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# The Impact of Repeated Marketing on Conversion

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# Background

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- Data from a Portuguese bank's direct marketing campaign
- Clients were contacted, often more times than once, and asked if they would subscribe to a bank term deposit
  - Clients either responded "yes" or "no"

# Question

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**Does contacting a client more than twice have an effect on the client subscribing to term deposit?**

# Assumption

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- Campaigning clients can increase the probability of deposit than no campaign.

# Threats to Causal Inference

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- Selection
  - Clients selected might not be representative of all bank clients
- Simultaneity
  - There could be additional unobserved advertisements/bank contact
- Omitted Variables
  - Maybe there's unobserved variable that is attributing to the client's decision
- Measurement Error
  - Possible measurement error of X

# Dataset

- Data collected from 2008 to 2013 (from UCI dataset)
- Each row is a client and his/her subscription decision

age	job	marital	education	default	housing	loan	contact	month
56	admin.	single	university.degree	no	yes	no	cellular	mar
32	management	married	university.degree	no	yes	no	telephone	mar
64	retired	married	basic.4y	no	yes	no	cellular	mar
56	unemployed	divorced	basic.4y	no	no	no	cellular	mar
56	unemployed	divorced	basic.4y	no	yes	no	cellular	mar
56	admin.	single	university.degree	no	no	no	cellular	mar

**Additional Factors**

Age, Gender, Client-Bank Relationship, Phone Call Context, Date-Time, Bank Profiling Indicators and Social and Economic Indicators

campaign
56
43
43
2
1
2

**Treatment Variable**

Number of calls to client

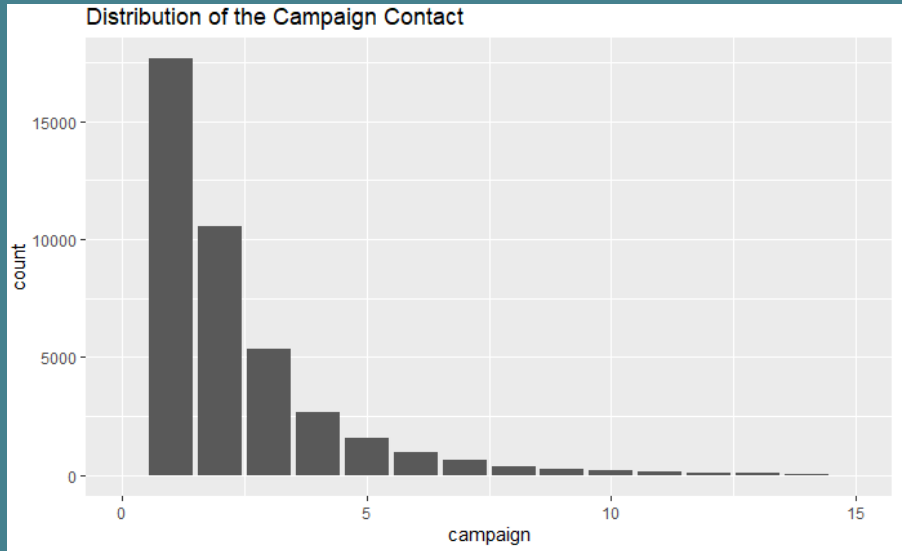
y
no
no
yes
yes
yes
yes

**Outcome Variable**

If the client subscribed to a term deposit

# Method-Define Control and Treatment

- Split Customers into Control and Treatment Groups
  - Control: Clients with 2 or less calls
  - Treatment: Clients with more than 2 calls



campaign
56
43
43
2
1
2



treatment
1
1
1
0
0
0

# Method-Randomization Checks

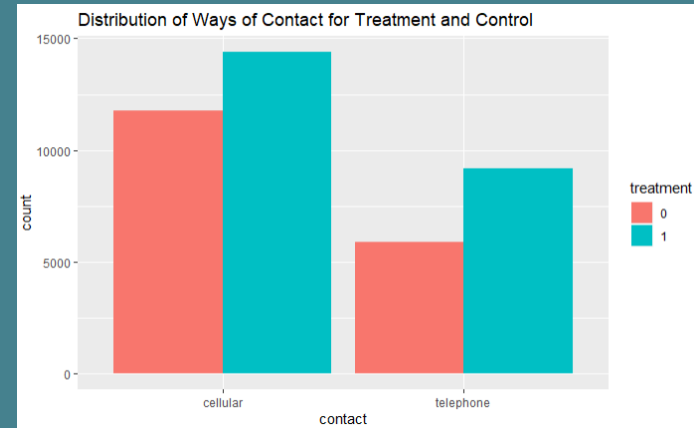
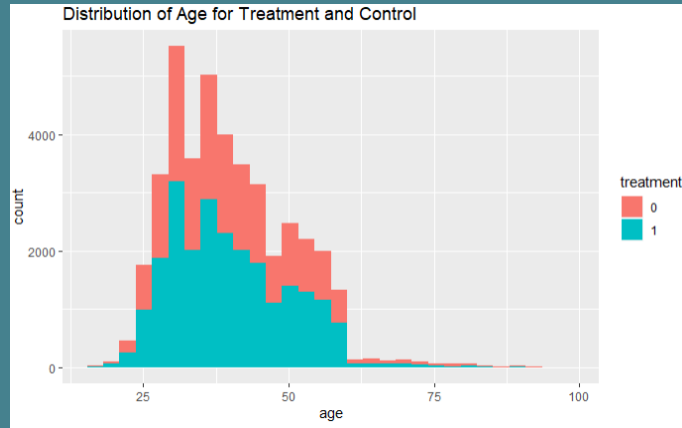
- Preformed randomization checks on the treatment and control groups
  - Control and Treatment are not similar

Randomized  
Variables

Age, Marital, Education,  
Loan

Not Randomized  
Variables

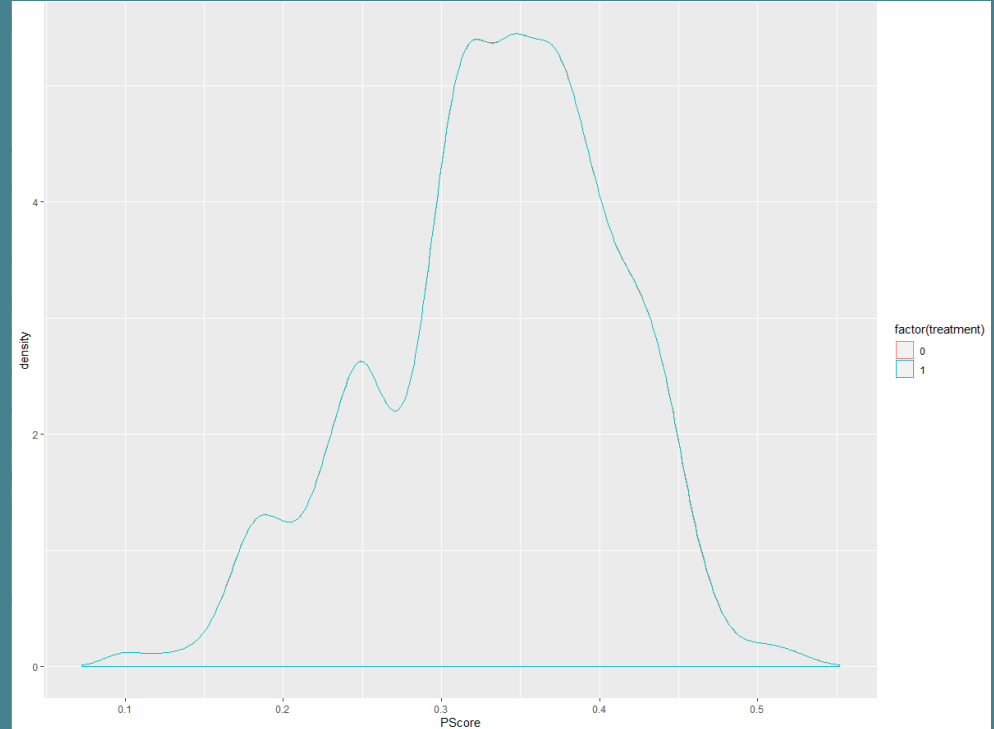
Job, Contact, Month, Day of  
Week





# Method-Matching

- Control matching to get similar treat and control groups
  - Used propensity scores



# Result-Treatment Affect Analysis

- On average, having campaigns more than 2 to a client will make he/she 2% less likely to have deposit in our bank

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Call:
glm(formula = y ~ treatment, family = "binomial", data = matched_data)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.4668 -0.4668 -0.4293 -0.4293  2.2045

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -2.16172    0.02940  -73.524  < 2e-16 ***
treatment    -0.17615    0.04314   -4.083  4.45e-05 ***
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Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

# Result-Sensitivity and Robustness Test

- Change the matching parameters (different caliper/ratio)
- Change the variables of matching

Parameters / variables	Caliper = 0.001	Caliper = 0.005	Ratio = 2	Less variables
Estimate	-0.17615	-0.12599	-0.18541	-0.13687
Standard error	0.04314	0.04309	0.03810	0.04335
P-value	4.45e-05	0.00345	1.13e-06	0.00159

# Result-Heterogeneous Treatment Effect

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- On average, having campaigns more than 2 to clients **by cellular phone** will make them 2.4% less likely to have deposit in our bank. However, the decrease of **using telephone** is 0.2%
- On average, having campaigns more than 2 to clients who **get retired** are 4.8% less likely to have deposit in our bank. The decrease of people who are **unemployed** is 4.5%. People who **have jobs** are about 0.9%

# Implication

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- In general, don't contact the same people more than twice, which will annoy our clients
- Using telephone not cellular phone to contact to clients for campaigns
- Don't over campaign on people who don't have a job

# Limitations

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- We don't have data about what happens if no campaigns, we are not sure whether campaigns increase the probability of deposit or not
- Only consider the cutoff of two campaigns, may create multiple cutoffs and find the best campaign frequency for each type of person in the future

# Questions

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# Thank you !