SCM 651 Business Analytics

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1. Perform a logit and probit analysis of the variables that affect whether a customer takes out a loan. Consider only main effects. Which variables are significant? How do the significant variables influence the likelihood of taking out a loan?

*Logit*



*Probit*



After performing a logit and probit analysis, it was determined that Income, Family, CCAvg, Education, SecuritiesAccount, CDAccount, Online, and CreditCard are significant.

**Income** – As the income of a person increases, so will the likelihood the person will take out a loan.

**Family** – As the amount of family members increase, so will the likelihood the person will take out a loan.

**CCAvg** – As CCAvg increases, so will the likelihood of a person taking out a loan.

**Education** – The more educated a person is, the more likely they will take out a loan.

**Securities Account** – If the person has a securities account, they are less likely to take out a loan.

**CDAccount** – If the person has a CD account, they are more likely to take out a loan.

**Online** – If the person has internet banking facilities, they are less likely to take out a loan.

**CreditCard** – If the person has a credit card issued by the bank, they are less likely to take out a loan.

1. Add moderating effects (interactions of variables). Which interactions make sense conceptually? Which interactions are statistically significant? How do you interpret the coefficients on these variables?



The interactions that make the most sense conceptually are family and credit card. For example if a person has a larger family, they might need more money to support their family. Therefore, they will be more likely to take out a loan. Additionally, if a person has a credit card they are less likely to take out a loan because they already have a credit line so they would not need additional funds to borrow. All of these interactions in the snippet above are statistically significant in the analysis. If a coefficient is positive, it is directly proportional to the probability of a person taking out a loan. If the coefficient is negative it is inversely proportional to the probability of a person taking out a loan. The only exception for the snippet above is income and family and this is due to the moderating effects. As one can see the coefficient for Income:Eduction is positive, this means as income and education increase, so will the probability of this person deciding to take out a loan.

1. Create a final regression model with the variables that you feel are important (both main effects and interaction terms). Create a spreadsheet prediction of the model. Which variables have the greatest influence on the customers’ loan behavior (combined main effects and interaction effects)? Perform a sensitivity analysis as seen earlier in the semester.



The two variables that have the greatest influence on a customer deciding to take out a loan are income and education. As one can see in the sensitivity analysis above, when analyzing income and credit card, income has a great influence on that person deciding to take out a loan. For example, as income increases the probability of a person deciding to take out a loan is still increasing whether a person has a credit card or not. Additionally, as income gets higher the probabilities of a person taking out a loan whether they have a credit card or do not have a credit card get closer and closer until at income of $200,000 the probability of that person taking out a loan is 100% whether they have a credit card or not. When analyzing income and education, one can see both of these inputs have a great influence. For example, we know income has a strong influence by itself based on looking at the probability increase from left to right in all three education categories. But education also has a strong influence because if one looks at the income of $120,000, they will see the large differences in probability based on their education level.

1. Perform a neural network analysis of the variables found to be significant in the logit and probit analysis above.





1. Create a prediction model of the neural network. Using the prediction model, perform a sensitivity analysis for the neural network model similar to the logit and probit sensitivity analysis.











