Question1

1. D) None of these
2. A) Seasonality
3. A) True
4. C) Current value of dependent variable is influenced by past values of both dependent and independent variables
5. B) AR(0)MA(1)
6. C) Zero autocovariances except at lag zero
7. A) Quadratic Trend
8. B) Only 2
9. E) 1,2 and 3
10. B) False
11. B) Delphi Approach
12. C) Both 1) and 2)
13. A) AR
14. B) Difference the series to obtain stationary data

Q5)

OLS-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: ESRCBPC | | |  |  |
| Method: Panel Least Squares | | |  |  |
| Date: 11/16/18 Time: 15:25 | | |  |  |
| Sample: 1970 1990 | | |  |  |
| Periods included: 21 | | |  |  |
| Cross-sections included: 50 | | |  |  |
| Total panel (balanced) observations: 1050 | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | 0.013021 | 0.000664 | 19.61062 | 0.0000 |
| ESRCD | -3.24E-05 | 1.36E-05 | -2.373196 | 0.0178 |
| ESRCB | -6.35E-08 | 2.76E-07 | -0.230126 | 0.8180 |
| ESRCBGPC | -0.131646 | 0.008976 | -14.66579 | 0.0000 |
| HDD | 6.96E-05 | 0.000774 | 0.089806 | 0.9285 |
| CDD | 0.011879 | 0.002205 | 5.386556 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.261580 | Mean dependent var | | 0.011208 |
| Adjusted R-squared | 0.258043 | S.D. dependent var | | 0.003467 |
| S.E. of regression | 0.002987 | Akaike info criterion | | -8.783572 |
| Sum squared resid | 0.009313 | Schwarz criterion | | -8.755249 |
| Log likelihood | 4617.375 | Hannan-Quinn criter. | | -8.772833 |
| F-statistic | 73.96576 | Durbin-Watson stat | | 0.050686 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

|  |  |
| --- | --- |
| Adjusted R-squared | 0.258043 |

Since in this case Adjusted R squared is very small, so we are not considering this model.

Estimation Command:

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

LS ESRCBPC C ESRCD ESRCB ESRCBGPC HDD CDD

Estimation Equation:

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

ESRCBPC = C(1) + C(2)\*ESRCD + C(3)\*ESRCB + C(4)\*ESRCBGPC + C(5)\*HDD + C(6)\*CDD

Substituted Coefficients:

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

ESRCBPC = 0.0130209425078 - 3.23522596776e-05\*ESRCD - 6.35119804223e-08\*ESRCB - 0.131645561153\*ESRCBGPC + 6.95507222897e-05\*HDD + 0.0118793424422\*CDD

**Fixed Effect model-**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: ESRCBPC | | |  |  |
| Method: Panel Least Squares | | |  |  |
| Date: 11/16/18 Time: 15:25 | | |  |  |
| Sample: 1970 1990 | | |  |  |
| Periods included: 21 | | |  |  |
| Cross-sections included: 50 | | |  |  |
| Total panel (balanced) observations: 1050 | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | 0.012539 | 0.000581 | 21.59295 | 0.0000 |
| ESRCD | -0.000225 | 1.58E-05 | -14.18094 | 0.0000 |
| ESRCB | 2.98E-07 | 3.94E-07 | 0.756326 | 0.4496 |
| ESRCBGPC | -0.023648 | 0.008848 | -2.672794 | 0.0076 |
| HDD | 0.002076 | 0.000853 | 2.434859 | 0.0151 |
| CDD | 0.013584 | 0.002482 | 5.473855 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section fixed (dummy variables) | | | |  |
| Period fixed (dummy variables) | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.951456 | Mean dependent var | | 0.011208 |
| Adjusted R-squared | 0.947772 | S.D. dependent var | | 0.003467 |
| S.E. of regression | 0.000792 | Akaike info criterion | | -11.37418 |
| Sum squared resid | 0.000612 | Schwarz criterion | | -11.02015 |
| Log likelihood | 6046.447 | Hannan-Quinn criter. | | -11.23994 |
| F-statistic | 258.2410 | Durbin-Watson stat | | 0.411352 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

ESRCBPC = 0.012539 + -0.000225\*ESRCD + 2.98E-07\*ESRCB + -0.023648\* ESRCBGPC +0.002076\* HDD + 0.013584\*CDD

When We performed Using Fixed effect model We got good Adjuested R-Squared

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  | |  |

Random Effects model-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: ESRCBPC | | |  |  |
| Method: Panel EGLS (Cross-section random effects) | | | | |
| Date: 11/16/18 Time: 15:10 | | |  |  |
| Sample: 1970 1990 | | |  |  |
| Periods included: 21 | | |  |  |
| Cross-sections included: 50 | | |  |  |
| Total panel (balanced) observations: 1050 | | | |  |
| Swamy and Arora estimator of component variances | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | 0.010145 | 0.000610 | 16.63035 | 0.0000 |
| ESRCD | 0.000155 | 6.35E-06 | 24.36407 | 0.0000 |
| ESRCB | 5.43E-07 | 3.86E-07 | 1.405887 | 0.1601 |
| ESRCBGPC | -0.114495 | 0.009614 | -11.90915 | 0.0000 |
| HDD | -0.000487 | 0.000720 | -0.676075 | 0.4991 |
| CDD | 0.011151 | 0.002139 | 5.213509 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification | |  |  |
|  |  |  | S.D. | Rho |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | | | 0.001238 | 0.5516 |
| Idiosyncratic random | | | 0.001117 | 0.4484 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Weighted Statistics | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.509331 | Mean dependent var | | 0.002164 |
| Adjusted R-squared | 0.506981 | S.D. dependent var | | 0.001770 |
| S.E. of regression | 0.001243 | Sum squared resid | | 0.001613 |
| F-statistic | 216.7417 | Durbin-Watson stat | | 0.289515 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Unweighted Statistics | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.121510 | Mean dependent var | | 0.011208 |
| Sum squared resid | 0.011080 | Durbin-Watson stat | | 0.042159 |
|  |  |  |  |  |
|  |  |  |  |  |

ESRCBPC = 0.010145 + 0.000155 \*ESRCD + 5.43E-07\*ESRCB + -0.114495\* ESRCBGPC +-0.000487\*HDD + 0.011151\*CDD

Conducting HausMan Test-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Correlated Random Effects - Hausman Test | | | |  |
| Equation: Untitled | | |  |  |
| Test cross-section random effects | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Test Summary | | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | | 255.197535 | 5 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |

HausMan Test Null Hypothesis-

The **null hypothesis** is that the preferred model is random effects.

The alternate **hypothesis** is that the model is fixed effects.

Since P <0.05 means alternative hypothesis is true.

Means Model is having the fixed affects.

D) FEM is best suitable for this.

E) Now all the steps for Natural Gas-

Dependent Variable is Natural Gas that is - ESRCBGPC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: ESRCBGPC | | |  |  |
| Method: Panel Least Squares | | |  |  |
| Date: 11/16/18 Time: 15:25 | | |  |  |
| Sample: 1970 1990 | | |  |  |
| Periods included: 21 | | |  |  |
| Cross-sections included: 50 | | |  |  |
| Total panel (balanced) observations: 1050 | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | 0.026473 | 0.002297 | 11.52649 | 0.0000 |
| ESRCBPC | -1.297626 | 0.088480 | -14.66579 | 0.0000 |
| ESRCD | -0.000203 | 4.25E-05 | -4.793105 | 0.0000 |
| ESRCB | 1.35E-06 | 8.66E-07 | 1.557991 | 0.1195 |
| HDD | 0.014118 | 0.002392 | 5.902484 | 0.0000 |
| CDD | 0.029246 | 0.006961 | 4.201525 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.237031 | Mean dependent var | | 0.019646 |
| Adjusted R-squared | 0.233377 | S.D. dependent var | | 0.010710 |
| S.E. of regression | 0.009377 | Akaike info criterion | | -6.495394 |
| Sum squared resid | 0.091799 | Schwarz criterion | | -6.467071 |
| Log likelihood | 3416.082 | Hannan-Quinn criter. | | -6.484655 |
| F-statistic | 64.86780 | Durbin-Watson stat | | 0.076918 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Estimation Command:

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

LS ESRCBGPC C ESRCBPC ESRCD ESRCB HDD CDD

Estimation Equation:

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

ESRCBGPC = C(1) + C(2)\*ESRCBPC + C(3)\*ESRCD + C(4)\*ESRCB + C(5)\*HDD + C(6)\*CDD

Substituted Coefficients:

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

ESRCBGPC = 0.0264733552568 - 1.29762580755\*ESRCBPC - 0.000203470395437\*ESRCD + 1.34844218643e-06\*ESRCB + 0.0141180734721\*HDD + 0.0292463352602\*CDD

Since in this case Adjusted R squared is very small, so we are not considering this model.

Fixed Effects Model-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: ESRCBGPC | | |  |  |
| Method: Panel Least Squares | | |  |  |
| Date: 11/16/18 Time: 15:20 | | |  |  |
| Sample: 1970 1990 | | |  |  |
| Periods included: 21 | | |  |  |
| Cross-sections included: 50 | | |  |  |
| Total panel (balanced) observations: 1050 | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | 0.015875 | 0.002495 | 6.363089 | 0.0000 |
| ESRCBPC | -0.307585 | 0.115080 | -2.672794 | 0.0076 |
| ESRCD | 0.000322 | 6.19E-05 | 5.194249 | 0.0000 |
| ESRCB | -8.76E-07 | 1.42E-06 | -0.617146 | 0.5373 |
| HDD | 0.006395 | 0.003078 | 2.077954 | 0.0380 |
| CDD | -0.010362 | 0.009080 | -1.141137 | 0.2541 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section fixed (dummy variables) | | | |  |
| Period fixed (dummy variables) | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.933813 | Mean dependent var | | 0.019646 |
| Adjusted R-squared | 0.928790 | S.D. dependent var | | 0.010710 |
| S.E. of regression | 0.002858 | Akaike info criterion | | -8.808700 |
| Sum squared resid | 0.007963 | Schwarz criterion | | -8.454662 |
| Log likelihood | 4699.568 | Hannan-Quinn criter. | | -8.674460 |
| F-statistic | 185.8922 | Durbin-Watson stat | | 0.609919 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Estimation Command:

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

LS(CX=F, PER=F) ESRCBGPC C ESRCBPC ESRCD ESRCB HDD CDD

Estimation Equation:

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

ESRCBGPC = C(1) + C(2)\*ESRCBPC + C(3)\*ESRCD + C(4)\*ESRCB + C(5)\*HDD + C(6)\*CDD + [CX=F, PER=F]

Substituted Coefficients:

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

ESRCBGPC = 0.01587535809 - 0.307585377105\*ESRCBPC + 0.00032164640558\*ESRCD - 8.76254460074e-07\*ESRCB + 0.0063950396833\*HDD - 0.0103616175761\*CDD + [CX=F, PER=F]  
  
Random Model Generation-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: ESRCBGPC | | |  |  |
| Method: Panel EGLS (Cross-section random effects) | | | | |
| Date: 11/16/18 Time: 15:25 | | |  |  |
| Sample: 1970 1990 | | |  |  |
| Periods included: 21 | | |  |  |
| Cross-sections included: 50 | | |  |  |
| Total panel (balanced) observations: 1050 | | | |  |
| Swamy and Arora estimator of component variances | | | | |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| C | 0.028685 | 0.002015 | 14.23621 | 0.0000 |
| ESRCBPC | -0.767428 | 0.078993 | -9.715177 | 0.0000 |
| ESRCD | -0.000119 | 2.20E-05 | -5.418494 | 0.0000 |
| ESRCB | -3.11E-07 | 1.35E-06 | -0.229790 | 0.8183 |
| HDD | 0.004832 | 0.002305 | 2.096313 | 0.0363 |
| CDD | -0.011625 | 0.007090 | -1.639554 | 0.1014 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification | |  |  |
|  |  |  | S.D. | Rho |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | | | 0.007734 | 0.8703 |
| Idiosyncratic random | | | 0.002986 | 0.1297 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Weighted Statistics | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.298338 | Mean dependent var | | 0.001649 |
| Adjusted R-squared | 0.294978 | S.D. dependent var | | 0.003593 |
| S.E. of regression | 0.003017 | Sum squared resid | | 0.009500 |
| F-statistic | 88.77938 | Durbin-Watson stat | | 0.617920 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Unweighted Statistics | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.186172 | Mean dependent var | | 0.019646 |
| Sum squared resid | 0.097918 | Durbin-Watson stat | | 0.059949 |
|  |  |  |  |  |
|  |  |  |  |  |

Estimation Command:

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

LS(CX=R) ESRCBGPC C ESRCBPC ESRCD ESRCB HDD CDD

Estimation Equation:

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

ESRCBGPC = C(1) + C(2)\*ESRCBPC + C(3)\*ESRCD + C(4)\*ESRCB + C(5)\*HDD + C(6)\*CDD + [CX=R]

Substituted Coefficients:

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

ESRCBGPC = 0.0286846749476 - 0.767428406576\*ESRCBPC - 0.000118991087276\*ESRCD - 3.10560740565e-07\*ESRCB + 0.00483156186084\*HDD - 0.011624903208\*CDD + [CX=R]

Hausman Test-

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Correlated Random Effects - Hausman Test | | | |  |
| Equation: Untitled | | |  |  |
| Test cross-section random effects | | | |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Test Summary | | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | | 26.765793 | 5 | 0.0001 |
|  |  |  |  |  |
|  |  |  |  |  |

The **null hypothesis** is that the preferred model is random effects.

The alternate **hypothesis** is that the model is fixed effects.

Since P <0.05 means alternative hypothesis is true.

Means Model is having the fixed affects.