COMMERCIAL BANKING, CORP

REQUEST FOR PROPOSAL
RFP #: IP – F1.H3

TITLE: BANKING INSURANCE PRODUCT – PHASE 3
CLOSING DATE AND TIME: SEPTEMBER 26. 2019 @ 5:00 PM

Banking Insurance Product – Phase 3: IP – F1.H3

Purpose

By responding to this Request for Proposal (RFP), the Proposer agrees that s/he has read and understood all documents within this RFP package.

Submission Details

Responders to this RFP should supply:

- A business report **up to 4 pages** (not including cover page, table of contents, or any needed appendix), including any supporting plots and tables.
- The commented code used to produce the results.

The report should address **all points described in the "Objective" section** below.

The report should be returned in the following way:

- Electronic (mailto: Aric_LaBarr@ncsu.edu; Subject Line: Banking Insurance Product – Phase 3)

Background

The Commercial Banking Corporation (hereafter the "Bank"), acting by and through its department of *Customer Services and New Products* is seeking proposals for banking services. The Bank ultimately wants to predict which customers will buy a variable rate annuity product.

A variable annuity is a contract between you and an insurance company / bank, under which the insurer agrees to make periodic payments to you, beginning either immediately or at some future date. You purchase a variable annuity contract by making either a single purchase payment or a series of purchase payments.

A variable annuity offers a range of investment options. The value of your investment as a variable annuity owner will vary depending on the performance of the investment options you choose. The investment options for a variable annuity are typically mutual funds that invest in stocks, bonds, money market instruments, or some combination of the three. If you are interested in more information, see: http://www.sec.gov/investor/pubs/varannty.htm

The project will be broken down into 3 phases:

- Phase 1 – Variable Understanding and Assumptions
- Phase 2 – Variable Selection and Modeling Building
- Phase 3 – Model Assessment and Prediction

Objective

The scope of services in this phase includes the following:

- For this phase use **only** the binned data sets (both training and validation will be needed).

- Report the variables used in your final logistic regression model to predict the purchase of the new insurance product.
    - (HINT: Feel free to use the final model you had from the previous report or build a whole new model if you are not satisfied with your previous one. If building a new model, detail the process you took for variable selection.)
    - Rank each of the variables by p-value.
- Report and interpret the following probability metrics for your model on **training data**.
    - Concordance percentage.
    - Discrimination slope – provide the coefficient of discrimination as well as a visual representation through histograms.
- Report and interpret the following classification metrics for your model on **training data**.
    - Visually show the ROC curve.
        - (HINT: Although this is one of the **only** times I will allow SAS output in a report, make sure the axes and title are well labeled.)
    - K-S Statistic. The Bank currently uses the K-S statistic to choose the threshold for classification but are open to other methods as long as they are documented in the report and defended.
- Report and interpret the following classification metrics for your model on **validation data.**
    - Display your final confusion matrix.
    - Accuracy.
    - Lift – add a visual to help show the model performance.
- (HINT: These steps are here to help you build your model, but **not** to tell you which order to write your report. Consider the most important information when done with these questions and write your report accordingly.)

Data Provided

The following two sets of data are provided for the proposal:

- The training data set **insurance_t_bin** contains 8,495 observations and 47 variables.
    - All of these customers have been offered the product in the data set under the variable **INS**, which takes a value of 1 if they bought and 0 if they did not buy.
    - There are 46 variables describing the customer's attributes **before** they were offered the new insurance product.
    - The Bank has strategically binned each of the continuous variables in the data set to help facilitate any further analysis.
        - (HINT: The original **insurance_t** and the new **insurance_t_bin** can be 1:1 row matched in case you wanted to know where the bins were split on.)
- The validation data set **insurance_v_bin** contains 2,124 observations and 47 variables.
- The table below describes the Roles and Description of the variables found in both data sets.
- (HINT: If you are using R, use the `haven` package and the `read_sas()` function to open the `.sas7bdat` files.

Name	*Model Role*	*Description*
ACCTAGE	Input	Age of oldest account
DDA	Input	Indicator for checking account
DDABAL	Input	Checking account balance
DEPAMT	Input	Total amount deposited
CASHBK	Input	Number of cash back requests
CHECKS	Input	Number of checks written
DIRDEP	Input	Indicator for direct deposit
NSF	Input	Number of insufficient fund issues
NSFAMT	Input	Amount of NSF
PHONE	Input	Number of telephone banking interactions
TELLER	Input	Number of teller visit interactions
SAV	Input	Indicator for savings account
SAVBAL	Input	Savings account balance
ATM	Input	Indicator for ATM interaction
ATMAMT	Input	Total ATM withdrawal amount
POS	Input	Number of point of sale interactions
POSAMT	Input	Total amount for point of sale interactions
CD	Input	Indicator for certificate of deposit account
CDBAL	Input	CD balance
IRA	Input	Indicator for retirement account
IRABAL	Input	IRA balance
LOC	Input	Indicator for line of credit
LOCBAL	Input	LOC balance
INV	Input	Indicator for investment account
INVBAL	Input	INV balance
ILS	Input	Indicator for installment loan
ILSBAL	Input	ILS balance
MM	Input	Indicator for money market account
MMBAL	Input	MM balance
MMCRED	Input	Number of money market credits
MTG	Input	Indicator for mortgage
MTGBAL	Input	MTG balance
CC	Input	Indicator for credit card
CCBAL	Input	CC balance
CCPURC	Input	Number of credit card purchases
SDB	Input	Indicator for safety deposit box
INCOME	Input	Income
HMOWN	Input	Indicator for home ownership
LORES	Input	Length of residence in years
HMVAL	Input	Value of home
AGE	Input	Age

CRSCORE	Input	Credit score
MOVED	Input	Recent address change
INAREA	Input	Indicator for local address
INS	Target	Indicator for purchase of insurance product
BRANCH	Input	Branch of bank
RES	Input	Area classification