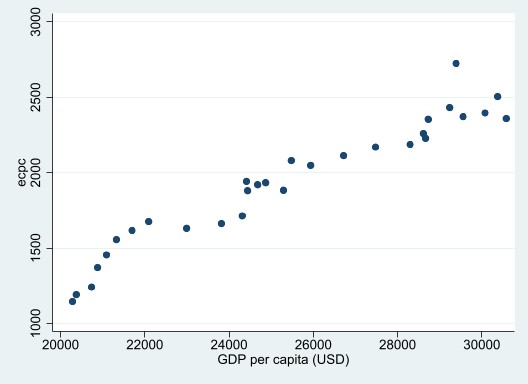
**ECON323 Assignment 2**

1)

The scatter plot above is presenting the relationship between per capita residential electricity demand and per capita income for France.

2)

When income increases by one percent, residential electricity demand increases by 3.07 percent in France for the years 1980 and 2009.

3) The functional form that we need to use is log-log regression since we try to analyze percentage changes in income and per capita residential electricity demand to calculate elasticity parameter.

One percent increase in income results in 1.64 percent increase in residential electricity demand for France. Number of observations is 30 (we observe 30 years) and R-squared equals to 0.9206. The model explains 92% of the dependent variable’s variation which indicates that our model has high explanatory power. For the statistical significance; since the t value is too high and P>|t| is 0, we can conclude that the elasticity parameter is statistically significant.

4) Log-Log regression model:

When electricity price increases by one percent, residential electricity demand increases by 0.6 percent in France. Number of observations is 30 (we observe 30 years) and R-squared equals to 0.3243. For just using one variable, this explanatory power can be considered as high because the model explains 32% of the dependent variable’s variation. P-value of this model is 0.001 which makes the parameter statistically significant for the usual significance levels.

5)

The p-value of lneprice is 0.169 and it is larger than 0.1 which is the maximum acceptable significance level. Thus, there is no price elasticity of electricity consumption. This insignificant result could be appeared because of the small number of observations or high standard error. Another possibility is the biasedness of the coefficient. Since we estimated linear regressions with small numbers of independent variables (price or income or both together), we might be neglecting several other factors that can affect the residential electricity consumption per capita and also correlated with the price. In that case, this coefficient is biased. The main problem about the elasticity calculations previously performed is the possibility that they might be biased since we did not consider other factors which can affect GDP and electricity price.

6)

|  |  |
| --- | --- |
|  | (1) |
| VARIABLES | lnecpc |
|  |  |
| lngdp | 0.532 |
|  | (0.457) |
| lneprice | 0.0328 |
|  | (0.0500) |
| lnhdd | 0.336\*\* |
|  | (0.150) |
| lncdd | 0.0832\*\*\* |
|  | (0.0200) |
| year | 0.0173\*\* |
|  | (0.00674) |
| Constant | -35.40\*\*\* |
|  | (8.767) |
|  |  |
| Observations | 30 |
| R-squared | 0.968 |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

By controlling for a linear time trend, heating and cooling requirements (to get more intuitive interpretation, log form of hdd and cdd is controlled), the multiple linear regression model is estimated as tabled above. One percent change in gdp increases residential electricity demand by 0.53 percent and one percent increase in electricity price increases residential electricity demand by 0.03 percent. The coefficients were decreased comparing the previous models because we included other parameters that affect gdp and ecpc (there are non-negligible correlations between the controlled parameters and gdp, ecpc). However, p-values of lngdp and lneprice are larger than all acceptable significance levels consequently, they are statistically insignificant.

7)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (Austria) | (Belgium) | (Denmark) | (Finland) | (France) | (Germany) |
| VARIABLES | lnecpc | lnecpc | lnecpc | lnecpc | lnecpc | lnecpc |
|  |  |  |  |  |  |  |
| lngdp | 2.588\*\* | 3.447\*\*\* | 1.676\*\*\* | -0.406 | 0.532 | -0.485 |
|  | (0.990) | (1.070) | (0.417) | (0.317) | (0.457) | (0.347) |
| lneprice | 0.235\*\* | -0.0377 | 0.209\*\* | -0.0343 | 0.0328 | 0.0269 |
|  | (0.0857) | (0.104) | (0.0990) | (0.0998) | (0.0500) | (0.0477) |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | (Greece) | (Ireland) | (Italy) | (Netherlands) | (Portugal) | (Spain) | (UK) |
|  | lnecpc | lnecpc | lnecpc | lnecpc | lnecpc | lnecpc | lnecpc |
|  |  |  |  |  |  |  |  |
| lngdp | -0.326\*\*\* | 0.450\*\*\* | 0.882\*\*\* | 0.820\*\*\* | 0.580\*\*\* | 0.432\*\* | 0.436\*\*\* |
|  | (0.115) | (0.0809) | (0.0999) | (0.192) | (0.110) | (0.195) | (0.154) |
| lneprice | -0.0643\* | 0.0153 | 0.0759\*\*\* | 0.0544\* | 0.0367 | -0.0273 | 0.0324 |
|  | (0.0341) | (0.0292) | (0.0235) | (0.0284) | (0.0331) | (0.0259) | (0.0276) |
|  |  |  |  |  |  |  | 0.297\*\* |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

When we repeat the model in question 6 for all countries separately, the income and price elasticities are estimated as in the table above.

If we consider only negative coefficients, Greece is the country with the highest price elasticity (-0.0643) and Spain has the lowest price elasticity (-0.0273).

8)

|  |  |
| --- | --- |
|  | (1) |
| VARIABLES | lnecpc |
|  |  |
| lngdp | 0.197\*\* |
|  | (0.0814) |
| lneprice | -0.180\*\*\* |
|  | (0.0399) |
| lnhdd | 0.839\*\*\* |
|  | (0.0390) |
| lncdd | 0.00485 |
|  | (0.00610) |
| year | 2.506\*\*\* |
|  | (0.599) |
| year2 | -0.000621\*\*\* |
|  | (0.000150) |
| Constant | -2,529\*\*\* |
|  | (597.2) |
|  |  |
| Observations | 390 |
| R-squared | 0.805 |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Basically, pooled linear regression models are applied to panel data which means if we use the whole data with including all years and different countries, our model becomes pooled multiple linear regression. According to the pooled multiple linear regression model for our full sample of EU countries, income elasticity is 0.197 and price elasticity equals to -0.180. To interpret, one percent increase of income increases residential electricity consumption by 0.197 percent and one percent increase of electricity price decreases the residential electricity consumption by 0.18 percent.

9)

|  |  |
| --- | --- |
|  | (1) |
| VARIABLES | lnecpc |
|  |  |
| lngdp | 0.326\*\*\* |
|  | (0.0820) |
| lneprice | -0.0757\*\* |
|  | (0.0304) |
| lnhdd | 0.273\*\*\* |
|  | (0.0978) |
| lncdd | -0.00448 |
|  | (0.00829) |
| year | 2.159\*\*\* |
|  | (0.376) |
| year2 | -0.000536\*\*\* |
|  | (9.42e-05) |
| 2.id | 0.270\*\*\* |
|  | (0.0403) |
| 4.id | 0.160\*\*\* |
|  | (0.0369) |
| 5.id | 0.518\*\*\* |
|  | (0.0590) |
| 6.id | 0.284\*\*\* |
|  | (0.0495) |
| 7.id | 0.0568\* |
|  | (0.0343) |
| 8.id | -0.105 |
|  | (0.0896) |
| 10.id | -0.0524 |
|  | (0.0652) |
| 11.id | -0.301\*\*\* |
|  | (0.0672) |
| 13.id | -0.211\*\*\* |
|  | (0.0410) |
| 16.id | -0.353\*\*\* |
|  | (0.115) |
| 19.id | -0.282\*\*\* |
|  | (0.0762) |
| 22.id | 0.151\*\*\* |
|  | (0.0392) |
| Constant | -2,171\*\*\* |
|  | (375.4) |
|  |  |
| Observations | 390 |
| R-squared | 0.927 |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

If we additionally consider the country-specific time-constat factors for the previous model, the obtained model becomes the one above. For our full sample of EU countries, this model estimates the income elasticity as 0.326 and price elasticity as -0.0757. One percent change in GDP leads 0.326 percent increase in the residential electricity demand and one percent change in electricity price leads 0.0757 percent decrease in the residential electricity demand.

10)

|  |  |
| --- | --- |
|  | (1) |
| VARIABLES | lnecpc |
|  |  |
| lngdp | 0.356\*\*\* |
|  | (0.0879) |
| lneprice | -0.205\*\*\* |
|  | (0.0488) |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The estimation of a pooled linear regression model (controlling for year-specific effects, heating and cooling requirement and country specific time-constant factors) shows the income and price elasticity of per capita residential electricity demand for our full sample of EU countries. The income elasticity is 0.356, one percent increase in income leads 0.356 percent increase in per capita residential electricity demand. The price elasticity equals to -0.205, one percent increase in electricity price causes 0.205 percent decrease in per capita residential electricity demand. In terms of significance, both coefficients have smaller p-values than 0.01 (see table) and hence they are statistically significant.

Based on the results, the estimated saving in residential electricity consumption is (20\*0.205) 4.1 percent as a result of a 20 percent increase in electricity prices in the EU.

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