Decision Making under Risk

Probabilities of states of nature is known.

Selecting the alternative with the highest expected monetary value

Expected Monetary Value (EMV)

- Expected value or mean value
- Long-run average value of a decision
- Sum of possible payoffs of the alternative, each weighted by the probability of that payoff occurring

$$EMV\ (\text{alternative}) = \sum X_i P(X_i)$$

where X_i = payoff for the alternative i

$P(X_i)$ = probability of achieving payoff X_i

Example: Thompson Lumber Company

Alternatives	State of Nature	
	Favorable Market	Unfavorable Market
Construct a large plant	200,000	- 180, 000
Construct a small plant	100,000	- 20, 000
Do Nothing	0	0
Probabilities	0.5	0.5

Decision Table with EVM

Alternatives	State of Nature		EVM
	Favorable Market	Unfavorable Market	
Construct a large plant	200,000	- 180,000	10,000
Construct a small plant	100,000	- 20,000	40,000
Do nothing	0	0	0
Probabilities	0.5	0.5	

Expected Value of Perfect Information (EVPI)

- Expected Value with Perfect Information (EVwPI)

$$EVwPI = \sum (\text{best payoff in state of nature})(\text{Probability of state of nature})$$

- Expected Value of Perfect Information (EVPI)

$$EVPI = EVwPI - \text{best } EMV$$

Decision Table with EVM

Alternatives	State of Nature		EVM
	Favorable Market	Unfavorable Market	
Construct a large plant	200,000	- 180,000	10,000
Construct a small plant	100,000	- 20,000	40,000
Do nothing	0	0	0
Probabilities	0.5	0.5	

Decision Table with Perfect Information

Alternatives	State of Nature		EVM
	Favorable Market	Unfavorable Market	
Construct a large plant	200,000	- 180,000	10,000
Construct a small plant	100,000	- 20,000	40,000 ← best EVM
Do nothing	0	0	0
Probabilities	0.5	0.5	
Best Payoff	200,000	0	100,000 ← EVwPI

EVPI = 60,000