**ECON613 HW2**

David Christian

**Reporting of Numbers, Outputs from R and Interpretation**

**Exercise 2: OLS**

* Correlation between Y and X1 = 0.214395.

How different is it from 1.2? Significant difference. Correlation isn’t the same as coefficient. Correlation could only take up a value of 0-1.

* Coefficients of OLS regression of Y on X where X=(1,X1,X2,X3)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 |
| OLS Coeff. | 2.46188824 | 1.22016690 | -0.89864211 | 0.07408614 |

* Calculate the standard errors of estimated coefficients:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 |
| Std. Error OLS | 0.040403101 | 0.017152761 | 0.002871315 | 0.021664003 |
| Std. Error B49 | 0.136032412 | 0.057630324 | 0.009806999 | 0.073001834 |
| Std. Error B499 | 0.13596917 | 0.05772607 | 0.00966345 | 0.07291236 |

**Exercise 3: Numerical Optimization**

* Probit parameters obtained from steepest ascent optimization algorithm

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 |
| Steepest Asc | 2.87558275 | 1.21847704 | -0.88665890 | 0.03748106 |
| True Param | 0.5 | 1.2 | -0.9 | 0.1 |

**Exercise 4: Discrete Choice**

* Comparison of coefficients obtained from pre-programmed optimization packages:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 |
| Probit | 2.91999344 | 1.21102642 | -0.89133655 | 0.03401492 |
| Logit | 5.1421674 | 2.1666104 | -1.5818825 | 0.0572931 |
| LPM | 6.343236e+24 | 1.020405e+26 | -2.173977e+26 | 9.898747e+25 |
| True Param | 0.5 | 1.2 | -0.9 | 0.1 |

* T-statistic and Significance of coefficients:

T-statistics obtained:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 |
| Probit | 55.626532 | 50.655525 | -220.758770 | 1.238825 |
| Logit | 61.553031 | 57.017328 | -244.580307 | 1.302973 |
| LPM | 0.5034963 | 1.7737433 | -2.4522613 | 1.8697457 |

Significant if t>1.96

* Interpretation from coefficients:

All we can conclude from the coefficients depend on their signs only, not their magnitude. Intercepts are positive in all models. Positive coefficients of B1, B3 show that the higher X1 and X3 are, the more likely it is that Y for individual i will be more than the sample average Y.

Meanwhile, negative coefficients of B2 show that the higher X2 is, the less likely it is that Y is going to lie above sample average Y.

In general, Probit coefficients are relatively closer to those of OLS and the true parameter, because both rely on normal distribution. Whereas Logit coefficients that rely on logistic distributions are not.

Intercepts, B1 and B2 are statistically significant across all models. We have enough evidence to conclude that variations of the values of X1 and X2 do significantly explain variation in ydum. Meanwhile, B3 isn’t significant statistically. We don’t have enough evidence to reject the hypothesis that B3 is statistically the same with zero.

**Exercise 5: Marginal Effects**

* Average marginal effect of X on Y

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 |
| Probit | 0.35025581 | 0.14526370 | -0.10691661 | 0.00408012 |
| Logit | 0.484609415 | 0.204186235 | -0.149080163 | 0.005399431 |

* Standard deviations / standard errors of marginal effects

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 |
| Probit – Delta Method | 0.004191249 | 0.007099756 | 0.003102693 | 0.003477847 |
| Probit – Bootstrap 49 | 0.0062965603 | 0.0028676773 | 0.0004843142 | 0.0032935396 |
| Logit – Delta Method | 0.010692756 | 0.004038257 | 0.008188363 | 0.005929016 |
| Logit – Bootstrap 49 | 0.0018477477 | 0.0005528921 | 0.0000944745 | 0.0006126259 |