows everything that is needed for a technologically satisfactory solution of his problem, the construction of a machine. As far as some fringes of uncertainty are left in his power to control, he tries to eliminate them by taking safety margins. The engineer

2. In life insurance the insured's stake spent in vain consists only in the difference between the amount collected and the amount he could have accumulated by saving.

knows only soluble problems and problems which cannot be solved under the present state of knowledge. He may sometimes discover from adverse experience that his knowledge was less complete than he had assumed and that he failed to recognize the indeterminateness of some issues which he thought he was able to control. Then he will try to render his knowledge more complete. Of course he can never eliminate altogether the element of gambling present in human life. But it is his principle to operate only within an orbit of certainty. He aims at full control of the elements of his action.

It is customary nowadays to speak of "social engineering." Like planning, this term is a synonym for dictatorship and totalitarian tyranny. The idea is to treat human beings in the same way in which the engineer treats the stuff out of which he builds bridges, roads, and machines. The social engineer's will is to be substituted for the will of the various people he plans to use for the construction of his utopia. Mankind is to be divided into two classes: the almighty dictator, on the one hand, and the underlings who are to be reduced to the status of mere pawns in his plans and cogs in his machinery, on the other. If this were feasible, then of course the social engineer would not have to bother about understanding other people's actions. He would be free to deal with them as technology deals with lumber and iron.

In the real world acting man is faced with the fact that there are fellow men acting on their own behalf as he himself acts. The necessity to adjust his actions to other people's actions makes him a speculator for whom success and failure depend on his greater or lesser ability to understand the future. Every action is speculation. There is in the course of human events no stability and consequently no safety.

5. Numerical Evaluation of Case Probability

Case probability is not open to any kind of numerical evaluation. What is commonly considered as such exhibits, when more closely scrutinized, a different character.

On the eve of the 1944 presidential election people could have said:

(a) I am ready to bet three dollars against one that Roosevelt will be elected.

(b) I guess that out of the total amount of electors 45 millions will exercise their franchise, 25 millions of whom will vote for Roosevelt.

(c) I estimate Roosevelt's chances as 9 to 1.

(d) I am certain that Roosevelt will be elected.

Statement (d) is obviously inexact. If asked under oath on the witness stand whether he is as certain about Roosevelt's future victory as about the fact that a block of ice will melt when exposed to a temperature of 150 degrees, our man would have answered no. He would have rectified his statement and would have declared: I am personally fully convinced that Roosevelt will carry on. That is my opinion. But, of course, this is not certainty, only the way I understand the conditions involved.

The case of statement (a) is similar. This man believed that he risked very little when laying such a wager. The relation 3:1 is the outcome of the interplay of two factors: the opinion that Roosevelt will be elected and the man's propensity for betting.

Statement (b) is an evaluation of the outcome of the impending event. Its figures refer not to a greater or smaller degree of probability, but to the expected result of the voting. Such a statement may be based on a systematic investigation like the Gallup poll or simply on estimates.

It is different with statement (c). This is a proposition about the expected outcome couched in arithmetical terms. It certainly does not mean that out of ten cases of the same type nine are favorable for Roosevelt and one unfavorable. It cannot have any reference to class probability. But what else can it mean?

It is a metaphorical expression. Most of the metaphors used in daily speech imaginatively identify an abstract object with another object that can be apprehended directly by the senses. Yet this is not a necessary feature of metaphorical language, but merely a consequence of the fact that the concrete is as a rule more familiar to us than the abstract. As metaphors aim at an explanation of something which is less well known by comparing it with something better known, they consist for the most part in identifying something abstract with a better-known concrete. The specific mark of our case is that it is an attempt to elucidate a complicated state of affairs by resorting to an analogy borrowed from a branch of higher mathematics, the calculus of probability. As it happens, this mathematical discipline is more popular than the analysis of the epistemological nature of understanding.

There is no use in applying the yardstick of logic to a critique of metaphorical language. Analogies and metaphors are always defective and logically unsatisfactory. It is usual to search for the underlying *tertium comparationis*. But even this is not permissible with regard to the metaphor we are dealing with. For the comparison is based on a conception which is in itself faulty in the very frame of the calculus of probability, namely the

gambler's fallacy. In asserting that Roosevelt's chances are 9:1, the idea is that Roosevelt is in regard to the impending election in the position of a man who owns 90 per cent of all tickets of a lottery in regard to the first prize. It is implied that this ratio 9:1 tells us something substantial about the outcome of the unique case in which we are interested. There is no need to repeat that this is a mistaken idea.

No less impermissible is the recourse to the calculus of probability in dealing with hypotheses in the field of the natural sciences. Hypotheses are tentative explanations consciously based on logically insufficient arguments. With regard to them all that can be asserted is: The hypothesis does or does not contradict either logical principles or the facts as experimentally established and considered as true. In the first case it is untenable, in the second case it is—under the present state of our experimental knowledge—not untenable. (The intensity of personal conviction is purely subjective.) Neither frequency probability nor historical understanding enters into the matter.

The term hypothesis, applied to definite modes of understanding historical events, is a misnomer. If a historian asserts that in the fall of the Romanoff dynasty the fact that this house was of German background played a relevant role, he does not advance a hypothesis. The facts on which his understanding is founded are beyond question. There was a widespread animosity against Germans in Russia, and the ruling line of the Romanoffs, having for 200 years intermarried exclusively with scions of families of German descent, was viewed by many Russians as a germanized family, even by those who assumed that Tsar Paul was not the son of Peter III. But the question remains what the relevance of these facts was in the chain of events which brought about the dethronement of this dynasty. Such problems are not open to any elucidation other than that provided by understanding.

6. Betting, Gambling, and Playing Games

A bet is the engagement to risk money or other things against another man on the result of an event about the outcome of which we know only so much as can be known on the ground of understanding. Thus people may bet on the result of an impending election or a tennis match. Or they may bet on whose opinion concerning the content of a factual assertion is right and whose is wrong.

Gambling is the engagement to risk money or other things against another man on the result of an event about which we do not know anything more than is known on the ground of knowledge concerning the behavior of the whole class.

Sometimes betting and gambling are combined. The outcome of horse racing depends both on human action—on the part of the owner of the horse, the trainer, and the jockey—and on nonhuman factors—the qualities of the horse. Most of those risking money on the turf are simply gamblers. But the experts believe they know something by understanding the people involved; as far as this factor influences their decision they are better. Furthermore they pretend to know the horses; they make a prognosis on the ground of their knowledge about the behavior of the classes of horses to which they assign the various competing horses. So far they are gamblers.

Later chapters of this book deal with the methods business applies in handling the problem of the uncertainty of the future. On this point of our reasoning only one more observation must be made.

Embarking upon games can be either an end or a means. It is an end for people who yearn for the stimulation and excitement with which the vicissitudes of a game provide them, or whose vanity is flattered by the display of their skill and superiority in playing a game which requires cunning and expertness. It is a means for professionals who want to make money by winning.

Playing a game can therefore be called an action. But it is not permissible to reverse this statement and to call every action a game or to deal with all actions as if they were games. The immediate aim in playing a game is to defeat the partner according to the rules of the game. This is a peculiar and special case of acting. Most actions do not aim at anybody's defeat or loss. They aim at an improvement in conditions. It can happen that this improvement is attained at some other men's expense. But this is certainly not always the case. It is, to put it mildly, certainly not the case within the regular operation of a social system based on the division of labor.

There is not the slightest analogy between playing games and the conduct of business within a market society. The card player wins money by outsmarting his antagonist. The businessman makes money by supplying customers with goods they want to acquire. There may exist an analogy between the strategy of a card player and that of a bluffer. There is no need to investigate this problem. He who interprets the conduct of business as trickery is on the wrong path.

The characteristic feature of games is the antagonism of two or more players or groups of players.³ The characteristic feature of business within

3. "Patience" or "Solitaire" is not a one-person game, but a pastime, a means of escaping boredom. It certainly does not represent a pattern for what is going on in a communistic society, as John von Neumann and Oscar Morgenstern (*Theory of Games and Economic Behavior* [Princeton, 1944], p. 86) assert.

a society, i.e., within an order based on the division of labor, is concord in the endeavors of its members. As soon as they begin to antagonize one another, a tendency toward social disintegration emerges.

Within the frame of a market economy competition does not involve antagonism in the sense in which this term is applied to the hostile clash of incompatible interests. Competition, it is true, may sometimes or even often evoke in the competitors those passions of hatred and malice which usually accompany the intention of inflicting evil on other people. Psychologists are therefore prone to confuse combat and competition. But praxeology must beware of such artificial and misleading difference between catallactic competition and combat. Competitors aim at excellence and preeminence in accomplishments within a system of mutual cooperation. The function of competition is to assign to every member of a social system that position in which he can best serve the whole of society and all its members. It is a method of selecting the most able man for each performance. Where there is social cooperation, there some variety of selection must be applied. Only where the assignment of various individuals to various tasks is effected by the dictator's decisions alone and the individuals concerned do not aid the dictator by endeavors to represent their own virtues and abilities in the most favorable light, is there no competition.

We will have to deal at a later stage of our investigations with the function of competition.⁴ At this point we must only emphasize that it is misleading to apply the terminology of mutual extermination to the problems of mutual cooperation as it works within a society. Military terms are inappropriate for the description of business operations. It is, e.g., a bad metaphor to speak of the conquest of a market. There is no conquest in the fact that one firm offers better or cheaper products than its competitors. Only in a metaphorical sense is there strategy in business operations.

7. Praxeological Prediction

Praxeological knowledge makes it possible to predict with apodictic certainty the outcome of various modes of action. But, of course, such prediction can never imply anything regarding quantitative matters. Quantitative problems are in the field of human action open to no other elucidation than that by understanding.

4. See below, pp. 273-277.

We can predict, as will be shown later, that—other things being equal—a fall in the demand for a will result in a drop in the price of a . But we cannot predict the extent of this drop. This question can be answered only by understanding.

The fundamental deficiency implied in every quantitative approach to economic problems consists in the neglect of the fact that there are no constant relations between what are called economic dimensions. There is neither constancy nor continuity in the valuations and in the formation of exchange ratios between various commodities. Every new datum brings about a reshuffling of the whole price structure. Understanding, by trying to grasp what is going on in the minds of the men concerned, can approach the problem of forecasting future conditions. We may call its methods unsatisfactory and the positivists may arrogantly scorn it. But such arbitrary judgments must not and cannot obscure the fact that understanding is the only appropriate method of dealing with the uncertainty of future conditions.