Dream with Beamer

Jimmy Kelliher

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Using Boxes to Highlight Theorems or Definitions

Theorem

There are infinitely many primes.

Proof. Toward contradiction, suppose there are finitely primes given by the collection $\{p_1, \ldots, p_n\}$. Define

$$p \equiv 1 + \prod_{i=1}^{n} p_i.$$

By construction, for all $i \in \{1, \ldots, n\}$, $p \equiv 1 \pmod{p_i}$, and hence p_i does not divide p. By the uniqueness of the prime factorization of p, then, the only divisors of p are 1 and itself, so p must also be a prime. However, because $p > p_i$ for all $i \in \{1, \ldots, n\}$, $p \notin \{p_1, \ldots, p_n\}$. Thus, we have constructed a new prime not in our collection of all primes, giving the desired contradiction. $\square$

Using Boxes to Highlight Theorems or Definitions

Definition 1.1.

Let G be any set and let $*: G \times G \to G$ be a binary operation on G. A *group* is an ordered pair $(G, *)$ such that

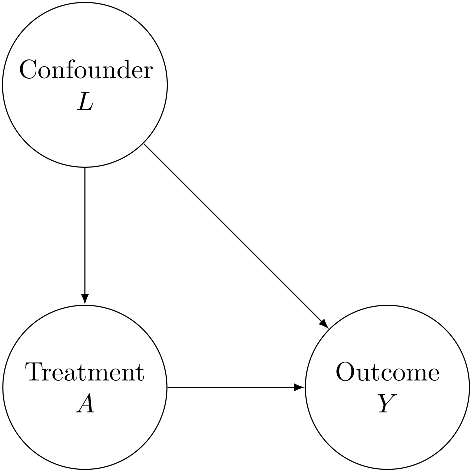
1. $\forall\, a, b, c \in G$, $(a * b) * c = a * (b * c)$;
2. $\exists\, e \in G$ such that $\forall\, a \in G$, $e * a = a * e = a$; and
3. $\forall\, a \in G$, $\exists\, b \in G$ such that $a * b = b * a = e$.

That is, the binary operation must be associative, an identity element must exist, and inverses must exist for all elements of the group.

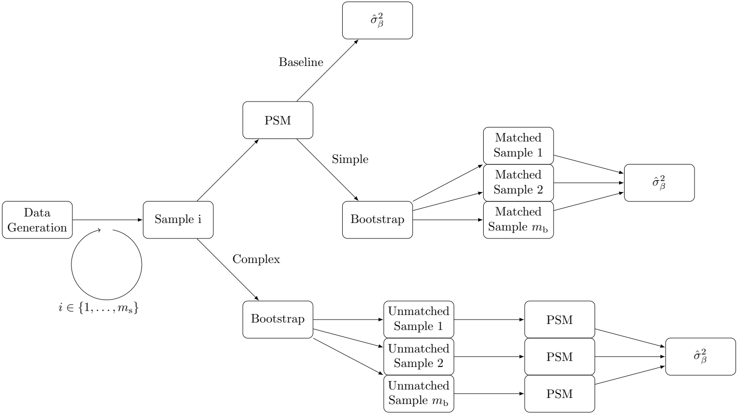
Example 1.2. The set of real numbers $\mathbb{R}$ is a group under addition.

Example 1.3. The set of real numbers $\mathbb{R}$ is *not* a group under multiplication, as zero has no inverse. However, $\mathbb{R} \setminus \{0\}$ is indeed a group under multiplication.

Using TikZ to Create Diagrams



Using TikZ to Create Diagrams

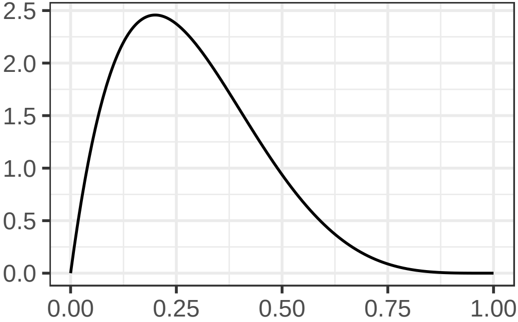


Using Tidyverse to Create Graphs

If $X \sim \text{Beta}(\alpha, \beta)$, then X has a density given by

$$f(x \mid \alpha, \beta) = \frac{\Gamma(\alpha)\Gamma(\beta)}{\Gamma(\alpha+\beta)} x^{\alpha-1}(1-x)^{\beta-1}.$$

Let's plot this density explicitly for $(\alpha, \beta) = (2, 5)$.



Using KableExtra to Create Tables

Suppose we have the data-generating process

$$Z = \beta_0 + \beta_1 X + \beta_2 Y + \varepsilon$$

for $X, Y \sim N(0, 1)$ and $\varepsilon \sim N(0, \sigma^2)$, all mutually uncorrelated. Let's assume $(\beta_0, \beta_1, \beta_2) = (1, 5, -2)$, draw an iid sample of size $n = 1{,}000$, and fit a linear model.

Table of Inferential Statistics

term	estimate	std.error	statistic	p.value
(Intercept)	1.05	0.10	10.72	0
X	5.15	0.09	54.45	0
Y	-1.93	0.09	-20.56	0

Click here for more on KableExtra!