

MATH4/68181: Extreme values and financial risk
Semester 1
Problem sheet for Week 8

1. If x_1, x_2, \dots, x_n is a random sample from $\text{Exp}(\lambda)$ find the maximum likelihood estimates of $\text{VaR}_p(X)$ and $\text{ES}_p(X)$.
2. If x_1, x_2, \dots, x_n is a random sample from the power function distribution with pdf $f(x) = ax^{a-1}$, $0 < x < 1$, $a > 0$ find the maximum likelihood estimates of $\text{VaR}_p(X)$ and $\text{ES}_p(X)$.
3. If x_1, x_2, \dots, x_n is a random sample from the normal distribution $N(\mu, \sigma^2)$ find the maximum likelihood estimates of $\text{VaR}_p(X)$ and $\text{ES}_p(X)$.
4. If x_1, x_2, \dots, x_n is a random sample from the log-normal distribution $LN(\mu, \sigma^2)$ find the maximum likelihood estimates of $\text{VaR}_p(X)$ and $\text{ES}_p(X)$.
5. If x_1, x_2, \dots, x_n is a random sample from a distribution with pdf $f(x) = \theta_2 x^{\theta_2-1} \theta_1^{-\theta_2}$, $0 < x < \theta_1$, $\theta_1 > 0$, $\theta_2 > 0$ find the maximum likelihood estimates of $\text{VaR}_p(X)$ and $\text{ES}_p(X)$.
6. If x_1, x_2, \dots, x_n is a random sample from the uniform $[\mu - \delta, \mu + \delta]$ distribution find the maximum likelihood estimates of $\text{VaR}_p(X)$ and $\text{ES}_p(X)$.