The Binomial Distribution

Big picture: Session 2

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Introduction

- Derived by Jacob Bernoulli, posthumously published in 1713
- Discrete probability distribution
- Describes the number of successes x in a sequence of n independent experiments, each with a binary outcome: success (with probability p) and failure (with probability $1 - p$)
- For $n = 1$, the Binomial distribution is a Bernoulli distribution

Properties

Probability mass function:

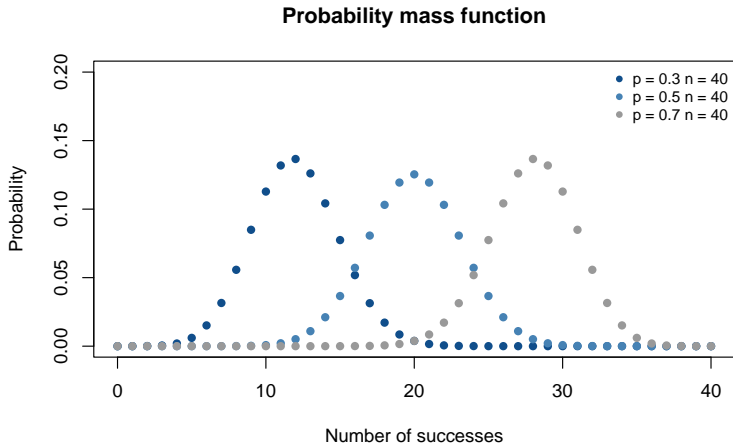$$f(x; n, p) = P(X = x) = \binom{n}{x} p^x (1 - p)^{n-x}; x \in \{0, 1, 2, ...\}$$

Expectation and Variance:

$$E[X] = np \qquad Var[X] = np(1 - p)$$

Functions in R: `dbinom` (PMF), `pbinom` (CDF), `qbinom` (Quantile function), `rbinom` (MC sampling)

Example

Probability mass function

References

Held, L. and Sabanes Bove, D. (2014). *Applied Statistical Inference:
Likelihood and Bayes*. Springer.
https://doi.org/10.1007/978-3-642-37887-4.