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### What Factors Contribute to A Top Tier Red Wine? An Analysis

#### Research Questions:

1. Does an increase in alcohol concentration lead to an increase in the red wine quality, while controlling for pH, fixed acidity, and residual sugar?
2. Are pH, alcohol concentration, fixed acidity, and residual sugar significantly linearly related to the quality of red wine?

### Abstract:

**Objective:** The purpose of conducting this study is to see what factors are statistically significant to predicting the quality of a red wine and see how significant those factors may be. I expect to find that alcohol concentration and residual sugar to both be linearly significant to the outcome variable, the quality of the wine.

**Methods:** The sample dataset used in this study has 1599 observations and 12 numerical variables, but I am only looking at 4 predicting factors (pH, alcohol concentration, fixed acidity, residual sugar) and the variable quality as the outcome variable. A linear regression model with the previous variables mentioned, with an interaction between alcohol concentration and fixed acidity, was run along with correlation tests between each of the predicting factors and the wine quality variable.

**Results:** After running the analysis, the factors pH, fixed acidity, and alcohol concentration were all shown to be significantly linearly correlated with the quality of the wine and the interaction between fixed acidity and alcohol concentration was not found to be significant. Looking at the linear regression model as a whole, 25.48% of the variation in the wine quality scores could be explained by the factors. Only the alcohol concentration factor was seen to have a moderately strong correlation with the quality score of the wine, but the factors pH, alcohol concentration, and fixed acidity all showed to be significantly correlated with the quality score of the wine.

**Implications:** These findings suggest that, within red wines seen in Northwest Portugal, the pH, alcohol concentration of a wine and fixed acidity, can help predict the quality of a red wine. Since the population of this study is limited to a specific region, the results of this study may not be reflective of all red wines.