Experiment 15

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1. Aim: To apply one and two sided F test to compare two variances.

```
X1 = c(12.47, 11.90, 12.77, 11.96, 12.78, 12.44, 12.13, 11.86, 12.25, 12.29)
Y1 = c(12.86, 12.83, 12.46, 12.98, 12.22, 12.34, 12.46, 12.39)
#

#
var.test(X1, Y1, conf.level = 0.99) # two sided
```

```
##
##  F test to compare two variances
##
## data:  X1 and Y1
## F = 1.4072, num df = 9, denom df = 7, p-value = 0.6671
## alternative hypothesis: true ratio of variances is not equal to 1
## 99 percent confidence interval:
##  0.1652829 9.6883691
## sample estimates:
## ratio of variances
##           1.407189
```

```
#

#
var.test(X1, Y1, alternative = "greater")
```

```
##
##  F test to compare two variances
##
## data:  X1 and Y1
## F = 1.4072, num df = 9, denom df = 7, p-value = 0.3336
## alternative hypothesis: true ratio of variances is greater than 1
## 95 percent confidence interval:
##  0.3827342       Inf
## sample estimates:
## ratio of variances
##           1.407189
```

2. Aim: To find densities, cdfs, inv cdfs and random sample for F distribution.

```
## (i) Probably density function of F-distribution:

# (a) f(0), with df=5, 7
df(0,5,7)
```

```
## [1] 0
```

```
# (b) 5, with df=10, 3
df(5,10,3)
```

```
## [1] 0.02724156
```

```
# (c) To Generate a sequence x<- seq(0,20,by=.1) and also y<- df(x) with df=5,7 for F-distribution
x = seq(0,20, 0.1)
x
```

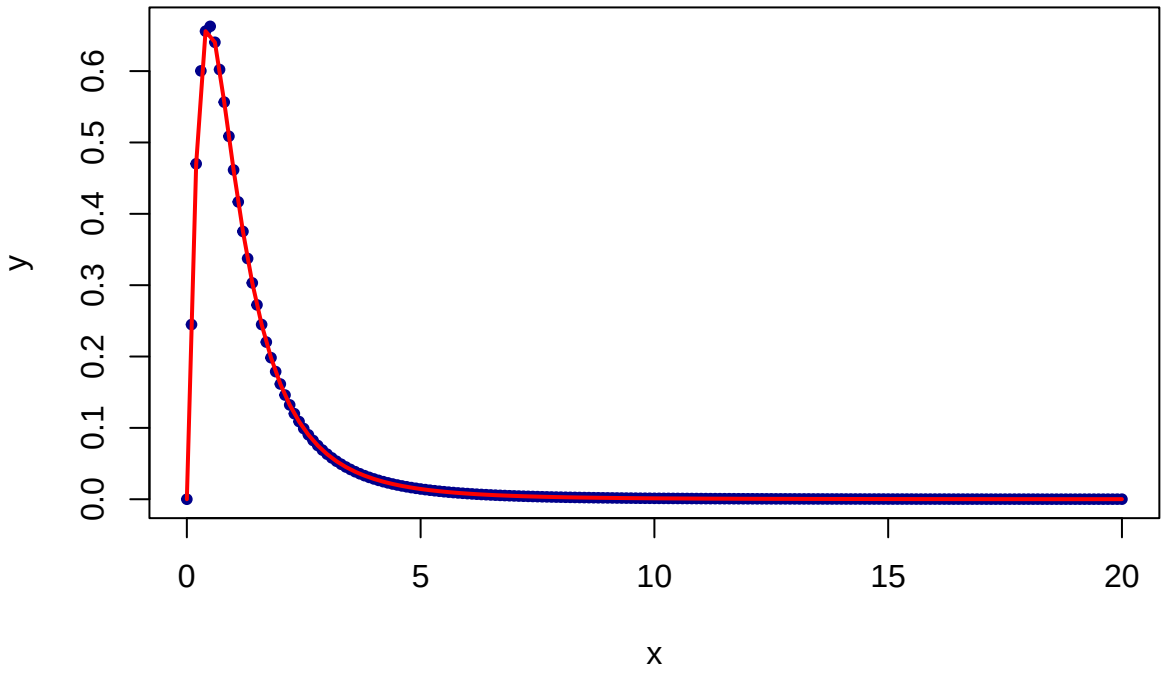
```
##   [1]  0.0  0.1  0.2  0.3  0.4  0.5  0.6  0.7  0.8  0.9  1.0  1.1  1.2  1.3  1.4
##  [16]  1.5  1.6  1.7  1.8  1.9  2.0  2.1  2.2  2.3  2.4  2.5  2.6  2.7  2.8  2.9
##  [31]  3.0  3.1  3.2  3.3  3.4  3.5  3.6  3.7  3.8  3.9  4.0  4.1  4.2  4.3  4.4
##  [46]  4.5  4.6  4.7  4.8  4.9  5.0  5.1  5.2  5.3  5.4  5.5  5.6  5.7  5.8  5.9
##  [61]  6.0  6.1  6.2  6.3  6.4  6.5  6.6  6.7  6.8  6.9  7.0  7.1  7.2  7.3  7.4
##  [76]  7.5  7.6  7.7  7.8  7.9  8.0  8.1  8.2  8.3  8.4  8.5  8.6  8.7  8.8  8.9
##  [91]  9.0  9.1  9.2  9.3  9.4  9.5  9.6  9.7  9.8  9.9 10.0 10.1 10.2 10.3 10.4
## [106] 10.5 10.6 10.7 10.8 10.9 11.0 11.1 11.2 11.3 11.4 11.5 11.6 11.7 11.8 11.9
## [121] 12.0 12.1 12.2 12.3 12.4 12.5 12.6 12.7 12.8 12.9 13.0 13.1 13.2 13.3 13.4
## [136] 13.5 13.6 13.7 13.8 13.9 14.0 14.1 14.2 14.3 14.4 14.5 14.6 14.7 14.8 14.9
## [151] 15.0 15.1 15.2 15.3 15.4 15.5 15.6 15.7 15.8 15.9 16.0 16.1 16.2 16.3 16.4
## [166] 16.5 16.6 16.7 16.8 16.9 17.0 17.1 17.2 17.3 17.4 17.5 17.6 17.7 17.8 17.9
## [181] 18.0 18.1 18.2 18.3 18.4 18.5 18.6 18.7 18.8 18.9 19.0 19.1 19.2 19.3 19.4
## [196] 19.5 19.6 19.7 19.8 19.9 20.0
```

```
y = df(x,5,7)
y
```

```
##   [1] 0.000000e+00 2.448327e-01 4.701561e-01 6.003511e-01 6.559518e-01
##   [6] 6.627510e-01 6.404185e-01 6.022104e-01 5.565650e-01 5.086437e-01
##  [11] 4.614764e-01 4.167407e-01 3.752742e-01 3.374034e-01 3.031523e-01
##  [16] 2.723741e-01 2.448327e-01 2.202522e-01 1.983471e-01 1.788396e-01
##  [21] 1.614687e-01 1.459949e-01 1.322014e-01 1.198943e-01 1.089011e-01
##  [26] 9.906935e-02 9.026451e-02 8.236818e-02 7.527630e-02 6.889746e-02
##  [31] 6.315137e-02 5.796748e-02 5.328377e-02 4.904568e-02 4.520515e-02
##  [36] 4.171983e-02 3.855234e-02 3.566962e-02 3.304245e-02 3.064493e-02
##  [41] 2.845407e-02 2.644945e-02 2.461290e-02 2.292823e-02 2.138100e-02
##  [46] 1.995831e-02 1.864860e-02 1.744154e-02 1.632784e-02 1.529917e-02
##  [51] 1.434803e-02 1.346766e-02 1.265198e-02 1.189548e-02 1.119320e-02
##  [56] 1.054063e-02 9.933694e-03 9.368696e-03 8.842274e-03 8.351372e-03
##  [61] 7.893208e-03 7.465246e-03 7.065175e-03 6.690883e-03 6.340439e-03
##  [66] 6.012076e-03 5.704176e-03 5.415257e-03 5.143956e-03 4.889023e-03
##  [71] 4.649308e-03 4.423754e-03 4.211386e-03 4.011305e-03 3.822685e-03
##  [76] 3.644759e-03 3.476821e-03 3.318216e-03 3.168341e-03 3.026634e-03
##  [81] 2.892576e-03 2.765686e-03 2.645516e-03 2.531650e-03 2.423703e-03
##  [86] 2.321316e-03 2.224153e-03 2.131904e-03 2.044278e-03 1.961005e-03
##  [91] 1.881831e-03 1.806522e-03 1.734856e-03 1.666628e-03 1.601645e-03
##  [96] 1.539726e-03 1.480702e-03 1.424416e-03 1.370717e-03 1.319469e-03
## [101] 1.270539e-03 1.223804e-03 1.179151e-03 1.136469e-03 1.095658e-03
## [106] 1.056621e-03 1.019268e-03 9.835137e-04 9.492784e-04 9.164864e-04
## [111] 8.850665e-04 8.549513e-04 8.260774e-04 7.983849e-04 7.718171e-04
## [116] 7.463207e-04 7.218448e-04 6.983417e-04 6.757661e-04 6.540750e-04
## [121] 6.332279e-04 6.131862e-04 5.939136e-04 5.753753e-04 5.575386e-04
## [126] 5.403724e-04 5.238471e-04 5.079347e-04 4.926084e-04 4.778431e-04
## [131] 4.636145e-04 4.498999e-04 4.366774e-04 4.239264e-04 4.116270e-04
## [136] 3.997606e-04 3.883093e-04 3.772560e-04 3.665845e-04 3.562793e-04
## [141] 3.463257e-04 3.367096e-04 3.274175e-04 3.184367e-04 3.097549e-04
## [146] 3.013604e-04 2.932421e-04 2.853893e-04 2.777918e-04 2.704399e-04
## [151] 2.633242e-04 2.564358e-04 2.497663e-04 2.433074e-04 2.370513e-04
## [156] 2.309906e-04 2.251181e-04 2.194269e-04 2.139104e-04 2.085624e-04
```

```
## [161] 2.033768e-04 1.983478e-04 1.934699e-04 1.887377e-04 1.841462e-04
## [166] 1.796903e-04 1.753655e-04 1.711671e-04 1.670908e-04 1.631325e-04
## [171] 1.592881e-04 1.555538e-04 1.519260e-04 1.484009e-04 1.449752e-04
## [176] 1.416456e-04 1.384090e-04 1.352623e-04 1.322025e-04 1.292268e-04
## [181] 1.263326e-04 1.235171e-04 1.207779e-04 1.181126e-04 1.155188e-04
## [186] 1.129942e-04 1.105367e-04 1.081441e-04 1.058146e-04 1.035460e-04
## [191] 1.013366e-04 9.918451e-05 9.708798e-05 9.504535e-05 9.305496e-05
## [196] 9.111527e-05 8.922474e-05 8.738192e-05 8.558538e-05 8.383376e-05
## [201] 8.212574e-05
```

```
# plot (x,y). Draw the curve on plot (x,y).
plot(x,y, pch=20, col="blue4")
curve(df(x,5,7), 0, 20, lwd = 2, col = "red", add = TRUE)
```




```
# (ii) Cumulative distribution function of F-distribution:

# (a) F(3), with df=4,3
pf(3,4,3)
```

```
## [1] 0.803226
```

```
# (b) F(0) with df=6,4
pf(0,6,4)
```

```
## [1] 0
```

```
# (iii) Inverse cumulative distribution function of F-distribution:
```

```r
# (a)F^-1 (0), with df=3,5
qf(0,3,5)
```

```
## [1] 0
```

```r
# (b) F^-1 (0.6) with df=5 ,4
qf(0.6,5,4)
```

```
## [1] 1.339205
```

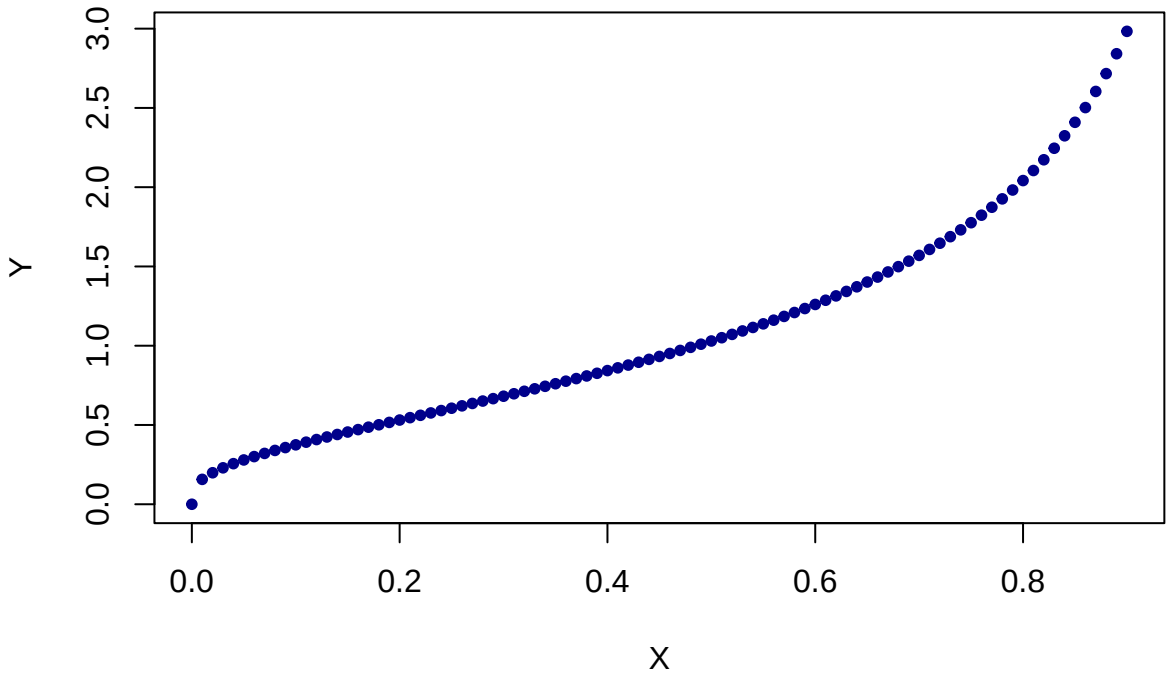
```r
# (c) Generate a sequence x<- seq(0,.9 by=.01) and also y<- qf(x) with df=8, 6 then plot (x,y).
X = seq(0, 0.9, 0.01)
X
```

```
##  [1] 0.00 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.10 0.11 0.12 0.13 0.14
## [16] 0.15 0.16 0.17 0.18 0.19 0.20 0.21 0.22 0.23 0.24 0.25 0.26 0.27 0.28 0.29
## [31] 0.30 0.31 0.32 0.33 0.34 0.35 0.36 0.37 0.38 0.39 0.40 0.41 0.42 0.43 0.44
## [46] 0.45 0.46 0.47 0.48 0.49 0.50 0.51 0.52 0.53 0.54 0.55 0.56 0.57 0.58 0.59
## [61] 0.60 0.61 0.62 0.63 0.64 0.65 0.66 0.67 0.68 0.69 0.70 0.71 0.72 0.73 0.74
## [76] 0.75 0.76 0.77 0.78 0.79 0.80 0.81 0.82 0.83 0.84 0.85 0.86 0.87 0.88 0.89
## [91] 0.90
```

```r
Y = qf(X, 8, 6)
Y
```

```
##  [1] 0.0000000 0.1569691 0.1985747 0.2297430 0.2559851 0.2792843 0.3006108
##  [8] 0.3205212 0.3393684 0.3573925 0.3747656 0.3916157 0.4080417 0.4241216
## [15] 0.4399185 0.4554846 0.4708637 0.4860932 0.5012053 0.5162285 0.5311879
## [22] 0.5461060 0.5610034 0.5758989 0.5908099 0.6057527 0.6207425 0.6357941
## [29] 0.6509213 0.6661378 0.6814567 0.6968909 0.7124530 0.7281558 0.7440119
## [36] 0.7600339 0.7762345 0.7926267 0.8092238 0.8260391 0.8430865 0.8603803
## [43] 0.8779351 0.8957662 0.9138896 0.9323217 0.9510799 0.9701824 0.9896482
## [50] 1.0094974 1.0297513 1.0504324 1.0715645 1.0931730 1.1152848 1.1379289
## [57] 1.1611359 1.1849391 1.2093738 1.2344784 1.2602941 1.2868656 1.3142411
## [64] 1.3424734 1.3716195 1.4017422 1.4329098 1.4651976 1.4986885 1.5334739
## [71] 1.5696554 1.6073459 1.6466713 1.6877731 1.7308101 1.7759623 1.8234339
## [78] 1.8734582 1.9263033 1.9822789 2.0417452 2.1051246 2.1729156 2.2457129
## [85] 2.3242319 2.4093433 2.5021201 2.6039034 2.7163960 2.8418019 2.9830356
```

```r
plot(X,Y, pch=20, col="blue4")
```




```
# (iv) Generate a random sample of 50 observations from a F-distribution with df=10,4.
rf(50,10,4)
```

```
##  [1] 2.5972042 1.4205435 1.2618325 2.2198830 1.4411698 0.6614391 4.3445349
##  [8] 1.6270301 0.7860824 1.0515309 0.2147888 0.5047950 1.2903156 0.8048581
## [15] 0.6067382 0.2378871 2.9718022 2.0357018 0.7354233 0.7322892 7.7109993
## [22] 0.9457997 0.5817478 1.8550551 7.1207918 1.6273698 0.3492569 3.3776764
## [29] 2.2229913 0.1628323 2.4275835 0.5991437 2.1165534 0.2586625 3.1014581
## [36] 1.1675524 0.7311572 3.3197381 1.1108701 1.3333589 0.5142783 0.4715567
## [43] 1.2345472 0.8090766 1.5132276 2.2952329 2.2426464 0.7390662 0.3981553
## [50] 0.9611788
```