

TO: CEO and Executive Team of Elegance Jewelers

FROM: Elizabeth Baker, University of Michigan Statistician

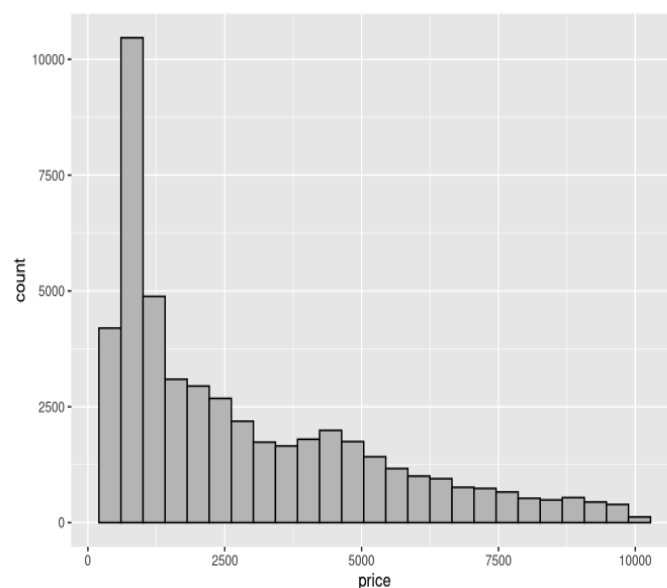
DATE: February 22, 2024

SUBJECT: Strategy to Improve Elegance Jewelers' Profitability

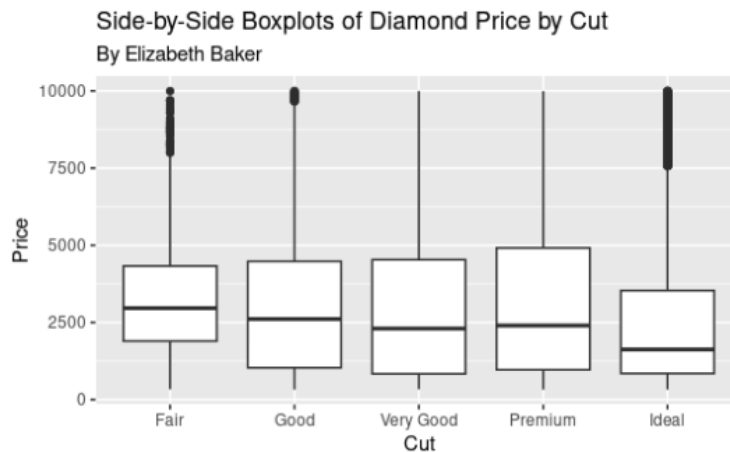
Memorandum

This memo reports on our study that investigates and compares the effectiveness of Strategies A and B in improving the overall profitability of Elegance Jewelers. Strategy A would improve the quality of the cuts performed on raw diamonds, while Strategy B would ‘grow’ synthetic diamonds in a laboratory environment, to have higher clarity. We used a data set of almost 50,000 diamonds, containing five variables: price, cut, carat, clarity, and color. Price is our only quantitative variable in this data set (in US dollars), the remaining are categorical (ordinal) variables. We used this data set to identify the factors that most significantly influence the selling price of a diamond. To choose the best strategy for increasing your profitability, we analyzed the association between diamond price, clarity, and cut, as well as considering any confounding variables.

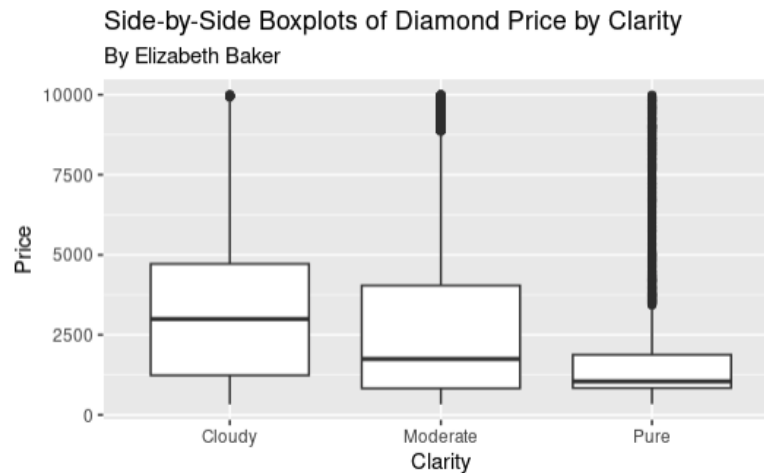
The Influence of Clarity and Cut on Price



The histogram above visualizes the distribution of prices from the diamonds in our data set. Our graph shows a distribution shape of diamond prices that is unimodal and right-skewed with a mean diamond price of about \$2880. With a minimum price of \$326 and a maximum price of \$10,000, the spread of the distribution can be found in its standard deviation of \$2388.



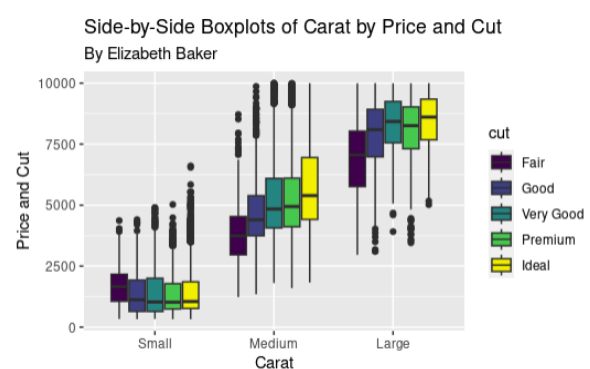
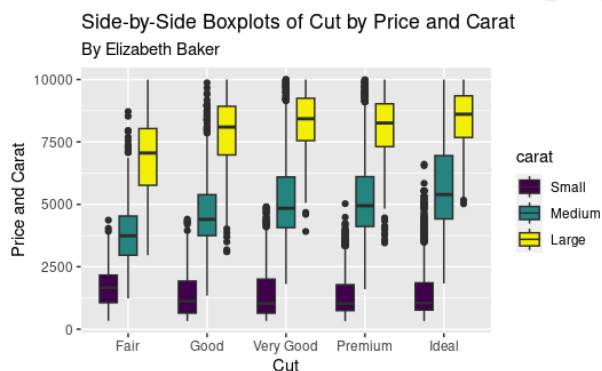
Measuring the association between the diamonds' price and cut, we created the box plot above. Analyzing this plot, there is a weak association between the diamonds' cut and price. As the quality of the cut increases, the price of the diamonds does not increase or decrease significantly. The median prices of all the various cut diamonds have very similar values hovering around \$2500. Most of the outliers of significantly high prices are observed in the most extreme categories of cut (fair and ideal). This observation suggests that a diamond can have a considerably high price regardless of the quality of its cut.



When measuring the association between a diamond's price and clarity, we used the box plot above. As shown, there is a clear association between the clarity of the diamond and its price. As the clarity of the diamonds becomes purer, the median price decreases. However, there are significantly more price outliers in the pure clarity category than in the other categories, which may be skewing this association.

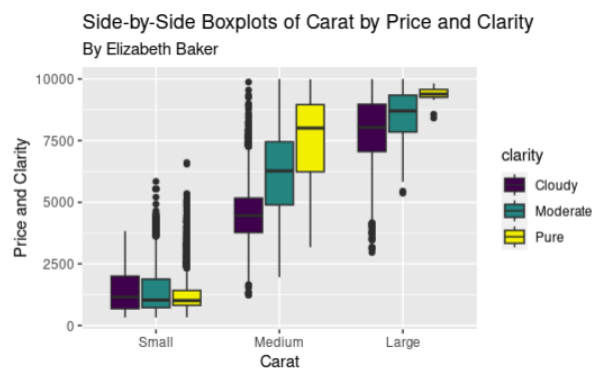
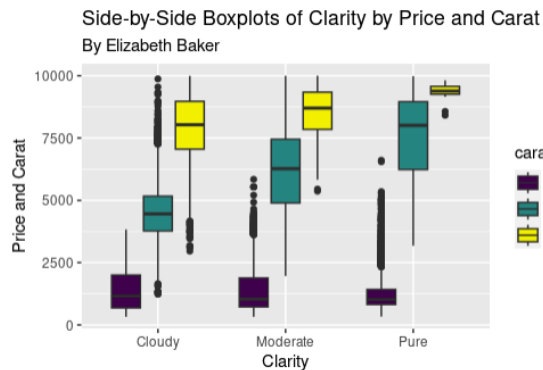
The Confounding Role of Diamond Carat

Before we can conclude that one variable has the most influence on the price of diamonds, we need to consider any confounding variable that may be affecting the cut and clarity of the diamonds: the carat (categorical variable).



Based on the two box plots above, there is a stronger association between the carat and the price of the diamonds. As the carat weight increases, the median price increases regardless of which

clarity category the diamond is in. Carat confounds the association between cut and price in this analysis.



Again, we see carat has the most effect on the price of diamonds. The median price increases as the carat weight increases regardless of the clarity of the diamonds. Carat also confounds the association between clarity and price.

In general, the cut and clarity have some effect on the price of diamonds. Considering all the plots above, we can visualize the conclusion that clarity has more effect on the price of diamonds than cut. Nevertheless, we must consider the diamond's carat category, as this variable affects both the clarity and cut of the diamond, thus affecting the price.

Strategy Recommendation

Considering both strategies, Strategy B appears more promising: our study demonstrated that clarity has a more pronounced effect on the price of diamonds than cut. By producing synthetic diamonds with superior clarity, Elegance Jewelers can capitalize on the evident association between clarity and price, leading to increased profitability. Regardless, it's important to consider the confounding role of a diamond carat, which influences both clarity and cut, thus having the most significant effect on the price.