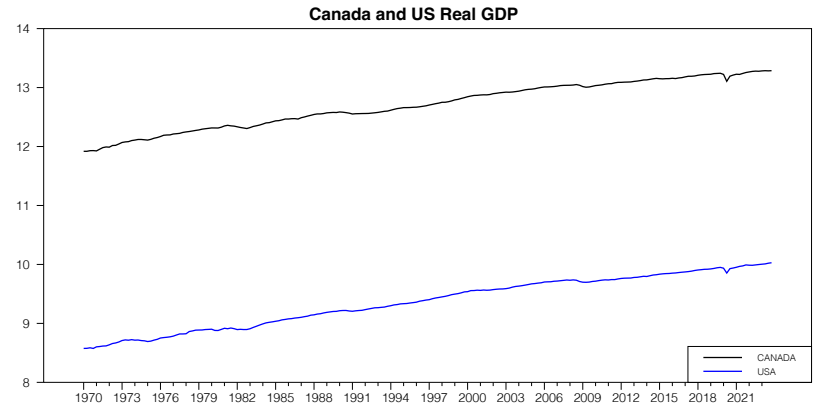
```
calendar(q) 1900:1
all 2028:4
data(format=fred,org=columns) * * ngdprsaxdccaq gdpc1
*
table(picture="*.##")
*
log ngdprsaxdccaq / canada
log gdpc1 / usa


compute startdate = 1970:1
compute enddate = 2023:4
*
graph(header="Canada and US Real GDP",key=loright) 2
# canada startdate enddate
# usa startdate enddate
*
*
@dfunit(det=trend,method=aic) canada startdate enddate
@dfunit(det=trend,method=aic) usa startdate enddate
**
**estimate coitnegrating relationship***
**
linreg(define=coint) usa startdate enddate resids
#constant canada
*
graph(header="residuals of cointegrationg relationship") 1
# resids startdate enddate
*
**engle granger cointegraion tests***
**
@egtestresids(maxlags=10,method=aic,det=none) resids startdate enddate
*
*determine lag length: method1****
***
@varlagselect(lags=24, crit=aic)  startdate enddate
# usa canada
*
***
***error correction model***
***
system(model=cointex)
variables usa canada
lags 1 to 5
det constant
ect coint
end(system)
estimate startdate enddate
*
compute implabel = ||"USA","Canada"||
@montevar(model=cointex,steps=25,varlabels=implabel,header="impulse response functions for usa
and canada GDP")
*
forecast(model=cointex,from=enddate,to=enddate+12,results=fore1,stderrors=serrors1)
set uppercon95 enddate enddate+12 = fore1(2) + %invnormal(0.975)*serrors1(2)
set lowercon95 enddate enddate+12 = fore1(2) - %invnormal(0.975)*serrors1(2)
set uppercon68 enddate enddate+12 = fore1(2) + %invnormal(0.841)*serrors1(2)
set lowercon68 enddate enddate+12 = fore1(2) - %invnormal(0.841)*serrors1(2)
*
set upperinc95 enddate enddate+12 = fore1(1) + %invnormal(0.975)*serrors1(1)
```

```
set lowerinc95 enddate enddate+12 = fore1(1) - %invnormal(0.975)*serrors1(1)
set upperinc68 enddate enddate+12 = fore1(1) + %invnormal(0.841)*serrors1(1)
set lowerinc68 enddate enddate+12 = fore1(1) - %invnormal(0.841)*serrors1(1)
**
***graph forecasts***
**
graph(style=line, header="usa gdp forecast", overlay=fan,ovcount=4,ovsame) 6
# usa 2016:1 *
# fore1(1) enddate-20 enddate+12 2
# upperinc95 enddate enddate+12 4
# upperinc68 enddate enddate+12
# lowerinc68 enddate enddate+12
# lowerinc95 enddate enddate+12
*
*
graph( header="canada gdp forecast", overlay=fan,ovcount=4,ovsame) 6
# canada 2016:1 *
# fore1(2) enddate-20 enddate+12 2
# uppercon95 enddate enddate+12 4
# uppercon68 enddate enddate+12
# lowercon68 enddate enddate+12
# lowercon95 enddate enddate+12
**
**
```

Series	Obs	Mean	Std Error	Minimum	Maximum
NGDPRSAXDCCAQ	252	321023.76	146510.61	90980.80	589116.80
GDPC1	308	9968.19	6050.89	2172.43	22668.99




```
Dickey-Fuller Unit Root Test, Series CANADA
Regression Run From 1970:02 to 2023:04
Observations        216
With intercept and trend
With 0 lags chosen from 3 by AIC
Null is unit root. Reject in left tail.

Sig Level    Crit Value
1%(**)         -4.00349
5%(*)          -3.43168
10%            -3.13926

T-Statistic    -2.22048
```

Dickey-Fuller Unit Root Test, Series USA
Regression Run From 1970:02 to 2023:04
Observations 216
With intercept and trend
With 0 lags chosen from 3 by AIC
Null is unit root. Reject in left tail.

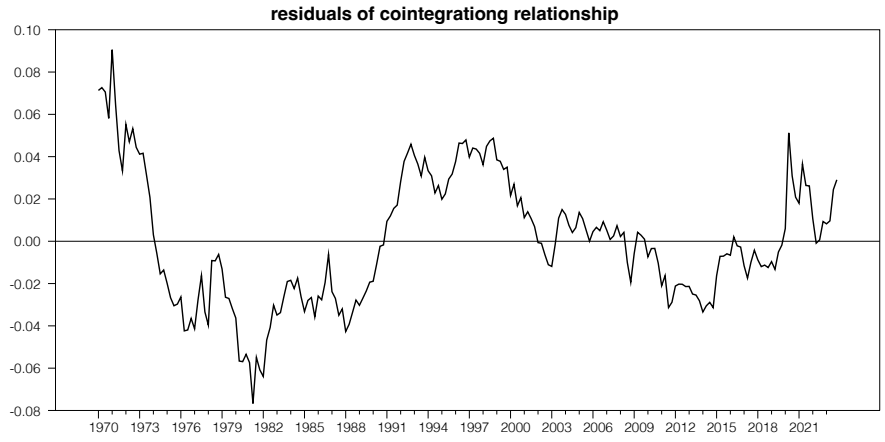
Sig Level	Crit Value
1%(**)	-4.00349
5%(*)	-3.43168
10%	-3.13926

T-Statistic -1.46001

Linear Regression - Estimation by Least Squares
Dependent Variable USA
Quarterly Data From 1970:01 To 2023:04

Usable Observations	216
Degrees of Freedom	214
Centered R^2	0.9950728
R-Bar^2	0.9950498
Uncentered R^2	0.9999896
Mean of Dependent Variable	9.3637017718
Std Error of Dependent Variable	0.4313310582
Standard Error of Estimate	0.0303475600
Sum of Squared Residuals	0.1970885215
Regression F(1,214)	43218.2535
Significance Level of F	0.0000000
Log Likelihood	449.4424
Durbin-Watson Statistic	0.0886

	Variable	Coeff	Std Error	T-Stat	Signif
1.	Constant	-4.529571129	0.066861815	-67.74526	0.00000000
2.	CANADA	1.093546952	0.005260219	207.89000	0.00000000



Engle-Granger Cointegration Test
Null is no cointegration (residual has unit root)
Regression Run From 1970:02 to 2023:04
Observations 216

With 0 lags chosen from 10 by AIC
No deterministic variables in cointegrating vector
Critical Values from MacKinnon for 2 Variables

Test Statistic -2.76000*
1%(**)   -3.39000
5%(*)   -2.76000
10%   -2.45000

VAR Lag Selection
Lags AICC
   0 -3.175170
   1 -12.969949*
   2 -12.963100
   3 -12.934314
   4 -12.898902
   5 -12.913234
   6 -12.872922
   7 -12.864149
   8 -12.824089
   9 -12.806604
  10 -12.766927
  11 -12.725754
  12 -12.689992
  13 -12.650055
  14 -12.624844
  15 -12.589606
  16 -12.563297
  17 -12.565264
  18 -12.544436
  19 -12.518548
  20 -12.474611
  21 -12.449443
  22 -12.460095
  23 -12.415488
  24 -12.392060

VAR/System - Estimation by Cointegrated Least Squares
Quarterly Data From 1970:01 To 2023:04
Usable Observations   216

Dependent Variable USA
Mean of Dependent Variable   0.0067207309
Std Error of Dependent Variable 0.0109382481
Standard Error of Estimate   0.0108933737
Sum of Squared Residuals   0.0244451117
Durbin-Watson Statistic   1.9999

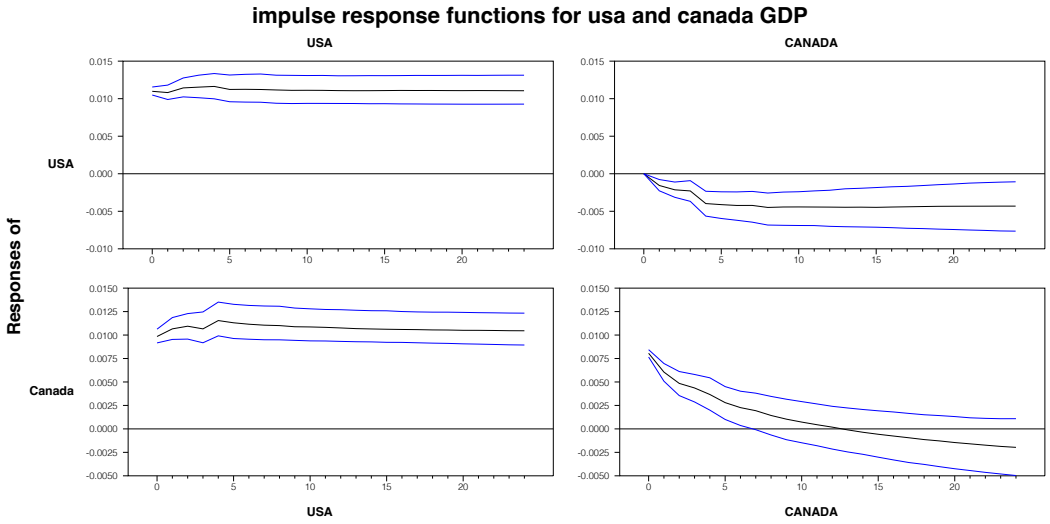
    Variable   Coeff   Std Error   T-Stat   Signif
****
1. D_USA{1}   0.130569255 0.105759970   1.23458 0.21839288
2. D_USA{2}   0.126241543 0.107045136   1.17933 0.23962702
3. D_USA{3}   0.018448119 0.107166007   0.17215 0.86349234
4. D_USA{4}   0.168800626 0.106455131   1.58565 0.11435247
5. D_CANADA{1}   -0.162657134 0.090438207   -1.79854 0.07355472
6. D_CANADA{2}   -0.064850536 0.091587717   -0.70807 0.47970204
7. D_CANADA{3}   -0.001301233 0.091626789   -0.01420 0.98868301
8. D_CANADA{4}   -0.194779526 0.090540007   -2.15131 0.03261583

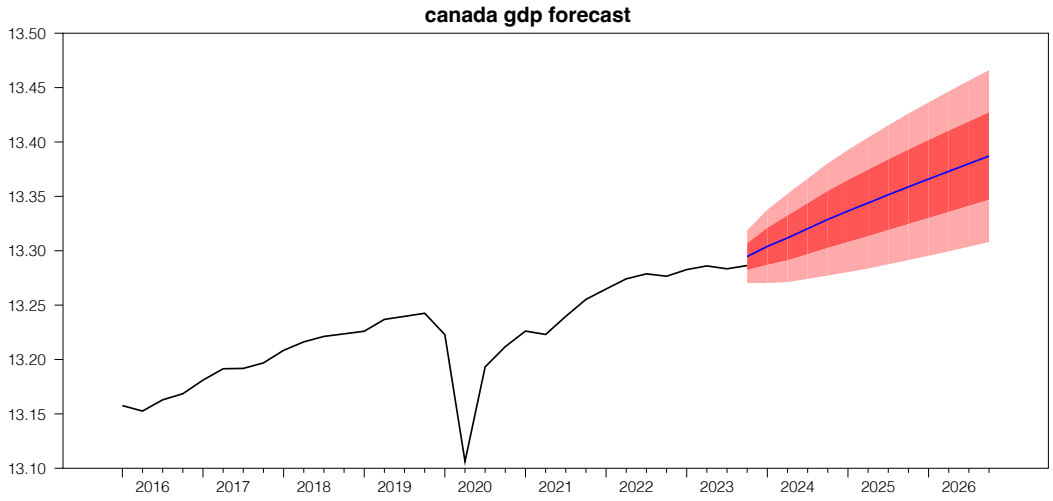
9.	Constant	0.006497758	0.001155733	5.62220	0.00000006
10.	EC1{1}	-0.025729468	0.024475325	-1.05124	0.29437946

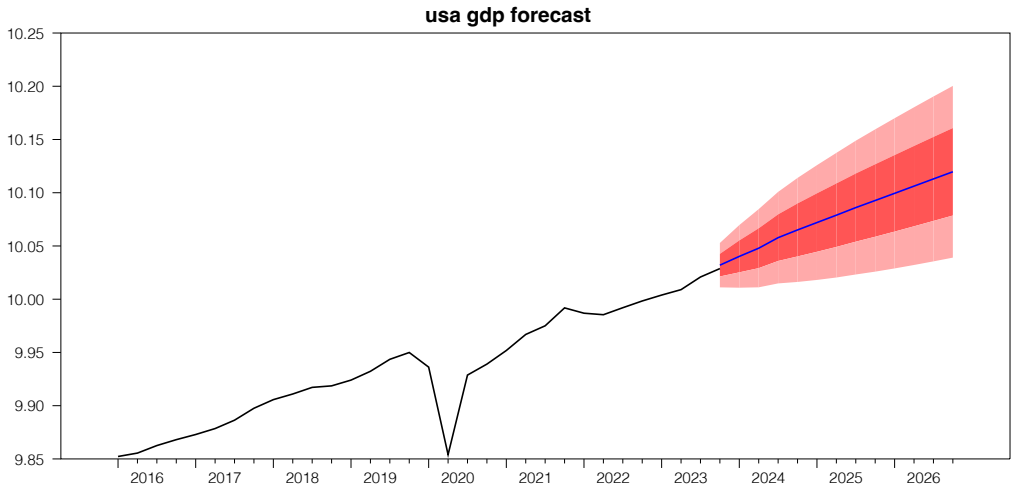
Dependent Variable CANADA

Mean of Dependent Variable	0.0063595831
Std Error of Dependent Variable	0.0128121381
Standard Error of Estimate	0.0126761676
Sum of Squared Residuals	0.0331011564
Durbin-Watson Statistic	2.0018

	Variable	Coeff	Std Error	T-Stat	Signif
1.	D_USA{1}	0.230305153	0.123068495	1.87136	0.06271315
2.	D_USA{2}	0.110669712	0.124563989	0.88846	0.37533136
3.	D_USA{3}	-0.010523791	0.124704642	-0.08439	0.93282853
4.	D_USA{4}	0.097023348	0.123877425	0.78322	0.43439710
5.	D_CANADA{1}	-0.174131430	0.105239194	-1.65463	0.09952333
6.	D_CANADA{2}	-0.077633810	0.106576831	-0.72843	0.46717737
7.	D_CANADA{3}	-0.003033556	0.106622297	-0.02845	0.97732965
8.	D_CANADA{4}	-0.030342271	0.105357655	-0.28799	0.77364161
9.	Constant	0.005332420	0.001344878	3.96498	0.00010123
10.	EC1{1}	-0.072164550	0.028480921	-2.53379	0.01202776




canada gdp forecast
13.50
13.45
13.40
13.35
13.30
13.25
13.20
13.15
13.10
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026


usa gdp forecast
10.25
10.20
10.15
10.10
10.05
10.00
9.95
9.90
9.85
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026