



# Decisions Under Uncertainty

## Module 2: Simple Information Value

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**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

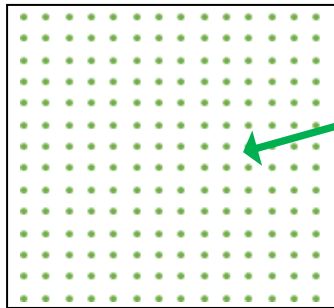
**Expected Opportunity Loss** = The Cost of Being Wrong x Chance of Being Wrong

**Expected Value of Perfect Information (EVPI)** = EOL

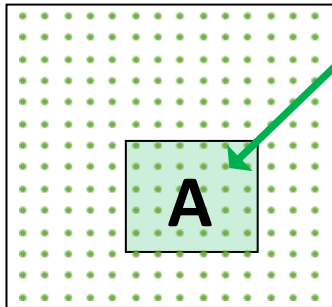


# Basic Probabilities

Probability is Equivalent to “Proportion”



**E: Every Possibility**



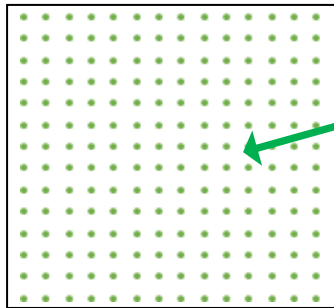
**Subset of E**

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

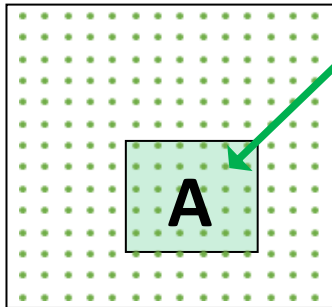


# Basic Probabilities

Probability is Equivalent to “Proportion”



**E: Every Possibility**



**Subset of E**

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

- Probabilities include 0, 1 and everything between them.

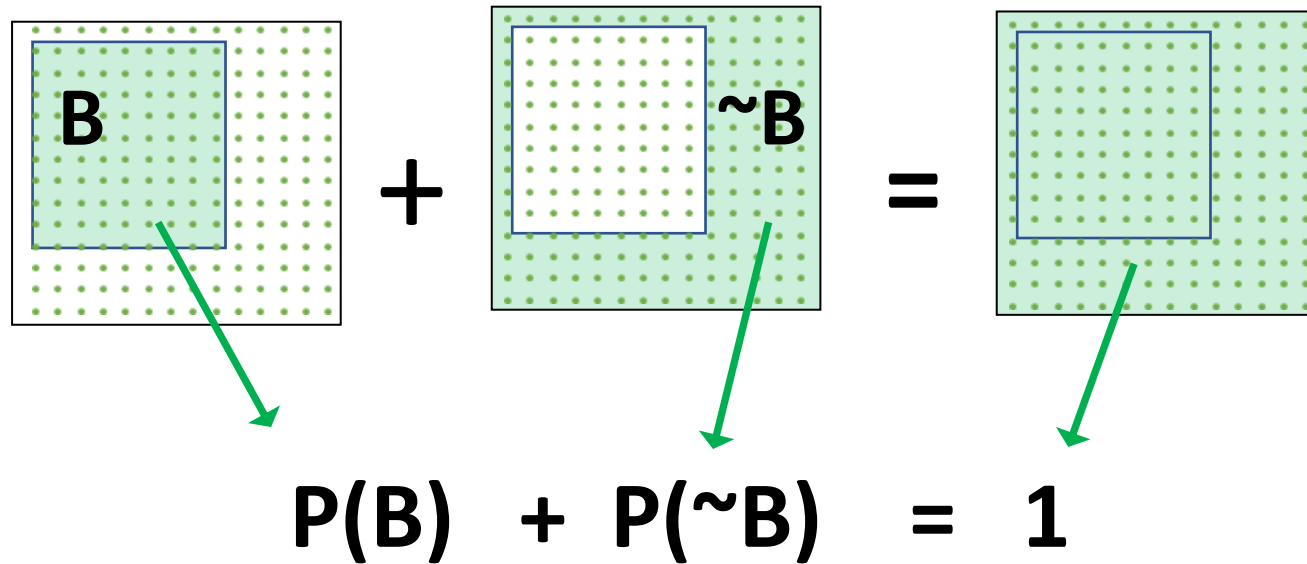
$$0 \leq P(A) \leq 1$$

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



# The Complement Rule

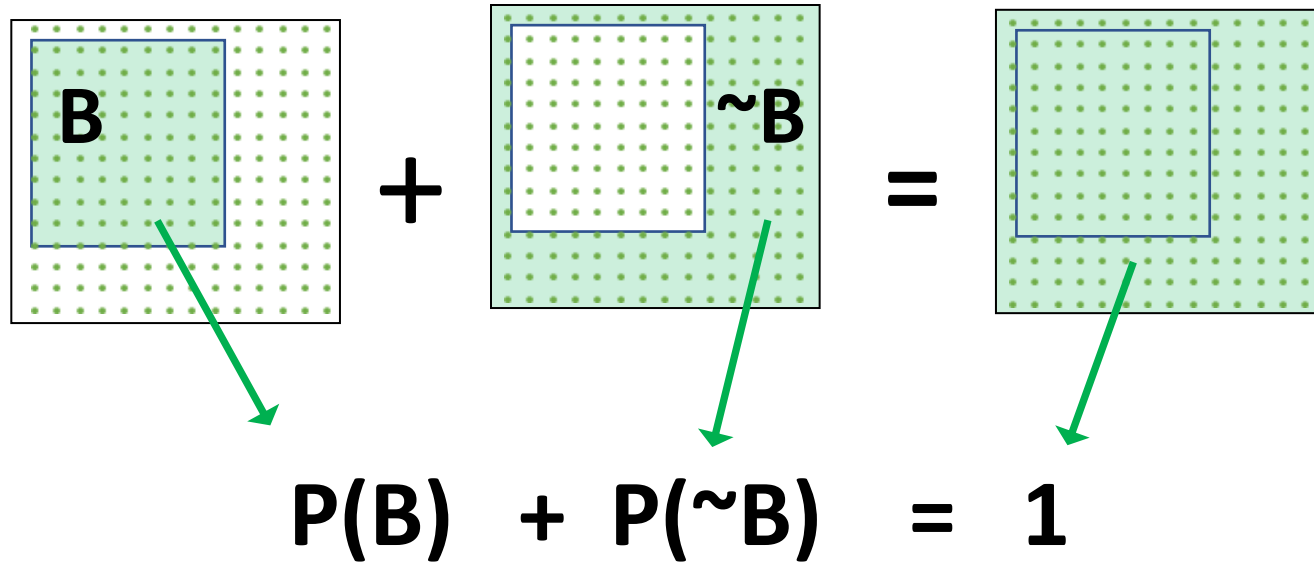
“To B or Not to B”





# The Complement Rule

“To B or Not to B”

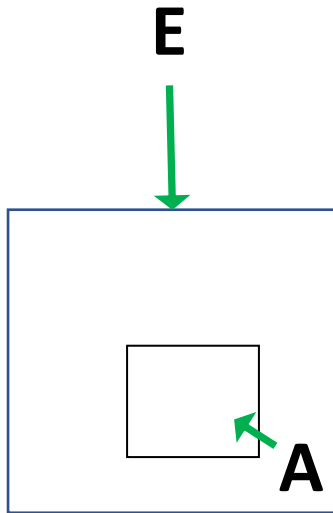


$$P(\sim B) = 1 - P(B)$$

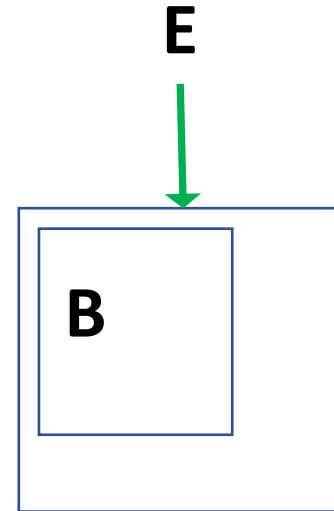


# Conditional Probabilities

## The “It Depends” Rule



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



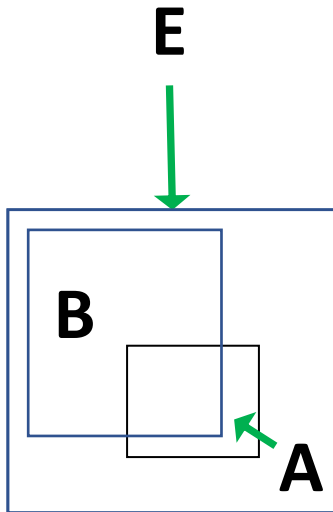
$$\frac{B}{E} = P(B)$$



# Conditional Probabilities

## The “It Depends” Rule

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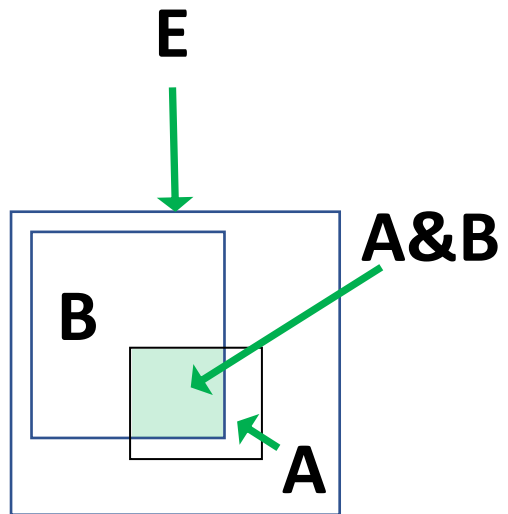






# Conditional Probabilities

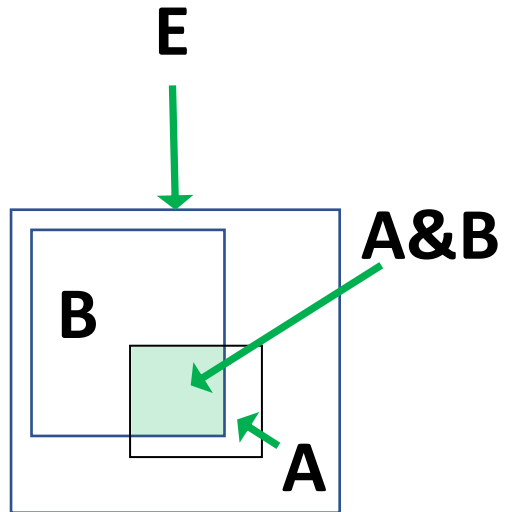
## The "It Depends" Rule





# Conditional Probabilities

## The "It Depends" Rule



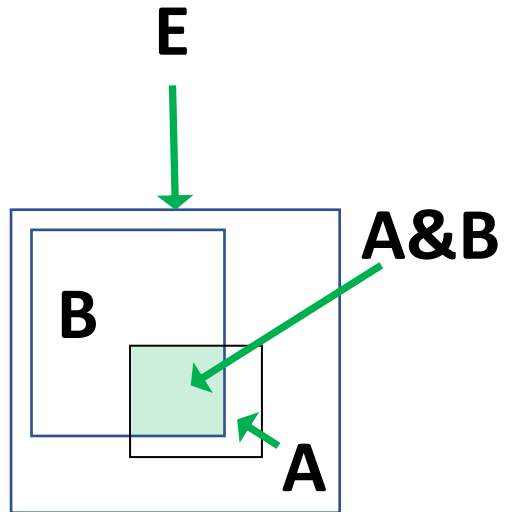
$$= \frac{A \& B}{A} = P(B|A)$$

A diagram showing a large blue rectangle containing a smaller white rectangle. Inside the white rectangle, a smaller green rectangle is shaded with green dots. This represents the intersection of sets A and B, which is used to calculate the conditional probability  $P(B|A)$ .



# Conditional Probabilities

## The "It Depends" Rule

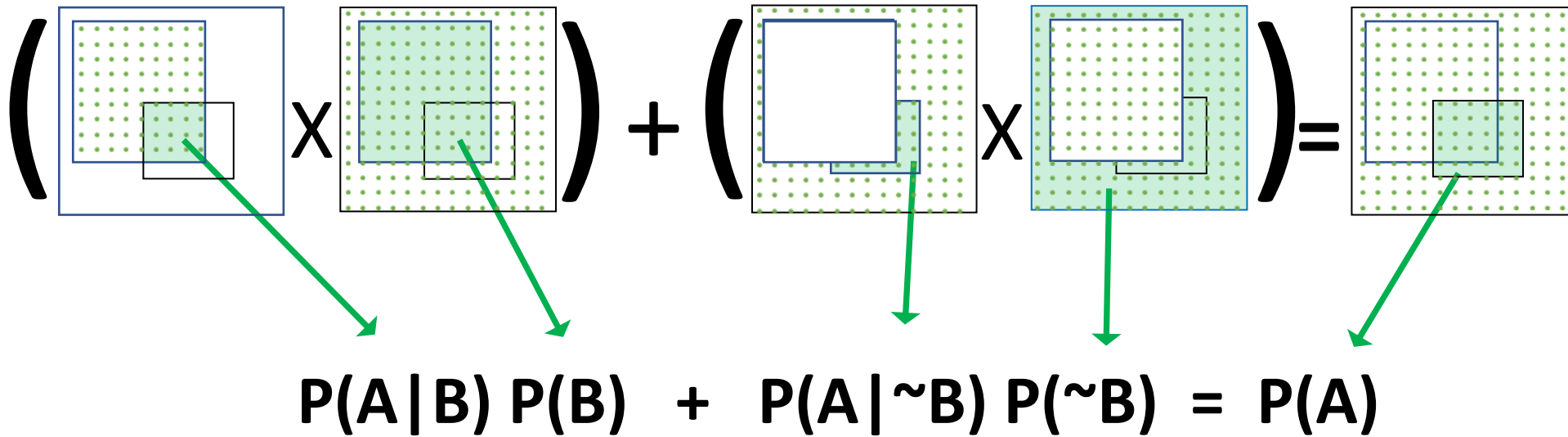


Two diagrams illustrating conditional probability. The top diagram shows a large rectangle representing set A, with a smaller green dotted rectangle representing set B overlaid on it. This is followed by the equation 
$$= \frac{A \& B}{A} = P(B | A)$$
 The bottom diagram shows a large rectangle representing set B, with a smaller green dotted rectangle representing set A overlaid on it. This is followed by the equation 
$$= \frac{A \& B}{B} = P(A | B)$$



# The Law of Total Probabilities

The “Ways of Happening” Rule





# 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

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

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

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

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

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