MLB Qualifying Offer Analysis: Inspired by 2025 Trent Grisham

Scott Lehrfeld

To begin, I would like to acknoledge I have no problem with Trent Grisham. I would say indifferent is the strongest word I would use. My friend however does not feel this way. As a Yankees fan he was dissapointed Grisham was offered the qualifying offer (QO), and irate that he accepted it. His passion peaked my interest, as I was not sure if there was a fair way to judge a team for their judgement on when to offer this special deal. It has only existed since 2012, (history here: https://www.mlb.com/news/history-of-mlb-qualifying-offer-decisions-c300602464) and the book is not out on how to proceed perfectly for both player and front office. In fact, 2025 marked the most ever acceptances in one season. My question is, did the Yankees make a mistake, or can my friend feel better about this front office decision?

Project Topics

1. History of qualifying offer summary
2. Summary of year-to-year performance changed based on QO decision (including charts)
3. Accept or Reject QO prediction model (Is Grisham expected to accept, and why)
4. QO offered player performance by team
5. Team player retention based on QO
6. Grisham stat comparison to other hitters who accepted the QO

Data

- Qulifying Offer data: Sourced from MLB.com article (Linked above)
- Player performance statistics: Baseball Savant data (https://baseballsavant.mlb.com/)
- Player IDs: https://www.smartfantasybaseball.com/tools/

Data Dictionary

Qualifying Offer Dataset

Column	Description
`Player`	Player name
`Year`	Season in which the Qualifying Offer was made

Column	Description
`Team1`	Team that extended the Qualifying Offer
`Team2`	Team the player signed with if they rejected and left (NaN if stayed)
`Decision`	Player decision on the QO (`Accepted` , `Rejected and Stayed` , `Rejected and Left`)
`Offer`	Dollar value of the Qualifying Offer
`Name_Clean`	Cleaned player name used for merging datasets
`MLBID`	Unique MLB player identifier

Player Performance Statistics

Column	Description
`home_run`	Home runs hit during the season
`k_percent`	Strikeout percentage
`bb_percent`	Walk percentage
`on_base_plus_slg`	On-base plus slugging percentage (OPS)
`woba`	Weighted On-Base Average
`xwoba`	Expected Weighted On-Base Average
`home_run_next_year`	Home runs in the season following the QO
`k_percent_next_year`	Strikeout percentage in the following season
`bb_percent_next_year`	Walk percentage in the following season
`on_base_plus_slg_next_year`	OPS in the following season
`woba_next_year`	wOBA in the following season
`xwoba_next_year`	xwOBA in the following season

Derived Features

Column	Description
`delta_home_run`	Change in home runs from QO year to next season
`delta_k_percent`	Change in strikeout rate
`delta_bb_percent`	Change in walk rate
`delta_on_base_plus_slg`	Change in OPS
`delta_woba`	Change in wOBA

Column	Description
`delta_xwoba`	Change in xwOBA

Machine Learning Features

Column	Description
`Offer_numeric`	Numeric version of QO value used for modeling
`Decision_binary`	Binary target variable (`1 = Accepted` , `0 = Rejected`)

In [163…
```
import pandas as pd
qo = pd.read_csv("Qualifying Offers history.csv")
player_ids = pd.read_csv("SFBB Player ID Map - PLAYERIDMAP.csv")
hitter_stats = pd.read_csv("stats_hitters.csv")
pitcher_stats = pd.read_csv("stats_pitchers.csv")
```

In [164…
```
qo["Name_Clean"] = qo["Player"]
player_ids["Name_Clean"] = player_ids["PLAYERNAME"]

if "MLBID" not in player_ids.columns:
    player_ids["MLBID"] = pd.NA

df_qo = qo.merge(player_ids[["Name_Clean", "MLBID"]], on="Name_Clean", how="left")
df_qo_next_year = df_qo.copy()
df_qo_next_year["Year"] = df_qo_next_year["Year"] + 1
```

In [165…
```
hitter_stats["Position_Type"] = "Hitter"
pitcher_stats["Position_Type"] = "Pitcher"
all_stats = pd.concat([hitter_stats, pitcher_stats], ignore_index=True)
```

In [166…
```
df_qo["MLBID"] = pd.to_numeric(df_qo["MLBID"], errors="coerce")
df_qo["Year"] = pd.to_numeric(df_qo["Year"], errors="coerce")
df_qo_next_year["MLBID"] = pd.to_numeric(df_qo_next_year["MLBID"], errors="coerce")
df_qo_next_year["Year"] = pd.to_numeric(df_qo_next_year["Year"], errors="coerce")
all_stats["player_id"] = pd.to_numeric(all_stats["player_id"], errors="coerce")
all_stats["year"] = pd.to_numeric(all_stats["year"], errors="coerce")
```

In [167…
```
stat_cols = ["home_run", "k_percent", "bb_percent", "on_base_plus_slg", "woba", "xw

df_qo_stats = df_qo.merge(
    all_stats,
    left_on=["MLBID", "Year"],
    right_on=["player_id", "year"],
    how="left"
)
df_qo_next_stats = df_qo_next_year.merge(
    all_stats,
    left_on=["MLBID", "Year"],
    right_on=["player_id", "year"],
    how="left"
)
```

In [168…
```
df_qo_next_stats_aligned = df_qo_next_stats.copy()
df_qo_next_stats_aligned["Year"] = df_qo_next_stats_aligned["Year"] - 1

next_year_stats = (
    df_qo_next_stats_aligned[
        ["MLBID", "Year"] + stat_cols
    ]
    .rename(columns={col: f"{col}_next_year" for col in stat_cols})
)
```

In [169…
```
df_qo_combined = df_qo_stats.merge(
    next_year_stats,
    on=["MLBID", "Year"],
    how="left"
)
```

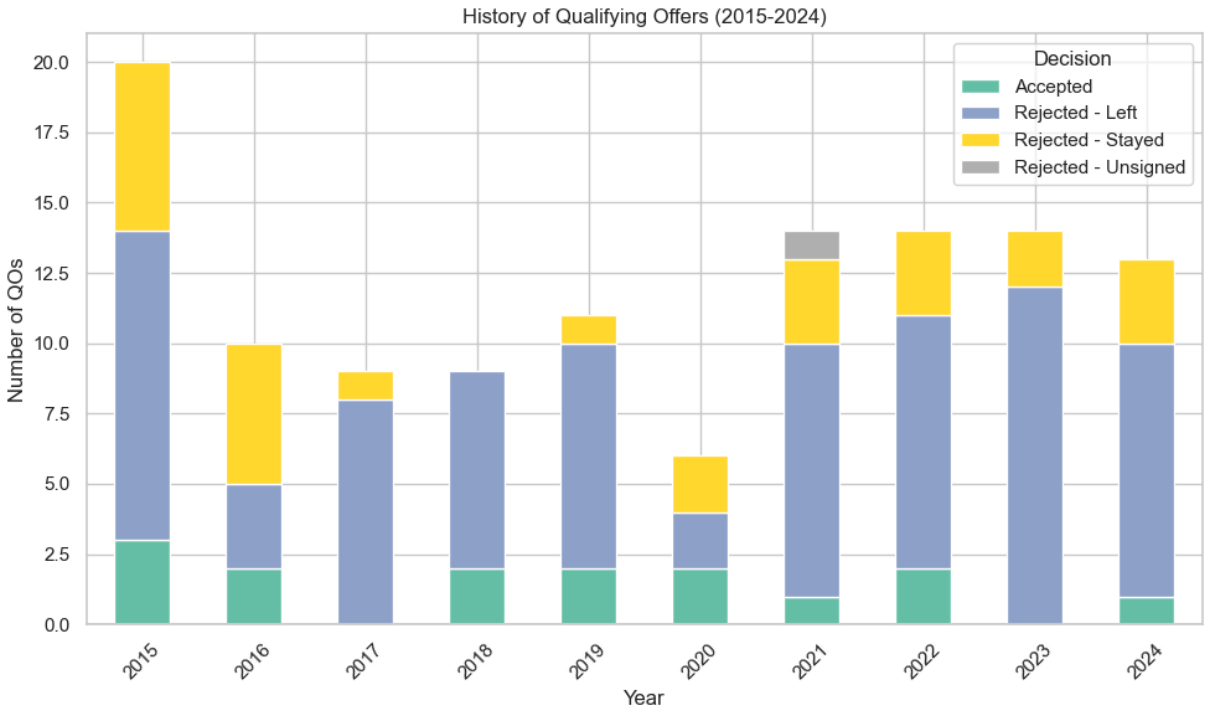
In [170…
```
qo_final = df_qo_combined.copy()

qo_final = qo_final[
    (qo_final["Year"] >= 2015) &
    (qo_final["Year"] <= 2024)
]

for col in stat_cols + [f"{col}_next_year" for col in stat_cols]:
    qo_final[col] = qo_final.apply(
        lambda row: -row[col] if row["Position_Type"] == "Pitcher" else row[col],
        axis=1
    )
```

In [171…
```
delta_cols = {}

for col in stat_cols:
    delta_name = f"delta_{col}"
    qo_final[delta_name] = qo_final[f"{col}_next_year"] - qo_final[col]
    delta_cols[col] = delta_name
```

In [172…
```
df_delta = qo_final.dropna(subset=[f"{col}_next_year" for col in stat_cols])
```

In [173…

```
import matplotlib.pyplot as plt

qo_history = qo_final.groupby(["Year", "Decision"]).size().unstack(fill_value=0)

qo_history.plot(kind="bar", stacked=True, figsize=(10,6), colormap="Set2")

plt.title("History of Qualifying Offers (2015-2024)")
plt.xlabel("Year")
plt.ylabel("Number of QOs")
plt.xticks(rotation=45)
plt.legend(title="Decision")
plt.tight_layout()
plt.show()
```



In [174…

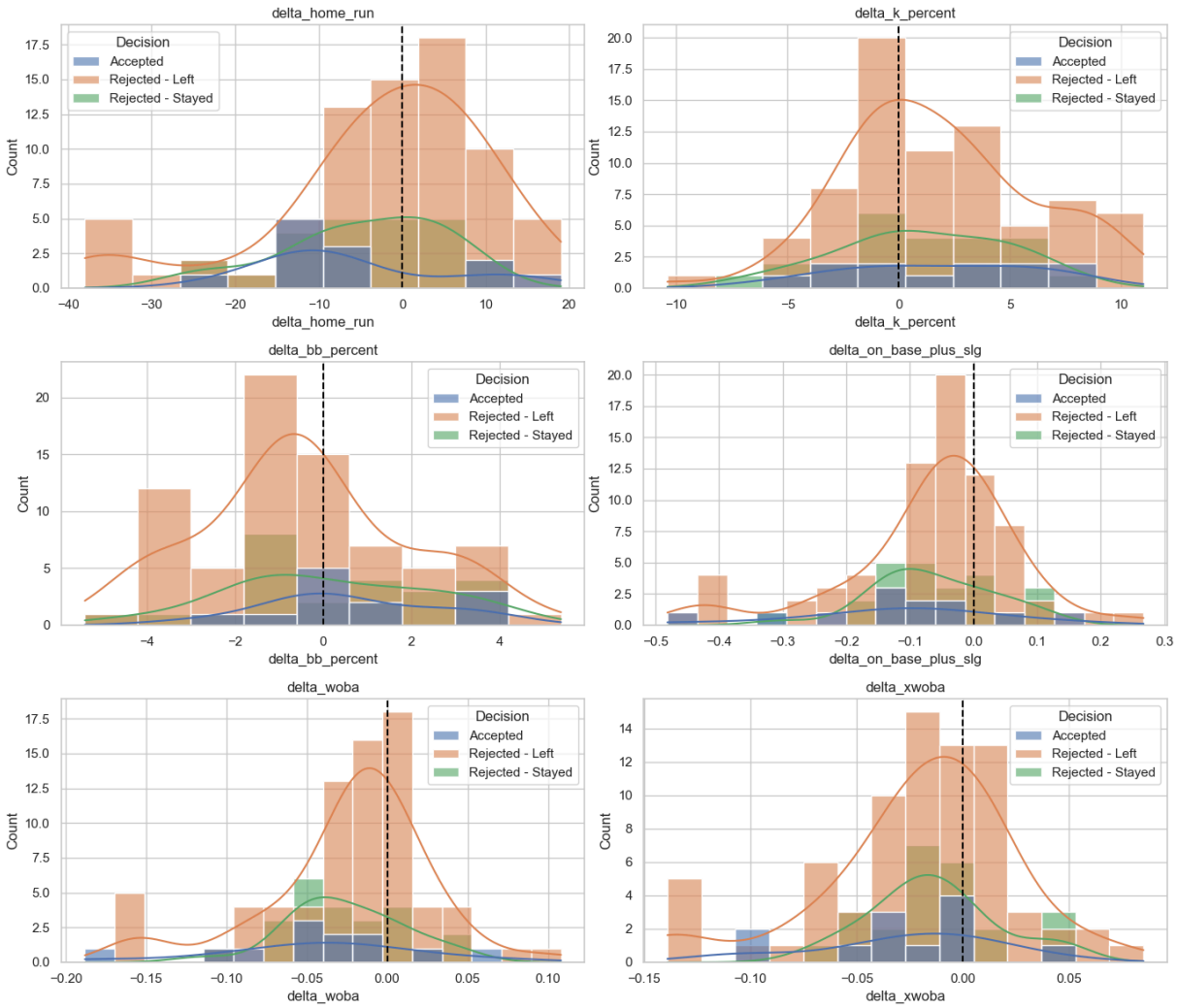
```
summary = (
    df_delta
    .groupby("Decision")[[f"delta_{col}" for col in stat_cols]]
    .agg(["mean", "median", "count"])
    .round(4)
)
print(summary)
```

```
                 delta_home_run              delta_k_percent              \
                           mean median count            mean median count
Decision
Accepted                -5.7500   -9.5    12          1.7833   1.75    12
Rejected - Left         -2.3733   -1.0    75          1.7573   1.30    75
Rejected - Stayed       -4.5833   -2.5    24          1.0583   0.80    24

                 delta_bb_percent              delta_on_base_plus_slg  \
                             mean median count                   mean
Decision
Accepted                   0.6250   0.15    12               -0.1202
Rejected - Left           -0.4253  -0.60    75               -0.0644
Rejected - Stayed          0.1833   0.00    24               -0.0636

                              delta_woba               delta_xwoba          \
                  median count       mean  median count        mean  median
Decision
Accepted          -0.1045    12    -0.0444 -0.0400    12     -0.0267 -0.0205
Rejected - Left   -0.0370    75    -0.0233 -0.0150    75     -0.0204 -0.0140
Rejected - Stayed -0.0765    24    -0.0256 -0.0315    24     -0.0135 -0.0160


                 count
Decision
Accepted            12
Rejected - Left     75
Rejected - Stayed   24
```

In [175…

```python
import matplotlib.pyplot as plt
import seaborn as sns
import math

sns.set(style="whitegrid")

delta_cols = [f"delta_{col}" for col in stat_cols]
n_cols = 2
n_rows = math.ceil(len(delta_cols) / n_cols)

fig, axes = plt.subplots(n_rows, n_cols, figsize=(14, 4*n_rows))
axes = axes.flatten()

for ax, col in zip(axes, delta_cols):
    sns.histplot(
        data=df_delta,
        x=col,
        hue="Decision",
        kde=True,
        ax=ax,
        alpha=0.6
    )
    ax.axvline(0, color="black", linestyle="--")
    ax.set_title(col)

for ax in axes[len(delta_cols):]:
    ax.remove()
```

```
plt.tight_layout()
plt.show()
```



In [176…

```
#Predicts accept or reject

from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, confusion_matrix
import numpy as np

df_delta["Offer_numeric"] = (
    df_delta["Offer"]
    .replace('[\$,]', '', regex=True)
    .astype(float)
)

feature_cols = stat_cols + ["Offer_numeric"]

X = df_delta[feature_cols].fillna(0)
y = df_delta["Decision"].apply(lambda x: 1 if x=="Accepted" else 0)

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_sta
rf = RandomForestClassifier(n_estimators=200, random_state=42)
rf.fit(X_train, y_train)
```

```
y_pred = rf.predict(X_test)
print(confusion_matrix(y_test, y_pred))
print(classification_report(y_test, y_pred))
```

```
<>:10: SyntaxWarning: invalid escape sequence '\$'
<>:10: SyntaxWarning: invalid escape sequence '\$'
C:\Users\slleh\AppData\Local\Temp\ipykernel_9596\4104537297.py:10: SyntaxWarning: in
valid escape sequence '\$'
  .replace('[\$,]', '', regex=True)
C:\Users\slleh\AppData\Local\Temp\ipykernel_9596\4104537297.py:8: SettingWithCopyWar
ning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/u
ser_guide/indexing.html#returning-a-view-versus-a-copy
  df_delta["Offer_numeric"] = (
[[21  1]
 [ 1  0]]
              precision    recall  f1-score   support

           0       0.95      0.95      0.95        22
           1       0.00      0.00      0.00         1

    accuracy                           0.91        23
   macro avg       0.48      0.48      0.48        23
weighted avg       0.91      0.91      0.91        23
```

In [177…

```
#Would Trent Grisham accept

player_row = pd.DataFrame([{
    "home_run": 34,
    "k_percent": 23.6,
    "bb_percent": 14.1,
    "on_base_plus_slg": 0.812,
    "woba": 0.353,
    "xwoba": 0.366,
    "Offer_numeric": 22025000
}])

player_row = player_row[feature_cols]

prediction = rf.predict(player_row)[0]
prob_accept = rf.predict_proba(player_row)[0][1]

print("Predicted Decision:", "Accepted" if prediction == 1 else "Rejected")
print(f"Probability of Accepting: {prob_accept:.2%}")
```

```
Predicted Decision: Rejected
Probability of Accepting: 4.00%
```

In [178…

```
#The model thought his stats were to good to accept and that he could find a better

accepted = df_delta[df_delta["Decision"] == "Accepted"]
rejected = df_delta[df_delta["Decision"] == "Rejected"]
```

```
for stat in ["woba", "xwoba", "on_base_plus_slg"]:
    accepted_pct = (accepted[stat] < player_row[stat].iloc[0]).mean()

    print(f"{stat.upper()}:")
    print(f"  Percentile among Accepted: {accepted_pct:.1%}")
```

```
WOBA:
  Percentile among Accepted: 76.9%
XWOBA:
  Percentile among Accepted: 84.6%
ON_BASE_PLUS_SLG:
  Percentile among Accepted: 61.5%
```

In [179…

```
# Player stat changes year after QO by team

team_summary = (
    df_delta.groupby("Team1")
    .agg({
        "delta_woba": "mean",
        "delta_on_base_plus_slg": "mean",
        "Decision": "count"
    })
    .rename(columns={"Decision": "Num_QO"})
    .sort_values("delta_woba")
)
print(team_summary)
```

Team1	delta_woba	delta_on_base_plus_slg	Num_QO
Angels	-0.068444	-0.194889	9
Reds	-0.057333	-0.150000	3
Twins	-0.056500	-0.150500	2
Yankees	-0.055750	-0.142750	4
Giants	-0.047714	-0.133714	7
Dodgers	-0.045182	-0.111364	11
Mariners	-0.041000	-0.103000	1
Rays	-0.041000	-0.105000	1
Orioles	-0.040333	-0.106000	6
Rangers	-0.035333	-0.098000	3
Rockies	-0.032000	-0.068500	2
Royals	-0.029750	-0.083000	4
Diamondbacks	-0.026500	-0.073000	2
Phillies	-0.022000	-0.055000	3
Blue Jays	-0.021667	-0.051833	6
Brewers	-0.021000	-0.054000	1
Cleveland	-0.017000	-0.052000	1
Red Sox	-0.016600	-0.048200	5
Astros	-0.014500	-0.039833	7
Nationals	-0.006000	-0.024750	4
Cubs	-0.005667	-0.008333	6
Braves	-0.003000	-0.018250	4
Mets	0.004000	0.011700	12
Padres	0.006750	0.012250	4
Cardinals	0.009250	0.024250	4
White Sox	0.047000	0.104500	2

In [180…

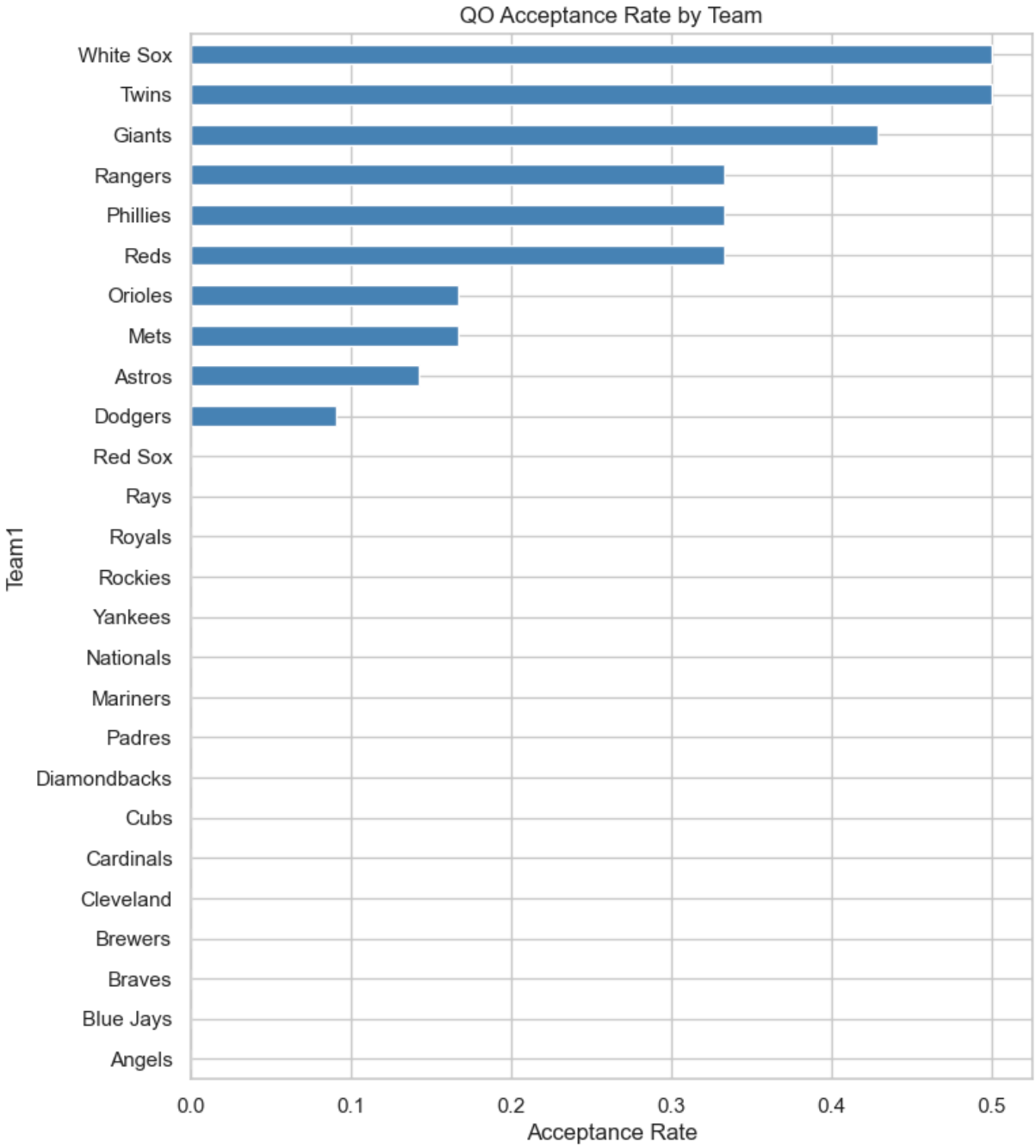
```
# team retention

team_retention = (
    df_delta
    .groupby("Team1")["Decision"]
    .value_counts(normalize=True)
    .rename("Rate")
    .reset_index()
)
team_retention_pivot = team_retention.pivot(
    index="Team1",
    columns="Decision",
    values="Rate"
).fillna(0)

team_retention_pivot["Accept_Rate"] = team_retention_pivot.get("Accepted", 0)
team_retention_pivot["Reject_Rate"] = team_retention_pivot.get("Rejected", 0)

team_retention_pivot = team_retention_pivot.sort_values("Accept_Rate")

print(team_retention_pivot)
```

Decision	Accepted	Rejected - Left	Rejected - Stayed	Accept_Rate
Team1				
Angels	0.000000	0.888889	0.111111	0.000000
Blue Jays	0.000000	0.666667	0.333333	0.000000
Braves	0.000000	1.000000	0.000000	0.000000
Brewers	0.000000	1.000000	0.000000	0.000000
Cleveland	0.000000	1.000000	0.000000	0.000000
Cardinals	0.000000	1.000000	0.000000	0.000000
Cubs	0.000000	0.666667	0.333333	0.000000
Diamondbacks	0.000000	1.000000	0.000000	0.000000
Padres	0.000000	1.000000	0.000000	0.000000
Mariners	0.000000	0.000000	1.000000	0.000000
Nationals	0.000000	1.000000	0.000000	0.000000
Yankees	0.000000	0.250000	0.750000	0.000000
Rockies	0.000000	1.000000	0.000000	0.000000
Royals	0.000000	0.500000	0.500000	0.000000
Rays	0.000000	1.000000	0.000000	0.000000
Red Sox	0.000000	1.000000	0.000000	0.000000
Dodgers	0.090909	0.454545	0.454545	0.090909
Astros	0.142857	0.714286	0.142857	0.142857
Mets	0.166667	0.500000	0.333333	0.166667
Orioles	0.166667	0.500000	0.333333	0.166667
Reds	0.333333	0.666667	0.000000	0.333333
Phillies	0.333333	0.000000	0.666667	0.333333
Rangers	0.333333	0.666667	0.000000	0.333333
Giants	0.428571	0.571429	0.000000	0.428571
Twins	0.500000	0.500000	0.000000	0.500000
White Sox	0.500000	0.500000	0.000000	0.500000

Decision	Reject_Rate
Team1	
Angels	0
Blue Jays	0
Braves	0
Brewers	0
Cleveland	0
Cardinals	0
Cubs	0
Diamondbacks	0
Padres	0
Mariners	0
Nationals	0
Yankees	0
Rockies	0
Royals	0
Rays	0
Red Sox	0
Dodgers	0
Astros	0
Mets	0
Orioles	0
Reds	0
Phillies	0
Rangers	0
Giants	0

```
Twins                0
White Sox            0
```

In [181…
```
team_retention_pivot["Accept_Rate"].plot(
    kind="barh", figsize=(8,10), color="steelblue"
)

plt.title("QO Acceptance Rate by Team")
plt.xlabel("Acceptance Rate")
plt.show()
```



In [182…
```
qo_accepted_hitters = qo_final[
    (qo_final["Position_Type"] == "Hitter") &
    (qo_final["Decision"] == "Accepted")
].copy()
```

In [183…

```
rank_stats = [
    "woba",
    "xwoba",
    "on_base_plus_slg",
    "k_percent"
]

rank_results = {}

player_row = pd.DataFrame([{
    "home_run": 34,
    "k_percent": 23.6,
    "bb_percent": 14.1,
    "on_base_plus_slg": 0.812,
    "woba": 0.353,
    "xwoba": 0.366
}])

for stat in rank_stats:
    if stat == "k_percent":
        rank = (qo_accepted_hitters[stat] > player_row[stat].iloc[0]).mean()
    else:
        rank = (qo_accepted_hitters[stat] < player_row[stat].iloc[0]).mean()

    rank_results[stat] = rank

for stat, pct in rank_results.items():
    print(f"{stat}: {pct:.1%} percentile among QO acceptances")
```

```
woba: 66.7% percentile among QO acceptances
xwoba: 83.3% percentile among QO acceptances
on_base_plus_slg: 33.3% percentile among QO acceptances
k_percent: 50.0% percentile among QO acceptances
```

In [184…

```
stats = [
    "home_run",
    "k_percent",
    "bb_percent",
    "on_base_plus_slg",
    "woba",
    "xwoba"
]

stat_names = {
    "home_run": "Home Runs",
    "k_percent": "Strikeout Rate (%)",
    "bb_percent": "Walk Rate (%)",
    "on_base_plus_slg": "OPS",
    "woba": "wOBA",
    "xwoba": "xwOBA"
}

player_name = "Trent Grisham (2025)"

n_stats = len(stats)
n_cols = 3
```

```
n_rows = (n_stats + n_cols - 1) // n_cols

fig, axes = plt.subplots(n_rows, n_cols, figsize=(5*n_cols, 4*n_rows))
axes = axes.flatten()

for ax, stat in zip(axes, stats):
    qo_accepted_hitters[stat].dropna().hist(
        bins=20, alpha=0.7, ax=ax
    )
    ax.axvline(
        player_row[stat].iloc[0],
        linestyle="--",
        linewidth=3,
        color="green",
        label=player_name
    )
    ax.set_title(f"{stat_names[stat]} among Hitters Who Accepted the QO")
    ax.set_xlabel(stat_names[stat])
    ax.set_ylabel("Count")
    ax.legend()


for ax in axes[n_stats:]:
    ax.remove()

plt.tight_layout()
plt.show()
```