CHAPTER V

PRAGMATIC JUSTIFICATION OF INDUCTION

It has been claimed by some philosophers that induction is pragmatically preferable to any other way of making predictions because it is most likely to reveal regularities if they exist in nature.

The pragmatic justification of induction was proposed by Herbert Feigl and elaborated by Hans Reichenbach. Both are founders of the logical empiricists movement. Their theory has been developed in recent years in many writings of W. C. Salmon.

The pragmatists think of the main task of the scientists, as finding the true laws of nature, if there be any such to be found. These laws of nature are either universal or statistical in character, i.e. either of the form `All A's are B' or `No A's are B', or the form ` 90% A's are B' or `the probablity of A being B is 9/10'.

If we want to find out a way of justifying inductive inference we must first of all try to establish a principle of induction. A principle of induction is a statement with the help of which we can put inductive inference into a logically defensible or guarded form. This principle is very important for scientific method. Reichenbach believes that this principle determines the truth of scientific theories. Herbert Feigl says, "The principle of induction is not a bit of knowledge, it is neither analytic nor synthetic, neither apriori nor aposteriori, it is not a proposition at all. It is rather the principle of a procedure, regulative maxim of an operational rule".[1]

In 1950 Herbert Feigl published an article `De Principiis Non Est Disputandum....?' It has come to be regarded a very famous piece of writing on the inductive problem. In it he distinguishes two kinds of justification; validation and vindication. He says "When we speak of `justification' we may have reference to the legitimizing of a knowledge - claim; or else we may have in mind the justification of an action. The first may be called "Justificatio Cognitionis" (validation); the second, "Justificatio actionis" (vindication). The rules of inductive and deductive inference serve as the justifying principles in validation; purposes together with (inductively confirmed or at least confirmable) empirical knowledge concerning means - ends relations, or in the extreme, degenerate case with purely logical truths, serve as the basis of vindication (pragmatic justification). Only ends can justify means, even if in accordance with the well known slogan it will be admitted that a given end may not justify the utilization of every means for its attainment".[2]

According to Feigl, rules, principles or propositions are validated by deriving them from more basic rules, principles and propositions. For example, a rule of conditional proof in deductive logic can be validated by proving that any conclusion which can be derived by using conditional proof, can also be proved by using only the basic logical rules. On the other hand vindication consists of showing that the adoption of a given rule, principle or proposition fulfills an accepted purpose. The fundamental rules of deduction would be vindicated if we can show that false conclusion can never be deducted from true premisses.

Feigl notes in his article `On the Vindication of Induction" that many analytic philosophers consider the quest for a justification of induction as a pseudo-problem because in their view this quest comes down to asking: Is it reasonable to be reasonable ? Because of an ambiguity of the term "reasonable" it is precisely here that the distinciton between `validation' and `vindication' is helpful. Feigl believes that a certain degree of probablity can be validated in the light of the available evidence and a rule of induction, when we ask for a justification of the given rule of induction the justification amounts to a vindication.

He says that in order to make predictions we need law like statements which may serve as premisses or as rules of inference. For the validation of these rules or laws, we require evidence and a rule of induction. A rule of induction must never be confused with a law of nature. Actually the laws of nature formulate deterministic or statistical regularities. If there are such regularities, it is obvious that the rule of induction will help to disclose them. Feigl considers the following formulation of the rule of induction. "Generalize from the broadest background of conceiveably relevant evidence, with maximum simplicity; the laws, be they deterministic or statistical, which result from such generalizations, are to be held open to revision (or even complete refutation) in the light of further forthcoming evidence".[3]

This formulation is prescriptive. It does not assert a uniformity of nature. It also indicates the self corrective character of the inductive procedure. It renders logically evident that if there is an order of nature of any kind, the inductive procedure is precisely designed as to catch hold of it. This rule of induction is the only one of which it can be shown that it is well adapted to the discovery of whatever regularities there might be in the universe. Karl Popper in his book 'Logic of Scientific Discovery' claims that the method of science consists in the severe testing of theories and that those theories which survive such testing are accepted in the corpus of science. He argues that there is no problem of induction.

Here Herbert Feigl argues against K. Popper that not all science is hypothetico - deductive. Even the non-refutation of some theories by severe testing is taken as a corroboration for the inductive trust in the validity of the theory in domains such as the future or in further ranges of the'theory' variables, in which the theory has not been tested.

Herbert Feigl argues that to ask for a general justification of inductive procedure is to ask for the impossible. We can justify particular inductions by reference to general principles of induction, but we cannot jusfity the principles in the same way. We can however ask for a vindication of the adoption of the rule of induction. Such a vindication consists precisely in showing that if the goal of predicting the future can be achieved, the rule of induction is a way to achieve it. This type of justification is given by Hans Reichenbach for what he calls `straight rule' of induction.

D. Kading argues that no pragmatic vindication succeeds, given the aim of predicting the future correctly. He says, we have no proof that inductive procedure would be the best method of fulfilling this aim. But Feigl never explicitly claimed that induction was the best method.

Reichenbach was the first philosopher to notice that Hume's argument excludes the possiblity of a validation of induction. He writes "Hume started with the assumption that a justification of inductive inference is only given if we can show that inductive inference must lead to success. In other words, Hume believed that any justified application of theinductive inference presupposes a demonstratation that the conclusion is true. It is this assumption on which Hume's criticism is based. His two objections directly concern only the question of the truth of the conclusion; they prove that the truth of the conclusion cannot be demonstrated. The two objections, therefore, are valid only in so far as the Humean assumption is valid. It is this question to which we must turn. Is it necessary for the justification of inductive inference to show that its conclusion is true ?".

Reichenbach gives an answer to this question by saying; "A rather simple analysis shows us that this assumption does not hold. Of course, if we were able to prove the truth of the conclusion, inductive inference would be justified; but the converse does not hold: a justification of inductive inference does not imply a proof of the truth of the conclusion. The proof of the truth of the conclusion is only a sufficient condition for the justification of induction, not a necessary condition".

Reichenbach maintains that the validation is the only way of approaching the problem of induction. He proceeds to argue that"... The inductive inference is a procedure which is to furnish us the best assumption concerning the future. If we do not know the truth about the future, there may be nonetheless a best assumption about it, i.e. a best assumption relative to what we know. We must ask whether such a characterization may be given for the principle of induction. If this turns out to be possible, the principle of induction will be justified".[4]

According to Reichenbach, this is a new type of justification, a vindication which shows that inductive inference satisfies the sufficient condition of predictive success. Thus the general problem of induction reduces to the subproblem whether it is possible to vindicate induction or not. If induction can be vindicated, the vindication takes the form of Reichenbach's pragmatic argument. Reichenbach developes his argument within the context of the frequency theory of probability. He argues that "Scientific method pursues the aim of predicting the future; in order to construct a precise formulation for the aim we interpret it as meaning that scientific method is intended to find the limits of the frequency".[5]

Reichenbach's analysis of the problem of induction is based on his conception of the aim of induction as the ascertainment of a limit of the frequency of occurence of events.

There are two stages in his argument. The first is his formulation of the rule of induction and second is the pragmatic justification of the rule.

According to him, rule of induction induces us to think that the limit of the relative frequency in a longer series of events is approximately the same as the relative frequency in an initial segment of the series. Reichenbach's rule of induction can be explained in the following way. Suppose that we have tossed a coin 200 times and that is has turned up heads 98 times, i.e. in an initial part of the series of coin tosses the relative frequency with which it has turned up head is 98/200. Here Reichenbach's rule of induction tells us to surmise that, if the coin is tossed long enough, the relative frequency with which heads occurs would remain approximately 98/200. More exactly his rule is that if in an initial segment of a series of events the relative frequency with which A's have been B's is m/n (where n is the number of A's and m is a number of A's that are B's), we can hold that in the long run, as the number of A's gets larger and larger, the relative frequency will continue to be approximately m/n. The relative frequency of occurence of any event continues to vary gradually as the number of observed instances increases, and the prediction or surmise about future cases is based on this fact.

Reichenbach claims that "The aim of induction is to find series of events whose frequency of occurence converges towards a limit".[6]

He conceives that the task of induction is that of estimating the limit of the relative frequency in an infinite series. As such all hypothesis in science are to be constructed as probability statements of this sort. We can only examine a finite initial segment of the series, yet we wish to estimate what will be the ultimate limit. For example if we have observed 1000 cloudy days and found that in just 500 cases there was rain, we can conclude that fifty percent of all cloudy days are followed by rain, that is the limit of the relative frequency of rain, in this finite series is 50%. Again if we have observed 100 swans and all have been found to be white, then we can accept the inductive generalization that all swans are white. It means that 100% is the limit of the relative frequency of whiteness in an infinite series of swans. In effect, the rule of induction which Reichenbach advocates is that if the relative frequency of a particular characteristic is such and such in the the part of the series so far observed, then we may adopt this same percentage as our best estimate of the limit of the relative frequency in an infinite series. The larger number of observed cases provide the greater weight to this estimate.

Reichenbach says that when we have observed only a small number of cases our estimate of the limit of the relative frequency in the long run may be very roughly made and may continue to be wrong for a long time. But if there is a limit of relative frequency then sooner or later by continuing application of the inductive procedure in course of time our estimate will diverge less and less from true value. If there is no limit then no probablity would exist and there would be nothing to be discovered. But if the limit does exist then this rule of enumerative induction will enable us to estimate it to any desired degree of accuracy provided we continue the search long enough.

If the world is predictable then what is the logical function of the principle of induction ? For this purpose we may consider the definition of limit. "The frequency h^n has a limit at p, if for any given E there is an n such that h^n is within p $\pm$ E and remains within this interval for all the rest of series. We may infer from the definition of limit that if there is a limit, there is an element of the series from which the principle of induction leads to the true value of limit. In this sense the principle of induction is a necessary condition for the determination of a limit'.[7]

Reichenbach formulates the rule of induction as follows: "If an initial section of n elements of a sequence x_i is given, resulting in the frequency f^n, and if, furthermore, nothing is known about the probablity on the second level for the occurrence of a certain limit p, we posit that the frequency $f^{i}(i>n)$ will approach a limit p within $f^{ni} \pm e$ when the sequence is continued".[8]

Reichenbach gives very much importance to his argument that nothing is known about the existence of sequences of events whose frequency of occurrence converges to a limit. The definition of the concept of the limit of an infinite series is such that a series $n_1, n_2 \ldots\ldots\ldots,$ is characterized as having a limit if an only if there is a number p such that, however we choose a small positive number e, there is an n_1 such that for every n_j, if $n_j > n_i$, the absolute difference between the relative frequency f^{ni} and p is less than e. This means that for the purpose of vindicating induction we cannot know whether there is such a p for any sequence of events.

Reichenbach believes that from the fact that we should have no kowledge of the existence of regularities it does not follow that there are no regularities. He says "We have no proof for the assumption (of the existence of a limit of the frequency). But the absence of proof does not mean that we know that there is no limit; it means only that we do not know whether there is a limit. In that case we have as much reason to try a posit as in the case that the existence of a limit is known; for, if a limit of the frequency exists we shall find it by the inductive method if only the acts of positing are continued sufficiently".[9]

How do we know that induction constitutes the best means or at least an adequate one, for finding limits if there exist any ? Reichenbach answers that if there is a limit of the frequency the use of the rule of induction will be a sufficient condition to find the limit to a desired degree of approximation. There may be other methods. But we do not know whether there is a limit. We can say, if there is any way to find a limit the rule of induction will be such a way.

Reichenbach's formulation of induction as "a procedure in which the relative frequency observed statistically is assumed to hold approximately for any future prolongation of series"[10], has come to be known as "the straight rule". By analogy let us call the other convergent rules as "crooked rules".

We can state that the problem which Reichenbach tried to solve is the problem of grounding a preference for the straight rule over each of the infinitely many crooked rules.

Reichenbach gives two solutions for this problem. The first is in his book "Experience and Prediction", and second in the book "The Theory of Probablity". The first is this:

"The `correction' Cn may be determined in such a way that the resulting wager furnishes even at an early stage of the series a good approximation of the limit p........ On the other hand it may happen also that Cn is badly determined, i.e. that the convergence is delayed by the correction. If the term Cn is arbitrarily formulated we know nothing about the two possibilities. The value Cn=0 - i.e. the inductive principle is therefore the value of the smallest risk; any other determination may worsen the convergence. This is the practical reason for preferring the inductive principle".[11]

According to Reichenbach these considerations provide a logical structure of the inductive inference. We can say that the applicability of the inductive principle is a necessary condition of the determination of a limit of the frequency.

The second `solution' Reichenbach offers may be introduced thus in his own words. "The rule of induction has the advantage of being easier to handle, owing to its descriptive simplicity. Since we are considering a choice among methods all of which will lead to the aim, we may let considerations of a technical nature determine our choice".[12]

In order to understand Reichenbach's argument, we should go into his discussion of Descriptive and Inductive simplicity. Descriptive simplicity is a phychologistic concept while inductive simplicity is an epistomological one. According to

Reichenbach Descriptive simplicity has nothing to do with truth. "For this kind of simplicity concerns only the description and not the facts co-ordinated to the description".[13] E.g. the metrical system may be said to be (descriptively) simpler than the system of yards and inches in that it makes measurement easier and economical in practice. But there is no difference between the two systems so far as truth-character (correctness) is concerned. Inductive procedure has descriptive simplicity in relation to other empirical methods with the same aim.

Descriptive simplicity as a criterion applies in cases where two or more constructions are logically equivalent in terms of their empirical content. On the other hand inductive simplicity applies in cases where two or more constructions are logically non-equivalent with respect to certain of their as yet-unverified consequences. Thus inductive simplicity is relevant to the choice between various hypothesis or theories when they are equally well supported by the available evidence, when the unverified consequences of some methods are inconsistent with those of the others. Reichenbach holds that the inductive method is preferable additionally on account of its greater or better power of correct prediction, i.e. on account of inductive simplicity also. Reichenbach's position becomes trivial when he gives an account of descriptive and inductive simplicity together with his claim that the straight rule is preferable on the basis of descriptive simplicity. We cannot make the choice between the straight rule and the crooked rules in terms of descriptive simplicity or inductive simplicity. "By definition the criterion of descriptive simplicity applies only to constructions which are logically equivalent; and the various members of the class of convergent rules are incompatible with each other. Since before convergence takes place, each gives different posits from each of the others. But, on the other hand, the choice between the straight rule and the crooked rules cannot be made on the basis of inducvtive simplicity either. As this notion has been defined the criterion of inductive simplicity makes its selection of the simplest construction on an inductive assumption to the effect that the simplest construction is the best predictor. Because this assumption has a truth-character, Reichenbach insists it itself must be justified within the theory of probablity and induction".[14] Since he prefers the straight rule on the basis of inductive simplicity which assumes true character, he commits a petitio principii, because correctness of inductive prediction, which is to be proved, is assumed.

J. Lenz has criticized Reichenbach's rule of induction. This rule does not enable us to predict what will happen in the short run (for example, to predict that in the next 100 tosses of the coin, the frequency of heads occuring would be what it had been in the preceeding 100 tosses). This means that even if Reichenbach succeeds in justifying his rule of induction, it does not follow that he will have succeeded in justifying a rule of induction enabling us to predict what happens in the short run.

According to Lenz, Reichenbach in his `pragmatic justification of induction' gives no assurance that any of the predictions one actually makes using his rule are corect or even probably correct. He only shows that repeated use of inductive rule will lead to success, if success is possible. He gives no reason for believing success is possible. It hardly helps to be assured that the repeated use of the inductive method will eventually lead to success. Still even if success is achieved by using his rule of induction, one will never know it on the strength of Reichenbach's justification, as he accepts that we do not know how many attempts with the inductive method we must make before success comes.

While Reichenbach offers a deductive proof that induction is most likely to succeed in discovering relative frequency limits where they exist, he fails to give any such proof that rational degrees of confidence about the future can only be estimated via knowledge or belief of limiting values of relative frequencies. Indeed all he does is to cite some example where our confidence is based on such knowledge. The least modification of his argument to meet this defect would be a proof that the ultimate aim of induction, that is correct prediction, could only be achieved via the discovery of probability laws as defined. However, such a proof has not been produced and does

that it has worked in the past. Certainly if any method is going to be a method that has worked in the past and will work in the future then a necessary condition is that it should have worked relative frequencies in infinite series. This has several untoward consequences. For one thing it would oblige us to suppose that whenever one asserts an inductive generalization, for example `All swans are white', one is committing oneself to the untestable metaphysical assumption that there exist an infinite number of swans. According to Reichenbach's analysis `All swans are white' might be true - that is, the limit of the relative frequency of whiteness in the infinite series of swans might be 100 percent. Reichenbach makes the meaning of an inductive generalization be a relative to the arrangement of things in a series. By rearranging the order of the items in a series one can alter the limit of a relative frequency in that series; suppose that we have a series of swans numbered 1,2,3,4, etc. and that every even numbered swan is white while every odd numbered swan happens not to be white. Then if we consider these swans in the numerical order, we shall say that half are white in a certain finite range. We can re-arrange these same swans in a slightly different order:1,3,2,5,7 or 9,11,6, etc. In this series the relative frequency of white swan is one third. In this way according to Reichenbach's view we can assert an inductive generalization only if one specifies the order in which the items of the finite series are arranged. This seems unsatisfactory because we suppose ourselves to understand quite well enough what it means to assert that all swans are white without having decided upon any order in which a series of swans are to be arranged.

John Lenz has criticized Reichenbach's views. According to him "Reichenbach does mention simplicity as a ground for choosing the straight rule, but this is surely a very weak ground and is, in any case separate from his `pragmatic justification'".[15]

Reichenbach's account of induction does not provide us with any guarantee that after any specified number of observations we are entitled to assume that our estimate of the long run relative frequency will be within some specified degree of accuracy. Therefore, it does not seem that his abstract justification could serve to justify any concrete inductive argument.

There are other difficulties in Reichenbach's views on the justification of induction. W. C. Salmon has developed his views and tried to avoid the difficulties. Salmon has shown great resourcefulness in defending Reichenbach's view of `Pragmatic justification of Induction'.

According to Salmon the most crucial objection against Reichenbach is the following: In Reichenbach's view, we are justified in selecting his rule of induction on the grounds of `descriptive simplicity'. But Salmon claims that descriptive simplicity cannot be considered as a basis for selecting one rule from the infinite class of asymptotic rules.

Salmon's defence and fortification of Reichenbach's practicalist justification of induction is combined with his criticism of the opponents of the theory. Max Black is one of the main critics of Reichenbach's view. He argues that the pragmatic justification can apply as well to the inductive policy. (If m of A's have been B, then we may predict a future ratio of $\frac{n-m}{n}$) as to the conventional one. This policy is also self-corrective and may lead to success and so on. Salmon argues that this is not the case. Indeed prediction made in accordance with Black's rule are contracidtory. For example if $\frac{1}{8}$ of the A's are B_3, $\frac{5}{8}$ of them B_1, and $\frac{2}{8}$ of them B_2 then Black's rule would lead to the prediction that $\frac{7}{8}$ of the A's are B_3, $\frac{6}{8}$ are B_2 and $\frac{3}{8}$are B_1 or (supposing B_1 B_2 B_3 mutually exclusive) that $\frac{16}{8}$of the A's have one or another of these properties. Such absurd results refute Black's contention.

Salmon says. "Let us use the symbol `IV Lim F^n (A,B)' to denote the inferred value of the limit of the relative frequency of B on the basis of the sample consisting of the first n members of A. We can lay down the following normalizing condition:

Let B_1..............B_k be any set of attributes mutually exclusive and exhaustive within A. The following relations must hold:

$$IV \; Lim \; F^n \; (A,B_1) \geq 0$$

$$\sum_{i=1}^{k} IV \; Lim \; F^n(A,B_1)=1$$

Rules which satisfy the normalizing condition are called 'regular'".[16]

The question may arise: How many regular asymptotic rules are there ? Salmon replies that there are innumerable regular asymptotic rules. For any given sequence the results of all asymptotic rules converge to the same value, that is the limit of the relative frequency, the convergency is non uniform.

Salmon asserts that only the rule of induction by enumeration for inferring limits of relative frequencies is free from contradiction, and says that every other rule except this one permits a logical contradiction on the basis of consistent evidence.

There is a choice: either we accept the rule of induction by enumeration for purposes of inferring limits of relative frequencies or we forgo entirely all attempts to infer the limits of relative frequencies. If the limits of relative frequencies exist, the persistent use of induction by enumeration will establish them to any desired degree of accuracy. Salmon attempts to tackle the problem of the 'short run' by suggesting that we make an estimate of the relative frequency and then apply that estimate to the short run. Many approaches have been made to solve the problem of the short run. One approach is the attempt to justify a short run rule for inferring the relative frequency in finite sample from the value of limit of the relative frequency in an infinite sequence. Another approach is to attempt to justify a rule of inferring directly from one finite sample to another non overlapping finite sample. Salmon admits in his article 'The Predictive Inference' that there are completely arbitrary rules, that have the same justification that he offers for the natural rule.

Salmon provides a further development along these lines in 1961. In his article 'Vindication of Induction', Salmon suggests two criteria - The criterion of convergence and the criterion of linguistic invariance - which are offered in the hope that they would lead to plausible solutions both for the short run problem and for the problem of selecting a unique member of the family of asymptotic rule. The criterion of linguistic invariance states that "no inductive rule is acceptable if the results it yeilds are functions of the arbitrary features of the choice of language".[17] He shows that only the straight rule satisfies his criterion of linguistic invariance. Salmon gives the following definition for the criterion of Linguistic invariance.

"Whenever two inductive inferences are made according to the same rule, if the premiss of the one differs purely linguistically from the premisses of the other then the conslusion of the one must not contradict the conclusion of the other".[18]

In `The Pragmatic justification of Induction', Salmon again gives a criterion of Linguistic invariance.

"Given two logically equivalent descriptions (in the same or different languages) of a body of evidence, no rule may permit mutually contradictory conclusions to be drawn on the basis of these statements of evidence".[19]

The force of this criterion may be explained by the following examples. "If in a scientific experiment, the result that a certain bar of iron is thirty six inches long confirms some hypothesis to a certain degree, then the criterion requires that the result that the same bar of iron is three feet long must conform that same hypothesis to the same degree. Similarly, suppose that we have observed the ratio of A's in a particular sample which are both red and round is m/n. It follows, that the ratio of A's in the same sample which are round and red is also m/n. If an inductive rule permits us to infer from the fact that m/n A's are red and round that the limit of the relative frequency of things being red and round in A is p, and the same inductive rule permits us to infer from the fact that m/n A's are red and round that the limit of the relative frequency of things being both red and round in A is q, where $p \neq q$, Salmon assumes that this rule would violate the criterion".[20]

In brief we can have a look on Salmon's attempt for giving a precise formulation to Reichenbach's theory. Salmon attempts to show that rule of induction by enumeration is superior than any other rules because it satisfies all the three criterion of asymptotic character, regularity and linguistic invariance. Salmon gives the following table to show the possiblities of rejecting the other rules of inference:

"	Rule	Asymptotic	Regular	Linguistically Invariant
(1)	Induction by enumeration	Yes	Yes	Yes
(2)	Apriori	No	Yes	No
(3)	Counter-inductive	No	No	Yes
(4)	Compromise	No	Yes	No
(5)	Normalized Counter-inductive	No	Yes	No
(6)	Vanishing Compromise	Yes	Yes	No "[21]

Salmon's comparative assessment of the inductive method and other anti-scientific method is as follows: "if an anti scientific method can be presented with some degree of clarity, we can examine it from the standpoint of regularity, lintguistic invariance, and convergence (asympotic properties), and perhaps show its inferiority to scientific methods".[22]

Stephen Barker claims to refute Salmon's conclusion. He tries to show that the straight rule violates the criterion of linguistic invariance. Barker gives an example of Nelson Goodman's curious predicates "Grue" and "Bleen", "Grue" meaning green before 2000 A.D. and blue afterwards. "Bleen" is defined correspondingly. Clearly the straight rule, as applied to a sequence of emeralds will lead us to make the estimate that the proportion of emeralds that are green is 1, and also that the proportions of emeralds that are grue is 1. But nothing can be both grue and green, so we are led again to an inconsistency.

Salmon attempts to give an answer to Barker's criticism by stipulating that the straight rule of estimation be applied only to purely ostensive predicates. He argues that Goodman type predicates are not "purely ostensive" because they must be defined. Grue things do not look alike, while green ones do. A purely ostensive predicate is one which has these characteristics: "(1) It can be defined ostensively. (How it is, infact, defined is immaterial). (2) Its positive and negative instances for ostensive definition can be indicated non-verbally. (3) The respect in which the positive instances resemble each other and differ from the negative instances is open to direct inspection, i.e. the resemblance in question is an observable resemblance".[23] This solution of Salmon is not all together satisfactory.

Brian Skyrms refutes the Salmon's characteristic of a purely ostensive predicate. According to him it is not very clear that what is meant by an "observable resemblance". If observable resemblance is taken as a substitute for `ostensive definable' then the definition is circular. He says, "that the occurrence of the model "can" in the definition precludes any attempt to define the physical modalities in term of our inductive logic".[24]

Max Black's main argument against Salmon is that this whole approach is wrong because anything we observe in the short run is compatible with any value of the limiting frequency.

Madden also has doubts about the adequacy of Salmon's principle of linguistic invariance. He says that suppose one of the rules other than the straight rules, one would be successful immediately but that the straight rule would not be successful because it is neither known to be true nor known to be false: In these circumstances we would certainly adopt the rule which was successful sooner. On the other hand if we believe that the straight rule is the only really successfull way of inductively knowing the future, then we are inductively justifying it and so giving up Reichenbach's vindication.

John Lenz points out that although continued use of straight rule will eventually give the true law, no one would ever know when it had been found. Lenz says that science is often interested in making short run prediction, the pragmatist cannot justify such predictions.

Prof. Black's objections against the pragmatic justification of induction is that, practicalists have narrowed the aim of science. Certainly science is not usually content to predict long run relative frequencies of events, it usually strives to predict the relative frequency of events in the short run. The practicalists pragmatic justification gives no assurance that such predictions of short run frequencies are correct or even probably correct. Reichenbach says that the frequency theory could not handle short run relative frequency directly. Here Lenz points out that even if we know that long run relative frequency of two events, we still cannot know the short run relative frequency of these events. We could do so only if we know that the short run relative frequencies approximate those of the long run but we have no assurance. He believes that "pragmatic justification of induction gives no assurance that any of the predictions that science actually makes are correct or even probably correct".[25]

According to Hacking "Salmon's argument on behalf of the straight rule amounts to an adequate justification only in those cases where the total relevant evidence consists of information regarding relative frequencies in the observed sample.

The straight rule is useless in the majority of cases under consideration unless it can be shown that the information is irrelevant to estimates of relative frequency. Hacking argues that Salmon fails to produce an argument to establish such irrelevance".[26]

Salmon in his paper "Short run" tries to build one pragmatic justification upon another argument, in effect that we have `nothing to lose' by assuming that `practical convergence' will occur in the finite series of events we shall in fact observe. But in his later paper "The predictive inference" he confesses that this attempt was a failure. He concludes "The treatment of the problem offered in "The short run" is totally inadequate. Among the rules justifiable by the arguments there presented we can find one which would justify any consistent prediction whatsoever about the short run. The whole difficulty seems to steer from the introduction of the limit of relative frequency as a mediator between the finite observed sample and the short run prediction".[27]

Although Salmon strenuously attempts to improve Reichenbach's original conception by providing supplementary reasons for rejecting unwanted non-standard policies, the prospects for vindicationism remains dubious. The determination of limiting values of relative frequencies is an intractable problem of inductive method.

Even though there has been real progress in inductive logic in recent years there is no satisfactory solution for the problem of determination of limiting values of relative frequencies and the problem of the short run.

Although Pragmatic justification of induction is full of short comings yet it has an important role in philosophy of science .