clear

clc

tic

%Independence

%input of simulation

model = 'MAR(0,1)';

H = 1;

dfchi = 4\*H;

phi = 0;

df = [-1,0,6];

long = 5000;

nobs = [100,200,500];

result(10,9) = zeros;

ggfval = zeros(long,9);

critic = zeros(1,9);

%for on coef

%%% r=1 for level and r=2:10 for power

for m = 1:3

eps = zeros(600,long);

for mm = 1:long

rng(mm,"twister");

if df(m) >= 2

epss = trnd(df(m),600,1);

elseif df(m) == 0

X1 = exprnd(1, 600, 1);

X2 = exprnd(1, 600, 1);

epss = X1-X2;

elseif df(m) == -1

epss = unifrnd(-1,1,600,1);

end

eps(:,mm) = epss;

end

for i = 1:3

ar5 = zeros(long,10);

for j = 1:long

z = eps(1:nobs(i)+100,j);

z(1:50,:) = [];

z = z(1:end-50,1);

gfval = dependence(z,H);

ggfval(j,3\*(i-1)+m) = nobs(i)\*gfval;

if nobs(i)\*gfval > chi2inv(0.95,dfchi)

ar5(j,1) = 1;

end

end

sortggfval = sort(ggfval);

critic(1,3\*(i-1)+m) = sortggfval(0.95\*long,3\*(i-1)+m);

for r = 2:10

psi = (r-1)/(10);

sortggfval = sort(ggfval);

for j = 1:long

z = DGP24(model,nobs(i),phi,psi,eps(1:nobs(i)+100,j));

gfval = dependence(z,H);

if nobs(i)\*gfval > critic(1,3\*(i-1)+m)

ar5(j,r) = 1;

end

end

end

s = 3\*(i-1)+m;

for rr = 1:10

result(rr,s) = sum(ar5(:,rr))/long;

end

end

end

% save("Jan31-24-local-independence-5000.mat","result");

toc

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

function [s1] = dependence(nn,H)

ps = nn;

eps(:,1) = ps;

eps(:,2) = (eps(:,1)).^2;

meann = mean(eps);

eps(:,1) = eps(:,1) - meann(1);

eps(:,2) = eps(:,2) - meann(2);

corr = 0;

pnobs = size(eps,1);

vc = cov(eps);

invv = inv(vc);

epl = eps;

i = 1;

while i<(H+1)

eps = eps(2:end,:);

epl = epl(1:(end-1),:);

co = (eps'\*epl)/(pnobs);

sco = co\*invv\*co'\*invv;

corr = corr+(sum(diag(sco)))';

i = i+1;

end

s1 = corr;

end

clear

clc

tic

%code of MAR(0,1) size

model = 'MAR(0,1)';

H = 3;

dfchi = 4\*H;

df = [-1,0,6];

long = 5000;

nobs = [100,200,500];

phi = 0;

result(9,9) = zeros;

jumps(9,9) = zeros;

for m = 1:3

eps = zeros(600,long+2000);

for mm = 1:long+2000

rng(mm,"twister");

if df(m) >= 2

epss = trnd(df(m),600,1);

elseif df(m) == 0

X1 = exprnd(1, 600, 1);

X2 = exprnd(1, 600, 1);

epss=X1-X2;

elseif df(m) == -1

epss = unifrnd(-1,1,[600,1]);

end

eps(:,mm) = epss;

end

for i = 1:3

ar5 = zeros(long+1000,9);

bais=zeros(long+1000,9);

gg=zeros(long,9);

for r = 1:9

%psi = 0.7;

psi = r/10;

jj=1;

j=1;

while jj< long+1

z = DGP24(model,nobs(i),phi,psi,eps(1:nobs(i)+100,j));

[g,gfval] = EST24('MAR(0,1)',z, H,psi);

if g<1 && g>0

if nobs(i)\*gfval> chi2inv(0.95,dfchi-1)

ar5(j,r) = 1;

end

jj=jj+1;

else

bais(j,r)=1;

end

j=j+1;

end

end

s = 3\*(i-1)+m;

for rr = 1:9

jumps(rr,s) = sum(bais(:,rr));

result(rr,s) = sum(ar5(:,rr))/(long);

end

end

end

% save("Jan31-24-MAR01-power-0.7-5000.mat","result");

% save("Jan31-24-jumps-MAR01-power-0.7-5000.mat","jumps");

toc

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

clear

clc

%code of MAR11 size

tic

model = 'MAR(1,1)';

H = 4;

dfchi = 4\*H;

phi = 0;

df = [-1,0,6];

long = 5000;

nobs = [100,200,500];

result(9,9) = zeros;

jumps(9,9) = zeros;

for m = 1:3

eps = zeros(600,long+10000);

parfor mm = 1:long+10000

rng(mm,"twister");

if df(m) >= 2

epss = trnd(df(m),600,1);

elseif df(m) == 0

X1 = exprnd(1, 600, 1);

X2 = exprnd(1, 600, 1);

epss=X1-X2;

elseif df(m) == -1

epss = unifrnd(-1,1,600,1);

end

eps(:,mm) = epss;

end

for i = 1:3

ar5 = zeros(long,9);

bais=zeros(long,9);

gg=zeros(long,2,9);

for r = 1:9

phi = r/10;

psi = 1-r/10;

jj=1;

j=1;

while jj< long+1

z = DGP24(model,nobs(i),phi,psi,eps(1:(nobs(i)+100),j));

[g,gfval] = EST24('MAR(1,1)',z, H,[psi,phi]');

gg(j,:,r) =g';

if all(g<1) && all(g>0)

if nobs(i)\*gfval > chi2inv(0.95,dfchi-2)

ar5(j,r) = 1;

end

jj=jj+1;

else

bais(j,r)=1;

end

j=j+1;

end

end

s = 3\*(i-1)+m;

for rr = 1:9

jumps(rr,s) = sum(bais(:,rr));

result(rr,s) = sum(ar5(:,rr))/(long-jumps(rr,s));

end

end

end

save("Jan31-24-MAR11-size-5000.mat","result");

toc

function [z] = DGP24(modelname,nobs,phi,psi,eps)

nobs = nobs+100;

s1 = 'MAR(0,1)' ;

s2 = 'MAR(1,1)';

t1 = strcmp(modelname,s1);

t2 = strcmp(modelname,s2);

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

if t1 == 1 %MAR(0,1)

y = zeros(nobs,1);

y(1,1) = 0.1;

y(nobs,1) = 0.1;

i = nobs-1;

while i >0

y(i,1) = psi\*y(i+1,1) + eps(i,1);

i = i-1;

end

y(1:50,:) = [];

y = y(1:end-50,1);

[z] = y;

end

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

if t2 == 1 %MAR(1,1)

nve = zeros(nobs,1);

nu = zeros(nobs,1);

nve(1,1) = eps(1,1);

nu(nobs,1) = eps(1,1);

y = zeros(nobs,1);

i = 2;

while i < nobs +1

nve(i,1) = eps(i,1) + phi\*nve(i-1,1);

i = i+1;

end

i = 1;

while i < nobs

k = nobs-i;

nu(k,1) = eps(k,1) + psi\*nu(k+1,1);

i = i+1;

end

i = 1;

while i < nobs

term = 1 - phi\*psi;

y(i) = (1/term) \* (nve(i,1) + psi\*nu(i+1,1));

i = i+1;

end

y(1:50,:) = [];

y = y(1:end-50,1);

z = y;

end

end

function [z , zfval] = EST24(modelname,inputmatrix,H,start)

s1 = 'MAR(0,1)' ;

s2 = 'MAR(1,1)';

t1 = strcmp(modelname,s1);

t2 = strcmp(modelname,s2);

if t1 == 1

options = optimoptions(@fmincon,'Algorithm' ...

,'interior-point','Display','off');

gcovAR01c = @(d) fitAR01new(inputmatrix,H,d);

[z,zfval] = fmincon(gcovAR01c,start,[],[],[],[],[],[],[],options);

end

if t2 == 1

gcovMAR11g = @(g) fitMAR11Gcovnew(inputmatrix,H,g);

options = optimoptions(@fmincon,'Algorithm' ...

,'interior-point','Display','off');

[z,zfval] = fmincon(gcovMAR11g,start,[],[],[],[],[],[],[],options);

end

end

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

function [s1] = fitAR01new(nn,H,b)

nobss = size(nn,1);

mm = nn;

te = nobss-1;

eps = zeros(te,2);

i = 1;

while i< nobss

ps(i,1) = mm(i,1) - b(1,1)\*mm(i+1,1);

i = i+1;

end

eps(:,1) = ps;

eps(:,2) = (eps(:,1)).^2;

meann = mean(eps);

eps(:,1) = eps(:,1) - meann(1);

eps(:,2) = eps(:,2) - meann(2);

corr = 0;

pnobs = size(eps,1);

vc = cov(eps);

invv = inv(vc);

epl = eps;

i = 1;

while i < (H+1)

eps = eps(2:end,:);

epl = epl(1:(end-1),:);

co = (eps'\*epl)/(pnobs-1);

sco = co\*invv\*co'\*invv;

corr = corr+(sum(diag(sco)))';

i = i+1;

end

s1 = corr;

end

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

function [s1] = fitMAR11Gcovnew(nn,H,b)

%%%b(1,1) psi b(2,1) phi

nobss = size(nn,1);

mm = nn;

te = nobss-2;

eps = zeros(te,2);

i = 2;

while i< nobss

ps(i,1) = (1+b(2,1)\*b(1,1))\*mm(i,1) - b(1,1)\*mm(i+1,1) -b(2,1)\*mm(i-1,1);

i = i+1;

end

eps(:,1) = ps(2:(nobss-1),1);

eps(:,2) = (eps(:,1)).^2;

meann = mean(eps);

eps(:,1) = eps(:,1) - meann(1);

eps(:,2) = eps(:,2) - meann(2);

corr = 0;

pnobs = size(eps,1);

vc = cov(eps);

invv = inv(vc);

epl = eps;

i = 1;

while i < (H+1)

eps = eps(2:end,:);

epl = epl(1:(end-1),:);

co = (eps'\*epl)/(pnobs-1);

sco = co\*invv\*co'\*invv;

corr = corr+(sum(diag(sco)))';

i = i+1;

end

s1 = corr;

end

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