

Financial Mathematics

Bayes' Law

0048-1. Suppose Odds[A] = 5, $\Pr[B|A] = 0.7$
and $\Pr[B|(\text{not } A)] = 0.8$.

a. Find Odds[A|B].

Suppose, in addition, that

$$\Pr[C|(B \& A)] = 0.3$$

and $\Pr[C|(B \& (\text{not } A))] = 0.1$.

b. Find Odds[A|(B & C)].

0048-2. Let C_1, \dots, C_9 be iid binary PCRVs with
 $\Pr[C_j = 1] = 0.5 = \Pr[C_j = -1]$,
 \forall integers $j \in [1, 9]$.

Let $S := C_1 + C_2 + C_3$ and $T := C_1 + \dots + C_9$.

a. Update the probabilities on C_1 under the information that $S = 1$.

That is, compute

$$\text{both } \Pr[(C_1 = 1) | (S = 1)] \\ \text{and } \Pr[(C_1 = -1) | (S = 1)].$$

b. Update the probabilities on C_1 under the information that $S = 1$ and $T = 3$.

That is, compute

$$\text{both } \Pr[(C_1 = 1) | (S = 1) \& (T = 3)] \\ \text{and } \Pr[(C_1 = -1) | (S = 1) \& (T = 3)].$$

0048-3. Let A and B be events

s.t. $\Pr[A|B] = 0.9,$

s.t. $\Pr[A] = 0.4$

and s.t. $\Pr[B] = 0.3.$

Find $\Pr[B|A].$

0048-4. Let A , B and C be events

s.t. $\text{Odds}[A] = 4/3,$

s.t. $\Pr[B|A] = 0.1,$

s.t. $\Pr[B|(\text{not } A)] = 0.2,$

s.t. $\Pr[C|(B \& A)] = 0.6,$

and s.t. $\Pr[C|(B \& (\text{not } A))] = 0.2.$

Find $\text{Odds}[A|(B \& C)].$