```
clear;
clc;
A=xlsread('Adata.xlsx');%GDP growth, logGDP, GovExp, Inv, Oil, CIS, Corrup, Year dummies for 1998-2004
B=xlsread('Bdata.xlsx');%logGDP, GovExp, Inv, Oil, CIS, Corrup for 1997-2002 that will be used as IVs
C=xlsread('Cdata.xlsx');%Oil, CIS, Corrup that will be used as IVs

N=20;
T=7;

%Forming Y, X, Z matrices
y=A(:,1);%GDP growth column
Y=y./100;%Dividing each element of y by 100 to get Y vector - GDP growth explained variable
X=[A(:,2:4) A(:,15)];%Forming X matrix that consists of logGDP, GovExp, Inv, Year dummies - Time variant
Z=[ones(N*T,1) A(:,5:7)];%Forming Z matrix that consists of Corrup, Oil, CIS dummies and ones - Time invariant

%Forming K transformation matrix
%L=zeros(7,6);
%for i = 1:6;
   % L(i,i)=-1;
    %L(i+1,i)=1;
%end
%e_t=ones(7,1);
%K=[L';e_t'/T]-T*T;%K transformation matrix

K_1=ones(1,T)/T;
L=zeros(T-1,T);
for i=1:size(L,1)
    L(i,i)=-1;
    L(i,i+1)=1;
end

K_2=[L;K_1];%-(T+1)*(T+1);
K=kron(eye(N),K_2);


%Forming H matrix
X_instrument=[ones(N*(T-1),1) B(:,3:5)];%Instruments for time invariant regressors
Z_instrument=[ones(size(C,1),1) C];%Instruments for time invariant regressors
H1=zeros(T*N, (T-1)*size(X_instrument,2)+size(Z_instrument,2));
H2=zeros((T-1)*N,(T-1)*size(X_instrument,2));
H3=zeros(T*N,(T-1)*size(X_instrument,2));
s=1;
format short
while s<=size(X_instrument,1);
    k=zeros(T-1,size(X_instrument,2));
    h=X_instrument(s:s+5,:);
    i=1;
    while i<=size(h,1);
        for j=1:size(k,1);
            k(j,i:i+3)=h(j,:);
            i=i+4;
        end
    end
    H2(s:s+5,:)=k;
    s=s+6;
```

```
end

i=1;
j=1;
while i<=size(H3,1);
    H3(i:i+5,:)=H2(j:j+5,:);
    i=i+7;
    j=j+6;
end

%Attaching myu-i after each 6th row
H4=[H3 zeros(size(H3,1), size(Z_instrument,2))];
i=7;
j=1;
while i<=size(H4,1);
    H4(i,size(H4,2)-3:size(H4,2))=Z_instrument(j,:);
    i=i+7;
    j=j+1;
end
H4(:,1:4);%for 99
H4(:,5:8);%for 00
H4(:,9:12);%for 01
H4(:,13:16);%for 02
H4(:,17:20);%for 03
H4(:,21:24);%for 04
H4(:,25:28);%for myu-i

%Premultiplying X, Z, Y by K
X_bar=K*X;
Z_bar=K*Z;
Y_bar=K*Y;
R_bar=[X_bar Z_bar];

%Estimating Delta_preliminary
Delta_preliminary=inv(R_bar'*H4*H4'*R_bar)*R_bar'*H4*H4'*Y_bar;

%Calculating residuals ui-hats
R=[X Z];
ui_hat=Y-R*Delta_preliminary;

%Calculating ui-hats-plus
ui_plus=zeros(N*T,1);
i=1;
for i=1:7:size(ui_hat,1);
    ui_plus(i:i+6,:)=K_2*ui_hat(i:i+6,:);
end

%Getting Omega matrix
Omega_hat=zeros(T);
i=1;
j=1;
for i=1:7:size(ui_plus,1);
    Omega=ui_plus(i:i+6,:);
    Omega_hat=Omega_hat+Omega*Omega';
end
Omega_hat_1=Omega_hat/N;
Omega_matrix=kron(eye(N), Omega_hat_1);

%Forming C_hat
C_hat=inv(H4'*Omega_matrix*H4);
```

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116
117 %Estimating Delta_hat
118 Delta_hat=inv(R_bar'*H4*C_hat*H4'*R_bar)*R_bar'*H4*C_hat*H4'*Y_bar;
119
120 %Calculating Covariance Matrix
121 CV=inv(R_bar'*H4*C_hat*H4'*R_bar);
122
123 %Getting variances & standard errors
124 Var_Delta_hat=diag(CV);
125 standard_errors=sqrt(Var_Delta_hat);
126
127 %Estimating t-statistic
128 t_statistic=Delta_hat./standard_errors;
129
130
131 results=[Delta_preliminary, Delta_hat, standard_errors, t_statistic]
132
```