1 Commonly Used Distributions

Distribution	PDF	Support	Mean	Variance
Binomial	$p(y) = \binom{n}{y} p^y (1-p)^{n-y}$	y = 0, 1, ..., n	np	$np(1-p)$
Geometric	$p(y) = p(1-p)^{y-1}$	y = 1, 2, ...	$\frac{1}{p}$	$\frac{1-p}{p^2}$
Poisson	$p(y) = \frac{\lambda^y e^{-\lambda}}{y!}$	y = 0, 1, 2, ...	λ	λ
Uniform	$f(y) = \frac{1}{\theta_2 - \theta_1}$	$\theta_1 \leq y \leq \theta_2$	$\frac{\theta_1+\theta_2}{2}$	$\frac{(\theta_2-\theta_1)^2}{12}$
Gaussian	$f(y) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(y-\mu)^2}{2\sigma^2}}$	$y \in \mathbb{R}$	μ	σ^2
Exponential	$f(y) = \frac{1}{\beta} e^{-y/\beta}$	$y > 0$	β	β^2
Gamma	$f(y) = \frac{y^{\alpha-1} e^{-y/\beta}}{\Gamma(\alpha)\beta^\alpha}$	$y > 0$	$\alpha\beta$	$\alpha\beta^2$
Beta	$f(y) = \left[\frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)}\right] y^{\alpha-1}(1-y)^{\beta-1}$	$0 < y < 1$	$\frac{\alpha}{\alpha+\beta}$	$\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$

2 Useful Quantile Functions in R

In `R`, quantile functions have arguments `p`, which represents a probability, and `lower.tail`, which represents whether to consider $\mathbb{P}(X \leq x)$ (if `TRUE`) or $\mathbb{P}(X > x)$ (if `FALSE`).

`qnorm(p, mean = 0, sd = 1, lower.tail = TRUE)`

- `mean` represents the mean of the Normal distribution.
- `sd` represents the standard deviation of the Normal distribution.

`qexp(p, rate = 1, lower.tail = TRUE)`

- `rate` represents the rate parameter of the Exponential distribution. Note that rate $= \frac{1}{\text{scale}}$.

`qgamma(p, shape, rate = 1, scale = 1/rate, lower.tail = TRUE)`

- `shape` represents the shape parameter of the Gamma distribution.
- `rate` represents the rate parameter of the Gamma distribution.
- `scale` represents the scale parameter of the Gamma distribution. This is what we commonly use, and if specified, will be used over the rate parameter.

`qbeta(p, shape1, shape2, lower.tail = TRUE)`

- `shape1` represents the α parameter of the Beta distribution.
- `shape2` represents the β parameter of the Beta distribution.