



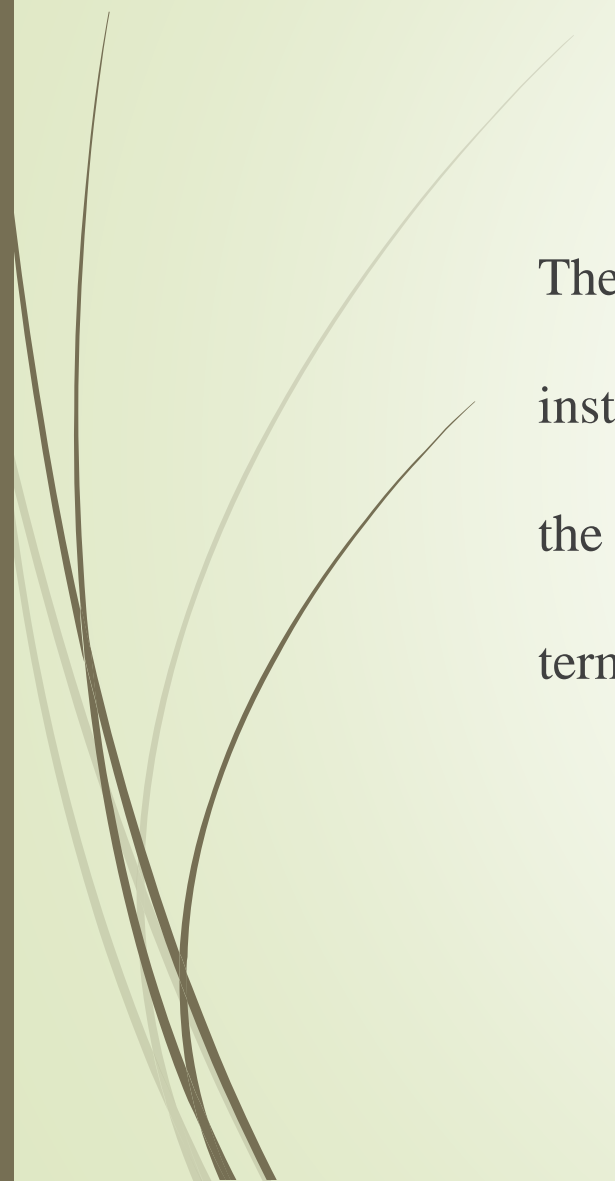
Capstone Project Bank Marketing

Data Analytics Bootcamp

Done by Fong Wai Ling Winnie



Problem Statement



The data is related with direct marketing campaigns of a Portuguese banking institution. The marketing campaigns were based on phone calls. This is to analyze the effectiveness of the campaign through phone calls and access if the product (bank term deposit) would be ('yes') or not ('no') subscribed.



What is a term deposit

A term deposit is a fixed-term investment that includes the deposit of money into an account at a financial institution. Term deposit investments usually range from one month to a few years and will have varying levels of required minimum deposits.

The investor must understand when buying a term deposit, they can only withdraw their funds after the term ends. In some cases, the bank may allow the investor for early termination or withdrawal, however there will be a penalty assessed for early termination.

<https://www.investopedia.com/terms/t/termdeposit.asp>




Dataset

This dataset is downloaded from UC Irvine Machine Learning Repository. It contains data of 41,188 and 20 inputs, ordered by date (from May 2008 to November 2010)

<https://archive.ics.uci.edu/dataset/222/bank+marketing>



Dataset – *Client data*



Variable	Description
Age	Client age
Job	Type of job
Marital	Marital status
Education	Education level
Default	Has credit in default?
Housing	Has housing loan?
Loan	Has personal loan?



Dataset – *related with the last contact of the current campaign*

Variable	Description
Contact	Contact communication type
Month	Last contact month of year
Day_of_week	Last contact day of the week



Dataset – *Other attributes*

Variable	Description
Campaign	Number of contacts performed during this campaign and for this client
Pdays	Number of days that passed by after the client was last contacted from a previous campaign (999 means client was not previously contacted)
Previous	Number of contacts performed before this campaign and for this client
Poutcome	Outcome of the previous marketing campaign

Dataset – *Social and economic context attributes*

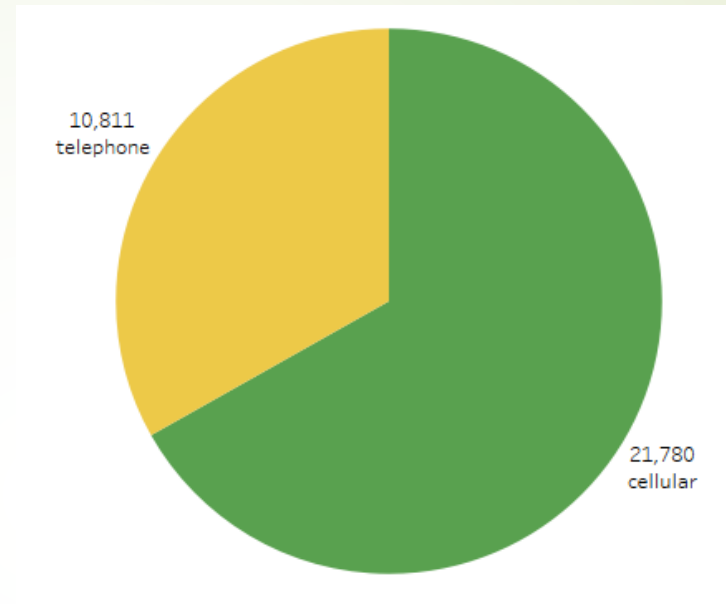
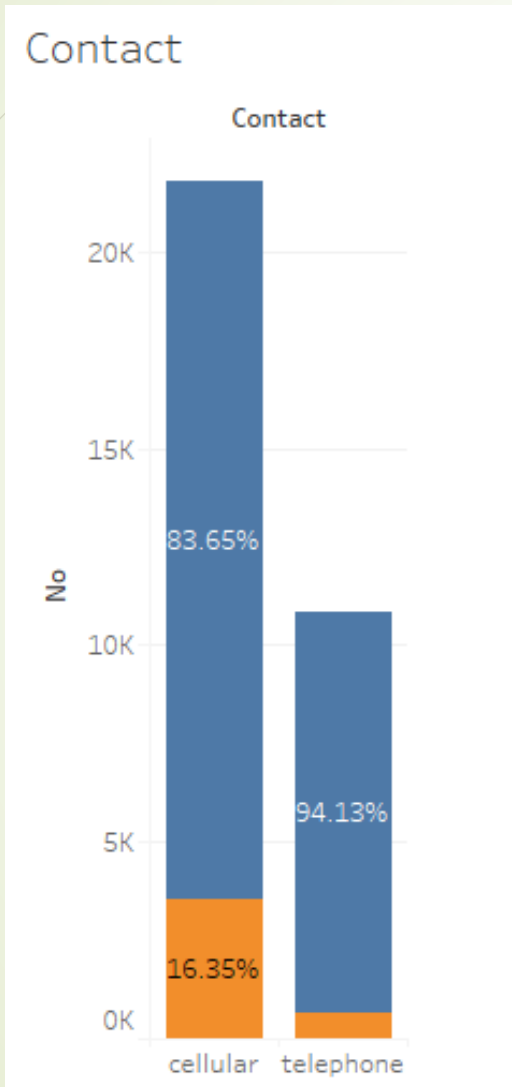
Variable	Description
Emp.var.rate	Employment variation rate (quarterly indicator)
Cons.price.idx	Consumer price index (monthly indicator)
Cons.conf.idx	Consumer confidence index (daily indicator)
Euribor3	Euribor 3 month rate (daily indicator)
Nr.employed	Number of employees (quarterly indicator)
y	Has the client subscribed a term deposit? (binary: Yes, No)

Data Preparation

- From dataset description, it was noted that the duration attribute highly affects the output target (e.g., if duration=0 then y="no"). Yet, the duration is not known before a call is performed. Also, after the end of the call y is obviously known. This input is only for benchmark purposes, therefore we will exclude the duration attribute in the analysis.
- There are also several missing values in some categorical attributes, all coded with the "unknown" label. We will remove those data that might affect client decision in getting the bank term deposit. Dataset has been reduced to 32,591.
- I have also included one more column and named it as “No” so that it is easier to work out the visualization charts in tableau.

age	job	marital	educati	default	housing	loan	contact	month	day_of	duration	campai	pdays	previous	outcome	emp.va	cons.pr	cons.cc	euribor
55	unknown	married	university	unknown	unknown	unknown	telephone	may	mon	362	1	999	0	nonexistent	1.1	93.994	-36.4	4.857
51	blue-colla	married	basic.4y	unknown	unknown	unknown	telephone	may	mon	212	1	999	0	nonexistent	1.1	93.994	-36.4	4.857
59	managem	married	basic.4y	unknown	unknown	unknown	telephone	may	tue	437	1	999	0	nonexistent	1.1	93.994	-36.4	4.857
48	services	married	high.scho	unknown	unknown	unknown	telephone	may	tue	152	1	999	0	nonexistent	1.1	93.994	-36.4	4.857
42	techniciar	single	professio	unknown	unknown	unknown	telephone	may	tue	529	1	999	0	nonexistent	1.1	93.994	-36.4	4.857
32	admin.	single	university	unknown	unknown	unknown	telephone	may	tue	49	1	999	0	nonexistent	1.1	93.994	-36.4	4.857
31	services	married	high.scho	unknown	unknown	unknown	telephone	may	tue	374	1	999	0	nonexistent	1.1	93.994	-36.4	4.857
40	managem	married	basic.9y	unknown	unknown	unknown	telephone	may	tue	427	1	999	0	nonexistent	1.1	93.994	-36.4	4.857
50	blue-colla	married	basic.4y	unknown	unknown	unknown	telephone	may	tue	153	1	999	0	nonexistent	1.1	93.994	-36.4	4.857

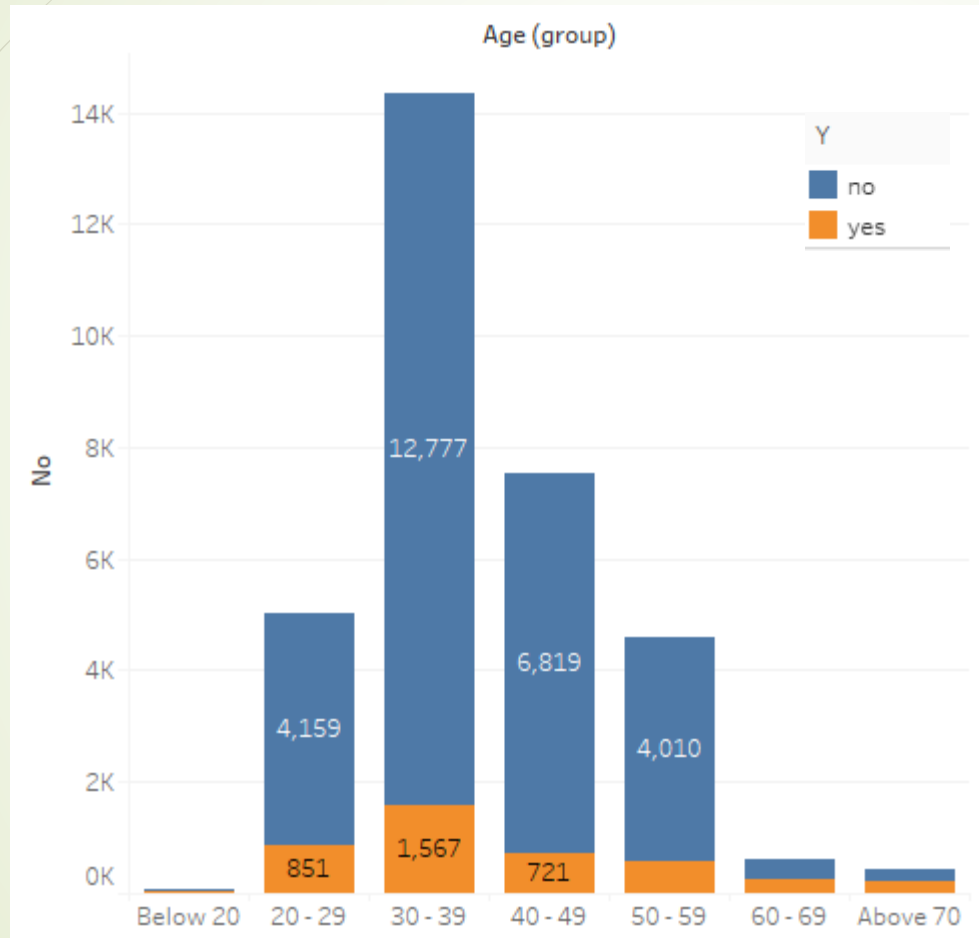
Contact – Cellular and Telephone



Most clients can be contact through cellular. Out of 21,780, only 3,562 or 16.35% of the clients will subscribe for term deposit.

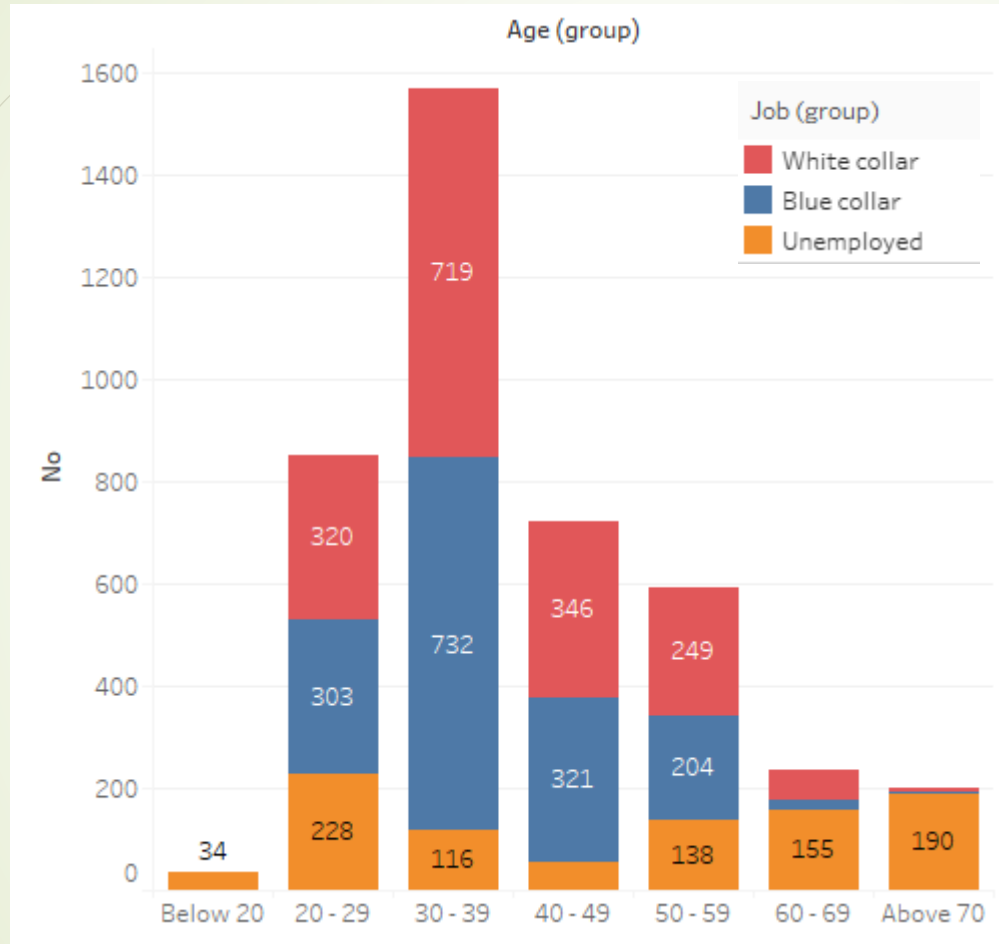
10,811 clients can be contacted through phone, only 635 or 5.77% will subscribe for term deposit.

Age Group



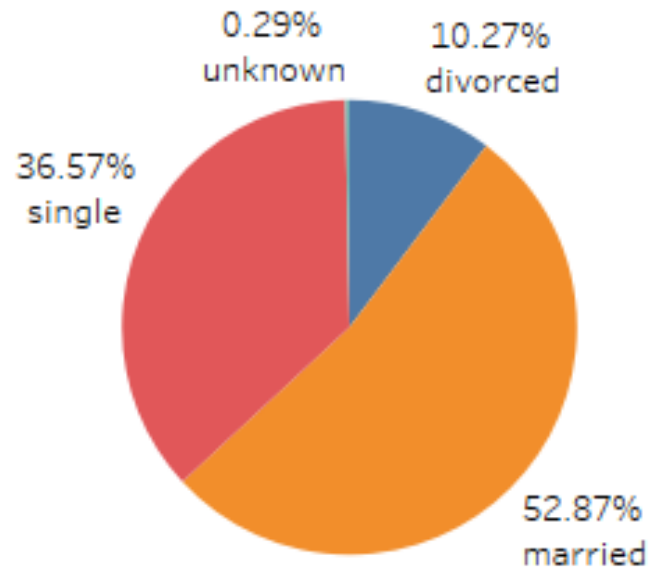
- In this campaign, majority of the client's age are between 20 to 59.
- Especially for clients between 30 – 39 years old, where majority should be working adult and will have more savings as compared to those below 30.
- From this chart, we can see that there are more clients (1,567) will subscribe for term deposit as compared to other age group

Age by Job



- This is the breakdown by age group and by the type of jobs of the clients who subscribe for term deposit.
- Client age group between 30 – 39, 719 are from white collar, 732 are from blue collar and 116 are unemployed that make up the total of 1,567.
- This means that 92.6% of the clients are employed and working

Marital Status



- This chart is to see if client marital will affect their decision in subscribing the term deposit
- Majority of the clients are married and will want to subscribe for term deposit
- Followed by 36.57% of the clients who are single

Age by Job and Education

Job (group)	Education (group)	Age (group)							Grand Total
		Below 20	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	Above 70	
White collar	Bachelors and Above		202	542	210	170	32	1	1,157
	Below Bachelors		108	171	120	63	18	3	483
	Not Educated		10	6	16	16	7	2	57
Blue collar	Bachelors and Above		139	376	130	78	9		732
	Below Bachelors		151	339	173	122	7	1	793
	Not Educated		13	17	18	4	7	1	60
Unemployed	Bachelors and Above		52	55	19	38	52	39	255
	Below Bachelors	18	151	46	26	92	92	129	554
	Not Educated	16	25	15	9	8	11	22	106
Grand Total		34	851	1,567	721	591	235	198	4,197

- This is a further breakdown for those who subscribe for term deposit by age group, by job and education level
- White collar and blue collar job with bachelors and above shows that they will tend to subscribe for term deposit as compared to those with below bachelors.
- Probably was due to these group of clients have higher income and thus more savings that allow them to keep some savings in term deposit.

Default, Housing and Personal Loan

Default	Housing	Loan	
yes	no	no	2
	yes	no	1

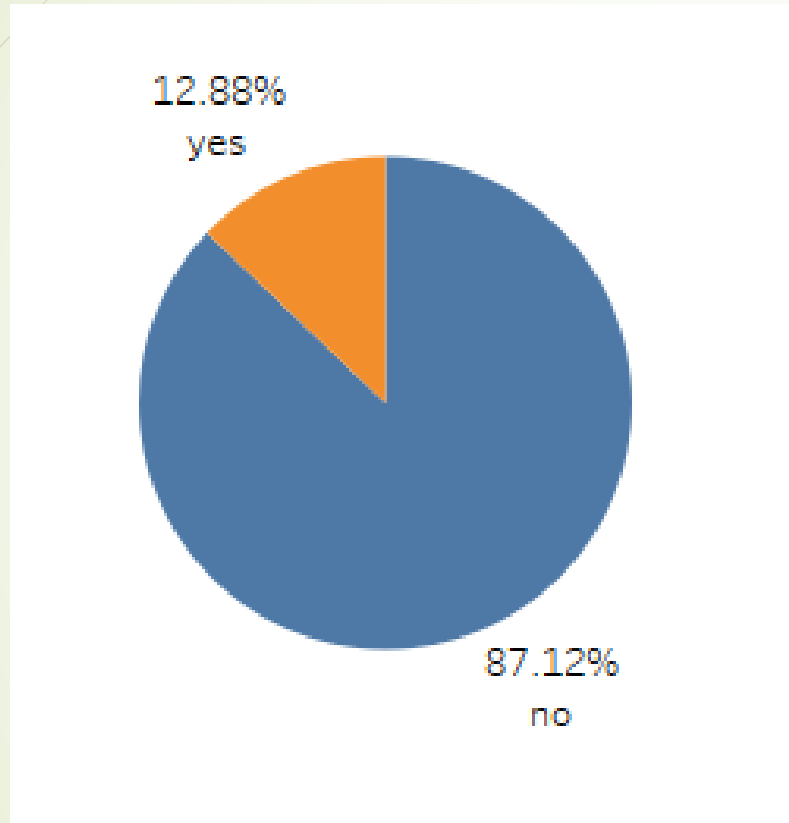
- There were only 3 clients have credit in default and they did not subscribe for term deposit
- Only 1 of the client had housing loan and the other 2 do not have any loan

Default, Housing and Personal Loan

Housing	Loan			Grand Total
	no	yes	unknown	
yes	1,909	373		2,282
no	1,569	250		1,819
unknown			96	96
Grand Total	3,478	623	96	4,197

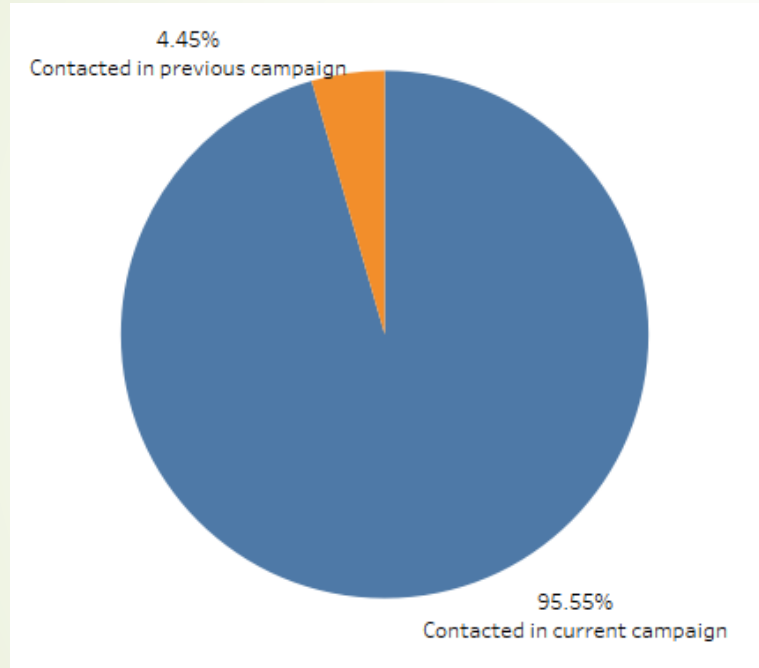
- Next, we will take a look at those who do not have credit in default. Will housing loan and personal loan affect clients' decision in subscribing for term deposit?
- From the table above, we see that those who do not have personal loan will tend to subscribe for term deposit.
- After excluding unknown default, there still have 96 records of unknown housing and personal loan

Current Campaign Effectiveness



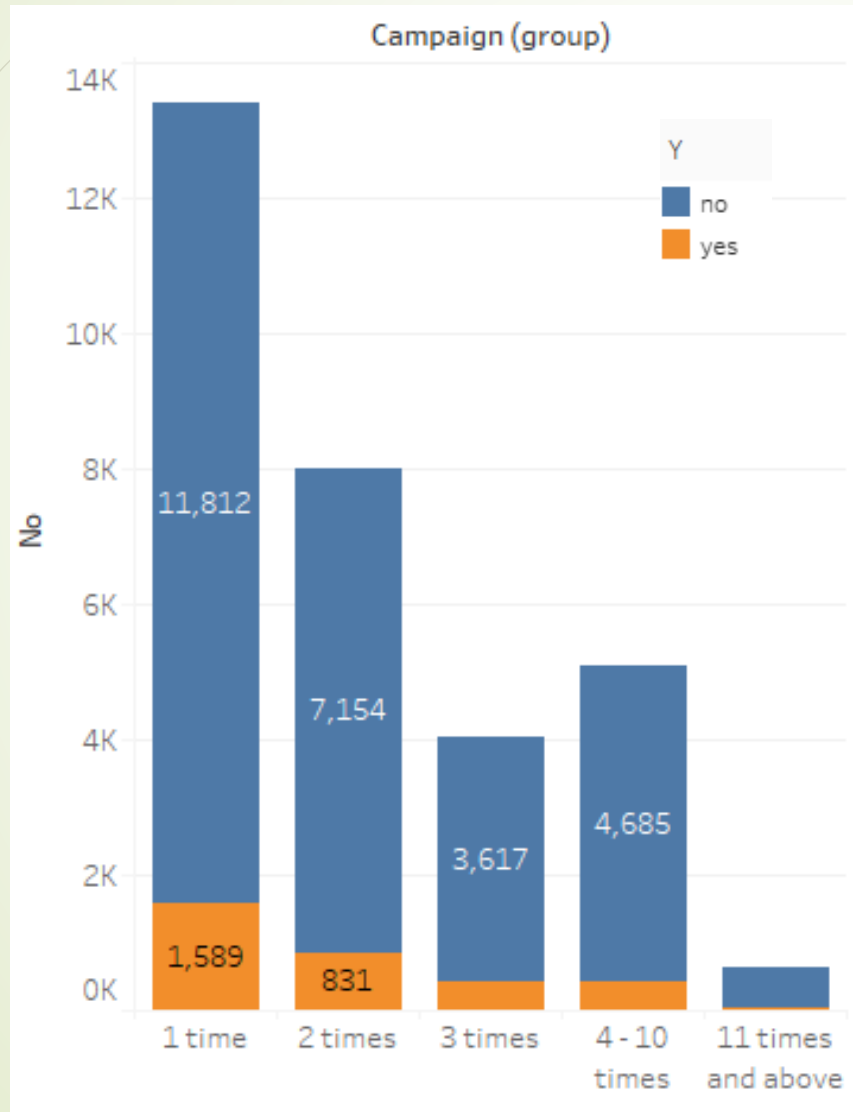
- In this campaign, 4,198 or 12.88% of the clients will subscribe for term deposit
- 28,394 or 87.12% of the clients did not subscribe for the term deposit

Campaign



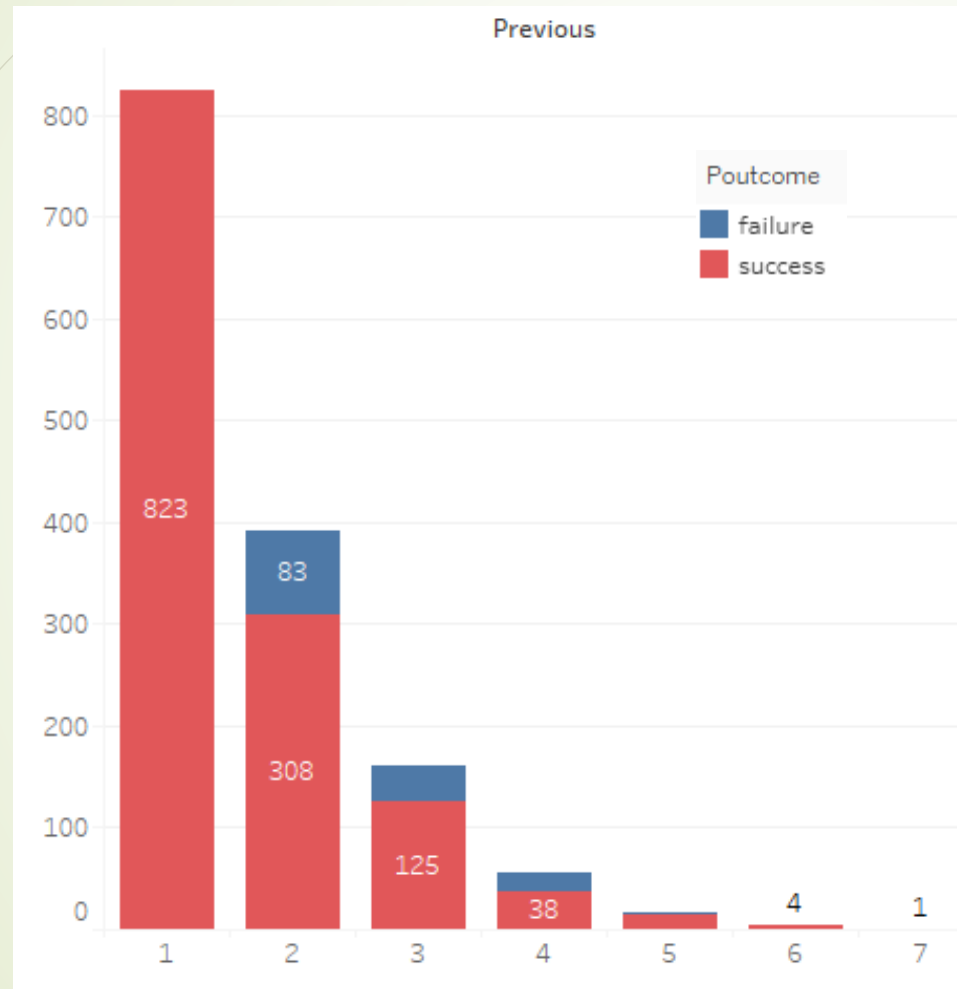
- In this campaign, 95.55% are new clients.
- 4.45% of the clients were from previous campaign

Campaign



- 13,401 of the clients were contacted once. Out of which, 1,589 or 11.86% subscribe for term deposit.
- Followed by 7,985 of the clients were being contacted twice. Out of which 831 or 10.41% agree to subscribe for term deposit.

Previous Campaign



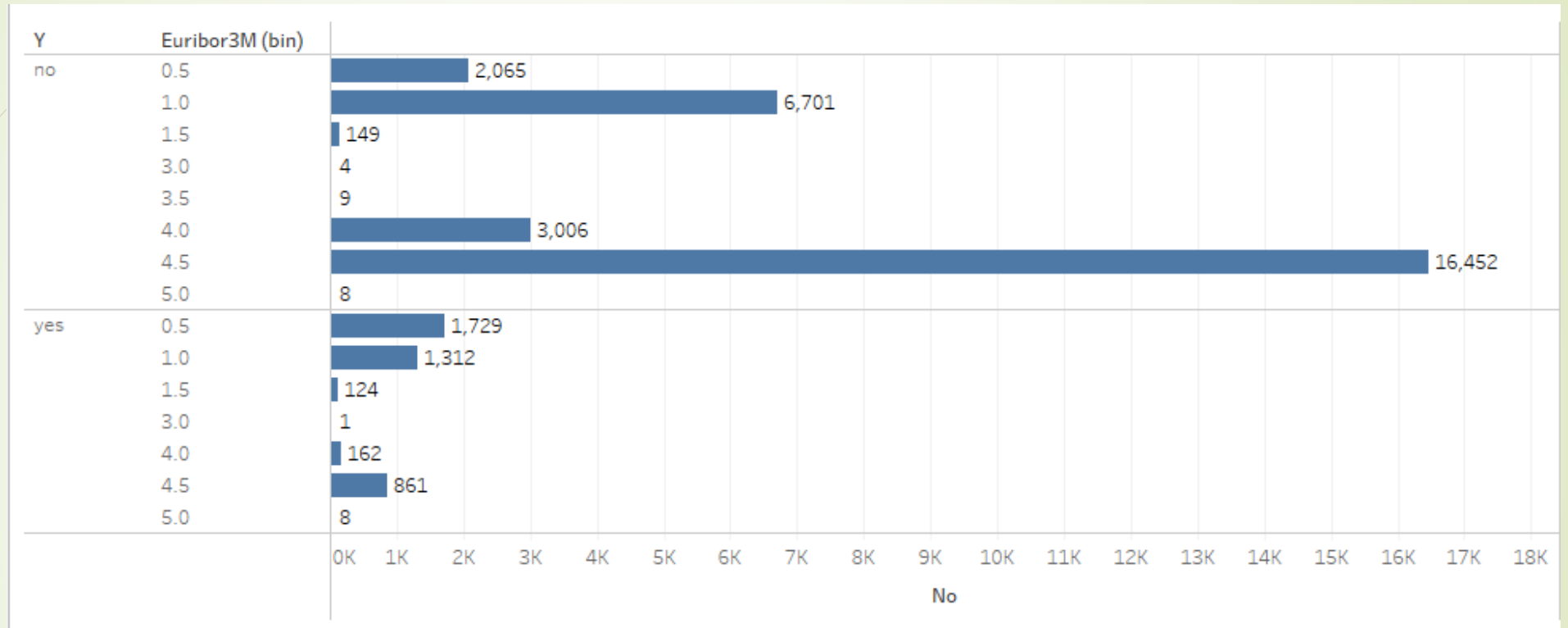
- In previous campaign, 823 clients were contacted the first time and outcome were successful
- From this chart, it also shows that although the number of clients being contacted is lower than the current campaign, but the success rate is higher

Signed for both campaign

Poutcome	Y	
	no	yes
failure	66	71
success	448	866

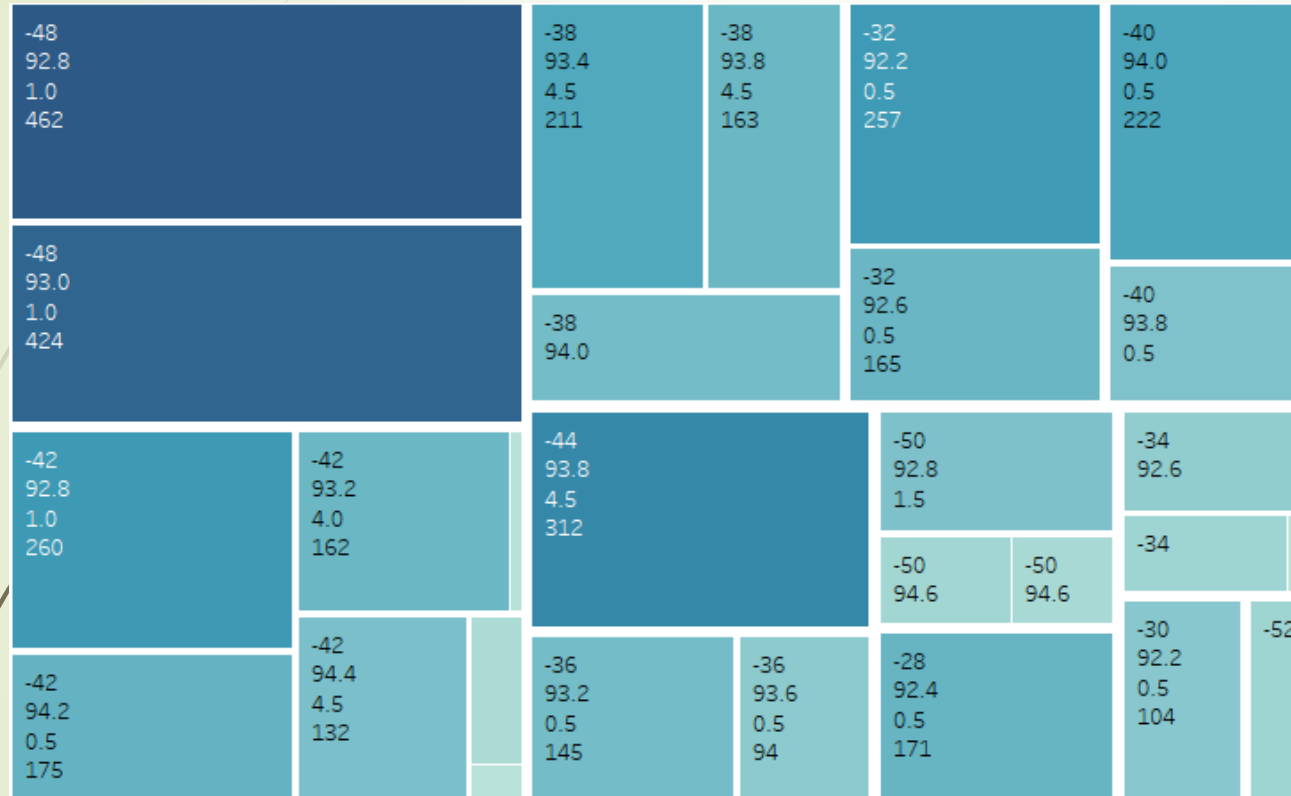
- 66 clients did not sign up for both campaign
- 488 clients signed up for previous campaign but did not sign up for current campaign
- 71 did not sign up for previous campaign but signed up for current campaign
- 866 clients signed up for both campaign
- This shows that those who had signed up in previous campaign, will have higher chance that they will signed up again in current campaign

Euribor3M



- The 3 month Euribor interest rate is the interest rate at which a selection of European banks lend one another funds denominated in euros whereby the loans have a maturity of 3 months.
- Most clients sign up for the campaign when Euribor3M rate was between 0.5 and 1.5

Euribor3M, Consumer confidence index & Consumer price index



- The above tree map shows that most client will subscribe for term deposit when confidence index is -48, price index is between 92.8 to 93 and Euribor3M rate is 1.0

- The Consumer Price Index measures the overall change in consumer prices based on a representative basket of goods and services over time.
- When confidence is trending down, consumers are saving more than they are spending, indicating the economy is in trouble or in the process of contracting further. Essentially, the more confident people feel about the stability of their incomes, the more likely they are to maintain, or increase, their spending patterns.

Employment variation rate

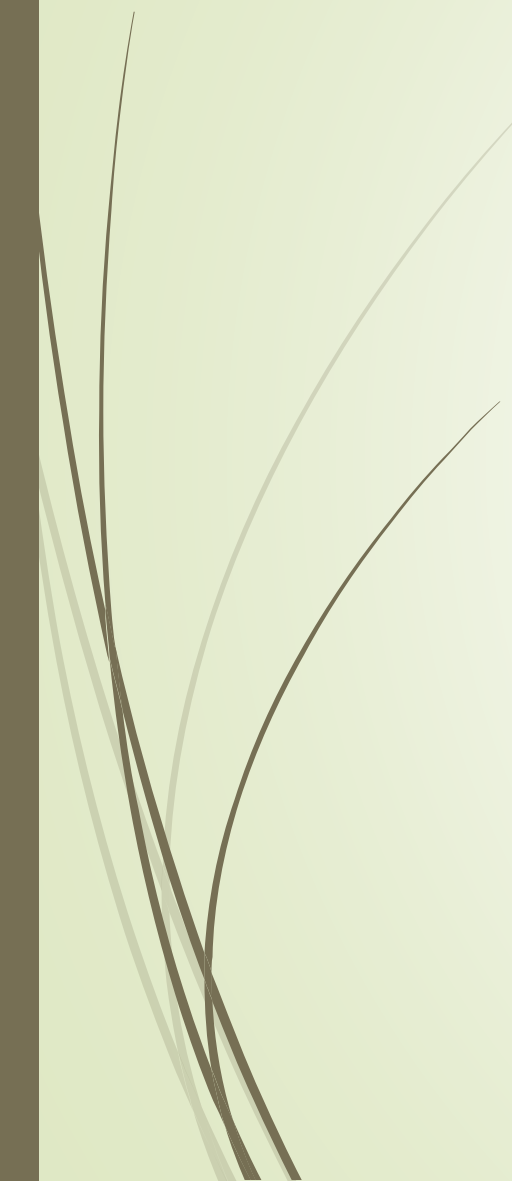
Emp.Var. Rate	Y	
	no	yes
-3.4	609	440
-3	82	84
-2.9	1,035	582
-1.8	6,498	1,369
-1.7	361	397
-1.1	330	293
-0.2	9	1
-0.1	3,049	213
1.1	5,147	163
1.4	11,274	655

- A high jobless rate can also indicate a weak economy, which can affect financial markets and make it harder for individuals to invest or save money.
- It's important to note that the jobless rate is just one of many factors that can affect financial decisions. It's always wise to consider multiple perspectives and consult with a professional before making any financial decisions.

<https://www.quora.com/What-is-meant-by-employment-variation-rate-Does-it-affect-in-any-way-the-financial-decisions-that-an-individual-takes>




Findings

- The campaign is more effective by using cellular
 - Clients age between 20 to 59 with education level bachelor and above will tend to subscribe for term deposit
 - Clients who are married or single prefer to save more money and keep in term deposit
 - Clients who do not have personal loan will have higher chance of subscribing term deposit
 - Continuous follow up with clients can also increase the chance of success campaign
 - More clients will subscribe for term deposit when Euribor3M is between 0.5 and 1.5
 - Clients will not subscribe for term deposit when employment variation rate is high
- 



Recommendation

- 
- The bank should review on the call content that their customer service team had with the clients. Then do out a standard call content for the team to follow so that they can relay the message to the client effectively cut down the call time per client and in turn increase the successful rate that clients will sign up during the campaign
 - The bank should also go through client data, last contact with clients and other attributes to help them filter out clients who will likely to sign up during campaign period. This could help them reduce the time spend on clients who probably will not sign up.
 - Beside using phone call to contact clients, the bank can consider other mode to promote the campaign example through bank website, send text messages, email or advertisement ad in other web page.



Thank you

https://public.tableau.com/views/WinnieFong_CapstoneProject/TermDepositCampaign?:language=en-US&publish=yes&:display_count=n&:origin=viz_share_link