STAT 2112 Midterm Test Formula Sheet

Criterion of Realism (Hurwicz):

$$\alpha \times (\text{maximum payoff for an alternative}) + (1\text{-}\alpha) \times (\text{minimum payoff for an alternative})$$

Expected Monetary Value

$$\textbf{EMV} = (\text{payoff of first state of nature}) \times (\text{probability of first state of nature}) +$$
$$+ (\text{payoff of second state of nature}) \times (\text{probability of second state of nature}) +$$
$$+ \ldots + (\text{payoff of last state of nature}) \times (\text{probability of last state of nature})\,\mathbf{.}$$

Expected Opportunity Loss

$$\textbf{EOL} = (\text{regret of first state of nature}) \times (\text{probability of first state of nature}) +$$
$$+ (\text{regret of second state of nature}) \times (\text{probability of second state of nature}) +$$
$$+ \ldots + (\text{regret of last state of nature}) \times (\text{probability of last state of nature})\,.$$

Expected Value with Perfect Information

$$\textbf{EVwPI} = (\text{best payoff of the first state of nature}) \times (\text{probability of first state of nature}) +$$
$$+ (\text{best payoff of the second state of nature}) \times (\text{probability of second state of nature}) +$$
$$+ \ldots + (\text{best payoff of the last state of nature}) \times (\text{probability of last state of nature})\,.$$

Expected Value of Perfect Information

EVPI = EVwPI – Max EMV = EVwPI – EVwoPI

Expected Value of Sample Information

$$\textbf{EVSI} = \begin{pmatrix} \text{expected value of best decision} \\ \text{with sample information,} \\ \text{assuming no cost to gather it} \end{pmatrix} - \begin{pmatrix} \text{expected value of} \\ \text{best decision without} \\ \text{sample information} \end{pmatrix} =$$

= EVwSI – Max EMV = EVwSI – EVwoSI

$$\textbf{Efficiency} = \frac{EVSI}{EVPI}$$

Table: Computation of Posterior Probabilities

(1) States of Nature	(2) Prior Probabilities	(3) Conditional Probabilities	(4) Joint Probabilities (2) x (3)	(5) Posterior Probabilities (4) /∑(4)

BAYES' THEOREM (for calculation of Posterior Probabilities)

The probability of event B_i given that event A has occurred is given by the formula

$$P\left(B_i \middle| A\right) = \frac{P(B_i)P\left(A \middle| B_i\right)}{P(B_1)P\left(A \middle| B_1\right) + P(B_2)P\left(A \middle| B_2\right) + \cdots + P(B_k)P\left(A \middle| B_k\right)}$$

where $B_1, B_2, \cdots, B_k$ are **mutually exclusive** and **collectively exhaustive** events.