**Season-3**

**Main EM for real data**

clc

clear

close all

for rr=1:5

%.........inputs......

ni=9;%tedade mah

m=30;%tadade ostan

p=4;%tedade param

v=2;%daraje azadi t

q=2;%tedade random effect

load fixed\_data

z=ones(ni,2,m);

z=z./z\*0.01;

% x=randn(ni,p,m);%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% fixed

beta=[1 2 3 1]';

% x0=x;

% % x\_nl0=xlsread('C:\Users\TechSystem\Desktop\matlab dir\datax.csv');%% fixed

% x\_nl=x\_nl0;

% % x\_nl(:,end)=[];

% x\_nl(:,1)=[];

% for j=1:m

% x1(:,:,j)=[x0(:,:,j) x\_nl(:,j)];

% end

% x\_sp00=xlsread('C:\Users\TechSystem\Desktop\matlab dir\datasp.csv'); % fixed

% x\_sp0=x\_sp00;

% x\_sp0(:,1)=[];

% for j=1:m

% x\_sp(:,:,j)=x\_sp0((j-1)\*ni+1:j\*ni,:);

% end

% for j=1:m

% x\_tilled(:,:,j)=[x(:,:,j) x\_sp(:,:,j)];

% end

% x2=x\_tilled;

x2=load('realdata','x');

x2=x2.x\*10;

COV=diag([0.1 0.1 0.1 0.1]);

Landa=zeros(4,4,30);

for j=1:m

Landa(1:4,1:4,j)=COV;

end

error=randn(ni,p,m);

error(:,(p+1):size(x2,2),:)=0;

for j=1:3

error(:,j,:)=error(:,j,:)\*sqrt(COV(j,j));

end

x2\_pure=x2;

x2\_error=x2+error/1000;

x2=x2\_error;

% beta=[rand(1,size(x1,2))]';%%%%%%%%%%%%%%%%%%%%%%% fixed

% beta(end)=0;

% z=randn(ni,q,m);%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% fixed

% D=[1 .5;.5 1];

% for i=1:m

% % u(:,:,i)=mvtrnd(D,v,1)'/100;

% u(:,:,i)=mvnrnd([0 0],D)'/10000;

%

% end

% sigmai=eye(ni);

% for i=1:m

% % ei(:,:,i)=mvtrnd(sigmai,v,1)';

% ei(:,:,i)=randn(100,1);

% end

% for i=1:m

% y(:,i)=x1(:,:,i)\*beta+z(:,:,i)\*u(:,:,i)+ei(:,:,i);

% end

y2=load('realdata','y');

y=y2.y\*10;

%%

%........................initial value................................

D0=[1 0.5;0.5 1]/10;

sigma0=rand;

%%

x=x2\_pure;

beta0=randn(size(x,2),1);

[beta\_em,sigma\_em,D\_em,u\_em,flag]=EM(z,x,y,beta0,sigma0,D0,Landa,[0 0 0],0.01);

[beta\_em,sigma\_em,D\_em,u\_em,flag]=EM(z,x,y,beta\_em,sigma0,D0,Landa,[1 0 0],0.01);

[beta\_em,sigma\_em,D\_em,u\_em,flag]=EM(z,x,y,beta\_em,sigma\_em,D0,Landa,[1 1 0],0.01);

if flag==1

rr=rr+1

y\_run(:,:,rr)=y;

D0\_run(:,:,rr)=D\_em;

sigma0\_run(:,:,rr)=sigma\_em;

beta0\_run(:,:,rr)=beta\_em;

for i=1:m

y\_em(:,i)=x2(:,:,i)\*beta\_em+z(:,:,i)\*u\_em(:,:,i);

end

y\_hat2\_run(:,:,rr)=y\_em;

MSE2(rr)=(mse(y-y\_em));

RMSE2(rr)=sqrt(MSE2(rr));

RMSE2(rr);

end

end

**EM function for real data**

function [beta\_em,sigma\_em,D\_em,u\_em,flag]=EM(z,x,y,beta0,sigma0,D0,Landa,fixing,Dist)

x2=x;

v=2;

m=30;

dist=1;

flag=1;

counter=0;

ni=9;

while dist>Dist

clc

disp(['num=' num2cell(evalin('base','rr')) 'counter=' num2cell(counter) ' dist=' num2cell(dist)])

%..........step E.......................

for i=1:m

u\_hat(:,:,i)=D0\*z(:,:,i)'\*(z(:,:,i)\*D0\*z(:,:,i)'+sigma0\*eye(ni))^-1\*(y(:,i)-x2(:,:,i)\*beta0);

end

for i=1:m

phi\_hat(:,:,i)=D0-D0\*(z(:,:,i))'\*((z(:,:,i)\*D0\*z(:,:,i)'+sigma0\*eye(ni))^-1)\*z(:,:,i)\*D0;

end

for i=1:m

delta0(:,i)=((y(:,i)-x(:,:,i)\*beta0-z(:,:,i)\*u\_hat(:,:,i))')\*(sigma0\*eye(ni))^-1\*(y(:,i)-x(:,:,i)\*beta0-z(:,:,i)\*u\_hat(:,:,i));

end

for i=1:m

t\_0(:,i)=(v+ni)/(v+delta0(:,i));

end

%%

%...........step M.....................

dist=1;temp0=0;

if fixing(1)==0

for i=1:m

temp0=temp0+(t\_0(:,i)\*(x(:,:,i)')\*(delta0(:,i)^2\*eye(ni))^-1\*x(:,:,i))+trace((z(:,:,i)\*D0\*z(:,:,i)'+sigma0\*eye(ni))^-1)\*Landa(:,:,i);

end

temp1=0;

for i=1:m

temp1=temp1+(t\_0(:,i)\*(x(:,:,i)')\*(delta0(:,i)^2\*eye(ni))^-1)\*(y(:,i)-z(:,:,i)\*u\_hat(:,:,i));

end

beta1=(temp0^-1)\*temp1;

else

beta1=beta0;

end

if fixing(2)==0

sigma1=0;

for i=1:m

sigma1=sigma1+((y(:,i)-x(:,:,i)\*beta1-z(:,:,i)\*u\_hat(:,:,i))')\*(y(:,i)-x(:,:,i)\*beta1-z(:,:,i)\*u\_hat(:,:,i))+trace(phi\_hat(:,:,i)\*(z(:,:,i)')\*z(:,:,i));

% trace((z(:,:,i)\*D0\*z(:,:,i)'+sigma0\*eye(ni))^-1)\*beta1'\*Landa(:,:,i)\*beta1;

end

sigma1=sigma1/size(z,1);

else

sigma1=sigma0;

end

D1=0;

for i=1:m

D1=D1+t\_0(:,i)\*u\_hat(:,:,i)\*u\_hat(:,:,i)'+phi\_hat(:,:,i);

end

D1=D1/m;

if fixing(1)==0

dist=sum(abs(beta0-beta1));

end

if fixing(1)==1&&fixing(2)==0

dist=sum(abs(sigma1-sigma0))

end

if fixing(1)==1&&fixing(2)==1&&fixing(3)==0

dist=sum(abs(D1(:)-D0(:)));

end

beta0=beta1;

D0=D1;

sigma0=sigma1;

counter=counter+1;

if counter>20

flag=0;

beta\_em=0;

sigma\_em=0;

D\_em=0;

u\_em=0;

return

end

end

beta\_em=beta0;

sigma\_em=sigma0/100;

D\_em=D0;

u\_em=u\_hat;

flag=1;

**Main EM for simulated data**

clc

clear

close all

for rr=1:1000

%.........inputs......

ni=100;%tedade mah

m=5;%tadade ostan

p=3;%tedade param

v=2;%daraje azadi t

q=2;%tedade random effect

load fixed\_data

z=z./z\*0.01;

% x=randn(ni,p,m);%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% fixed

beta=[1 2 3 ]';

x0=x;

% x\_nl0=xlsread('C:\Users\TechSystem\Desktop\matlab dir\datax.csv');%% fixed

x\_nl=x\_nl0;

% x\_nl(:,end)=[];

x\_nl(:,1)=[];

for j=1:m

x1(:,:,j)=[x0(:,:,j) x\_nl(:,j)];

end

% x\_sp00=xlsread('C:\Users\TechSystem\Desktop\matlab dir\datasp.csv'); % fixed

x\_sp0=x\_sp00;

x\_sp0(:,1)=[];

for j=1:m

x\_sp(:,:,j)=x\_sp0((j-1)\*ni+1:j\*ni,:);

end

for j=1:m

x\_tilled(:,:,j)=[x(:,:,j) x\_sp(:,:,j)];

end

x2=x\_tilled;%bspline added

COV=diag([0.2 0.3 0.4]);%

Landa=zeros(16,16,5);

for j=1:m

Landa(1:3,1:3,j)=COV;

end

error=randn(ni,p,m);

error(:,(p+1):size(x2,2),:)=0;

for j=1:3

error(:,j,:)=error(:,j,:)\*sqrt(COV(j,j));

end

x2\_pure=x2;

x2\_error=x2+error/100;%add messurments error

x2=x2\_error;

% beta=[rand(1,size(x1,2))]';%%%%%%%%%%%%%%%%%%%%%%% fixed

% beta(end)=0;

% z=randn(ni,q,m);%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% fixed

D=[1 .5;.5 1];

for i=1:m

u(:,:,i)=mvtrnd(D,v,1)'/100;

% u(:,:,i)=mvnrnd([0 0],D)'/100;

end

sigmai=eye(ni);

for i=1:m

ei(:,:,i)=mvtrnd(sigmai,v,1)';

% ei(:,:,i)=randn(100,1);

end

beta=[beta ;1];

for i=1:m

y(:,i)=x1(:,:,i)\*beta+z(:,:,i)\*u(:,:,i)+ei(:,:,i);

end

%%

%........................initial value................................

D0=[1 0.5;0.5 1];

sigma0=rand;

%%

x=x2\_pure;

beta0=rand(size(x,2),1);

[beta\_em,sigma\_em,D\_em,u\_em,flag]=EM(z,x,y,beta0,sigma0,D0,Landa,[0 0 0],0.0001);

[beta\_em,sigma\_em,D\_em,u\_em,flag]=EM(z,x,y,beta\_em,sigma0,D0,Landa,[1 0 0],0.001);

[beta\_em,sigma\_em,D\_em,u\_em,flag]=EM(z,x,y,beta\_em,sigma\_em,D0,Landa,[1 1 0],0.01);

if flag==1

rr=rr+1

y\_run(:,:,rr)=y;

D0\_run(:,:,rr)=D\_em;

sigma0\_run(:,:,rr)=sigma\_em;

beta0\_run(:,:,rr)=beta\_em;

for i=1:m

y\_em(:,i)=x2(:,:,i)\*beta\_em+z(:,:,i)\*u\_em(:,:,i);

end

y\_hat2\_run(:,:,rr)=y\_em;

MSE2(rr)=(mse(y-y\_em));

RMSE2(rr)=sqrt(MSE2(rr));

RMSE2(rr);

end

end

###########EM function-#############

function [beta\_em,sigma\_em,D\_em,u\_em,flag]=EM(z,x,y,beta0,sigma0,D0,Landa,fixing,Dist)

x2=x;

v=2;

m=5;

dist=1;

flag=1;

counter=0;

ni=100;

while dist>Dist

clc

disp(['num=' num2cell(evalin('base','rr')) 'counter=' num2cell(counter) ' dist=' num2cell(dist)])

%..........step E.......................

for i=1:m

u\_hat(:,:,i)=D0\*z(:,:,i)'\*(z(:,:,i)\*D0\*z(:,:,i)'+sigma0\*eye(ni))^-1\*(y(:,i)-x2(:,:,i)\*beta0);

end

for i=1:m

phi\_hat(:,:,i)=D0-D0\*(z(:,:,i))'\*((z(:,:,i)\*D0\*z(:,:,i)'+sigma0\*eye(ni))^-1)\*z(:,:,i)\*D0;

end

for i=1:m

delta0(:,i)=((y(:,i)-x(:,:,i)\*beta0-z(:,:,i)\*u\_hat(:,:,i))')\*(sigma0\*eye(ni))^-1\*(y(:,i)-x(:,:,i)\*beta0-z(:,:,i)\*u\_hat(:,:,i));

end

for i=1:m

t\_0(:,i)=(v+ni)/(v+delta0(:,i));

end

%%

%...........step M.....................

dist=1;temp0=0;

if fixing(1)==0

for i=1:m

temp0=temp0+(t\_0(:,i)\*(x(:,:,i)')\*(delta0(:,i)^2\*eye(ni))^-1\*x(:,:,i))+trace((z(:,:,i)\*D0\*z(:,:,i)'+sigma0\*eye(ni))^-1)\*Landa(:,:,i);

end

temp1=0;

for i=1:m

temp1=temp1+(t\_0(:,i)\*(x(:,:,i)')\*(delta0(:,i)^2\*eye(ni))^-1)\*(y(:,i)-z(:,:,i)\*u\_hat(:,:,i));

end

beta1=(temp0^-1)\*temp1;

else

beta1=beta0;

end

if fixing(2)==0

sigma1=0;

for i=1:m

sigma1=sigma1+((y(:,i)-x(:,:,i)\*beta1-z(:,:,i)\*u\_hat(:,:,i))')\*(y(:,i)-x(:,:,i)\*beta1-z(:,:,i)\*u\_hat(:,:,i))+trace(phi\_hat(:,:,i)\*(z(:,:,i)')\*z(:,:,i))-...

trace((z(:,:,i)\*D0\*z(:,:,i)'+sigma0\*eye(ni))^-1)\*beta1'\*Landa(:,:,i)\*beta1;

end

sigma1=sigma1/size(z,1);

else

sigma1=sigma0;

end

D1=0;

for i=1:m

D1=D1+t\_0(:,i)\*u\_hat(:,:,i)\*u\_hat(:,:,i)'+phi\_hat(:,:,i);

end

D1=D1/m;

if fixing(1)==0

dist=sum(abs(beta0-beta1));

end

if fixing(1)==1&&fixing(2)==0

dist=sum(abs(sigma1-sigma0))

end

if fixing(1)==1&&fixing(2)==1&&fixing(3)==0

dist=sum(abs(D1(:)-D0(:)));

end

beta0=beta1;

D0=D1;

sigma0=sigma1;

counter=counter+1;

if counter>500

break

flag=0;

beta\_em=0;

sigma\_em=0;

D\_em=0;

u\_em=0;

end

end

beta\_em=beta0;

sigma\_em=sigma0/100;

D\_em=D0;

u\_em=u\_hat;

flag=1;

**season 4**

**fitness function for simulated data**

function z=ga\_fun1(corom)

% clc

% clear

w=0.8;

p=3;

% corom=rand(1,11);

% Beta=corom(1:9)';

% corom(10:end)=abs(corom(10:end));%ensure var parameters are possitive

% corom(10:end)=corom(10:end)/max(corom(10:end))\*0.2;%all cov parameters are between 0 and 1

% covar1\_error=corom(10);

% covar2\_error=corom(11);

% covar3\_error=corom(12);

% covar1\_u=corom(13);

% covar2\_u=corom(14);

% covar3\_u=corom(15);

% var\_e=corom(16);

corom=abs(corom);%ensure var parameters are possitive

corom=corom/max(corom)\*0.3;%all cov parameters are between 0 and 1

Beta=corom(1:4)';

covar1\_error=corom(5);

covar2\_error=corom(6);

covar3\_error=corom(7);

covar1\_u=corom(8);

covar2\_u=corom(9);

covar3\_u=corom(10);

var\_e=corom(11);

num\_run=100;

%.........inputs......

ni=100;%tedade mah

m=5;%tadade ostan

v=2;%daraje azadi t

%.................x.....................................................

load sample4

x=Sample.xsim;

z=x(:,1:2,:)./x(:,1:2,:)\*0.01;

%........................................................................

COV=diag([covar1\_error covar2\_error covar3\_error]);%

for jj=1:num\_run

error=randn(ni,3,m);

error(:,(p+1):size(x,2),:)=0;

for j=1:3

error(:,j,:)=error(:,j,:)\*sqrt(COV(j,j));

end

x2\_error=x+error\*0.03;%add messurments error

x=x2\_error;

D=[covar1\_u covar2\_u;covar2\_u covar3\_u];

if det(D)<0

covar2\_u=sqrt(covar1\_u\*covar3\_u)-0.001;

D=[covar1\_u covar2\_u;covar2\_u covar3\_u];

end

try

for i=1:size(x,3)

u(:,:,i)=mvtrnd(D,v,1)';

% u(:,:,i)=mvnrnd([0 0],D)';

ei(:,:,i)=mvtrnd(var\_e,2,size(x,1));

end

catch

z=100;

return

end

% ei=randn(size(x,1),1,size(x,3))\*var\_e;

Y=[];

for i=1:size(x,3)

Y(:,i)=x(:,:,i)\*Beta+z(:,:,i)\*u(:,:,i)+ei(:,:,i);

end

ys(:,:,jj)=Y;

jj;

end

y\_hat=mean(ys,3);

y=Sample.y;

z1=mse(y(:)-y\_hat(:));

z1=z1\*(z1<0.5)+z1\*(z1>0.5&&z1<1)\*5+z1\*(z1>1&&z1<2)\*10+z1\*(z1>2&&z1<10)\*100+z1\*(z1>10)\*1000;

[h,n,z2]=kstest2(y(:),ys(:));

z=z1\*w+(1-w)\*z2;

% z=z1;

**Main Ga code for simulated data**

clc

clear

load opt

options.PopulationSize=20;

options.Generations=1000;

options.StallGenLimit=1000;

[corom,fval]=ga(@ga\_fun1,16,options);

w=0.8;

p=3;

corom=abs(corom);%ensure var parameters are possitive

corom=corom/max(corom)\*0.3;%all cov parameters are between 0 and 1

Beta=corom(1:4)';

covar1\_error=corom(5);

covar2\_error=corom(6);

covar3\_error=corom(7);

covar1\_u=corom(8);

covar2\_u=corom(9);

covar3\_u=corom(10);

var\_e=corom(11);

num\_run=100;

%.........inputs......

ni=100;%tedade mah

m=5;%tadade ostan

v=2;%daraje azadi t

%.................x.....................................................

load sample4

x=Sample.xsim;

z=x(:,1:2,:)./x(:,1:2,:)\*0.01;

%........................................................................

COV=diag([covar1\_error covar2\_error covar3\_error]);%

for jj=1:num\_run

error=randn(ni,3,m);

error(:,(p+1):size(x,2),:)=0;

for j=1:3

error(:,j,:)=error(:,j,:)\*sqrt(COV(j,j));

end

x2\_error=x+error\*0.03;%add messurments error

x=x2\_error;

D=[covar1\_u covar2\_u;covar2\_u covar3\_u];

if det(D)<0

covar2\_u=sqrt(covar1\_u\*covar3\_u)-0.001;

D=[covar1\_u covar2\_u;covar2\_u covar3\_u];

end

try

for i=1:size(x,3)

% u(:,:,i)=mvtrnd(D,v,1)';

u(:,:,i)=mvnrnd([0 0],D)';

ei(:,:,i)=mvtrnd(var\_e,2,size(x,1));

end

catch

z=100;

return

end

% ei=randn(size(x,1),1,size(x,3))\*var\_e;

Y=[];

for i=1:size(x,3)

Y(:,i)=x(:,:,i)\*Beta+z(:,:,i)\*u(:,:,i)+ei(:,:,i);

end

ys(:,:,jj)=Y;

jj;

end

y\_hat=mean(ys,3);

y=Sample.y;

z1=mse(y(:)-y\_hat(:));

% z1=z1\*(z1<0.5)+z1\*(z1>0.5&&z1<1)\*5+z1\*(z1>1&&z1<2)\*10+z1\*(z1>2&&z1<10)\*100+z1\*(z1>10)\*1000;

[h,n,z2]=kstest2(y(:),ys(:));

z=z1\*w+(1-w)\*z2;

z=z1;

**fitness function for real data**

function z=ga\_fun(corom)

% clc

w=0.5;

% clear

% corom=rand(1,11);

Beta=corom(1:4)';

corom(5:end)=abs(corom(5:end));%ensure var parameters are possitive

corom(5:end)=corom(5:end)/max(corom(5:end))\*0.95;%all cov parameters are between 0 and 1

covar1\_error=corom(5);

covar2\_error=corom(6);

covar3\_error=corom(7);

covar1\_u=corom(8);

covar2\_u=corom(9);

covar3\_u=corom(10);

var\_e=corom(11);

num\_run=100;

%.........inputs......

ni=100;%tedade mah

m=5;%tadade ostan

p=3;%tedade param

v=2;%daraje azadi t

q=2;%tedade random effect

error\_domain=0.1;

e\_domain=0.1;

u\_domain=0.1;

load realdata

xx=y;yy=y;

% for j=1:size(x,3)

% xx=[xx;x(:,:,j)];

% yy=[yy;y(:,j)];

% end

z=x(:,1:2,:)./x(:,1:2,:);

% beta=[1 2 3 ]';

% %.................x.....................................................

% x0=x;

% % x\_nl0=xlsread('C:\Users\TechSystem\Desktop\matlab dir\datax.csv');%% fixed

% x\_nl=x\_nl0;

% % x\_nl(:,end)=[];;

% x\_nl(:,1)=[];

% for j=1:m

% x1(:,:,j)=[x0(:,:,j) x\_nl(:,j)];

% end

% % x\_sp00=xlsread('C:\Users\TechSystem\Desktop\matlab dir\datasp.csv'); % fixed

% x\_sp0=x\_sp00;

% x\_sp0(:,1)=[];

% for j=1:m

% x\_sp(:,:,j)=x\_sp0((j-1)\*ni+1:j\*ni,:);

% end

% for j=1:m

% x\_tilled(:,:,j)=[x(:,:,j) x\_sp(:,:,j)];

% end

% x2=x\_tilled;%bspline added

% %.......................................................................

%........................................................................

COV=diag([covar1\_error covar2\_error covar3\_error]);%

Landa=zeros(16,16,5);

for j=1:m

Landa(1:3,1:3,j)=COV;

end

% Beta=[Beta ;1];

for jj=1:num\_run

% error=randn(ni,p,m);

% error(:,(p+1):size(x2,2),:)=0;

% for j=1:3

% error(:,j,:)=error(:,j,:)\*sqrt(COV(j,j));

% end

% x2\_pure=x2;

% x2\_error=x2+error\*error\_domain;%add messurments error

% x2=x2\_error;

D=[covar1\_u covar2\_u;covar2\_u covar3\_u];

try

for i=1:size(x,3)

u(:,:,i)=mvtrnd(D,v,1)'\*u\_domain;

% u(:,:,i)=mvnrnd([0 0],D)'\*u\_domian;

end

catch

z=100;

return

end

% sigmai=eye(ni);

for i=1:size(x,3)

ei(:,:,i)=mvtrnd(var\_e,2,size(x,1));

% ei(:,:,i)=randn(size(x,1),1)\*var\_e\*e\_domain;

end

Y=[];

for i=1:size(x,3)

Y(:,i)=x(:,:,i)\*Beta+z(:,:,i)\*u(:,:,i)+ei(:,:,i);

end

y(:,:,jj)=Y;

jj;

end

y\_hat=mean(y,3);

y=yy;

z1=mse(y(:)-y\_hat(:));

% z1=z1\*(z1<0.5)+z1\*(z1>0.5&&z1<1)\*5+z1\*(z1>1&&z1<2)\*10+z1\*(z1>2&&z1<10)\*100+z1\*(z1>10)\*1000;

[h,n,z2]=kstest2(y(:),y\_hat(:));

z=z1\*w+(1-w)\*z2;

% z=z1;

% load data\_ga

% z=mse(yy(:)-y\_hat(:));

**Main GA code for real data**

clc

clear

load opt

[corom,fval]=ga(@ga\_fun,11,options);

% corom=x

% function z=ga\_fun(corom)

% clc

w=0.5;

% clear

% corom=rand(1,11);

Beta=corom(1:4)';

corom(5:end)=abs(corom(5:end));%ensure var parameters are possitive

corom(5:end)=corom(5:end)/max(corom(5:end))\*0.95;%all cov parameters are between 0 and 1

covar1\_error=corom(5);

covar2\_error=corom(6);

covar3\_error=corom(7);

covar1\_u=corom(8);

covar2\_u=corom(9);

covar3\_u=corom(10);

var\_e=corom(11);

num\_run=100;

%.........inputs......

ni=100;%tedade mah

m=5;%tadade ostan

p=3;%tedade param

v=2;%daraje azadi t

q=2;%tedade random effect

error\_domain=0.1;

e\_domain=0.1;

u\_domain=0.1;

load realdata

xx=y;yy=y;

% for j=1:size(x,3)

% xx=[xx;x(:,:,j)];

% yy=[yy;y(:,j)];

% end

z=x(:,1:2,:)./x(:,1:2,:);

% beta=[1 2 3 ]';

% %.................x.....................................................

% x0=x;

% % x\_nl0=xlsread('C:\Users\TechSystem\Desktop\matlab dir\datax.csv');%% fixed

% x\_nl=x\_nl0;

% % x\_nl(:,end)=[];;

% x\_nl(:,1)=[];

% for j=1:m

% x1(:,:,j)=[x0(:,:,j) x\_nl(:,j)];

% end

% % x\_sp00=xlsread('C:\Users\TechSystem\Desktop\matlab dir\datasp.csv'); % fixed

% x\_sp0=x\_sp00;

% x\_sp0(:,1)=[];

% for j=1:m

% x\_sp(:,:,j)=x\_sp0((j-1)\*ni+1:j\*ni,:);

% end

% for j=1:m

% x\_tilled(:,:,j)=[x(:,:,j) x\_sp(:,:,j)];

% end

% x2=x\_tilled;%bspline added

% %.......................................................................

%........................................................................

COV=diag([covar1\_error covar2\_error covar3\_error]);%

Landa=zeros(16,16,5);

for j=1:m

Landa(1:3,1:3,j)=COV;

end

% Beta=[Beta ;1];

for jj=1:num\_run

% error=randn(ni,p,m);

% error(:,(p+1):size(x2,2),:)=0;

% for j=1:3

% error(:,j,:)=error(:,j,:)\*sqrt(COV(j,j));

% end

% x2\_pure=x2;

% x2\_error=x2+error\*error\_domain;%add messurments error

% x2=x2\_error;

D=[covar1\_u covar2\_u;covar2\_u covar3\_u];

try

for i=1:size(x,3)

u(:,:,i)=mvtrnd(D,v,1)'\*u\_domain;

% u(:,:,i)=mvnrnd([0 0],D)'\*u\_domian;

end

catch

z=100;

return

end

% sigmai=eye(ni);

for i=1:size(x,3)

ei(:,:,i)=mvtrnd(var\_e,2,size(x,1));

% ei(:,:,i)=randn(size(x,1),1)\*var\_e\*e\_domain;

end

Y=[];

for i=1:size(x,3)

Y(:,i)=x(:,:,i)\*Beta+z(:,:,i)\*u(:,:,i)+ei(:,:,i);

end

y(:,:,jj)=Y;

jj;

end

y\_hat=mean(y,3);

y=yy;

z1=mse(y(:)-y\_hat(:));

% z1=z1\*(z1<0.5)+z1\*(z1>0.5&&z1<1)\*5+z1\*(z1>1&&z1<2)\*10+z1\*(z1>2&&z1<10)\*100+z1\*(z1>10)\*1000;

[h,n,z2]=kstest2(y(:),y\_hat(:));

z=z1\*w+(1-w)\*z2;

% z=z1;

% load data\_ga

% z=mse(yy(:)-y\_hat(:));