APPENDIX 2

Common Probability Distributions, Means, Variances, and Moment-Generating Functions

Table 1 Discrete Distributions

Distribution	Probability Function	Mean	Variance	Moment- Generating Function
Binomial	$p(y) = \binom{n}{y} p^{y} (1-p)^{n-y};$	np	np(1-p)	$[pe^t + (1-p)]^n$
	$y = 0, 1, \ldots, n$			
Geometric	$p(y) = p(1 - p)^{y-1};$ y = 1, 2,	$\frac{1}{p}$	$\frac{1-p}{p^2}$	$\frac{pe^t}{1 - (1 - p)e^t}$
Hypergeometric	$p(y) = \frac{\binom{r}{y} \binom{N-r}{n-y}}{\binom{N}{n}};$	$\frac{nr}{N}$	$n\left(\frac{r}{N}\right)\left(\frac{N-r}{N}\right)\left(\frac{N-n}{N-1}\right)$	does not exist in closed form
	$y = 0, 1,, n \text{ if } n \le r,$ y = 0, 1,, r if n > r			
Poisson	$p(y) = \frac{\lambda^y e^{-\lambda}}{y!};$	λ	λ	$\exp[\lambda(e^t-1)]$
	$y=0,1,2,\ldots$			
Negative binomial	$p(y) = {\binom{y-1}{r-1}} p^r (1-p)^{y-r};$ y = r, r+1,	$\frac{r}{p}$	$\frac{r(1-p)}{p^2}$	$\left[\frac{pe^t}{1-(1-p)e^t}\right]^r$

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Table 2 Continuous Distributions

Distribution	Probability Function	Mean	Variance	Moment- Generating Function
Uniform	$f(y) = \frac{1}{\theta_2 - \theta_1}; \theta_1 \le y \le \theta_2$	$\frac{\theta_1 + \theta_2}{2}$	$\frac{(\theta_2 - \theta_1)^2}{12}$	$\frac{e^{t\theta_2} - e^{t\theta_1}}{t(\theta_2 - \theta_1)}$
Normal	$f(y) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\left(\frac{1}{2\sigma^2}\right)(y-\mu)^2\right]$ $-\infty < y < +\infty$	μ	σ^2	$\exp\left(\mu t + \frac{t^2\sigma^2}{2}\right)$
Exponential	$f(y) = \frac{1}{\beta} e^{-y/\beta}; \beta > 0$ $0 < y < \infty$	β	$oldsymbol{eta}^2$	$(1-\beta t)^{-1}$
Gamma	$f(y) = \left[\frac{1}{\Gamma(\alpha)\beta^{\alpha}}\right] y^{\alpha-1} e^{-y/\beta};$ $0 < y < \infty$	αβ	$lphaeta^2$	$(1-\beta t)^{-\alpha}$
Chi-square	$f(y) = \frac{(y)^{(\nu/2)-1}e^{-y/2}}{2^{\nu/2}\Gamma(\nu/2)};$ y > 0	ν	2v	$(1-2t)^{-\nu/2}$
Beta	$f(y) = \left[\frac{\Gamma(\alpha + \beta)}{\Gamma(\alpha)\Gamma(\beta)}\right] y^{\alpha - 1} (1 - y)^{\beta - 1};$ $0 < y < 1$	$\frac{\alpha}{\alpha + \beta}$	$\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$	does not exist in closed form