

# How impactful are *Free Trials* on *Streaming Service Subscriptions*?

---

Mitchell Booher, Matthew Cheng, Sahir Doshi, Yonghee (Ian) Jeon, Arya Mohan

# Introduction

- Who We Are - *Netflix 2.0*
- Recently tested a new free trial offering.

# Data

Variable	Changes
<i>Date</i>	Dropped
<i>MonthlySubscriptionCost</i>	Converted to Numeric
<i>SubscriptionType</i>	N/A
<i>DurationOfFreeTrial</i>	N/A
<i>HoursStreamed</i>	Converted to Numeric
<i>UserSatisfactionScore</i>	N/A
<i>CustomerID</i>	Dropped
<i>CustomerMaritalStatus</i>	“Married” or “With a partner” = 1 ; Others = 0

# Data

Variable	Changes
<i>CustomerGender</i>	N/A
<i>CustomerAge</i>	N/A
<i>OnlineShopper</i>	Renamed from 'Online Shopper Or Not' + Converted to Binary 1/0
<i>AnnualIncome</i>	Renamed from 'Annual Income + Converted to Numeric
<i>Subscribed</i>	Renamed from 'RenewAfterTrial' + Converted to Binary 1/0

# Data

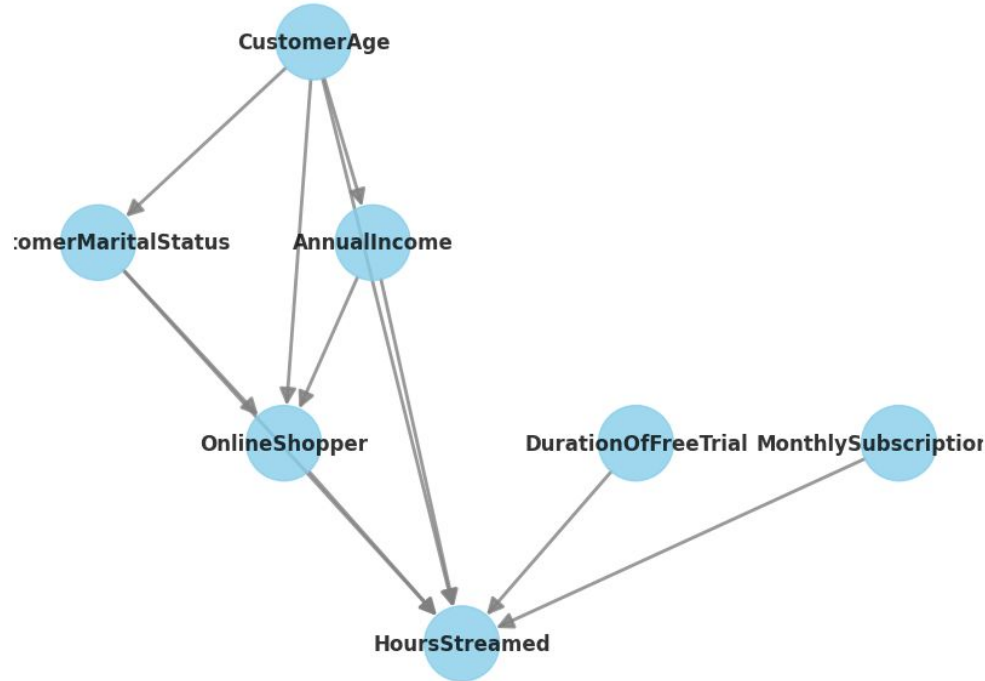
Variable	Changes
<i>SubscriptionTypeBinary</i>	'PremiumNoAds' = 1 ; Others = 0
<i>CustomerGender_Female</i>	Dummy for Regression
<i>CustomerGender_Male</i>	Dummy for Regression
<i>Customer_GenderOther</i>	Dummy for Regression
<i>Customer_GenderPrefer not to answer</i>	Dummy for Regression
<i>AnnualIncomeBlocked</i>	>130 = 1 ; <=130 = 0 - (Median)

- Raw Data: 13 Columns and 933 Data Points
- Cleaned Data: 18 Columns and 928 Data Points

# Q1: Does ***Online Shopping*** affect ***Hours Streamed***?

- Treatment: *OnlineShopper*
- Outcome: *HoursStreamed*
- Method: DoWhy
- Importance:
  - Those that shop online may spend more time shopping and less time streaming
  - Those that shop online may be excessive spends and are influenced by fashion trends in movies and TV shows. Perhaps users who are online shoppers are inspired by their favorite characters and want to look like them
  - If someone is an online shopper, then knowing how often they stream shows is valuable because we can position ads more efficiently (timing of ads, placement of ads, what type of ads, etc.)

Q1: Does ***Online Shopping*** affect ***Hours Streamed***?



# Q1: Does *Online Shopping* affect *Hours Streamed*?

- Refutation Methods

## BACKDOOR LINEAR REGRESSION RESULTS

Results with placebo treatment refuter:

Refute: Use a Placebo Treatment

Estimated effect:0.3596302919676475

New effect:-0.06963792476257247

p value:0.45827121720857633

Results with data subset refuter:

Refute: Use a subset of data

Estimated effect:0.3596302919676475

New effect:0.35598816757104146

p value:0.49844966923689493

## BACKDOOR PROPENSITY SCORE MATCHING RESULTS

Results with placebo treatment refuter:

Refute: Use a Placebo Treatment

Estimated effect:15.787715517241379

New effect:0.13243534482758623

p value:0.4823229276202304

Results with data subset refuter:

Refute: Use a subset of data

Estimated effect:15.787715517241379

New effect:14.916778975741243

p value:0.4134893571199838

## BACKDOOR PROPENSITY SCORE WEIGHTING RESULTS

Results with placebo treatment refuter:

Refute: Use a Placebo Treatment

Estimated effect:0.7616610269645818

New effect:-0.3441843245391073

p value:0.38134355113744234

Results with data subset refuter:

Refute: Use a subset of data

Estimated effect:0.7616610269645818

New effect:1.047495062880353

p value:0.25722573450943687



## Q2: Does ***Subscription Type*** Affect ***Hours Streamed***?

- Treatment: *SubscriptionType* (*MonthlySubscriptionCost*)
  - *MonthlySubscriptionCost* is a numerical representation
- Outcome: *HoursStreamed*
- Controlling on *AnnualIncome*
- Method: Linear Regression
- Importance:
  - Perhaps the type of subscription plan (Basic, Premium, PremiumNoAds) has an impact on # of hours streamed since having ads may reduce stream time (and vice versa).
  - Controlling on income to eliminate biases.

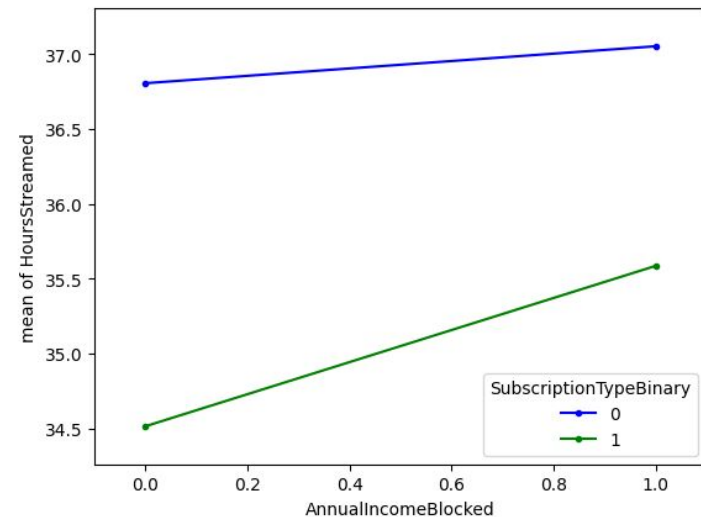
## Q2: Does *Subscription Type* Affect *Hours Streamed*?

- **Conclusion:** Not significant (Model and Variable P-Values)

OLS Regression Results						
Dep. Variable:	HoursStreamed	R-squared:	0.001			
Model:	OLS	Adj. R-squared:	-0.002			
Method:	Least Squares	F-statistic:	0.2695			
Date:	Mon, 04 Dec 2023	Prob (F-statistic):	0.764			
Time:	15:09:12	Log-Likelihood:	-3803.6			
No. Observations:	928	AIC:	7613.			
Df Residuals:	925	BIC:	7628.			
Df Model:	2					
Covariance Type:	nonrobust					
	coef	std err	t	P> t	[0.025	0.975]
const	38.3022	2.759	13.880	0.000	32.887	43.718
MonthlySubscriptionCost	-0.1488	0.232	-0.640	0.522	-0.605	0.307
AnnualIncome	-0.0043	0.012	-0.364	0.716	-0.028	0.019
Omnibus:	55.685	Durbin-Watson:	2.036			
Prob(Omnibus):	0.000	Jarque-Bera (JB):	49.509			
Skew:	0.498	Prob(JB):	1.78e-11			
Kurtosis:	2.462	Cond. No.	780.			

## Q2: Does ***Subscription Type*** Affect ***Hours Streamed***?

- Treatment: *SubscriptionTypeBinary*
- Outcome: *HoursStreamed*
- Controlling on *AnnualIncomeBlocked*
- Method: Interaction Plot + ANOVA Analysis



## Q2: Does *Subscription Type* Affect *Hours Streamed*?

- $HoursStreamed = SubscriptionType + Annual\ Income + SubscriptionType\_Annual\ Income$
- **Conclusion:** Not Significant (F-Statistic)

	df	sum_sq	mean_sq	F	PR(>F)
C(SubscriptionType)	2.0	1133.517827	566.758913	2.692459	0.068591
C(AnnualIncome)	140.0	29602.843799	211.448884	1.004514	0.475906
C(SubscriptionType):C(AnnualIncome)	280.0	58071.556709	207.398417	0.985272	0.552361
Residual	560.0	117879.235714	210.498635	NaN	NaN

### Q3: Does ***Marital Status*** Affect ***User Satisfaction Score***?

- Treatment: *CustomerMaritalStatus*
- Outcome: *UserSatisfactonScore*
- Controlling on *CustomerAge* and *CustomerGender* (using dummies)
- Method: Linear Regression
- Importance:
  - A significant relationship would help us to distinguish our target market.
  - Those married or with partners are more likely to be families, and what type of content we offer in the future could shift towards or away depending on the significance and impact of *CustomerMaritalStatus*.

### Q3: Does *Marital Status* Affect *User Satisfaction Score*?

- **Conclusion:** Not significant (R-Squared, P-Value)

OLS Regression Results						
=====						
Dep. Variable:	UserSatisfactionScore	R-squared:	0.005			
Model:	OLS	Adj. R-squared:	-0.001			
Method:	Least Squares	F-statistic:	0.8035			
Date:	Mon, 04 Dec 2023	Prob (F-statistic):	0.567			
Time:	13:01:24	Log-Likelihood:	-828.33			
No. Observations:	928	AIC:	1671.			
Df Residuals:	921	BIC:	1704.			
Df Model:	6					
Covariance Type:	nonrobust					
=====						
	coef	std err	t	P> t	[0.025	0.975]
const	4.4420	0.071	62.671	0.000	4.303	4.581
CustomerMaritalStatus	0.0517	0.039	1.326	0.185	-0.025	0.128
CustomerAge	-0.0019	0.001	-1.542	0.123	-0.004	0.001
CustomerGender_Female	-0.0317	0.061	-0.517	0.606	-0.152	0.089
CustomerGender_Male	0.0182	0.061	0.298	0.766	-0.102	0.138
CustomerGender_Non-binary	0.0061	0.060	0.102	0.919	-0.112	0.124
CustomerGender_Other	0.0019	0.061	0.031	0.976	-0.118	0.122
=====						
Omnibus:	102.229	Durbin-Watson:	2.044			
Prob(Omnibus):	0.000	Jarque-Bera (JB):	91.859			
Skew:	-0.695	Prob(JB):	1.13e-20			
Kurtosis:	2.335	Cond. No.	251.			
=====						

## Q4: Does ***Subscription Type*** Affect ***Subscription Rate***?

- Treatment: *SubscriptionTypeBinary*
- Outcome: *Subscribed*
- Method: A/B Testing + Proportions Test
- Importance:
  - Perhaps a customer's likelihood to renew their subscription is dependent on the type of subscription experienced in their free trial. Hence, there may be a relationship (how does the presence-of or lack-of ads impact subscription renewal)

## Q5: Does ***Length of Free Trial*** Affect ***Subscription Rate***?

- Treatment: *DurationOfFreeTrial*
- Outcome: *Subscribed*
- Splitting on # of Days (Short/Long Trial)
  - $\leq 10$  - 'Short'
  - $>10$  - 'Long'
- Method: A/B Testing + Proportions Tests
- Hypotheses:
  - Null ( $H_0$ ): Adding a longer trial period (A) does not change the subscription renewal rate compared to a shorter trial period (B)
  - Alternative ( $H_a$ ): Adding a longer trial period (A) does change the subscription renewal rate compared to a shorter trial period (B)



## Q5: Does *Length of Free Trial* Affect *Subscription Rate*?

- Importance:
  - By conducting an A/B test, we can identify the optimal trial length that would increase the likelihood of converting trial users into paying customers.
  - By converting trial users into long-term subscribers, we can increase customer lifetime value.
- Conclusion: Significant
  - At significance level ( $\alpha$ ) 0.05, we can reject the null hypothesis and conclude that adding a longer trial period changes (increases) the subscription renewal rate.

```
Conversion rate of short (< 10 days) trial period: 0.53  
Conversion rate of long (>= 10 days) trial period: 0.73  
Proportions z-test p-value: 1.1703261822899281e-09  
Chi-squared test p-value: 1.8153283099004142e-09
```

# Conclusion

---

# Significant Tests

- Online shopper status does have an effect on hours streamed.
- Subscription Type (Basic, Premium, PremiumNoAds) does not have an effect on Subscription Renewal Rate
  - Significant for both Gen-Z and Non-Gen-Z (Blocked by Age)
- Length of Free Trial does have an effect on Subscription Renewal Rate
  - Longer period increases subscription rate

# Final Conclusion

As a business, we acknowledge the importance of having different subscription types and we should do further analysis into which is more effective. Additionally, we now know that having a longer free trial period has a higher conversion rate. Hence, we should consider setting our free trial to a set 14-days rather than providing an option to customers.

Interestingly, the majority of our tests were insignificant, suggesting that additional testing and data is required to make a fully-confident decision. In summary, we gained some guidance into the efficacy of our free trial among other factors in relation to the user's satisfaction and subscription likelihood.