Olympiad problem. Econometrics

Researcher John Smith estimated two models for Fertility using a data set on socio-economic indicators of Swizerland at about 1888 (47 observations):

|  |  |  |
| --- | --- | --- |
|  | Model 1 | Model 2 |
| (Intercept) | 60.304 (4.251) | 86.225 (4.735) |
| Agriculture | 0.194 (0.077) | -0.203 (0.071) |
| Catholic |  | 0.145 (0.030) |
| Education |  | -1.072 (0.156) |
| R^2 | 0.1 | 0.6 |
| RSS | 6283.1 | 2567.9 |

Fertility - (dependent variable) standardized female fertility measure, Agriculture - percentage of males involved in agriculture, Education - percentage of educated beyond primary school for draftees, Catholic - percentage of catholic people, (standard errors are in parenthesis).

Estimate of covariance matrix for Model 1:

|  |  |  |
| --- | --- | --- |
|  | (Intercept) | Agriculture |
| **(Intercept)** | 18.07 | -0.2981 |
| **Agriculture** | -0.2981 | 0.005885 |

1. [4 pts] Find a 95% confindence interval for coefficient before Agriculture in Model 2.
2. [6 pts] Using appropriate test compare the two models at 5% significance level. Clearly state the null and alternative hypothesis.
3. [10 pts] Find 95% predictive interval for fertility in Model 1 for a region with 50% of males involved in agriculture as occupation.

Solution:

Arithmetics errors cost [-1 pt] for each error.

Part 1.

General formula for confidence interval [+3 pts]:

Critical value : either approximate (2) or from statistical table for (2.0167) or for (1.96) --- all are considered correct [+1 pt]

Final answer (considered correct if two decimal digits after point coincide): [-0.34; -0.06]

Part 2.

Statement of hyphothesis: [1 pt]:

: Model 1 is true OR ()

: Model 1 is false, but Model 2 is true OR (at least one of or is not equal to zero)

Observed value of F-statistic [3 pts]

Critical value for F-statistic [1 pt]

Statistical conclusion [1 pt]

is rejected.

Part 3.

Point prediction: [+1 pt]

Estimation of standard error of regression : [+2 pts]

Formula for estimate of variance of forecast: [+2 pts]

Formula for estimate of forecast variance [+2 pts]

Formula for predictive interval [+2 pts]

Critical value of t-statistic: either approximate (2) or from statistical table for (2.0141) or for (1.96) - all are considered correct [+1 pt]

Final answer: [46; 94] (plus-minus 1 is considered ok)