Driving University Applications: The Role of Institution Type, Acceptance Rate, and Enrollment Trends

Group 10

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Research Question and Objective

- Question: What factors influence the number of university applications?
- Objective: Identify predictors such as acceptance rates, enrollment rates, and University type to help universities optimize strategies.
- Dataset: Collected from 777 universitates across the U.S. (public and private)

Data Set Summary

- Dependent Variable**:** Applications received.
- Independent Variables**:**
  - Quantitative: Accept (accepted students), Enroll (enrolled students).
  - Qualitative: Private (university type).
- Sample Size**:** 777 universities.
- Visuals**:** Statistical Summary showing distribution of private vs. public universities.

Private

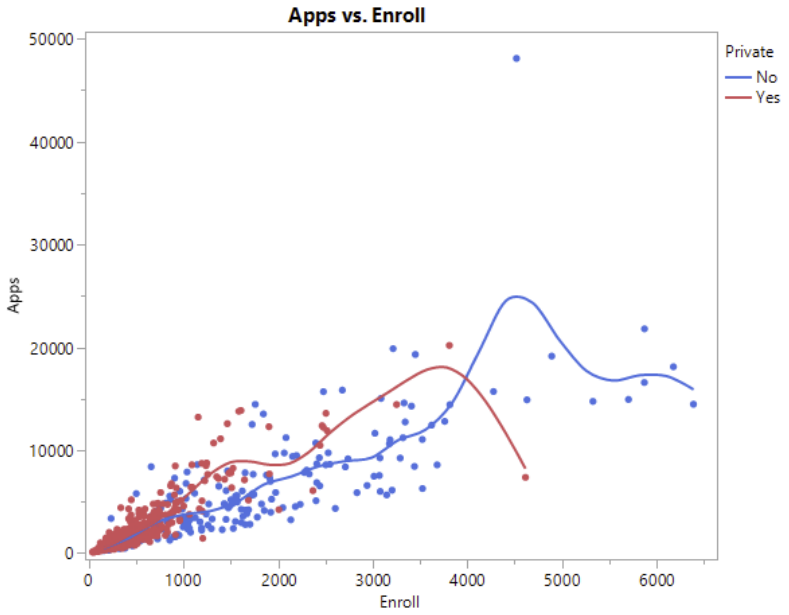
Quantiles		
100.0%	maximum	20192
99.5%		13963.77
97.5%		10220.35
90.0%		4296.2
75.0%	quartile	2188
50.0%	median	1133
25.0%	quartile	617.5
10.0%		383
2.5%		223.5
0.5%		134.03
0.0%	minimum	81

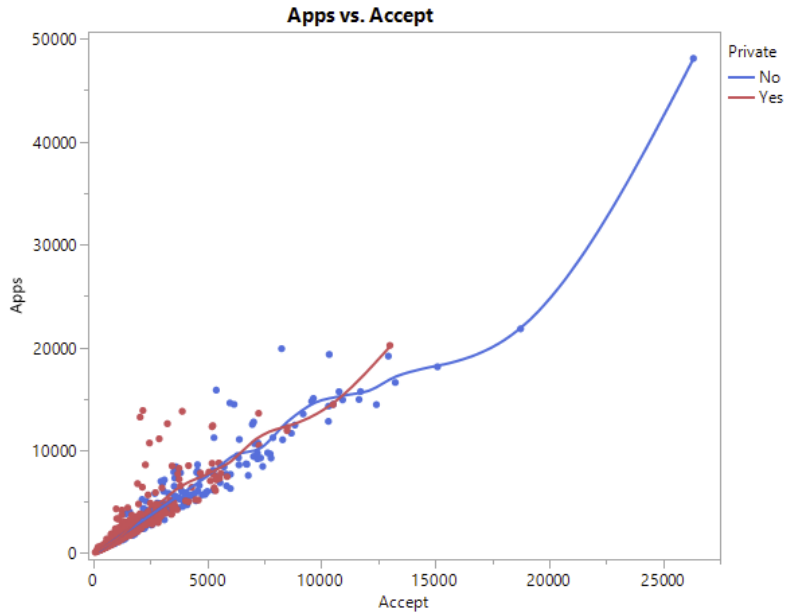
Summary Statistics	
Mean	1977.9292
Std Dev	2443.3413
Std Err Mean	102.79214
Upper 95% Mean	2179.8314
Lower 95% Mean	1776.027
N	565
N Missing	0

Public

Quantiles		
100.0%	maximum	48094
99.5%		46385.15
97.5%		18814.65
90.0%		12791
75.0%	quartile	7781.5
50.0%	median	4307
25.0%	quartile	2178.25
10.0%		991
2.5%		447.5
0.5%		236.38
0.0%	minimum	233

Summary Statistics	
Mean	5729.9198
Std Dev	5370.6753
Std Err Mean	368.8595
Upper 95% Mean	6457.0417
Lower 95% Mean	5002.7979
N	212
N Missing	0





Regression Models and Steps

- Models:
  - Model 1: Quantitative predictors (Accept, Enroll)
  - Model 2: Adds qualitative predictor (Private)
  - Model 3: Includes interaction Includes Quadratic terms from Accept*Accept and Erroll*Enroll
  - Model 4: only studying the qualitative predictor

Summary of Fit

RSquare	0.89114
RSquare Adj	0.890859
Root Mean Square Error	1278.579
Mean of Response	3001.638
Observations (or Sum Wgts)	777

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	21.206074	60.25667	0.35	0.7250
Enroll	-0.327017	0.120188	-2.72	0.0067*
Accept	1.6026795	0.045561	35.18	<.0001*

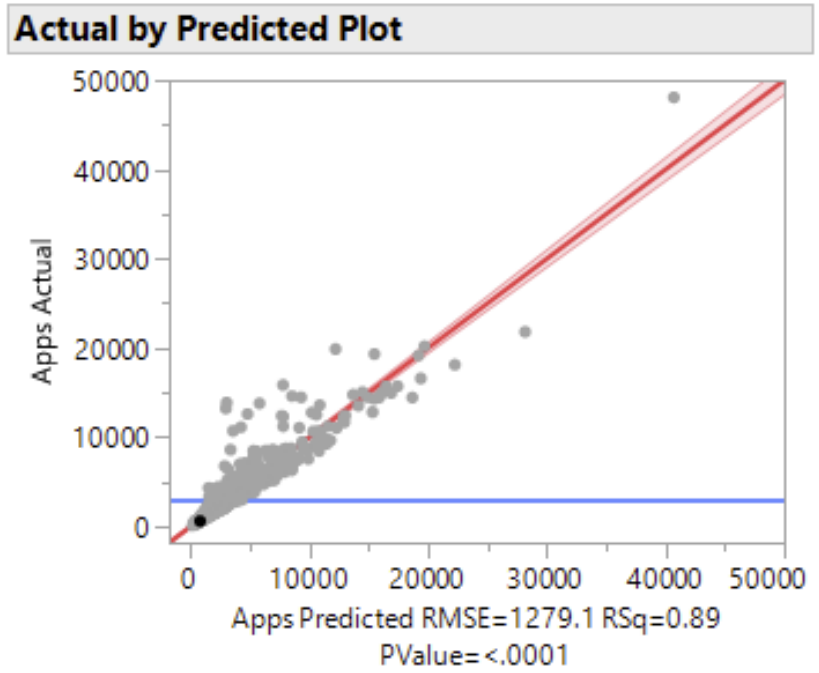
Results – Model 1

- Equations: $E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$
  - β_1: Significant positive effect of x_1: acceptance rate (p < 0.0001)
  - β_2: Negative effect of x_2 enrollment rate (p = 0.0067)
- Performance: $R^2 = 89.11\%, R^2_{Adj} = 89.09\%$

Analysis of Variance Test (F-Test):

- **F-Ratio:** 3168.032
- **P-Value:** < 0.0001
- Null Hypothesis (H_0): $\beta_1 = \beta_2 = 0$
- Alternative Hypothesis (H_A): At least one $\beta \neq 0$.
- At the 5% significance level, H_0 is rejected, providing strong evidence that at least one model coefficient is non-zero. This confirms the model's statistical usefulness for predicting the number of applications received.

Results – Model 2



Analysis of Variance (F-Test):

- F-Ratio: 2110.356
- P-Value: < 0.0001
- Null Hypothesis (H_0): $\beta_1 = \beta_2 = \beta_3 = 0$
- Alternative Hypothesis (H_A): $At\ least\ one\ \beta \neq 0$.
- At the 5% significance level, H_0 is rejected. The model is statistically useful for predicting applications received.

- Equation: $E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3$
- x_3 Private Universities have a slight advantage in application ($\beta_3 = 37.181$)
- Performance: $R^2 = 89.12\%, R^2_{Adj} = 89.08\%$

Prediction Expression

-10.99934

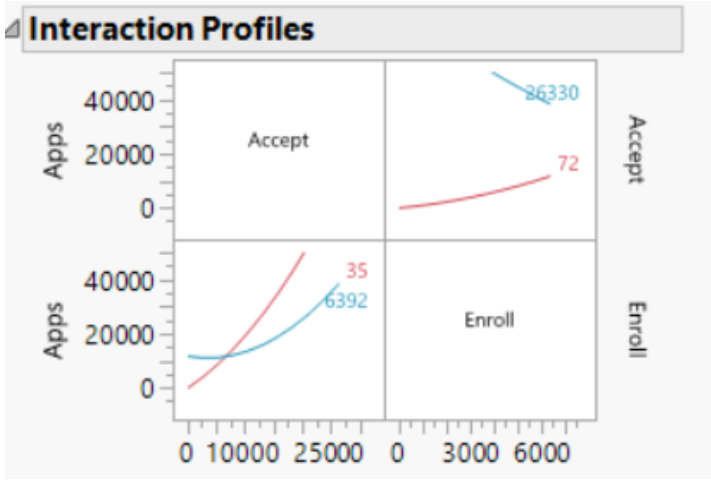
+ 1.5992794714 • Accept

+ -0.298582738 • Enroll

+ Match(Private, "No" ⇒ -37.1810208, "Yes" ⇒ 37.181020798, else ⇒ .)

Results – Model 3

- Equations: $E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 x_2 + \beta_4 x_1^2 + \beta_5 x_2^2$
  - Interaction (β_3): Negative interaction between acceptance and enrollment.
  - Quadratic term for Accept (β_4): Significant nonlinear relationship.
  - Performance: R^2=90.35%R 2 =90.35%, R^2_{Adj}=90.28%R 2 =90.28%.



Summary of Fit

RSquare	0.891189
RSquare Adj	0.890767
Root Mean Square Error	1279.119
Mean of Response	3001.638
Observations (or Sum Wgts)	777

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	-229.9008	73.22317	-3.14	0.0018*
Accept	1.4073476	0.093068	15.12	<.0001*
Enroll	0.8156237	0.251381	3.24	0.0012*
Accept*Enroll	-0.000278	5.456e-5	-5.10	<.0001*
Accept*Accept	5.2627e-5	7.132e-6	7.38	<.0001*
Enroll*Enroll	0.0001626	9.528e-5	1.71	0.0883

Analysis of Variance test (F-tetst)

F Raito = 1443.078

Pvalue < 0.0001

$$H_0 : \beta_1,\ \beta_2, \beta_3, \beta_4, \beta_5 \neq 0 \qquad H_A : At\ least\ \ \beta_1,\ \beta_2, \beta_3, \beta_4\ or\ \beta_5 = 0$$

(H_0 initial hypothesis is rejected. At 5% significance level, there is strong evidence that at least one of the model coefficients is non-zero. This model is statistically useful for predicting the number of applications received.

Results – Model 4

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2170135119	2.1701e+9	177.9147
Error	775	9453149477	12197612	Prob > F
C. Total	776	1.1623e+10		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	3853.9245	140.6455	27.40	<.0001*
Private[No]	1875.9953	140.6455	13.34	<.0001*

Analysis of Variance test (F-test)

$$H_0 : \beta_1 = 0 \qquad H_A : \beta_1 \neq 0$$

(H_0) Initial hypothesis is rejected. At 5% significance level, there is strong evidence of the difference between the predicted number of applications received depending on the Public/private indicator, thus Public/private indicator is useful predictor of number of applications received.

Key Takeaways

- **Factors Studied:** Applications accepted, applications enrolled, public/private status.
- **Key Findings:**
  - Higher acceptance rates = More applications.
  - Higher enrollment rates = Fewer applications.
  - Private universities attract more applications.
  - Applications increase slower as acceptance rates grow but faster with enrollment rate growth.
- Conclusion: In summary universities depending on mor acceptance and enrollment rates will create a slow growth of number of applications, they should focus more in creating an extra incentive for students to apply, for example they can reduce tuition or connect with more scholarship funders. Also, they can work on introducing their majors and programs to high schools' juniors or seniors.

Q & A

- P.S: Github: https://github.com/Dcampoverdlema/Stat_311_FinalProject