Decisions Under Uncertainty

Module 2: Simple Information Value

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The Value of Information

Expected Value of Information (EVI) = Change in Expected Value of a Decision
=Change in "Expected Opportunity Loss" (EOL)

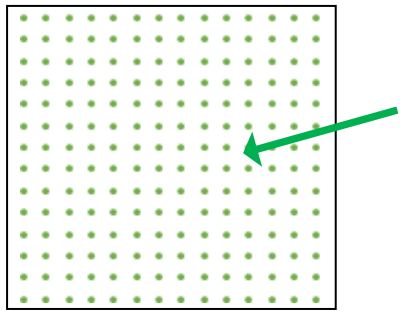
Opportunity Loss = The Cost of Being Wrong

Expected Opportunity Loss = The Cost of Being Wrong x Chance of Being Wrong

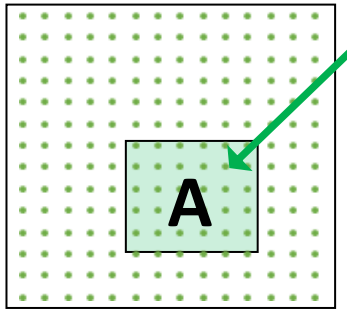
Expected Value of Perfect Information (EVPI) = EOL

Basic Probabilities

Probability is Equivalent to “Proportion”



E: Every Possibility

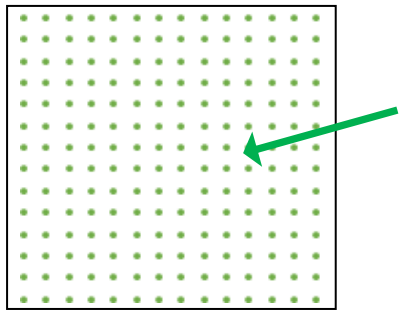


Subset of E

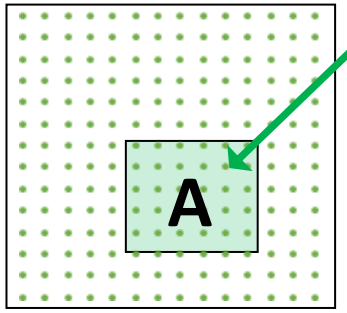
$$\frac{A}{E} = P(A)$$

Basic Probabilities

Probability is Equivalent to “Proportion”



E: Every Possibility



Subset of E

$$\frac{A}{E} = P(A)$$

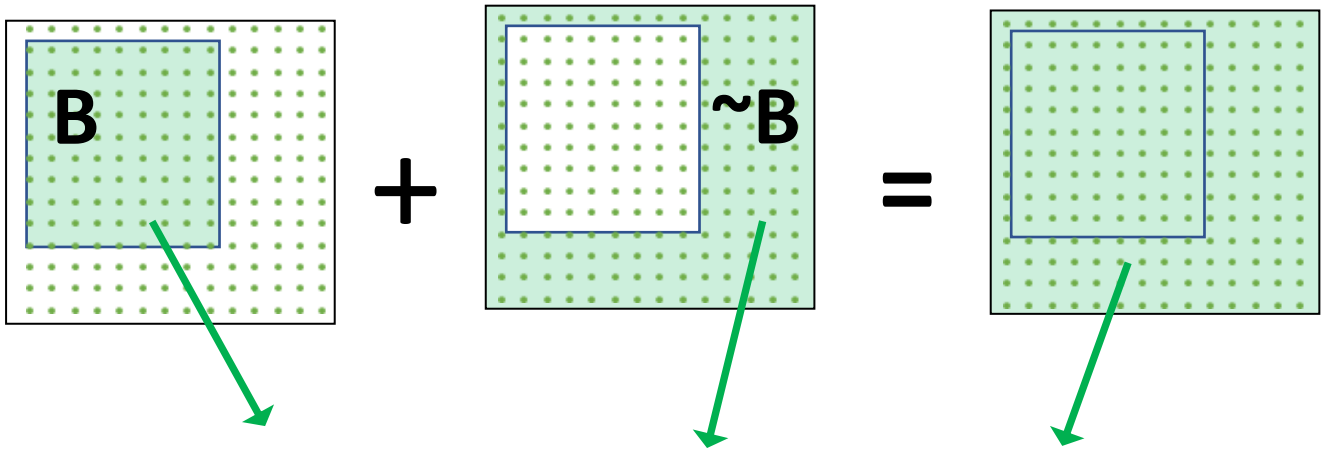
- Probabilities include 0, 1 and everything between them.

$$0 \leq P(A) \leq 1$$

- Ideally, they would be based on actual data but often a subjective “equivalent” is sufficient to guide a decision.

The Complement Rule

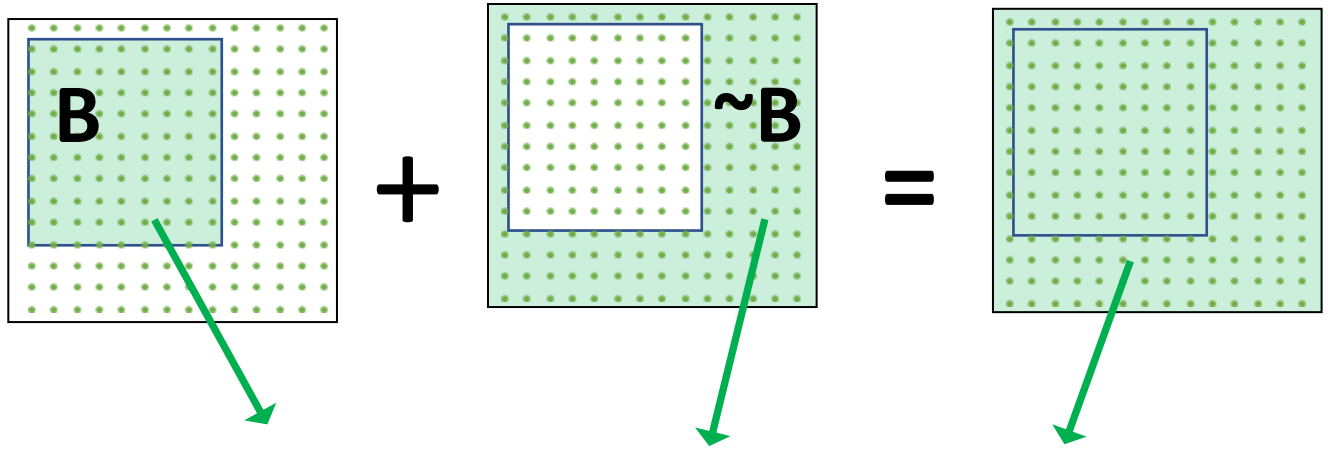
"To B or Not to B"



$$P(B) + P(\sim B) = 1$$

The Complement Rule

"To B or Not to B"

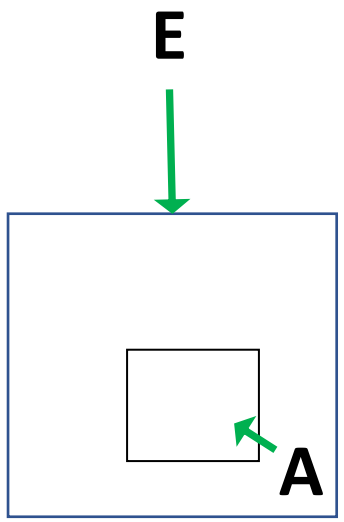


$$P(B) + P(\sim B) = 1$$

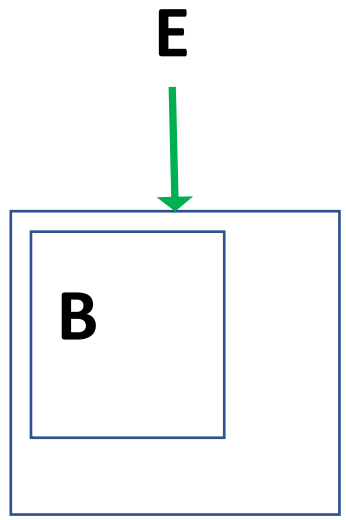
$$P(\sim B) = 1 - P(B)$$

Conditional Probabilities

The “It Depends” Rule



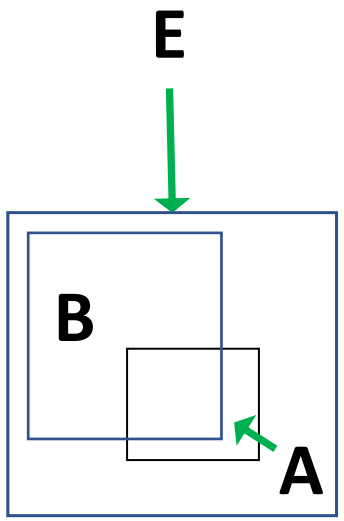
$$\frac{A}{E} = P(A)$$



$$\frac{B}{E} = P(B)$$

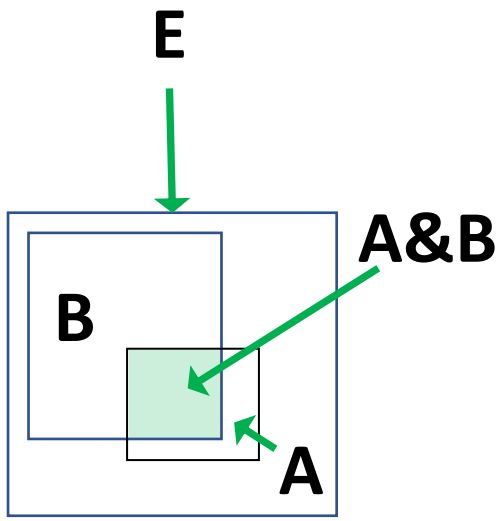
Conditional Probabilities

The “It Depends” Rule



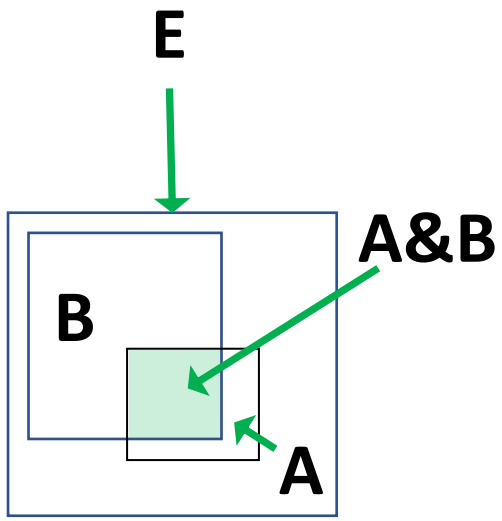
Conditional Probabilities

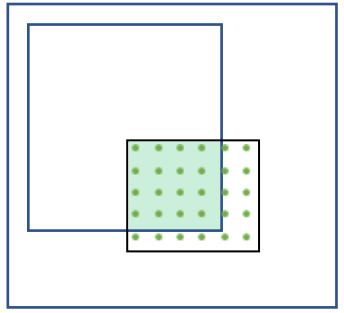
The “It Depends” Rule



Conditional Probabilities

The “It Depends” Rule

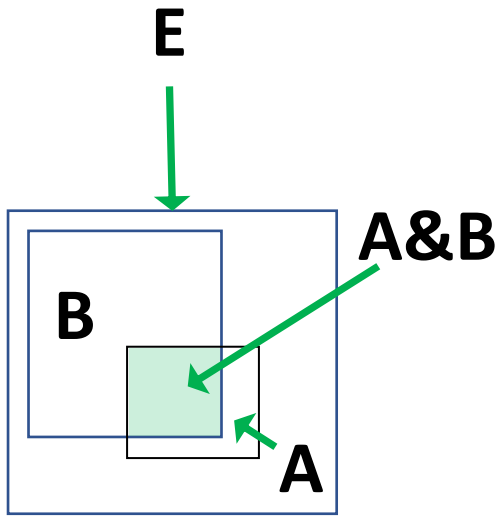


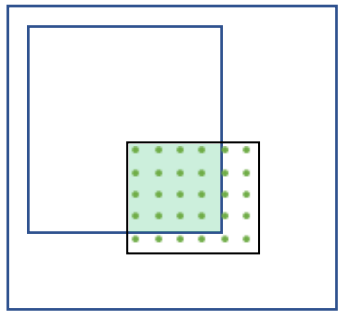


$$= \frac{A\&B}{A} = P(B|A)$$

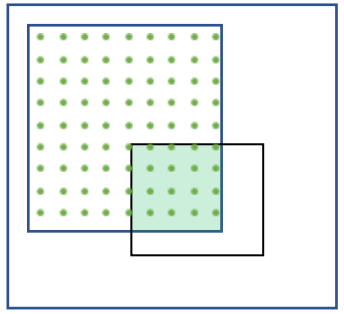
Conditional Probabilities

The “It Depends” Rule





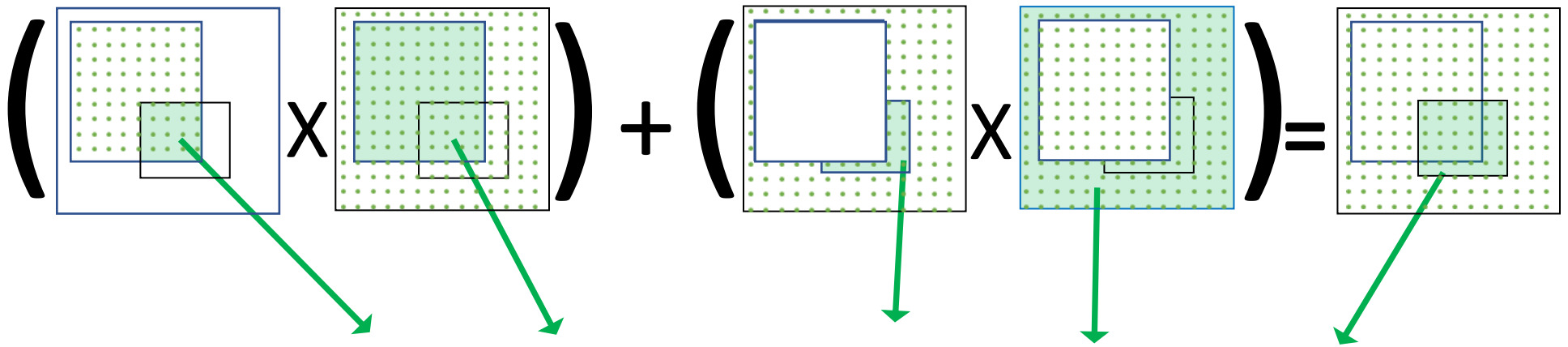
$$= \frac{A\&B}{A} = P(B|A)$$



$$= \frac{A\&B}{B} = P(A|B)$$

The Law of Total Probabilities

The “Ways of Happening” Rule



$$P(A|B)\,P(B) + P(A|\sim B)\,P(\sim B) = P(A)$$

The Law of Total Probabilities

The "Ways of Happening" Rule

We can use the Law of Probabilities to solve for the chance of a given result on the market survey.

F=Favorable Survey Result
S= Successful Investment

$$P(S) = P(S|F)P(F) + P(S|\sim F)(1 - P(F))$$

$$P(S) = P(S|F)P(F) + P(S|\sim F) - P(S|\sim F)P(F)$$

$$P(S) - P(S|\sim F) = P(S|F)P(F) - P(S|\sim F)P(F)$$

$$P(S) - P(S|\sim F) = (P(S|F) - P(S|\sim F))P(F)$$

$$[P(S) - P(S|\sim F)]/[P(S|F) - P(S|\sim F)] = P(F)$$