School of Mathematics(SOM)

Thapar Institute of Engineering and Technology (TIET)

Probability and Statistics(UCS410) Exp. sheet 07 (Chi-square, t-distribution, F-distribution)

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(1) Use the $rt(n, df)$ function in r to investigate the t-distribution for $n = 100$ and $df = n - 1$ and plot the histogram for the same. T distribution and n is number of terms and df is degree of freedom rt(100,99) and to plot histogram use hist(rt(100,99))

(2) Use the $rchisq(n, df)$ function in r to investigate the chi-square distribution with $n = 100$ and $df = 2, 10, 25$. Chi square distribution rchisq(2,degree of freedoms)

(3) Generate a vector of 100 values between -6 and 6. Use the $dt()$ function in r to find the values of a t-distribution given a random variable x and degrees of freedom 1,4,10,30. Using these values plot the density function for students t-distribution with degrees of freedom 30. Also shows a comparison of probability density functions having different degrees of freedom (1,4,10,30).

use seq(-6,6,length=100) to generate values

on the above sequence apply dt(seq,1)

then plot the above using plot(dt(seq,1),type="l",col="red")

to compare we can add lines on above graph using lines(dt(seq,2),type="l",col="grey")

(4) Write a r-code

for F distribution we take two degree of freedoms df(0.95,10,20)

(i) To find the 95^{th} percentile of the F-distribution with $(10, 20)$ degrees of freedom.

(ii) To calculate the area under the curve for the interval $[0, 1.5]$ and the interval $[1.5, +\infty)$ of a F-curve with $v_1 = 10$ and $v_2 = 20$ (USE $pf()$). pf(0.15,10,20) and pf(INF,10,20)-pf(0.15,10,20) or for the second part we can do pf (0.15,10,20,lower.tail=FALSE)

(iii) To calculate the quantile for a given area (= probability) under the curve for a F-curve with $v_1 = 10$ and $v_2 = 20$ that corresponds to $q = 0.25, 0.5, 0.75$ and 0.999. (use the $qf()$) qf(0.25,10,20)

(iv) To generate 1000 random values from the F-distribution with $v_1 = 10$ and $v_2 = 20$ (use $rf()$)and plot a histogram. hist(rf(1000,10,20))