

COMMERCIAL BANKING, CORP

REQUEST FOR PROPOSAL RFP #: IP - F1.H1

TITLE: BANKING INSURANCE PRODUCT - PHASE 1

CLOSING DATE AND TIME: SEPTEMBER 1. 2022 @ 5:00 PM

Banking Insurance Product – Phase 1: IP – F1.H1

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 (submit via Moodle)

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 - Phase 1

The scope of services in this phase includes the following:

• For this phase use **only** the training data set.

Can't do this using just logistic regression models one by one - that only works for continuous predictors

For the binary and ordinal predictors, we will use mantel-haenzsel test instead (test of linear relationship between two ordinal variables)

For nominal predictors we will use Pearson's Chi Square test (test of linear relationship between any two categorical variables)

Make 4 separate tables - one for each data type - with the var name, p-value, and variable type (this variable will be the same for the entire table). This will be the table for the appendix, and from this we can filter only those below the alpha level to get the final table

- Explore the predictor variables **individually** with the target variable of whether the customer bought the insurance product.
 - O Summarize **only the significant variables** in a table ranking from most significant to least significant the Bank currently uses $\alpha=0.002$, but is open to another if you defend your reason.
 - This table should separate out the four possible classes of variables binary, ordinal, nominal, continuous.
 - (HINT: Explore the predictor variables individually for now since you have not yet accounted for missing values.)
 - (HINT: The downside to software sometimes is displaying a full p-value for ranking. That doesn't mean you cannot get them through the right commands.
 As long as you have the same degrees of freedom you can rank on test statistic as well.)
 - o In an appendix, include a table with **all** of the variables ranked by significance.
- Provide a table of odds ratios for **only binary predictor variables** in relation to the target variable.
 - Rank these odds ratios by magnitude.
 - Interpret only the highest magnitude odds ratio.
 - Report on any interesting findings.
 - (HINT: This is open-ended and has no correct answer. However, you should get use to keeping an eye out for what you might deem important or interesting when exploring data to report in an executive summary.)
- Provide a summary of results around the linearity assumption of continuous variables.
 - List both which variables meet and do not meet the needed assumption for continuous variables.
 - (HINT: Do not get overly mathematical here. Just report what you find; do not teach.)
- Provide a summary of important data considerations as follows:
 - Visual representation of which variables have the highest (defined by you for now) amount of missing values.
 - List any combinations of variables that you feel have redundant information so the Bank might consider removing them in the future.
 - (HINT: This is open-ended and has no correct answer. For example, presence of a money market account and money market balance.)
 - Report on any interesting findings.
 - (HINT: This is open-ended and has no correct answer. However, you should get use to keeping an eye out for what you might deem important or interesting when exploring data to report in an executive summary. For example, teller visits as well as other variables might represent human contact with the bank as compared to only online contact.)

Data Provided

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

- The training data set **insurance_t** contains 8,495 observations and 48 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 47 variables describing the customer's attributes before they were offered the new insurance product.
- The validation data set **insurance_v** contains 2,124 observations and 48 variables.
- The table below describes the Roles and Description of the variables found in both data sets.
 - Except for Branch of Bank, consider anything with more than 10 distinct values as continuous.

ACCTAGE DDA Input Indicator for checking account DDABAL DEP Input Checking account balance DEP Input Checking deposits DEPAMT Input Number of cash back requests CHECKS Input Indicator for direct deposit NSF Input Number of insufficient fund issues NSFAMT Input Number of telephone banking interactions Input Indicator for savings account SAVBAL Input Savings account balance ATM Input Indicator for aTM interaction Input Indicator for all interactions Input Number of telephone banking interactions Input Indicator for savings account SAVBAL Input Savings account balance ATM Input Indicator for ATM interaction Input Number of point of sale interactions Input Number of point of sale interactions POSAMT Input Total ATM withdrawal amount POS Input Number of point of sale interactions CD Input Indicator for retirement account IRA Input Indicator for retirement account IRABAL Input Indicator for line of credit LOCBAL Input Indicator for line of credit LOCBAL Input Indicator for investment account INV Input Indicator for investment account INVBAL Input Indicator for investment account INVBAL Input Indicator for investment account INVBAL Input Indicator for money market credits Input Indicator for m	Name	Model Role	Description
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	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