Probability and Stastics

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1 Tables

1.1 Distribution Tables

Table 1: Properties of Discrete Distribution

Distribution	**Probability Mass Function**	**Probability Generating Function**	**Moment Generating Function**	**Characteristic Function**
Bernoulli	$p^x(1-p)^{1-x}$	$q+pz$	$q+pe^t$	$q+pe^{it}$
Binomial	$\binom{n}{k}p^k(1-p)^{n-k}$	$[(1-p)+pz]^n$	$[(1-p)+pe^t]^n$	$[(1-p)+pe^{it}]^n$
Geometric	$(1-p)^{k-1}p$	$\frac{pt}{1-(1-p)t}$	$\frac{pe^t}{1-(1-p)e^t}$	$\frac{pe^{it}}{1-(1-p)e^{it}}$
Negative Binomial	$\begin{pmatrix} k-r+1 \\ k \end{pmatrix}(1-p)^r p^k$	$(\frac{1-p}{1-pz})^r$	$(\frac{1-p}{1-pe^t})^r$	$(\frac{1-p}{1-pe^{it}})^r$
Poisson	$\frac{\lambda^k e^{-\lambda}}{k!}$	$e^{\lambda(z-1)}$	$e^{\lambda(e^t-1)}$	$e^{\lambda(e^{it}-1)}$

Table 2: Properties of Continous Distribution

Distribution	**Probability Density Function**	**Probability Generating Function**	**Moment Generating Function**	**Characteristic Function**
Exponential	$\lambda e^{-\lambda x}$	$\frac{\lambda}{\lambda-logt}$	$\frac{\lambda}{\lambda-t}$	$\frac{\lambda}{\lambda-it}$
Gamma	$\frac{1}{\Gamma(k)\theta^k}x^{k-1}e^{-\frac{x}{\theta}}$	$(1-\theta logt)^{-k}$	$(1-\theta t)^{-k}$	$(1-\theta it)^{-k}$
Normal	$\frac{1}{\sqrt{2\pi\sigma^2}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$		$e^{\mu t+\frac{1}{2}\sigma^2t^2}$	$e^{\mu t-\frac{1}{2}\sigma^2t^2}$
Log-Normal	$\frac{1}{x\sigma\sqrt{2\pi}}e^{-\frac{ln(x-\mu)^2}{2\sigma^2}}$		$e^{n\mu+n^2\frac{\sigma^2}{2}}$	$\sum_{n=0}^{\infty}\frac{(it)^n}{n!}e^{n\mu+n^2\frac{\sigma^2}{2}}$
Weibull	$\frac{k}{\lambda}(\frac{x}{k})^{k-1}e^{-(\frac{x}{\lambda})^k} \text{for} x \geq 0$		$\sum_{n=0}^{\infty}\frac{t^n\lambda^n}{n!}\Gamma(1+\frac{n}{k})$	$\sum_{n=0}^{\infty}\frac{(it)^n\lambda^n}{n!}\Gamma(1+\frac{n}{k})$

1.2 Regression Tables

1.2.1 Values of ϕ in Orthogonal Regression Table for n=7

1. $\phi_0 = 1$
2. $\phi_1 = \xi_i$
3. $\phi_2 = \xi_i^2 - 4$
4. $\phi_3 = \xi_i(\xi_i^2 - 7)$
5. $\phi_4 = 7\xi_i^4 - 67\xi_i^2 + 72$
6. $\phi_5 = \xi_i(21\xi_i^4 - 245\xi_i^2 + 2096)$
7. $\phi_6 = 77\xi_i^6 - 1015\xi_i^4 + 3038\xi_i^2 - 1200$

Table 3: Orthogonal Regression Table for n=7

ξ_i	ϕ_0	ϕ_1	ϕ_2	ϕ_3	ϕ_4	ϕ_5	ϕ_6
-3	1	-3	5	-1	3	-1	1
-2	1	-2	0	1	-7	4	-6
-1	1	-1	-3	1	1	-5	15
0	1	0	-4	0	6	0	-20
1	1	1	-3	-1	1	5	5
2	1	2	0	-1	-7	-4	-6
3	1	3	5	6	3	1	1
λ^2	6	28	84	6	154	84	924

Table 4: Orthogonal Regression Table for n=8

ξ_i	$\phi_0 = 1$	$\phi_1 = \xi_i$	ϕ_2	ϕ_3	ϕ_4	ϕ_5	ϕ_6	ϕ_7