**MULTIVARIATE ANALYSIS ASSIGNMENT 1**

# **TEAM INFORMATION**

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# **DESCRIPTION**

The project we are going to analyze is about the effect of a marketing campaign of a commercial bank in Portugal. This campaign is about promoting the sales of the banks’ term deposits. We want to know what influences client’s decisions about buying term deposits. In this analysis, the factor we are looking at is what key factor captures client’s decisions. And there are bunch of other factors affecting this decision from various respects. To specify these factors, we hereby propose our hypothesis below.

Hypothesis 1: We assume that clients’ characteristics is relevant to the decision of buying term deposits.

Hypothesis 2: We assume that clients’ previous contacts are relevant to the decision of buying term deposits.

Hypothesis 3: We assume that the performance of markets is relevant to the decision of buying term deposits.

# **SPAP ANALYSIS**

Based on these hypothesizes above, we start presenting our SPAP analysis.

1. S.M.A.R.T Goal:

Determine clients’ decisions of buying term deposits from a bank

2. Measures of the dependent variable:

1. The binary variable that shows whether a client subscribes to a term deposit. (Data.world database, binary values summed by dates) Based on which, we calculate the ratio of 1 (yes to the term deposit).
2. The binary variable that shows whether a client subscribe a term deposit. (Data.world database, binary values summed by names of clients) Based on which, we calculate the ratio of 1 (yes to the term deposit).
3. The binary variable that shows whether a client subscribe a term deposit. (Data.world database, binary values summed by names of deposit products) Based on which, we calculate the ratio of 1 (yes to the term deposit).

3. Propose potential aspects for independent variables:

* 1. Do clients’ characteristics influence their decisions of buying term deposits?
  2. Do clients’ previous contacts influence their decisions of buying term deposits?
  3. Does the performance of market influence their decisions of buying term deposits?

4. Determine independent variables:

1. From hypothesis 1 and the first question above, we can see that independent variables may contain age, type of job, marital status, default record, ongoing housing loan, ongoing personal loan, and education level.
2. From hypothesis 2 and the second question above, we can see that independent variables may contain number of days that passed by after the client was last contacted from a previous campaign, contact communication type, last contact month of year, last contact duration, number of contacts both before and during the campaign, and outcome of previous campaign on clients.
3. From hypothesis 3 and the third question above, we can see that independent variables may contain employment variation rate, consumer price index, consumer confidence index, EUIRBOR 3-month rate, and number of employees.

5. Evaluate the accessibility of the data:

We know the location: consumer price index, consumer confidence index, EUIRBOR 3-month rate, last contact month of year, number of days that passed by after the client was last contacted from a previous campaign, number of contacts both before and during the campaign, age, type of job, marital status, default record, ongoing housing loan, ongoing personal loan

We only know the existence: number of employees, contact communication type, outcome of previous campaign on clients,

The existence is unclear: employment variation rate, last contact duration, education level

6. For independent variables that the locations are known, here are the table of primitive analysis:

|  |  |  |  |
| --- | --- | --- | --- |
| independent variable | chart type | x-axis | y-axis |
| consumer price index | line | consumer price index | ratios of 1 (Yes) from decisions |
| consumer confidence index | line | consumer confidence index | ratios of 1 (Yes) from decisions |
| EUIRBOR 3 | line | EUIRBOR 3 | ratios of 1 (Yes) from decisions |
| last contact month of year | bar | last contact month of year | ratios of 1 (Yes) from decisions |
| Number of days that passed by after the client was last contacted from a previous campaign | line | Number of days that passed by after the client was last contacted from a previous campaign | ratios of 1 (Yes) from decisions |
| Number of contacts both before and during the campaign | bar | Number of contacts both before and during the campaign | ratios of 1 (Yes) from decisions |
| age | bar | age | ratios of 1 (Yes) from decisions |
| type of job | bar | type of job | ratios of 1 (Yes) from decisions |
| marital status | bar | marital status | ratios of 1 (Yes) from decisions |
| default record | bar | number of defaults | ratios of 1 (Yes) from decisions |
| ongoing housing loan | bar | number of housing loans | ratios of 1 (Yes) from decisions |
| ongoing personal loan | bar | number of personal loans | ratios of 1 (Yes) from decisions |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **TABLE** | **COLUMN** | **DATA TYPE** | **REQUIRED** | **SENSITIVE** | **VALUES** | **DESCRIPTION** |
| Bank | Age | Numeric |  |  |  |  |
| Bank | Job | Categorical |  |  | Admin Blue-Collar Entrepreneur Housemaid Management Retired Self-Employed  Services Student Technician Unemployed Unknown | Type of job |
| Bank | Marital | Categorical |  |  | Divorced Married Single Unknown | Divorced also covers widowed |
| Bank | Education | Categorical |  |  | Primary Secondary Tertiary |  |
| Bank | Default | Categorical |  |  | No Yes Unknown | Has credit in default? |
| Bank | Balance |  |  |  |  |  |
| Bank | Housing | Categorical |  |  | No Yes Unknown | Has housing loan? |
| Bank | Loan | Categorical |  |  | No Yes Unknown | Has personal loan? |
| Bank | Contact | Categorical |  |  | Cellular Telephone | Contact Communication Type |
| Bank | Day | Categorical |  |  | Mon Tue Wed Thu Fri | Last contact day of the week |
| Bank | Month | Categorical |  |  | Jan Feb Mar  Apr May Jun Jul Aug Sep Oct Nov Dec | Last contact month of year |
| Bank | Duration | Numeric |  |  |  | Last contact duration in seconds |
| Bank | Campaign | Numeric |  |  |  | Number of contacts performed during this campaign and for this client |
| Bank | Pdays | Numeric |  |  |  | Number of days that passed by after the client was last contacted from a previous campaign \* 999 means client was not previously contacted |
| Bank | Previous | Numeric |  |  |  | Number of contacts performed before this campaign and for this client |
| Bank | Poutcome | Categorical |  |  | Failure Nonexistent Success | Outcome of the previous marketing campaign |
| Bank | y | Binary |  |  | Yes No | Has the client subscribed a term deposit |
| Bank Additional | Emp\_var\_rate |  |  |  |  | Quarterly indicator pf employment variation rate |
| Bank Additional | Cons\_price\_idx |  |  |  |  | Consumer price index - monthly indicator |
| Bank Additional | Cons\_conf\_idx |  |  |  |  | Consumer confidence index - monthly indicator |
| Bank Additional | |  | | --- | | euribor3m | |  |  |  |  | Euribor 3 month rate - daily indicator |
| Bank Additional | Nr\_employed |  |  |  |  | Number of employees - quarterly indicator |