GRE Demonstration, Compiled by Paul Roundy

• Dozens of peer reviewed papers argue that the GRE is not predictive of student success in graduate school. I created this presentation to demonstrate important statistical weaknesses in these papers that should be considered before graduate programs decide to discontinue using the GRE. The principal consequence of these errors for these papers is that even if the GRE is predictive of success, these published assessments would probably not show it, because of how the GRE itself has been used in the process of admitting students, resulting in a "truncated" or a "censored" distribution. These slides demonstrate that effect by using a hypothetical distribution that assumes a significant real relationship. Assessing the usefulness of the GRE as a predictor of graduate student success is difficult. Consider a hypothetical scatterplot between an objective metric of student success (vertical axis), and the GRE score:



GRE Score

This scatterplot represents hypothetical outcomes of a sample of people who took the GRE. The vertical axis shows a hypothetical metric of success that is resilient to whether a person attends grad school. A statistically significant association is assumed, for illustration. A full distribution of people who could have taken the test would have included more points across the domain, but with more concentration on the left side, especially the left bottom (since people self select for the test).

Assessing the usefulness of the GRE as a predictor of graduate student success is difficult. Consider a hypothetical scatterplot between an objective metric of student or success, and the GRE score:



GRE Score

Points on the right side represent people with above median GRE scores. Points on the top represent people who would have been successful in graduate school independent of whether they attended.

Assessing the usefulness of the GRE as a predictor of graduate student success is difficult. Consider a hypothetical scatterplot between an objective metric of student success, and the GRE score:



GRE Score

A substantial and statistically significant relationship occurs between the GRE and the objective success metric.

There are data that are suggestive of a distribution similar to this hypothetical one, but, unfortunately, actual data like this do not exist. I provide it as an explanation of concept.



GRE Score

The red points denote students who were admitted to and joined graduate programs. Analysis of actual student data show that admitted students cluster in the upper half of GRE scores.



GRE Score

There is little statistically significant relationship between the GRE and the success metric among those admitted to graduate school.



Now consider a subset of rejected students:

GRE Score

The people represented by the blue dots in the lower left quadrant were rejected from graduate school, partially due to low GRE scores (though it could have been based on grades or many other factors, because these other factors partially correlate with GRE).



Now consider a subset of rejected students:

GRE Score

Although the full population shows a strong relationship between GRE scores and success, the red distribution has been "truncated" or "censored" so that the actual relationship between the GRE and success is masked. Truncation has well-known statistical consequences, in reducing the perceived relationship between variables.



GRE Score

The purple point is an outlier applicant who scored poorly on the GRE, but who had some other characteristic, evident in their application, which made it clear the person was likely to succeed in grad school (& who was admitted ultimately did succeed).



GRE Score

The purple point is a good illustration of how the GRE is an imperfect predictor of success, but, since the committee decided admission based on the student's full application, a distinguishing factor was found, the student was admitted in spite of the low GRE.



GRE Score

Points like the purple one contribute to the poor calculated relationship in such truncated data studies. Since the GRE is a good but incomplete predictor of student success, the truncated distribution of admitted applicants can mislead us to believe that the GRE is a poor predictor of student success, even when it might be useful overall.



GRE Score

That is, after students are rejected, the remaining cluster of students possesses no substantial remaining relationship determined by the GRE.

- The above constitutes a statistical argument assuming that the GRE is actually a good predictor, but the actual distribution of objective student success relative to the GRE is not known. However, this assessment demonstrates a known statistical artifact of truncation of a distribution. Most published assessments of the effectiveness of the GRE as a metric of prospective student quality are based on such truncated distributions (such as, how many publications a graduate student produces, without the possibility of comparing results against a null group of rejected students). When such studies show no predictive power in the GRE, they do not necessarily demonstrate what they claim.
- This product represents my professional opinion and my personal understanding, but does not represent any official opinion of my employer.