```
function y=gci(x)
% example
%X=[90 10 60 186 61 49 14 24 56 20 79 84 44 59 29 118 25 156 310 76 26 44 23 62 130 208 70 101
208];
%X=[58 82 42 28 118 96 49 54 42 51 66 89 40 51 54 55 59 42 39 40 60 63 59 70 32 52 79];
X=[5.1 2.4 0.4 0.5 2.5 0.1 6.8 1.2 0.5 0.6 5.3 2.3 1.8 1.2 1.3 1.1 0.9 3.2 1.0 0.9 0.4 0.6 8.0 0.4 2.7 0.2
2.0 0.2 0.5 0.8 2.0 2.9 0.1 4.0];
n=length(X);t0=25;
r1=1;m1=2;p1=1;r2=10;m2=3;p2=2;
z1=norminv(0.95,0,1);z2=-z1;z3=norminv(0.975,0,1);z4=-z3;
Xg=mean(log(X));Xm=mean(X);t=Xg-log(Xm);X3=2*n*Xm;


x1=erfen(n,t,z1);x2=erfen(n,t,z2);%90% ACI for the shape parameter
x3=erfen(n,t,z3);x4=erfen(n,t,z4);%95% ACI for the shape parameter
disp('90% CI for the shape parameter')
[x1 x2]
disp('95% CI for the shape parameter')
[x3 x4]

B=100000;
for j=1:B
    zz=norminv(unifrnd(0,1),0,1);
    u=erfen(n,t,zz);x0=2*u;
    W1(j)=chi2rnd(x0*n)/X3;
    W2(j)=u/W1(j);W3(j)=chi2inv(0.1,x0)/(2*W1(j));
    W4(j)=1-chi2cdf(2*t0*W1(j),x0);
    W5(j)=gamrnd(u,1/W1(j));
    zz1=gamrnd(u,1/W1(j),m1,r1);zz1=sort(zz1);
    W61(j)=max(zz1(p1,1:r1));
    zz2=gamrnd(u,1/W1(j),m1,r2);zz2=sort(zz2);
    W62(j)=max(zz2(p1,1:r2));
    zz3=gamrnd(u,1/W1(j),m2,r2);zz3=sort(zz3);
    W63(j)=max(zz3(p1,1:r2));W64(j)=max(zz3(p2,1:r2));
end
W1=sort(W1);W2=sort(W2);W3=sort(W3);W4=sort(W4);W5=sort(W5);
W61=sort(W61);W62=sort(W62);W63=sort(W63);W64=sort(W64);


disp('90\% GCI for the scale parameter')
[W1(0.05*B) W1(.95*B)]
disp('95\% GCI for the scale parameter')
[W1(0.025*B) W1(.975*B)]

disp('90\% GCI for the mean')
[W2(0.05*B) W2(.95*B)]
disp('95% GCI for the mean')
[W2(0.025*B) W2(.975*B)]

disp('90\% GCI for X_0.1')
[W3(0.05*B) W3(.95*B)]
disp('95\% GCI for X_0.1')
[W3(0.025*B) W3(.975*B)]

disp('90\% GCI for R(t_0)')
[W4(0.05*B) W4(.95*B)]
```

```
disp('95\% GCI for R(t_0)')
[W4(0.025*B) W4(.975*B)]


disp('90\% UPL for X_{n+1}')
W5(0.9*B)
disp('95\% UPL for X_{n+1}')
W5(.95*B)

disp('90\% UPLs for at least p of m measurements at each of r locations')
[W61(.9*B) W62(.9*B) W63(.9*B) W64(.9*B)]
disp('95\% UPLs for at least p of m measurements at each of r locations')
[W61(.95*B) W62(.95*B) W63(.95*B) W64(.95*B)]



function zz=erfen(n,s,z)    \%bisectin method
a=0;b=15;
h=f(b,n,s,z);
while h<0
   b=b+1;h=f(b,n,s,z);
end
c=(a+b)/2;h=f(c,n,s,z);
while abs(a-b)>1.0e-6
   if h>0
      b=c;
   else
      a=c;
   end
   c=(a+b)/2;
   h=f(c,n,s,z);
end
zz=c;


function h=f(x,n,s,z)
p=1/n;y=n*x;
j1=psi(x)-psi(y)+log(n);\% the 1st cumulant of T
j2=psi(1,x)*p-psi(1,y); \% the 2nd cumulant of T
j3=psi(2,x)*p^2-psi(2,y);\% the 3rd cumulant of T
j4=psi(3,x)*p^3-psi(3,y);\% the 4th cumulant of T
j5=psi(4,x)*p^4-psi(4,y);\% the 5th cumulant of T

k3=j3*j2^(-3/2);
k4=j4*j2^(-2);
k5=j5*j2^(-5/2);

%cornish fisher
r=z+1/6.*k3.*(z^2-1)+1/24.*k4.*(z^3-3*z)-1/36.*k3.^2.*(2*z^3-5*z)+1/120.*k5.*(z^4-6*z^2+3)-
1/24.*k3.*k4.*(z^4-5*z^2+2)+1/324.*k3.^3*(12*z^4-53*z^2+17);

h=r.*j2.^(1/2)+j1-s;
```