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Activity 4, 20 Marks  
DANA 4820  
Fall 2023, Due: Dec 1  
Please include your RStudio output to support your answers

**Question**

the Credit data file at the text website, shows data for a sample of 100 adults randomly selected for an Italian study on the relation between x = annual income and y = whether you have a travel credit card (1 = yes, 0 = no). At each level of x (in thousands of euros), the table indicates the number of subjects in the sample and the number of those having at least one travel credit card.

1. Report the prediction equation and interpret the sign of βˆ.

A screenshot of a computer

Description automatically generated

->Logit[P(Y=1)] = -3.51 + 0.10\*Income(x)

For Income:

The estimated odds for having a travel credit card for 1 thousand euros increase in annual income is increased by a factor of exp(βˆ(0.10541)) equals 1.11. With positive sign the relationship between travel credit card and income will increase.

b) When P (Y ˆ= 1) = 0.50, show that the estimated logit value is 0. Based on this, for these data explain why the estimated probability of a travel credit card is 0.50 at income = 33.4 thousand euros.

->For P (Y ˆ= 1) = 0.50,

->Logit(0.50)=log(0.50/1-0.50)

->Logit(0.50)=log(0.50/0.50)=log(1)=0

Hence, the estimated logit value at P (Y ˆ= 1) = 0.50 is 0.

-> when π(x) = 0.50

->log( 0.5/1−.5 ) = log(1) = 0 = α + βx

->x = − α/β=-(-3.51/0.1054)=33.4 thousand euros.

c) Use the logistic output to interpret the effect of income on the odds of possessing a travel credit card, and conduct a significance test and a confidence interval for that effect.

Interpretation:

For Income:

The estimated odds for having a travel credit card for 1 thousand euros increase in annual income is increased by a factor of exp(βˆ(0.10541)) equals 1.11.

Significance test:

H0 (Null hypothesis): β0=0

Ha (Alternate hypothesis): β0! =0

A test results with a white background

Description automatically generated with medium confidence

With chisq statistic of 26.594 and Df=1, chisq p-value of 2.51e-07 < 0.05, at 5% level of significance, we reject null hypothesis and estimate that income is significant in predicting travel credit card from the model.

Confidence Interval:

A close-up of numbers

Description automatically generated

For the model above, we are 95% confident that the interval for income on predicting travel credit card is between (0.059,0.162).