

1) Suppose x_1, \dots, x_n are iid 2×1 random vectors from a multivariate lognormal $LN(\mu, \Sigma)$ distribution. Let $x_i = (X_{i1}, X_{i2})^T$. Following Press (2005, p. 149-150), $E(X_{ij}) = \exp(\mu_j + \sigma_j^2/2)$, $V(X_{ij}) = \exp(\sigma_j^2)[\exp(\sigma_j^2) - 1] \exp(2\mu_j)$ for $j = 1, 2$, and $\text{Cov}(X_{i1}, X_{i2}) = \exp[\mu_1 + \mu_2 + 0.5(\sigma_1^2 + \sigma_2^2) + \sigma_{12}][\exp(\sigma_{12}) - 1]$. Find the limiting distribution of $\sqrt{n}(\bar{x} - c)$ for appropriate vector c .

$$\sqrt{n} \left[\bar{X} - \begin{pmatrix} \exp(\mu_1 + \frac{\sigma_1^2}{2}) \\ \exp(\mu_2 + \frac{\sigma_2^2}{2}) \end{pmatrix} \right] \xrightarrow{D} \dots$$

3.24

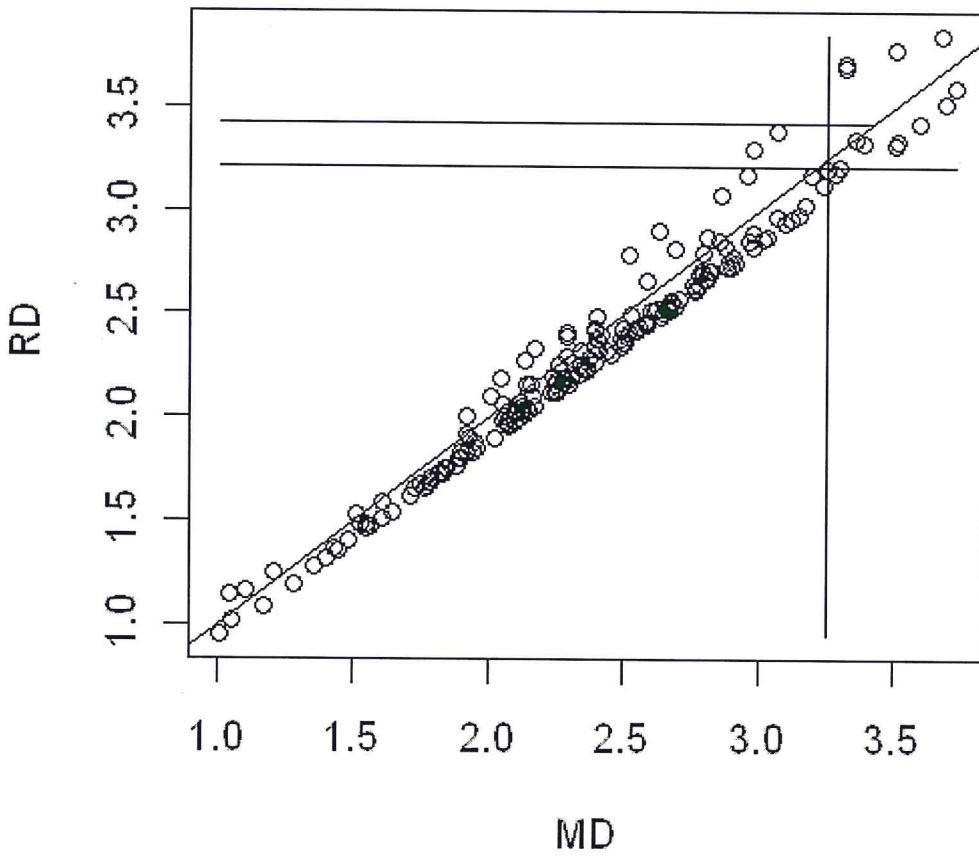
$$N_2 \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \exp(\sigma_1^2)[\exp(\sigma_1^2) - 1] \exp(2\mu_1) & \text{Cov}(X_{i1}, X_{i2}) \\ \text{Cov}(X_{i1}, X_{i2}) & \exp(\sigma_2^2)[\exp(\sigma_2^2) - 1] \exp(2\mu_2) \end{pmatrix} \right)$$

$$\begin{pmatrix} V(X_{i1}) & \text{Cov}(X_{i1}, X_{i2}) \\ \text{Cov}(X_{i1}, X_{i2}) & V(X_{i2}) \end{pmatrix}$$

15

2) What is the start for the DGK estimator?

$$\left(\bar{x}, S \right)$$



ddplot4(Seatbelts[,1:6])

\$cuplim 93.125% 3.251247 , \$ruplim 93.125% 3.209553, \$mvnlim[1] 3.422047

Seatbelts
 2) UKDriverDeaths is a time series giving the monthly totals of car drivers in Great Britain killed or seriously injured Jan 1969 to Dec 1984. Compulsory wearing of seat belts was introduced on 31 Jan 1983. The six variables were DriversKilled=car drivers killed, drivers^{drivers killed or seriously injured}, front=front-seat passengers killed or seriously injured, rear=rear-seat passengers killed or seriously injured, Kms=distance driven, and PetrolPrice = petrol price. What is the nonparametric region in the DD plot shown above?

$$\{x : MD_x \leq 3.25\}$$

so area to the left of MD = 3.25