Validity of gre test in predicting the final gpa scores and degree completion fre...

1. A relationship research question involving GPA and GRE scores

In the United States, many graduate educational programs may sometimes require the students to take and submit their GRE scores as part of the university admission requirements. The main reason for this is that the admission board tend to believe that the GRE scores can be used to predict the academic performance and success of students in graduate college and thus they use it to screen for applicants whom they want to believe will succeed in the graduate educational pursuit if the opportunity is awarded to them.

However, many educators at the state university believe that the GRE is a poor evaluator of undergraduate performance as well as a poor predictor of graduate school performance and because of this the dean at the state university is considering eliminating the GRE from graduate school admissions requirements.

Joel et al (2016) did a study to assess the predictive ability of admission GRE scores on cumulative GPA scores at graduation of construction management graduate students. The hypothesis tested for this study was that students who scored high in GRE at the time of admission would attain higher cumulative GPAs at the time of graduation. In this study, the GRE verbal score, GRE quantitative score and total GRE score were the independent variables while the GPA score was the dependent variable.

The study results indicated a weak predictive indices where GRE quantitative score was the better predictor of graduation GPA. With regard to this, the hypothesis of a higher GPAs being associated with higher GRE scores was

very weakly supported. The authors recommended that construction management graduate programs should re-evaluate requiring GRE scores as part of their admission criteria.

The dean of the state university is interested in determining whether GRE scores are a good predictor of graduate school performance and course completion frequency.

The question of the study is does scoring a better GRE score predict a better graduate GPA score?

From the data collected by the dean of the school of education, the dependent variables in this study is the GPA score while the independent variable is the GRE test score. The null hypothesis is that having a high score of GRE is an indication of scoring a high score on the final GPA score against the alternative hypothesis that having a high score of GRE is not an indication of scoring a high score on the final GPA score.

The analysis of descriptive statistics which comprises the mean, mode, median, standard deviation, maximum and minimum values, kurtosis, skewness and analysis of score distribution all showed the nature of the distributions and variations of the GRE and GPA scores of the selected students.

The average GPA score was 3. 15 and a standard deviation of 1. 12 while GRE test scores had a mean of 160 and a standard deviation of 25. The mode for GPA scores was 3. 00 while that for GRE scores was 150. For the

GRE dataset, the median was 158 and for GPA the median was 3. 01. The distribution of the datasets was symmetric with no outliers.

Regression and correlation analysis were carried out to determine the nature and strength of the relationship between the GRE scores and GPA scores. Trend analysis was also done in order to assess whether there was an existence of an upward or downward trend in the correlation indices. If there is an increase that implies an increase in predictability while a decrease would imply an in ability of the GRE scores to predict success and performance. The correlation analysis investigated the strength of the relationship between the GPA and GRE scores and showed a weak correlation coefficient and the graphical plot of the correlation indices showed no clear stability or improvement in the relationships.

A R^2 value of below . 1 indicated that the model can only explain up to 10% of the variation in the variables under study and thus GRE is not a good predictor of GPA scores.

The regression coefficient for GRE was statistically significant at p = . 05 because the p value = . 04 was less than . 05 and thus the interpretation is to reject the null hypothesis and conclude that having a high score of GRE is not an indication of scoring a high score on the final GPA score.

2. A relationship research question involving gender, GPA and GRE scores

Historically, in the United States, many university admission committees require students to take the standardized GRE test in order to determine

whether if the student is enrolled in the specific program, he or she will excel to completion and eventually graduate.

Liane et al (2017) state that the predictive validity of GRE scores on graduate student success is unclear, that is, it is not very clear whether GRE scores are good predictors of student success and final GPA scores.

Overtime, there has been noticeable differences in GRE test scores of males and females. The research question in this study is does GRE score and gender have an influence on the final GPA. Another question to consider is, does gender influence final GPA scores performance? The dependent variable is GPA scores which is measured on a ratio scale while the independent variables are gender and GRE scores which is measured on a ratio scale while gender is a categorical variable.

Data available had a sample size of 30 males and 30 females. Descriptive statistics for the GPA scores and GRE scores show an average GPA of 3. 23 with a standard deviation of 1. 5 for females and 3. 15 with a standard deviation of 1. 2 for males. Multiple regression will be used because we want to predict the value of a dependent variable based on the value of two or more other variables. There are two types of hypothesis tests that will be carried out for the multiple linear regression model.

First we test for significance of regression model. The test is used to check if a linear statistical relationship exists between the response variable (GPA test scores) and at least one of the predictor variables (gender and GRE test scores)

Hypothesis testing.

The null hypothesis is $\beta_1 = \beta_2 = \ldots \beta_k = 0$

Alternate hypothesis is $\beta_j \neq 0$ for at least one j.

The test for the null hypothesis is $F_0 = MS_R / MS_E$

If the null hypothesis H_0, is true then the statistic F_0 follows the F distribution with k degrees of freedom in the numerator and n-(k+1) degrees of freedom in the denominator. The null hypothesis H_0 is rejected if the calculated statistic F_0 is greater than f-value obtained from the table with the specified degrees of freedom and alpha level.

Our model had an $F_0 = 34$ and a Fα, k, n-(k+1) = 2. 76 and a p-value of 0. 000* which is statistically significant. And thus we reject the null hypothesis and conclude that at least one $\beta_j \neq 0$, thus at least one β_j is significant. The study concludes that a regression model exists between final GPA scores and either gender or GRE score or both of them.

The t-test will be used to check the significance of individual regression coefficients in the multiple linear regression model. The focus question is whether the addition of a significant variable to a regression model makes the model more effective and does adding an unimportant variable make the model worse.

The null hypothesis to test the significance of a certain regression coefficient β_j is $\beta_j = 0$ while the alternate hypothesis is $\beta_j \neq 0$

The P-value corresponding to the test statistic T_0 based on the t-distribution with 14 degrees of freedom is 0. 0087. This value is significant at 0. 05 alpha level and thus one of the coefficient for GRE scores or gender of the regression is significant.

Another test to be done is the use of the coefficient of multiple determination R^2 to determine the amount of total variability explained by the regression model. The R^2 ranges between 0 and 100% where 0% indicates that the model can explain none of the variability of the response data around its mean while 100% shows that the model can explain all the variability of the response data around the mean.

Our model had an R^2 of . 423 which can be interpreted that the model can explain 42. 3% of variability of the response data around the mean.

3. An effect research question involving gender and GRE scores.

As a required for most of the United States academic programs, new education program applicants are expected to take the GRE test score in order to determine their possibility of attaining a success in the enrolled program.

Recheka & Kingsley (2014) state that the GRE test is recommended because of its validity, reliability and predictive ability, thus that's why it is used by many graduate schools to make informed student admission decisions. Although it is encouraged around the United States, at the state university, many educators believe the GRE is a poor evaluator of undergraduate

performance as well as a poor predictor of graduate school performance and thus the dean is looking abolish it.

Recheka & Kingsley (2014) study on trends in GRE scores and graduate enrolments by gender and ethnicity showed that the gap between male's and female's GRE quantitative reasoning scores had changed to some extend since the 1980s, although women's representation in STEM graduate programs has increased substantially too. This is an indication of significant difference in GRE test performance with respect to gender.

In this research study, the question under investigation is whether the gender of a student applicant has an influence on GRE test score which is being used to determine admission status.

The independent variable in this study is age which is measured in years on a ratio scale. The dependent variable is GRE test scores which is also measured on a ratio scale.

Using a sample of 30 men and 30 female from the collected data, the average GRE score for men of 150 was higher than that of women of 144 but almost the same standard deviation of 40 for men and 39 for women. Test of normality showed a symmetric distribution for both groups with a slight right skewness for the ladies data set. No outliers were identified in the male nor female datasets.

The independent samples t-test for showing that two groups do not differ on gender will be used. The Independent Samples t-test is useful when one needs to compare the means of two independent groups for example gender

in order to determine whether there is a statistical evidence that the associated population means are significantly different.

The test requires the dependent variable to be continuous and in ratio level and the independent variable to be categorical i. e. gender. The test assumes that the sample is randomly selected from a normally distributed population and is large enough to represent the population well.

The null hypothesis being tested is that the mean for men population is equal to that of women while the alternate hypothesis is there is a significant difference between the men and women population means.

Since $p < .001$ is less than our chosen significance level $\alpha = 0.05$, we can reject the null hypothesis, and conclude that there is a significant difference between men and women population means.

Based on the results, we can state the following that there is a significant difference between GRE test scores and gender. Where the men tend to score higher than the women.

Linear regression and correlation are also used to determine if there is a linear relationship between the dependent variable GRE test scores and one independent variables being gender. The p-value for each term tests the null hypothesis that the coefficient is equal to zero against the alternative hypothesis that the coefficient is not equal to zero. The p-value for gender as predictor is 0. 001 which is low enough to warrant the rejection of the null hypothesis and conclude that gender is a significant addition to the model for predicting the GRE test scores.

Thus we can conclude that GRE scores for men are significantly different from the GRE scores for women.

4. An effect research question involving gender, GRE score and degree completion frequency.

The Graduate Record Examinations (GRE) is a standardized test that is an admissions requirement for most graduate programs in the United States. According to Kuncel, Hezlett, & Ones (2001), this GRE test aims to measure quantitative reasoning, verbal reasoning, analytical writing, and critical thinking skills that have been acquired over a long period of learning in order to determine whether if the student is awarded the opportunity they are requesting for will they be able to achieve success. The level of emphasis that is placed upon GRE scores in the graduate school admissions process varies widely between schools and departments within schools. The main importance of a GRE score may range from being just a mere admission formality in a college to an important selection factor for student admission.

Despite this GRE test being recommended across the United States, many educators at the state university believe that the GRE is a poor predictor of GPA and final success in completing the program. Due to this, the GRE is being described as a gatekeeper that denies equitable access to education program by all and thus the dean looks to do away with it for good.

In this study, the study question is to determine whether gender and GRE test scores have a significant impact on the frequency of degree completion.

The independent variable are GRE test score and gender. Gender is a categorical variable while GPA tests scores is on the ratio level. The dependent variable is degree completion frequency measured on a ratio level.

A random sample of 30 male and 30 female students was selected using a random sample technique. The descriptive statistics for men show an average GRE score of 150 and a standard deviation of 20 while the average GRE for women was 160 and a standard deviation 18.

Multiple regression was used because the study is interested in predicting the value of the dependent variable (degree completion frequency) based on the value of two independent variables which are gender and GRE scores. There are two types of hypothesis tests that were carried out for the multiple linear regression model.

First we test for significance of regression. This test is used to check if a linear statistical relationship exists between the response variable (degree completion frequency) and at least one of the independent variables (gender and GRE scores).

Hypothesis testing.

The null hypothesis is $\beta 1 = \beta 2 = ... \beta k = 0$

Alternate hypothesis is $\beta j \neq 0$ for at least one j.

The test for the null hypothesis is $F_0 = MS_R / MS_E$

If the null hypothesis H_0, is true then the statistic F_0 will be following the F distribution with k degrees of freedom in the numerator and n-(k+1) degrees of freedom in the denominator.

The null hypothesis H_0 is rejected if the calculated statistic F_0 is greater than F-value obtained from the table with the specified degrees of freedom and alpha level.

Our model had an $F_0 = 56$ and a $F\alpha$, k, n-(k+1) = 2. 76 and a p-value of 0. 003* which is significant. Thus we can reject the null hypothesis and conclude that at least one $\beta j \neq 0$, thus at least one βj is significant. The study concludes that a regression model exists between degree of completion and either gender or GRE score or both of them.

The t-test will was used to check the significance of individual regression coefficients in the multiple linear regression model. The research study is interested in figuring out whether addition or removal of variables from the model make it a better predictor or not.

The null hypothesis to test the significance of a certain regression coefficient βj is $\beta j = 0$ while the alternate hypothesis is $\beta j \neq 0$

The P-value corresponding to the test statistic T_0 based on the t-distribution with 29 degrees of freedom is 0. 0066. This value is significant at 0. 05 alpha level and thus one of the coefficient for GRE scores or gender of the regression is significant and can appropriately be used to predict the degree completion frequency.

In the study, the coefficient of multiple determination denoted as R^2 was also used to determine the amount of total variability explained by the regression model. R^2 values ranges between 0 and 100% where 0% indicates that the model can explain none of the variability of the response data around its mean while 100% is an indication that the model can explain all the variability of the response data around the mean.

Our model had an R^2 of . 489 which can be interpreted that the model can explain 48. 9% of variability of the response data around the mean.

5. Written analysis of results and recommendations

Introduction

The GRE is believed to be able to predict the academic performance and success of students in graduate school. Despite the GRE test being a recommendation for most graduate admission programs in the United States, still many educators believe the GRE is a poor evaluator of undergraduate performance as well as a poor predictor of graduate school performance and thus the dean of the State University is considering eliminating the GRE from graduate school admissions requirements.

Background

The dean has already collected data on four variables; gender, grade point average (GPA), GRE score and graduate degree completion frequency and wishes to test whether the GRE is a good predictor of final GPA scores and degree completion frequency.

Results

The analysis results show that there is a significant relationship between gender and GRE test scores. There was a significant difference between the mean of men population compared to that of women.

For the research question involving gender, GPA, and GRE scores, the results show that in a regression equation, gender is a significant contributor to the final GPA scores predictive model. There was no significant relationship between final GPA scores and GRE scores using a regression model, GRE test scores were not significant predictors of the final GPA score.

The multiple regression analysis for gender, GRE score and degree completion frequency showed that gender can be used to predict degree completion frequency. GRE test score had no significant impact on the model coefficients and thus not significant.

For the research question involving gender and GRE scores, there was a meaningful relationship between gender and GRE score were the men were performing better than women. The study found that gender tends to affect final GPA and GRE test scores.

Proposed Solution

Due to the in ability of the GRE test scores to be significant predictor of final GPA scores and degree completion frequency we can conclude that GRE test scores are not good predictors of GPA finals scores and degree completion frequency.

This can be supported by findings from a study by Joel O Wao, Robert Ries, Ian Flood, Sarel Lavy & Mehmet E Ozbek (2016) on the relationship between admission GRE scores and graduation GPA scores of construction management graduate students.

The results of the study demonstrated weak predictive indices. GRE quantitative score was the better predictor of graduation GPA. Thus, the hypothesis of higher GPAs being associated with higher GRE scores was weakly supported. The authors eventually recommended that construction management graduate programs should re-evaluate requiring GRE scores as part of their admission criteria.

Recommendations

The dean intends to make an informed decision regarding the future use of the GRE in the State University because its believed that GRE test are not good indicators of final GPA test scores and degree completion frequency. With respect to the findings of the study, it is advisable for the school of education dean to do away with the GRE tests because they did not demonstrate any significant effect to the final GPA scores nor the degree completion frequency using simple regression, multiple regression and t-tests.

Although in the United States GRE test are recommended for graduate education programs, the findings of this research study differ because GRE test scores did not demonstrate the ability to predict significantly the final GPA test scores and the degree completion frequency.

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