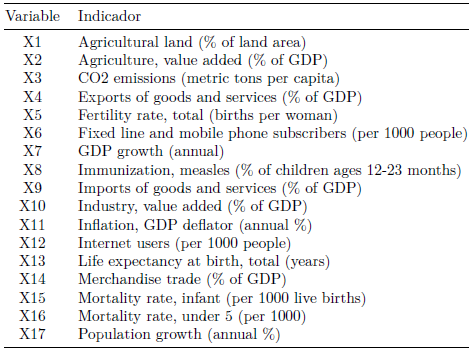
**Trabajo Práctico N° 5**

**Ejercicio 1.**

*El archivo “ind.dta” contiene información sobre 17 indicadores económicos:*



**(a)** *Realizar un test de normalidad multivariada.*

Test for multivariate normality

Mardia mSkewness = 293.0869 chi2(969) = 8076.406 Prob>chi2 = 0.0000

Mardia mKurtosis = 589.9546 chi2(1) = 4467.836 Prob>chi2 = 0.0000

Henze-Zirkler = 1.28147 chi2(1) =33372.390 Prob>chi2 = 0.0000

Doornik-Hansen chi2(34) =10057.382 Prob>chi2 = 0.0000

Por lo tanto, con un nivel de significancia del 1%, estos datos aportan evidencia suficiente para indicar que no tienen una distribución normal multivariada.

Test for multivariate normality

Mardia mSkewness = 101.7785 chi2(969) = 1820.830 Prob>chi2 = 0.0000

Mardia mKurtosis = 364.9691 chi2(1) = 70.893 Prob>chi2 = 0.0000

Henze-Zirkler = 1.014665 chi2(1) = 122.887 Prob>chi2 = 0.0000

Doornik-Hansen chi2(34) = 313.331 Prob>chi2 = 0.0000

Por lo tanto, con un nivel de significancia del 1%, estos datos aportan evidencia suficiente para indicar que no tienen una distribución normal multivariada.

**(b)** *Determinar el número de factores a extraer.*

Factor analysis/correlation Number of obs = 162

Method: principal factors Retained factors = 10

Rotation: (unrotated) Number of params = 125

--------------------------------------------------------------------------

Factor | Eigenvalue Difference Proportion Cumulative

-------------+------------------------------------------------------------

Factor1 | 6.39667 4.13220 0.5822 0.5822

Factor2 | 2.26447 1.08372 0.2061 0.7883

Factor3 | 1.18075 0.47077 0.1075 0.8957

Factor4 | 0.70998 0.16765 0.0646 0.9604

Factor5 | 0.54233 0.26020 0.0494 1.0097

Factor6 | 0.28213 0.09976 0.0257 1.0354

Factor7 | 0.18238 0.09753 0.0166 1.0520

Factor8 | 0.08485 0.06604 0.0077 1.0597

Factor9 | 0.01881 0.01822 0.0017 1.0614

Factor10 | 0.00059 0.00898 0.0001 1.0615

Factor11 | -0.00840 0.01935 -0.0008 1.0607

Factor12 | -0.02775 0.03482 -0.0025 1.0582

Factor13 | -0.06257 0.03448 -0.0057 1.0525

Factor14 | -0.09706 0.02685 -0.0088 1.0437

Factor15 | -0.12391 0.03113 -0.0113 1.0324

Factor16 | -0.15504 0.04577 -0.0141 1.0183

Factor17 | -0.20081 . -0.0183 1.0000

--------------------------------------------------------------------------

LR test: independent vs. saturated: chi2(136) = 2464.59 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances

---------------------------------------------------------------------------------------------------------------------------------

Variable | Factor1 Factor2 Factor3 Factor4 Factor5 Factor6 Factor7 Factor8 Factor9 Factor10 | Uniqueness

-------------+----------------------------------------------------------------------------------------------------+--------------

x1 | -0.1011 0.0073 -0.2529 0.1506 -0.0530 0.0688 0.3052 0.0205 -0.0004 0.0005 | 0.8020

x2 | -0.7498 -0.0044 -0.1385 0.2422 -0.0394 0.0634 -0.1638 0.1517 -0.0301 -0.0050 | 0.3036

x3 | 0.6551 -0.0201 0.3683 -0.1094 0.0635 -0.0960 0.0737 0.1535 -0.0156 -0.0033 | 0.3804

x4 | 0.4284 0.8210 0.0432 0.0381 -0.0608 -0.0534 0.0000 0.0313 -0.0574 -0.0006 | 0.1282

x5 | -0.8124 0.1095 0.2020 -0.0115 0.0598 -0.1511 -0.0400 -0.0163 0.0618 0.0011 | 0.2550

x6 | 0.7793 -0.1949 0.4131 0.3098 -0.0566 0.0920 0.0597 -0.0461 -0.0030 0.0022 | 0.0708

x7 | 0.1398 0.1956 0.0440 -0.1209 0.4829 0.2649 -0.0576 0.0165 -0.0076 -0.0020 | 0.6186

x8 | 0.7332 -0.0219 -0.3124 -0.0741 0.0689 -0.0115 0.0677 0.1534 0.0705 0.0014 | 0.3209

x9 | 0.2591 0.7625 -0.2627 0.3534 -0.0507 -0.1093 -0.0099 -0.0036 0.0022 0.0032 | 0.1429

x10 | 0.2370 0.3700 0.2722 -0.4667 -0.1433 0.0304 0.0685 -0.0054 -0.0204 0.0002 | 0.4885

x11 | -0.2111 0.1827 0.2023 -0.1510 -0.4183 0.0839 -0.0950 0.0575 0.0347 0.0019 | 0.6627

x12 | 0.6562 -0.1771 0.5314 0.3422 0.0060 0.0053 -0.0412 0.0197 0.0210 -0.0020 | 0.1360

x13 | 0.9098 -0.1873 -0.1503 -0.0537 0.0298 -0.0103 -0.1288 0.0122 -0.0150 0.0172 | 0.0935

x14 | 0.2948 0.7954 0.0793 0.0140 0.1124 0.0803 -0.0346 -0.0541 0.0555 -0.0022 | 0.2477

x15 | -0.9450 0.1666 0.2159 0.0522 0.0733 0.1018 0.0686 0.0488 -0.0015 0.0144 | 0.0069

x16 | -0.9385 0.1462 0.2639 0.0913 0.0316 0.0786 0.0749 0.0364 -0.0049 0.0028 | 0.0057

x17 | -0.3169 0.0364 0.1941 -0.0477 0.2597 -0.3415 0.0159 0.0117 -0.0104 0.0021 | 0.6737

---------------------------------------------------------------------------------------------------------------------------------

Por lo tanto, el número de factores a extraer es 6.

**(c)** *Realizar el análisis exploratorio de acuerdo con el modelo factorial.*

Factor analysis/correlation Number of obs = 162

Method: principal factors Retained factors = 6

Rotation: (unrotated) Number of params = 87

--------------------------------------------------------------------------

Factor | Eigenvalue Difference Proportion Cumulative

-------------+------------------------------------------------------------

Factor1 | 6.39667 4.13220 0.5822 0.5822

Factor2 | 2.26447 1.08372 0.2061 0.7883

Factor3 | 1.18075 0.47077 0.1075 0.8957

Factor4 | 0.70998 0.16765 0.0646 0.9604

Factor5 | 0.54233 0.26020 0.0494 1.0097

Factor6 | 0.28213 0.09976 0.0257 1.0354

Factor7 | 0.18238 0.09753 0.0166 1.0520

Factor8 | 0.08485 0.06604 0.0077 1.0597

Factor9 | 0.01881 0.01822 0.0017 1.0614

Factor10 | 0.00059 0.00898 0.0001 1.0615

Factor11 | -0.00840 0.01935 -0.0008 1.0607

Factor12 | -0.02775 0.03482 -0.0025 1.0582

Factor13 | -0.06257 0.03448 -0.0057 1.0525

Factor14 | -0.09706 0.02685 -0.0088 1.0437

Factor15 | -0.12391 0.03113 -0.0113 1.0324

Factor16 | -0.15504 0.04577 -0.0141 1.0183

Factor17 | -0.20081 . -0.0183 1.0000

--------------------------------------------------------------------------

LR test: independent vs. saturated: chi2(136) = 2464.59 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances

-----------------------------------------------------------------------------------------

Variable | Factor1 Factor2 Factor3 Factor4 Factor5 Factor6 | Uniqueness

-------------+------------------------------------------------------------+--------------

x1 | -0.1011 0.0073 -0.2529 0.1506 -0.0530 0.0688 | 0.8956

x2 | -0.7498 -0.0044 -0.1385 0.2422 -0.0394 0.0634 | 0.3544

x3 | 0.6551 -0.0201 0.3683 -0.1094 0.0635 -0.0960 | 0.4097

x4 | 0.4284 0.8210 0.0432 0.0381 -0.0608 -0.0534 | 0.1325

x5 | -0.8124 0.1095 0.2020 -0.0115 0.0598 -0.1511 | 0.2607

x6 | 0.7793 -0.1949 0.4131 0.3098 -0.0566 0.0920 | 0.0765

x7 | 0.1398 0.1956 0.0440 -0.1209 0.4829 0.2649 | 0.6223

x8 | 0.7332 -0.0219 -0.3124 -0.0741 0.0689 -0.0115 | 0.3540

x9 | 0.2591 0.7625 -0.2627 0.3534 -0.0507 -0.1093 | 0.1430

x10 | 0.2370 0.3700 0.2722 -0.4667 -0.1433 0.0304 | 0.4937

x11 | -0.2111 0.1827 0.2023 -0.1510 -0.4183 0.0839 | 0.6763

x12 | 0.6562 -0.1771 0.5314 0.3422 0.0060 0.0053 | 0.1385

x13 | 0.9098 -0.1873 -0.1503 -0.0537 0.0298 -0.0103 | 0.1108

x14 | 0.2948 0.7954 0.0793 0.0140 0.1124 0.0803 | 0.2549

x15 | -0.9450 0.1666 0.2159 0.0522 0.0733 0.1018 | 0.0142

x16 | -0.9385 0.1462 0.2639 0.0913 0.0316 0.0786 | 0.0127

x17 | -0.3169 0.0364 0.1941 -0.0477 0.2597 -0.3415 | 0.6742

-----------------------------------------------------------------------------------------

**(d)** *Reportar las comunalidades.*

commonality[17,1]

commonality

x1 .10443817

x2 .6456483

x3 .59033742

x4 .86754007

x5 .73931917

x6 .92349359

x7 .37773843

x8 .64597902

x9 .85698196

x10 .50634663

x11 .32371151

x12 .8614879

x13 .88924266

x14 .745089

x15 .98584624

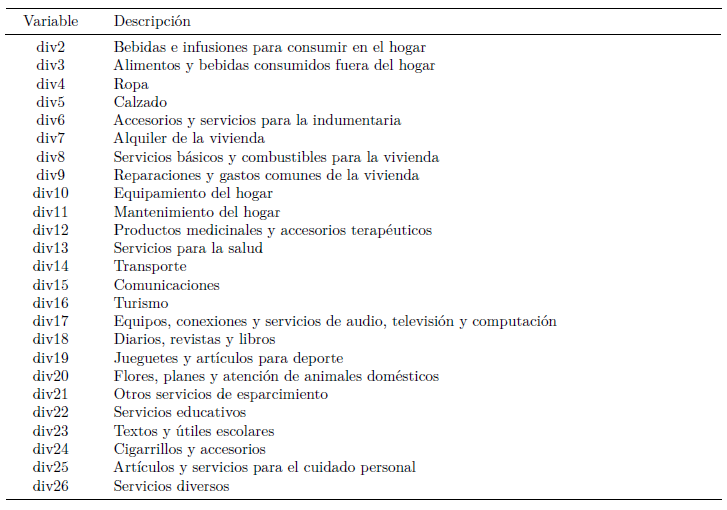
x16 .98729607

x17 .32582455

**Ejercicio 2.**

*El archivo “ipc2dig.dta” contiene datos sobre variaciones mensuales de precios desagregados en componentes de la canasta básica de alimentos para el período comprendido entre marzo de 2022 y marzo de 2006.*





**(a)** *Realizar un análisis factorial y determinar el número de factores a considerar en el mismo.*

Test for multivariate normality

Mardia mSkewness = 475.4859 chi2(3276) = 4297.740 Prob>chi2 = 0.0000

Mardia mKurtosis = 759.9989 chi2(1) = 8.966 Prob>chi2 = 0.0027

Henze-Zirkler = 1.000247 chi2(1) = 11.470 Prob>chi2 = 0.0007

Doornik-Hansen chi2(52) = 776.759 Prob>chi2 = 0.0000

Por lo tanto, con un nivel de significancia del 1%, estos datos aportan evidencia suficiente para indicar que no tienen una distribución normal multivariada.

Factor analysis/correlation Number of obs = 51

Method: principal factors Retained factors = 4

Rotation: (unrotated) Number of params = 98

--------------------------------------------------------------------------

Factor | Eigenvalue Difference Proportion Cumulative

-------------+------------------------------------------------------------

Factor1 | 12.08887 9.82667 0.6040 0.6040

Factor2 | 2.26220 0.68136 0.1130 0.7170

Factor3 | 1.58085 0.49465 0.0790 0.7960

Factor4 | 1.08620 0.23100 0.0543 0.8503

Factor5 | 0.85521 0.03978 0.0427 0.8930

Factor6 | 0.81542 0.30611 0.0407 0.9337

Factor7 | 0.50931 0.14179 0.0254 0.9592

Factor8 | 0.36753 0.05479 0.0184 0.9775

Factor9 | 0.31273 0.08655 0.0156 0.9932

Factor10 | 0.22618 0.02765 0.0113 1.0045

Factor11 | 0.19853 0.08151 0.0099 1.0144

Factor12 | 0.11702 0.02778 0.0058 1.0202

Factor13 | 0.08923 0.03101 0.0045 1.0247

Factor14 | 0.05822 0.01640 0.0029 1.0276

Factor15 | 0.04182 0.02055 0.0021 1.0297

Factor16 | 0.02127 0.02397 0.0011 1.0307

Factor17 | -0.00270 0.00399 -0.0001 1.0306

Factor18 | -0.00669 0.01393 -0.0003 1.0303

Factor19 | -0.02063 0.00605 -0.0010 1.0292

Factor20 | -0.02667 0.00824 -0.0013 1.0279

Factor21 | -0.03492 0.01923 -0.0017 1.0262

Factor22 | -0.05414 0.00437 -0.0027 1.0235

Factor23 | -0.05852 0.02775 -0.0029 1.0205

Factor24 | -0.08627 0.05588 -0.0043 1.0162

Factor25 | -0.14215 0.04044 -0.0071 1.0091

Factor26 | -0.18259 . -0.0091 1.0000

--------------------------------------------------------------------------

LR test: independent vs. saturated: chi2(325) = 1451.04 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances

---------------------------------------------------------------------

Variable | Factor1 Factor2 Factor3 Factor4 | Uniqueness

-------------+----------------------------------------+--------------

div1 | 0.9243 0.1403 0.0508 -0.0283 | 0.1226

div2 | 0.9278 -0.0300 -0.0495 -0.1762 | 0.1048

div3 | 0.4967 0.5590 0.3778 0.2111 | 0.2535

div4 | 0.6179 0.5234 -0.4220 0.1719 | 0.1366

div5 | 0.8875 0.2726 -0.1709 0.0932 | 0.1002

div6 | 0.9735 0.0151 -0.0440 0.0602 | 0.0466

div7 | -0.2276 0.3753 0.0376 -0.1729 | 0.7760

div8 | 0.2853 -0.1056 0.1629 0.4399 | 0.6874

div9 | 0.3114 0.0928 0.3854 -0.1314 | 0.7286

div10 | 0.9703 -0.0469 -0.0408 -0.1318 | 0.0373

div11 | 0.9436 -0.0683 -0.0171 -0.1674 | 0.0767

div12 | 0.8900 0.1640 -0.0467 -0.2200 | 0.1304

div13 | 0.2770 0.4537 0.4446 -0.0089 | 0.5197

div14 | 0.9204 0.0466 0.2044 0.1893 | 0.0731

div15 | 0.4895 -0.4788 0.0907 -0.1398 | 0.5034

div16 | 0.1155 -0.3809 0.5300 -0.0282 | 0.5599

div17 | 0.9286 -0.1886 -0.1047 -0.1031 | 0.0806

div18 | 0.4423 -0.1346 0.1006 0.6517 | 0.3515

div19 | 0.9110 -0.1410 -0.1277 -0.0393 | 0.1324

div20 | 0.6107 -0.2521 0.2895 0.1006 | 0.4696

div21 | -0.0193 0.5537 0.4005 -0.1749 | 0.5021

div22 | -0.1151 0.4670 -0.2868 0.1314 | 0.6691

div23 | 0.8660 -0.1777 -0.1542 0.0110 | 0.1945

div24 | -0.0563 -0.2340 0.2771 0.0114 | 0.8652

div25 | 0.9436 -0.0199 -0.0429 -0.1849 | 0.0732

div26 | -0.2469 0.2354 0.2200 -0.2191 | 0.7872

---------------------------------------------------------------------

Por lo tanto, el número de factores a considerar en el análisis factorial es 4.

**(b)** *Estimar los factores.*

Scoring coefficients (method = regression)

------------------------------------------------------

Variable | Factor1 Factor2 Factor3 Factor4

-------------+----------------------------------------

div1 | 0.07925 0.18186 -0.05170 -0.59974

div2 | 0.04326 -0.11339 0.05872 -0.44253

div3 | -0.00436 0.23518 0.16104 0.00260

div4 | -0.01953 0.49494 -0.53807 0.41634

div5 | 0.12488 0.03240 -0.02813 0.20538

div6 | 0.16392 -0.03118 0.05927 -0.04948

div7 | -0.01557 0.14109 -0.03078 -0.16704

div8 | 0.00063 -0.02647 -0.04099 0.06205

div9 | 0.00216 0.03724 0.10942 -0.12597

div10 | 0.14911 -0.26471 0.01094 -1.20009

div11 | 0.09499 0.06966 0.00325 -0.03244

div12 | 0.01092 0.24549 0.00071 -0.26581

div13 | 0.02381 0.10769 0.21193 0.03472

div14 | 0.13740 0.10581 0.60434 1.43553

div15 | 0.01255 -0.06698 0.04572 -0.03451

div16 | -0.01914 -0.03677 0.11613 -0.08001

div17 | 0.03816 -0.41828 -0.26528 -0.14701

div18 | 0.03628 -0.13264 0.05431 0.21385

div19 | 0.05068 -0.03080 -0.18010 0.06339

div20 | 0.02680 -0.09034 0.13100 0.09015

div21 | -0.00201 0.13760 0.18718 -0.13885

div22 | -0.00168 0.10451 -0.08293 -0.07340

div23 | 0.01771 -0.03543 -0.21777 0.40487

div24 | 0.00482 -0.04115 0.10567 0.04613

div25 | 0.11943 0.01387 0.03226 0.25898

div26 | 0.00484 0.04779 0.08075 -0.01031

------------------------------------------------------

**(c)** *Analizar los residuos del modelo, con arreglo a los supuestos considerados.*

Test for multivariate normality

Mardia mSkewness = 475.4859 chi2(3276) = 4297.740 Prob>chi2 = 0.0000

Mardia mKurtosis = 759.9989 chi2(1) = 8.966 Prob>chi2 = 0.0027

Henze-Zirkler = 1.000247 chi2(1) = 11.470 Prob>chi2 = 0.0007

Doornik-Hansen chi2(52) = 601.620 Prob>chi2 = 0.0000

Por lo tanto, con un nivel de significancia del 1%, estos datos aportan evidencia suficiente para indicar que los residuos no tienen una distribución normal multivariada.

Test that covariance matrix is diagonal

Adjusted LR chi2(325) = 944.31

Prob > chi2 = 0.0000

Por lo tanto, con un nivel de significancia del 1%, estos datos aportan evidencia suficiente para indicar que la matriz de varianzas y covarianzas de los residuos no es diagonal.

**(d)** *Obtener las principales medidas estadísticas que permitan inferir acerca de la bondad del ajuste del modelo estimado.*

Coeficiente de correlación al cuadrado entre cada variable observable y los factores:

rho2\_1 = .98497393

rho2\_2 = .98902324

rho2\_3 = .93575745

rho2\_4 = .98133713

rho2\_5 = .9899648

rho2\_6 = .99782874

rho2\_7 = .39777721

rho2\_8 = .52745178

rho2\_9 = .46913039

rho2\_10 = .99861103

rho2\_11 = .99412209

rho2\_12 = .98300747

rho2\_13 = .72994253

rho2\_14 = .9946607

rho2\_15 = .74662227

rho2\_16 = .68655422

rho2\_17 = .99350546

rho2\_18 = .87645452

rho2\_19 = .98246967

rho2\_20 = .77948868

rho2\_21 = .74787243

rho2\_22 = .5522995

rho2\_23 = .96217425

rho2\_24 = .25149728

rho2\_25 = .99464147

rho2\_26 = .38029008

Coeficiente de determinación= 0,12818739.