```
------------------------------------------------------------------------------
      name:  <unnamed>
       log:  C:\Users\saiomkark\OneDrive - The University of Chicago\AdvStats\
> PS5\Question2.log
  log type:  text
 opened on:   5 Nov 2021, 19:31:36

.
. clear

. *For this exercise, you will use a simulation to see how well the CLT works
> with finite samples in R. Parts (a) and (b) of this question each describe a
>  distribution. For each distribution, use 10,000 draws using each of the fol
> lowing sample sizes: n = 36, n = 64, n = 100, n = 225, n = 2500, and n = 121
> 00. Then discuss how well the normal approximation fits your simulated estim
> ates of the means at the critical values of 0.025 and 0.975.
. * a) Suppose that x is binary with Pr(x = 1) = 0.35.
. * b) Suppose that x is binary with Pr(x = 1) = 0.97
.
.
. capture program drop clt

. program clt, rclass
  1. version 15.0
  2.
.
.
.
. args N
  3. clear
  4.
. *
. *
. quietly set obs `N'
  5. *
. *
. tempvar y1 y2
  6. *
. * y1 is binary with Pr(y1=1) = 0.35
. *
. gen `y1' = uniform() < 0.35
  7. *
. * y2 is binary with Pr(y1=1) = 0.97
. *
. gen `y2' = uniform() < 0.97
  8. *
. *
. quietly sum `y1'
  9. *
. *
. return scalar mu1 = r(mean)
 10. return scalar sd1 = r(sd)
 11. *
. *
. quietly sum `y2'
 12. *
. *
. return scalar mu2 = r(mean)
 13. return scalar sd2 = r(sd)
 14. *
```

```
. *
. end

. *
. *
. set seed 24031997

.
. *
. *
. simulate mu1 = r(mu1) mu2 = r(mu2) sd1 = r(sd1) sd2 = r(sd2), reps(10000) no
> dots: clt 36

      command:  clt 36
          mu1:  r(mu1)
          mu2:  r(mu2)
          sd1:  r(sd1)
          sd2:  r(sd2)


. *
. *
. save clt36, replace
file clt36.dta saved

. *
. * Sample of 36 observations
. *
. use clt36
(simulate: clt)

. gen z1 = (mu1-0.35)      /(sd1/36^(1/2))

. gen z2 = (mu2-0.97)      /(sd2/36^(1/2))
(3,360 missing values generated)

.
. *
. *
. gen rrej1 = z1 >  1.96 & z1 < .

. gen lrej1 = z1 < -1.96

. gen rrej2 = z2 >  1.96

. gen lrej2 = z2 < -1.96

. *
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .0208    .1427214          0          1
       lrej1 |     10,000       .0307    .1725123          0          1
       rrej2 |     10,000        .336    .4723625          0          1
       lrej2 |     10,000       .0005    .0223562          0          1

.
. bitest lrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej1 |    10000         307          250     0.02500     0.03070

  Pr(k >= 307)             = 0.000227  (one-sided test)
  Pr(k <= 307)             = 0.999819  (one-sided test)
  Pr(k <= 196 or k >= 307) = 0.000421  (two-sided test)
```

```
. bitest rrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000        208          250       0.02500      0.02080

  Pr(k >= 208)             = 0.997387  (one-sided test)
  Pr(k <= 208)             = 0.003217  (one-sided test)
  Pr(k <= 208 or k >= 294) = 0.006455  (two-sided test)

. bitest lrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000          5          250       0.02500      0.00050

  Pr(k >= 5)             = 1.000000  (one-sided test)
  Pr(k <= 5)             = 0.000000  (one-sided test)
  Pr(k <= 5 or k >= 647) = 0.000000  (two-sided test)

. bitest rrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       3360          250       0.02500      0.33600

  Pr(k >= 3360) = 0.000000  (one-sided test)
  Pr(k <= 3360) = 1.000000  (one-sided test)
  Pr(k >= 3360) = 0.000000  (two-sided test)

  note: lower tail of two-sided p-value is empty

.
.
. replace rrej1 = z1 >  0.975 & z1 < .
(1,396 real changes made)

. replace lrej1 = z1 < -0.975
(1,041 real changes made)

. replace rrej2 = z2 >  0.975
(0 real changes made)

. replace lrej2 = z2 < -0.975
(919 real changes made)

.
. *0.175
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .1604     .366995          0          1
       lrej1 |     10,000       .1348    .3415269          0          1
       rrej2 |     10,000        .336    .4723625          0          1
       lrej2 |     10,000       .0924    .2896043          0          1

.
. bitest lrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000       1348         1750       0.17500      0.13480

  Pr(k >= 1348)              = 1.000000  (one-sided test)
  Pr(k <= 1348)              = 0.000000  (one-sided test)
  Pr(k <= 1348 or k >= 2178) = 0.000000  (two-sided test)
```

```
. bitest rrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000       1604         1750       0.17500      0.16040

  Pr(k >= 1604)              = 0.999951  (one-sided test)
  Pr(k <= 1604)              = 0.000054  (one-sided test)
  Pr(k <= 1604 or k >= 1899) = 0.000109  (two-sided test)

. bitest lrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000        924         1750       0.17500      0.09240

  Pr(k >= 924)              = 1.000000  (one-sided test)
  Pr(k <= 924)              = 0.000000  (one-sided test)
  Pr(k <= 924 or k >= 2696) = 0.000000  (two-sided test)

. bitest rrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       3360         1750       0.17500      0.33600

  Pr(k >= 3360)              = 0.000000  (one-sided test)
  Pr(k <= 3360)              = 1.000000  (one-sided test)
  Pr(k <= 473 or k >= 3360) = 0.000000  (two-sided test)

.
.
. replace rrej1 = z1 >  0.025 & z1 < .
(3,504 real changes made)

. replace lrej1 = z1 < -0.025
(3,544 real changes made)

. replace rrej2 = z2 >  0.025
(3,693 real changes made)

. replace lrej2 = z2 < -0.025
(2,023 real changes made)

.
. *0.5
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .5108    .4999083          0          1
       lrej1 |     10,000       .4892    .4999083          0          1
       rrej2 |     10,000       .7053    .4559306          0          1
       lrej2 |     10,000       .2947    .4559306          0          1

.
. bitest lrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000       4892         5000       0.50000      0.48920

  Pr(k >= 4892)              = 0.984999  (one-sided test)
  Pr(k <= 4892)              = 0.015775  (one-sided test)
  Pr(k <= 4892 or k >= 5108) = 0.031550  (two-sided test)
```

```
. bitest rrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000       5108         5000       0.50000      0.51080

  Pr(k >= 5108)              = 0.015775  (one-sided test)
  Pr(k <= 5108)              = 0.984999  (one-sided test)
  Pr(k <= 4892 or k >= 5108) = 0.031550  (two-sided test)

. bitest lrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000       2947         5000       0.50000      0.29470

  Pr(k >= 2947)              = 1.000000  (one-sided test)
  Pr(k <= 2947)              = 0.000000  (one-sided test)
  Pr(k <= 2947 or k >= 7053) = 0.000000  (two-sided test)

. bitest rrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       7053         5000       0.50000      0.70530

  Pr(k >= 7053)              = 0.000000  (one-sided test)
  Pr(k <= 7053)              = 1.000000  (one-sided test)
  Pr(k <= 2947 or k >= 7053) = 0.000000  (two-sided test)

.
.
. clear

.
. *
. *
. simulate mu1 = r(mu1) mu2 = r(mu2) sd1 = r(sd1) sd2 = r(sd2), reps(10000) no
> dots: clt 64

      command:  clt 64
          mu1:  r(mu1)
          mu2:  r(mu2)
          sd1:  r(sd1)
          sd2:  r(sd2)


. *
. * save this data
. *
. save clt64, replace
file clt64.dta saved

. *
. * Sample using 64 observations
. *
. use clt64
(simulate: clt)

. gen z1 = (mu1-0.35)      /(sd1/64^(1/2))
```

```
. gen z2 = (mu2-0.97)      /(sd2/64^(1/2))
(1,419 missing values generated)

.
. *
. * construct rejection level 5 percent rate; left and right tails
. *
. gen rrej1 = z1 >  1.96 & z1 < .

. gen lrej1 = z1 < -1.96

. gen rrej2 = z2 >  1.96

. gen lrej2 = z2 < -1.96

. *
. * Should be 0.05, 1 binary 2 binary
. *
. sum rrej1-lrej2 // 64 observations

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .0183    .1340407          0          1
       lrej1 |     10,000       .0332    .1791674          0          1
       rrej2 |     10,000       .1419     .348965          0          1
       lrej2 |     10,000       .0023    .0479055          0          1

. /*
> 99% (-1%)  2.33
> 95% (-5%)  1.65
> 90% (-10%) 1.29
> 75% (-25%) 0.58
> */
. bitest lrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej1 |    10000         332          250       0.02500      0.03320

  Pr(k >= 332)              = 0.000000  (one-sided test)
  Pr(k <= 332)              = 1.000000  (one-sided test)
  Pr(k <= 175 or k >= 332) = 0.000001  (two-sided test)

. bitest rrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej1 |    10000         183          250       0.02500      0.01830

  Pr(k >= 183)              = 0.999997  (one-sided test)
  Pr(k <= 183)              = 0.000004  (one-sided test)
  Pr(k <= 183 or k >= 323) = 0.000008  (two-sided test)

. bitest lrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej2 |    10000          23          250       0.02500      0.00230

  Pr(k >= 23)              = 1.000000  (one-sided test)
  Pr(k <= 23)              = 0.000000  (one-sided test)
  Pr(k <= 23 or k >= 591) = 0.000000  (two-sided test)
```

```
. bitest rrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       1419          250       0.02500      0.14190

  Pr(k >= 1419) = 0.000000  (one-sided test)
  Pr(k <= 1419) = 1.000000  (one-sided test)
  Pr(k >= 1419) = 0.000000  (two-sided test)

  note: lower tail of two-sided p-value is empty

.
.
. replace rrej1 = z1 >  0.975 & z1 < .
(1,224 real changes made)

. replace lrej1 = z1 < -0.975
(1,249 real changes made)

. replace rrej2 = z2 >  0.975
(0 real changes made)

. replace lrej2 = z2 < -0.975
(1,206 real changes made)

.
. *
. * Should be around 0.175
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .1407    .3477292          0          1
       lrej1 |     10,000       .1581     .364853          0          1
       rrej2 |     10,000       .1419     .348965          0          1
       lrej2 |     10,000       .1229    .3283388          0          1

.
. bitest lrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000       1581         1750       0.17500      0.15810

  Pr(k >= 1581)              = 0.999997  (one-sided test)
  Pr(k <= 1581)              = 0.000004  (one-sided test)
  Pr(k <= 1581 or k >= 1923) = 0.000007  (two-sided test)

. bitest rrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000       1407         1750       0.17500      0.14070

  Pr(k >= 1407)              = 1.000000  (one-sided test)
  Pr(k <= 1407)              = 0.000000  (one-sided test)
  Pr(k <= 1407 or k >= 2112) = 0.000000  (two-sided test)
```

```
. bitest lrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000       1229         1750       0.17500      0.12290

  Pr(k >= 1229)              = 1.000000  (one-sided test)
  Pr(k <= 1229)              = 0.000000  (one-sided test)
  Pr(k <= 1229 or k >= 2315) = 0.000000  (two-sided test)

. bitest rrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       1419         1750       0.17500      0.14190

  Pr(k >= 1419)              = 1.000000  (one-sided test)
  Pr(k <= 1419)              = 0.000000  (one-sided test)
  Pr(k <= 1419 or k >= 2098) = 0.000000  (two-sided test)

.
.
. replace rrej1 = z1 >  0.025 & z1 < .
(3,408 real changes made)

. replace lrej1 = z1 < -0.025
(3,604 real changes made)

. replace rrej2 = z2 >  0.025
(2,813 real changes made)

. replace lrej2 = z2 < -0.025
(4,539 real changes made)

.
. *
. * Should be 0.50
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .4815    .4996826          0          1
       lrej1 |     10,000       .5185    .4996826          0          1
       rrej2 |     10,000       .4232    .4940913          0          1
       lrej2 |     10,000       .5768    .4940913          0          1

.
. bitest lrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000       5185         5000       0.50000      0.51850

  Pr(k >= 5185)              = 0.000112  (one-sided test)
  Pr(k <= 5185)              = 0.999897  (one-sided test)
  Pr(k <= 4815 or k >= 5185) = 0.000224  (two-sided test)

. bitest rrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000       4815         5000       0.50000      0.48150

  Pr(k >= 4815)              = 0.999897  (one-sided test)
  Pr(k <= 4815)              = 0.000112  (one-sided test)
  Pr(k <= 4815 or k >= 5185) = 0.000224  (two-sided test)
```

```
. bitest lrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000       5768         5000       0.50000      0.57680

  Pr(k >= 5768)              = 0.000000  (one-sided test)
  Pr(k <= 5768)              = 1.000000  (one-sided test)
  Pr(k <= 4232 or k >= 5768) = 0.000000  (two-sided test)

. bitest rrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       4232         5000       0.50000      0.42320

  Pr(k >= 4232)              = 1.000000  (one-sided test)
  Pr(k <= 4232)              = 0.000000  (one-sided test)
  Pr(k <= 4232 or k >= 5768) = 0.000000  (two-sided test)

.
.
. clear

. *
. *  run simulation for 100 observations
. *
. simulate mu1 = r(mu1) mu2 = r(mu2) sd1 = r(sd1) sd2 = r(sd2), reps(10000) no
> dots: clt 100

      command:  clt 100
          mu1:  r(mu1)
          mu2:  r(mu2)
          sd1:  r(sd1)
          sd2:  r(sd2)


. *
. * save this data
. *
. save clt100, replace
file clt100.dta saved

. *
. * Sample using 100 observations
. *
. use clt100
(simulate: clt)

. gen z1 = (mu1-0.35)      /(sd1/100^(1/2))

. gen z2 = (mu2-0.97)      /(sd2/100^(1/2))
(469 missing values generated)

.
. *
. * construct rejection level 5 percent rate; left and right tails
. *
. gen rrej1 = z1 >  1.96 & z1 < .
```

```
. gen lrej1 = z1 < -1.96

. gen rrej2 = z2 >  1.96

. gen lrej2 = z2 < -1.96

. *
. * Should be 0.05, 1 binary 2 binary
. *
. sum rrej1-lrej2 // 100 observations

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .0237    .1521204          0          1
       lrej1 |     10,000       .0365      .18754          0          1
       rrej2 |     10,000       .1968    .3975998          0          1
       lrej2 |     10,000       .0033    .0573536          0          1

. /*
> 99% (-1%)  2.33
> 95% (-5%)  1.65
> 90% (-10%) 1.29
> 75% (-25%) 0.58
> */
.
. bitest lrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej1 |    10000        365          250       0.02500      0.03650

  Pr(k >= 365)             = 0.000000  (one-sided test)
  Pr(k <= 365)             = 1.000000  (one-sided test)
  Pr(k <= 149 or k >= 365) = 0.000000  (two-sided test)

. bitest rrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej1 |    10000        237          250       0.02500      0.02370

  Pr(k >= 237)             = 0.805713  (one-sided test)
  Pr(k <= 237)             = 0.212713  (one-sided test)
  Pr(k <= 237 or k >= 263) = 0.423316  (two-sided test)

. bitest lrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej2 |    10000         33          250       0.02500      0.00330

  Pr(k >= 33)              = 1.000000  (one-sided test)
  Pr(k <= 33)              = 0.000000  (one-sided test)
  Pr(k <= 33 or k >= 566) = 0.000000  (two-sided test)

. bitest rrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej2 |    10000       1968          250       0.02500      0.19680

  Pr(k >= 1968) = 0.000000  (one-sided test)
  Pr(k <= 1968) = 1.000000  (one-sided test)
  Pr(k >= 1968) = 0.000000  (two-sided test)

  note: lower tail of two-sided p-value is empty
```

```
.
.
. replace rrej1 = z1 >  0.975 & z1 < .
(1,467 real changes made)

. replace lrej1 = z1 < -0.975
(1,309 real changes made)

. replace rrej2 = z2 >  0.975
(0 real changes made)

. replace lrej2 = z2 < -0.975
(760 real changes made)

.
. *
. * Should be around 0.175
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .1704    .3760026          0          1
       lrej1 |     10,000       .1674    .3733513          0          1
       rrej2 |     10,000       .1968    .3975998          0          1
       lrej2 |     10,000       .0793    .2702199          0          1

.
. bitest lrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej1 |    10000       1674         1750       0.17500      0.16740

  Pr(k >= 1674)              = 0.978424  (one-sided test)
  Pr(k <= 1674)              = 0.022988  (one-sided test)
  Pr(k <= 1674 or k >= 1827) = 0.045479  (two-sided test)

. bitest rrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej1 |    10000       1704         1750       0.17500      0.17040

  Pr(k >= 1704)              = 0.889758  (one-sided test)
  Pr(k <= 1704)              = 0.115315  (one-sided test)
  Pr(k <= 1704 or k >= 1796) = 0.231111  (two-sided test)

. bitest lrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej2 |    10000        793         1750       0.17500      0.07930

  Pr(k >= 793)               = 1.000000  (one-sided test)
  Pr(k <= 793)               = 0.000000  (one-sided test)
  Pr(k <= 793 or k >= 2875)  = 0.000000  (two-sided test)

. bitest rrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej2 |    10000       1968         1750       0.17500      0.19680

  Pr(k >= 1968)              = 0.000000  (one-sided test)
  Pr(k <= 1968)              = 1.000000  (one-sided test)
  Pr(k <= 1538 or k >= 1968) = 0.000000  (two-sided test)
```

```
.
.
. replace rrej1 = z1 >  0.025 & z1 < .
(2,839 real changes made)

. replace lrej1 = z1 < -0.025
(2,949 real changes made)

. replace rrej2 = z2 >  0.025
(2,216 real changes made)

. replace lrej2 = z2 < -0.025
(2,688 real changes made)

.
. *
. * Should be 0.50
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .4543     .497932          0          1
       lrej1 |     10,000       .4623    .4986016          0          1
       rrej2 |     10,000       .4184    .4933212          0          1
       lrej2 |     10,000       .3481    .4763917          0          1

.
. bitest lrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej1 |    10000       4623         5000       0.50000      0.46230

  Pr(k >= 4623)              = 1.000000  (one-sided test)
  Pr(k <= 4623)              = 0.000000  (one-sided test)
  Pr(k <= 4623 or k >= 5377) = 0.000000  (two-sided test)

. bitest rrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej1 |    10000       4543         5000       0.50000      0.45430

  Pr(k >= 4543)              = 1.000000  (one-sided test)
  Pr(k <= 4543)              = 0.000000  (one-sided test)
  Pr(k <= 4543 or k >= 5457) = 0.000000  (two-sided test)

. bitest lrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej2 |    10000       3481         5000       0.50000      0.34810

  Pr(k >= 3481)              = 1.000000  (one-sided test)
  Pr(k <= 3481)              = 0.000000  (one-sided test)
  Pr(k <= 3481 or k >= 6519) = 0.000000  (two-sided test)

. bitest rrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej2 |    10000       4184         5000       0.50000      0.41840

  Pr(k >= 4184)              = 1.000000  (one-sided test)
  Pr(k <= 4184)              = 0.000000  (one-sided test)
  Pr(k <= 4184 or k >= 5816) = 0.000000  (two-sided test)
```

```
.
.
. clear

.
. *
. *  run simulation for 225 observations
. *
. simulate mu1 = r(mu1) mu2 = r(mu2) sd1 = r(sd1) sd2 = r(sd2), reps(10000) no
> dots: clt 225

      command:  clt 225
          mu1:  r(mu1)
          mu2:  r(mu2)
          sd1:  r(sd1)
          sd2:  r(sd2)


. *
. * save this data
. *
. save clt225, replace
file clt225.dta saved

. *
. * Sample using 225 observations
. *
. use clt225
(simulate: clt)

. gen z1 = (mu1-0.35)      /(sd1/225^(1/2))

. gen z2 = (mu2-0.97)      /(sd2/225^(1/2))
(11 missing values generated)

.
. *
. * construct rejection level 5 percent rate; left and right tails
. *
. gen rrej1 = z1 >  1.96 & z1 < .

. gen lrej1 = z1 < -1.96

. gen rrej2 = z2 >  1.96

. gen lrej2 = z2 < -1.96

. *
. * Should be 0.05, 1 binary 2 binary
. *
. sum rrej1-lrej2 // 225 observations

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .0203    .1410316          0          1
       lrej1 |     10,000       .0312    .1738666          0          1
       rrej2 |     10,000       .0931    .2905871          0          1
       lrej2 |     10,000       .0083      .09073          0          1

. /*
> 99% (-1%)  2.33
> 95% (-5%)  1.65
> 90% (-10%) 1.29
> 75% (-25%) 0.58
> */
```

```
.
. bitest lrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000         312          250     0.02500      0.03120

  Pr(k >= 312)             = 0.000071  (one-sided test)
  Pr(k <= 312)             = 0.999945  (one-sided test)
  Pr(k <= 191 or k >= 312) = 0.000120  (two-sided test)

. bitest rrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000         203          250     0.02500      0.02030

  Pr(k >= 203)             = 0.999138  (one-sided test)
  Pr(k <= 203)             = 0.001086  (one-sided test)
  Pr(k <= 203 or k >= 300) = 0.002100  (two-sided test)

. bitest lrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000          83          250     0.02500      0.00830

  Pr(k >= 83)              = 1.000000  (one-sided test)
  Pr(k <= 83)              = 0.000000  (one-sided test)
  Pr(k <= 83 or k >= 466)  = 0.000000  (two-sided test)

. bitest rrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000         931          250     0.02500      0.09310

  Pr(k >= 931) = 0.000000  (one-sided test)
  Pr(k <= 931) = 1.000000  (one-sided test)
  Pr(k >= 931) = 0.000000  (two-sided test)

  note: lower tail of two-sided p-value is empty

.
.
. replace rrej1 = z1 >  0.975 & z1 < .
(1,509 real changes made)

. replace lrej1 = z1 < -0.975
(1,282 real changes made)

. replace rrej2 = z2 >  0.975
(1,019 real changes made)

. replace lrej2 = z2 < -0.975
(1,293 real changes made)

.
. *
. * Should be around 0.175
```

```
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .1712    .3767025          0          1
       lrej1 |     10,000       .1594     .366067          0          1
       rrej2 |     10,000        .195    .3962205          0          1
       lrej2 |     10,000       .1376    .3444969          0          1

.
. bitest lrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000       1594         1750       0.17500      0.15940

  Pr(k >= 1594)              = 0.999985  (one-sided test)
  Pr(k <= 1594)              = 0.000017  (one-sided test)
  Pr(k <= 1594 or k >= 1910) = 0.000034  (two-sided test)

. bitest rrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000       1712         1750       0.17500      0.17120

  Pr(k >= 1712)              = 0.844550  (one-sided test)
  Pr(k <= 1712)              = 0.161854  (one-sided test)
  Pr(k <= 1712 or k >= 1788) = 0.323673  (two-sided test)

. bitest lrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000       1376         1750       0.17500      0.13760

  Pr(k >= 1376)              = 1.000000  (one-sided test)
  Pr(k <= 1376)              = 0.000000  (one-sided test)
  Pr(k <= 1376 or k >= 2146) = 0.000000  (two-sided test)

. bitest rrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       1950         1750       0.17500      0.19500

  Pr(k >= 1950)              = 0.000000  (one-sided test)
  Pr(k <= 1950)              = 1.000000  (one-sided test)
  Pr(k <= 1555 or k >= 1950) = 0.000000  (two-sided test)

.
.
. replace rrej1 = z1 >  0.025 & z1 < .
(3,382 real changes made)

. replace lrej1 = z1 < -0.025
(3,312 real changes made)

. replace rrej2 = z2 >  0.025
(2,940 real changes made)
```

```
. replace lrej2 = z2 < -0.025
(3,734 real changes made)

.
. *
. * Should be 0.50
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .5094    .4999366          0          1
       lrej1 |     10,000       .4906    .4999366          0          1
       rrej2 |     10,000        .489     .499904          0          1
       lrej2 |     10,000        .511     .499904          0          1

.
. bitest lrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej1 |    10000       4906         5000       0.50000      0.49060

  Pr(k >= 4906)              = 0.970624  (one-sided test)
  Pr(k <= 4906)              = 0.030739  (one-sided test)
  Pr(k <= 4906 or k >= 5094) = 0.061478  (two-sided test)

. bitest rrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej1 |    10000       5094         5000       0.50000      0.50940

  Pr(k >= 5094)              = 0.030739  (one-sided test)
  Pr(k <= 5094)              = 0.970624  (one-sided test)
  Pr(k <= 4906 or k >= 5094) = 0.061478  (two-sided test)

. bitest lrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej2 |    10000       5110         5000       0.50000      0.51100

  Pr(k >= 5110)              = 0.014260  (one-sided test)
  Pr(k <= 5110)              = 0.986450  (one-sided test)
  Pr(k <= 4890 or k >= 5110) = 0.028519  (two-sided test)

. bitest rrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej2 |    10000       4890         5000       0.50000      0.48900

  Pr(k >= 4890)              = 0.986450  (one-sided test)
  Pr(k <= 4890)              = 0.014260  (one-sided test)
  Pr(k <= 4890 or k >= 5110) = 0.028519  (two-sided test)

.
.
. clear
```

```
.
. *
. *  run simulation for 2500 observations
. *
. simulate mu1 = r(mu1) mu2 = r(mu2) sd1 = r(sd1) sd2 = r(sd2), reps(10000) no
> dots: clt 2500

      command:  clt 2500
          mu1:  r(mu1)
          mu2:  r(mu2)
          sd1:  r(sd1)
          sd2:  r(sd2)


. *
. * save this data
. *
. save clt2500, replace
file clt2500.dta saved

. *
. * Sample using 2500 observations
. *
. use clt2500
(simulate: clt)

. gen z1 = (mu1-0.35)      /(sd1/2500^(1/2))

. gen z2 = (mu2-0.97)      /(sd2/2500^(1/2))

.
. *
. * construct rejection level 5 percent rate; left and right tails
. *
. gen rrej1 = z1 >  1.96 & z1 < .

. gen lrej1 = z1 < -1.96

. gen rrej2 = z2 >  1.96

. gen lrej2 = z2 < -1.96

. *
. * Should be 0.05, 1 binary 2 binary
. *
. sum rrej1-lrej2 // 2500 observations

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .0242    .1536773          0          1
       lrej1 |     10,000       .0244    .1542952          0          1
       rrej2 |     10,000       .0294    .1689334          0          1
       lrej2 |     10,000       .0176    .1314989          0          1

. /*
> 99% (-1%)  2.33
> 95% (-5%)  1.65
> 90% (-10%) 1.29
> 75% (-25%) 0.58
> */
```

```
. bitest lrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000        244          250       0.02500      0.02440

  Pr(k >= 244)             = 0.658333  (one-sided test)
  Pr(k <= 244)             = 0.365661  (one-sided test)
  Pr(k <= 244 or k >= 256) = 0.724658  (two-sided test)

. bitest rrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000        242          250       0.02500      0.02420

  Pr(k >= 242)             = 0.704462  (one-sided test)
  Pr(k <= 242)             = 0.318266  (one-sided test)
  Pr(k <= 242 or k >= 258) = 0.630982  (two-sided test)

. bitest lrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000        176          250       0.02500      0.01760

  Pr(k >= 176)             = 1.000000  (one-sided test)
  Pr(k <= 176)             = 0.000000  (one-sided test)
  Pr(k <= 176 or k >= 331) = 0.000001  (two-sided test)

. bitest rrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000        294          250       0.02500      0.02940

  Pr(k >= 294)             = 0.003239  (one-sided test)
  Pr(k <= 294)             = 0.997310  (one-sided test)
  Pr(k <= 207 or k >= 294) = 0.005851  (two-sided test)

.
.
. replace rrej1 = z1 >  0.975 & z1 < .
(1,366 real changes made)

. replace lrej1 = z1 < -0.975
(1,413 real changes made)

. replace rrej2 = z2 >  0.975
(1,624 real changes made)

. replace lrej2 = z2 < -0.975
(1,452 real changes made)

.
. *
. * Should be around 0.175
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .1608    .3673647          0          1
       lrej1 |     10,000       .1657    .3718297          0          1
       rrej2 |     10,000       .1918    .3937363          0          1
       lrej2 |     10,000       .1628    .3692016          0          1
```

```
.
. bitest lrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000       1657         1750       0.17500      0.16570

  Pr(k >= 1657)              = 0.993348  (one-sided test)
  Pr(k <= 1657)              = 0.007166  (one-sided test)
  Pr(k <= 1657 or k >= 1844) = 0.014374  (two-sided test)

. bitest rrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000       1608         1750       0.17500      0.16080

  Pr(k >= 1608)              = 0.999924  (one-sided test)
  Pr(k <= 1608)              = 0.000084  (one-sided test)
  Pr(k <= 1608 or k >= 1895) = 0.000167  (two-sided test)

. bitest lrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000       1628         1750       0.17500      0.16280

  Pr(k >= 1628)              = 0.999426  (one-sided test)
  Pr(k <= 1628)              = 0.000630  (one-sided test)
  Pr(k <= 1628 or k >= 1874) = 0.001262  (two-sided test)

. bitest rrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       1918         1750       0.17500      0.19180

  Pr(k >= 1918)              = 0.000007  (one-sided test)
  Pr(k <= 1918)              = 0.999994  (one-sided test)
  Pr(k <= 1585 or k >= 1918) = 0.000012  (two-sided test)

.
.
. replace rrej1 = z1 >  0.025 & z1 < .
(3,304 real changes made)

. replace lrej1 = z1 < -0.025
(3,254 real changes made)

. replace rrej2 = z2 >  0.025
(2,907 real changes made)

. replace lrej2 = z2 < -0.025
(3,057 real changes made)

.
. *
. * Should be 0.50
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .4912    .4999476          0          1
       lrej1 |     10,000       .4911    .4999458          0          1
       rrej2 |     10,000       .4825    .4997186          0          1
       lrej2 |     10,000       .4685    .4990317          0          1
```

```
.
. bitest lrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000       4911         5000       0.50000      0.49110

  Pr(k >= 4911)              = 0.963276  (one-sided test)
  Pr(k <= 4911)              = 0.038361  (one-sided test)
  Pr(k <= 4911 or k >= 5089) = 0.076722  (two-sided test)

. bitest rrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000       4912         5000       0.50000      0.49120

  Pr(k >= 4912)              = 0.961639  (one-sided test)
  Pr(k <= 4912)              = 0.040057  (one-sided test)
  Pr(k <= 4912 or k >= 5088) = 0.080113  (two-sided test)

. bitest lrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000       4685         5000       0.50000      0.46850

  Pr(k >= 4685)              = 1.000000  (one-sided test)
  Pr(k <= 4685)              = 0.000000  (one-sided test)
  Pr(k <= 4685 or k >= 5315) = 0.000000  (two-sided test)

. bitest rrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       4825         5000       0.50000      0.48250

  Pr(k >= 4825)              = 0.999776  (one-sided test)
  Pr(k <= 4825)              = 0.000241  (one-sided test)
  Pr(k <= 4825 or k >= 5175) = 0.000482  (two-sided test)

.
. clear

.
. *
. *  run simulation for 12100 observations
. *
. simulate mu1 = r(mu1) mu2 = r(mu2) sd1 = r(sd1) sd2 = r(sd2), reps(10000) no
> dots: clt 12100

      command:  clt 12100
          mu1:  r(mu1)
          mu2:  r(mu2)
          sd1:  r(sd1)
          sd2:  r(sd2)


. *
. * save this data
```

```
. *
. save clt12100, replace
file clt12100.dta saved

. *
. *
. * Sample using 12100 observations
. *
. use clt12100
(simulate: clt)

. gen z1 = (mu1-0.35)          /(sd1/12100^(1/2))

. gen z2 = (mu2-0.97)      /(sd2/12100^(1/2))

.
. *
. * construct rejection level 5 percent rate; left and right tails
. *
. gen rrej1 = z1 >  1.96 & z1 < .

. gen lrej1 = z1 < -1.96

. gen rrej2 = z2 >  1.96

. gen lrej2 = z2 < -1.96

. *
. * Should be 0.05
. *
. sum rrej1-lrej2 // 12100 observations

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .0235    .1514927          0          1
       lrej1 |     10,000       .0239    .1527453          0          1
       rrej2 |     10,000       .0328    .1781217          0          1
       lrej2 |     10,000       .0213    .1443897          0          1

.
. bitest lrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       lrej1 |    10000        239          250       0.02500      0.02390

  Pr(k >= 239)             = 0.767907  (one-sided test)
  Pr(k <= 239)             = 0.252391  (one-sided test)
  Pr(k <= 239 or k >= 261) = 0.501244  (two-sided test)

. bitest rrej1 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+-----------------------------------------------------------
       rrej1 |    10000        235          250       0.02500      0.02350

  Pr(k >= 235)             = 0.839596  (one-sided test)
  Pr(k <= 235)             = 0.176844  (one-sided test)
  Pr(k <= 235 or k >= 265) = 0.352966  (two-sided test)
```

```
. bitest lrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000        213          250       0.02500      0.02130

  Pr(k >= 213)             = 0.992936  (one-sided test)
  Pr(k <= 213)             = 0.008503  (one-sided test)
  Pr(k <= 213 or k >= 288) = 0.017722  (two-sided test)

. bitest rrej2 = 0.025

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000        328          250       0.02500      0.03280

  Pr(k >= 328)             = 0.000001  (one-sided test)
  Pr(k <= 328)             = 0.999999  (one-sided test)
  Pr(k <= 178 or k >= 328) = 0.000002  (two-sided test)

.
.
. replace rrej1 = z1 >  0.975 & z1 < .
(1,404 real changes made)

. replace lrej1 = z1 < -0.975
(1,330 real changes made)

. replace rrej2 = z2 >  0.975
(1,492 real changes made)

. replace lrej2 = z2 < -0.975
(1,423 real changes made)

.
. *
. * Should be around 0.175
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .1639    .3702033          0          1
       lrej1 |     10,000       .1569    .3637246          0          1
       rrej2 |     10,000        .182    .3858638          0          1
       lrej2 |     10,000       .1636    .3699307          0          1

.
. bitest lrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000       1569         1750       0.17500      0.15690

  Pr(k >= 1569)              = 0.999999  (one-sided test)
  Pr(k <= 1569)              = 0.000001  (one-sided test)
  Pr(k <= 1569 or k >= 1936) = 0.000001  (two-sided test)

. bitest rrej1 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000       1639         1750       0.17500      0.16390

  Pr(k >= 1639)              = 0.998446  (one-sided test)
  Pr(k <= 1639)              = 0.001694  (one-sided test)
  Pr(k <= 1639 or k >= 1863) = 0.003339  (two-sided test)
```

```
. bitest lrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000       1636         1750       0.17500      0.16360

  Pr(k >= 1636)              = 0.998806  (one-sided test)
  Pr(k <= 1636)              = 0.001304  (one-sided test)
  Pr(k <= 1636 or k >= 1866) = 0.002581  (two-sided test)

. bitest rrej2 = 0.175

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       1820         1750       0.17500      0.18200

  Pr(k >= 1820)              = 0.034185  (one-sided test)
  Pr(k <= 1820)              = 0.967743  (one-sided test)
  Pr(k <= 1680 or k >= 1820) = 0.067368  (two-sided test)

.
.
. replace rrej1 = z1 >  0.025 & z1 < .
(3,308 real changes made)

. replace lrej1 = z1 < -0.025
(3,238 real changes made)

. replace rrej2 = z2 >  0.025
(3,120 real changes made)

. replace lrej2 = z2 < -0.025
(3,193 real changes made)

.
. *
. * Should be 0.50
. *
. sum rrej1-lrej2

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       rrej1 |     10,000       .4947    .4999969          0          1
       lrej1 |     10,000       .4807    .4996524          0          1
       rrej2 |     10,000        .494     .499989          0          1
       lrej2 |     10,000       .4829    .4997325          0          1

.
. bitest lrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej1 |    10000       4807         5000       0.50000      0.48070

  Pr(k >= 4807)              = 0.999946  (one-sided test)
  Pr(k <= 4807)              = 0.000059  (one-sided test)
  Pr(k <= 4807 or k >= 5193) = 0.000118  (two-sided test)

. bitest rrej1 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej1 |    10000       4947         5000       0.50000      0.49470

  Pr(k >= 4947)              = 0.857691  (one-sided test)
  Pr(k <= 4947)              = 0.146859  (one-sided test)
  Pr(k <= 4947 or k >= 5053) = 0.293718  (two-sided test)
```

```
. bitest lrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       lrej2 |    10000       4829         5000       0.50000      0.48290

  Pr(k >= 4829)              = 0.999699  (one-sided test)
  Pr(k <= 4829)              = 0.000324  (one-sided test)
  Pr(k <= 4829 or k >= 5171) = 0.000649  (two-sided test)

. bitest rrej2 = 0.50

    Variable |        N   Observed k   Expected k   Assumed p   Observed p
-------------+------------------------------------------------------------
       rrej2 |    10000       4940         5000       0.50000      0.49400

  Pr(k >= 4940)              = 0.886861  (one-sided test)
  Pr(k <= 4940)              = 0.117022  (one-sided test)
  Pr(k <= 4940 or k >= 5060) = 0.234045  (two-sided test)

.
. clear

.
. *Observations
. * As we increase N, the percentage of sample means that have a z-score below
>  -0.025 and above 0.025) is ~99%.
. * As we increase N, the percentage of sample means that have a z-score below
>  -0.975 and above 0.975) is ~34%.
. * As we increase N, the percentage of sample means that have a z-score below
>  -1.96 and above 1.96 is ~5%.
.
. *
. * close log file
. *
. log close
      name:  <unnamed>
       log:  C:\Users\saiomkark\OneDrive - The University of Chicago\AdvStats\
> PS5\Question2.log
  log type:  text
 closed on:   5 Nov 2021, 19:32:20
-------------------------------------------------------------------------------
```