Anexo: 1

Cuadro de datos:

Tasa de desempleo y Producto Interno Bruto real

AÑO	U (%)	PIBr (%)
2006	0,08	0,048
2007	0,077	0,046
2008	0,044	0,061
2009	0,049	0,034
2010	0,044	0,041
2011	0,038	0,052
2012	0,032	0,051
2013	0,04	0,068
2014	0,062	0,055
2015	0,051	0,049
2016	0,041	0,043
2017	0,04	0,042

Fuente: Elaboración propia, en base a datos del INE, la Unidad de Análisis de Políticas Económicas y Sociales (UDAPE) y el Banco Mundial (BM).

Anexo: 2

Tasa de desempleo, obtenida trimestralmente mediante método de Chow-Lin (Eviews 9)

Trimestre	U (%)
2006Q1	0,08000
2006Q2	0,07914
2006Q3	0,07835
2006Q4	0,07764
2007Q1	0,07700
2007Q2	0,06872
2007Q3	0,06048
2007Q4	0,05225
2008Q1	0,04400
2008Q2	0,04531
2008Q3	0,04657
2008Q4	0,04780
2009Q1	0,04900
2009Q2	0,04780
2009Q3	0,04657
2009Q4	0,04531
2010Q1	0,04400
2010Q2	0,04258
2010Q3	0,04111
2010Q4	0,03959
2011Q1	0,03800
2011Q2	0,03661
2011Q3	0,03515
2011Q4	0,03362

Trimestre	U (%)
2012Q1	0,03200
2012Q2	0,03411
2012Q3	0,03615
2012Q4	0,03811
2013Q1	0,04000
2013Q2	0,04554
2013Q3	0,05104
2013Q4	0,05652
2014Q1	0,06200
2014Q2	0,05925
2014Q3	0,05651
2014Q4	0,05376
2015Q1	0,05100
2015Q2	0,04855
2015Q3	0,04608
2015Q4	0,04356
2016Q1	0,04100
2016Q2	0,04084
2016Q3	0,04062
2016Q4	0,04034
2017Q1	0,04000
2017Q2	0,04020
2017Q3	0,04056
2017Q4	0,04082

Anexo: 3

Producto Interno Bruto real, datos trimestrales.

Trimestre	PIB (miles de bs.)
2006Q1	6259400
2006Q2	7150289
2006Q3	6807897
2006Q4	7061326
2007Q1	6417302
2007Q2	7442694
2007Q3	7171628
2007Q4	7492403
2008Q1	6837878
2008Q2	7955173
2008Q3	7678219
2008Q4	7806556
2009Q1	7039510
2009Q2	8130167
2009Q3	7956762
2009Q4	8167814
2010Q1	7266227
2010Q2	8437640
2010Q3	8251995
2010Q4	8629817
2011Q1	7715275
2011Q2	8796981
2011Q3	8683047
2011Q4	9086166

Trimestre	PIB (miles de bs.)
2012Q1	8101797
2012Q2	9183013
2012Q3	9081845
2012Q4	9670805
2013Q1	8656909
2013Q2	9833485
2013Q3	9744162
2013Q4	10252014
2014Q1	9168558
2014Q2	10305085
2014Q3	10331313
2014Q4	10783199
2015Q1	9609051
2015Q2	10846338
2015Q3	10737402
2015Q4	11366807
2016Q1	10123441
2016Q2	11197082
2016Q3	11268033
2016Q4	11785749
2017Q1	10461781
2017Q2	11621187
2017Q3	11750299
2017Q4	12402633

Fuente: Elaboración propia, en base a datos del INE

Anexo: 4

Tasa de variación trimestral de avance del Producto Interno Bruto real.

Trimestre	ΔlnPibr
2006Q1	-0,06995
2006Q2	0,13307
2006Q3	-0,04907
2006Q4	0,03655
2007Q1	-0,09564
2007Q2	0,14824
2007Q3	-0,03710
2007Q4	0,04376
2008Q1	-0,09141
2008Q2	0,15134
2008Q3	-0,03543
2008Q4	0,01658
2009Q1	-0,10343
2009Q2	0,14404
2009Q3	-0,02156
2009Q4	0,02618
2010Q1	-0,11696
2010Q2	0,14947
2010Q3	-0,02225
2010Q4	0,04477
2011Q1	-0,11202
2011Q2	0,13121
2011Q3	-0,01304
2011Q4	0,04538
Trimestre	**ΔlnPibr**
2012Q1	-0,11467
2012Q2	0,12527
2012Q3	-0,01108
2012Q4	0,06283
2013Q1	-0,11075
2013Q2	0,12744
2013Q3	-0,00913
2013Q4	0,05081
2014Q1	-0,11169
2014Q2	0,11686
2014Q3	0,00254
2014Q4	0,04281
2015Q1	-0,11528
2015Q2	0,12112
2015Q3	-0,01009
2015Q4	0,05696
2016Q1	-0,11584
2016Q2	0,10080
2016Q3	0,00632
2016Q4	0,04492
2017Q1	-0,11916
2017Q2	0,10510
2017Q3	0,01105
2017Q4	0,05403

Obtenido mediante: $\mathbf{\Delta LnPIBr = Ln\left(\frac{PIBr_t}{PIBr_{t-1}}\right)}$

Fuente: Elaboración propia, en base a datos del INE.

Anexo: 5

Hipótesis de estacionariedad:

Ho: La serie no es estacionaria (presenta raíz unitaria)

Ha: La serie es estacionaria

Test de raíces unitarias Dickey-Fuller aumentado (DFA)

- **Serie Tasa de Desempleo**

Null Hypothesis: U has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.242178	**0.0238**
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(U)
Method: Least Squares
Sample (adjusted): 2006Q3 2017Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
U(-1)	-0.081256	0.025062	-3.242178	0.0023
D(U(-1))	0.684328	0.095285	7.181940	0.0000
C	366.5159	123.5507	2.966523	0.0049

R-squared	0.617239	Mean dependent var	-83.30435
Adjusted R-squared	0.599437	S.D. dependent var	321.5302
S.E. of regression	203.4967	Akaike info criterion	13.53217
Sum squared resid	1780669.	Schwarz criterion	13.65143
Log likelihood	-308.2399	Hannan-Quinn criter.	13.57685
F-statistic	34.67089	Durbin-Watson stat	1.958711
Prob(F-statistic)	0.000000		

0.0238<0.05 Se rechaza la Ho.

La serie U es estacionaria, no presenta raíz unitaria.

- **Primera diferencia de la serie tasa de desempleo.**

Null Hypothesis: D(U) has a unit root
Exogenous: Constant
Lag Length: 2 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.964101	0.0463
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(U,2)
Method: Least Squares
Sample (adjusted): 2007Q1 2017Q4
Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(U(-1))	-0.372186	0.125564	-2.964101	0.0051
D(U(-1),2)	0.185183	0.156497	1.183299	0.2437
D(U(-2),2)	0.160774	0.156355	1.028265	0.3100
C	-30.63246	36.35991	-0.842479	0.4045

R-squared	0.180640	Mean dependent var	2.204545
Adjusted R-squared	0.119188	S.D. dependent var	244.6874
S.E. of regression	229.6431	Akaike info criterion	13.79744
Sum squared resid	2109438.	Schwarz criterion	13.95964
Log likelihood	-299.5436	Hannan-Quinn criter.	13.85759
F-statistic	2.939522	Durbin-Watson stat	2.073570
Prob(F-statistic)	0.044663		

0.0463<0.05 Se rechaza Ho.

La primera diferencia de la serie tasa de desempleo es estacionaria, por lo tanto, no presenta raíz unitaria.

- **Primera diferencia del logaritmo natural de la serie tasa de desempleo.**

Null Hypothesis: D(LnU) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.684057	0.0845
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNU,2)
Method: Least Squares
Sample (adjusted): 2006Q3 2017Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNU(-1))	-0.282618	0.105295	-2.684057	0.0102
C	-0.003799	0.006631	-0.572963	0.5696

R-squared	0.140695	Mean dependent var	0.000374
Adjusted R-squared	0.121165	S.D. dependent var	0.046636
S.E. of regression	0.043720	Akaike info criterion	-3.379520
Sum squared resid	0.084103	Schwarz criterion	-3.300014
Log likelihood	79.72896	Hannan-Quinn criter.	-3.349737
F-statistic	7.204163	Durbin-Watson stat	1.838241
Prob(F-statistic)	0.010213		

0.0845>0.05 No se rechaza la Ho.

La primera diferencia del logaritmo natural de la serie tasa de desempleo no es estacionaria.

- **Serie Producto Interno Bruto real.**

Null Hypothesis: PIBr has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.222659	0.9978
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PIBr)
Method: Least Squares
Sample (adjusted): 2007Q2 2017Q4
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PIBr(-1)	0.013475	0.011021	1.222659	0.2292
D(PIBr(-1))	-0.396680	0.134802	-2.942696	0.0056
D(PIBr(-2))	-0.430406	0.129493	-3.323785	0.0020
D(PIBr(-3))	-0.461451	0.131464	-3.510080	0.0012
D(PIBr(-4))	0.601072	0.136284	4.410444	0.0001
C	65805.83	86645.08	0.759487	0.4524

R-squared	0.989513	Mean dependent var	139193.7
Adjusted R-squared	0.988096	S.D. dependent var	790324.1
S.E. of regression	86227.32	Akaike info criterion	25.69615
Sum squared resid	2.75E+11	Schwarz criterion	25.94190
Log likelihood	-546.4672	Hannan-Quinn criter.	25.78677
F-statistic	698.2672	Durbin-Watson stat	2.060887
Prob(F-statistic)	0.000000		

0.9978>0.05 No se rechaza la Ho

La serie Producto Interno Bruto real no es estacionaria.

- **Primera diferencia de la serie Producto Interno Bruto real.**

Null Hypothesis: D(PIBr) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.985812	0.0442
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PIBr,2)
Method: Least Squares
Sample (adjusted): 2007Q2 2017Q4
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PIBr(-1))	-1.347452	0.451285	-2.985812	0.0049
D(PIBr(-1),2)	0.041184	0.339483	0.121313	0.9041
D(PIBr(-2),2)	-0.305167	0.231045	-1.320812	0.1945
D(PIBr(-3),2)	-0.684475	0.118749	-5.764038	0.0000
C	152603.0	49998.57	3.052148	0.0041

R-squared	0.996823	Mean dependent var	30147.86
Adjusted R-squared	0.996488	S.D. dependent var	1464510.
S.E. of regression	86787.00	Akaike info criterion	25.68925
Sum squared resid	2.86E+11	Schwarz criterion	25.89404
Log likelihood	-547.3188	Hannan-Quinn criter.	25.76477
F-statistic	2980.454	Durbin-Watson stat	2.148714
Prob(F-statistic)	0.000000		

0.0442<0.05 Se rechaza la Ho.

Por lo tanto, la primera diferencia de la serie Producto Interno Bruto real es estacionaria.

- **Primera diferencia del logaritmo natural de la serie Producto Interno Bruto real.**

Null Hypothesis: D(LNPIBr) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-77.13948	0.0001
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPIBr,2)
Method: Least Squares
Sample (adjusted): 2007Q1 2017Q4
Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPIBr(-1))	-3.926295	0.050899	-77.13948	0.0000
D(LNPIBr(-1),2)	1.970044	0.039992	49.26123	0.0000
D(LNPIBr(-2),2)	1.004539	0.018798	53.43858	0.0000
C	-3.337893	165.5925	-0.020157	0.9840

R-squared	0.998868	Mean dependent var	-96.90909
Adjusted R-squared	0.998783	S.D. dependent var	31484.63
S.E. of regression	1098.179	Akaike info criterion	16.92720
Sum squared resid	48239892	Schwarz criterion	17.08940
Log likelihood	-368.3985	Hannan-Quinn criter.	16.98735
F-statistic	11768.10	Durbin-Watson stat	**2.318535**
Prob(F-statistic)	0.000000		

Nota: La primera diferencia del logaritmo natural de la serie Producto Interno Bruto real, presenta autocorrelación.

Por esa razón se procedió a corregir la regresión para eliminar la autocorrelación resultando de la siguiente manera:

Null Hypothesis: D(LNPIBr) has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.696628	0.0000
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPIBr,2)
Method: Least Squares
Sample (adjusted): 2006Q4 2017Q4
Included observations: 45 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPIBr(-1))	-1.965521	0.293509	-6.696628	0.0000
D(LNPIBr(-1),2)	0.077096	0.152030	0.507109	0.6147
C	18.20011	1367.283	0.013311	0.9894

R-squared	0.918507	Mean dependent var	500.2667
Adjusted R-squared	0.914626	S.D. dependent var	31381.54
S.E. of regression	9169.324	Akaike info criterion	21.14946
Sum squared resid	3.53E+09	Schwarz criterion	21.26990
Log likelihood	-472.8627	Hannan-Quinn criter.	21.19436
F-statistic	236.6893	Durbin-Watson stat	**2.142905**
Prob(F-statistic)	0.000000		

La regresión de la serie ha sido ajustada al número de rezagos convenientes. A estas instancias ya no presenta autocorrelación.

0.000<0.05 Se rechaza la Ho.

La primera diferencia del logaritmo natural de la serie Producto Interno Bruto real es estacionaria.

Anexo:6

Test de heteroscedasticidad.

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.000667	Prob. F(1,44)	0.9795
Obs*R-squared	0.000697	Prob. Chi-Square(1)	0.9789
Scaled explained SS	0.000969	Prob. Chi-Square(1)	0.9752

Dependent Variable: RESID^2
Sample: 2006Q3 2017Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	100929.7	26530.87	3.804234	0.0004
D(LNPIBR(-1))	-0.041743	1.616796	-0.025818	0.9795

R-squared	0.000015	Mean dependent var	100922.3
Adjusted R-squared	-0.022712	S.D. dependent var	177921.7
S.E. of regression	179930.8	Akaike info criterion	27.08104
Sum squared resid	1.42E+12	Schwarz criterion	27.16054
Log likelihood	-620.8638	Hannan-Quinn criter.	27.11082
F-statistic	0.000667	Durbin-Watson stat	0.569594
Prob(F-statistic)	0.979519		

Heteroskedasticity Test: White

F-statistic	0.042552	Prob. F(2,43)	0.9487
Obs*R-squared	0.065872	Prob. Chi-Square(2)	0.9556
Scaled explained SS	0.114565	Prob. Chi-Square(2)	0.9488

Dependent Variable: RESID^2
Sample: 2006Q3 2017Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	88751.42	50037.73	1.773690	0.0832
D(LNPIBR(-1))^2	4.54E-05	0.000158	0.288255	0.7745
D(LNPIBR(-1))	-0.327168	1.910529	-0.171245	0.8648

R-squared	0.001944	Mean dependent var	100922.3
Adjusted R-squared	-0.044477	S.D. dependent var	177921.7
S.E. of regression	181835.4	Akaike info criterion	27.12258
Sum squared resid	1.42E+12	Schwarz criterion	27.24184
Log likelihood	-620.8194	Hannan-Quinn criter.	27.16726
F-statistic	0.041872	Durbin-Watson stat	0.573479
Prob(F-statistic)	0.959032		

Anexo:7

Detección de autocorrelación

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	48.23796	Prob. F(1,44)	0.0000
Obs*R-squared	24.57973	Prob. Chi-Square(1)	0.0000

Corrección de autocorrelación.

Dependent Variable: D(U)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Sample: 2006Q2 2017Q4
Included observations: 47
Convergence achieved after 29 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-78.54365	207.2826	-0.378921	0.7066
D(LNPIBR)	0.000148	0.001789	0.082810	0.9344
AR(1)	0.709558	0.080048	8.864207	0.0000
SIGMASQ	47261.44	6775.898	6.974934	0.0000

R-squared	0.522805	Mean dependent var	-83.36170
Adjusted R-squared	0.489513	S.D. dependent var	318.1088
S.E. of regression	227.2836	Akaike info criterion	13.78644
Sum squared resid	2221288.	Schwarz criterion	13.94390
Log likelihood	-319.9812	Hannan-Quinn criter.	13.84569
F-statistic	15.70333	Durbin-Watson stat	1.795670
Prob(F-statistic)	0.000000		

Inverted AR Roots	.71