DIAMOND QUALITY VS. PRICE TRADEOFF: FINDING THE BEST VALUE COMBINATIONS

By Chi (Alison) Dang

AGENDA:

- Project Overview
- Dataset Summary
- Tools & Workflow
- Exploratory Data Analysis (EDA)
- Business Insights Q&As
- Conclusion & Future Recommendations
- References

PROJECT OVERVIEW

Client: General Customer who does not have much knowledge in diamonds

Business Problem: How can customers identify the best quality-to-price combinations in diamonds?

Goal: Analyze the tradeoff between price and quality dimensions.

DATASET SUMMARY

Source: Diamonds from Kaggle

Dataset: ~54,000 diamonds with pricing and quality attributes

Key variables: carat, cut, color, clarity, depth, table, price, x, y, z

Adding variable: price_per_carat

Number of rows: 53,940 entries

Number of columns: 12

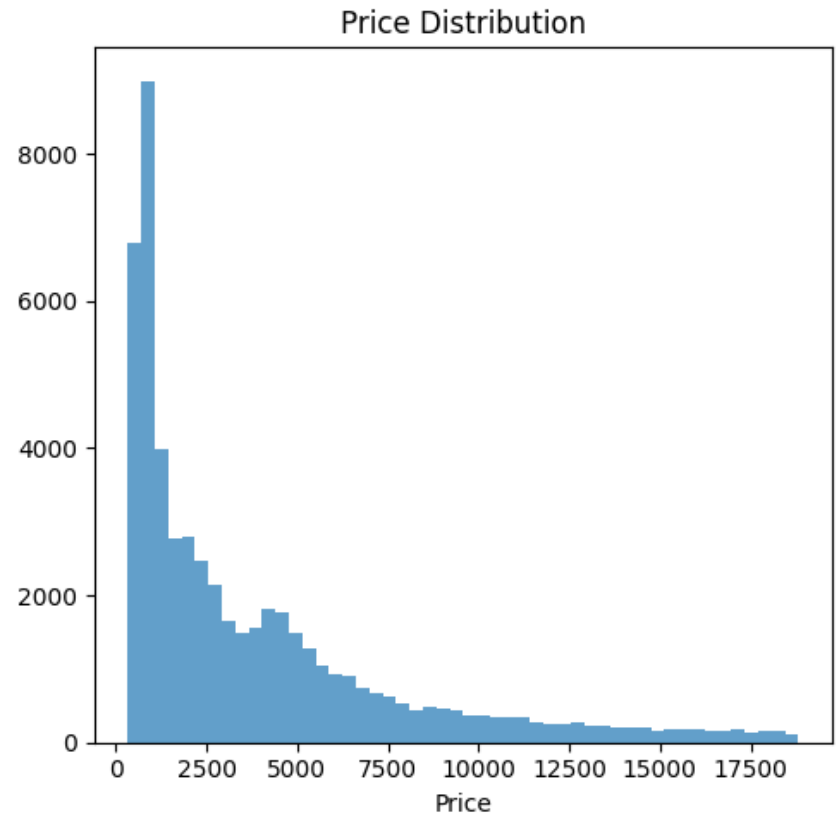
TOOL & WORKFLOW

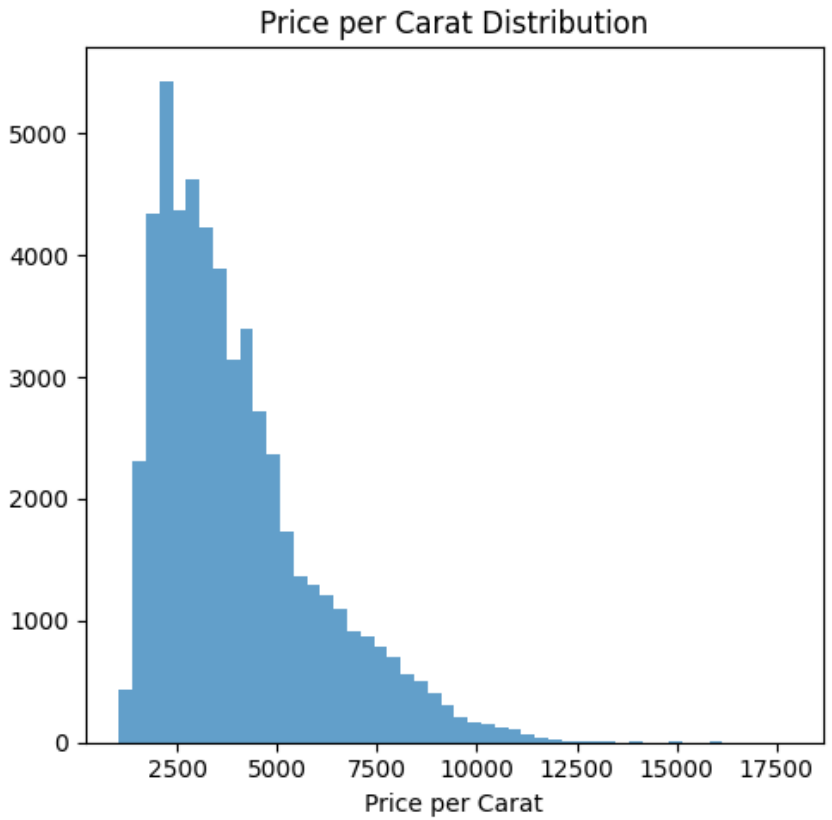
- **Tools:** Python (pandas, seaborn, matplotlib, numpy) in Google Colab
- **Workflow:** Data Cleaning & Transformation → Exploratory Data Analysis (EDA) → Heatmaps → Business Recommendation

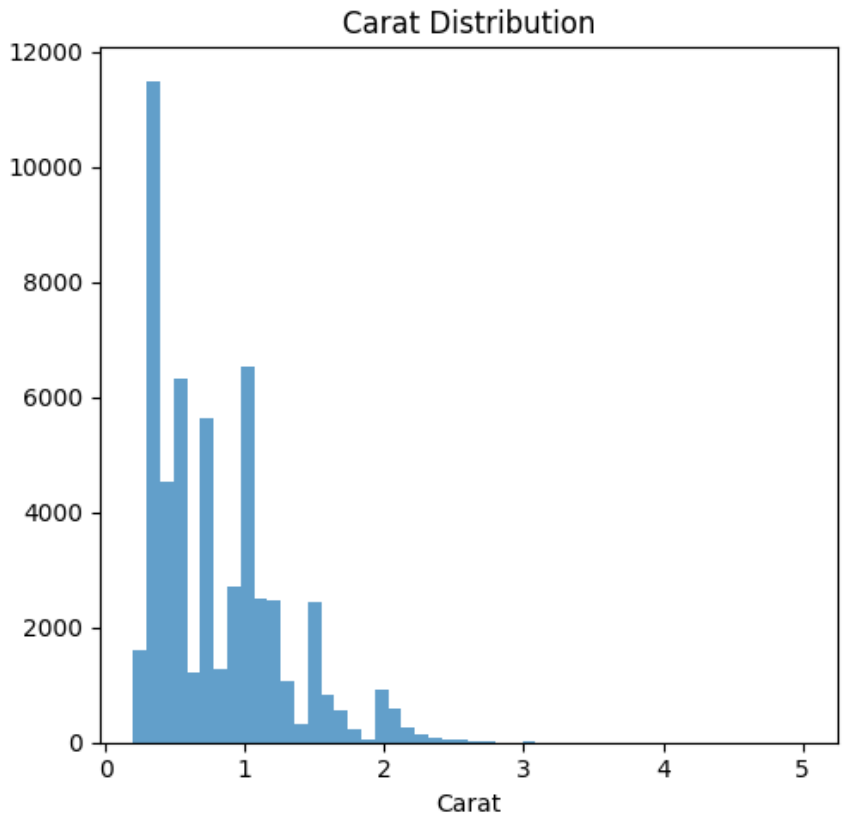
EXPLORATORY DATA ANALYSIS (PT.1)

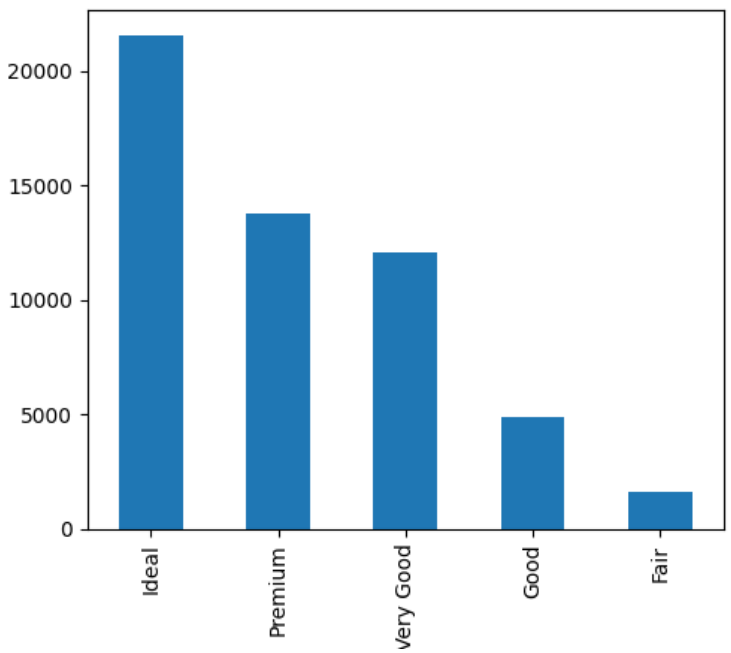
- All distributions below are heavily skewed.
- For the Price and Price per Carat have most diamonds priced under $5,000 and price-per-carat values peaking between $2,000 and $3,000. And for the Carat distribution, we can see the peak between around 0.2 and 1.5 carat
- Fewer diamonds have extreme price per carat beyond $7,000.

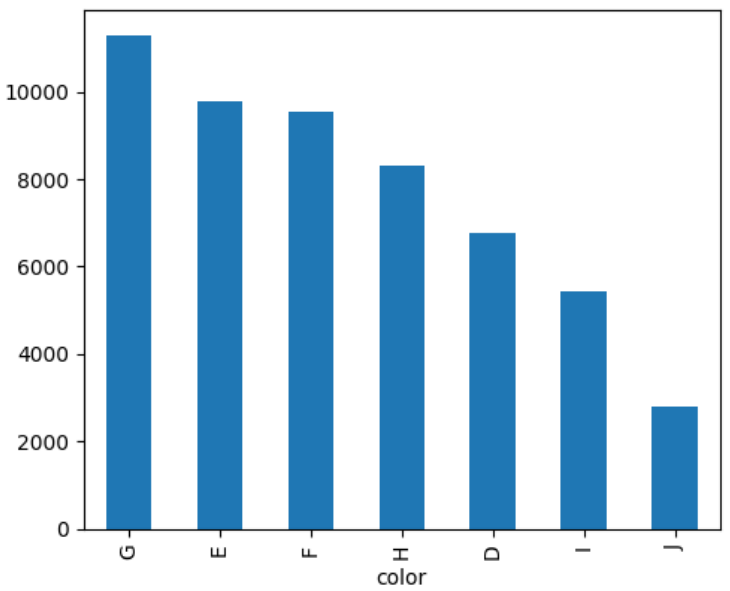
=> A majority of diamonds are lower-priced with a small carat, but a small number are extremely expensive.

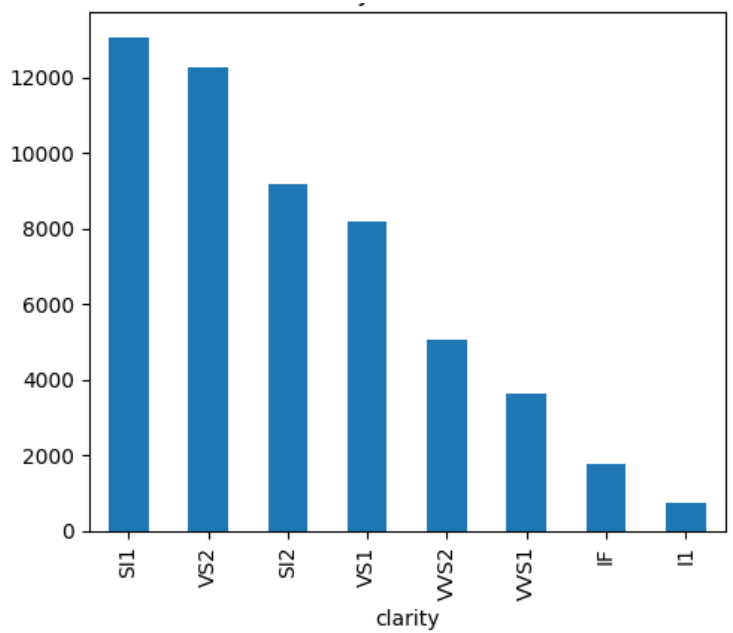










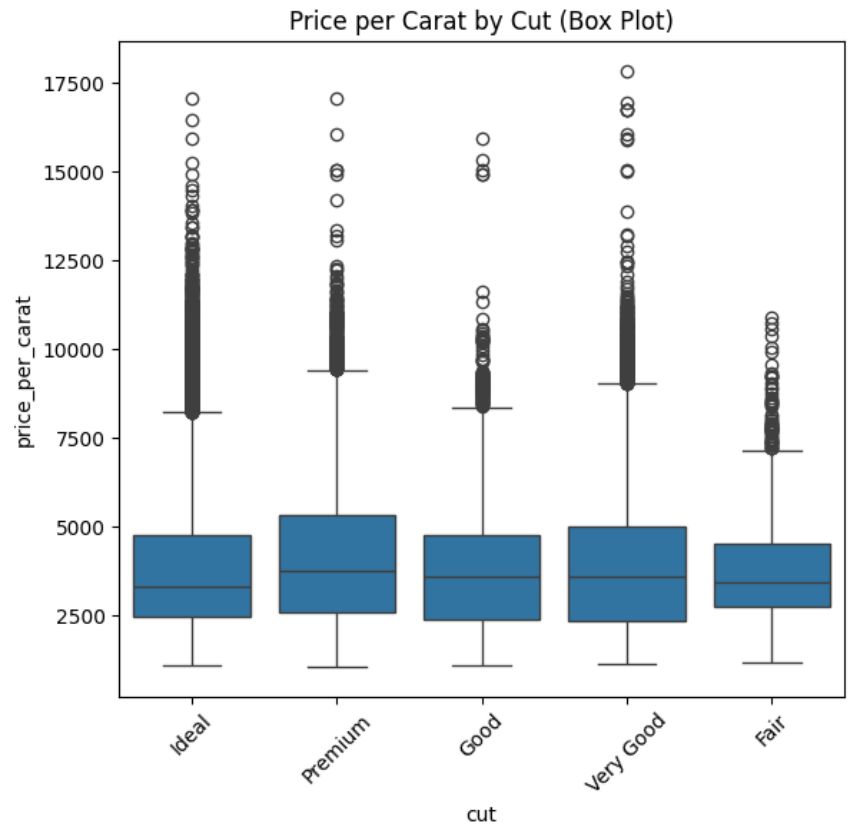


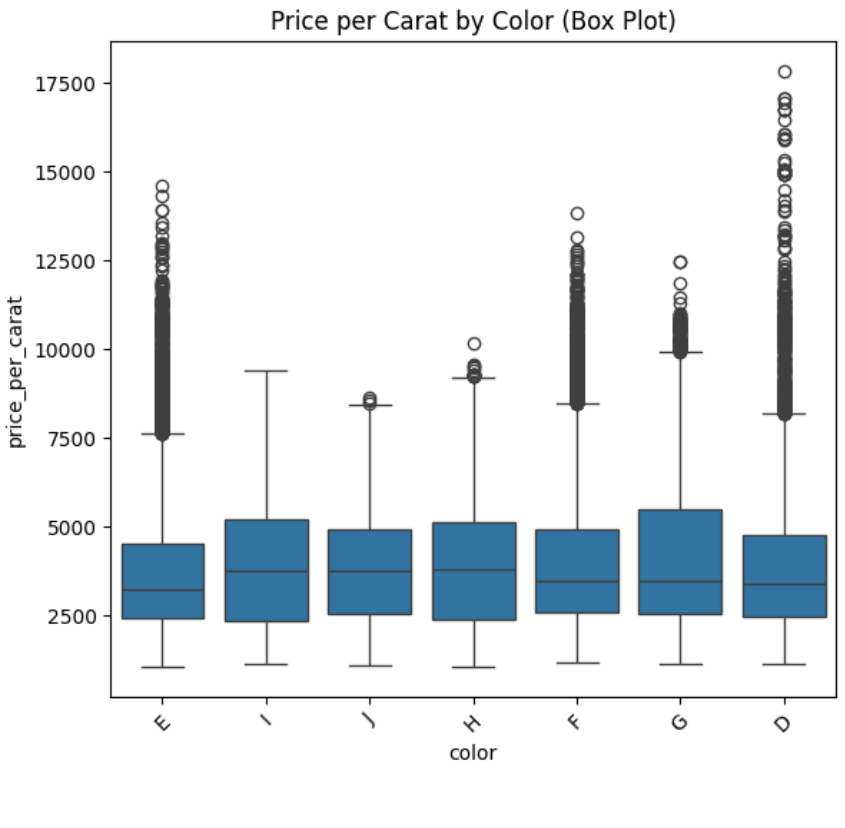
EXPLORATORY DATA ANALYSIS (PT.2)

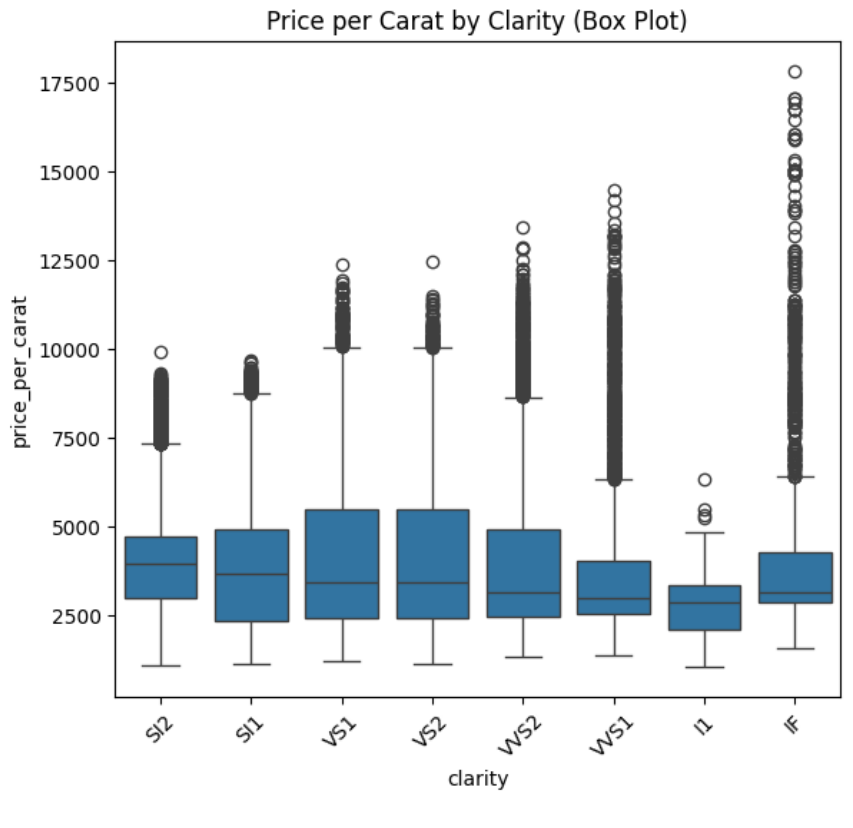
- "Ideal" cut is the most common, likely reflecting both demand and supply.
- Color G is most prevalent—suggesting it may be the sweet spot between visual quality and price. The relative scarcity of D may indicate high cost and low affordability, while J may be unpopular due to visible yellow tint.
- Mid-tier clarity grades (SI1, VS2) dominate, which may indicate a consumer preference for balancing price and perceived flawlessness. Higher clarity grades might be overkill for the naked eye but come at a premium.

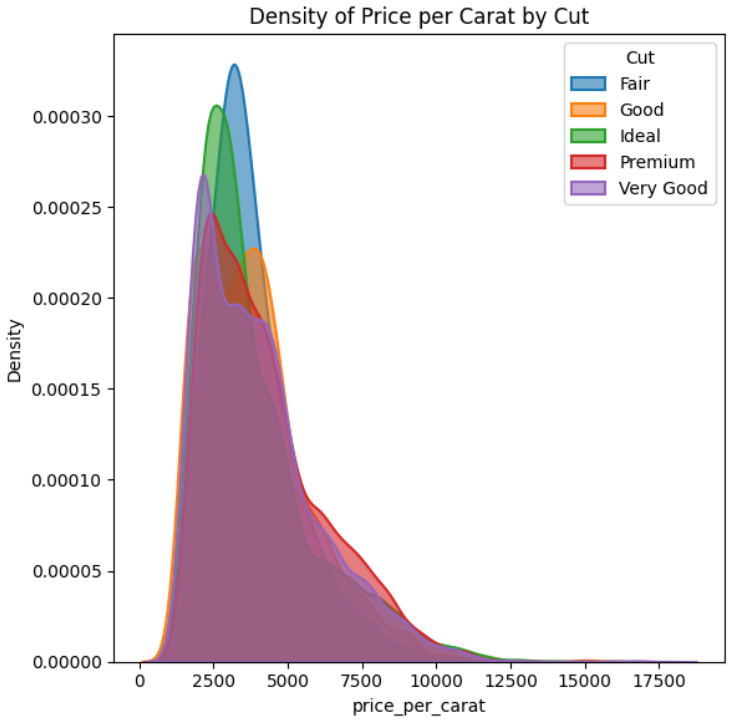
EXPLORATORY DATA ANALYSIS (PT.3)

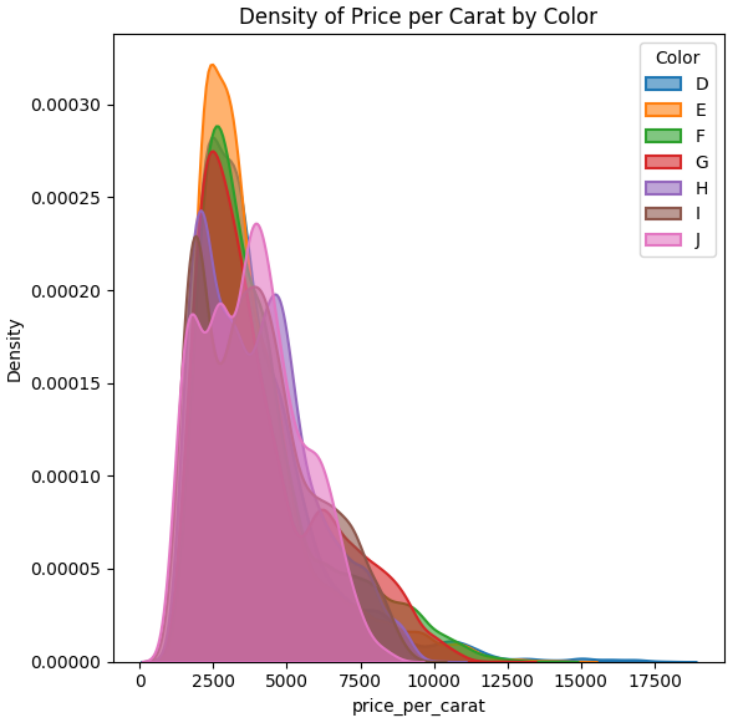
- We can see the box plots have the many outliers will skew to the right strongly.
- **"Very Good" cut** provides comparable brilliance to Ideal/Premium, at better value
- **Color G/H** offers near-colorless appearance at lower prices than D/E
- **Clarity VS2/SI1** delivers good visual clarity at a fraction of the cost of VVS1/IF
- **IF clarity, D color, and Premium cut** may drive prices up without visible benefits — they are best reserved for collectors or high-certification buyers

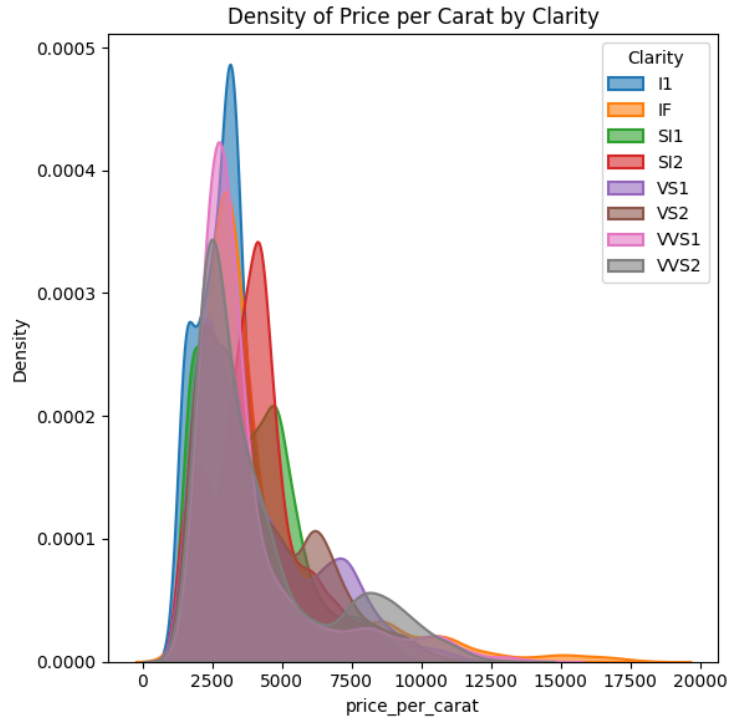








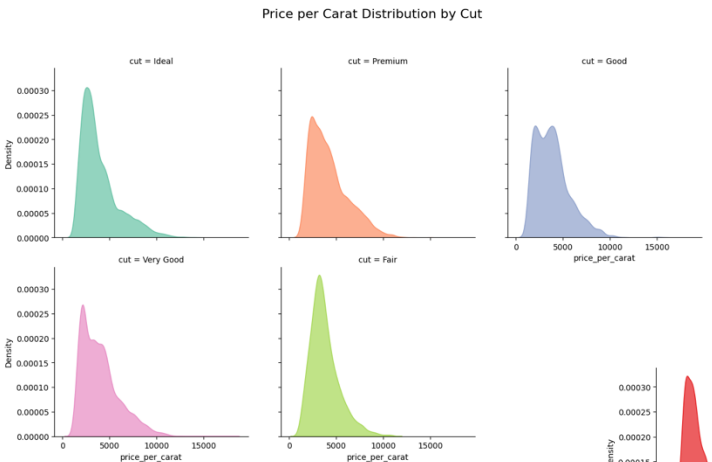


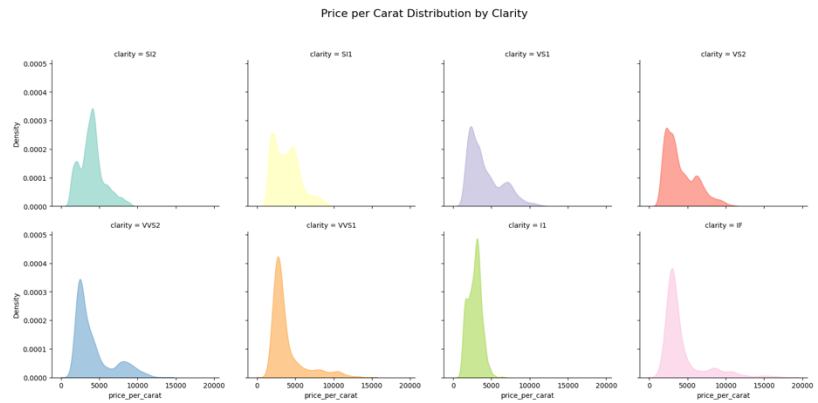


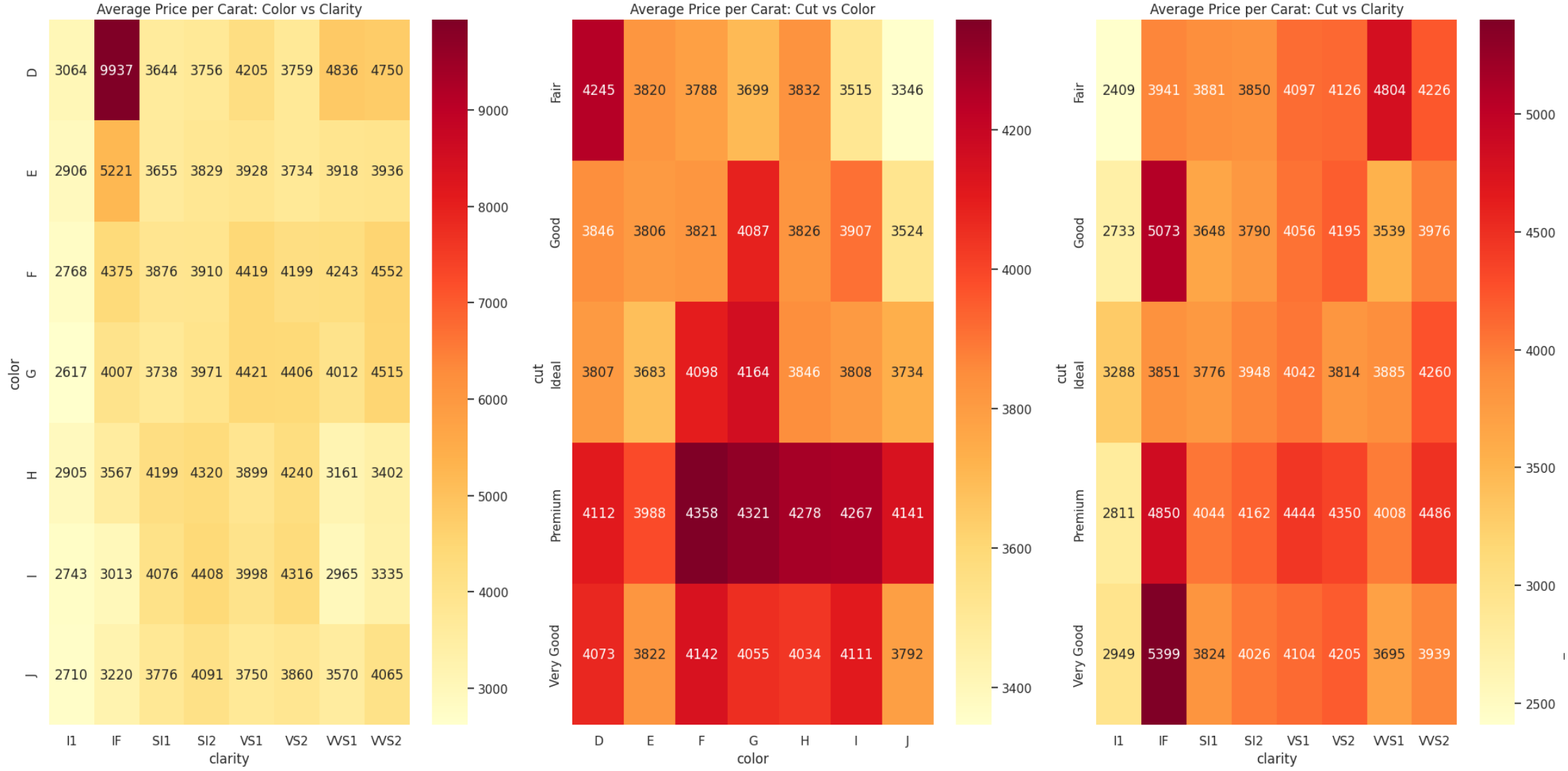
EXPLORATORY DATA ANALYSIS (PT.4)

- "Ideal" and "Premium" cuts don't always justify the price gap over "Very Good"
- G and H color grades hit the sweet spot in color/price balance
- VS2 and SI1 clarity grades provide high quality at mid-tier pricing — without overspending for imperceptible benefits.

EXPLORATORY DATA ANALYSIS (PT.5)

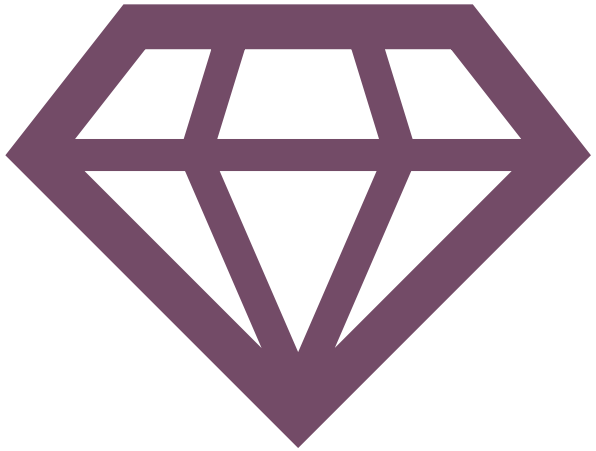






EXPLORATORY DATA ANALYSIS (PT.6)

BUSINESS INSIGHTS Q&A



1) Which combinations of clarity + color offer similar visual quality but significantly lower price?

- If we pick the similar clarity of the diamond, we can choose **SI1** and **SI2** with the color from **D** to **G**, which is the best diamond color you can choose but with an average price below $4000.

2) Is "ideal" cut worth the premium based on price/carat vs. "Very Good" or "Premium"?

- The "**Ideal**" vs "**Very Good**" cut have the similar price range when it comes to color and clarity, so it's worth the premium. However, "**Premium**" is not worth the premium and the cut is between the "**Ideal**" and "**Very Good**," but its price are more expensive than the other two.

3) Which overrated quality grade drive up cost without proportional visual improvement?

- Grades like **IF**, **VVS1**, and **D color** tend to **inflate price** disproportionately to their actual visual improvement. Most buyers can achieve the **same aesthetic result** with **VS2–SI1 clarity** and **G–H color**, at **significantly lower cost.**

CONCLUSION & FUTURE RECOMMENDATIONS

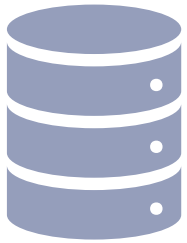
Best Value Sweet Spot:

- **Cut**: “Ideal”
- **Color**: E
- **Clarity**: SI1 or VS2

Recommendations:

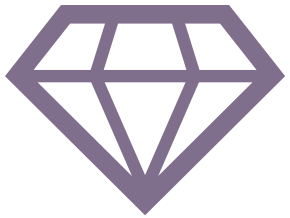
- **Educate consumers** on purchasing diamonds based on their clarity, color, and cut.
- The best option to purchase a diamond is to buy the one has “Ideal” cut with color D or E and any clarity.
- Avoid D color unless paired with IF clarity for investment purposes.

REFERENCE:



Dataset: Kaggle

Tool: Google Collab



Diamond Guideline:
Tiffiany & Co., DIA