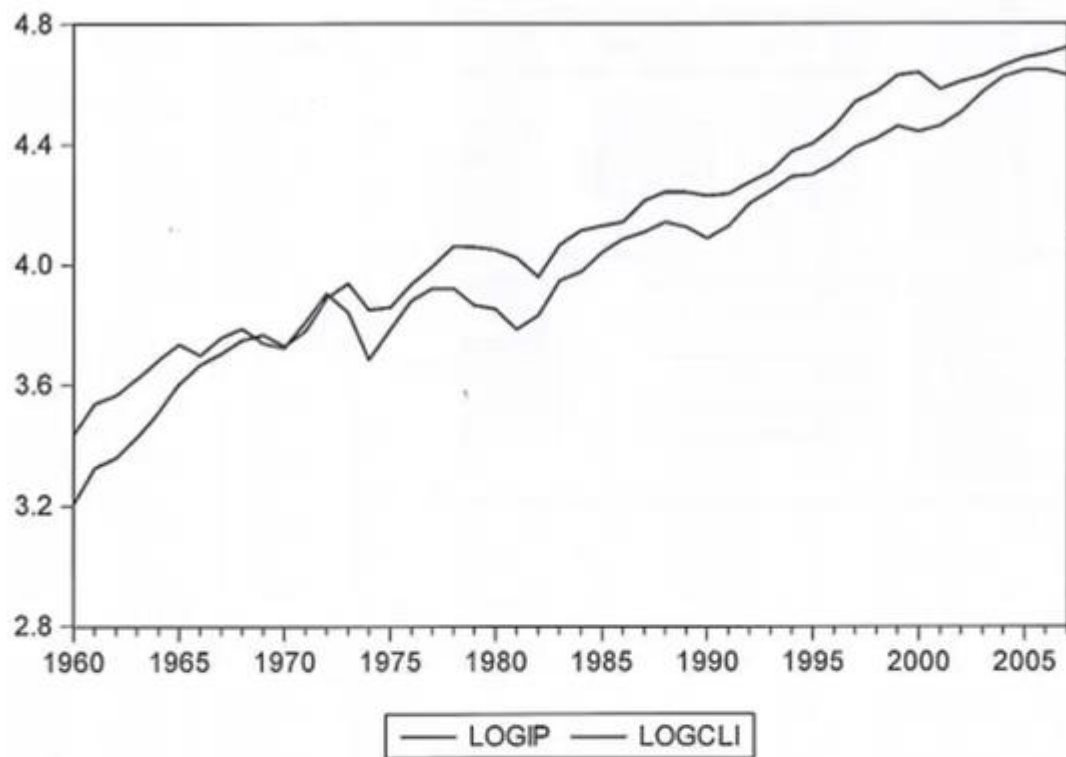
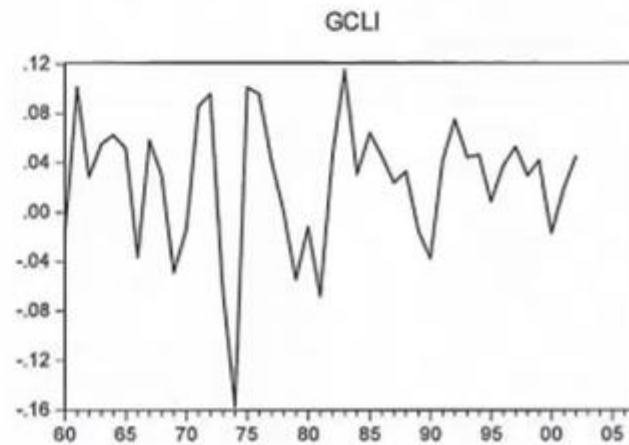
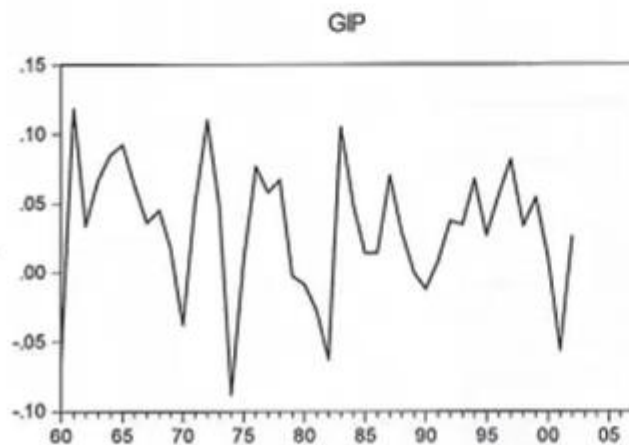


a)



→ perhaps cointegrated?

rather stationary
↑



b) i) $\text{coeff} = -0.28$, $\text{SE} = 0.10$, $t\text{-value} = -2.71$

ADF critical value = -3.5

$-2.71 > -3.5 \rightarrow \log(\text{IP})$ not stationary

ii) $\text{coeff} = -0.24$, $\text{SE} = 0.13$, $t\text{-value} = -1.89$

$-1.89 > -3.5 \rightarrow \log(\text{CLI})$ not stationary

c) EG step 1:

$$\log(\text{IP}_t) = -1.02 + 1.27 \log(\text{CLI}_t) + e_t$$

EG step 2:

$$\Delta e_t = 1.76 - 0.00t - 0.18e_{t-1} + 0.14\Delta e_{t-1} - 0.32\Delta e_{t-2}$$

\downarrow
 $t\text{-value} = -1.76$

critical value = -3.8

as $-1.76 > -3.8 \rightarrow e_t$ is not stationary
so $\log(\text{IP})$ and $\log(\text{CLI})$
not cointegrated

d) F-test :

$$F = \frac{(R_1^2 - R_0^2)/g}{(1 - R_1^2)/(n - k)}$$

with

$$g = 2$$

$$n = 41$$

$$k = 5$$

$$F(2, 36) \quad C.V = 3.26$$

For CLI: $F = 2.67 < 3.26 \rightarrow H_0$ not rejected, so IP not Granger causal for CLI

For IP: $F = 11.75 > 3.26 \rightarrow$ Reject H_0 , so CLI is Granger causal for IP.

Indeed, as past CLI helps to predict current IP yearly growth rate

e) AR(2) model coeff p-values:

GIP_{-1} p-value = 0.1011
 GIP_{-2} p-value = 0.1152 } not significant

AR(1) model coeff p-value:

GIP_{-1} p-value = 0.4563 → not significant

model with constant

mean value 0.031, p-value = 0.000

f) Test for $\beta_1 = \beta_2 = \gamma_2 = 0$
F-test, with $g=3$, $n=41$, $h=5$

$$R_1^2 = 0.464$$

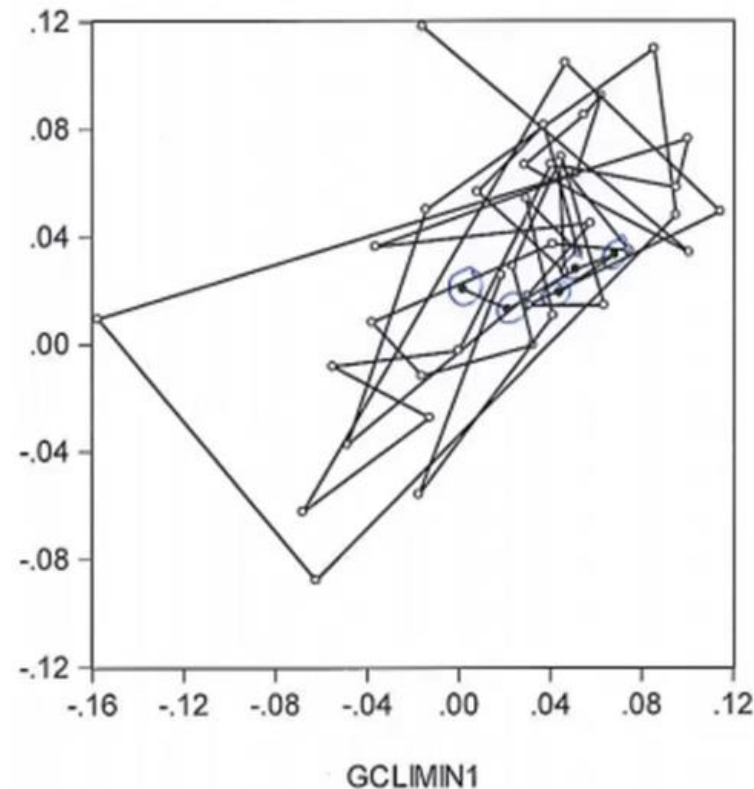
$$R_0^2 = 0.396 \quad \nearrow \text{c.v.}$$

$$F = 1.52 < 2.87 \rightarrow \text{not reject } H_0$$

Hence, we use the simple model

$$GIP_t = \alpha + \beta GCLI_{t-1} + \varepsilon_t$$

Note: The unrestricted model has 2 lags, and can therefore be estimated for 1962 – 2002 ($n = 41$).
The restricted model has 1 lag and could be estimated for 1961 – 2002, but the F-test requires the same sample for both models, so again 1961 – 2002.

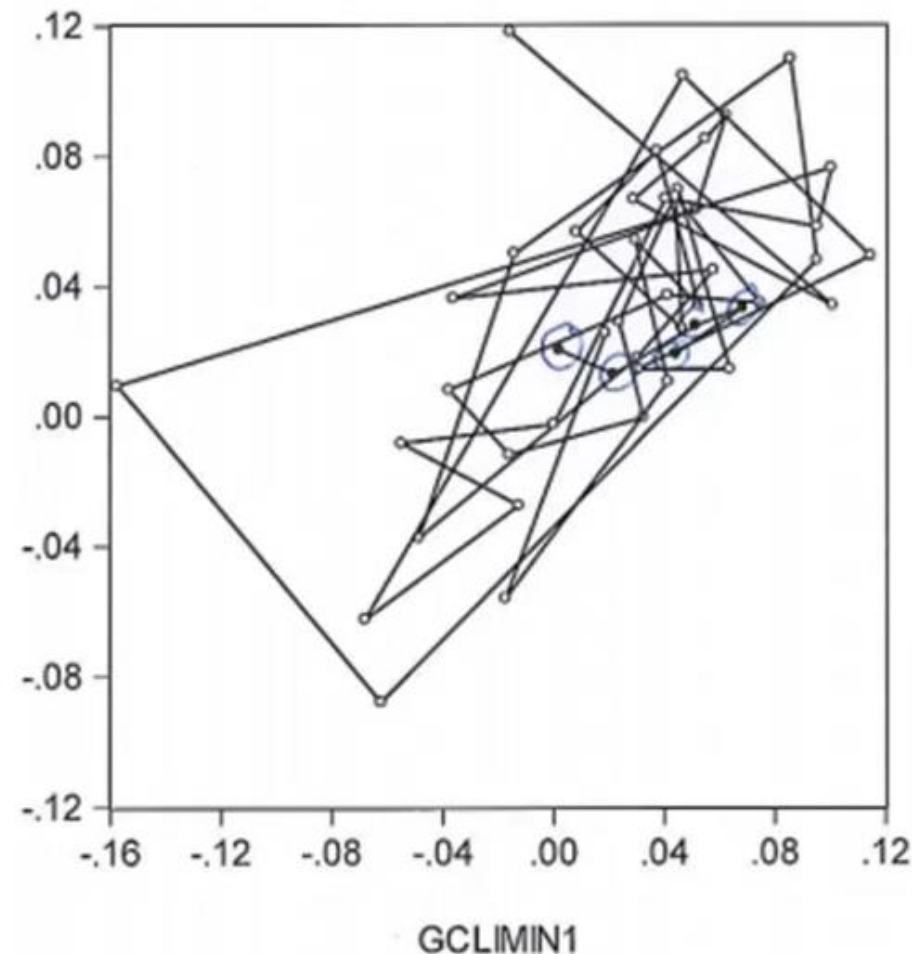


g) Forecast evaluation 2003 - 2007

	AR(0)	AR(1)	ADL(0,1)
RMSE	0.0110	0.0122	0.0185
MAE	0.0093	0.0103	0.0170
SUM	-0.0421	-0.0491	-0.0850



2003 - 2007
 GIP very flat
 GCLZ still fluctuating



g) Forecast evaluation 2003 - 2007

	AR(0)	AR(1)	ADL(0,1)
RMSE	0.0110	0.0122	0.0185
MAE	0.0093	0.0103	0.0170
SUM	-0.0421	-0.0491	-0.0850

So: not possible to predict GTP in 2003 - 2007, simply the mean over 1960-2002 is best.

Seems economic structure has changed after millenium break,
^{crise} of 2003 + turmoil worldwide. So good performance 1960-2002
 breaks down in 2003-2007 period