Assignment 4: Bootstrap and Jackknife

GROUP PROJECT: SriKaavya Toodi(st938), Rithvik (ra830),Aravind reddy(ad1452),Sowmya(sa1607)

03/10/2020

Build a bias, standard deviation, and confidence interval estimator for an arbitrary statistic (named statfunc) based on the bootstrap (use 10000 =nboot) and the jackknife

bootstrap function

```
bootstrap <-function(vec0,statfunc=mean,nboot=10000,alpha=0.05)
{
  #Extracting sample size, mean and standard deviation from the original data
  n0<-length(vec0)
  mean0<-mean(vec0)

  jack = Jackknife(vec0,statfunc) #Jackknife function is called over here with input vector Vec0
  sd0<-jack$jacksd #jackknife Standard Deviation
  bias0<-jack$jackbias #jackknife bias

  #create a vector to store the location of the bootstrap studentized deviation vector

  boot_pivot_vec<-NULL #vector for the bootpivotal values
  boot_bias_vec<-NULL #vector for the bootbias values
  jacck_bias_vec<-NULL #vector for the jackbias values
  jack_sd_vec<-NULL #vector for the jacksd values
  boot_percentile_vec<-NULL #vector for the bootpercentile values


  for(i in 1:nboot)
  {
    vecb<-sample(vec0,replace=T)
    meanb<-statfunc(vecb)
    sdb<-Jackknife(vecb,statfunc)$jacksd
    boot_pivot_vec<-c(boot_pivot_vec,(meanb-mean0)/(sdb/sqrt(n0)))
    boot_bias_vec<-c(boot_bias_vec,meanb-mean0)
    boot_percentile_vec = c(boot_percentile_vec,meanb)
  }

  # bias in the statistic
  bootbias<-mean(boot_bias_vec)
```

```r
#Calculating lower and upper quantile of the bootstrap distribution
lq<-quantile(boot_pivot_vec,alpha/2)
uq<-quantile(boot_pivot_vec,1-alpha/2)

lqpercentile = quantile(boot_percentile_vec,alpha/2)
uqpercentile = quantile(boot_percentile_vec, 1-alpha/2)

sdboot = sd(boot_percentile_vec)
LB<-mean0-(sd0/sqrt(n0))*uq
UB<-mean0-(sd0/sqrt(n0))*lq

LBpercentile<-lqpercentile
UBpercentile<-uqpercentile

NLB<-mean0-(sd0/sqrt(n0))*qt(1-alpha/2,n0-1)
NUB<-mean0+(sd0/sqrt(n0))*qt(1-alpha/2,n0-1)

BNCLB = mean0 -sdboot*qt(1-alpha/2,n0-1)
BNCUB = mean0 +sdboot*qt(1-alpha/2,n0-1)

list(bootstrap.pivotal.confidence.interval=c(LB,UB),normal.confidence.interval.jackknife=
c(NLB,NUB),

bootstrap.percentile.confidence.interval=c(LBpercentile,UBpercentile),boot.normal.confidence.interval =
}
```

Jackknife Function

```r
Jackknife<-function(v1,statfunc=sd){

  n1<-length(v1)
  jackvec<-NULL
  mu0<-statfunc(v1)

  for(i in 1:n1)
  {
    mua<-statfunc(v1[-i])
    jackvec<-c(jackvec, n1*(mu0)-(n1-1)*mua)
  }

  jackbias<-mean(jackvec)-mu0
  jacksd<-sd(jackvec)

  list(mu0=mu0,jackbias=jackbias,jacksd=jacksd)
}
```

Simulation Function

```r
Sim.func<-function(mu.val=3,n=30,nsim=1000)
{
 #empty vectors for the bootstrap, normal and Jackknife confidence interval
 cvec.boot_pivotal<-NULL #coverage vector for boot pivotal confidence interval
 cvec.norm_jackknife<-NULL #coverage vector for normal confidence interval(jackknife)
 cvec.boot_normal<-NULL #coverage vector for boot normal confidence interval
 cvec.boot_percentile = NULL #coverage vector for boot percentile confidence interval

 #Calculating the mean of the lognormal distribution
 mulnorm<-(exp(mu.val+1/2))

 #run simulation
 for(i in 1:nsim){ #i is current simulation number

 if((i/10)==floor(i/100)){ print(i)
 #let me know computer hasn't died
 }

 #sample the simulation vector
 vec.sample<-rlnorm(n,mu.val)

 #bootstrap it
 boot.trial<-bootstrap(vec.sample) #Call for the bootstrap function to obtain required confidence inter

 boot_pivotal.conf<-boot.trial$bootstrap.pivotal.confidence.interval
 norm_jackknife.conf<-boot.trial$normal.confidence.interval.jackknife
 boot_percentile.conf<-boot.trial$bootstrap.percentile.confidence.interval
 boot_normal.conf<-boot.trial$boot.normal.confidence.interval

 #calculate if confidence intervals include mu

 #count up the coverage by the bootstrap pivotal interval
 cvec.boot_pivotal<-
c(cvec.boot_pivotal,(boot_pivotal.conf[1]<mulnorm)*(boot_pivotal.conf[2]>mulnorm))

 #count up the coverage by the normal confidence interval(jackknife)
 cvec.norm_jackknife <- c(cvec.norm_jackknife,(norm_jackknife.conf[1]<mulnorm)*(norm_jackknife.conf[2]>m

 #count up the coverage by the bootstrap percentile interval
 cvec.boot_percentile<- c(cvec.boot_percentile,(boot_percentile.conf[1]<mulnorm)*(boot_percentile.conf[

 #count up the coverage by the bootstrap normal interval
 cvec.boot_normal<-
c(cvec.boot_normal,(boot_normal.conf[1]<mulnorm)*(boot_normal.conf[2]>mulnorm))
 }
 #calculate and output coverage probability estimates
list(boot_pivotal.coverage=(sum(cvec.boot_pivotal)/nsim),norm_jackknife.coverage=(sum(cvec.norm_jackkni

boot_percentile.coverage=(sum(cvec.boot_percentile)/nsim),boot_normal.coverage=(sum(cvec.boot_normal)/ns
}
```

The above function calls the bootstrap and Jackknife function nsim times.

The lower and upper bound for the 4 confidence intervals are obtained.

```
#Sim for n=10
Sim.func(3,10,1000)
```

```
## $boot_pivotal.coverage
## [1] 0.894
##
## $norm_jackknife.coverage
## [1] 0.831
##
## $boot_percentile.coverage
## [1] 0.801
##
## $boot_normal.coverage
## [1] 0.82
```

```
#Sim for n=30
Sim.func(3,30,1000)
```

```
## $boot_pivotal.coverage
## [1] 0.929
##
## $norm_jackknife.coverage
## [1] 0.89
##
## $boot_percentile.coverage
## [1] 0.88
##
## $boot_normal.coverage
## [1] 0.888
```

```
#Sim for n=100
Sim.func(3,100,1000)
```

```
## $boot_pivotal.coverage
## [1] 0.937
##
## $norm_jackknife.coverage
## [1] 0.916
##
## $boot_percentile.coverage
## [1] 0.918
##
## $boot_normal.coverage
## [1] 0.914
```

Estimate the bias by computing the difference between the standard deviation of the sample data and the standard deviation of the original data.

bootstrap:

```
BootstrapBias<-function(vec0,nsim=1000)
{
  n0<-length(vec0)
  mean0<-mean(vec0)
  sd0<-sqrt(var(vec0))

  bootvec<-NULL
  bootbiasvec<-NULL

  for(i in 1:n0){
    vecb<-sample(vec0,replace=T)
    nb<-length(vecb)
    meanb<-mean(vecb)
    sdb<-sqrt(var(vecb))
  }

  final_bias_boot<-(sdb/nb)-(sd0/n0) #nsim is no.of simulations

    list(bootstrap_bias = final_bias_boot)
}
```

Next, for Jackknife:

```
JackknifeBias<-function(v1,statfunc=sd,nsim=1000)
{
  n1<-length(v1)
  jack_vec<-NULL
  mu0<-statfunc(v1)
  for(i in 1:n1){
    mua<-statfunc(v1[-i])
    jack_vec<-c(jack_vec, n1*(mu0)-(n1-1)*mua)
  }
  jackbias <- mean(jack_vec)-mu0
  jacksd<-sd(jack_vec)

  final_bias_jack<-(jacksd/n1)-(mu0/n1) #nsim is no.of simulations
  list(jackknife_bias = final_bias_jack)
}
```

Calling the functions with sample data

```
Sim.bias<-function(mu.val=3,n=30,nsim=1000)
{
  biasBootstrap<-NULL
  biasJackknife<-NULL

  #run simulation
  for(i in 1:nsim)
  {
    vec.sample<-rlnorm(n,mu.val)

    boot.list<-BootstrapBias(vec.sample)
    jack_knife.list<-JackknifeBias(vec.sample)

    biasBootstrap<-c(biasBootstrap,boot.list$bootstrap_bias)
    biasJackknife<-c(biasJackknife,jack_knife.list$jackknife_bias)
  }

  list(biasBoot = biasBootstrap, biasJack = biasJackknife)
}
```

Running the Simulations function

```
var<-Sim.bias(3,30,1000)
var
```

```
## $biasBoot
##     [1] -1.513235e-01 -2.687348e-01  4.416845e-02  2.663964e-01 -1.636585e-01
##     [6]  3.012367e-01  1.039559e+00  1.882204e-01 -9.774030e-01 -2.007840e-01
##    [11] -8.970393e-02  1.511761e-02 -1.038021e-01 -1.865735e-01  9.832305e-02
##    [16] -1.801811e-01 -8.340955e-02  5.852781e-02 -2.440450e-02 -5.474333e-02
##    [21] -3.314023e-01 -3.209443e-01 -2.664136e-01 -2.458400e-01  1.776194e-01
##    [26] -3.668517e-02 -2.372298e-02 -9.982571e-02 -8.872450e-02 -6.762909e-03
##    [31]  1.448753e-01 -4.873674e-01  1.238876e-01  2.397245e-01  4.311292e-03
##    [36] -3.789116e-02 -2.073652e-01 -1.081804e-01  2.351548e-01 -1.001576e-01
##    [41] -5.013597e-01  8.878961e-03 -5.919898e-01  3.256672e-02 -5.501389e-02
##    [46] -2.203460e+00 -2.653466e-01  1.843181e-02 -9.033033e-01 -8.523287e-01
##    [51] -4.753945e-01 -7.251238e-01  8.440882e-02  9.047392e-02  4.289988e-01
##    [56]  1.506958e-01 -8.111619e-02 -1.492755e-01 -4.076418e-02 -1.650384e+00
##    [61] -4.321640e-02 -3.436724e-02 -7.386809e-02 -3.866761e-01 -7.450586e-01
##    [66] -5.255839e-02 -1.182057e-01 -1.295028e-02 -2.901639e-02 -4.029677e-01
##    [71]  1.473860e-01 -2.329843e-01  5.131966e-02  2.077058e-03 -5.054937e-02
##    [76] -9.428928e-02  1.841779e-01  1.110411e+00 -4.452932e-03 -7.907448e-02
##    [81] -2.739898e-01 -1.150810e-01  1.046878e+00 -4.775516e-01 -2.593650e-01
##    [86] -3.204444e-02  9.199544e-02 -2.305488e+00 -3.944728e-01  1.026430e-01
##    [91] -4.587084e-01 -2.982305e-02 -3.807993e-01  2.377293e-01  3.408862e-02
##    [96] -3.996251e-02 -1.095560e-01 -8.612454e-01 -4.227505e-01 -6.305966e-01
##   [101] -1.110086e-01 -1.066471e+00  1.417697e-01 -4.161845e-02 -1.716210e-01
##   [106]  3.946578e-01  3.160609e-01 -2.217272e-01 -6.652867e-01  2.115884e-01
##   [111] -9.184635e-02 -2.373889e-02 -3.811150e-01 -2.569712e-02 -1.971922e-01
##   [116]  1.666275e-01  6.889328e-02 -5.212146e-02 -1.341152e-01 -6.069840e-01
```

```
## [121]  1.236243e+00 -3.710756e-01  5.455233e-02  7.594593e-03 -6.800707e-02
## [126]  1.885055e-01  3.099158e-01 -1.699075e-01 -9.843301e-02 -2.278417e-01
## [131] -4.488182e-02 -5.675839e-01  1.643091e-01  3.145617e-01 -1.060269e+00
## [136] -1.148139e-02  8.023083e-02  2.791538e-01 -1.687727e-01  2.588341e-02
## [141]  2.355699e-01 -2.851170e-03 -3.976688e+00  1.022390e+00  2.670507e-02
## [146] -2.973135e-01 -2.320433e-01  3.621911e-02  4.564244e-01  6.713426e-02
## [151] -1.130317e+00  7.664862e-01 -5.966378e-01 -7.513015e-02 -3.552997e-02
## [156] -1.478592e+00  2.113268e-01  2.416221e-01 -7.828960e-01 -6.424266e-01
## [161] -2.754160e-01  3.029476e-02 -7.713247e-01  1.984356e-01  7.776151e-02
## [166] -3.558309e-01  1.577752e-01  4.169879e-01 -2.535677e-01  9.820146e-02
## [171] -8.829022e-02 -8.655320e-02  2.696367e-02 -1.131117e+00 -5.146161e-01
## [176] -2.748926e-01 -2.516580e-01  8.608468e-03  2.873309e-02  2.310238e-02
## [181] -3.294877e-02 -1.573873e-01  6.787106e-01 -6.736716e-04  2.570081e-01
## [186] -7.170465e-02  7.173125e-02 -7.869659e-01 -2.009706e-02  1.680867e+00
## [191]  4.189710e-01  6.383522e-02  8.589728e-02 -9.735505e-02 -1.368240e-02
## [196] -1.532355e-01  2.468278e-02 -1.884572e-02  3.413147e-01  3.023946e-03
## [201] -1.649180e+00  5.143733e-02  9.590415e-02 -1.665983e-01 -4.992595e-02
## [206] -7.014735e-02 -1.445378e+00 -1.733394e-01  8.003132e-02 -6.768987e-02
## [211] -2.853439e-01  3.168692e-02 -5.036856e-01 -9.026221e-01 -5.100124e-02
## [216] -3.422185e-04 -2.957686e-02 -9.689854e-02  1.173049e-02 -1.313110e+00
## [221]  2.957076e-01 -2.523995e-01 -1.238953e+00 -1.655874e-01  2.702583e-02
## [226] -3.620745e-01  3.888149e-02  1.807396e+00  6.569487e-01 -7.053560e-02
## [231] -3.134239e-02  2.512715e-02 -8.446070e-02 -7.151944e-01 -3.907621e-02
## [236]  4.044513e-02  2.148863e-01  6.135975e-02 -2.257905e+00  8.394182e-02
## [241] -3.595811e-01 -4.914935e-01  1.555733e-01 -2.493209e-01  4.754373e-01
## [246] -1.083293e-01  3.861200e-02 -5.585298e-02 -2.999488e-01 -8.452716e-01
## [251] -7.109603e-01  1.970503e-01 -1.355272e+00 -9.444419e-02 -3.987855e-02
## [256] -2.286926e-01  2.031156e-01  3.464684e-01  5.477538e-02 -4.430302e-02
## [261]  1.529680e-01  1.238867e-03 -3.317859e-02  2.699704e-01  3.572800e-01
## [266]  4.809864e-03 -2.335635e-01  7.565128e-02 -2.565655e-01 -7.210606e-02
## [271] -5.286812e-01  3.830286e-01  8.938554e-01 -1.088357e+00 -1.194211e+00
## [276] -2.116039e-01 -1.710145e-01 -2.337276e-01 -1.286893e-01 -1.031016e-02
## [281]  7.445819e-01  3.291414e-01 -3.567699e-01 -4.663380e-01 -2.110138e-01
## [286]  6.003674e-02 -1.215517e-01 -7.122660e-02 -1.060487e-01 -1.852596e-01
## [291]  9.892658e-02  9.228088e-01 -2.116340e-01 -1.122250e-02 -4.497142e-01
## [296] -1.476785e-01 -1.108507e-01 -2.887266e-01 -7.586014e-02  7.762516e-02
## [301] -1.921958e+00 -2.638167e-01  1.275125e-01 -5.933550e-02  4.768897e-02
## [306]  1.439980e-01  4.956194e-01 -3.349841e-01 -6.639996e-02  3.170408e-02
## [311] -1.339774e-01  1.554157e-01  3.475375e-02  7.798289e-02  1.965836e+00
## [316] -8.075291e-01 -8.769132e-02  1.917479e-01  1.218580e-01 -7.283682e-01
## [321]  3.154450e-03 -4.129938e-02  1.081964e-01  5.107761e-02 -9.931497e-01
## [326] -4.068786e-01 -3.151217e-01 -3.013067e-01  1.580203e-03 -6.907068e-01
## [331] -7.422664e-01  2.605527e-01  1.669257e-01 -2.499286e-01 -9.992892e-02
## [336]  8.009989e-02 -3.153708e-01 -5.356750e-02 -2.394143e-01 -2.690378e-01
## [341]  4.783292e-06 -9.754535e-02 -7.771605e-02 -1.772735e-01  3.474077e-02
## [346] -3.010117e-01 -5.117452e-01  1.804654e-01 -2.446726e-01 -2.704495e-01
## [351]  4.488113e-01  9.505585e-02  1.634244e-01  4.251381e-02 -3.965038e-01
## [356] -1.263159e+00 -8.841368e-01  5.464862e-03 -2.050466e-01  2.119523e-01
## [361] -1.435261e-02  1.441322e-01 -6.502561e-01 -3.076903e-01 -2.127491e-01
## [366] -6.964798e-01  8.631933e-02 -2.373242e-01 -1.667143e-01  1.162998e-01
## [371] -1.063778e+00 -3.053853e-02 -2.756772e-02  2.358486e-01 -3.145807e-01
## [376] -4.046375e-02 -1.568638e-02 -1.881034e-01 -4.701611e-02 -1.889752e-01
## [381] -2.720844e-01  5.759333e-03 -6.593067e-02 -2.371768e-01  3.434870e-01
## [386]  1.062934e-01 -2.609175e-02 -1.238931e-01 -3.062166e-01 -1.108727e+00
```

```
## [391] -2.803793e-02  6.373418e-02  4.662377e-01 -9.095963e-02  2.242177e-01
## [396] -1.081296e-01 -1.639673e-01 -5.128088e-01 -5.270386e-01 -2.995889e-01
## [401]  9.203631e-02  1.231496e-01  1.912926e-01  1.128268e-01 -7.160193e-02
## [406] -1.660910e-01 -1.753446e-01 -1.620869e-01 -3.677784e-01 -8.992701e-01
## [411]  8.567261e-02  9.882984e-01  2.536278e-01 -1.578756e-02  1.246171e-01
## [416]  2.058120e-02 -6.584196e-01 -2.529058e-01 -4.067466e-03 -2.609925e-01
## [421] -1.077266e-02  6.312613e-01  3.626695e-02 -5.034707e-02  1.856702e-01
## [426] -3.718419e-01  1.979509e-01 -2.965339e-01  2.532732e-02  2.708008e-01
## [431]  3.395198e-01 -3.069581e+00 -1.156960e-01  1.004724e-01  1.093466e-01
## [436] -5.204448e-02 -1.794360e-02  4.263735e-02  3.981111e-01 -2.983234e-02
## [441]  4.319370e-01 -1.153392e-01 -4.565213e-02 -2.662882e-01 -1.978012e-01
## [446] -2.674912e-01  1.931991e-01 -2.821755e-01 -1.927913e-02 -5.670606e-02
## [451] -1.203708e-01  4.616164e-02  1.704626e-01 -6.434449e-02 -2.045507e-02
## [456]  9.606294e-02  4.717105e-02 -4.665075e-01 -2.321939e-01 -6.902557e-03
## [461] -3.501423e-01 -1.448127e-01 -7.410351e-01  7.977661e-01 -3.336277e-01
## [466] -2.633232e-01 -1.648831e+00 -8.514828e-01  2.724743e-02 -6.900877e-02
## [471] -6.370972e-02  3.466131e-01  1.483691e-01  2.654254e-01  1.889741e-01
## [476] -2.537549e+00 -2.661437e-02 -9.707499e-01  2.701169e-01  6.973337e-02
## [481] -4.396964e-01 -8.218181e-02 -6.606882e-02 -1.782051e-01  1.477984e-02
## [486]  5.674330e-01 -2.521314e-01  3.510237e-03  2.512247e-01  7.916889e-04
## [491] -1.493893e-02 -2.709959e-02  3.219551e-01  5.036374e-01 -1.495819e-01
## [496] -5.694688e-01  3.308512e-02  8.540867e-02  4.720241e-01  4.223080e-01
## [501]  7.317023e-03  2.197069e+00 -2.615478e-01  3.403264e-02 -1.921914e-01
## [506] -8.474151e-01  3.082183e-01 -2.188352e-01  9.244837e-02  5.134317e-01
## [511] -5.361725e-02 -7.797507e-02 -5.169359e-02  2.690896e-01  1.174505e-01
## [516] -3.145858e-01 -4.148119e-01  2.242991e-01  1.431007e-01 -1.216639e-02
## [521] -3.601190e-01 -6.446917e-01 -3.424038e-01 -2.625315e-02  1.051083e-01
## [526] -4.238176e-01 -1.471354e-02  1.029842e-01  5.054052e-01  1.170977e-01
## [531]  1.638221e-01 -1.224863e-01 -6.399632e-01  2.750327e-01 -1.901272e-01
## [536]  3.239814e-01  6.910575e-02 -1.304631e+00 -2.994380e-01 -8.555518e-01
## [541] -1.376796e+00 -7.653765e-03  1.661133e-01 -4.260636e-01 -1.384016e-01
## [546] -1.366388e-01  2.808959e-01  3.280947e-03  1.191745e-01 -1.450782e+00
## [551] -2.088644e-02 -4.923835e-01 -5.189812e-02 -3.356605e-02 -1.784418e-01
## [556]  3.601823e-01 -7.006219e-01 -4.349377e-01 -7.833568e-01  1.467286e-01
## [561]  3.281452e-03 -1.967563e-02 -1.196025e+00  4.290230e-02  1.910623e-02
## [566] -8.844627e-02  3.388454e-02 -2.521887e-01  1.844469e-01 -5.686366e-02
## [571]  5.717150e-02 -5.439402e-01 -1.221822e+00 -1.887897e-01 -7.792351e-02
## [576]  9.277431e-01  3.604373e-01  1.200393e+00 -1.238759e+00 -1.049986e-01
## [581]  5.640796e-02  5.417319e-01  2.320799e-01 -2.149581e-01 -5.125629e-02
## [586] -2.726351e-02 -2.927652e-01 -1.083931e-01 -2.147707e-01 -1.681199e-01
## [591]  7.995239e-02 -3.557169e-02 -1.452535e-01 -2.095262e-01  4.940214e-01
## [596]  1.039358e-01 -7.551828e-02 -8.905711e-01 -1.374006e-02 -3.606420e-02
## [601]  7.427094e-02  8.069992e-02 -4.010628e-01  1.629180e-03  2.934228e-02
## [606] -8.694031e-01 -1.120762e+00  1.273680e-01  1.148237e-01 -6.781801e-01
## [611] -2.750065e-02  1.863423e-01 -1.085363e+00 -1.312614e-01  1.065979e-01
## [616]  5.051679e-02 -2.149665e-03 -2.510925e-02 -1.471157e-01 -9.933038e-02
## [621] -1.073153e-01  7.017331e-02  6.159818e-02 -6.410383e-02 -1.212499e-01
## [626] -9.094856e-01 -8.025527e-01 -7.009544e-01  8.802570e-02  1.050586e-02
## [631] -2.539620e-01  1.864060e-02 -1.590564e-02  1.750728e-02  2.533198e-01
## [636] -1.300860e+00  2.368675e-01  2.085245e-01  1.831396e-01 -1.002120e-01
## [641]  4.147953e-01 -7.190051e-02  1.684722e+00 -6.645868e-01 -2.390416e-01
## [646] -4.344094e-02 -5.273212e-01 -2.161144e-02  3.847827e-01 -7.195851e-01
## [651]  4.029774e-02 -1.041301e-01 -4.062564e-01 -6.206624e-01  7.801476e-03
## [656]  2.852163e-01  1.707020e+00 -4.437237e-03 -1.945006e-01 -8.565205e-01
```

```
## [661] -3.637480e-01  2.131443e-02  2.037025e-01 -4.765917e-02 -3.264328e-02
## [666]  3.046856e-02  1.184847e-01 -2.358741e-01 -1.480364e-01  1.930682e-02
## [671]  4.014659e-02 -3.517109e-02 -5.887807e-01  1.735914e-01 -6.422555e-02
## [676] -1.643162e-01 -5.880486e-01 -1.536934e-01 -1.247423e-01 -3.261264e-01
## [681] -4.809954e-01  3.044314e-01 -1.790721e-02 -1.113248e-01 -3.785917e-01
## [686] -9.010206e-02  6.571444e-03  8.581092e-02 -7.672606e-01 -2.385337e-01
## [691]  2.468412e-01 -4.375649e-01 -6.342055e-02 -3.627582e-01  2.156434e-01
## [696] -2.470904e-01  5.508715e-02  1.840576e-01 -2.150733e-02 -1.625090e-01
## [701]  2.983617e-02  4.805083e-01 -1.621047e-01 -1.415552e-01 -1.574850e-01
## [706]  8.751064e-01 -1.674026e-02 -5.356540e-02  5.106786e-01  4.394082e-01
## [711]  2.758687e-02 -3.988326e-01  6.465429e-01 -2.706109e-01  3.424932e-02
## [716] -6.866482e-02 -5.298112e-02  2.480326e-02 -7.139497e-01 -3.630970e-02
## [721] -4.188901e-01  6.531666e-01 -5.873444e-01  2.689455e-01  9.869960e-01
## [726] -1.070126e-01  1.750486e-01 -2.013815e-01 -2.129429e-01  7.594478e-02
## [731] -1.672570e+00 -1.064866e-01  1.574931e-01  1.979385e-02 -5.150945e-01
## [736] -3.766733e-01 -2.137498e-02 -1.073810e-01 -2.134635e-01 -1.855818e-01
## [741] -1.708807e-02 -1.726505e-01  1.032147e-01  8.987223e-02 -2.565729e-01
## [746] -5.972939e-02  5.300176e-01 -1.881394e-01 -7.514623e-02 -1.737221e-01
## [751]  8.981558e-02 -1.748445e-01  3.526893e-02 -4.491055e-02  1.145586e-01
## [756]  8.069149e-02 -3.601578e-01  8.716559e-02  1.365754e-01  4.346924e-01
## [761] -2.783346e-02  6.832110e-02  7.206550e-01 -3.813790e-02 -7.751635e-01
## [766] -8.436457e-02  2.263570e-02 -6.688793e-01 -9.590185e-01  7.818311e-02
## [771] -3.607070e-02 -1.210050e-03  2.883370e-01  1.729405e-01  1.734814e+00
## [776] -5.664017e-02 -1.951159e-01 -1.051384e-02 -6.885826e-01  1.681728e-01
## [781] -6.072303e-02 -1.695583e-01  4.107151e-02 -6.392449e-01 -6.848177e-01
## [786]  4.278814e-01  2.662421e-02  1.266999e-03 -4.422224e-01 -6.194561e-03
## [791] -1.279596e-01 -1.997994e-01 -5.742697e-01  4.382236e-02 -2.601747e-02
## [796]  5.436311e-01 -1.660106e-01  6.978404e-02 -2.627708e-02  3.497172e-01
## [801]  1.243375e-02 -2.010872e-01 -8.080743e-03  2.759599e-01  5.547329e-01
## [806]  1.392803e+00 -1.529106e-01  1.434344e-01  1.602694e-01 -9.842346e-02
## [811] -1.124265e-01  4.220789e-02 -2.395565e+00  3.710113e-01  1.053457e-01
## [816] -3.446116e-01 -3.351426e-01 -2.300393e-03 -2.646974e-01 -2.915750e-02
## [821] -1.301216e-01 -6.492286e-02 -7.821830e-01  1.023477e-01 -3.226525e-01
## [826]  9.055688e-02 -1.112345e+00 -1.560123e-02 -6.262339e-02  1.703541e-02
## [831]  5.435710e-01  5.243943e-01 -4.134813e-02  1.385248e+00 -4.477960e-03
## [836]  7.839295e-03 -6.401370e-02  4.112528e-01 -1.388894e-01 -1.013133e-02
## [841] -2.003827e-01 -5.732053e-01 -3.241531e-01 -3.651057e-03  1.082202e-03
## [846]  1.414863e-01 -2.378914e-01  6.748553e-02 -1.843722e-01 -6.178440e-02
## [851] -1.001225e+00 -2.170602e-01 -4.001898e-01  3.712064e-02 -2.155293e+00
## [856]  2.531280e-01 -2.833104e-02  7.969625e-03 -4.197018e-02  3.135933e-02
## [861]  1.713399e-01  1.835889e-01 -2.531916e-01 -3.677541e-01 -1.067876e+00
## [866]  9.960498e-02 -1.142538e-01 -5.550962e-02  3.758049e-01  4.856341e-01
## [871] -1.771682e-01  1.022977e-02  1.761463e-01  3.862662e-01  6.943657e-03
## [876] -5.428801e-01 -9.254432e-01  8.749307e-02  3.383820e-01 -1.216975e-01
## [881] -1.413384e-01 -1.600098e+00  1.535121e-01  1.958398e-01 -1.001117e-01
## [886] -7.961919e-03 -3.682498e-01 -1.246021e-01 -5.491021e-02  9.324107e-03
## [891]  5.804491e-02  5.694383e-01 -2.537172e-01 -6.806673e-02 -8.973917e-02
## [896] -1.709497e-03 -1.378458e-01 -4.448251e-01 -3.308261e-01 -5.166114e-01
## [901]  7.216130e-02 -2.707516e-02 -4.020304e-01  9.196608e-02  5.559217e-03
## [906]  4.367326e-01 -7.877105e-01 -3.179396e-01 -2.795404e-01  1.211986e-01
## [911]  2.407538e-01 -6.047215e-01  3.223219e-01 -4.248844e-01 -1.332464e-01
## [916] -9.476880e-02  1.511279e+00  1.285364e-02  8.766584e-01 -6.769949e-01
## [921]  9.305113e-02  2.693269e-01 -5.542841e-01 -8.134732e-01 -1.472321e-01
## [926] -1.096858e+00  3.655388e-02 -7.222563e-01  3.505404e-01 -1.573563e-01
```

```
## [931]   1.453708e-01  -1.368368e-03   2.997664e-01   3.756843e-01  -4.532368e-02
## [936]  -4.993287e-01   2.220290e-02  -4.082097e-02  -1.864702e-01  -7.322576e-02
## [941]  -2.797777e-01  -9.794069e-03   3.711692e-01  -7.423237e-01  -6.397348e-02
## [946]  -2.937286e-01  -3.967584e-01   2.990345e-02  -4.106767e-01   8.386137e-01
## [951]  -6.177124e-02  -3.788948e-01   1.470180e-01  -1.423557e-01  -9.145924e-02
## [956]   4.229455e-02   2.794844e-01  -3.081458e-02   3.322778e-01  -2.871966e-02
## [961]   3.766519e-01   9.475360e-03  -1.782158e-01  -4.785746e-01   2.010021e-02
## [966]   1.857162e-01   1.186293e-02  -4.816801e-02  -1.337408e-01  -1.283471e-02
## [971]   3.296937e-02   1.007022e-02  -1.838323e-03  -2.177544e-02  -2.428603e-01
## [976]   2.763019e-01  -4.200811e-01  -1.578880e-01  -3.317435e-01   2.190314e-02
## [981]  -3.046373e-01   5.735525e-01  -1.763280e-02   2.802891e-02   1.067253e-01
## [986]   6.136927e-01   2.480730e-02  -1.614928e-01  -2.289983e-01  -9.952987e-03
## [991]  -6.919070e-02  -2.860666e-02   4.406815e-01   2.579119e-01  -1.036065e-01
## [996]   5.641981e-01   2.995383e-02  -5.978907e-02   2.877935e-01  -9.308276e-01
##
## $biasJack
##    [1]  -0.091543437   0.389945375   0.144705965   1.439806466   0.111027072
##    [6]   1.356570621   3.327457775   0.282274147   1.424559926  -0.074251557
##   [11]   0.042274550  -0.168229752  -0.051478736   0.152687984   0.148916110
##   [16]   1.397121927  -0.101832391   0.301761957   0.467017302  -0.148813862
##   [21]   0.867845661   0.987101309   0.196482605   0.480234162   0.239796443
##   [26]  -0.125412396   0.040031591   0.212660348   0.282547234   0.297159926
##   [31]  -0.109088421   0.983175455   0.302364456  -0.127193172   0.194211649
##   [36]   1.073398348  -0.031500223   0.128410330   0.531195000   0.228137451
##   [41]   0.999395962   0.407794865   1.793748134   0.225601127   0.096588791
##   [46]   5.416565614   0.308159076   0.030390382   1.358309682   2.319936289
##   [51]   0.957966139   2.316304120   2.244932151   0.389279594   0.627310965
##   [56]  -0.253428909   0.374655168   0.132493375   0.027279725   6.173689945
##   [61]   0.368091109   0.678138773   0.231180010  -0.174998763   2.856531878
##   [66]  -0.079978137  -0.137928122   6.997365277  -0.120789887   0.385907444
##   [71]   0.098489384   0.462974539   0.072102818   0.094037050   2.982024322
##   [76]   3.133814259   0.219094908   7.943043499   1.035284162  -0.140773495
##   [81]   0.471144691   0.345896180   2.883436287   1.083752573  -0.213923698
##   [86]   0.107122194   1.125379906   5.930094414   0.769162729  -0.072311149
##   [91]   0.990209755  -0.161387726   1.125498991   0.335292509   0.130167504
##   [96]  -0.125181270  -0.193618268   3.978581155   0.267847455   1.693228700
##  [101]  -0.311398425   3.545180087   0.125869408  -0.095637945  -0.102012965
##  [106]   1.739355739   1.369022638  -0.010575169   2.156840000  -0.086770375
##  [111]   1.359485988   0.249248146   0.842349160  -0.115925833   0.096778008
##  [116]   0.248918676  -0.021367003  -0.175264566   0.184906968   0.603572562
##  [121]   5.911183087   1.302383371  -0.037675047   0.472453521   0.858389094
##  [126]   0.772308306   1.136497456  -0.093828161   0.012080482   0.468231259
##  [131]   0.073445847   0.681890489   0.492995708   0.554176550   3.330943743
##  [136]   1.465084781   0.589297326   1.337449921   0.312228420  -0.197118010
##  [141]   0.868191128  -0.319636851  12.317197765   1.625706326  -0.129868837
##  [146]   0.209720285   0.887501904   0.673427325   1.214109282  -0.273797667
##  [151]   4.585206344   4.055364883   2.072205218   0.279948295  -0.105772227
##  [156]   4.272327251   1.208580657   0.262632544   2.949162520   2.371291421
##  [161]   1.917097092   5.732319855   1.400053646   0.012028434   0.078796610
##  [166]   0.387006533  -0.154137576   8.066234890   0.167387551  -0.092520199
##  [171]  -0.216997506  -0.038496032   3.460198855   3.017062468   1.064361007
##  [176]  -0.032925485   2.582490311   1.216932845  -0.100434940   0.119897658
##  [181]   8.460928076  -0.106833463   0.500376569   0.903025465  -0.064395372
##  [186]   0.169579110  -0.054551591   2.040383915  -0.008797921  15.448523981
```

```
## [191]   2.664424537  0.044811964 10.606532976  1.268511517 -0.202291178
## [196]   5.283325970  0.053129517 -0.252167916  1.243312864  2.514782684
## [201]   4.477980256 -0.329284771  0.117385838  4.319983005 -0.074920671
## [206]   0.007500206  2.619131292  2.799271035  0.531934163 -0.006393313
## [211]   0.146569134 -0.031203740  1.609680607  0.773833266  1.477519415
## [216]  -0.286753803  0.721086311  0.127058704  1.100671802  4.022272075
## [221]   0.123902566  0.633914526  3.792009732  0.400398530 -0.122620253
## [226]   1.209852482  0.249501882 16.853929385  1.600428141  2.072662500
## [231]   0.403009154  0.850255026  0.210014508  0.818305154  0.109679688
## [236]   2.682145479 -0.003647328  0.078498897  7.675370468 -0.258634946
## [241]   1.273135071  0.878964474  0.482023479 -0.040015398  0.481456555
## [246]   0.399741872 -0.296389309  0.120217476  0.198689420  1.863815034
## [251]   2.240610443  0.184102504  4.806669736 -0.259640286 -0.232218272
## [256]   0.826217265  2.014450025  0.668911054  0.030446704  0.057542377
## [261]   1.214404371  2.901759601 -0.128102427  0.424993945  0.408111202
## [266]   2.196195136  0.486803093  1.172200618  0.142142412  2.383283632
## [271]   1.554832856  1.014446860  3.176953663  1.176839449  2.668915808
## [276]   0.130214034 -0.175965966  0.594822933 -0.200553491  3.069303839
## [281]   4.068371012  0.243893160  0.136367399  0.737914920  0.287891237
## [286]  -0.036156103 -0.082572169  7.801349828 -0.005973993  0.483944726
## [291]   0.722919271  2.962047202  1.346580834  5.445513634  0.406217223
## [296]   0.220400274 -0.193683498  1.248616176 -0.221381464  1.805948589
## [301]   7.629848682  0.274216599  0.710536249  0.670816388 -0.116469820
## [306]  -0.080625480  2.789090541  0.655362676  0.766178783  0.289509717
## [311]  -0.027529988  0.714045402  1.303651461  0.241128478  7.440865270
## [316]   3.110768405  0.166919539 -0.193308644  0.212267818  1.466431251
## [321]   1.496160052 -0.240961963 -0.001857222 -0.047299404  3.611758652
## [326]   0.882704941  1.310181182  0.468139037  0.021677373  0.179098659
## [331]   1.423991231  0.209110143  0.364443893  0.307965967  0.800518977
## [336]   0.404808469  0.306005427 -0.161505324  0.199556468  0.428159585
## [341]  -0.144013689 -0.024936130  0.540712820  0.326637442 -0.079577001
## [346]  -0.041242180  1.139363266 11.430023847  0.668251432  0.528987791
## [351]   0.798257420 -0.099468189  0.129174526 -0.291321126  0.806904779
## [356]   4.954149702  0.311584663 -0.171713081  0.055481522 -0.193228288
## [361]  -0.203428771 -0.265492808  2.471740665 -0.108979162  0.501532746
## [366]   1.277984248  0.452557258  0.170910242  0.062265341  0.925618164
## [371]   3.839467830 -0.112169194  0.358040224  0.264212134  0.228352048
## [376]  -0.282458372  7.500971176 -0.134894166  0.354398381  0.071649904
## [381]  -0.081951397 -0.101850905  0.525131833  0.371933353  1.093903380
## [386]   1.203420315 -0.069269373 -0.449951407  0.222907298  4.511484615
## [391]   1.170745507  2.362705052  0.811275163 -0.026664677  0.864028776
## [396]   2.734810092  0.153667727  0.038382241  1.264201485  0.277511060
## [401]   0.356101884  0.896627930 -0.086192604 -0.060932758  0.233301569
## [406]   2.434857356  0.073453587  0.265200274  1.361029288  2.830224524
## [411]  -0.189312015  6.823561462  0.222470245  0.357869281  0.182370754
## [416]   3.343290238  2.093064856 -0.285401093  0.451924081 -0.106722949
## [421]  -0.142944412  1.725491598 -0.083742877 -0.033842930  0.716811170
## [426]   1.051983842  1.064222987  0.978865487  0.652526971  0.723000789
## [431]   0.389969293 12.752098200 -0.044580081  1.070417522  0.067968203
## [436]  -0.323107849  0.032076763  0.889602341  2.682613513  0.250967216
## [441]   0.710291460  0.048798706 -0.006856676  0.228942257  0.706502912
## [446]   0.573005393  0.156882873  0.485378088  1.683671814  1.680457884
## [451]   0.174724701 -0.310065857 -0.303572707 -0.329278032  5.592342890
## [456]   3.798039485  0.361383446  1.193263082 -0.197033729  0.238696386
```

```
## [461] -0.054271914  0.010914240  2.206860385  2.322131582  0.666718360
## [466] -0.125598105  3.772800287  1.686864076  0.064353866  0.201029459
## [471] -0.250297367  1.472356909  0.193713728  1.189540143  0.383234015
## [476]  7.595325850  2.718089136  2.866219835  0.267791521  1.082575005
## [481]  1.344092238 -0.229956729 -0.046322195  0.145918052  0.261599015
## [486]  1.791381209  0.743510988  0.432306370  0.564141013  4.807898369
## [491]  0.036931196  0.351984552  0.826856438  0.528182129 -0.138101771
## [496]  1.422415436  1.326938966  1.226050768  1.980418078  0.002092057
## [501]  0.122030564 18.392905981  0.435402815  3.237962310  0.246836172
## [506]  3.381171794  1.177456555  5.639899913 -0.177699825  2.410335082
## [511]  2.414517552  0.758264823  3.065781569  1.145743947  0.022253593
## [516]  0.312713062  0.499586702 -0.327855021  0.269999417  0.263762259
## [521]  0.298686419  0.106752042  0.111158166  3.126699108  0.067433694
## [526]  6.959474807  0.121757055 -0.128970755  2.803753420  0.485198851
## [531]  1.063973771  1.474758286  2.655363316  0.276438476 -0.090653421
## [536]  1.425594171  1.257756197  5.486608464  1.193132431  1.641678856
## [541]  4.335043804  3.183931845  0.498418538  1.810885500  0.162074816
## [546]  0.026315159  1.310928603  0.033415251 -0.096253228  1.907351042
## [551]  3.675564970  1.285339393  0.120225086  1.447897739  0.258271757
## [556]  0.068395776  2.359318624  2.166380211  2.213558769  2.518840301
## [561]  0.378247995  0.007784927  4.648034860  1.010066564 10.569853606
## [566]  0.467299411  0.288614825  0.408140094 -0.033362472 -0.139393791
## [571] -0.227173544  1.264740856  2.718047844 -0.259248400  0.394207529
## [576]  3.292425300  1.996962398  2.471688612  3.085288116 -0.392162278
## [581]  0.043535630  3.144914164  0.768557707  0.768481420 -0.169723052
## [586]  4.238681662  1.230217463  0.057974783  2.322587134  0.372279688
## [591] -0.216415254  1.092896213  0.581430703  0.611459042  1.193201128
## [596]  0.217179799  0.031039868  3.725360592  2.835054189  0.706579016
## [601] -0.023893099 -0.121749547  0.485863255  0.296802176  0.073641924
## [606]  3.220573439  4.143331572  0.021980794  0.037240385  1.291324360
## [611]  5.559227986  0.521556371  3.901571180 -0.122186473 -0.096276826
## [616]  0.763208589  0.879186166  0.514374097 -0.141175743 -0.153732382
## [621]  0.178718856 -0.207740365 -0.334104471 -0.062040417  0.549932068
## [626]  0.544403105  2.296815233  1.721462698  0.933930615  0.072209612
## [631]  0.322863185 -0.178315499  0.221120907  0.444676901  0.007740173
## [636]  2.682133597  0.889213544  0.360444002  0.309903042  0.067293190
## [641] -0.266354948  0.577398301  7.316178765  2.708076800  0.431339023
## [646]  0.233164845  0.614251554  3.269670180  1.794081822  2.366903928
## [651] -0.176233636  0.152866009  1.105192090  1.311276536 -0.147698874
## [656] -0.215607233  4.504597590  0.261187985  0.433675180  2.016785281
## [661]  0.954810257  1.691426847  0.152032201  1.457495980 -0.246214758
## [666] -0.028041547  0.117833363  0.023275337 -0.084208841  3.071414711
## [671]  0.678526936  1.384630882  1.378943673 -0.026900902  0.738271668
## [676] -0.325120041  1.878824300  0.434680008  0.533269872  0.487550612
## [681]  1.210025412  0.203896997  0.326599105  0.044449392  1.128518524
## [686]  0.336210286 -0.138427508  0.070208945  1.436119743  0.154894635
## [691]  1.201106031  0.545905946  9.610973095  0.321413114 -0.350668660
## [696]  0.262472299  0.305480701  1.869734149  0.075603325 -0.147105279
## [701]  0.315709893  0.483145853  0.505592107  0.032224032  0.350255512
## [706]  1.787186937 -0.253946383 -0.166686670  1.191561570  1.121776834
## [711] -0.226719287  0.548153324  4.392931859  0.796134139  0.009629549
## [716]  1.413839426 -0.243905999  0.276568917  1.995723906 -0.265579715
## [721]  0.408866486  3.799170953  2.355414143  0.947604196  2.233717388
## [726]  0.244778639  0.068329569  0.468028027 -0.136793176 11.114076754
```

```
## [731]  4.597844150  0.149618396  0.766842446  1.633149276  1.350335442
## [736]  0.520189338  0.899194668  0.081793439  0.710447678  0.976387355
## [741]  2.494126131  0.104900490 -0.487786253  0.079543893  0.509850140
## [746]  1.231620539  1.146198203  3.982308630  0.190330755 -0.186062511
## [751]  0.451894103  0.559151954  0.100250168  0.058983917  0.067636011
## [756]  0.371361960  0.327879233  0.721356182 -0.302994742  1.332198050
## [761]  3.048231567 -0.101348936  0.472819954 -0.027001859  0.366609132
## [766] -0.051855601  0.147504443  0.841580339  1.525814109 -0.163379845
## [771]  0.099339137  1.060916704  1.588602925  0.436153557 15.198175775
## [776]  0.050682316  1.153535072  0.819126709  2.053295155 -0.203571920
## [781]  3.269503484  0.701942719  0.204570688  1.400403954  2.625175500
## [786]  2.130956777  0.208000297  0.215446774  1.428817989 -0.042573057
## [791] -0.030371818  0.180715725  0.765459513  0.643273610  1.059467852
## [796]  1.057833154  0.331629352 -0.036164817  1.509320127  0.597221361
## [801] -0.170280474  0.245316524 -0.205052688  0.886523853  1.410516343
## [806]  9.815844261  3.039193385  0.191098069 -0.077639188 -0.168553079
## [811]  4.747266736  0.464664762 10.017572935  0.796606520  0.191967613
## [816]  0.465473181  0.530732630  1.754329290 -0.371791146  0.140597425
## [821]  0.207173219 -0.001693673  1.966292584  0.399564726  0.687309222
## [826]  0.827212312  1.399552368  0.043222803  9.237144293  0.011415214
## [831]  0.573536976  0.638492964 -0.038804752  5.343214402 -0.196739737
## [836] -0.091431230 -0.345330509  0.989352827  0.063376037 15.404732648
## [841]  0.168851195  1.450956132  1.087571443  0.568880687  5.368596082
## [846]  0.221879350  0.527877780  2.328432828  1.118226362 -0.168612835
## [851]  0.956217706 -0.073651786 -0.086962873 -0.036056451  8.239685357
## [856]  0.307939746  0.838424961 -0.087615893  0.370089025  0.747754198
## [861]  0.078368522  0.369477947  0.785871003  0.184967916  4.362888907
## [866]  0.595770400  0.068220537  3.280221956  0.805006831  3.940811266
## [871]  0.343641875 -0.170345602  0.196851573  0.552687576 -0.404300189
## [876]  0.300164051  2.698085907  0.285465723  0.784208205  0.138050952
## [881]  0.329690058  2.694554804  0.146861214  0.486027422 -0.103961587
## [886]  0.195929118  0.758677018 -0.206013134  0.463120958  0.083354691
## [891] -0.142877672  3.221810233  0.645301104  0.014060244  0.322471283
## [896] -0.298290384  0.085840988  1.630759888 -0.388897681  0.587629060
## [901]  0.454026558 -0.158057686 -0.096575467 -0.543621465  0.143075934
## [906]  0.026851221  1.196468584  0.114115164  0.434857578  0.553500253
## [911]  0.001566375  0.536372169  1.445329591  1.075902391  0.197237064
## [916] -0.117680249  6.567570625  1.631286286  3.385749023  1.263781194
## [921]  0.192588918  0.238750547  1.665821601  2.175294368  0.219054569
## [926]  3.721314327  0.556488877  2.327967635  2.167831741  0.713675583
## [931]  0.609053578  5.075105149  1.500413302  0.151787471  0.003482716
## [936]  1.879564680  1.855279686  0.042781359  0.134825325  2.326899015
## [941]  0.309614216  5.933761249  2.332235417  0.872591003  1.436784184
## [946]  1.124041619 -0.173269951  1.708657425  0.787989383  5.460158354
## [951]  0.459125188  0.386138247 -0.115764271  2.782541828  0.543227296
## [956] -0.218097765  1.255960724  1.334216990 -0.099360182 -0.024196860
## [961]  0.547886340  2.123594342  0.573086164  0.188383802  0.911520610
## [966]  0.191505981  1.272049719  0.105177344  0.203856150  1.952051394
## [971] -0.074097325  0.264613914  2.657517929  0.159967219 -0.246906654
## [976]  0.465964791  0.123468685 -0.013674342  2.158392599  0.048989321
## [981]  0.900525113  0.588499216  2.283156289  0.132412437  1.056101869
## [986]  3.912590299 -0.168517103  0.303695408  0.129866569 -0.145065630
## [991]  0.150372806  2.190299045  2.218875667  1.050364504  0.857487771
## [996]  1.286937663 -0.166323559  0.049778753  1.599548964  2.690361965
```

```
# Line Plot

d <- var$biasBoot
dj <-var$biasJack

plot(d,main ="Comparision between the bootstrap and the jacknife bias",type="l",col="red")
lines(dj,col="blue")
```

Comparision between the bootstrap and the jacknife bias