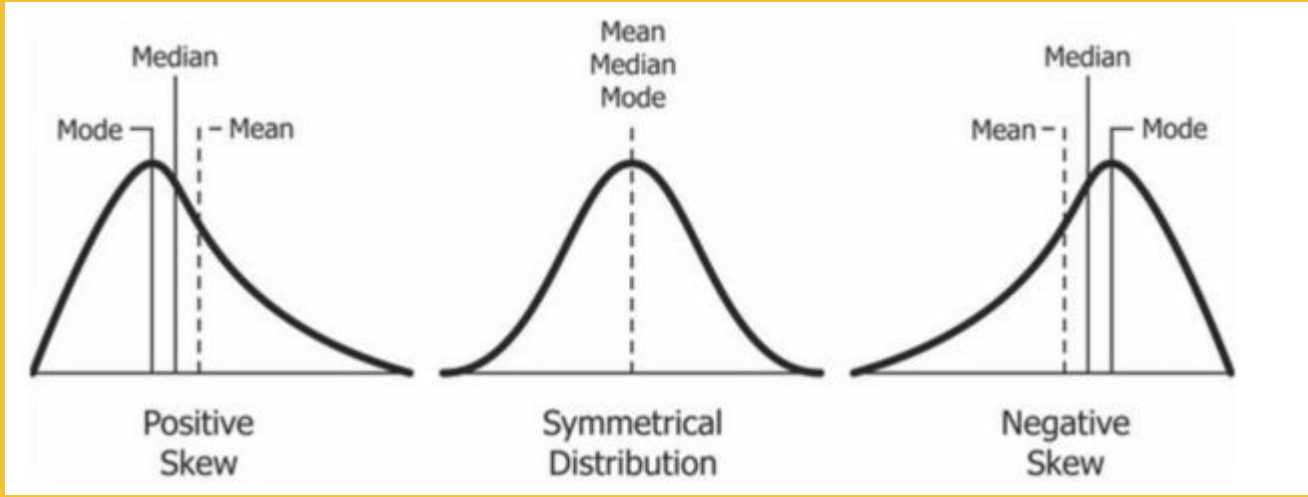


Econ 2250: Stats for Econ

Fall 2022

Source for pic stats above.

Announcements

- Homework 4 is due on Thursday (9/22)
- Sample test will be available end of next week
- Class on next Friday will be async (virtual on Loom)

What we will do today?

- Review HW3
- Read through Hw4
- Review AND and OR rules for unconditional prob
- Discuss Conditional Probability

Basic Rules of Probability

1. For any event P(E) [0,1]
2. If an event cannot occur P(E) = 0
3. If an event is certain to occur P(E) =1
4. The sum of the probability of all outcomes must equal 1.

Likelihood of event

$$P(\text{event}) = \frac{\#\text{ of outcomes of event}}{\#\text{ of outcomes in } \Omega}$$

Probability Jargon

Marginal Probability: P(A)

Joint Probability: P(A and B) = P(A,B)

Conditional Probability: P(A given B) = P(A|B)

P(A|B) = P(A,B)/P(B)

NOTICE: P(A|B) NOT EQUAL P(B|A)

Bayes Rule

- P(A|B) = P(B|A) * P(A) / P(B)
- NOTE: we often do not have access to P(B) and have to calculate by looking at all possible cases:
- P(B) = P(B|A) * P(A) + P(not B|not A) * P(not A)
  a. P(not A) = 1 – P(A)
  b. P(not B|not A) IS UNKNOWN, needs to be given

Here are some examples of bayes rule

https://www.mathsisfun.com/data/bayes-theorem.html

Make sure to check out the test questions at the bottom. You should be able to identify

P(A|B) (what you're looking for),

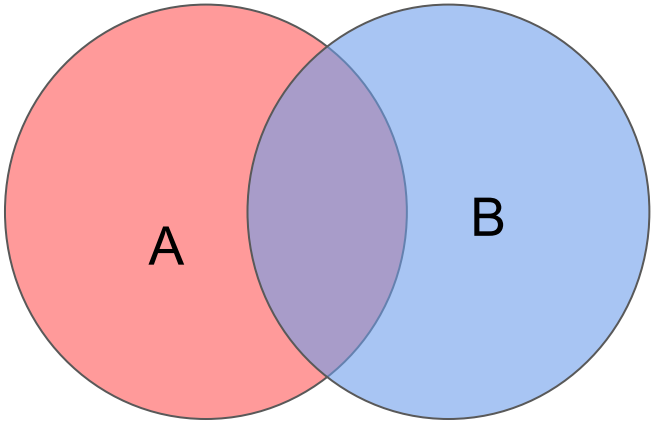
P(B|A) the prior,

P(A) the marginal of the conditional that you are looking for, and

P(B) marginal of the condition (or how to find it)

If no P(B), define P(A)P(B|A) + P(not A)P(not A|not B)

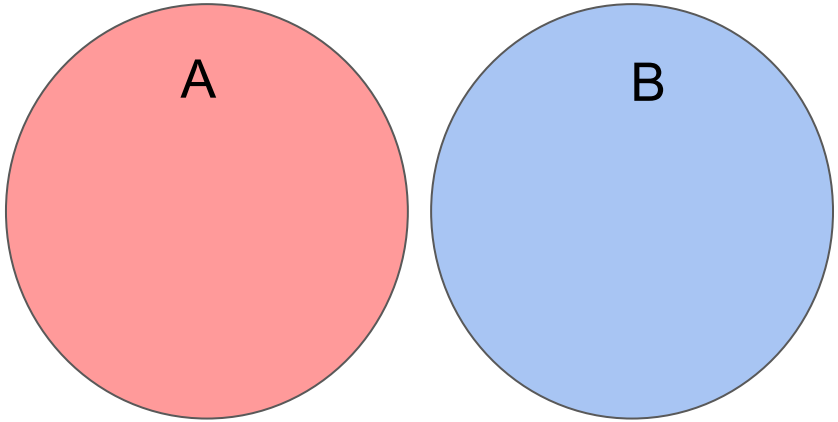
Non-mutually exclusive



P(A U B)

P(A) + P(B) - P(A|B)

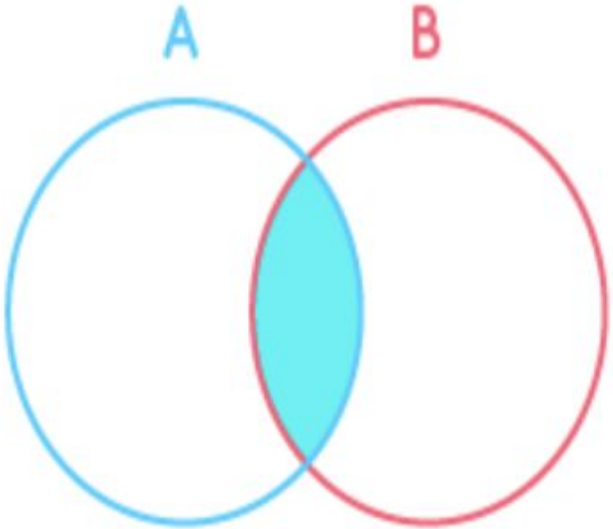
Mutually exclusive



P(A U B)

P(A) + P(B)

Independent



$$P(A \cap B)$$

P(A) * P(B)

Summary of probabilities

Event	Probability
A	$P(A) \in [0,1]$
not A	$P(A^\complement) = 1 - P(A)$
A or B	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $P(A \cup B) = P(A) + P(B)$ if A and B are mutually exclusive
A and B	$P(A \cap B) = P(A\|B)P(B) = P(B\|A)P(A)$ $P(A \cap B) = P(A)P(B)$ if A and B are independent
A given B	$P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{P(B\|A)P(A)}{P(B)}$

End of class form

(https://forms.gle/UKa1VTomUy8ys3RL8)