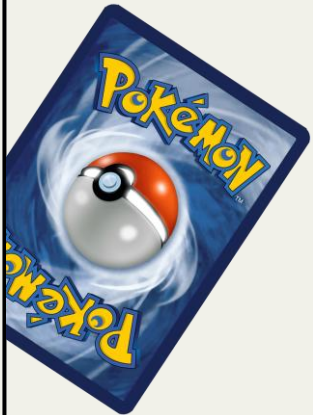
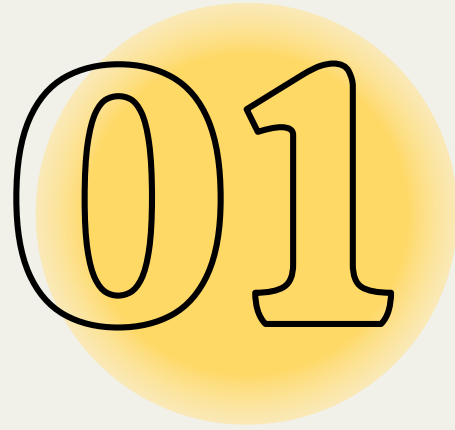




Invisible Hand on Card Price



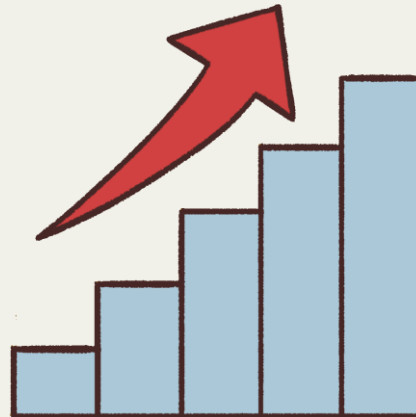
Jihun Kim
William C. Parham



Motivation

Motivation

- Card market prices constantly fluctuate, making it difficult to invest confidently.
- Due to our mutual interest in card games, we devised a way to solve this problem in the Pokémon TCG.
- We first determined whether rarity alone contributed to the price.
- Then, the project was expanded to determine what other factors affected the price.





Data Description

Pokémon TCG Data



```
artist: "PLANETA Igarashi"
▶ attacks: (2) [{...}, {...}]
▶ cardmarket: {url: 'https://prices.pokemontcg.io/cardma
convertedRetreatCost: 1
hp: "180"
id: "swsh1-1"
▶ images: {small: 'https://images.pokemontcg.io/swsh1/1.p
▶ legalities: {unlimited: 'Legal', expanded: 'Legal'}
name: "Celebi V"
▶ nationalPokedexNumbers: [251]
number: "1"
rarity: "Rare Holo V"
regulationMark: "D"
▶ retreatCost: ['Colorless']
▶ rules: ['V rule: When your Pokémon V is Knocked Out, yc
▶ set: {id: 'swsh1', name: 'Sword & Shield', series: 'Swo
▶ subtypes: (2) ['Basic', 'V']
supertype: "Pokémon"
▶ tcgplayer: {url: 'https://prices.pokemontcg.io/tcgplay
▶ types: ['Grass']
▶ weaknesses: [{...}]
```

- Information on the name, type, battle information, rarity, image, and illustrator(s) of the card in JSON format
- Notable Features:
 - Set ID*
 - Number*
 - Name
 - Rarity
 - Artist (Illustrator)

TCGdex Pricing History

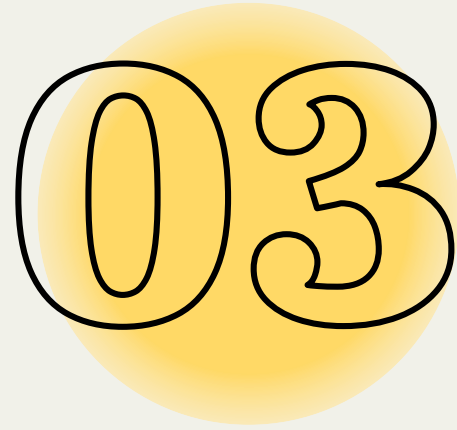


[price-history](#) / [en](#) / [swsh1](#) / 1.tcgplayer.json

```
"holo-good": {  
  "history": {  
    "2022-11-12": {  
      "avg": 166,  
      "count": 2  
    },  
    "2022-12-07": {  
      "avg": 230,  
      "count": 4,  
      "min": 174,  
      "max": 399  
    },  
    "2022-12-09": {  
      "avg": 140,  
      "count": 4,  
      "min": 113,  
      "max": 149  
    },  
  },  
}
```



- The average price, the lowest price, and the highest price according to card grade are stored in JSON format.
- Notable Features:
 - Set ID*
 - Number*
 - Date
 - Grade
 - Price



Methodology

Combine Datasets

```
{
  name: "Celebi V",
  nationalPokedexNumbers: [251],
  number: "1",
  rarity: "Rare Holo V",
  regulationMark: "D",
  retreatCost: ["Colorless"],
  rules: ["V rule: When your Pokémon V is Knocked Out, yo"],
  set: {id: "swsh1", name: "Sword & Shield", series: "Swo"}
}
```

Pokémon TCG Data

Set ID	Number	Name	Rarity
swsh1	1	Celebi V	Rare Holo V
swsh1	2	Roselia	Common
swsh1	3	Roselia	Common

TCGdex Pricing History

[price-history / en / swsh1 / 1](#)tcgplayer.json

```
{
  "holo-good": {
    "history": {
      "2022-11-12": {
        "avg": 166,
        "count": 2
      }
    }
  }
}
```

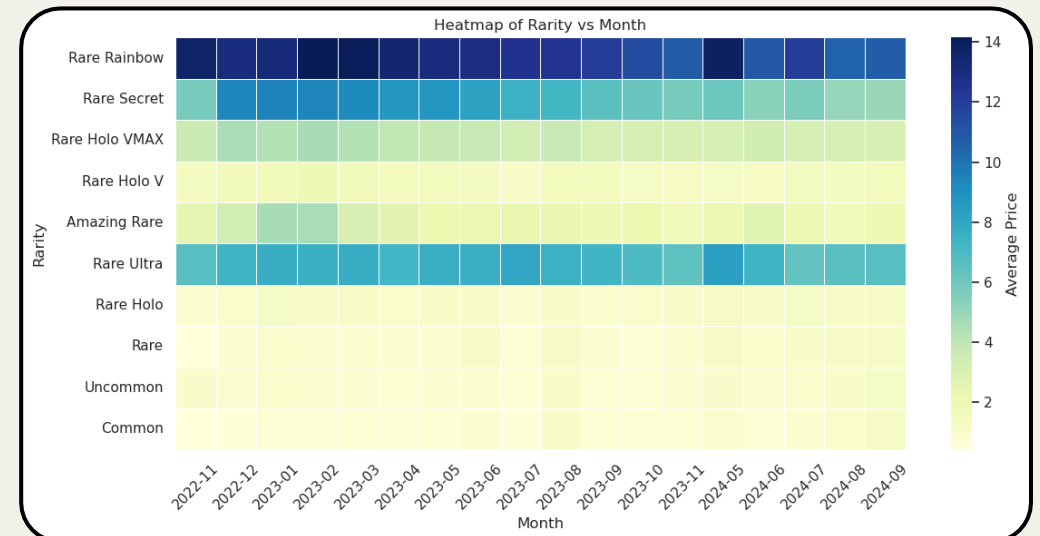
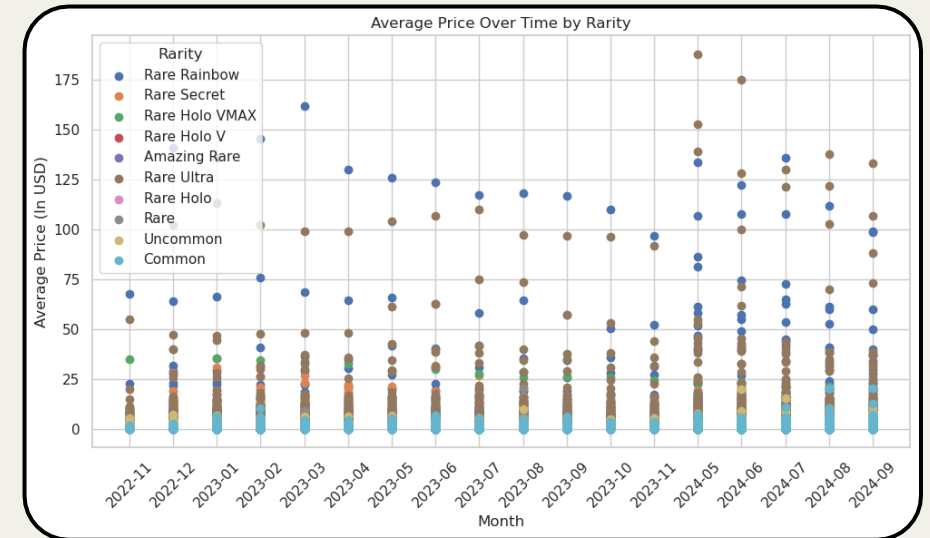
Average price by month

Set ID	Number	Name	Rarity	Grade	Month	Average
swsh1	1	Celebi V	Rare Holo V	holo-good	Nov-22	166
swsh1	1	Celebi V	Rare Holo V	holo-good	Dec-22	125.95
swsh1	1	Celebi V	Rare Holo V	holo-good	Jan-23	176
swsh1	1	Celebi V	Rare Holo V	holo-good	Feb-23	200.71
swsh1	1	Celebi V	Rare Holo V	holo-good	Mar-23	163.75

Set ID	Number	Grade	Month	Average
swsh1	1	holo-good	Nov-22	166
swsh1	1	holo-good	Dec-22	125.95
swsh1	1	holo-good	Jan-23	176

Clean and Analyze Dataset

- Since the prices are in cents, divide them by 100 to convert to dollars.
- Convert all dates into yyyy-mm format.
- Convert rarities/grades from a textual format to a numerical format.
- Group and plot card data to observe trends.
 - Heatmaps, Scatterplots, Line Graphs, Box Plots, and K-mean Clustering
 - Outliers in averages



Scrape Web Decklists



Rank by Top 8 finishes ☐ Split decks into their variants

Time: 2022-2023

Time: 2023-2024

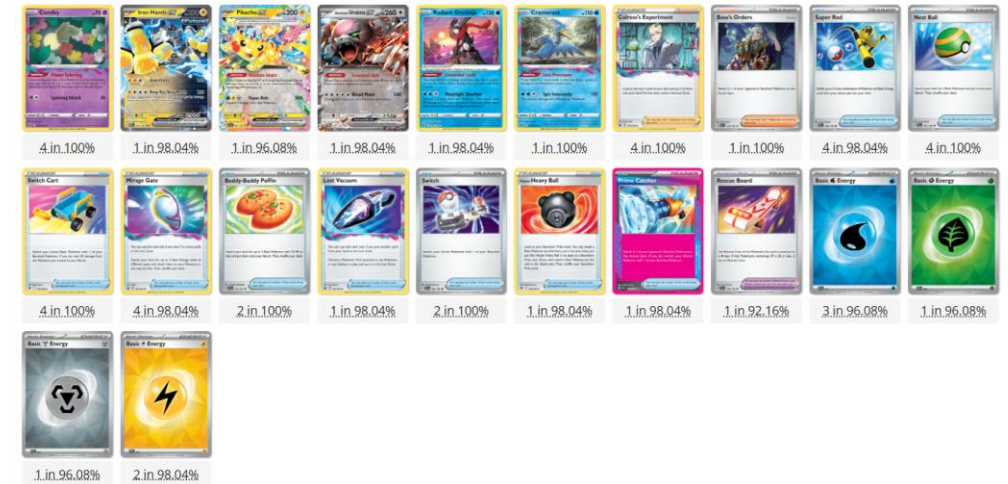
Edit tournament filter

#

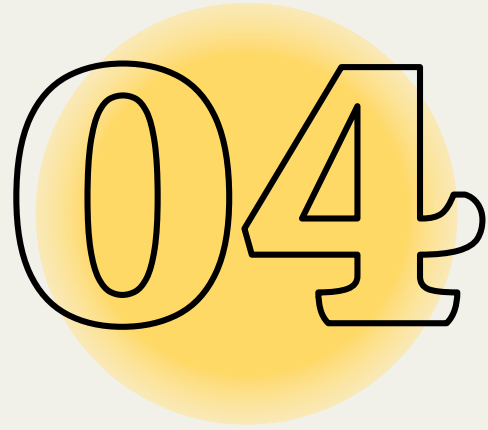
Deck

1		Lost Zone Box
2		Lugia Archeops
3		Gardevoir ex
4		Mew Genesect Fusion Strike
5		Charizard ex
6		Arceus VSTAR
7		Giratina VSTAR
8		Chien-Pao Baxcalibur
9		Miraidon ex
10		Palkia VSTAR

Core Cards (BRS-PRE)

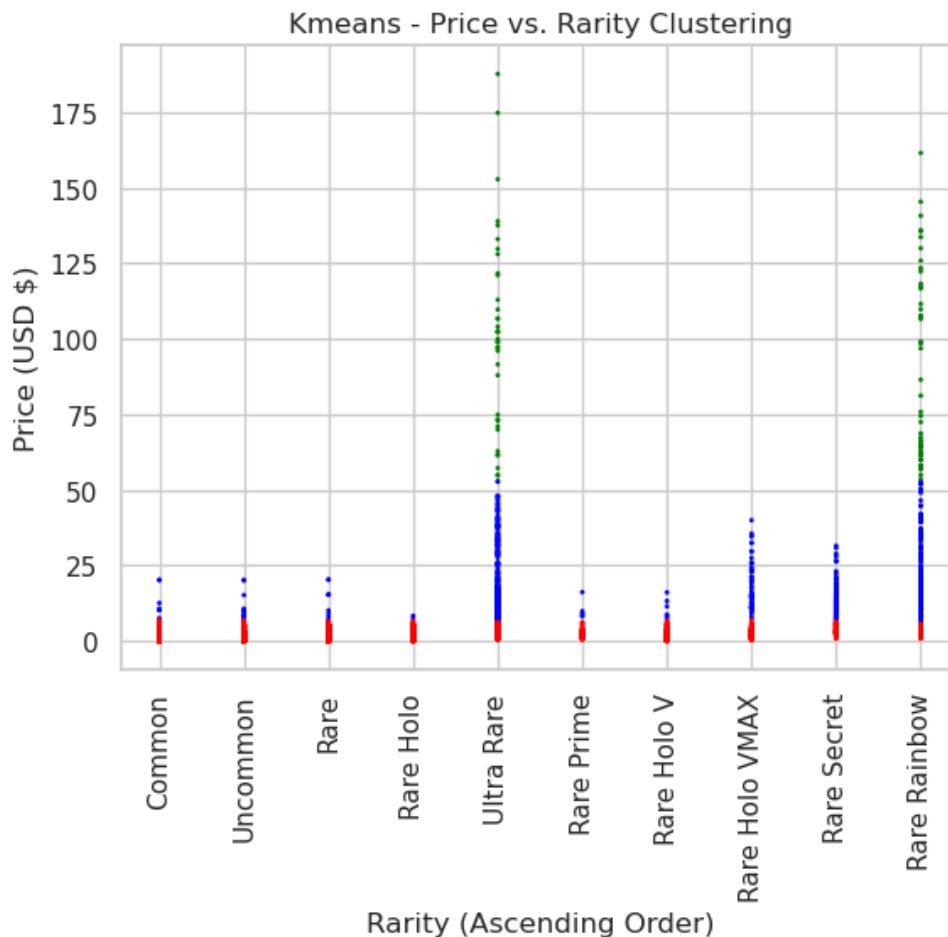


Deck Nam	Card Nam	Count	Set	Price (USD)	Card URL
Lost Zone	Comfey	4	LOR	\$0.76	https://pa
Lost Zone	Cramorant	1.1	LOR	\$0.15	https://pa
Lost Zone	Iron Hands	1	PAR	\$2.29	https://pa
Lost Zone	Bloodmoon	1	TWM	\$1.95	https://pa
Lost Zone	Radiant Gr	1	ASR	\$1.20	https://pa

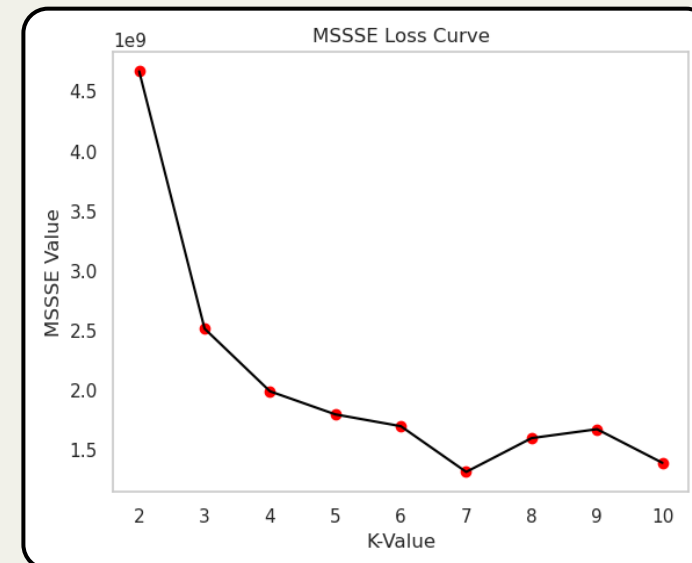


Results

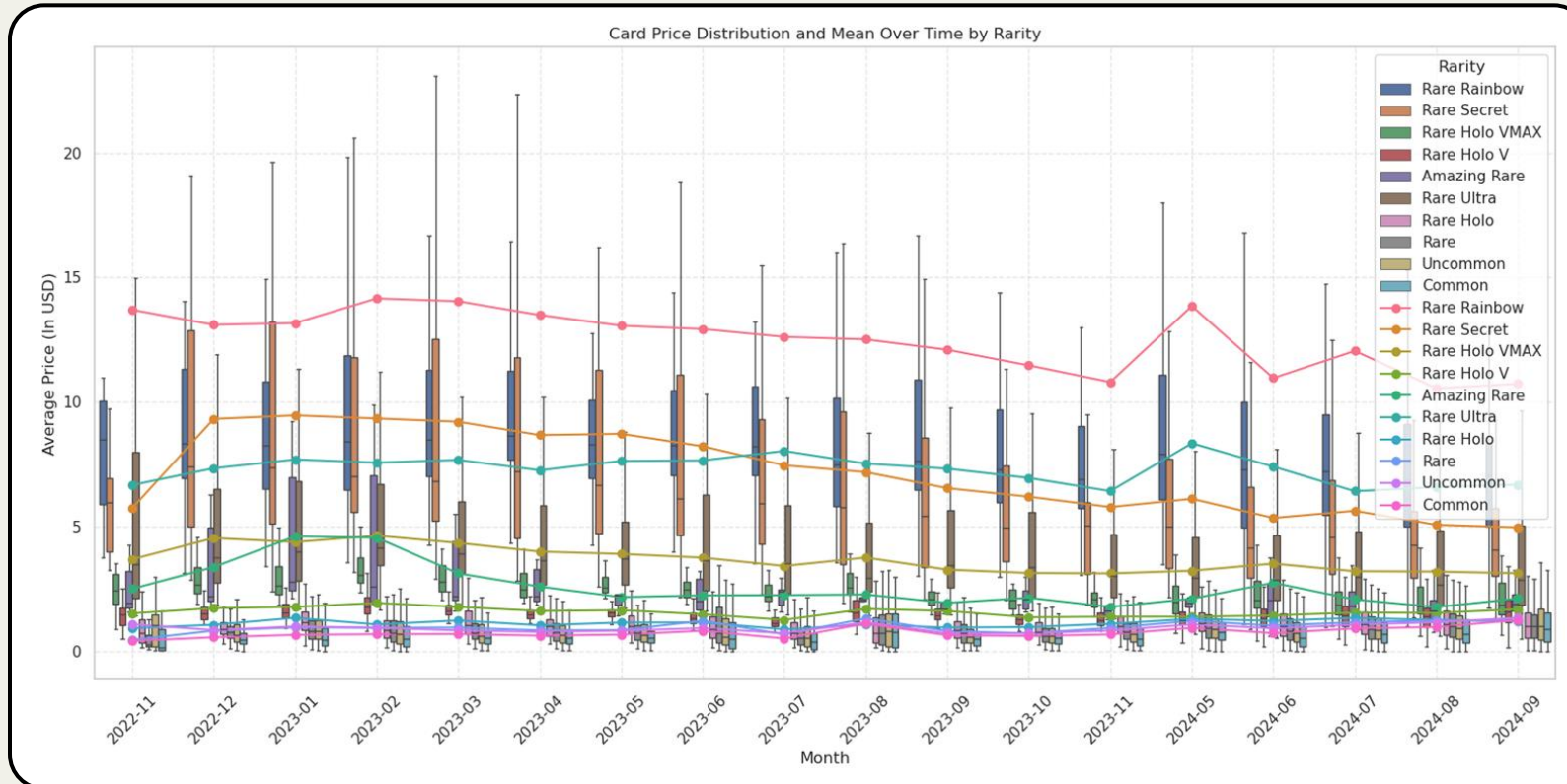
Rarity - Matters



- K-means clustering helps illustrate that as rarity increases, generally, price increases.
 - Two rarities are "expensive":
 - Ultra Rare and Rainbow Rare
- Note that even common cards have some pricing overlap with Rare Rainbows.
 - Outliers should be considered.

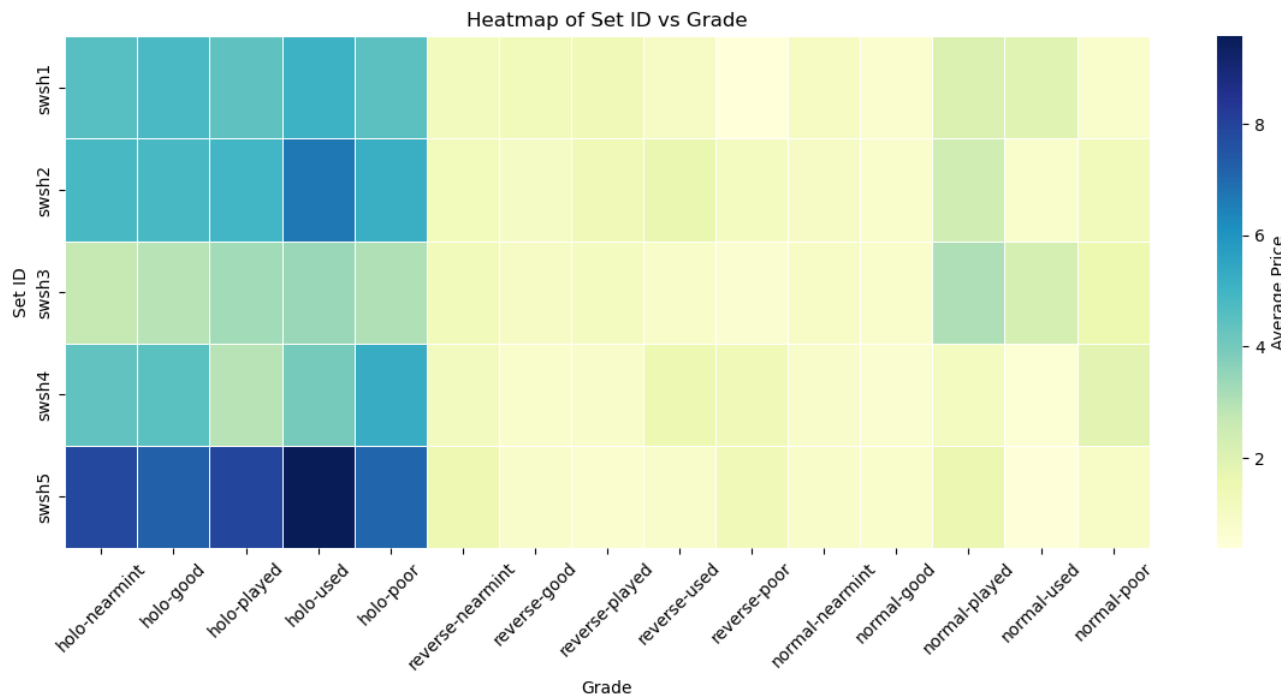


Rarity - Matters



- Specific outliers make it hard to work with averages.
- The most expensive common can be worth a similar amount to a cheap rainbow rare

Grade - Matters



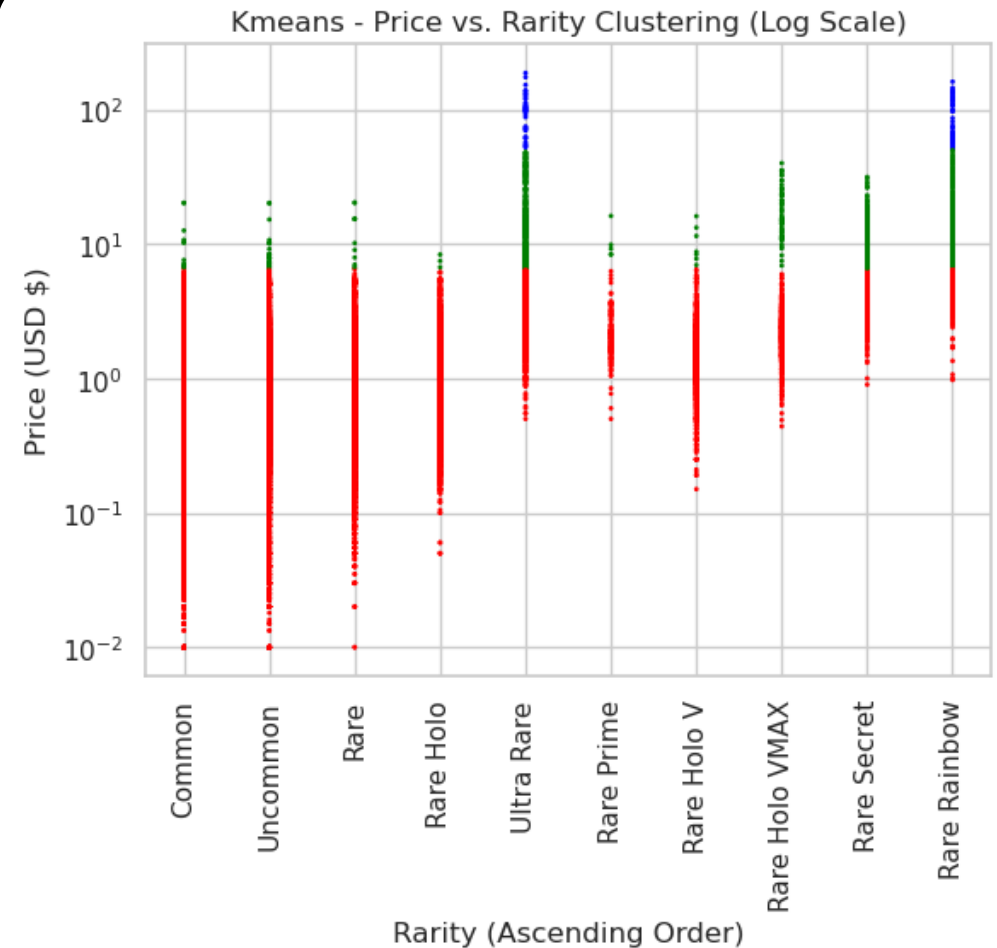
- Grade plays a significant role in Pokémon TCG, specifically since it is a collector's TCG.
- A card's grade or "quality" can greatly affect its price, leading to notable outliers.

Set ID	Number	Name	Rarity	Grade	Month	Average
swsh5	155	Tyranitar V	Rare Ultra	holo-nearmint	2024-05	18767.00
swsh5	155	Tyranitar V	Rare Ultra	holo-nearmint	2024-06	17478.89
swsh4	188	Pikachu VMAX	Rare Rainbow	holo-good	2023-03	16151.90
swsh5	155	Tyranitar V	Rare Ultra	holo-good	2024-05	15283.57
swsh4	188	Pikachu VMAX	Rare Rainbow	holo-good	2023-02	14541.60

Meta Decklist - Does Not Matter

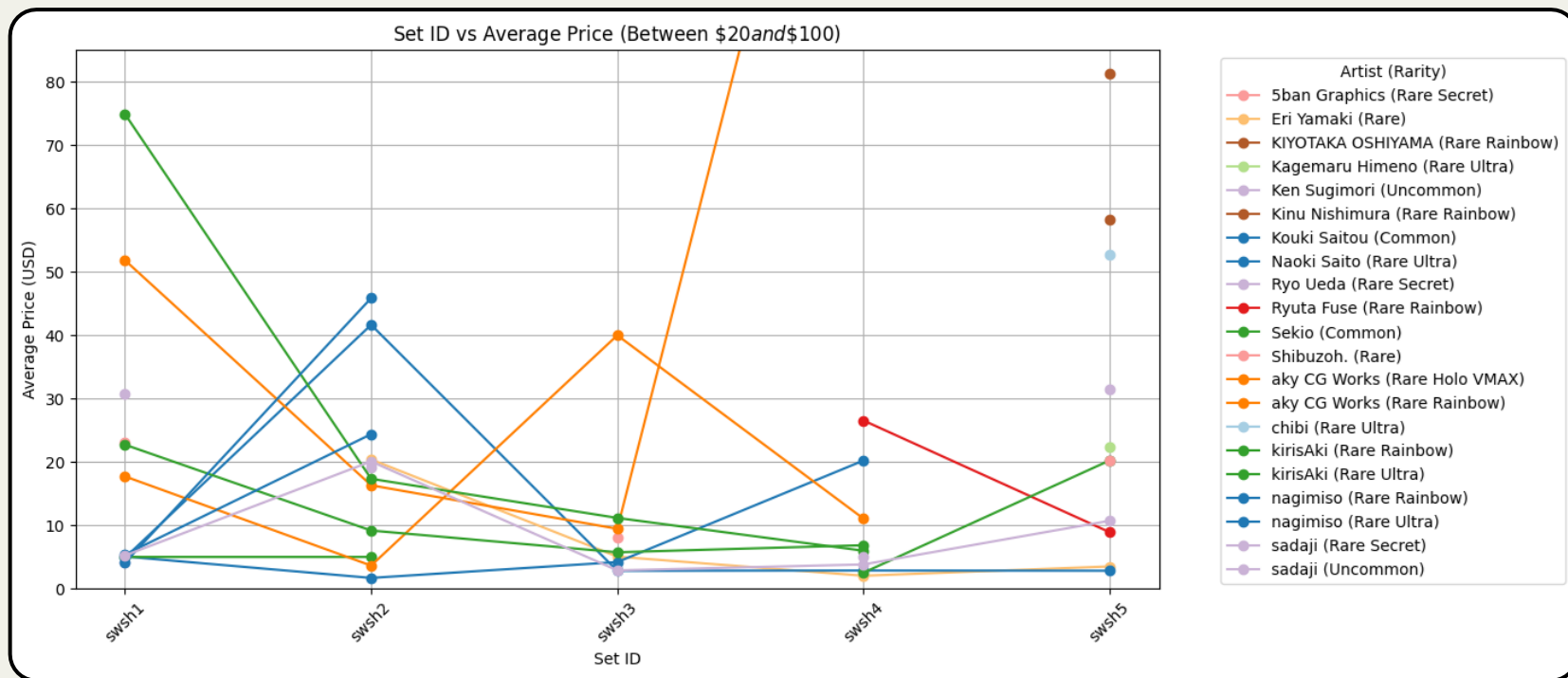
- Cross examine our dataset with meta decklists.
- The most expensive meta card is just shy of \$11.
- Every card after is less and less expensive.
- Something else must be driving card prices ...

Set ID	swsh2
Number	194
Name	Cinderace VMAX
Rarity	Rare Rainbow
Grade	holo-good
Month	2023-11
Average	1096.57
rarity_rank	31



Illustrator - Somewhat Matters

- Some illustrators tend to garner higher prices for unique or sought after artwork
 - "Aky CG Works" and "kirisAki" tend to be higher than average.





Conclusion & Future Work

Conclusion



Rarity

In most cases, cards with higher rarity have higher prices.



Grade

If they are the same card, it is natural that a higher-grade card is traded at a higher price.



Meta Decks

Being part of a meta deck has a low influence on a card's price.



Illustrators

Certain illustrators tend to be associated with higher card prices, though not universally.

Future Works

- Predict the card price based on the market trend.
- Estimate what card would be appealing to customers.



Questions?





Thank you!

