

*A Bayesian Foundation
for Classical Hypothesis Testing*

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ABSTRACT

A decision-maker can ensure dynamic consistency by following Bayes' rule, but he may wish to balance such consistency against other goals. That is, when the decision-maker is surprised by a pattern unaccounted for in his prior, he may wish to change his beliefs in a way which violates Bayes' rule, but he may also wish to limit his inconsistency. We show that if such non-Bayesian events, or "paradigm shifts," are rare, in the sense that they occur only with a small probability α according to the decision-maker's initial belief, the decision-maker will be "approximately" dynamically consistent. Our notion of "approximate" dynamic consistency is that the possible arbitrage against the decision-maker is small compared to the size of his transactions. The quantity α is equivalent to the level of a classical hypothesis test, so our results provide a decision-theoretic foundation for the classical criteria for rejecting a null hypothesis. Our findings give the decision-maker some latitude to revise his model while bounding the pain of inconsistency, and unify the classical and Bayesian modes of inference.