**Antarlin Chanda C22003 Project**

Null Hypothesis: Advertisement expense and the number of distributors have  
no impact on the firm sales revenue

Alternate Hypothesis: Atleast one of Advertisement expense and the number of distributors are having an  
impact on the firm sales revenue

Pooled Regression Model: 𝒚𝒊𝒕=𝜶+𝜷𝒙𝒊𝒕+𝜸𝒛𝒊𝒕+𝜺𝒊𝒕

Fixed effect Model(Entity and time fixed effect model):

𝒚𝒊𝒕=𝜶𝟑+𝜷𝒙𝒊𝒕+𝜸𝒛𝒊𝒕+𝝁𝟐𝑫𝟐𝒊𝒕+𝝁𝟑𝑫𝟑𝒊𝒕+⋯+𝝁𝑵𝑫𝑵𝒊𝒕+𝝀𝟐𝑷𝟐𝒊𝒕+𝝀𝟑𝑷𝟑𝒊𝒕+⋯+𝝀𝑵𝑷𝑻𝒊𝒕+𝝊𝒊𝒕

Random Effect Model(Entity random effect and fixed time effect due to gretl limitation):

𝒚𝒊𝒕=𝜶𝟑+𝜷𝒙𝒊𝒕+𝜸𝒛𝒊𝒕+𝝎𝒊+𝝀𝟐𝑷𝟐𝒊𝒕+𝝀𝟑𝑷𝟑𝒊𝒕+⋯+𝝀𝑵𝑷𝑻𝒊𝒕+𝝊𝒊𝒕

Sales 1 Pooled Regression

Model 1: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales1

coefficient std. error t-ratio p-value

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

const −15890.1 9830.44 −1.616 0.1063

AdvExpX1 3.91523 0.982626 3.984 7.26e-05 \*\*\*

NoOfDistrX2 −4.78401 0.470040 −10.18 3.27e-023 \*\*\*

GDP\_GrowthRate −2347.81 5975.30 −0.3929 0.6945

Size\_TA 0.137265 0.0229961 5.969 3.32e-09 \*\*\*

Ownership\_Pub −265.158 207.306 −1.279 0.2012

Mean dependent var 22026.39 S.D. dependent var 3270.013

Sum squared resid 9.26e+09 S.E. of regression 3052.507

R-squared 0.132967 Adjusted R-squared 0.128606

F(5, 994) 30.48781 P-value(F) 6.61e-29

Log-likelihood −9439.648 Akaike criterion 18891.30

Schwarz criterion 18920.74 Hannan-Quinn 18902.49

rho −0.052005 Durbin-Watson 1.911312

Excluding the constant, p-value was highest for variable 15 (GDP\_GrowthRate)

Inference

1.Through regression is significant Low r2 value model can be improved much further as there is other effects present which had not been captured.

**Sales 1 Fixed Effect**

Model 2: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales1

coefficient std. error t-ratio p-value

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

const −16223.8 10351.4 −1.567 0.1174

AdvExpX1 3.91629 1.03547 3.782 0.0002 \*\*\*

NoOfDistrX2 −4.71796 0.500731 −9.422 3.71e-020 \*\*\*

dt\_2 698.588 433.812 1.610 0.1077

dt\_3 375.055 433.371 0.8654 0.3870

dt\_4 662.647 433.210 1.530 0.1265

dt\_5 834.148 433.183 1.926 0.0545 \*

dt\_6 1472.43 433.173 3.399 0.0007 \*\*\*

dt\_7 1261.36 433.579 2.909 0.0037 \*\*\*

dt\_8 1532.39 433.143 3.538 0.0004 \*\*\*

dt\_9 1786.19 433.498 4.120 4.14e-05 \*\*\*

dt\_10 1498.93 433.363 3.459 0.0006 \*\*\*

Mean dependent var 22026.39 S.D. dependent var 3270.013

Sum squared resid 8.34e+09 S.E. of regression 3062.723

LSDV R-squared 0.219356 Within R-squared 0.132948

LSDV F(110, 889) 2.270943 P-value(F) 7.49e-11

Log-likelihood −9387.169 Akaike criterion 18996.34

Schwarz criterion 19541.10 Hannan-Quinn 19203.39

rho −0.158765 Durbin-Watson 2.107216

Joint test on named regressors -

Test statistic: F(2, 889) = 50.603

with p-value = P(F(2, 889) > 50.603) = 1.53759e-21

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 1.03072

with p-value = P(F(99, 889) > 1.03072) = 0.404187

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 32.6426

with p-value = 0.0001541

Inferences

1.From Joint test Fixed Effect of time is there and some time dummies are significant.

2.From group intercepts No Entity specific effects are found

**Sales 1 Random Effect**

Model 6: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | −14515.0 | 9890.08 | −1.468 | 0.1422 |  |
| AdvExpX1 | 3.74620 | 0.989308 | 3.787 | 0.0002 | \*\*\* |
| NoOfDistrX2 | −4.73864 | 0.473766 | −10.00 | <0.0001 | \*\*\* |
| dt\_2 | 702.595 | 433.385 | 1.621 | 0.1050 |  |
| dt\_3 | 377.457 | 432.984 | 0.8718 | 0.3833 |  |
| dt\_4 | 663.561 | 432.838 | 1.533 | 0.1253 |  |
| dt\_5 | 834.519 | 432.813 | 1.928 | 0.0538 | \* |
| dt\_6 | 1472.28 | 432.804 | 3.402 | 0.0007 | \*\*\* |
| dt\_7 | 1259.38 | 433.168 | 2.907 | 0.0036 | \*\*\* |
| dt\_8 | 1532.79 | 432.777 | 3.542 | 0.0004 | \*\*\* |
| dt\_9 | 1789.14 | 433.100 | 4.131 | <0.0001 | \*\*\* |
| dt\_10 | 1500.27 | 432.977 | 3.465 | 0.0005 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22026.39 |  | S.D. dependent var | 3270.013 |
| Sum squared resid | 9.30e+09 |  | S.E. of regression | 3065.882 |
| Log-likelihood | −9441.499 |  | Akaike criterion | 18907.00 |
| Schwarz criterion | 18965.89 |  | Hannan-Quinn | 18929.38 |
| rho | −0.158765 |  | Durbin-Watson | 2.107216 |

'Between' variance = 45376.7

'Within' variance = 9.38027e+006

theta used for quasi-demeaning = 0.0233437

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 112.314

with p-value = 4.08564e-25

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 32.687

with p-value = 0.000151383

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 0.0477472

with p-value = 0.827031

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.3389

with p-value = 0.844129

**Inferences**

1. Fixed effect in time found
2. Bresuh pagan and hausman conflicting results so inconclusive if random effect of entity present

For Sales 1 best model is pooled regression according to SIC

Sales 2 Pooled Regression

Model 7: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | 4775.88 | 12092.1 | 0.3950 | 0.6930 |  |
| AdvExpX1 | 4.14225 | 0.981565 | 4.220 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.77387 | 0.469578 | −10.17 | <0.0001 | \*\*\* |
| GDP\_GrowthRate | −279909 | 88198.6 | −3.174 | 0.0016 | \*\*\* |
| Size\_TA | 0.689521 | 0.0239764 | 28.76 | <0.0001 | \*\*\* |
| Ownership\_Pub | −228.762 | 206.667 | −1.107 | 0.2686 |  |
| dt\_2 | 1287.59 | 539.856 | 2.385 | 0.0173 | \*\* |
| dt\_3 | −163.873 | 375.483 | −0.4364 | 0.6626 |  |
| dt\_4 | −12768.7 | 4034.02 | −3.165 | 0.0016 | \*\*\* |
| dt\_5 | 998.064 | 431.535 | 2.313 | 0.0209 | \*\* |
| dt\_6 | 3255.60 | 837.018 | 3.890 | 0.0001 | \*\*\* |
| dt\_7 | −6313.14 | 2189.70 | −2.883 | 0.0040 | \*\*\* |
| dt\_8 | −5185.69 | 1927.51 | −2.690 | 0.0073 | \*\*\* |
| dt\_9 | −2424.53 | 1156.94 | −2.096 | 0.0364 | \*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 27930.00 |  | S.D. dependent var | 4456.402 |
| Sum squared resid | 9.11e+09 |  | S.E. of regression | 3040.348 |
| R-squared | 0.540602 |  | Adjusted R-squared | 0.534545 |
| F(13, 986) | 89.25273 |  | P-value(F) | 2.3e-156 |
| Log-likelihood | −9431.616 |  | Akaike criterion | 18891.23 |
| Schwarz criterion | 18959.94 |  | Hannan-Quinn | 18917.35 |
| rho | −0.053305 |  | Durbin-Watson | 1.924583 |

Inferences

1.Regression is significant and except ownership pubs most variables ae significant .

**Sales 2 Fixed Effect Model**

Model 36: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −11868.3 | 10340.7 | −1.148 | 0.2514 |  |
| AdvExpX1 | 3.93619 | 1.03441 | 3.805 | 0.0002 | \*\*\* |
| NoOfDistrX2 | −4.71898 | 0.500216 | −9.434 | <0.0001 | \*\*\* |
| dt\_2 | 1010.47 | 433.366 | 2.332 | 0.0199 | \*\* |
| dt\_3 | 983.324 | 432.925 | 2.271 | 0.0234 | \*\* |
| dt\_4 | 1568.48 | 432.764 | 3.624 | 0.0003 | \*\*\* |
| dt\_5 | 2036.79 | 432.737 | 4.707 | <0.0001 | \*\*\* |
| dt\_6 | 2972.11 | 432.727 | 6.868 | <0.0001 | \*\*\* |
| dt\_7 | 3058.69 | 433.133 | 7.062 | <0.0001 | \*\*\* |
| dt\_8 | 3625.51 | 432.697 | 8.379 | <0.0001 | \*\*\* |
| dt\_9 | 4176.67 | 433.052 | 9.645 | <0.0001 | \*\*\* |
| dt\_10 | 4184.52 | 432.917 | 9.666 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 27930.00 |  | S.D. dependent var | 4456.402 |
| Sum squared resid | 8.32e+09 |  | S.E. of regression | 3059.569 |
| LSDV R-squared | 0.580542 |  | Within R-squared | 0.260539 |
| LSDV F(110, 889) | 11.18549 |  | P-value(F) | 3.9e-108 |
| Log-likelihood | −9386.139 |  | Akaike criterion | 18994.28 |
| Schwarz criterion | 19539.04 |  | Hannan-Quinn | 19201.32 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

Joint test on named regressors -

Test statistic: F(2, 889) = 50.7946

with p-value = P(F(2, 889) > 50.7946) = 1.29456e-21

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 9.19602

with p-value = P(F(99, 889) > 9.19602) = 1.56868e-83

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 203.982

with p-value = 4.84315e-39

**Inferences**

**1.Fixed Effect of entity is there**

**2.Time effect of dummies also there**

**Sales 2 Randome Effect**

Model 9: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | −11300.8 | 10281.8 | −1.099 | 0.2717 |  |
| AdvExpX1 | 3.87922 | 1.02814 | 3.773 | 0.0002 | \*\*\* |
| NoOfDistrX2 | −4.71428 | 0.496591 | −9.493 | <0.0001 | \*\*\* |
| dt\_2 | 1011.53 | 432.985 | 2.336 | 0.0195 | \*\* |
| dt\_3 | 983.983 | 432.549 | 2.275 | 0.0229 | \*\* |
| dt\_4 | 1568.89 | 432.390 | 3.628 | 0.0003 | \*\*\* |
| dt\_5 | 2037.04 | 432.363 | 4.711 | <0.0001 | \*\*\* |
| dt\_6 | 2972.20 | 432.354 | 6.874 | <0.0001 | \*\*\* |
| dt\_7 | 3058.46 | 432.754 | 7.067 | <0.0001 | \*\*\* |
| dt\_8 | 3625.66 | 432.324 | 8.386 | <0.0001 | \*\*\* |
| dt\_9 | 4177.46 | 432.674 | 9.655 | <0.0001 | \*\*\* |
| dt\_10 | 4185.18 | 432.541 | 9.676 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 27930.00 |  | S.D. dependent var | 4456.402 |
| Sum squared resid | 1.68e+10 |  | S.E. of regression | 4127.152 |
| Log-likelihood | −9738.751 |  | Akaike criterion | 19501.50 |
| Schwarz criterion | 19560.39 |  | Hannan-Quinn | 19523.89 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

'Between' variance = 7.82502e+006

'Within' variance = 9.36096e+006

theta used for quasi-demeaning = 0.673126

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 102.465

with p-value = 5.62259e-23

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 204.336

with p-value = 4.08211e-39

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 914.946

with p-value = 5.5293e-201

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.301948

with p-value = 0.85987

**Inferences**

1.Time Fixed Effect is significant

2.Random entity effect is present as can be seen from Breusch Pagan rejected ,Hausman accepted and this model is good

For Sales 2 best model is pooled regression according to SIC

**Sales 3 Pooled Regression**

Model 11: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −68824.1 | 12092.1 | −5.692 | <0.0001 | \*\*\* |
| AdvExpX1 | 4.14225 | 0.981565 | 4.220 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.77387 | 0.469578 | −10.17 | <0.0001 | \*\*\* |
| GDP\_GrowthRate | 620091 | 88198.6 | 7.031 | <0.0001 | \*\*\* |
| Size\_TA | 0.689521 | 0.0239764 | 28.76 | <0.0001 | \*\*\* |
| Ownership\_Pub | −228.762 | 206.667 | −1.107 | 0.2686 |  |
| dt\_2 | −1012.41 | 539.856 | −1.875 | 0.0610 | \* |
| dt\_3 | 636.127 | 375.483 | 1.694 | 0.0906 | \* |
| dt\_4 | 28931.3 | 4034.02 | 7.172 | <0.0001 | \*\*\* |
| dt\_5 | −1001.94 | 431.535 | −2.322 | 0.0204 | \*\* |
| dt\_6 | −4644.40 | 837.018 | −5.549 | <0.0001 | \*\*\* |
| dt\_7 | 14986.9 | 2189.70 | 6.844 | <0.0001 | \*\*\* |
| dt\_8 | 12914.3 | 1927.51 | 6.700 | <0.0001 | \*\*\* |
| dt\_9 | 7075.47 | 1156.94 | 6.116 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 23180.00 |  | S.D. dependent var | 4233.076 |
| Sum squared resid | 9.11e+09 |  | S.E. of regression | 3040.348 |
| R-squared | 0.490850 |  | Adjusted R-squared | 0.484137 |
| F(13, 986) | 73.11998 |  | P-value(F) | 1.4e-134 |
| Log-likelihood | −9431.616 |  | Akaike criterion | 18891.23 |
| Schwarz criterion | 18959.94 |  | Hannan-Quinn | 18917.35 |
| rho | −0.053305 |  | Durbin-Watson | 1.924583 |

**Inferences**

1.p values is low and model is significant but r2 value is low and not really a good model.

**Sales 3 Fixed Effect**

Model 13: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −14368.3 | 10340.7 | −1.389 | 0.1650 |  |
| AdvExpX1 | 3.93619 | 1.03441 | 3.805 | 0.0002 | \*\*\* |
| NoOfDistrX2 | −4.71898 | 0.500216 | −9.434 | <0.0001 | \*\*\* |
| dt\_2 | 510.473 | 433.366 | 1.178 | 0.2391 |  |
| dt\_3 | −16.6763 | 432.925 | −0.03852 | 0.9693 |  |
| dt\_4 | 68.4808 | 432.764 | 0.1582 | 0.8743 |  |
| dt\_5 | 36.7911 | 432.737 | 0.08502 | 0.9323 |  |
| dt\_6 | 472.114 | 432.727 | 1.091 | 0.2756 |  |
| dt\_7 | 58.6914 | 433.133 | 0.1355 | 0.8922 |  |
| dt\_8 | 125.505 | 432.697 | 0.2901 | 0.7718 |  |
| dt\_9 | 176.667 | 433.052 | 0.4080 | 0.6834 |  |
| dt\_10 | −315.479 | 432.917 | −0.7287 | 0.4664 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 23180.00 |  | S.D. dependent var | 4233.076 |
| Sum squared resid | 8.32e+09 |  | S.E. of regression | 3059.569 |
| LSDV R-squared | 0.535116 |  | Within R-squared | 0.106648 |
| LSDV F(110, 889) | 9.302770 |  | P-value(F) | 3.43e-90 |
| Log-likelihood | −9386.139 |  | Akaike criterion | 18994.28 |
| Schwarz criterion | 19539.04 |  | Hannan-Quinn | 19201.32 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

Joint test on named regressors -

Test statistic: F(2, 889) = 50.7946

with p-value = P(F(2, 889) > 50.7946) = 1.29456e-21

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 9.19602

with p-value = P(F(99, 889) > 9.19602) = 1.56868e-83

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 5.49391

with p-value = 0.789305

**Inferences**

1.Fixed Entity effect is there

2.Time Effect is not present.Not really a good model.

**Sales 3 Random Effect**

Model 14: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | −13800.8 | 10281.8 | −1.342 | 0.1795 |  |
| AdvExpX1 | 3.87922 | 1.02814 | 3.773 | 0.0002 | \*\*\* |
| NoOfDistrX2 | −4.71428 | 0.496591 | −9.493 | <0.0001 | \*\*\* |
| dt\_2 | 511.534 | 432.985 | 1.181 | 0.2374 |  |
| dt\_3 | −16.0169 | 432.549 | −0.03703 | 0.9705 |  |
| dt\_4 | 68.8890 | 432.390 | 0.1593 | 0.8734 |  |
| dt\_5 | 37.0388 | 432.363 | 0.08567 | 0.9317 |  |
| dt\_6 | 472.195 | 432.354 | 1.092 | 0.2748 |  |
| dt\_7 | 58.4570 | 432.754 | 0.1351 | 0.8925 |  |
| dt\_8 | 125.655 | 432.324 | 0.2907 | 0.7713 |  |
| dt\_9 | 177.460 | 432.674 | 0.4101 | 0.6817 |  |
| dt\_10 | −314.817 | 432.541 | −0.7278 | 0.4667 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 23180.00 |  | S.D. dependent var | 4233.076 |
| Sum squared resid | 1.68e+10 |  | S.E. of regression | 4127.152 |
| Log-likelihood | −9738.751 |  | Akaike criterion | 19501.50 |
| Schwarz criterion | 19560.39 |  | Hannan-Quinn | 19523.89 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

'Between' variance = 7.82502e+006

'Within' variance = 9.36096e+006

theta used for quasi-demeaning = 0.673126

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 102.465

with p-value = 5.62259e-23

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 5.50591

with p-value = 0.788167

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 914.946

with p-value = 5.5293e-201

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.301948

with p-value = 0.85987

**Inferences**

1.Time Fixed Effect Not there

2.Random Effect entity is there as Breush pagan is rejected and Hausman is accepted

For Sales 3 best model is pooled regression according to SIC

**Sales 4 Pooled Regression**

Model 15: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −13724.6 | 10622.0 | −1.292 | 0.1966 |  |
| AdvExpX1 | 3.91488 | 1.06174 | 3.687 | 0.0002 | \*\*\* |
| NoOfDistrX2 | −4.88764 | 0.507886 | −9.624 | <0.0001 | \*\*\* |
| GDP\_GrowthRate | −14992.4 | 6456.41 | −2.322 | 0.0204 | \*\* |
| Size\_TA | 0.0837765 | 0.0248476 | 3.372 | 0.0008 | \*\*\* |
| Ownership\_Pub | −370.621 | 223.997 | −1.655 | 0.0983 | \* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22880.00 |  | S.D. dependent var | 3488.142 |
| Sum squared resid | 1.08e+10 |  | S.E. of regression | 3298.286 |
| R-squared | 0.110371 |  | Adjusted R-squared | 0.105896 |
| F(5, 994) | 24.66389 |  | P-value(F) | 1.80e-23 |
| Log-likelihood | −9517.088 |  | Akaike criterion | 19046.18 |
| Schwarz criterion | 19075.62 |  | Hannan-Quinn | 19057.37 |
| rho | 0.061001 |  | Durbin-Watson | 1.665910 |

**Inferences**

1.Very Low adjusted r2 but regression is significant.overall model is bad

**Sales 4 Fixed Effect**

Model 16: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −16918.3 | 10340.7 | −1.636 | 0.1022 |  |
| AdvExpX1 | 3.93619 | 1.03441 | 3.805 | 0.0002 | \*\*\* |
| NoOfDistrX2 | −4.71898 | 0.500216 | −9.434 | <0.0001 | \*\*\* |
| dt\_2 | 1010.47 | 433.366 | 2.332 | 0.0199 | \*\* |
| dt\_3 | 983.324 | 432.925 | 2.271 | 0.0234 | \*\* |
| dt\_4 | 1568.48 | 432.764 | 3.624 | 0.0003 | \*\*\* |
| dt\_5 | 2036.79 | 432.737 | 4.707 | <0.0001 | \*\*\* |
| dt\_6 | 2972.11 | 432.727 | 6.868 | <0.0001 | \*\*\* |
| dt\_7 | 3058.69 | 433.133 | 7.062 | <0.0001 | \*\*\* |
| dt\_8 | 3625.51 | 432.697 | 8.379 | <0.0001 | \*\*\* |
| dt\_9 | 4176.67 | 433.052 | 9.645 | <0.0001 | \*\*\* |
| dt\_10 | 4184.52 | 432.917 | 9.666 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22880.00 |  | S.D. dependent var | 3488.142 |
| Sum squared resid | 8.32e+09 |  | S.E. of regression | 3059.569 |
| LSDV R-squared | 0.315350 |  | Within R-squared | 0.260539 |
| LSDV F(110, 889) | 3.722494 |  | P-value(F) | 8.89e-28 |
| Log-likelihood | −9386.139 |  | Akaike criterion | 18994.28 |
| Schwarz criterion | 19539.04 |  | Hannan-Quinn | 19201.32 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

Joint test on named regressors -

Test statistic: F(2, 889) = 50.7946

with p-value = P(F(2, 889) > 50.7946) = 1.29456e-21

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 0.856569

with p-value = P(F(99, 889) > 0.856569) = 0.834305

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 203.982

with p-value = 4.84315e-39

**Inferences**

1.Fixed Entity Effect is not there

2.Time Fixed Effect is there.

**Sales4 Random Effect**

Model 17: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | −15518.6 | 9796.64 | −1.584 | 0.1132 |  |
| AdvExpX1 | 3.79675 | 0.979962 | 3.874 | 0.0001 | \*\*\* |
| NoOfDistrX2 | −4.73317 | 0.469091 | −10.09 | <0.0001 | \*\*\* |
| dt\_2 | 1013.69 | 430.176 | 2.356 | 0.0185 | \*\* |
| dt\_3 | 985.258 | 429.780 | 2.292 | 0.0219 | \*\* |
| dt\_4 | 1569.25 | 429.636 | 3.653 | 0.0003 | \*\*\* |
| dt\_5 | 2037.12 | 429.611 | 4.742 | <0.0001 | \*\*\* |
| dt\_6 | 2972.02 | 429.602 | 6.918 | <0.0001 | \*\*\* |
| dt\_7 | 3057.17 | 429.962 | 7.110 | <0.0001 | \*\*\* |
| dt\_8 | 3625.84 | 429.576 | 8.441 | <0.0001 | \*\*\* |
| dt\_9 | 4179.04 | 429.895 | 9.721 | <0.0001 | \*\*\* |
| dt\_10 | 4185.67 | 429.773 | 9.739 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22880.00 |  | S.D. dependent var | 3488.142 |
| Sum squared resid | 9.12e+09 |  | S.E. of regression | 3035.967 |
| Log-likelihood | −9431.693 |  | Akaike criterion | 18887.39 |
| Schwarz criterion | 18946.28 |  | Hannan-Quinn | 18909.77 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

'Between' variance = 0

'Within' variance = 9.36096e+006

theta used for quasi-demeaning = 0

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 114.684

with p-value = 1.24938e-25

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 206.932

with p-value = 1.16461e-39

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 0.929936

with p-value = 0.33488

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.217844

with p-value = 0.8968

**Inferences**

1.Fixed time effects are there

2.Conflicting results from Breush pagan random entity not there, while housman says coefficients are goof so this model is not very good.

For Sales 4 best model is random effect entity and fixed effect time according to SIC

**Sales5 Pooled Regression**

Model 18: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −20411.3 | 16069.3 | −1.270 | 0.2043 |  |
| AdvExpX1 | 3.91572 | 1.60625 | 2.438 | 0.0150 | \*\* |
| NoOfDistrX2 | −4.55175 | 0.768350 | −5.924 | <0.0001 | \*\*\* |
| GDP\_GrowthRate | 61665.9 | 9767.52 | 6.313 | <0.0001 | \*\*\* |
| Size\_TA | 3.19298 | 0.0375905 | 84.94 | <0.0001 | \*\*\* |
| Ownership\_Pub | 329.079 | 338.872 | 0.9711 | 0.3317 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 43565.70 |  | S.D. dependent var | 14474.43 |
| Sum squared resid | 2.47e+10 |  | S.E. of regression | 4989.778 |
| R-squared | 0.881756 |  | Adjusted R-squared | 0.881161 |
| F(5, 994) | 1482.465 |  | P-value(F) | 0.000000 |
| Log-likelihood | −9931.076 |  | Akaike criterion | 19874.15 |
| Schwarz criterion | 19903.60 |  | Hannan-Quinn | 19885.34 |
| rho | 0.852152 |  | Durbin-Watson | 0.239632 |

**Inferences**

1.Regression significant and adjusted r2 also there.So pooled regression is actually a good model here

**Sales5 Fixed Effec**t

Model 19: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | 19082.9 | 3446.90 | 5.536 | <0.0001 | \*\*\* |
| AdvExpX1 | 2.64540 | 0.344802 | 7.672 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.90633 | 0.166739 | −29.43 | <0.0001 | \*\*\* |
| dt\_2 | 170.758 | 144.455 | 1.182 | 0.2375 |  |
| dt\_3 | −6.15877 | 144.308 | −0.04268 | 0.9660 |  |
| dt\_4 | 8.42693 | 144.255 | 0.05842 | 0.9534 |  |
| dt\_5 | 12.2637 | 144.246 | 0.08502 | 0.9323 |  |
| dt\_6 | 159.171 | 144.242 | 1.103 | 0.2701 |  |
| dt\_7 | 11.4638 | 144.378 | 0.07940 | 0.9367 |  |
| dt\_8 | 34.6351 | 144.232 | 0.2401 | 0.8103 |  |
| dt\_9 | 54.3891 | 144.351 | 0.3768 | 0.7064 |  |
| dt\_10 | −106.660 | 144.306 | −0.7391 | 0.4600 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 43565.70 |  | S.D. dependent var | 14474.43 |
| Sum squared resid | 9.25e+08 |  | S.E. of regression | 1019.856 |
| LSDV R-squared | 0.995582 |  | Within R-squared | 0.508154 |
| LSDV F(110, 889) | 1821.273 |  | P-value(F) | 0.000000 |
| Log-likelihood | −8287.527 |  | Akaike criterion | 16797.05 |
| Schwarz criterion | 17341.81 |  | Hannan-Quinn | 17004.10 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

Joint test on named regressors -

Test statistic: F(2, 889) = 456.517

with p-value = P(F(2, 889) > 456.517) = 3.98257e-137

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 2014.77

with p-value = P(F(99, 889) > 2014.77) = 0

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 5.66086

with p-value = 0.773322

**Inferences**

1.Entity Fixed Effect is there

2.No time Effect is present

**Sales5 Random Effect**

Model 20: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | 19092.6 | 3740.17 | 5.105 | <0.0001 | \*\*\* |
| AdvExpX1 | 2.64442 | 0.344476 | 7.677 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.90619 | 0.166580 | −29.45 | <0.0001 | \*\*\* |
| dt\_2 | 170.774 | 144.322 | 1.183 | 0.2367 |  |
| dt\_3 | −6.14827 | 144.175 | −0.04264 | 0.9660 |  |
| dt\_4 | 8.43444 | 144.122 | 0.05852 | 0.9533 |  |
| dt\_5 | 12.2686 | 144.113 | 0.08513 | 0.9322 |  |
| dt\_6 | 159.173 | 144.109 | 1.105 | 0.2694 |  |
| dt\_7 | 11.4620 | 144.244 | 0.07946 | 0.9367 |  |
| dt\_8 | 34.6377 | 144.099 | 0.2404 | 0.8100 |  |
| dt\_9 | 54.4016 | 144.217 | 0.3772 | 0.7060 |  |
| dt\_10 | −106.647 | 144.173 | −0.7397 | 0.4595 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 43565.70 |  | S.D. dependent var | 14474.43 |
| Sum squared resid | 2.08e+11 |  | S.E. of regression | 14516.84 |
| Log-likelihood | −10996.47 |  | Akaike criterion | 22016.95 |
| Schwarz criterion | 22075.84 |  | Hannan-Quinn | 22039.33 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

'Between' variance = 2.13418e+008

'Within' variance = 1.04011e+006

theta used for quasi-demeaning = 0.977929

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 914.686

with p-value = 2.39065e-199

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 5.6714

with p-value = 0.772302

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 4454.25

with p-value = 0

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.18009

with p-value = 0.91389

**Inferences**

1.No time fixed effect is there

2.No random effect is present.Bad model.

For Sales 5 best model is fixed effect according to SIC

Sales6 Pooled Regression

Model 21: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales6

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −3547.30 | 3496.51 | −1.015 | 0.3106 |  |
| AdvExpX1 | 2.69031 | 0.349503 | 7.698 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.97842 | 0.167185 | −29.78 | <0.0001 | \*\*\* |
| GDP\_GrowthRate | −4083.62 | 2125.31 | −1.921 | 0.0550 | \* |
| Size\_TA | 0.147014 | 0.00817930 | 17.97 | <0.0001 | \*\*\* |
| Ownership\_Pub | −99.2363 | 73.7350 | −1.346 | 0.1787 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22043.14 |  | S.D. dependent var | 1632.899 |
| Sum squared resid | 1.17e+09 |  | S.E. of regression | 1085.723 |
| R-squared | 0.560114 |  | Adjusted R-squared | 0.557901 |
| F(5, 994) | 253.1351 |  | P-value(F) | 1.9e-174 |
| Log-likelihood | −8405.931 |  | Akaike criterion | 16823.86 |
| Schwarz criterion | 16853.31 |  | Hannan-Quinn | 16835.05 |
| rho | 0.045921 |  | Durbin-Watson | 1.703652 |

**Inferences**

1.Regression significant and adjustedr2 0.55 so other effects are present and we need to improve this model

**Sales6 Fixed Effect**

Model 22: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales6

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −3144.96 | 3459.98 | −0.9090 | 0.3636 |  |
| AdvExpX1 | 2.62550 | 0.346111 | 7.586 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.90530 | 0.167372 | −29.31 | <0.0001 | \*\*\* |
| dt\_2 | 358.273 | 145.004 | 2.471 | 0.0137 | \*\* |
| dt\_3 | 386.173 | 144.856 | 2.666 | 0.0078 | \*\*\* |
| dt\_4 | 616.993 | 144.802 | 4.261 | <0.0001 | \*\*\* |
| dt\_5 | 809.621 | 144.793 | 5.592 | <0.0001 | \*\*\* |
| dt\_6 | 1157.69 | 144.790 | 7.996 | <0.0001 | \*\*\* |
| dt\_7 | 1222.23 | 144.926 | 8.433 | <0.0001 | \*\*\* |
| dt\_8 | 1448.72 | 144.780 | 10.01 | <0.0001 | \*\*\* |
| dt\_9 | 1668.41 | 144.899 | 11.51 | <0.0001 | \*\*\* |
| dt\_10 | 1709.25 | 144.854 | 11.80 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22043.14 |  | S.D. dependent var | 1632.899 |
| Sum squared resid | 9.32e+08 |  | S.E. of regression | 1023.728 |
| LSDV R-squared | 0.650227 |  | Within R-squared | 0.582284 |
| LSDV F(110, 889) | 15.02405 |  | P-value(F) | 1.5e-140 |
| Log-likelihood | −8291.316 |  | Akaike criterion | 16804.63 |
| Schwarz criterion | 17349.39 |  | Hannan-Quinn | 17011.68 |
| rho | −0.156287 |  | Durbin-Watson | 2.099268 |

Joint test on named regressors -

Test statistic: F(2, 889) = 452.5

with p-value = P(F(2, 889) > 452.5) = 2.90279e-136

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 3.07683

with p-value = P(F(99, 889) > 3.07683) = 1.36591e-18

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 301.079

with p-value = 1.54108e-59

**Inferences**

1.Fixed Entity Effects are there

2.Fixed Time Effect is also there.So this model is good to fit this.

**Sales6 Random effect Model**

Model 23: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales6

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | −2855.66 | 3404.33 | −0.8388 | 0.4016 |  |
| AdvExpX1 | 2.59673 | 0.340509 | 7.626 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.90949 | 0.164090 | −29.92 | <0.0001 | \*\*\* |
| dt\_2 | 358.967 | 144.868 | 2.478 | 0.0132 | \*\* |
| dt\_3 | 386.587 | 144.725 | 2.671 | 0.0076 | \*\*\* |
| dt\_4 | 617.142 | 144.673 | 4.266 | <0.0001 | \*\*\* |
| dt\_5 | 809.676 | 144.664 | 5.597 | <0.0001 | \*\*\* |
| dt\_6 | 1157.66 | 144.661 | 8.003 | <0.0001 | \*\*\* |
| dt\_7 | 1221.87 | 144.792 | 8.439 | <0.0001 | \*\*\* |
| dt\_8 | 1448.78 | 144.651 | 10.02 | <0.0001 | \*\*\* |
| dt\_9 | 1668.92 | 144.766 | 11.53 | <0.0001 | \*\*\* |
| dt\_10 | 1709.47 | 144.722 | 11.81 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22043.14 |  | S.D. dependent var | 1632.899 |
| Sum squared resid | 1.25e+09 |  | S.E. of regression | 1124.664 |
| Log-likelihood | −8438.648 |  | Akaike criterion | 16901.30 |
| Schwarz criterion | 16960.19 |  | Hannan-Quinn | 16923.68 |
| rho | −0.156287 |  | Durbin-Watson | 2.099268 |

'Between' variance = 223523

'Within' variance = 1.04802e+006

theta used for quasi-demeaning = 0.43502

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 941.383

with p-value = 3.81223e-205

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 301.582

with p-value = 1.20503e-59

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 133.719

with p-value = 6.29498e-31

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.24977

with p-value = 0.882598

**Inferences**

1.Fixed time effect is there

2.Random entity effect also there.This model is also good.

For Sales 6 best model is pooled regression according to SIC

**Sales7 Pooled Regression**

Model 24: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales7

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −4311.30 | 3894.33 | −1.107 | 0.2685 |  |
| AdvExpX1 | 2.95149 | 0.389267 | 7.582 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −5.01028 | 0.186206 | −26.91 | <0.0001 | \*\*\* |
| GDP\_GrowthRate | −4637.30 | 2367.11 | −1.959 | 0.0504 | \* |
| Size\_TA | 0.732671 | 0.00910988 | 80.43 | <0.0001 | \*\*\* |
| Ownership\_Pub | −104.116 | 82.1241 | −1.268 | 0.2052 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 27946.75 |  | S.D. dependent var | 3502.433 |
| Sum squared resid | 1.45e+09 |  | S.E. of regression | 1209.250 |
| R-squared | 0.881392 |  | Adjusted R-squared | 0.880796 |
| F(5, 994) | 1477.313 |  | P-value(F) | 0.000000 |
| Log-likelihood | −8513.685 |  | Akaike criterion | 17039.37 |
| Schwarz criterion | 17068.82 |  | Hannan-Quinn | 17050.56 |
| rho | 0.199584 |  | Durbin-Watson | 1.403649 |

**Inferences**

1.Adjusted r2 value is high and p value is significant.So this mode is quite good.

**Sales7 Fixed effect Model**

Model 25: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales7

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | 1210.56 | 3446.90 | 0.3512 | 0.7255 |  |
| AdvExpX1 | 2.64540 | 0.344802 | 7.672 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.90633 | 0.166739 | −29.43 | <0.0001 | \*\*\* |
| dt\_2 | 670.158 | 144.455 | 4.639 | <0.0001 | \*\*\* |
| dt\_3 | 994.441 | 144.308 | 6.891 | <0.0001 | \*\*\* |
| dt\_4 | 1522.83 | 144.255 | 10.56 | <0.0001 | \*\*\* |
| dt\_5 | 2012.26 | 144.246 | 13.95 | <0.0001 | \*\*\* |
| dt\_6 | 2657.37 | 144.242 | 18.42 | <0.0001 | \*\*\* |
| dt\_7 | 3019.56 | 144.378 | 20.91 | <0.0001 | \*\*\* |
| dt\_8 | 3541.84 | 144.232 | 24.56 | <0.0001 | \*\*\* |
| dt\_9 | 4058.89 | 144.351 | 28.12 | <0.0001 | \*\*\* |
| dt\_10 | 4394.84 | 144.306 | 30.46 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 27946.75 |  | S.D. dependent var | 3502.433 |
| Sum squared resid | 9.25e+08 |  | S.E. of regression | 1019.856 |
| LSDV R-squared | 0.924547 |  | Within R-squared | 0.766502 |
| LSDV F(110, 889) | 99.02929 |  | P-value(F) | 0.000000 |
| Log-likelihood | −8287.527 |  | Akaike criterion | 16797.05 |
| Schwarz criterion | 17341.81 |  | Hannan-Quinn | 17004.10 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

Joint test on named regressors -

Test statistic: F(2, 889) = 456.517

with p-value = P(F(2, 889) > 456.517) = 3.98257e-137

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 79.814

with p-value = P(F(99, 889) > 79.814) = 0

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 1921.44

with p-value = 0

**Inferences**

1.Fixed Entity effect is present

2.Fixed Time Dummies effect is present.So model is good.

**Sales7 Random Effect Model**

Model 26: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales7

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | 1263.90 | 3453.79 | 0.3659 | 0.7144 |  |
| AdvExpX1 | 2.64003 | 0.344282 | 7.668 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.90565 | 0.166464 | −29.47 | <0.0001 | \*\*\* |
| dt\_2 | 670.252 | 144.324 | 4.644 | <0.0001 | \*\*\* |
| dt\_3 | 994.500 | 144.177 | 6.898 | <0.0001 | \*\*\* |
| dt\_4 | 1522.87 | 144.124 | 10.57 | <0.0001 | \*\*\* |
| dt\_5 | 2012.29 | 144.115 | 13.96 | <0.0001 | \*\*\* |
| dt\_6 | 2657.38 | 144.112 | 18.44 | <0.0001 | \*\*\* |
| dt\_7 | 3019.55 | 144.247 | 20.93 | <0.0001 | \*\*\* |
| dt\_8 | 3541.85 | 144.102 | 24.58 | <0.0001 | \*\*\* |
| dt\_9 | 4058.96 | 144.220 | 28.14 | <0.0001 | \*\*\* |
| dt\_10 | 4394.91 | 144.175 | 30.48 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 27946.75 |  | S.D. dependent var | 3502.433 |
| Sum squared resid | 9.14e+09 |  | S.E. of regression | 3040.793 |
| Log-likelihood | −9433.282 |  | Akaike criterion | 18890.56 |
| Schwarz criterion | 18949.46 |  | Hannan-Quinn | 18912.95 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

'Between' variance = 8.35196e+006

'Within' variance = 1.04011e+006

theta used for quasi-demeaning = 0.889093

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 915.576

with p-value = 1.53188e-199

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 1924.93

with p-value = 0

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 3544.1

with p-value = 0

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.21336

with p-value = 0.898813

**Inferences**

1.Fixed time effect is there

2.Random entity effect is also there.

For Sales 7 best model is pooled regression according to SIC

**Sales8 Pooled regression**

Model 27: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales8

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −8900.89 | 4475.18 | −1.989 | 0.0470 | \*\* |
| AdvExpX1 | 2.87399 | 0.447328 | 6.425 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.83103 | 0.213979 | −22.58 | <0.0001 | \*\*\* |
| GDP\_GrowthRate | 12958.8 | 2720.18 | 4.764 | <0.0001 | \*\*\* |
| Size\_TA | 0.634271 | 0.0104687 | 60.59 | <0.0001 | \*\*\* |
| Ownership\_Pub | 17.6230 | 94.3732 | 0.1867 | 0.8519 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 23196.75 |  | S.D. dependent var | 3191.387 |
| Sum squared resid | 1.92e+09 |  | S.E. of regression | 1389.614 |
| R-squared | 0.811353 |  | Adjusted R-squared | 0.810404 |
| F(5, 994) | 855.0188 |  | P-value(F) | 0.000000 |
| Log-likelihood | −8652.711 |  | Akaike criterion | 17317.42 |
| Schwarz criterion | 17346.87 |  | Hannan-Quinn | 17328.61 |
| rho | 0.359670 |  | Durbin-Watson | 1.101210 |

**Inferences**

1.Regression is significant with high adjusted r2 value but can be improved upon.

**Sales8 Fixed Effect**

Model 28: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales8

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −1289.44 | 3446.90 | −0.3741 | 0.7084 |  |
| AdvExpX1 | 2.64540 | 0.344802 | 7.672 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.90633 | 0.166739 | −29.43 | <0.0001 | \*\*\* |
| dt\_2 | 170.158 | 144.455 | 1.178 | 0.2391 |  |
| dt\_3 | −5.55877 | 144.308 | −0.03852 | 0.9693 |  |
| dt\_4 | 22.8269 | 144.255 | 0.1582 | 0.8743 |  |
| dt\_5 | 12.2637 | 144.246 | 0.08502 | 0.9323 |  |
| dt\_6 | 157.371 | 144.242 | 1.091 | 0.2756 |  |
| dt\_7 | 19.5638 | 144.378 | 0.1355 | 0.8922 |  |
| dt\_8 | 41.8351 | 144.232 | 0.2901 | 0.7718 |  |
| dt\_9 | 58.8891 | 144.351 | 0.4080 | 0.6834 |  |
| dt\_10 | −105.160 | 144.306 | −0.7287 | 0.4664 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 23196.75 |  | S.D. dependent var | 3191.387 |
| Sum squared resid | 9.25e+08 |  | S.E. of regression | 1019.856 |
| LSDV R-squared | 0.909123 |  | Within R-squared | 0.508162 |
| LSDV F(110, 889) | 80.84928 |  | P-value(F) | 0.000000 |
| Log-likelihood | −8287.527 |  | Akaike criterion | 16797.05 |
| Schwarz criterion | 17341.81 |  | Hannan-Quinn | 17004.10 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

Joint test on named regressors -

Test statistic: F(2, 889) = 456.517

with p-value = P(F(2, 889) > 456.517) = 3.98257e-137

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 79.814

with p-value = P(F(99, 889) > 79.814) = 0

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 5.49391

with p-value = 0.789305

**Inferences**

1.Fixed Entity effect is there

2.No time effect is there

**Sales8 Random Effect**

Model 29: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales8

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | −1236.10 | 3453.79 | −0.3579 | 0.7204 |  |
| AdvExpX1 | 2.64003 | 0.344282 | 7.668 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.90565 | 0.166464 | −29.47 | <0.0001 | \*\*\* |
| dt\_2 | 170.252 | 144.324 | 1.180 | 0.2381 |  |
| dt\_3 | −5.49961 | 144.177 | −0.03814 | 0.9696 |  |
| dt\_4 | 22.8674 | 144.124 | 0.1587 | 0.8739 |  |
| dt\_5 | 12.2895 | 144.115 | 0.08528 | 0.9320 |  |
| dt\_6 | 157.382 | 144.112 | 1.092 | 0.2748 |  |
| dt\_7 | 19.5504 | 144.247 | 0.1355 | 0.8922 |  |
| dt\_8 | 41.8495 | 144.102 | 0.2904 | 0.7715 |  |
| dt\_9 | 58.9598 | 144.220 | 0.4088 | 0.6827 |  |
| dt\_10 | −105.093 | 144.175 | −0.7289 | 0.4660 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 23196.75 |  | S.D. dependent var | 3191.387 |
| Sum squared resid | 9.14e+09 |  | S.E. of regression | 3040.793 |
| Log-likelihood | −9433.282 |  | Akaike criterion | 18890.56 |
| Schwarz criterion | 18949.46 |  | Hannan-Quinn | 18912.95 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

'Between' variance = 8.35196e+006

'Within' variance = 1.04011e+006

theta used for quasi-demeaning = 0.889093

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 915.576

with p-value = 1.53188e-199

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 5.50434

with p-value = 0.788317

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 3544.1

with p-value = 0

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.21336

with p-value = 0.898813

**Inferences**

1.No fixed time effect is there

2.Random entity effect is there

For Sales 8 best model is fixed effect model according to SIC

**Sales9 Pooled Regression**

Model 30: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales9

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −1381.81 | 5371.96 | −0.2572 | 0.7971 |  |
| AdvExpX1 | 2.68996 | 0.536968 | 5.010 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −5.08205 | 0.256859 | −19.79 | <0.0001 | \*\*\* |
| GDP\_GrowthRate | −16728.2 | 3265.27 | −5.123 | <0.0001 | \*\*\* |
| Size\_TA | 0.0935258 | 0.0125665 | 7.442 | <0.0001 | \*\*\* |
| Ownership\_Pub | −204.699 | 113.285 | −1.807 | 0.0711 | \* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22896.75 |  | S.D. dependent var | 2040.867 |
| Sum squared resid | 2.77e+09 |  | S.E. of regression | 1668.079 |
| R-squared | 0.335302 |  | Adjusted R-squared | 0.331958 |
| F(5, 994) | 100.2831 |  | P-value(F) | 1.14e-85 |
| Log-likelihood | −8835.357 |  | Akaike criterion | 17682.71 |
| Schwarz criterion | 17712.16 |  | Hannan-Quinn | 17693.91 |
| rho | 0.490544 |  | Durbin-Watson | 0.838912 |

**Inferences**

1.Regression is significant but p value very low.So bad model.

**Sales9 Fixed Effect**

Model 31: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales9

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −3839.44 | 3446.90 | −1.114 | 0.2656 |  |
| AdvExpX1 | 2.64540 | 0.344802 | 7.672 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.90633 | 0.166739 | −29.43 | <0.0001 | \*\*\* |
| dt\_2 | 670.158 | 144.455 | 4.639 | <0.0001 | \*\*\* |
| dt\_3 | 994.441 | 144.308 | 6.891 | <0.0001 | \*\*\* |
| dt\_4 | 1522.83 | 144.255 | 10.56 | <0.0001 | \*\*\* |
| dt\_5 | 2012.26 | 144.246 | 13.95 | <0.0001 | \*\*\* |
| dt\_6 | 2657.37 | 144.242 | 18.42 | <0.0001 | \*\*\* |
| dt\_7 | 3019.56 | 144.378 | 20.91 | <0.0001 | \*\*\* |
| dt\_8 | 3541.84 | 144.232 | 24.56 | <0.0001 | \*\*\* |
| dt\_9 | 4058.89 | 144.351 | 28.12 | <0.0001 | \*\*\* |
| dt\_10 | 4394.84 | 144.306 | 30.46 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22896.75 |  | S.D. dependent var | 2040.867 |
| Sum squared resid | 9.25e+08 |  | S.E. of regression | 1019.856 |
| LSDV R-squared | 0.777779 |  | Within R-squared | 0.766502 |
| LSDV F(110, 889) | 28.28660 |  | P-value(F) | 6.1e-224 |
| Log-likelihood | −8287.527 |  | Akaike criterion | 16797.05 |
| Schwarz criterion | 17341.81 |  | Hannan-Quinn | 17004.10 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

Joint test on named regressors -

Test statistic: F(2, 889) = 456.517

with p-value = P(F(2, 889) > 456.517) = 3.98257e-137

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 0.856569

with p-value = P(F(99, 889) > 0.856569) = 0.834305

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 1921.44

with p-value = 0

**Inferences**

1.No fixed enity effect is there

2.Fixed time dummies effect is there

**Sales9 Random Effect**

Model 32: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales9

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | −3372.87 | 3265.55 | −1.033 | 0.3017 |  |
| AdvExpX1 | 2.59892 | 0.326654 | 7.956 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.91106 | 0.156364 | −31.41 | <0.0001 | \*\*\* |
| dt\_2 | 671.230 | 143.392 | 4.681 | <0.0001 | \*\*\* |
| dt\_3 | 995.086 | 143.260 | 6.946 | <0.0001 | \*\*\* |
| dt\_4 | 1523.08 | 143.212 | 10.64 | <0.0001 | \*\*\* |
| dt\_5 | 2012.37 | 143.204 | 14.05 | <0.0001 | \*\*\* |
| dt\_6 | 2657.34 | 143.201 | 18.56 | <0.0001 | \*\*\* |
| dt\_7 | 3019.06 | 143.321 | 21.07 | <0.0001 | \*\*\* |
| dt\_8 | 3541.95 | 143.192 | 24.74 | <0.0001 | \*\*\* |
| dt\_9 | 4059.68 | 143.298 | 28.33 | <0.0001 | \*\*\* |
| dt\_10 | 4395.22 | 143.258 | 30.68 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 22896.75 |  | S.D. dependent var | 2040.867 |
| Sum squared resid | 1.01e+09 |  | S.E. of regression | 1011.989 |
| Log-likelihood | −8333.081 |  | Akaike criterion | 16690.16 |
| Schwarz criterion | 16749.06 |  | Hannan-Quinn | 16712.55 |
| rho | −0.159926 |  | Durbin-Watson | 2.110507 |

'Between' variance = 0

'Within' variance = 1.04011e+006

theta used for quasi-demeaning = 0

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 1036.35

with p-value = 9.12994e-226

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 1949.51

with p-value = 0

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 0.929936

with p-value = 0.33488

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.217844

with p-value = 0.8968

**Inferences**

1.Fixed Time Effect is there

2.Random entity effect has conflicting results so doiubtful zone.

For Sales 9 best model is random effect according to SIC

**Sales10 pooled regression**

Model 33: Pooled OLS, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales10

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | −5918.70 | 3506.62 | −1.688 | 0.0918 | \* |
| AdvExpX1 | 2.60279 | 0.350513 | 7.426 | <0.0001 | \*\*\* |
| NoOfDistrX2 | −4.84544 | 0.167668 | −28.90 | <0.0001 | \*\*\* |
| GDP\_GrowthRate | 1095.71 | 2131.45 | 0.5141 | 0.6073 |  |
| Size\_TA | 4.99649 | 0.00820295 | 609.1 | <0.0001 | \*\*\* |
| Ownership\_Pub | −187.726 | 73.9482 | −2.539 | 0.0113 | \*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 53182.77 |  | S.D. dependent var | 21280.04 |
| Sum squared resid | 1.18e+09 |  | S.E. of regression | 1088.862 |
| R-squared | 0.997395 |  | Adjusted R-squared | 0.997382 |
| F(5, 994) | 76113.46 |  | P-value(F) | 0.000000 |
| Log-likelihood | −8408.818 |  | Akaike criterion | 16829.64 |
| Schwarz criterion | 16859.08 |  | Hannan-Quinn | 16840.83 |
| rho | 0.061170 |  | Durbin-Watson | 1.684944 |

**Inferences**

1.Very high r2 and p value significant.So model is quite good.

**Sales10 Fixed Effect**

Model 34: Fixed-effects, using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales10

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *t-ratio* | *p-value* |  |
| const | 45326.3 | 13792.9 | 3.286 | 0.0011 | \*\*\* |
| AdvExpX1 | 0.00769885 | 1.37974 | 0.005580 | 0.9955 |  |
| NoOfDistrX2 | −4.60973 | 0.667211 | −6.909 | <0.0001 | \*\*\* |
| dt\_2 | 2225.91 | 578.043 | 3.851 | 0.0001 | \*\*\* |
| dt\_3 | 4254.29 | 577.455 | 7.367 | <0.0001 | \*\*\* |
| dt\_4 | 6537.05 | 577.241 | 11.32 | <0.0001 | \*\*\* |
| dt\_5 | 7516.34 | 577.205 | 13.02 | <0.0001 | \*\*\* |
| dt\_6 | 10255.0 | 577.192 | 17.77 | <0.0001 | \*\*\* |
| dt\_7 | 13139.0 | 577.733 | 22.74 | <0.0001 | \*\*\* |
| dt\_8 | 15191.6 | 577.151 | 26.32 | <0.0001 | \*\*\* |
| dt\_9 | 17494.5 | 577.625 | 30.29 | <0.0001 | \*\*\* |
| dt\_10 | 20075.3 | 577.445 | 34.77 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 53182.77 |  | S.D. dependent var | 21280.04 |
| Sum squared resid | 1.48e+10 |  | S.E. of regression | 4080.997 |
| LSDV R-squared | 0.967272 |  | Within R-squared | 0.737853 |
| LSDV F(110, 889) | 238.8546 |  | P-value(F) | 0.000000 |
| Log-likelihood | −9674.206 |  | Akaike criterion | 19570.41 |
| Schwarz criterion | 20115.17 |  | Hannan-Quinn | 19777.46 |
| rho | 0.841022 |  | Durbin-Watson | 0.254731 |

Joint test on named regressors -

Test statistic: F(2, 889) = 23.8836

with p-value = P(F(2, 889) > 23.8836) = 7.88024e-11

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(99, 889) = 240.114

with p-value = P(F(99, 889) > 240.114) = 0

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 2429.6

with p-value = 0

**Inferences**

1.Fixed Entity Effect is there

2.Fixed Time Effect is also there

**Sales10 Random Effect Model**

Model 35: Random-effects (GLS), using 1000 observations

Included 100 cross-sectional units

Time-series length = 10

Dependent variable: Sales10

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Coefficient* | *Std. Error* | *z* | *p-value* |  |
| const | 45427.9 | 13923.5 | 3.263 | 0.0011 | \*\*\* |
| AdvExpX1 | −0.00253823 | 1.37817 | −0.001842 | 0.9985 |  |
| NoOfDistrX2 | −4.60789 | 0.666422 | −6.914 | <0.0001 | \*\*\* |
| dt\_2 | 2226.08 | 577.502 | 3.855 | 0.0001 | \*\*\* |
| dt\_3 | 4254.40 | 576.914 | 7.374 | <0.0001 | \*\*\* |
| dt\_4 | 6537.13 | 576.700 | 11.34 | <0.0001 | \*\*\* |
| dt\_5 | 7516.40 | 576.665 | 13.03 | <0.0001 | \*\*\* |
| dt\_6 | 10255.0 | 576.651 | 17.78 | <0.0001 | \*\*\* |
| dt\_7 | 13139.0 | 577.192 | 22.76 | <0.0001 | \*\*\* |
| dt\_8 | 15191.7 | 576.611 | 26.35 | <0.0001 | \*\*\* |
| dt\_9 | 17494.7 | 577.084 | 30.32 | <0.0001 | \*\*\* |
| dt\_10 | 20075.4 | 576.905 | 34.80 | <0.0001 | \*\*\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean dependent var | 53182.77 |  | S.D. dependent var | 21280.04 |
| Sum squared resid | 4.11e+11 |  | S.E. of regression | 20379.64 |
| Log-likelihood | −11335.70 |  | Akaike criterion | 22695.40 |
| Schwarz criterion | 22754.29 |  | Hannan-Quinn | 22717.78 |
| rho | 0.841022 |  | Durbin-Watson | 0.254731 |

'Between' variance = 4.05901e+008

'Within' variance = 1.66545e+007

theta used for quasi-demeaning = 0.936076

Joint test on named regressors -

Asymptotic test statistic: Chi-square(2) = 47.8451

with p-value = 4.0791e-11

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(9) = 2434.16

with p-value = 0

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 4145.53

with p-value = 0

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(2) = 0.153325

with p-value = 0.926203

**Inferences**

1.Fixed time effect is there

2.Random entity effect is there

For Sales 10 best model is pooled regression according to SIC