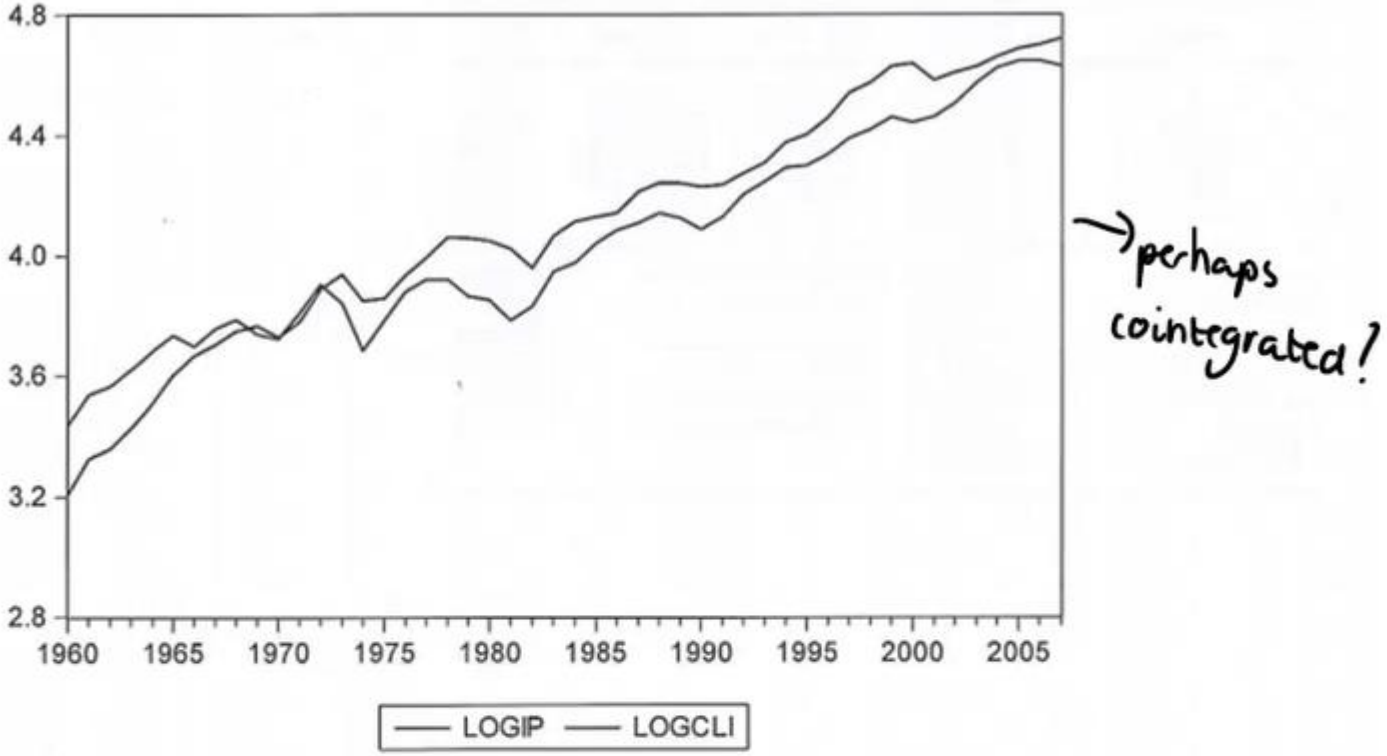
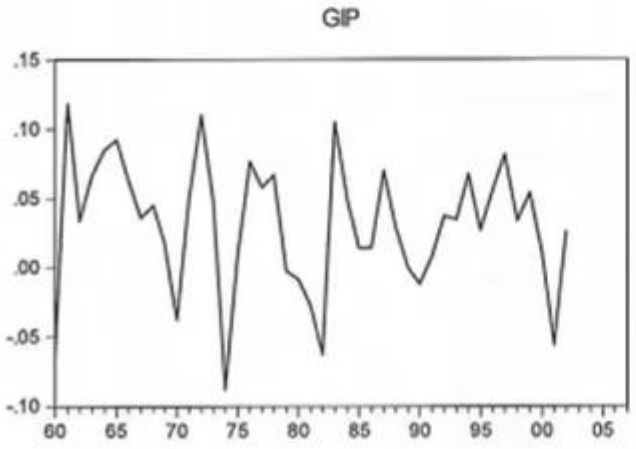
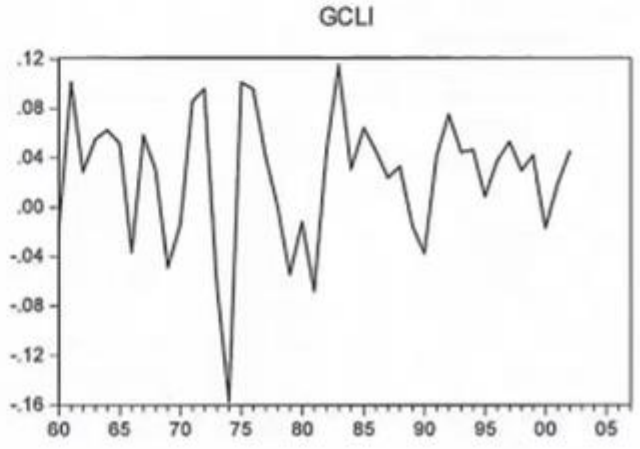
a)



→ perhaps cointegrated!

rather stationary ↗





b) i) coeff = −0.28, SE = 0.10, t-value = −2.71

ADF critical value = −3.5

−2.71 > −3.5 → log(Ip) not stationary

ii) coeff = −0.24, SE = 0.13, t-value = −1.89

−1.89 > −3.5 → log(CLI) not stationary

c) EG step 1:

$$\log(Ip_t) = -1.02 + 1.27\log(CLI_t) + e_t$$

EG step 2:

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

↓

t-value = −1.76

critical value = −3.8

as −1.76 > −3.8 → e_t is not stationary

so log(Ip) and log(CLI) not cointegrated

d) F-test :

$$F = \frac{(R_1^2 - R_0^2)/g}{(1 - R_1^2)/(n-w)} \quad \text{with} \quad \begin{array}{l} g = 2 \\ n = 41 \\ k = 5 \\ F(2, 36) \quad C.V = 3.26 \end{array}$$

For CLI: $F = 2.67 < 3.26 \rightarrow H_0$ not rejected, so Ip <u>not</u> Granger causal for CLI

For Ip : $F = 11.75 > 3.26 \rightarrow$ Reject H_0, so CLI <u>is</u> 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 $g = 3$, $n = 41$, $k = 5$

$R_1^2 = 0.464$

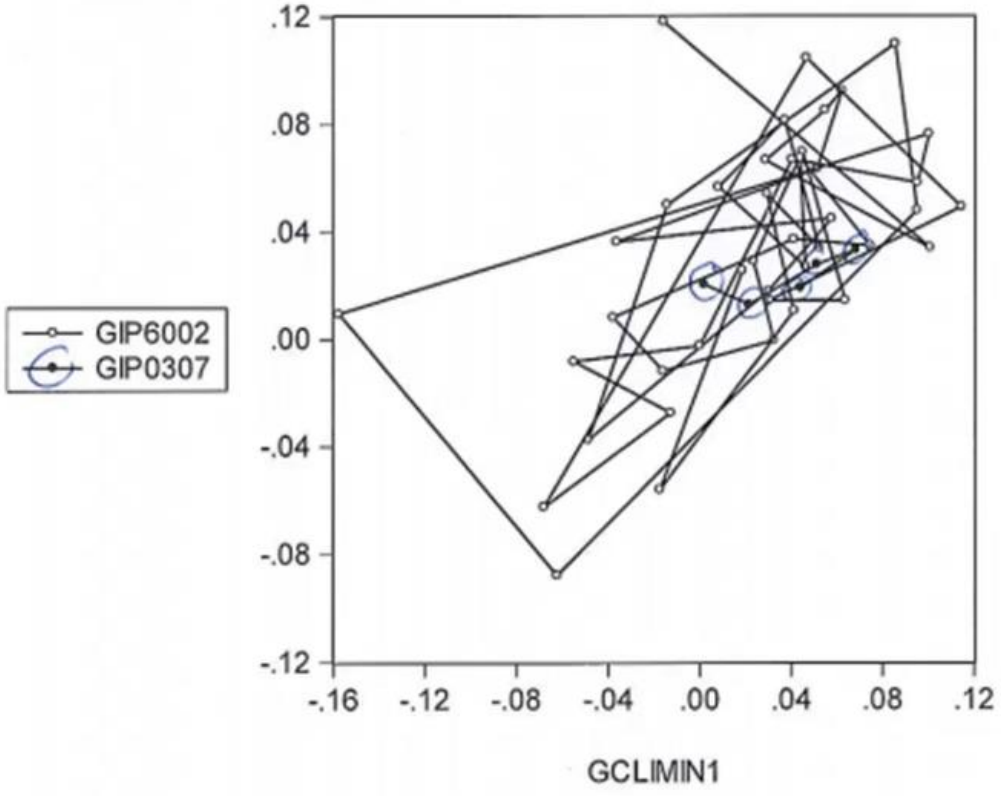
$R_0^2 = 0.318$

C.V.

$F = 1.52 < 2.87 \rightarrow$ not reject H_0

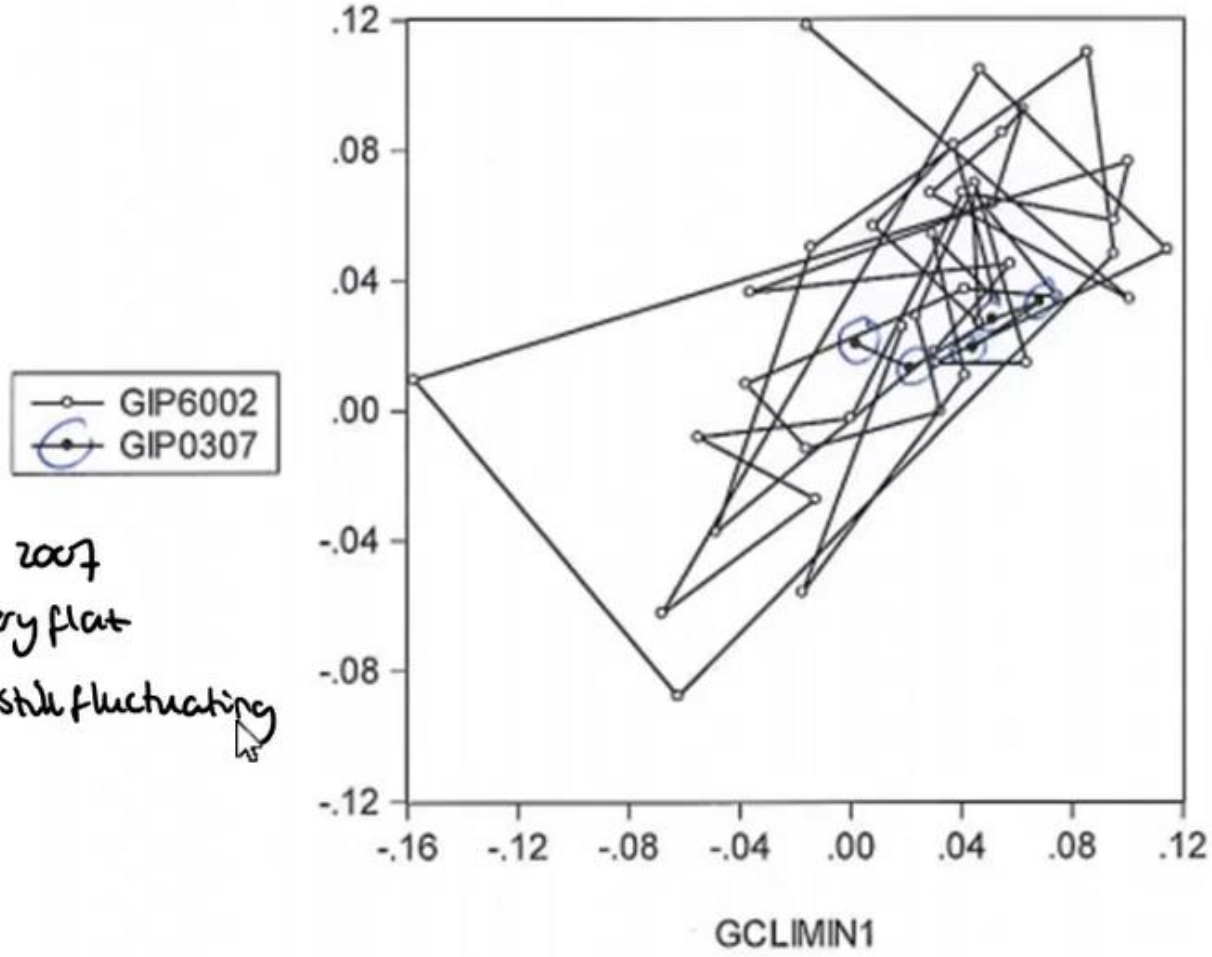
Hence, we use the simple model

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



g) Forecast evaluation 2003 - 2007

	AR(0)	AR(1)	ADL(0,1)
RMSE	0.0110	0.0122	0.0145
MAE	0.0093	0.0103	0.0118
SUM	-0.0850	-0.0421	-0.0491



2003 - 2007

GIP very flat

GCLI still fluctuating

g) Forecast evaluation 2003 - 2007

	AR(0)	AR(1)	ADL(0,1)
RMSE	0.0110	0.0122	0.0145
MAE	0.0093	0.0103	0.0118
SUM	-0.0850	-0.0421	-0.0491

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, of course 2003+ turmoil worldwide. So good performance 1960–2002 breaks down in 2003 – 2007 period.