Table A The most frequently used discrete and continuous distributions

Distribution	Density & support	Moments & cumulants	Mgf
Binomial(n,p) ($0<p<1$, $n\in\mathbb{N}$)	$\binom{n}{x}p^x(1-p)^{n-x}$ $x=0,1,\ldots,n$	$\mathrm{E}=np, \mathrm{Var}=np(1-p)$, $\gamma=\frac{np(1-p)(1-2p)}{\sigma^3}$	$(1-p+pe^t)^n$
Bernoulli(p)	$\equiv$ Binomial(1,p)		
Poisson(λ) ($\lambda>0$)	$e^{-\lambda}\frac{\lambda^x}{x!}, x=0,1,\ldots$	$\mathrm{E}=\mathrm{Var}=\lambda$, $\gamma=1/\sqrt{\lambda}$, $\kappa_j=\lambda, j=1,2,\ldots$	$\exp[\lambda(e^t-1)]$
Negative binomial(r,p) ($r>0$, $0<p<1$)	$\binom{r+x-1}{x}p^r(1-p)^x$ $x=0,1,2,\ldots$	$\mathrm{E}=r(1-p)/p$ $\mathrm{Var}=\mathrm{E}/p$, $\gamma=\frac{(2-p)}{p\sigma}$	$\left(\frac{p}{1-(1-p)e^t}\right)^r$
Geometric(p)	$\equiv$ Negative binomial(1,p)		
Uniform(a,b) ($a<b$)	$\frac{1}{b-a}$; $a<x<b$	$\mathrm{E}=(a+b)/2$, $\mathrm{Var}=(b-a)^2/12$, $\gamma=0$	$\frac{e^{bt}-e^{at}}{(b-a)t}$
N(μ,σ^2) ($\sigma>0$)	$\frac{1}{\sigma\sqrt{2\pi}}\exp\frac{-(x-\mu)^2}{2\sigma^2}$	$\mathrm{E}=\mu$, $\mathrm{Var}=\sigma^2$, $\gamma=0$ ($\kappa_j=0$, $j\geq 3$)	$\exp(\mu t+\frac{1}{2}\sigma^2t^2)$
Gamma(α,β) ($\alpha,\beta>0$)	$\frac{\beta^\alpha}{\Gamma(\alpha)}x^{\alpha-1}e^{-\beta x}, x>0$	$\mathrm{E}=\alpha/\beta$, $\mathrm{Var}=\alpha/\beta^2$, $\gamma=2/\sqrt{\alpha}$	$\left(\frac{\beta}{\beta-t}\right)^\alpha$ ($t<\beta$)
Exponential(β)	$\equiv$ gamma(1,β)		
$\chi^2(k)$ ($k\in\mathbb{N}$)	$\equiv$ gamma(k/2,1/2)		
Inverse Gaussian(α,β) ($\alpha>0,\beta>0$)	$\frac{\alpha x^{-3/2}}{\sqrt{2\pi\beta}}\exp\left(\frac{-(\alpha-\beta x)^2}{2\beta x}\right)$	$\mathrm{E}=\alpha/\beta$, $\mathrm{Var}=\alpha/\beta^2$, $\gamma=3/\sqrt{\alpha}$	$e^{\alpha(1-\sqrt{1-2t/\beta})}$ ($t\leq\beta/2$)
	$F(x)=\Phi\left(\frac{-\alpha}{\sqrt{\beta x}}+\sqrt{\beta x}\right)+e^{2\alpha}\Phi\left(\frac{-\alpha}{\sqrt{\beta x}}-\sqrt{\beta x}\right)$, $x>0$		
Beta(a,b) ($a>0,b>0$)	$\frac{x^{a-1}(1-x)^{b-1}}{B(a,b)}, 0<x<1$	$\mathrm{E}=\frac{a}{a+b}$, $\mathrm{Var}=\frac{\mathrm{E}(1-\mathrm{E})}{a+b+1}$	
Lognormal(μ,σ^2) ($\sigma>0$)	$\frac{1}{x\sigma\sqrt{2\pi}}\exp\frac{-(\log x-\mu)^2}{2\sigma^2}$, $x>0$	$\mathrm{E}=e^{\mu+\sigma^2/2}$, $\mathrm{Var}=e^{2\mu+2\sigma^2}-e^{2\mu+\sigma^2}$, $\gamma=c^3+3c$ with $c^2=\mathrm{Var}/\mathrm{E}^2$	
Pareto(α,x_0) ($\alpha,x_0>0$)	$\frac{\alpha x_0^\alpha}{x^{\alpha+1}}, x>x_0$	$\mathrm{E}=\frac{\alpha x_0}{\alpha-1}$, $\mathrm{Var}=\frac{\alpha x_0^2}{(\alpha-1)^2(\alpha-2)}$	
Weibull(α,β) ($\alpha,\beta>0$)	$\alpha\beta\,(\beta y)^{\alpha-1}e^{-(\beta y)^\alpha}, x>0$	$\mathrm{E}=\Gamma(1+1/\alpha)/\beta$, $\mathrm{Var}=\Gamma(1+2/\alpha)/\beta^2-\mathrm{E}^2$, $\mathrm{E}[Y^t]=\Gamma(1+t/\alpha)/\beta^t$	