Bayesian Inference

On why is it inconsistency to say: my forecast is 85% and I may change my mind if new information comes in.

Fundamental generators or pictures to draw:
Contingency table

Bayesian inference (/ˈbeɪziən/ *BAY-zee-ən* or /ˈbeɪʒən/ *BAY-zhən*)[1] is a method of statistical inference in which Bayes' theorem is used to update the probability for a hypothesis as more evidence or information becomes available. Bayesian inference is an important technique in statistics, and especially in mathematical statistics. Bayesiar updating is particularly important in the dynamic analysis of a sequence of data. Bayesian inference has found application in a wide range of activities, including science, engineering, philosophy, medicine, sport, and law. In the philosophy of decision theory, Bayesian inference is closely related to subjective probability, often called "Bayesian probability".

If new information comes in, you adjust but subsequent information may also come in.

Contingency table

Hypothesis / Evidence	Satisfies hypothesis H	Violates hypothesis ¬H	Total
Has evidence E	**P(H|E)·P(E)** = P(E|H)·P(H)	**P(¬H|E)·P(E)** = P(E|¬H)·P(¬H)	**P(E)**
No evidence ¬E	**P(H|¬E)·P(¬E)** = P(¬E|H)·P(H)	**P(¬H|¬E)·P(¬E)** = P(¬E|¬H)·P(¬H)	**P(¬E) = 1−P(E)**
Total	P(H)	P(¬H) = 1−P(H)	1

Cox's theorem, named after the physicist Richard Threlkeld Cox, is a derivation of the laws of probability theory from a certain set of postulates.[1][2] This derivation justifies the so-called "logical" interpretation of probability, as the laws of probability derived by Cox's theorem are applicable to any proposition. Logical (also known as objective Bayesian) probability is a type of Bayesian probability. Other forms of Bayesianism, such as the subjective interpretation, are given other justifications.

Cox's assumptions [edit]

Cox wanted his system to satisfy the following conditions:

1. Divisibility and comparability – The plausibility of a proposition is a real number and is dependent on information we have related to the proposition.
2. Common sense – Plausibilities should vary sensibly with the assessment of plausibilities in the model.
3. Consistency – If the plausibility of a proposition can be derived in many ways, all the results must be equal.

The postulates as stated here are taken from Arnborg and Sjödin.[3][4][5] "Common sense" includes consistency with Aristotelian logic in the sense that logically equivalent propositions shall have the same plausibility.

The postulates as originally stated by Cox were not mathematically rigorous (although more so than the informal description above), as noted by Halpern.[6][7] However it appears to be possible to augment them with various mathematical assumptions made either implicitly or explicitly by Cox to produce a valid proof.