NORDSTROM

DIGITAL PERFORMANCE MANAGEMENT

A CASE STUDY PRESENTATION BY:
DATA DRILLERS

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01 INTRODUCTION / EXECUTIVE SUMMARY

INTRODUCTION

- Nordstrom is an upscale department store that recently began to focus on their **online business** market.
    - Nordstrom started focusing on **digital marketing and e-commerce** as core to their strategies moving forward in their online business.
- Now, Nordstrom wants to know if their media spending in the new digital channels is a cost-effective business measure.
- In this presentation, we will put in place some basic **digital performance management infrastructure** to help Nordstrom better understand how to best allocate their money going towards their digital platforms.

Nordstrom Online Advertisement

EXECUTIVE SUMMARY

Nordstrom Online Advertisement

- Nordstrom's media group spent $10,000 on their campaign
  - Primarily in **online display advertising**.

- We will deliver an analysis on:
  - An estimated **effect** and **return of investment (ROI)** of their display advertising and what this means to Nordstroms marketing team,
  - A **NEW** estimate based on an unseen variable previously undiscovered and its meaning to the team, as well as a comparison to the previous estimates,
  - Calculations and analysis with new variables previously unseen.

- Finally, we will conclude with our **recommendations** on improving Nordstrom's online presence and the **impact** we expect to see from these recommendations.

BUSINESS QUESTION AND HYPOTHESES

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BUSINESS QUESTIONS

1. What is the estimated **effect** of the display advertisement on sales?
    a. What are the changes in the effect of the display advertisement given different variables in each milestone.

2. What is the estimated return on investment **(ROI)** after the display advertisements were launched?
    a. Is there an increase/decrease/no change between each milestone? Why so?

3. What non-random assignment rule (based on the other available covariates) would give us the largest possible effect size?
    a. What can we do as data analysts to make the most impact on the information given and help Nordstrom's marketing team?

HYPOTHESES

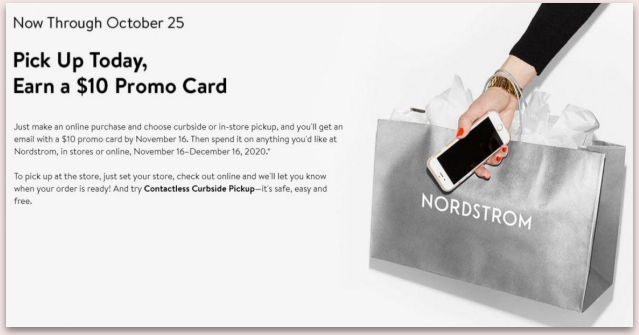
1. For the first milestone, we hypothesize that people who saw the ads spent a **few dollars (less than $50)** more than those who did not.

   As a result, we expect a small increase in the ROI of under **20%**.

2. For the second milestone, we expect that people who were assigned to see the ads spent a **few dollars (less than $20)** more than those who were not.

   As a result, we expect an even smaller increase in the ROI of under **10%.**

3. For the third milestone after our non-random assignment rule, we expect a very large increase in the ROI of around **1000%**.



Nordstrom Online Advertisement

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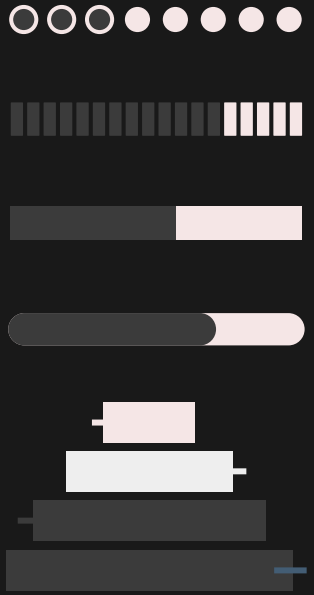
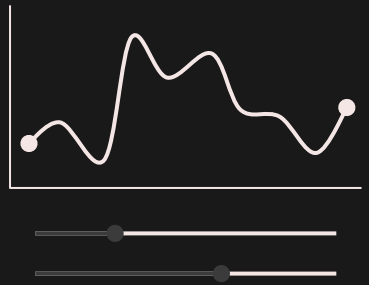
DATA AND METHOD





VARIABLES IN DATA

CUSTID - Customer ID code.

CART_TOTAL - The dollar amount the customer checked out for.

PREVIOUS_CHECKOUTS - The number of checkouts observed previously for the customer.

PAGE_VIEWS - The number of pages the customer viewed before their latest checkout.

ESTIMATED_INCOME_DECILE - A modeled income decile using first party data; scale from 1-10.

PRODUCT_VIEWS - The number of products viewed by customer (multiple products per page).

ATTRIB_DISPLAY_AD - A flag for whether a customer was attributed to have seen the display ad.

ASSIGNED_DISPLAY_AD - A flag indicating whether customer was assigned to see the display ad.

CART_TOTAL_Y0 - What the customer would have spent had they had *not* been given the ad.

CART_TOTAL_Y1 - What the customer would have spent had they been given the ad.

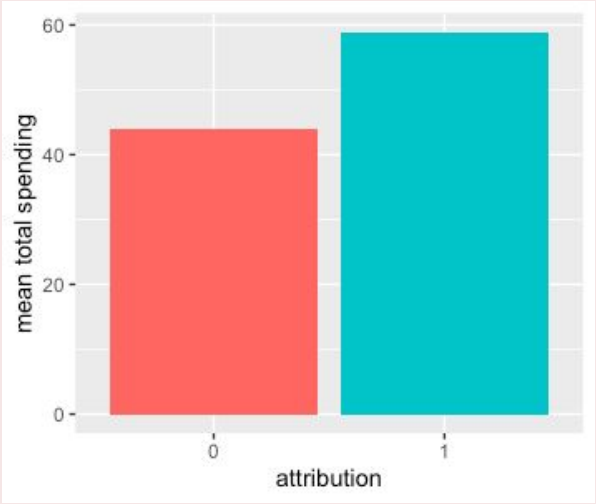
DATA	MILESTONE ONE	MILESTONE TWO	MILESTONE THREE
CUSTID	AVAILABLE	AVAILABLE	AVAILABLE
CART_TOTAL	AVAILABLE	AVAILABLE	AVAILABLE
PREVIOUS_CHECKOUTS	AVAILABLE	AVAILABLE	AVAILABLE
PAGE_VIEWS	AVAILABLE	AVAILABLE	AVAILABLE
ESTIMATED_INC_DECILE	AVAILABLE	AVAILABLE	AVAILABLE
PRODUCT_VIEWS	AVAILABLE	AVAILABLE	AVAILABLE
ATTRIB_DISPLAY_AD	AVAILABLE	AVAILABLE	AVAILABLE
ASSIGNED_DISPLAY_AD	UNAVAILABLE	AVAILABLE	AVAILABLE
CART_TOTAL_Y0	UNAVAILABLE	UNAVAILABLE	AVAILABLE
CART_TOTAL_Y1	UNAVAILABLE	UNAVAILABLE	AVAILABLE

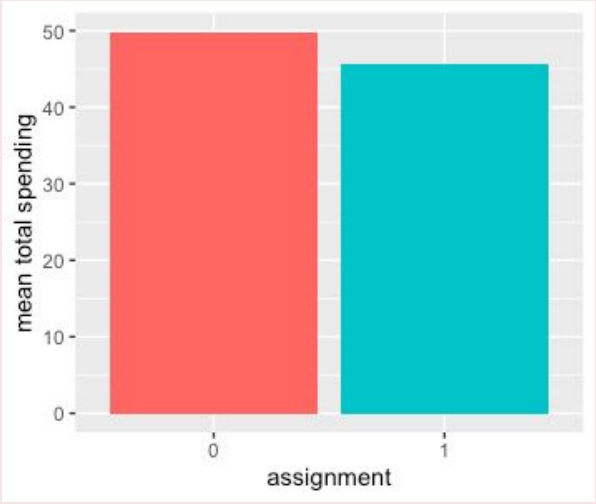
DATA

- TOTAL CUSTOMERS: 2875
- Group by ATTRIB_DISPLAY_AD
- Group by ASSIGNED_DISPLAY_AD

ATTRIB_DISPLAY_AD	MUTOTAL	N
<int>	<dbl>	<int>
0	43.9	2136
1	58.9	739

ASSIGNED_DISPLAY_AD	MUTOTAL	N
<int>	<dbl>	<int>
0	49.8	1430
1	45.7	1445





METHOD

1. Linear regression to estimate the effect of ads
    a. Milestone 1 - attribution
    b. MIlestone 2 - assignment
    c. Milestone 3 - assignment
2. The slope is the estimate for marginal effect of ads on individual spending
3. Assumptions:
    a. Our data satisfies the conditions of linear regression
    b. It cost $10,000 to advertise to those assigned the ad campaign even if they didn't see the ads

FINDINGS / MILESTONES

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MILESTONE ONE

ESTIMATED EFFECT OF DISPLAY ADVERTISING

```
lm(formula = CART_TOTAL ~ ATTRIB_DISPLAY_AD + PREVIOUS_CHECKOUTS +
    ESTIMATED_INCOME_DECILE, data = df)

Residuals:
    Min      1Q  Median      3Q     Max
-50.381 -12.308  -1.677  11.386  70.056

Coefficients:
                        Estimate Std. Error t value Pr(>|t|)
(Intercept)              36.1078     0.8005  45.106  < 2e-16 ***
ATTRIB_DISPLAY_AD        13.5587     0.8194  16.547  < 2e-16 ***
PREVIOUS_CHECKOUTS        1.0258     0.2634   3.894 0.000101 ***
ESTIMATED_INCOME_DECILE   1.3165     0.1242  10.599  < 2e-16 ***
```

Interpretation: Display advertising has a positive effect of about **$13.6 dollars** (13.5587) on the cart total of customers who have seen the display ad.

ESTIMATED ROI OF DISPLAY ADVERTISING

$$ROI = \frac{(\$ \text{ MADE} - \$ \text{ SPENT})}{\$ \text{ SPENT}}$$

$ MADE = $13.5587 * 739 = $10,019.88
$ SPENT = $10,000

0.2%

Interpretation: We expect to see an increase in return on investment (ROI) of **0.2%** for our advertising.

MILESTONE TWO

ESTIMATED EFFECT OF DISPLAY ADVERTISING

```
lm(formula = CART_TOTAL ~ ASSIGNED_DISPLAY_AD + PREVIOUS_CHECKOUTS +
    ESTIMATED_INCOME_DECILE, data = df2)

Residuals:
    Min      1Q  Median      3Q     Max
-55.939 -12.314  -0.552  12.162  64.265

Coefficients:
                         Estimate Std. Error t value Pr(>|t|)
(Intercept)               39.8606     0.8950  44.536  < 2e-16 ***
ASSIGNED_DISPLAY_AD       -4.4791     0.7360  -6.086 1.31e-09 ***
PREVIOUS_CHECKOUTS         1.4577     0.2731   5.338 1.01e-07 ***
ESTIMATED_INCOME_DECILE    1.6078     0.1281  12.555  < 2e-16 ***
```

Interpretation: Display advertising has a negative effect of about **$4.5 dollars** (-4.4791) on the cart total of customers who have been assigned to see the ad.

ESTIMATED ROI OF DISPLAY ADVERTISING

$$ROI = \frac{(\$\ MADE - \$\ SPENT)}{\$\ SPENT}$$

$\$\ MADE = -\$4.4791 * 1445 = -\$6472.3$

$\$\ SPENT = \$10{,}000$

-164.723%

Interpretation: We expect to see a decrease in return on investment (ROI) of **165%** for our advertising.

MILESTONE THREE

Individual Effect of Advertisement

= Cart Total Given Ad - Cart Total WIthout Ad

Mean of Individual Effect

-4.90

Non-random Assignment Rule

Advertise to Highest Predicted Spenders

$ MADE = $11582
$ SPENT = $609

1802%

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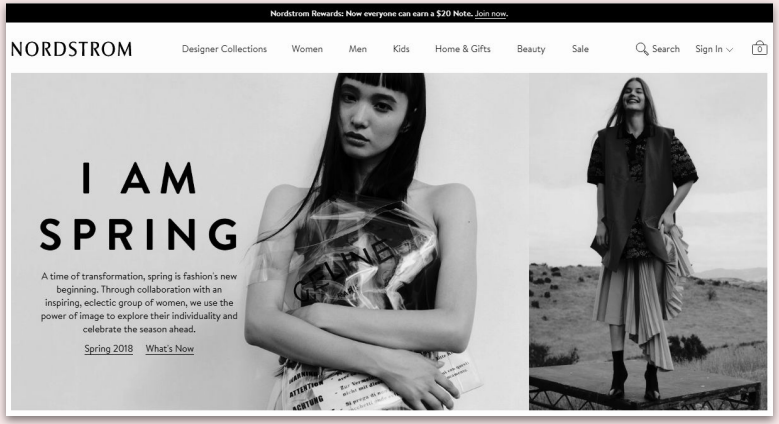
DISCUSSION

MILESTONE ONE

- The advertising campaign seems **effective** in Milestone 1
- Average customer spending $13 more
- 0.2% ROI means marketing yields a positive investment and should look to be expanded



MILESTONE TWO

- The advertising campaign is **ineffective** in the analysis of Milestone 2
- **1445 people** were assigned to see the ads but only **739 people** saw it
- Interactive binary variables:

ASSIGNED_SEE = ASSIGNED_DISPLAY_AD * ATTRIB_DISPLAY_AD

ASSIGNED_NOTSEE = ASSIGNED_DISPLAY_AD * (1 - ATTRIB_DISPLAY_AD)

```
lm(formula = CART_TOTAL ~ assigned_see + assigned_notsee, data = df2)

Residuals:
    Min      1Q  Median      3Q     Max
-49.806 -11.821  -0.247  11.283  65.574

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)      49.8064     0.4748  104.89   <2e-16 ***
assigned_see      9.0714     0.8135   11.15   <2e-16 ***
assigned_notsee -17.9194     0.8259  -21.70   <2e-16 ***
```

MILESTONE THREE

- Marketing Campaign has a **negative** impact on consumer spending
- ROI from Milestone 1 is incorrect
- Easy to “hack” the ROI by marketing to groups that were already going to spend and overstate marketing’s impact
- Consumers marketed towards were more likely to purchase large amounts regardless of marketing

RECOMMENDATIONS 06

RECOMMENDATION

- Change advertising channels
- Collect more detailed data on the advertising: whether the time it appears affect consumers' purchasing behaviors to attract more people seeing the ads
  - Holiday seasons
  - Paycheck days
  - During shopping, near check-out
- Focus on club's members

THANK YOU!

Any questions?

THANKS