Table 1.1. Discrete Distributions on $\mathcal{R}$

Uniform	p.d.f.	$1/m$, $x = a_1, ..., a_m$
	m.g.f.	$\sum_{j=1}^m e^{a_j t}/m$, $t \in \mathcal{R}$
$DU(a_1, ..., a_m)$	Expectation	$\sum_{j=1}^m a_j/m$
	Variance	$\sum_{j=1}^m (a_j - \bar{a})^2/m$, $\bar{a} = \sum_{j=1}^m a_j/m$
	Parameter	$a_i \in \mathcal{R}$, $m = 1, 2, ...$
Binomial	p.d.f.	$\binom{n}{x} p^x (1-p)^{n-x}$, $x = 0, 1, ..., n$
	m.g.f.	$(pe^t + 1 - p)^n$, $t \in \mathcal{R}$
$Bi(p, n)$	Expectation	np
	Variance	$np(1-p)$
	Parameter	$p \in [0, 1]$, $n = 1, 2, ...$
Poisson	p.d.f.	$\theta^x e^{-\theta}/x!$, $x = 0, 1, 2, ...$
	m.g.f.	$e^{\theta(e^t - 1)}$, $t \in \mathcal{R}$
$P(\theta)$	Expectation	θ
	Variance	θ
	Parameter	$\theta > 0$
Geometric	p.d.f.	$(1-p)^{x-1}p$, $x = 1, 2, ...$
	m.g.f.	$pe^t/[1 - (1-p)e^t]$, $t < -\log(1-p)$
$G(p)$	Expectation	$1/p$
	Variance	$(1-p)/p^2$
	Parameter	$p \in [0, 1]$
Hyper-	p.d.f.	$\binom{n}{x}\binom{m}{r-x} / \binom{N}{r}$
geometric		$x = 0, 1, ..., \min\{r, n\}$, $r - x \leq m$
	m.g.f.	No explicit form
$HG(r, n, m)$	Expectation	rn/N
	Variance	$rnm(N-r)/[N^2(N-1)]$
	Parameter	$r, n, m = 1, 2, ...$, $N = n + m$
Negative	p.d.f.	$\binom{x-1}{r-1} p^r (1-p)^{x-r}$, $x = r, r+1, ...$
binomial	m.g.f.	$p^r e^{rt}/[1 - (1-p)e^t]^r$, $t < -\log(1-p)$
	Expectation	r/p
$NB(p, r)$	Variance	$r(1-p)/p^2$
	Parameter	$p \in [0, 1]$, $r = 1, 2, ...$
Log-	p.d.f.	$-(\log p)^{-1} x^{-1} (1-p)^x$, $x = 1, 2, ...$
distribution	m.g.f.	$\log[1 - (1-p)e^t]/\log p$, $t \in \mathcal{R}$
	Expectation	$-(1-p)/(p \log p)$
$L(p)$	Variance	$-(1-p)[1 + (1-p)/\log p]/(p^2 \log p)$
	Parameter	$p \in (0, 1)$

All p.d.f.'s are w.r.t. counting measure.

Table 1.2. Distributions on $\mathcal{R}$ with Lebesgue p.d.f.'s

Uniform	p.d.f.	$(b-a)^{-1}I_{(a,b)}(x)$
	m.g.f.	$(e^{bt}-e^{at})/[(b-a)t], \ \ t \in \mathcal{R}$
$U(a,b)$	Expectation	$(a+b)/2$
	Variance	$(b-a)^2/12$
	Parameter	$a, \ b \in \mathcal{R}, \ \ a < b$
Normal	p.d.f.	$\frac{1}{\sqrt{2\pi}\sigma}e^{-(x-\mu)^2/2\sigma^2}$
	m.g.f.	$e^{\mu t+\sigma^2t^2/2}, \ \ t \in \mathcal{R}$
$N(\mu,\sigma^2)$	Expectation	μ
	Variance	σ^2
	Parameter	$\mu \in \mathcal{R}, \ \ \sigma > 0$
Exponential	p.d.f.	$\theta^{-1}e^{-(x-a)/\theta}I_{(a,\infty)}(x)$
	m.g.f.	$e^{at}(1-\theta t)^{-1}, \ \ t < \theta^{-1}$
$E(a,\theta)$	Expectation	$\theta + a$
	Variance	θ^2
	Parameter	$\theta > 0, \ \ a \in \mathcal{R}$
Chi-square	p.d.f.	$\frac{1}{\Gamma(k/2)2^{k/2}}x^{k/2-1}e^{-x/2}I_{(0,\infty)}(x)$
	m.g.f.	$(1-2t)^{-k/2}, \ \ t < 1/2$
χ^2_k	Expectation	k
	Variance	$2k$
	Parameter	$k = 1, 2, ...$
Gamma	p.d.f.	$\frac{1}{\Gamma(\alpha)\gamma^\alpha}x^{\alpha-1}e^{-x/\gamma}I_{(0,\infty)}(x)$
	m.g.f.	$(1-\gamma t)^{-\alpha}, \ \ t < \gamma^{-1}$
$\Gamma(\alpha,\gamma)$	Expectation	$\alpha\gamma$
	Variance	$\alpha\gamma^2$
	Parameter	$\gamma > 0, \ \alpha > 0$
Beta	p.d.f.	$\frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)}x^{\alpha-1}(1-x)^{\beta-1}I_{(0,1)}(x)$
	m.g.f.	No explicit form
$B(\alpha,\beta)$	Expectation	$\alpha/(\alpha+\beta)$
	Variance	$\alpha\beta/[(\alpha+\beta+1)(\alpha+\beta)^2]$
	Parameter	$\alpha > 0, \ \ \beta > 0$
Cauchy	p.d.f.	$\frac{1}{\pi\sigma}\left[1+\left(\frac{x-\mu}{\sigma}\right)^2\right]^{-1}$
	ch.f.	$e^{\sqrt{-1}\mu t-\sigma\|t\|}$
$C(\mu,\sigma)$	Expectation	Does not exist
	Variance	Does not exist
	Parameter	$\mu \in \mathcal{R}, \ \ \sigma > 0$

Table 1.2. (continued)

t-distribution	p.d.f.	$\frac{\Gamma[(n+1)/2]}{\sqrt{n\pi}\Gamma(n/2)}\left(1+\frac{x^2}{n}\right)^{-(n+1)/2}$
	ch.f.	No explicit form
t_n	Expectation	$0, \ (n>1)$
	Variance	$n/(n-2), \ (n>2)$
	Parameter	$n=1,2,...$
F-distribution	p.d.f.	$\frac{n^{n/2}m^{m/2}\Gamma[(n+m)/2]x^{n/2-1}}{\Gamma(n/2)\Gamma(m/2)(m+nx)^{(n+m)/2}}I_{(0,\infty)}(x)$
	ch.f.	No explicit form
$F_{n,m}$	Expectation	$m/(m-2), \ (m>2)$
	Variance	$2m^2(n+m-2)/[n(m-2)^2(m-4)]$, $(m>4)$
	Parameter	$n=1,2,..., \ m=1,2,...$
Log-normal	p.d.f.	$\frac{1}{\sqrt{2\pi}\sigma}x^{-1}e^{-(\log x-\mu)^2/2\sigma^2}I_{(0,\infty)}(x)$
	ch.f.	No explicit form
$LN(\mu,\sigma^2)$	Expectation	$e^{\mu+\sigma^2/2}$
	Variance	$e^{2\mu+\sigma^2}(e^{\sigma^2}-1)$
	Parameter	$\mu\in\mathcal{R}, \ \sigma>0$
Weibull	p.d.f.	$\frac{\alpha}{\theta}x^{\alpha-1}e^{-x^\alpha/\theta}I_{(0,\infty)}(x)$
	ch.f.	No explicit form
$W(\alpha,\theta)$	Expectation	$\theta^{1/\alpha}\Gamma(\alpha^{-1}+1)$
	Variance	$\theta^{2/\alpha}\left\{\Gamma(2\alpha^{-1}+1)-\left[\Gamma(\alpha^{-1}+1)\right]^2\right\}$
	Parameter	$\theta>0, \ \alpha>0$
Double	p.d.f.	$\frac{1}{2\theta}e^{-\lvert x-\mu\rvert/\theta}$
Exponential	m.g.f.	$e^{\mu t}/(1-\theta^2t^2), \ \lvert t\rvert<\theta^{-1}$
	Expectation	μ
$DE(\mu,\theta)$	Variance	$2\theta^2$
	Parameter	$\mu\in\mathcal{R}, \ \theta>0$
Pareto	p.d.f.	$\theta a^\theta x^{-(\theta+1)}I_{(a,\infty)}(x)$
	ch.f.	No explicit form
$Pa(a,\theta)$	Expectation	$\theta a/(\theta-1), \ (\theta>1)$
	Variance	$\theta a^2/[(\theta-1)^2(\theta-2)], \ (\theta>2)$
	Parameter	$\theta>0, \ a>0$
Logistic	p.d.f.	$\sigma^{-1}e^{-(x-\mu)/\sigma}/[1+e^{-(x-\mu)/\sigma}]^2$
	m.g.f.	$e^{\mu t}\Gamma(1+\sigma t)\Gamma(1-\sigma t), \ \lvert t\rvert<\sigma^{-1}$
$LG(\mu,\sigma)$	Expectation	μ
	Variance	$\sigma^2\pi^2/3$
	Parameter	$\mu\in\mathcal{R}$, $\sigma>0$