World Rank of a University

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May 13, 2016
SDS 358

TEXAS
The University of Texas at Austin

Statistics + Data Sciences

Introduction

Objectives: Investigate the significance of greater proportion of variance on Alumni Score and Awards Score have on the total score for determining the world rank of a university, when controlling for Nature and Science Score and PUB Score. Since I was a Junior in high school, I have been curious on what factors caused certain universities to be ranked higher than others.

Hypotheses: Alumni and Award score does account for a significant greater proportion of variance for determining the world rank of a university when controlling for Nature and Science Score and PUB Score.

Methods

Sample: Subjects were the top 100 World Universities from each year from 2005 to 2015. The total score of universities (quantitative), alumni score (quantitative), award score (quantitative), nature and science score (quantitative), and PUB score (quantitative) were measured. After tagging the observation that I will use for the model, I had 1101 samples. From using the three outs method, I had 18 outliers that were removed.

Analysis Method: A sequential multiple regression was performed.

Descriptives

Response Variable:

	Mean	SD	Min	Max
Total Score	36.38	13.56	23.5	100

Explanatory Variables:

	Mean	SD	Min	Max
NS Score **(Control Variable)**	16.08	12.51	0	100
PUB Score **(Control Variable)**	38.25	13.05	7.3	100
Alumni Score	9.16	14.14	0	100
Award Score	7.69	15.49	0	100

Results

Overall Significance of Variance Change:

Model	RSS	Df	F-value	P-value
Control Variables	24598.20			
+ Variables of Interest	2892.30	2	4045.1	<.001

Regression Table:

Model 1 (Just Control Variables):

Coefficient	Estimate	SE	t-value	P-value
Intercept	5.32279	.66173	8.044	<.001
NS	0.76845	.01287	59.073	<.001
PUB	0.10881	.01541	7.062	<.001

Overall Model Fit: $F(2,1080)= 3544$, $p<.001$; Multiple $R^2= 0.8678$, Adjusted $R^2 =0.8675$

Model 2 (With Variable of Interest)

| Coefficient	Estimate	SE	t-value	P-value
Intercept	1.244374	.238944	5.208	<.001
NS	.410574	.006180	66.436	<.001
PUB	.24210	.005943	40.741	<.001
Alumni	.109702	.004260	25.753	<.001
Award	.218962	.004365	50.166	<.001

Overall Model Fit: $F(4,1078) = 1.074 * 10^4$, $p < 0.001$; Multiple $R^2 = 0.9845$, Adjusted $R^2 = 0.9844$

Difference of Variance between Variables of Interest and Control Variables: 0.1166785

Assumptions

Assumptions: To check for multicollinearity I used the Variation Inflation Factor (VIF). The Variance Inflation Factor for all variables was under 5, so there was no multicollinearity in the model. A Residual vs. Fitted Plot was used to check and confirmed Homoscedasticity. Cook's Distance Plot and the use of Three Outs was used to determine outlier removal.

Cook's Distance

Residuals vs. Fitted
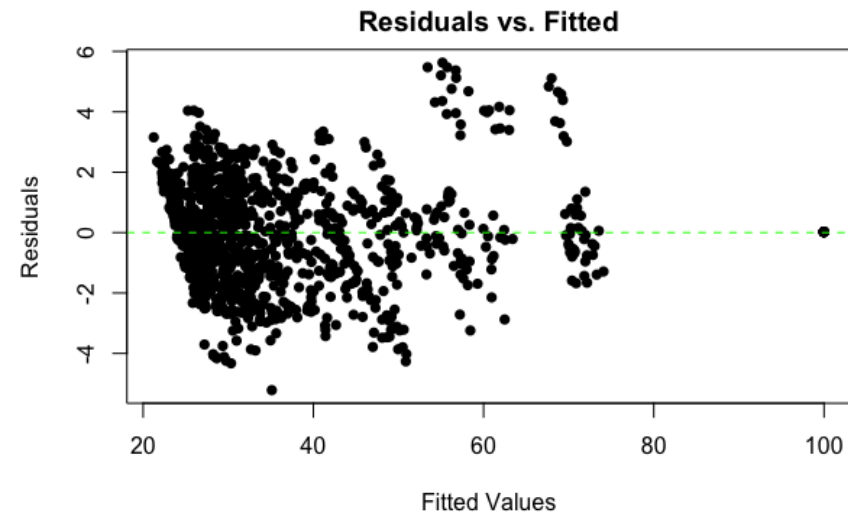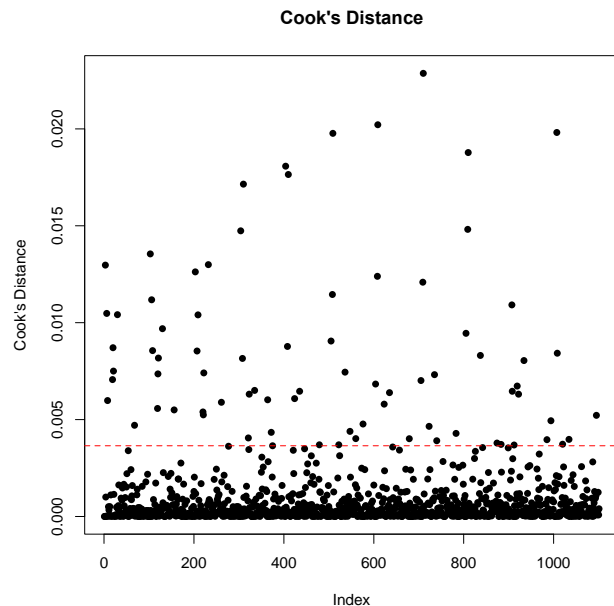
Discussion

Interpretation: The variance change from the first model to the second model was significant with $F(2,1078)= 4045.1$, $p<.05$. Difference of variance between the variable of interest and the control variables is 0.1166785. The overall full model (second model) was significant with $F(4,1078)= 1 * 10^4$, $p<.05$. The individual slopes of the full model showed a positive impact on the total score of a university ranking for NS Score ($\beta=0.410574$, $t(1078)=66.436$, $p<.05$), PUB Score ($\beta=0.242120$, $t(1078)=40.741$, $p<.05$), Alumni Score ($\beta=0.109702$, $t(1078)=25.743$, $p<.05$), Award Score ($\beta=0.218962$, $t(1078)=50.166$, $p<.05$).

Limitations: The model did not take into account other factors that impact the total score of a university such as the HiCi Score and the PCP score.

Implications: Several indicators for determining the rank of a university were based on research, papers published and awards based on staff members and alumni from the institution. I think factors related to the students such as employment of graduates, quality of professors, value of degree from the school in terms of income, graduation rate should also determine the rank of the university.

References: The methodology and use of the Academic Ranking of World University website.
http://www.shanghairanking.com/