Alfonso Camarillo Núñez
Modulo Macroeconométria

1.- Con los datos del "ANEXO 1":

a. Probar si el modelo econométrico: CPRt = Bo+B1PBIt+ ut fue estable o no para el punto de quiebre: 2001, en el periodo 1980-2019, utilizar Eviews.

1er paso: Planteamos la ecuación restringida del modelo:

CPRt = Bo+B1PBIt+ ut

2do paso: Estimando la eq restringida para toda la muestra (1980-2019), queremos saber la SCRR

Dependent Variable: CONSPR
Method: Least Squares
Date: 05/10/24 Time: 16:49
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7243.331	2520.444	2.873832	0.0066
PBI	0.617590	0.008289	74.50498	0.0000

R-squared	0.993201	Mean dependent var	178272.9
Adjusted R-squared	0.993022	S.D. dependent var	78795.25
S.E. of regression	6582.117	Akaike info criterion	20.47081
Sum squared resid	1.65E+09	Schwarz criterion	20.55525
Log likelihood	-407.4161	Hannan-Quinn criter.	20.50134
F-statistic	5550.992	Durbin-Watson stat	0.197879
Prob(F-statistic)	0.000000		

PRt = 7243.33+0.61759PBIt

SCRR= 1,650,000,000

3er paso: Planteamos la eq no restringidas:

Para N1=(1980-2000): Yt=a0+a1Xt+u1t

Para N2=(2001-2019): Yt=b0+b1Xt+u2t

Estimamos las eq no restringidas para las dos sub muestras y queremos saber la SCR1 y SCR2

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Dependent Variable: CONSPR
Method: Least Squares
Date: 05/10/24 Time: 17:09
Sample: 1 21
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6060.481	8866.120	0.683555	0.5025
PBI	0.636947	0.048604	13.10480	0.0000

R-squared	0.900386	Mean dependent var	121380.2
Adjusted R-squared	0.895143	S.D. dependent var	15317.09
S.E. of regression	4959.925	Akaike info criterion	19.94656
Sum squared resid	4.67E+08	Schwarz criterion	20.04604
Log likelihood	-207.4389	Hannan-Quinn criter.	19.96815
F-statistic	171.7359	Durbin-Watson stat	0.428527
Prob(F-statistic)	0.000000		

(Sub muestra N1): Yt=6060.481+0.636947Xt

SCR1=467,000,000

Dependent Variable: CONSPR
Method: Least Squares
Date: 05/10/24 Time: 17:12
Sample: 22 40
Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-12596.96	4669.656	-2.697622	0.0153
PBI	0.662704	0.011753	56.38614	0.0000

R-squared	0.994682	Mean dependent var	241154.3
Adjusted R-squared	0.994369	S.D. dependent var	72398.27
S.E. of regression	5432.930	Akaike info criterion	20.13765
Sum squared resid	5.02E+08	Schwarz criterion	20.23706
Log likelihood	-189.3076	Hannan-Quinn criter.	20.15447
F-statistic	3179.397	Durbin-Watson stat	0.240489
Prob(F-statistic)	0.000000		

(Sub muestra N2): Yt=-12596.96+0.662704Xt

SCR2=502,000,000

4to paso:

SCRR= 1,650,000,000

SCRNR=SCR1+SCR2= 467000000+502000000 = 969,000,000

SCRR>SCRNR → **Hubo cambio estructural**

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5to paso:

H0: a0=b0

a1=b1

H1: a0≠b0

a1≠b1

Fchow= $(((\boldsymbol{SCRR}-\boldsymbol{SCRNR}))/\boldsymbol{K})/(\boldsymbol{SCRNR}/((\boldsymbol{N}-2\boldsymbol{k})))$

Donde: SCRNR = SCR1 + SCR2

$$\boldsymbol{F}_{chow} = \frac{\frac{(1650000000-969000000)}{2}}{\frac{969000000}{(40-4)}} = \mathbf{12.650}$$

Según la tabla para un 5% de significancia F(2,36) = **3.32**

Entonces, Fcalcu>Fcrit → se rechaza H0 y se acepta HA, lo que significa que no hubo estabilidad en la ecuación.

La ruta en eviews: Estimamos el modelo por MCO, luego vamos a view=> diagnóstico de estabilidad => chow breakpoint test => Ingresamos lo puntos de quiebre

Chow Breakpoint Test: 2001
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1980 2019

F-statistic	12.57550	Prob. F(2,36)	0.0001
Log likelihood ratio	21.19309	Prob. Chi-Square(2)	0.0000
Wald Statistic	25.15100	Prob. Chi-Square(2)	0.0000

Prueba con el p-value del Chow breakpoint test

H0: La eq estimada es estable

H1: La eq estimada no es estable

- ⇨ Como el p-value es 0.0000<0.05 (5% de significancia) => **Rechazamos H0**
- ⇨ **Aceptamos H1, que implica que la eq estimada no es estable.**

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b. Probar si el modelo econométrico: CPRt = Bo+B1PBIt+ ut fue estable o no para los puntos de quiebre: 1991 2002, en el periodo 1980-2019, utilizar Eviews.

N1: (1980-1990)

Dependent Variable: CONSPR
Method: Least Squares
Date: 05/10/24 Time: 18:05
Sample: 1980 1990
Included observations: 11

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-14290.86	19606.16	-0.728896	0.4846
PBI	0.744507	0.113963	6.532871	0.0001

R-squared	0.825846	Mean dependent var	113406.3
Adjusted R-squared	0.806496	S.D. dependent var	11488.47
S.E. of regression	5053.679	Akaike info criterion	20.05659
Sum squared resid	2.30E+08	Schwarz criterion	20.12893
Log likelihood	-108.3112	Hannan-Quinn criter.	20.01098
F-statistic	42.67841	Durbin-Watson stat	0.603481
Prob(F-statistic)	0.000107		

SCR1 = 230,000,000

N2: (1991-2001)

Dependent Variable: CONSPR
Method: Least Squares
Date: 05/10/24 Time: 18:07
Sample: 1991 2001
Included observations: 11

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	29064.86	6615.515	4.393439	0.0017
PBI	0.526632	0.033728	15.61412	0.0000

R-squared	0.964399	Mean dependent var	131467.7
Adjusted R-squared	0.960443	S.D. dependent var	14471.23
S.E. of regression	2878.169	Akaike info criterion	18.93066
Sum squared resid	74554716	Schwarz criterion	19.00301
Log likelihood	-102.1186	Hannan-Quinn criter.	18.88506
F-statistic	243.8007	Durbin-Watson stat	0.625746
Prob(F-statistic)	0.000000		

SCR2 = 74,554,716

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N3: (2002-2019)

Dependent Variable: CONSPR
Method: Least Squares
Date: 05/10/24 Time: 18:08
Sample: 2002 2019
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-16293.58	4697.768	-3.468366	0.0032
PBI	0.670855	0.011605	57.80508	0.0000

R-squared	0.995234	Mean dependent var	246516.8
Adjusted R-squared	0.994937	S.D. dependent var	70507.58
S.E. of regression	5017.149	Akaike info criterion	19.98355
Sum squared resid	4.03E+08	Schwarz criterion	20.08248
Log likelihood	-177.8520	Hannan-Quinn criter.	19.99719
F-statistic	3341.427	Durbin-Watson stat	0.304074
Prob(F-statistic)	0.000000		

SCR3 = 403,000,000

⇨ **SCRNR = 707,554,716**

Para N: (1980-2019)

Dependent Variable: CONSPR
Method: Least Squares
Date: 05/10/24 Time: 18:09
Sample: 1980 2019
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7243.331	2520.444	2.873832	0.0066
PBI	0.617590	0.008289	74.50498	0.0000

R-squared	0.993201	Mean dependent var	178272.9
Adjusted R-squared	0.993022	S.D. dependent var	78795.25
S.E. of regression	6582.117	Akaike info criterion	20.47081
Sum squared resid	1.65E+09	Schwarz criterion	20.55525
Log likelihood	-407.4161	Hannan-Quinn criter.	20.50134
F-statistic	5550.992	Durbin-Watson stat	0.197879
Prob(F-statistic)	0.000000		

⇨ **SCRR= 1,650,000,000**

Fchow= $(((\boldsymbol{SCRR}-\boldsymbol{SCRNR}))/(\boldsymbol{S}-\mathbf{1})\boldsymbol{k})/(\boldsymbol{SCRNR}/((\boldsymbol{N}-\boldsymbol{SK})))$ = **11.3218**

F critico según la tabla: F (4,34) = 2.69

Fcalcu> Fcrit ➔ Se rechaza H0, se acepta H1

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- ⇨ En los tres periodos considerados, **no ha habido estabilidad en los parámetros del modelo estimado.**

Chow Breakpoint Test: 1991 2002
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1980 2019

F-statistic	11.28863	Prob. F(4,34)	0.0000
Log likelihood ratio	33.80166	Prob. Chi-Square(4)	0.0000
Wald Statistic	45.15454	Prob. Chi-Square(4)	0.0000

Como el p-value es 0.0000<0.05 (5% de significancia)
=> **Rechazamos H0 Aceptamos H1, que implica que la eq estimada no es estable.**

c. Probar si para los años 2018 y 2019 las importaciones de Perú respecto al PBI (IMt= Bo + B1PBIt + ut) fueron iguales en relación con el periodo 2000-2017, hay que considerar que el periodo de quiebre en este caso es el año 2018.

Consideramos

Para N: (2000-2019)

Dependent Variable: IM
Method: Least Squares
Date: 05/13/24 Time: 12:58
Sample: 2000 2019
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-37646.85	4753.031	-7.920599	0.0000
PBI	0.356735	0.012174	29.30359	0.0000

R-squared	0.979468	Mean dependent var	96081.90
Adjusted R-squared	0.978328	S.D. dependent var	40360.88
S.E. of regression	5941.716	Akaike info criterion	20.31202
Sum squared resid	6.35E+08	Schwarz criterion	20.41160
Log likelihood	-201.1202	Hannan-Quinn criter.	20.33146
F-statistic	858.7001	Durbin-Watson stat	1.078579
Prob(F-statistic)	0.000000		

- ⇨ **SCRR= 635,000,000**

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N1: (2000-2017):

Dependent Variable: IM
Method: Least Squares
Date: 05/13/24 Time: 12:58
Sample: 2000 2017
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-40974.42	5160.473	-7.940051	0.0000
PBI	0.367708	0.013947	26.36508	0.0000

R-squared	0.977500	Mean dependent var	90099.89
Adjusted R-squared	0.976094	S.D. dependent var	37967.94
S.E. of regression	5870.441	Akaike info criterion	20.29769
Sum squared resid	5.51E+08	Schwarz criterion	20.39662
Log likelihood	-180.6792	Hannan-Quinn criter.	20.31133
F-statistic	695.1177	Durbin-Watson stat	1.210414
Prob(F-statistic)	0.000000		

SCR1=551,000,000

$$F_{chow} = \frac{\frac{(635{,}000{,}000 - 55100000\ )}{2}}{\frac{551000000}{(20-2)}} = \mathbf{1.372}$$

F critico: F(2,18) = 3.55

Planteamiento de Hipotesis:

H0 : Las ultimas observaciones(N2) provienen del modelo que genero la regresión del (periodo I) en base a N1

H1 : Las ultimas observaciones (N2) no provienen del modelo que genero la regresión del (periodo I) en base a N1

Fcalcu<Fcrit ➔ Se acepta Ho, se rechaza la H1 ➔ **Las ultimas observaciones (N2) provienen del modelo que genero la regresión del (periodo I) en base a N1.**

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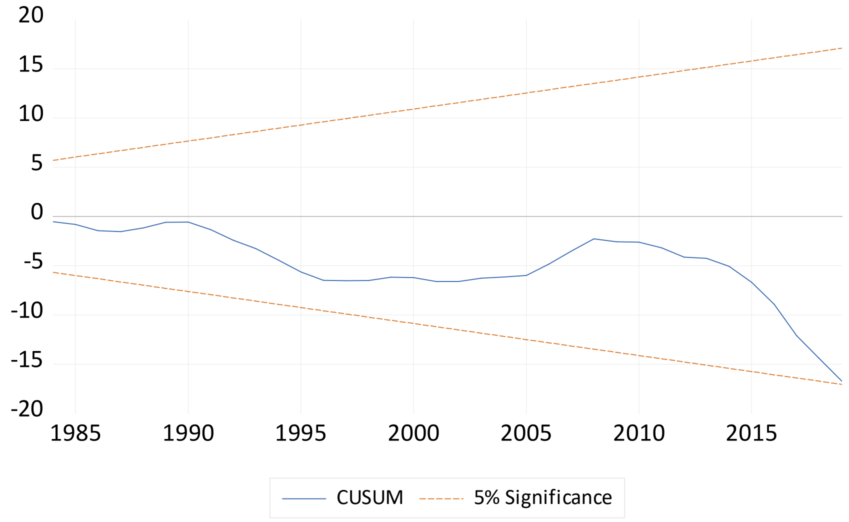
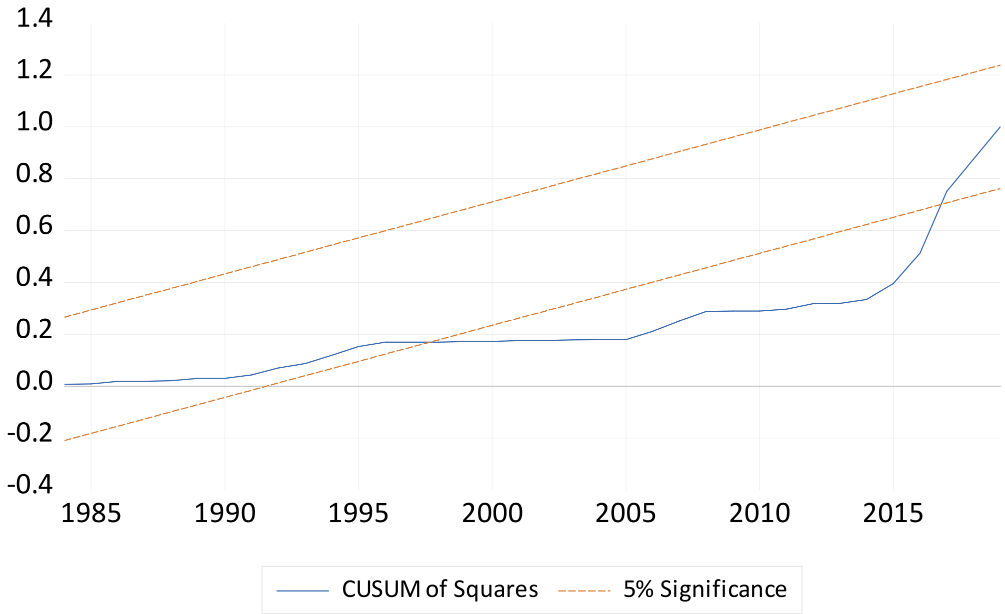
2.- Con los datos del “ANEXO 2”:

a. Estimar la ecuación: FBKt = B0 + B1IMt +B1 EXt +ut y probar la estabilidad de la ecuación estimada mediante la prueba: CUSUM y CUSUMQ. ¿Qué significa el resultado de la prueba CUSUM y CUSUMQ?

Para la prueba de CUSUM me arroja que en la ecuación estimada no existe punto de quiebre estructural, es decir, es estable



Para la prueba CUSUMQ, el modelo estimado no es estable, ya que la línea azul sale del intervalo de confianza a un 5% de significancia en los años 1980-2019. EN 1998 pudo haber un quiebre estructural.



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3.- Con los datos del "ANEXO 3":
a. Probar el cambio estructural mediante variables dicótomas, si esta ha sido estable o no a un 5% de nivel de significancia.

$IM_t = B_0 + B_1 PBI_1 + B_2 D_i + B_3 D_i PBI_t + \mu_t$

Donde: D_i = 1(Si pertenece al periodo I)

0 (si pertenece al periodo II)

Dependent Variable: IM
Method: Least Squares
Date: 05/13/24 Time: 15:47
Sample: 1980 2019
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-38451.99	5570.684	-6.902562	0.0000
PBI	0.358512	0.013762	26.05093	0.0000
DI	3078.591	11413.30	0.269737	0.7889
DIPBI	-0.000462	0.055722	-0.008293	0.9934

R-squared	0.983656	Mean dependent var	62477.50
Adjusted R-squared	0.982294	S.D. dependent var	44710.86
S.E. of regression	5949.410	Akaike info criterion	20.31461
Sum squared resid	1.27E+09	Schwarz criterion	20.48350
Log likelihood	-402.2922	Hannan-Quinn criter.	20.37568
F-statistic	722.2120	Durbin-Watson stat	0.709099
Prob(F-statistic)	0.000000		

Yt= 154.0270+ 0.6585PBI -3078.59Di – 0.0004DIPBI

Hipotesis:

- Bo=0
  Bo≠0
- ⇨ P-value =0.0000
- B1=0
  B1≠0
- ⇨ P-value =0.0000
- B2=0
  B2≠0
- ⇨ P-value = 0.7889
- B3=0
  B3≠0
- ⇨ P-value = 0.9934

➔ El p value al ser mayor al 5% => B2≠0, B3≠0

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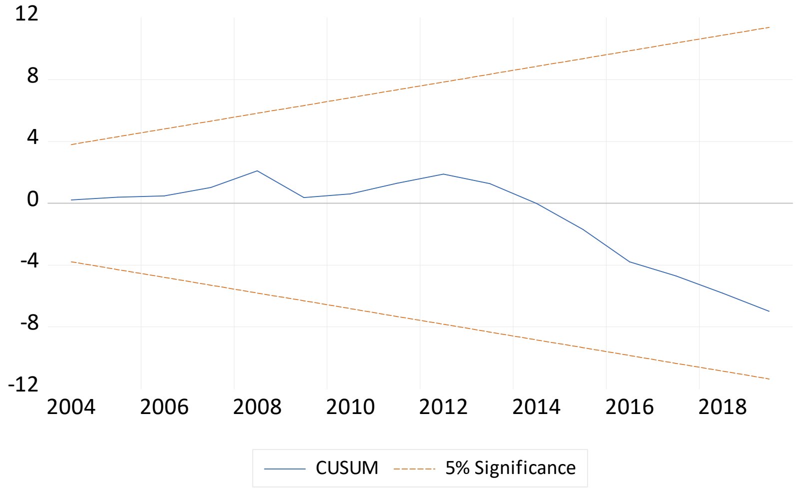
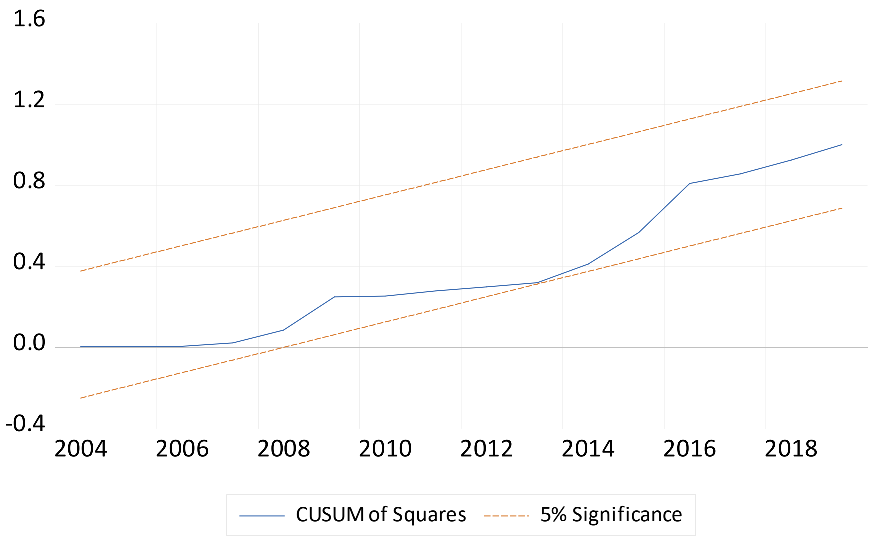
➔ Por lo tanto, al ser el parámetro autónomo y el parâmetro estimado nos significativos al 5%, afirmamos que el modelo estimado **es estable.**

b. Aplicar la prueba: CUSUM y CUSUMQ y si sale del intervalo de confianza aplicar la prueba de chow.

Para la prueba de CUSUM me arroja que en la ecuación estimada no existe punto de quiebre estructural, es decir, es estable



Para la prueba CUSUMQ, el modelo estimado es estable, ya que la línea azul no sale del intervalo de confianza a un 5% de significancia en los años 1980-2019.



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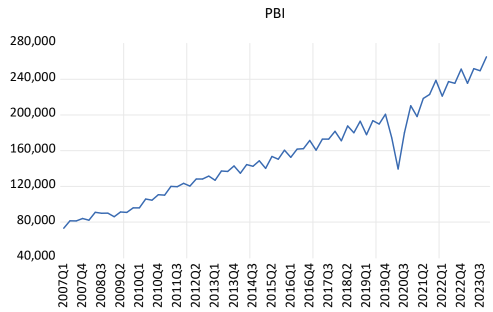
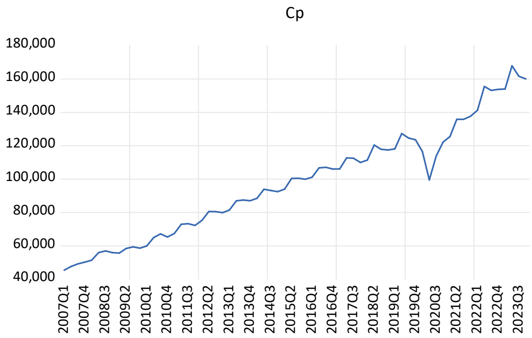
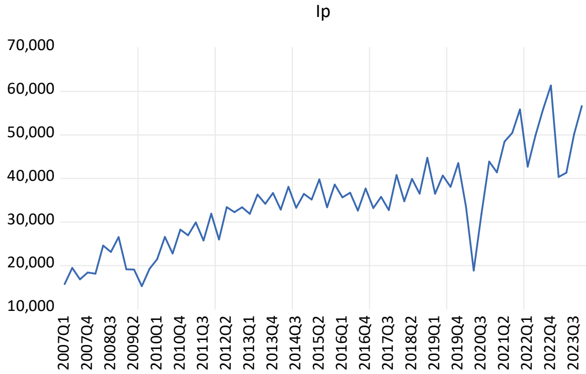
4.- Con los datos del "ANEXO 4":

a. Descomponer las series de tiempo, graficar las series suavizadas. y evaluar la estacionariedad de las series a niveles según las pruebas de raíz unitaria (ADF, PP, KPSS).

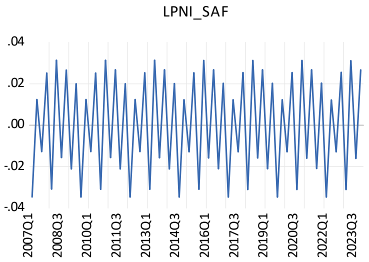
Graficando:

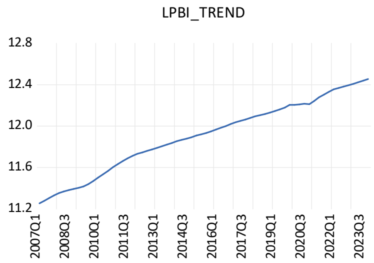


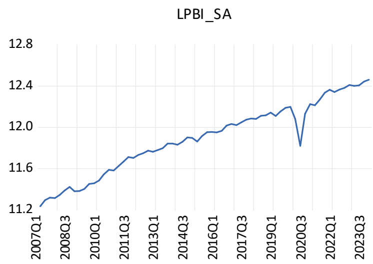


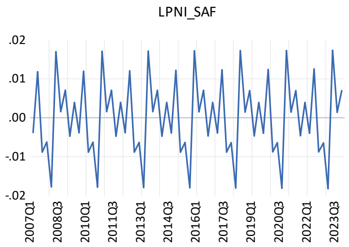


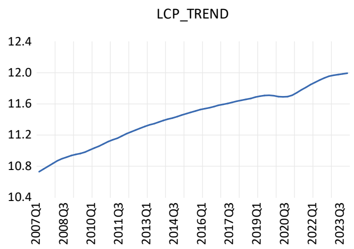
Graficando las series suavizadas

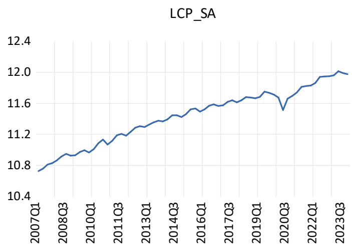












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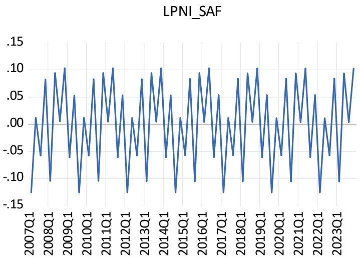

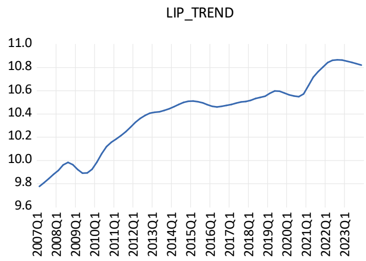

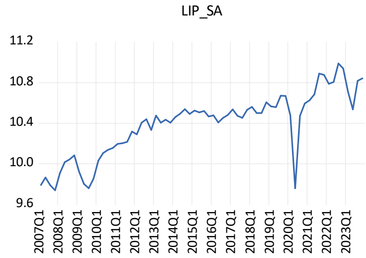

Evaluando la estacionariedad

Augmented Dickey-Fuller Unit Root Test on LPBI_SA

Null Hypothesis: LPBI_SA has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.818309	0.8071
Test critical values:	1% level	-3.534868	
	5% level	-2.906923	
	10% level	-2.591006	

*MacKinnon (1996) one-sided p-values.

Phillips-Perron Unit Root Test on LPBI_SA

Null Hypothesis: LPBI_SA has a unit root
Exogenous: Constant
Bandwidth: 37 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.117186	0.7044
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

*MacKinnon (1996) one-sided p-values.

KPSS Unit Root Test on LPBI_SA

Null Hypothesis: LPBI_SA is stationary
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.057271
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

El p-valor es mayor al 5% de significancia por lo que la serie tiene raíz unitaria, lo que indica que la serie no es estacionaria.

Augmented Dickey-Fuller Unit Root Test on LCP_SA

Null Hypothesis: LCP_SA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.393121	0.5806
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

*MacKinnon (1996) one-sided p-values.

Phillips-Perron Unit Root Test on LCP_SA

Null Hypothesis: LCP_SA has a unit root
Exogenous: Constant
Bandwidth: 16 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.021665	0.2771
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

*MacKinnon (1996) one-sided p-values.

KPSS Unit Root Test on LCP_SA

Null Hypothesis: LCP_SA is stationary
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.060787
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

El p-valor es mayor al 5% de significancia por lo que la serie tiene raíz unitaria, lo que indica que la serie no es estacionaria.

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Augmented Dickey-Fuller Unit Root Test on LIP_SA

Null Hypothesis: LIP_SA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.255149	0.1894
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

*MacKinnon (1996) one-sided p-values.

Phillips-Perron Unit Root Test on LIP_SA

Null Hypothesis: LIP_SA has a unit root
Exogenous: Constant
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.958214	0.3043
Test critical values:	1% level	-3.531592	
	5% level	-2.905519	
	10% level	-2.590262	

*MacKinnon (1996) one-sided p-values.

KPSS Unit Root Test on LIP_SA

Null Hypothesis: LIP_SA is stationary
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.927944
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

El p-valor es mayor al 5% de significancia por lo que la serie tiene raíz unitaria, lo que indica que la serie no es estacionaria.

Por lo que aplicamos diferenciación y volvemos a evaluar.

Augmented Dickey-Fuller Unit Root Test on TPBI

Null Hypothesis: TPBI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.297852	0.0010
Test critical values:	1% level	-3.538362	
	5% level	-2.908420	
	10% level	-2.591799	

*MacKinnon (1996) one-sided p-values.

Phillips-Perron Unit Root Test on TPBI

Null Hypothesis: TPBI has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.377326	0.0008
Test critical values:	1% level	-3.538362	
	5% level	-2.908420	
	10% level	-2.591799	

*MacKinnon (1996) one-sided p-values.

KPSS Unit Root Test on TPBI

Null Hypothesis: TPBI is stationary
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.089834
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

El p-valor es menor al 5% de significancia por lo que la serie ya no tiene raíz unitaria, lo que indica que la serie es estacionaria.

Augmented Dickey-Fuller Unit Root Test on TCP

Null Hypothesis: TCP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.747642	0.0055
Test critical values:	1% level	-3.538362	
	5% level	-2.908420	
	10% level	-2.591799	

*MacKinnon (1996) one-sided p-values.

Phillips-Perron Unit Root Test on TCP

Null Hypothesis: TCP has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.838663	0.0042
Test critical values:	1% level	-3.538362	
	5% level	-2.908420	
	10% level	-2.591799	

*MacKinnon (1996) one-sided p-values.

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KPSS Unit Root Test on TCP

Null Hypothesis: TCP is stationary
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.193308
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

El p-valor es menor al 5% de significancia por lo que la serie ya no tiene raíz unitaria, lo que indica que la serie es estacionaria.

Augmented Dickey-Fuller Unit Root Test on TIP

Null Hypothesis: TIP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.154075	0.0016
Test critical values:	1% level	-3.538362	
	5% level	-2.908420	
	10% level	-2.591799	

*MacKinnon (1996) one-sided p-values.

Phillips-Perron Unit Root Test on TIP

Null Hypothesis: TIP has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.270618	0.0011
Test critical values:	1% level	-3.538362	
	5% level	-2.908420	
	10% level	-2.591799	

*MacKinnon (1996) one-sided p-values.

KPSS Unit Root Test on TIP

Null Hypothesis: TIP is stationary
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.101796
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

El p-valor es menor al 5% de significancia por lo que la serie ya no tiene raíz unitaria, lo que indica que la serie es estacionaria.

c. Evaluar si las series cointegran utilizando la tabla de Hamilton y el test de Johansen.

Para PBI vemos que no hay autocorrelación ya que tiene un DW de 1.86, nos indica que el primer rezago es significativo, comparando el p-valor de vemos que es menor al 5% se rechaza H0 hay evidencia de que no tiene raíz unitaria.

Null Hypothesis: TPBI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.278700	0.0062
Test critical values:	1% level	-4.110440	
	5% level	-3.482763	
	10% level	-3.169372	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TPBI)
Method: Least Squares
Date: 05/14/24 Time: 18:00
Sample (adjusted): 6 68
Included observations: 63 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TPBI(-1)	-0.466699	0.109075	-4.278700	0.0001
C	3.816621	2.163807	1.763846	0.0828
@TREND("1")	-0.016065	0.048525	-0.331073	0.7417

R-squared	0.233829	Mean dependent var	-0.094085
Adjusted R-squared	0.208290	S.D. dependent var	7.837608
S.E. of regression	6.973753	Akaike info criterion	6.768632
Sum squared resid	2917.994	Schwarz criterion	6.870686
Log likelihood	-210.2119	Hannan-Quinn criter.	6.808770
F-statistic	9.155762	Durbin-Watson stat	1.863224
Prob(F-statistic)	0.000339		

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Para PC vemos que es posible que no haya autocorrelación ya que tiene un DW de 1.82, nos indica que el primer rezago es significativo, comparando el p-valor de vemos que es menor al 5% se rechaza H0 hay evidencia de que no tiene raíz unitaria.

Null Hypothesis: TCP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.772891	0.0246
Test critical values:	1% level	-4.110440	
	5% level	-3.482763	
	10% level	-3.169372	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TCP)
Method: Least Squares
Date: 05/14/24 Time: 18:10
Sample (adjusted): 6 68
Included observations: 63 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TCP(-1)	-0.381226	0.101043	-3.772891	0.0004
C	3.459295	1.699153	2.035894	0.0462
@TREND("1")	-0.020466	0.034852	-0.587229	0.5593

R-squared	0.191797	Mean dependent var	-0.177319
Adjusted R-squared	0.164857	S.D. dependent var	5.422081
S.E. of regression	4.955030	Akaike info criterion	6.085132
Sum squared resid	1473.140	Schwarz criterion	6.187186
Log likelihood	-188.6816	Hannan-Quinn criter.	6.125270
F-statistic	7.119405	Durbin-Watson stat	1.821330
Prob(F-statistic)	0.001681		

Para IP vemos que es posible no hay autocorrelación ya que tiene un DW de 1.80, nos indica que el primer rezago es significativo, comparando el p-valor de vemos que es menor al 5% se rechaza H0 hay evidencia de que no tiene raíz unitaria.

Null Hypothesis: TIP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.177551	0.0083
Test critical values:	1% level	-4.110440	
	5% level	-3.482763	
	10% level	-3.169372	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TIP)
Method: Least Squares
Date: 05/14/24 Time: 18:11
Sample (adjusted): 6 68
Included observations: 63 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TIP(-1)	-0.452831	0.108396	-4.177551	0.0001
C	5.210393	5.180503	1.005770	0.3186
@TREND("1")	-0.077962	0.125849	-0.619487	0.5379

R-squared	0.225464	Mean dependent var	-0.344960
Adjusted R-squared	0.199647	S.D. dependent var	20.15613
S.E. of regression	18.03218	Akaike info criterion	8.668641
Sum squared resid	19509.57	Schwarz criterion	8.770695
Log likelihood	-270.0622	Hannan-Quinn criter.	8.708779
F-statistic	8.732886	Durbin-Watson stat	1.806533
Prob(F-statistic)	0.000469		

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Con lo anterior vemos que las tres son del mismo orden. Realizando una regresión MCO tenemos y obtenemos la prueba de raíz unitaria nos indica que el primer rezago es significativo, comparando el p-valor de vemos que es menor al 5% se rechaza H0 hay evidencia de que no tiene raíz unitaria), es decir, es estacionaria. Comparando el valor t vemos -3.63 contra el valor de la tabla de -3.37. Esto confirma que las series están cointegradas (La regresión no es espuria)

Null Hypothesis: ERROR_MCO has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.631608	0.0005
Test critical values:	1% level	-2.602185	
	5% level	-1.946072	
	10% level	-1.613448	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ERROR_MCO)
Method: Least Squares
Date: 05/14/24 Time: 18:25
Sample (adjusted): 6 68
Included observations: 63 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERROR_MCO(-1)	-0.360993	0.099403	-3.631608	0.0006
R-squared	0.174571	Mean dependent var	0.086569	
Adjusted R-squared	0.174571	S.D. dependent var	2.740843	
S.E. of regression	2.490142	Akaike info criterion	4.678302	
Sum squared resid	384.4500	Schwarz criterion	4.712320	
Log likelihood	-146.3665	Hannan-Quinn criter.	4.691681	
Durbin-Watson stat	1.670361			

Dependent Variable: TPBI
Method: Least Squares
Date: 05/14/24 Time: 18:22
Sample (adjusted): 5 68
Included observations: 64 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.737822	0.842088	0.876182	0.3844
TCP	0.732430	0.120068	6.100118	0.0000
TIP	0.147205	0.035686	4.124978	0.0001
R-squared	0.844189	Mean dependent var	7.109485	
Adjusted R-squared	0.839080	S.D. dependent var	8.093569	
S.E. of regression	3.246718	Akaike info criterion	5.238907	
Sum squared resid	643.0118	Schwarz criterion	5.340105	
Log likelihood	-164.6450	Hannan-Quinn criter.	5.278774	
F-statistic	165.2499	Durbin-Watson stat	0.725072	
Prob(F-statistic)	0.000000			

TABLE B.9
Critical Values for the Phillips Z_t Statistic or the Dickey-Fuller t Statistic When Applied to Residuals from Spurious Cointegrating Regression

Number of right-hand variables in regression, excluding trend or constant $(n-1)$	*Sample size* (T)	*Probability that* $(\hat{\rho}-1)/\hat{\sigma}_{\hat{\rho}}$ *is less than entry*						
		0.010	*0.025*	*0.050*	*0.075*	*0.100*	*0.125*	*0.150*
				Case 1				
1	500	−3.39	−3.05	−2.76	−2.58	−2.45	−2.35	−2.26
2	500	−3.84	−3.55	−3.27	−3.11	−2.99	−2.88	−2.79
3	500	−4.30	−3.99	−3.74	−3.57	−3.44	−3.35	−3.26
4	500	−4.67	−4.38	−4.13	−3.95	−3.81	−3.71	−3.61
5	500	−4.99	−4.67	−4.40	−4.25	−4.14	−4.04	−3.94
				Case 2				
1	500	−3.96	−3.64	−3.37	−3.20	−3.07	−2.96	−2.86
2	500	−4.31	−4.02	−3.77	−3.58	−3.45	−3.35	−3.26
3	500	−4.73	−4.37	−4.11	−3.96	−3.83	−3.73	−3.65
4	500	−5.07	−4.71	−4.45	−4.29	−4.16	−4.05	−3.96
5	500	−5.28	−4.98	−4.71	−4.56	−4.43	−4.33	−4.24
				Case 3				
1	500	−3.98	−3.68	−3.42	—	−3.13	—	—
2	500	−4.36	−4.07	−3.80	−3.65	−3.52	−3.42	−3.33
3	500	−4.65	−4.39	−4.16	−3.98	−3.84	−3.74	−3.66
4	500	−5.04	−4.77	−4.49	−4.32	−4.20	−4.08	−4.00
5	500	−5.36	−5.02	−4.74	−4.58	−4.46	−4.36	−4.28

The probability shown at the head of the column is the area in the left-hand tail.

Source: P. C. B. Phillips and S. Ouliaris, "Asymptotic Properties of Residual Based Tests for Cointegration," *Econometrica* 58 (1990), p. 190. Also Wayne A. Fuller, *Introduction to Statistical Time Series*, Wiley, New York, 1976, p. 373.

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Con la prueba de Johansen se rechaza la hipótesis de "no cointegración"

Date: 05/14/24 Time: 20:19
Sample (adjusted): 11 68
Included observations: 58 after adjustments
Trend assumption: Linear deterministic trend
Series: TPBI TCP TIP
Lags interval (in first differences): 1 to 5

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.337257	47.11949	29.79707	0.0002
At most 1 *	0.263615	23.26010	15.49471	0.0028
At most 2 *	0.090658	5.511950	3.841465	0.0189

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.337257	23.85938	21.13162	0.0201
At most 1 *	0.263615	17.74815	14.26460	0.0135
At most 2 *	0.090658	5.511950	3.841465	0.0189

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

TPBI	TCP	TIP
-0.625527	0.668235	-0.044182
-0.462462	0.145255	0.278135
-0.281501	-0.223511	0.106948

Unrestricted Adjustment Coefficients (alpha):

D(TPBI)	-0.447853	-1.641362	1.596838
D(TCP)	-1.051374	-0.899190	1.121492
D(TIP)	-2.573953	-5.942253	2.508783

1 Cointegrating Equation(s): Log likelihood -464.7118

Normalized cointegrating coefficients (standard error in parentheses)

TPBI	TCP	TIP
1.000000	-1.068276	0.070631
	(0.17745)	(0.08967)

Adjustment coefficients (standard error in parentheses)

D(TPBI)	0.280144
	(0.60805)
D(TCP)	0.657662
	(0.42709)
D(TIP)	1.610076
	(1.43706)

2 Cointegrating Equation(s): Log likelihood -455.8377

Normalized cointegrating coefficients (standard error in parentheses)

TPBI	TCP	TIP
1.000000	0.000000	-0.881309
		(0.14385)
0.000000	1.000000	-0.891099
		(0.15587)

Adjustment coefficients (standard error in parentheses)

D(TPBI)	1.039211	-0.537686
	(0.72941)	(0.64120)
D(TCP)	1.073503	-0.833176
	(0.51978)	(0.45692)
D(TIP)	4.358140	-2.583145
	(1.63485)	(1.43714)

Evaluando el test de Hansen al tener un p-valor menor al 5% las series están cointegradas

Dependent Variable: TPBI
Method: Fully Modified Least Squares (FMOLS)
Date: 05/14/24 Time: 18:43
Sample (adjusted): 6 68
Included observations: 63 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TCP	0.626204	0.157382	3.978870	0.0002
TIP	0.164678	0.046429	3.546896	0.0008
C	1.516589	1.091529	1.389416	0.1698

R-squared	0.841161	Mean dependent var	7.046168
Adjusted R-squared	0.835867	S.D. dependent var	8.142585
S.E. of regression	3.298837	Sum squared resid	652.9395
Long-run variance	17.53530		

Cointegration Test - Hansen Parameter Instability
Date: 05/14/24 Time: 18:44
Equation: EQ01
Series: TPBI TCP TIP
Null hypothesis: Series are cointegrated
Cointegrating equation deterministics: C

Lc statistic	Stochastic Trends (m)	Deterministic Trends (k)	Excluded Trends (p2)	Prob.*
0.405611	2	0	0	0.0805

*Hansen (1992b) Lc(m2=2, k=0) p-values, where m2=m-p2 is the number of stochastic trends in the asymptotic distribution

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Con Hengle-Grannger y el de Phillips-Oulairs tenemos
-Ho: Series no están cointegradas (no hay relación de largo plazo)
-Ha: Series si están cointegradas
Como el valor de tau es mayor al 5% no rechazamos H0 las series no están cointegradas (no hay relación de largo plazo)

Cointegration Test - Engle-Granger
Date: 05/14/24 Time: 18:45
Equation: EQ01
Specification: TPBI TCP TIP C
Cointegrating equation deterministics: C
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz info criterion, maxlag=10)

	Value	Prob.*
Engle-Granger tau-statistic	-3.631608	0.0851
Engle-Granger z-statistic	-22.74258	0.0601

*MacKinnon (1996) p-values.

Intermediate Results:

Rho - 1	-0.360993
Rho S.E.	0.099403
Residual variance	6.200806
Long-run residual variance	6.200806
Number of lags	0
Number of observations	63
Number of stochastic trends**	3

**Number of stochastic trends in asymptotic distribution.

Engle-Granger Test Equation:
Dependent Variable: D(RESID)
Method: Least Squares
Date: 05/14/24 Time: 18:45
Sample (adjusted): 6 68
Included observations: 63 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.360993	0.099403	-3.631608	0.0006

R-squared	0.174571	Mean dependent var	0.086569
Adjusted R-squared	0.174571	S.D. dependent var	2.740843
S.E. of regression	2.490142	Akaike info criterion	4.678302
Sum squared resid	384.4500	Schwarz criterion	4.712320
Log likelihood	-146.3665	Hannan-Quinn criter.	4.691681
Durbin-Watson stat	1.670361		

Cointegration Test - Phillips-Ouliaris
Date: 05/14/24 Time: 18:46
Equation: EQ01
Specification: TPBI TCP TIP C
Cointegrating equation deterministics: C
Null hypothesis: Series are not cointegrated
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)
No d.f. adjustment for variances

	Value	Prob.*
Phillips-Ouliaris tau-statistic	-3.866608	0.0514
Phillips-Ouliaris z-statistic	-25.92845	0.0287

*MacKinnon (1996) p-values.

Intermediate Results:

Rho - 1	-0.360993
Bias corrected Rho - 1 (Rho* - 1)	-0.411563
Rho* S.E.	0.106440
Residual variance	6.102380
Long-run residual variance	7.109832
Long-run residual autocovariance	0.503726
Number of observations	63
Number of stochastic trends**	3

**Number of stochastic trends in asymptotic distribution.

Phillips-Ouliaris Test Equation:
Dependent Variable: D(RESID)
Method: Least Squares
Date: 05/14/24 Time: 18:46
Sample (adjusted): 6 68
Included observations: 63 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.360993	0.099403	-3.631608	0.0006

R-squared	0.174571	Mean dependent var	0.086569
Adjusted R-squared	0.174571	S.D. dependent var	2.740843
S.E. of regression	2.490142	Akaike info criterion	4.678302
Sum squared resid	384.4500	Schwarz criterion	4.712320
Log likelihood	-146.3665	Hannan-Quinn criter.	4.691681
Durbin-Watson stat	1.670361		

d. Estimar el modelo VAR con las series desestacionalizadas y en primeras diferencias, escoger el número de rezagos óptimos según los criterios de información.

EL modelo VAR seria:
===============================
LS 1 2 TCP TIP TPBI

VAR Model:
===============================
TCP = C(1,1)*TCP(-1) + C(1,2)*TCP(-2) + C(1,3)*TIP(-1) + C(1,4)*TIP(-2) + C(1,5)*TPBI(-1) + C(1,6)*TPBI(-2) + C(1,7)

TIP = C(2,1)*TCP(-1) + C(2,2)*TCP(-2) + C(2,3)*TIP(-1) + C(2,4)*TIP(-2) + C(2,5)*TPBI(-1) + C(2,6)*TPBI(-2) + C(2,7)

TPBI = C(3,1)*TCP(-1) + C(3,2)*TCP(-2) + C(3,3)*TIP(-1) + C(3,4)*TIP(-2) + C(3,5)*TPBI(-1) + C(3,6)*TPBI(-2) + C(3,7)

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VAR Model - Substituted Coefficients:

===============================

TCP = 0.786135991449*TCP(-1) - 0.440012274617*TCP(-2) - 0.0262676709866*TIP(-1) - 0.00341301941722*TIP(-2) - 0.0180850892134*TPBI(-1) + 0.266028198151*TPBI(-2) + 3.16826421712

TIP = 0.572595964654*TCP(-1) - 1.90431759407*TCP(-2) + 0.556136033409*TIP(-1) - 0.323711040493*TIP(-2) - 0.334061467692*TPBI(-1) + 1.89132436122*TPBI(-2) + 3.4497530432

TPBI = 0.0640248117812*TCP(-1) - 0.505571122487*TCP(-2) - 0.0681852390603*TIP(-1) - 0.0256561241091*TIP(-2) + 0.66094063617*TPBI(-1) + 0.31927134255*TPBI(-2) + 4.01247629995

Vector Autoregression Estimates
Date: 05/14/24 Time: 12:47
Sample (adjusted): 7 68
Included observations: 62 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	TCP	TIP	TPBI
TCP(-1)	0.786136	0.572596	0.064025
	(0.41159)	(1.45153)	(0.57496)
	[1.91001]	[0.39448]	[0.11136]
TCP(-2)	-0.440012	-1.904318	-0.505571
	(0.38491)	(1.35746)	(0.53770)
	[-1.14314]	[-1.40285]	[-0.94025]
TIP(-1)	-0.026268	0.556136	-0.068185
	(0.07723)	(0.27236)	(0.10788)
	[-0.34013]	[2.04192]	[-0.63203]
TIP(-2)	-0.003413	-0.323711	-0.025656
	(0.07878)	(0.27783)	(0.11005)
	[-0.04332]	[-1.16514]	[-0.23313]
TPBI(-1)	-0.018085	-0.334061	0.660941
	(0.30264)	(1.06730)	(0.42276)
	[-0.05976]	[-0.31300]	[1.56338]
TPBI(-2)	0.266028	1.891324	0.319271
	(0.28813)	(1.01615)	(0.40250)
	[0.92328]	[1.86126]	[0.79321]
C	3.168264	3.449753	4.012476
	(1.42556)	(5.02747)	(1.99141)
	[2.22248]	[0.68618]	[2.01489]
R-squared	0.418288	0.386070	0.338352
Adj. R-squared	0.354828	0.319096	0.266172
Sum sq. resids	1392.076	17313.81	2716.529
S.E. equation	5.030952	17.74251	7.027904
F-statistic	6.591414	5.764468	4.687629
Log likelihood	-184.4281	-262.5701	-205.1534
Akaike AIC	6.175101	8.695809	6.843659
Schwarz SC	6.415261	8.935969	7.083820
Mean dependent	7.296262	5.573411	7.010376
S.D. dependent	6.263435	21.50167	8.204059
Determinant resid covariance (dof adj.)		8781.757	
Determinant resid covariance		6130.479	
Log likelihood		-534.2744	
Akaike information criterion		17.91208	
Schwarz criterion		18.63256	
Number of coefficients		21	

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Obteniendo los rezagos óptimos vemos que serían 5

VAR Lag Order Selection Criteria
Endogenous variables: TCP TIP TPBI
Exogenous variables: C
Date: 05/14/24 Time: 12:54
Sample: 1 68
Included observations: 56

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-532.2995	NA	40304.60	19.11784	19.22634	19.15991
1	-480.0352	97.06227	8602.319	17.57269	18.00669*	17.74095*
2	-475.2443	8.384220	10029.85	17.72301	18.48252	18.01747
3	-467.4596	12.78904	10555.43	17.76642	18.85143	18.18707
4	-457.0202	16.03192	10170.43	17.71501	19.12552	18.26186
5	-442.4061	20.87731*	8518.090*	17.51450*	19.25052	18.18755
6	-437.1232	6.981003	10073.08	17.64726	19.70878	18.44650
7	-430.6048	7.915204	11569.83	17.73589	20.12291	18.66133
8	-424.2178	7.071301	13607.70	17.82921	20.54173	18.88085

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Y el VAR quedaría de la siguiente forma:
===============================
LS 1 5 TCP TIP TPBI

VAR Model:
===============================
TCP = C(1,1)*TCP(-1) + C(1,2)*TCP(-2) + C(1,3)*TCP(-3) + C(1,4)*TCP(-4) + C(1,5)*TCP(-5) + C(1,6)*TIP(-1) + C(1,7)*TIP(-2) + C(1,8)*TIP(-3) + C(1,9)*TIP(-4) + C(1,10)*TIP(-5) + C(1,11)*TPBI(-1) + C(1,12)*TPBI(-2) + C(1,13)*TPBI(-3) + C(1,14)*TPBI(-4) + C(1,15)*TPBI(-5) + C(1,16)

TIP = C(2,1)*TCP(-1) + C(2,2)*TCP(-2) + C(2,3)*TCP(-3) + C(2,4)*TCP(-4) + C(2,5)*TCP(-5) + C(2,6)*TIP(-1) + C(2,7)*TIP(-2) + C(2,8)*TIP(-3) + C(2,9)*TIP(-4) + C(2,10)*TIP(-5) + C(2,11)*TPBI(-1) + C(2,12)*TPBI(-2) + C(2,13)*TPBI(-3) + C(2,14)*TPBI(-4) + C(2,15)*TPBI(-5) + C(2,16)

TPBI = C(3,1)*TCP(-1) + C(3,2)*TCP(-2) + C(3,3)*TCP(-3) + C(3,4)*TCP(-4) + C(3,5)*TCP(-5) + C(3,6)*TIP(-1) + C(3,7)*TIP(-2) + C(3,8)*TIP(-3) + C(3,9)*TIP(-4) + C(3,10)*TIP(-5) + C(3,11)*TPBI(-1) + C(3,12)*TPBI(-2) + C(3,13)*TPBI(-3) + C(3,14)*TPBI(-4) + C(3,15)*TPBI(-5) + C(3,16)

VAR Model - Substituted Coefficients:
===============================
TCP = 0.704815206166*TCP(-1) - 0.218981700032*TCP(-2) + 0.12274469791*TCP(-3) - 1.06728119156*TCP(-4) + 0.517917862442*TCP(-5) - 0.117781310419*TIP(-1) + 0.134087018322*TIP(-2) - 0.131407548525*TIP(-3) + 0.0397193053943*TIP(-4) - 0.0030646643048*TIP(-5) + 0.286830270771*TPBI(-1) - 0.181909603288*TPBI(-2) + 0.249545759364*TPBI(-3) + 0.333796761228*TPBI(-4) - 0.0184152243048*TPBI(-5) + 2.53831320819

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TIP = 0.0963298384273*TCP(-1) + 0.162294916997*TCP(-2) - 1.14954483013*TCP(-3) - 3.19919569708*TCP(-4) + 1.13911464802*TCP(-5) + 0.0455245889344*TIP(-1) + 0.180570855653*TIP(-2) - 0.287107291075*TIP(-3) - 0.261146249071*TIP(-4) + 0.14238323296*TIP(-5) + 1.07476115498*TPBI(-1) - 0.525443861374*TPBI(-2) + 1.38064060079*TPBI(-3) + 1.68939439067*TPBI(-4) - 0.117664974815*TPBI(-5) + 3.52922064113

TPBI = 0.214667594431*TCP(-1) - 0.103993618519*TCP(-2) + 0.105956332097*TCP(-3) - 1.4148340582*TCP(-4) + 0.423873573683*TCP(-5) - 0.259085057719*TIP(-1) + 0.0970345359369*TIP(-2) - 0.104720131471*TIP(-3) + 0.0720492607175*TIP(-4) - 0.0980446925974*TIP(-5) + 0.971755647187*TPBI(-1) - 0.219963969058*TPBI(-2) + 0.21039524781*TPBI(-3) + 0.303327474219*TPBI(-4) + 0.252876243896*TPBI(-5) + 3.74720771031

Vector Autoregression Estimates
Date: 05/14/24 Time: 13:00
Sample (adjusted): 10 68
Included observations: 59 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	TCP	TIP	TPBI
TCP(-1)	0.704815	0.096330	0.214668
	(0.48273)	(1.54728)	(0.67316)
	[1.46007]	[0.06226]	[0.31889]
TCP(-2)	-0.218982	0.162295	-0.103994
	(0.57591)	(1.84596)	(0.80311)
	[-0.38024]	[0.08792]	[-0.12949]
TCP(-3)	0.122745	-1.149545	0.105956
	(0.56864)	(1.82265)	(0.79297)
	[0.21586]	[-0.63070]	[0.13362]
TCP(-4)	-1.067281	-3.199196	-1.414834
	(0.54051)	(1.73248)	(0.75374)
	[-1.97459]	[-1.84660]	[-1.87710]
TCP(-5)	0.517918	1.139115	0.423874
	(0.45136)	(1.44673)	(0.62942)
	[1.14747]	[0.78737]	[0.67344]
TIP(-1)	-0.117781	0.045525	-0.259085
	(0.10392)	(0.33308)	(0.14491)
	[-1.13342]	[0.13668]	[-1.78789]
TIP(-2)	0.134087	0.180571	0.097035
	(0.09827)	(0.31498)	(0.13703)
	[1.36451]	[0.57329]	[0.70811]
TIP(-3)	-0.131408	-0.287107	-0.104720
	(0.09896)	(0.31718)	(0.13799)
	[-1.32793]	[-0.90517]	[-0.75887]
TIP(-4)	0.039719	-0.261146	0.072049
	(0.10199)	(0.32691)	(0.14223)
	[0.38944]	[-0.79882]	[0.50658]
TIP(-5)	-0.003065	0.142383	-0.098045
	(0.09216)	(0.29541)	(0.12852)
	[-0.03325]	[0.48199]	[-0.76287]
TPBI(-1)	0.286830	1.074761	0.971756
	(0.34323)	(1.10014)	(0.47863)
	[0.83569]	[0.97693]	[2.03030]
TPBI(-2)	-0.181910	-0.525444	-0.219964
	(0.40068)	(1.28431)	(0.55875)
	[-0.45400]	[-0.40913]	[-0.39367]
TPBI(-3)	0.249546	1.380641	0.210395
	(0.38707)	(1.24066)	(0.53976)
	[0.64471]	[1.11283]	[0.38979]
TPBI(-4)	0.333797	1.689394	0.303327
	(0.37969)	(1.21702)	(0.52948)
	[0.87913]	[1.38814]	[0.57288]
TPBI(-5)	-0.018415	-0.117665	0.252876
	(0.33584)	(1.07646)	(0.46832)
	[-0.05483]	[-0.10931]	[0.53996]
C	2.538313	3.529221	3.747208
	(1.89036)	(6.05916)	(2.63611)
	[1.34276]	[0.58246]	[1.42149]
R-squared	0.571496	0.616257	0.521244
Adj. R-squared	0.422018	0.482394	0.354236
Sum sq. resids	1005.507	10330.45	1955.331
S.E. equation	4.835689	15.49978	6.743354
F-statistic	3.823277	4.603619	3.121073
Log likelihood	-167.3708	-236.0941	-186.9903
Akaike AIC	6.215960	8.545564	6.881027
Schwarz SC	6.779360	9.108964	7.444427
Mean dependent	7.161138	4.821156	7.014625
S.D. dependent	6.360646	21.54397	8.391489
Determinant resid covariance (dof adj.)		4032.248	
Determinant resid covariance		1560.977	
Log likelihood		-468.0676	
Akaike information criterion		17.49382	
Schwarz criterion		19.18402	
Number of coefficients		48	

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Al revisar normalidad vemos que el p-valor conjunto es menor al 5%, por lo que los reciduos no se comportan de manera normal

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: Residuals are multivariate normal
Date: 05/14/24 Time: 13:10
Sample: 1 68
Included observations: 59

Component	Skewness	Chi-sq	df	Prob.*
1	-1.768514	30.75516	1	0.0000
2	0.271952	0.727253	1	0.3938
3	0.452173	2.010527	1	0.1562
Joint		33.49294	3	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	14.07955	301.7762	1	0.0000
2	3.327996	0.264470	1	0.6071
3	3.462066	0.524865	1	0.4688
Joint		302.5656	3	0.0000

Component	Jarque-Bera	df	Prob.
1	332.5314	2	0.0000
2	0.991724	2	0.6090
3	2.535393	2	0.2815
Joint	336.0585	6	0.0000

*Approximate p-values do not account for coefficient estimation

Corrigiendo esto usamos una variable dummy y el VAR queda de la siguiente forma:

```
===============================
LS 1 5 TCP TIP TPBI @ C DT

VAR Model:
===============================
TCP = C(1,1)*TCP(-1) + C(1,2)*TCP(-2) + C(1,3)*TCP(-3) + C(1,4)*TCP(-4) + C(1,5)*TCP(-5) + C(1,6)*TIP(-1)
+ C(1,7)*TIP(-2) + C(1,8)*TIP(-3) + C(1,9)*TIP(-4) + C(1,10)*TIP(-5) + C(1,11)*TPBI(-1) + C(1,12)*TPBI(-2) +
C(1,13)*TPBI(-3) + C(1,14)*TPBI(-4) + C(1,15)*TPBI(-5) + C(1,16) + C(1,17)*DT

TIP = C(2,1)*TCP(-1) + C(2,2)*TCP(-2) + C(2,3)*TCP(-3) + C(2,4)*TCP(-4) + C(2,5)*TCP(-5) + C(2,6)*TIP(-1)
+ C(2,7)*TIP(-2) + C(2,8)*TIP(-3) + C(2,9)*TIP(-4) + C(2,10)*TIP(-5) + C(2,11)*TPBI(-1) + C(2,12)*TPBI(-2) +
C(2,13)*TPBI(-3) + C(2,14)*TPBI(-4) + C(2,15)*TPBI(-5) + C(2,16) + C(2,17)*DT

TPBI = C(3,1)*TCP(-1) + C(3,2)*TCP(-2) + C(3,3)*TCP(-3) + C(3,4)*TCP(-4) + C(3,5)*TCP(-5) + C(3,6)*TIP(-1)
+ C(3,7)*TIP(-2) + C(3,8)*TIP(-3) + C(3,9)*TIP(-4) + C(3,10)*TIP(-5) + C(3,11)*TPBI(-1) + C(3,12)*TPBI(-2) +
C(3,13)*TPBI(-3) + C(3,14)*TPBI(-4) + C(3,15)*TPBI(-5) + C(3,16) + C(3,17)*DT

VAR Model - Substituted Coefficients:
===============================
TCP = 0.487153373193*TCP(-1) - 0.0715255949267*TCP(-2) - 0.42267811015*TCP(-3) -
0.252247599155*TCP(-4) + 0.18532562578*TCP(-5) - 0.00971162582867*TIP(-1) + 0.0618368060934*TIP(-
2) - 0.0295696555493*TIP(-3) + 0.00274268464741*TIP(-4) + 0.0532237146275*TIP(-5) +
0.0986440567527*TPBI(-1) - 0.0708209042104*TPBI(-2) + 0.409498525092*TPBI(-3) -
0.098715991058*TPBI(-4) - 0.000757580939892*TPBI(-5) + 5.33635626235 - 26.5333992974*DT

TIP =  - 0.569286562385*TCP(-1) + 0.613220100421*TCP(-2) - 2.81746410409*TCP(-3) -
0.706798573965*TCP(-4) + 0.122037632352*TCP(-5) + 0.376004919415*TIP(-1) - 0.0403724561098*TIP(-2)
+ 0.024316034103*TIP(-3) - 0.374221862189*TIP(-4) + 0.314514780695*TIP(-5) + 0.499282079262*TPBI(-1)
- 0.185731294219*TPBI(-2) + 1.86978094648*TPBI(-3) + 0.366757447163*TPBI(-4) -
0.0636673728334*TPBI(-5) + 12.0857200585 - 81.1399293133*DT
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TPBI = - 0.0924025197376*TCP(-1) + 0.104032577029*TCP(-2) - 0.663508124087*TCP(-3) - 0.265011625614*TCP(-4) - 0.0453365523565*TCP(-5) - 0.106623921414*TIP(-1) - 0.0048936735918*TIP(-2) + 0.0389493993587*TIP(-3) + 0.0198838672757*TIP(-4) - 0.0186349094995*TIP(-5) + 0.706268761249*TPBI(-1) - 0.0632437069769*TPBI(-2) + 0.436051318802*TPBI(-3) - 0.306847210105*TPBI(-4) + 0.277787063078*TPBI(-5) + 7.69459429781 - 37.4324420604*DT

Vector Autoregression Estimates
Date: 05/14/24 Time: 13:13
Sample (adjusted): 10 68
Included observations: 59 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	TCP	TIP	TPBI
TCP(-1)	0.487153	-0.569287	-0.092403
	(0.32384)	(1.09662)	(0.44468)
	[1.50432]	[-0.51913]	[-0.20780]
TCP(-2)	-0.071526	0.613220	0.104033
	(0.38526)	(1.30462)	(0.52902)
	[-0.18566]	[0.47004]	[0.19665]
TCP(-3)	-0.422678	-2.817464	-0.663508
	(0.38702)	(1.31058)	(0.53144)
	[-1.09214]	[-2.14978]	[-1.24852]
TCP(-4)	-0.252248	-0.706799	-0.265012
	(0.37763)	(1.27880)	(0.51855)
	[-0.66797]	[-0.55271]	[-0.51106]
TCP(-5)	0.185326	0.122038	-0.045337
	(0.30489)	(1.03245)	(0.41866)
	[0.60785]	[0.11820]	[-0.10829]
TIP(-1)	-0.009712	0.376005	-0.106624
	(0.07095)	(0.24027)	(0.09743)
	[-0.13688]	[1.56493]	[-1.09438]
TIP(-2)	0.061837	-0.040372	-0.004894
	(0.06638)	(0.22477)	(0.09114)
	[0.93162]	[-0.17962]	[-0.05369]
TIP(-3)	-0.029570	0.024316	0.038949
	(0.06754)	(0.22870)	(0.09274)
	[-0.43783]	[0.10632]	[0.41999]
TIP(-4)	0.002743	-0.374222	0.019884
	(0.06832)	(0.23136)	(0.09381)
	[0.04014]	[-1.61751]	[0.21195]
TIP(-5)	0.053224	0.314515	-0.018635
	(0.06204)	(0.21009)	(0.08519)
	[0.85787]	[1.49702]	[-0.21874]
TPBI(-1)	0.098644	0.499282	0.706269
	(0.23071)	(0.78126)	(0.31680)
	[0.42757]	[0.63907]	[2.22938]
TPBI(-2)	-0.070821	-0.185731	-0.063244
	(0.26810)	(0.90789)	(0.36815)
	[-0.26416]	[-0.20457]	[-0.17179]
TPBI(-3)	0.409499	1.869781	0.436051
	(0.25949)	(0.87872)	(0.35632)
	[1.57809]	[2.12784]	[1.22376]
TPBI(-4)	-0.098716	0.366757	-0.306847
	(0.26035)	(0.88164)	(0.35750)
	[-0.37917]	[0.41600]	[-0.85831]
TPBI(-5)	-0.000758	-0.063667	0.277787
	(0.22437)	(0.75980)	(0.30810)
	[-0.00338]	[-0.08380]	[0.90163]
C	5.336356	12.08572	7.694594
	(1.31866)	(4.46546)	(1.81073)
	[4.04679]	[2.70649]	[4.24944]
DT	-26.53340	-81.13993	-37.43244
	(3.59913)	(12.1879)	(4.94217)
	[-7.37217]	[-6.65741]	[-7.57409]
R-squared	0.813208	0.813288	0.797641
Adj. R-squared	0.742050	0.742159	0.720552
Sum sq. resids	438.3165	5026.341	826.4720
S.E. equation	3.230496	10.93960	4.435979
F-statistic	11.42810	11.43408	10.34701
Log likelihood	-142.8768	-214.8422	-161.5864
Akaike AIC	5.419552	7.859058	6.053777
Schwarz SC	6.018165	8.457671	6.652389
Mean dependent	7.161138	4.821156	7.014625
S.D. dependent	6.360646	21.54397	8.391489

Determinant resid covariance (dof adj.)	1781.605
Determinant resid covariance	642.6925
Log likelihood	-441.8893
Akaike information criterion	16.70811
Schwarz criterion	18.50395
Number of coefficients	51

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Al evaluar nuevamente normalidad vemos que se corrige y ahora el p-valor es mayor al 5% lo que indica que los residuos se comportan de manera normal.

VAR Residual Normality Tests
Orthogonalization: Residual Correlation (Doornik-Hansen)
Null Hypothesis: Residuals are multivariate normal
Date: 05/14/24 Time: 13:16
Sample: 1 68
Included observations: 59

Component	Skewness	Chi-sq	df	Prob.*
1	0.258033	0.774962	1	0.3787
2	0.539277	3.155600	1	0.0757
3	0.194243	0.443503	1	0.5054
Joint		4.374064	3	0.2238

Component	Kurtosis	Chi-sq	df	Prob.
1	4.167711	5.735183	1	0.0166
2	3.202557	0.024978	1	0.8744
3	2.634818	0.059176	1	0.8078
Joint		5.819337	3	0.1207

Component	Jarque-Bera	df	Prob.
1	6.510144	2	0.0386
2	3.180578	2	0.2039
3	0.502679	2	0.7778
Joint	10.19340	6	0.1167

*Approximate p-values do not account for coefficient estimation

e. Probar la autocorrelación, heterocedasticidad del modelo VAR y evaluar si el modelo es estable o no según la prueba del círculo unitario.

Probando la autocorrelación:

VAR Residual Serial Correlation LM Tests
Date: 05/14/24 Time: 13:20
Sample: 1 68
Included observations: 59

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	6.531252	9	0.6858	0.723510	(9, 90.2)	0.6862
2	4.000212	9	0.9114	0.437130	(9, 90.2)	0.9115
3	16.87794	9	0.0507	1.978086	(9, 90.2)	0.0509
4	17.94574	9	0.0358	2.115624	(9, 90.2)	0.0360
5	11.41797	9	0.2481	1.298802	(9, 90.2)	0.2487

Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	6.531252	9	0.6858	0.723510	(9, 90.2)	0.6862
2	12.45392	18	0.8229	0.678569	(18, 96.7)	0.8243
3	29.77481	27	0.3244	1.123419	(27, 91.2)	0.3322
4	65.64759	36	0.0018	2.137976	(36, 83.5)	0.0023
5	67.28871	45	0.0173	1.680425	(45, 75.0)	0.0232

*Edgeworth expansion corrected likelihood ratio statistic.

VAR Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: No residual autocorrelations up to lag h
Date: 05/14/24 Time: 13:21
Sample: 1 68
Included observations: 59

Lags	Q-Stat	Prob.*	Adj Q-Stat	Prob.*	df
1	2.280557	---	2.319877	---	---
2	4.330972	---	4.442236	---	---
3	16.93159	---	17.71788	---	---
4	28.08008	---	29.67718	---	---
5	37.22289	---	39.66654	---	---
6	46.89946	0.0000	50.43858	0.0000	9
7	58.67594	0.0000	63.80035	0.0000	18
8	66.69904	0.0000	73.08197	0.0000	27

*Test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution
*df and Prob. may not be valid for models with exogenous variables

Para la prueba de autocorrelación tenemos que hasta el rezago numero 5 no existe presencia de autocorrelación serial.

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Revisando la herterocedastisidad vemos que el p-valor es mayor al 5% lo que me indica que los errores de mi modelo son homocedasticios.

VAR Residual Heteroskedasticity Tests (Levels and Squares)
Date: 05/14/24 Time: 13:26
Sample: 1 68
Included observations: 59

Joint test:

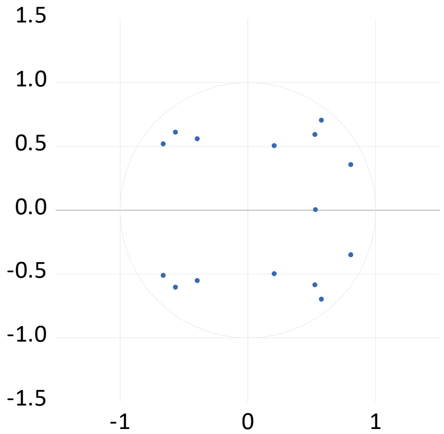
Chi-sq	df	Prob.
202.7144	186	0.1904

Individual components:

Dependent	R-squared	F(31,27)	Prob.	Chi-sq(31)	Prob.
res1*res1	0.920056	10.02382	0.0000	54.28333	0.0060
res2*res2	0.947662	15.77033	0.0000	55.91207	0.0040
res3*res3	0.920357	10.06488	0.0000	54.30104	0.0060
res2*res1	0.972347	30.62525	0.0000	57.36847	0.0027
res3*res1	0.921505	10.22481	0.0000	54.36877	0.0059
res3*res2	0.958979	20.36121	0.0000	56.57975	0.0033

Analizando la estabilidad del modelo vemos que los valores son menores a 1 y todos están dentro del círculo unitario por lo que concluimos que el modelo es estable.

Inverse Roots of AR Characteristic Polynomial



Roots of Characteristic Polynomial
Endogenous variables: TCP TIP TPBI
Exogenous variables: C DT
Lag specification: 1 5
Date: 05/14/24 Time: 13:28

Root	Modulus
0.580694 - 0.701301i	0.910511
0.580694 + 0.701301i	0.910511
0.811462 - 0.353301i	0.885038
0.811462 + 0.353301i	0.885038
-0.658749 - 0.514758i	0.836018
-0.658749 + 0.514758i	0.836018
-0.562562 - 0.607559i	0.828011
-0.562562 + 0.607559i	0.828011
0.528472 - 0.589329i	0.791575
0.528472 + 0.589329i	0.791575
-0.392412 - 0.556041i	0.680565
-0.392412 + 0.556041i	0.680565
0.210821 - 0.502343i	0.544788
0.210821 + 0.502343i	0.544788
0.533975	0.533975

No root lies outside the unit circle.
VAR satisfies the stability condition.

f. Estimar el modelo SVAR (restricción a largo plazo – matriz F), explicar el comportamiento según la tabla de la descomposición de la varianza e interpretar las gráficas de Impulso – respuesta estructural y descomposición histórica.

Estimando el modelo SVAR tenemos que a largo plazo los componentes si son significativos excepto el de rezago 5

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Structural VAR Estimates
Date: 05/14/24 Time: 13:13
Sample (adjusted): 10 68
Included observations: 59 after adjustments
Estimation method: Maximum likelihood via Newton-Raphson (analytic derivatives)
Convergence achieved after 21 iterations
Structural VAR is just-identified

Model: e = Phi*Fu where E[uu']=I
F =

C(1)	0	0
C(2)	C(4)	0
C(3)	C(5)	C(6)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	4.442424	0.408958	10.86278	0.0000
C(2)	4.729812	1.082027	4.371253	0.0000
C(3)	4.148454	0.519737	7.981833	0.0000
C(4)	7.608583	0.700427	10.86278	0.0000
C(5)	0.628256	0.347760	1.806580	0.0708
C(6)	-2.633993	0.242479	-10.86278	0.0000

Log likelihood -471.9676

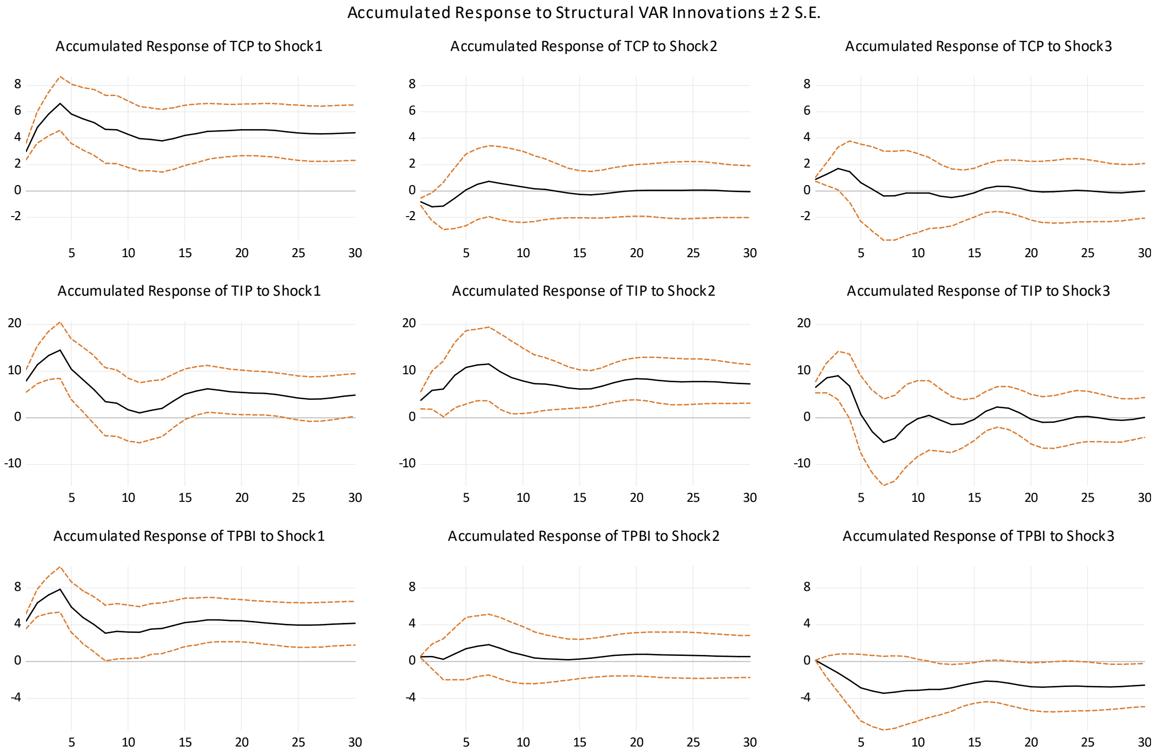
Estimated S matrix:

2.998099	-0.809696	0.889890
7.913874	3.762062	6.549218
4.404453	0.511215	0.131742

Estimated F matrix:

4.442424	0.000000	0.000000
4.729812	7.608583	0.000000
4.148454	0.628256	-2.633993

Grafica de impulso respuesta



Al analizar las gráficas todas parten de un mismo periodo y tienden a su estado estacionario.

Para la primer grafica del CP tenemos que la respuesta hacia si misma es un efecto significativo y la respuesta de este si responde a un shock en ella misma.

En el shock 2 vemos que tiene un efecto significativo a lo largo de los periodos.

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En el shock 3 inicia con un efecto significativo, pero después deja de serlo y tiende a su estado estacionario.

Para el IP un efecto significativo después del periodo 6 al 15 deja de ser significativa, pero después vuelve a ser significativa.

En el shock 2 vemos que tiene un efecto no significativo.

En el shock 3 inicia con un efecto significativo, pero después del 4 periodo deja de serlo.

Para el PBI es un efecto significativo

En el shock 2 vemos que tiene un efecto no significativo a lo largo de los periodos.

En el shock 3 vemos que tiene un efecto no significativo a lo largo de los periodos.

Revisando la descomposición de la varianza vemos lo siguiente:

El CP se explica a si mismo al inicio en un 100% después disminuye hasta el periodo 5 donde se vuelve constante hasta con una explicación del 90%.

El CP con respecto al IP se tiene que no explica prácticamente nada.

El CP con respecto al PBI explica al inicio nada, pero después del 5 periodo llega a explicar un 10%

El PBI con respecto al CP explica desde un inicio prácticamente un 50%

El IP con respecto a si misma se explica en un inicio un 40% pero disminuye y después del periodo 5 explica solo un 30%.

El IP con respecto al PBI no explica nada en los primeros 3 periodos y después empieza a explicar estabilizándose después del periodo 10 a un 20%

El PBI con respecto al CP inicia explicando un 80% y después naja un poco logrando mantenerse a partir del 3 periodo en explicar un 76%

El PBI con respecto al IP no logra explicar mucho, es prácticamente nada

El PBI con respecto a si mismo se logra explicar un 20%

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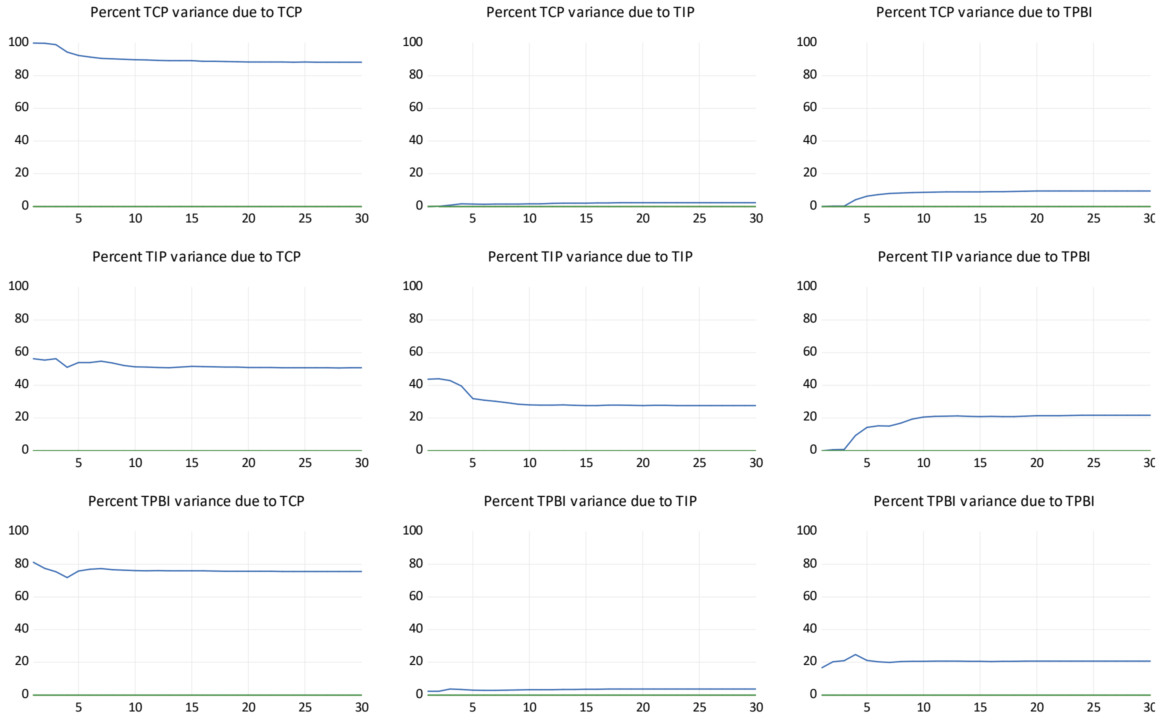

Descomposición histórica

Al ver las gráficas vemos que el CP si se explica en su mayoría a sí mismo, el CP no explica las variaciones de la serie de IP prácticamente en nada y el PBI explica solo una parte, pero no todo.

El IP explica una gran parte del CP pero a sí misma solo un poco también no captura todas las variaciones y con respecto al PBI solo explica un poco.

El PBI si explica una gran parte de las variaciones del CP, pero de IP no lo logra y sobre si misma solo logra explicar algunas variaciones.

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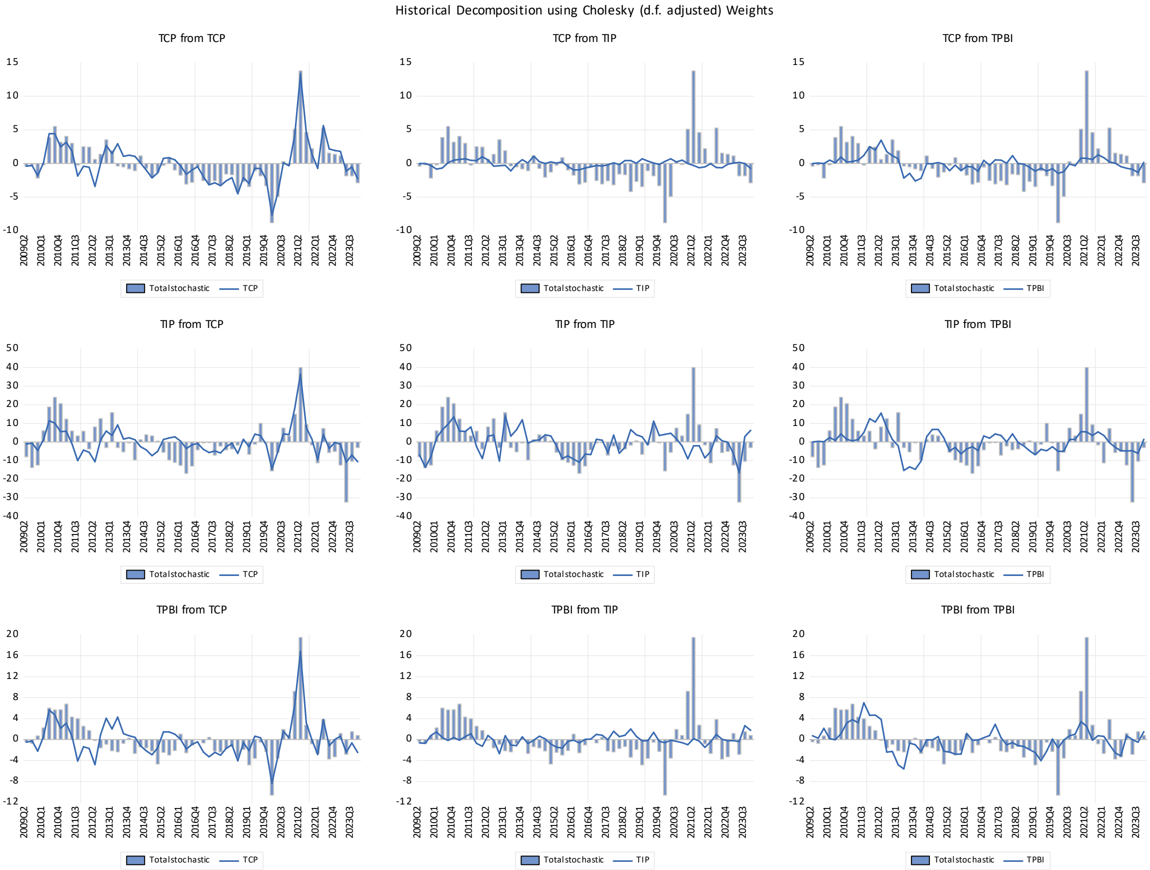

g. Evaluar la Causalidad a lo Granger en las series de tiempo diferenciadas y desestacionalizadas.

Vemos que el CP no causa a lo Granger a el PBI y el IP (0.5941), El IP causa a lo Granger al CP y al PBI (0.0060), y el PBI no causa a lo Granger a el CP y el IP (0.3642).
La causalidad es unidireccional.

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 05/14/24 Time: 16:48
Sample: 1 68
Included observations: 59

Dependent variable: TCP

Excluded	Chi-sq	df	Prob.
TIP	1.773029	5	0.8796
TPBI	4.210326	5	0.5195
All	8.356127	10	0.5941

Dependent variable: TIP

Excluded	Chi-sq	df	Prob.
TCP	22.18556	5	0.0005
TPBI	12.99886	5	0.0234
All	24.65715	10	0.0060

Dependent variable: TPBI

Excluded	Chi-sq	df	Prob.
TCP	10.51751	5	0.0618
TIP	2.309449	5	0.8049
All	10.91430	10	0.3642

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5.- Según la econometría Bayesiana, responder las siguientes preguntas:

a. Si tenemos la función de producción de Cobb-Douglas: Y = A$K\alpha N\beta$. En términos lineales, según nuestra función de producción. ¿Cuál será nuestro Prior?

La función en términos lineales es $y = \alpha k + \beta n + \mu$ de esta función de producción $\alpha \in (0,1)$ es el Prior

b. Si el posterior model probality: p(M1jy) = 0.9 versus p(M2jy) = 0.3, ¿Cuál es el mejor modelo en explicar los datos? (M1 o M2).

La probabilidad posterior del modelo $M1$ es significativamente mayor que la de $M2$.

- La probabilidad de que el modelo $M1$ sea el correcto es del 90%.
- La probabilidad de que el modelo $M2$ sea el correcto es del 30%.

Por lo tanto, **el modelo $M1$ es el mejor modelo para explicar los datos** que el modelo M2 según las probabilidades posteriores. En términos bayesianos, seleccionamos el modelo con la mayor probabilidad posterior, que en este caso es $M1$ con una probabilidad posterior de 0.9.