The Nexus between Squad Depth and NBA Championship

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Motivation & Research Problem

Background & Problem

- NBA is the most popular basketball league
  - Thousands of data & many models that evaluate team strength
- Squad depth is the number of quality players on the team contributing to the team success… BUT
  - No established metric to measure it in the NBA
  - State-of-the-art NBA prediction model (Cheng et al) did not consider squad depth

Question: Do championship winning teams have a significantly greater squad depth than other playoff teams? Can we use squad depth to predict team strength?

Hypothesis: Championship teams will have a higher true mean squad depth.

$$H_0 : \mu_{champ} - \mu_{nochamp} = 0$$

$$H_A : \mu_{champ} - \mu_{nochamp} > 0$$

Data

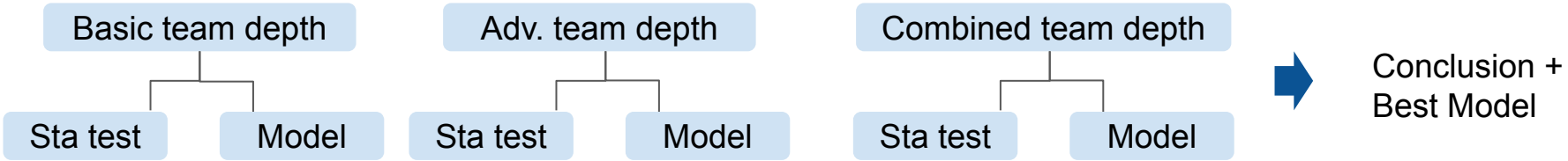
Squad depth = #Quality Players / #Rotation Players

- Rotation player - >= 10 mpg
- 0-1 scale

Strategies

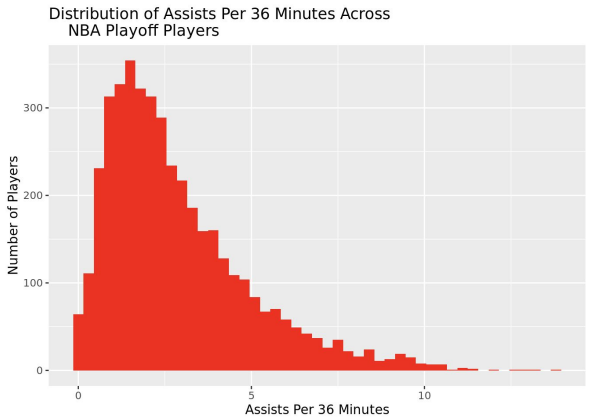
- Simple: Points, Rebounds, OR Assists threshold met
- Advanced: PER OR WS/48 thresholds met
- Combo: Simple AND Advanced thresholds met

Compare Championship and Non-Champ teams by each strategy

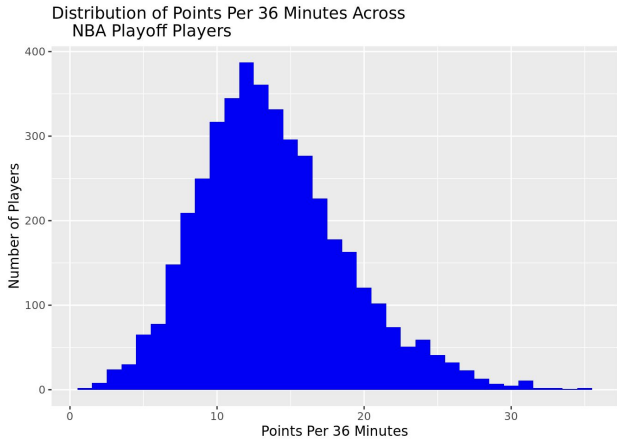


EDA: Stats Accounted For In Basic Squad Depth

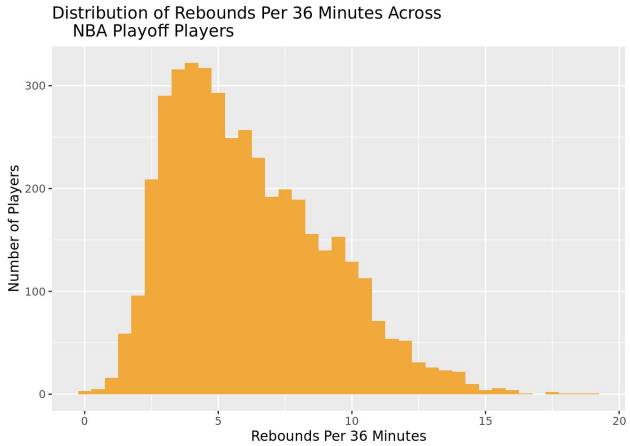
Assists



Points

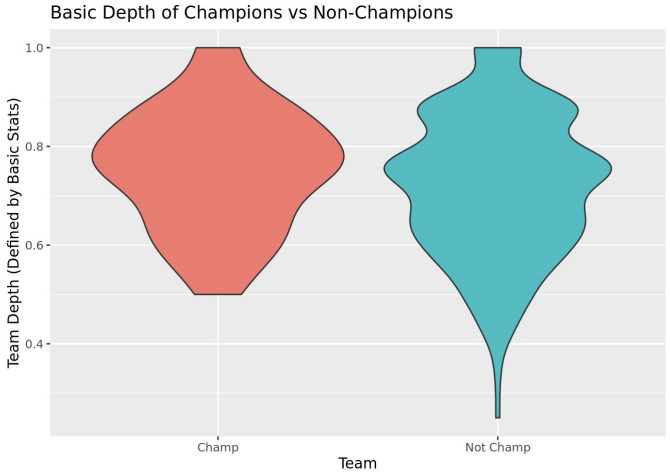


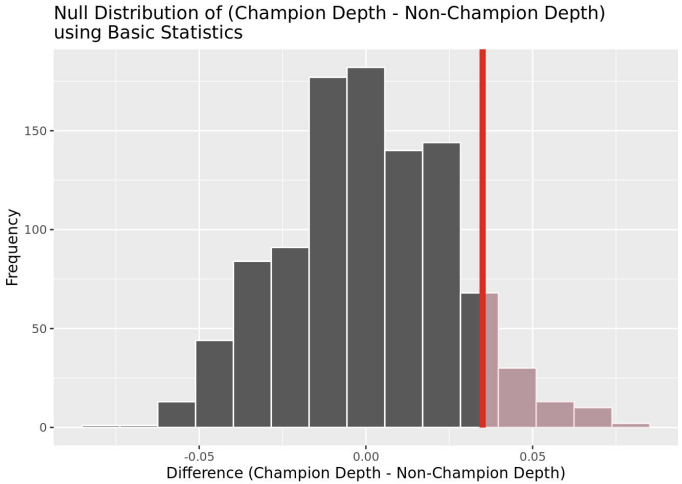
Rebounds



Basic Squad Depth Approach

Basic Depth= (number of players who met the pp36 threshold, the rp36 threshold, and the ap36 threshold) / (number of players in rotation (played >or= 10 pg)





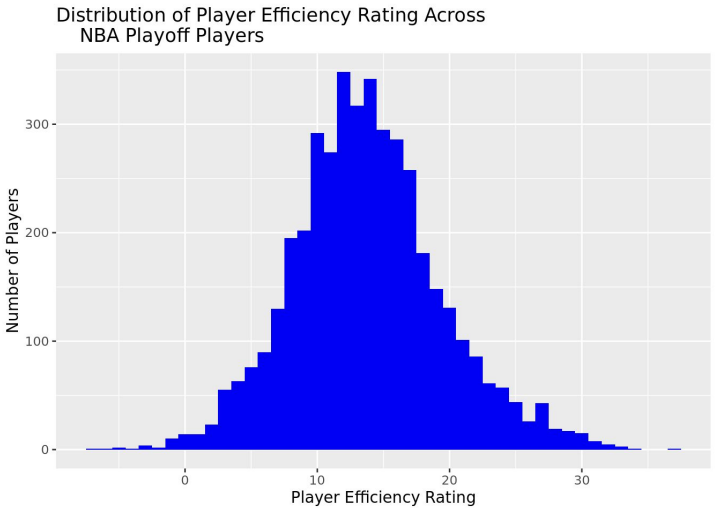

```
# A tibble: 2 × 2
  Championship `mean(Basic_depth)`
  <chr>                       <dbl>
1 Champ                       0.755
2 Not Champ                   0.720
```

```
  p_value
    <dbl>
1   0.078
```

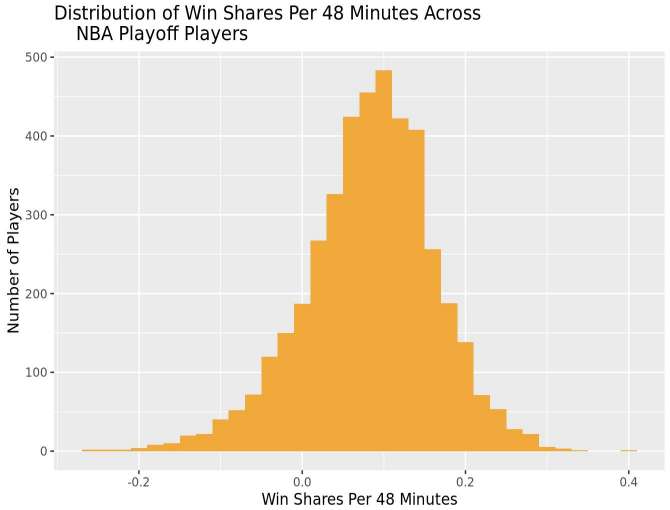
Point Estimate: $\bar{x_c} - \bar{x_n} = 0.035$

EDA: Stats Accounted For In Advanced Squad Depth

Player Efficiency Rating

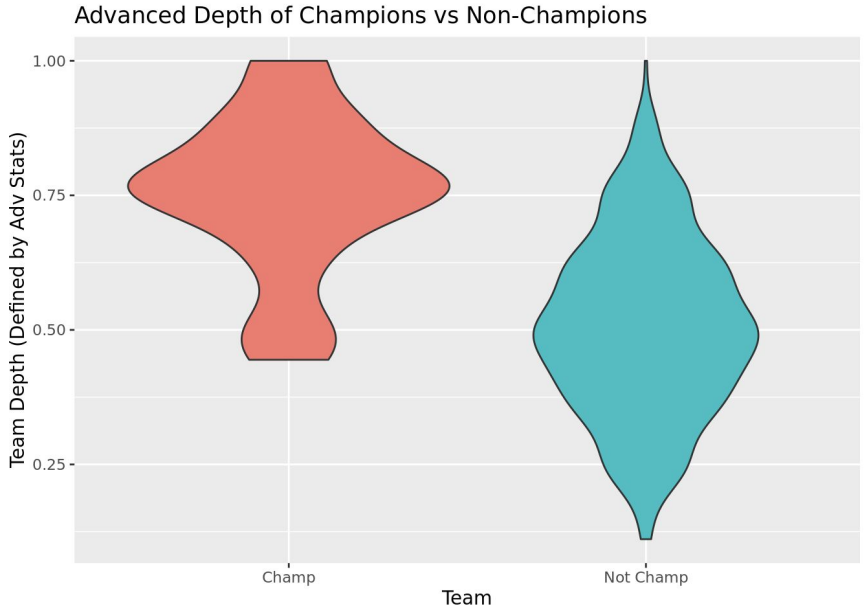


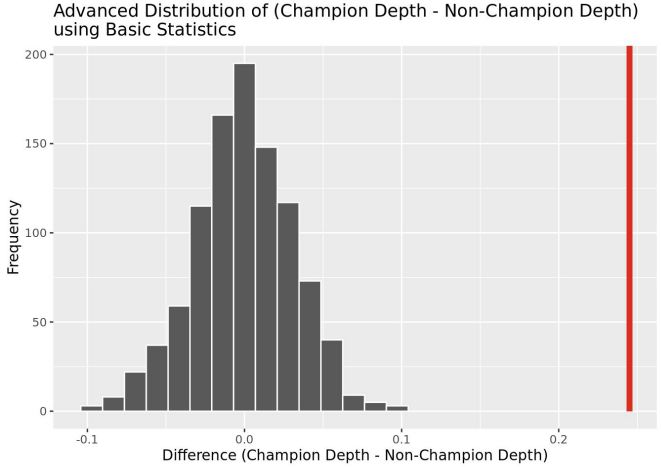
Win Shares



Advanced Squad Depth Approach

$$\frac{(\text{number of players above PER threshold} \mid \text{above win share threshold})}{\text{number of rotation players}}$$






```
# A tibble: 2 × 2
  Championship `mean(Adv_depth)`
  <chr>                    <dbl>
1 Champ                    0.751
2 Not Champ                0.506
```

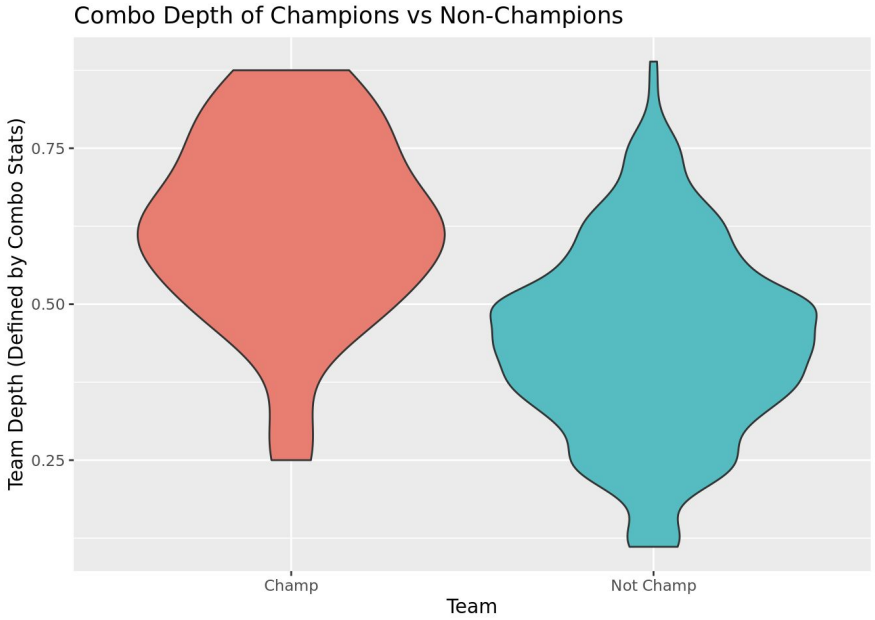
Point Estimate: $\bar{x_c} - \bar{x_n} = 0.245$

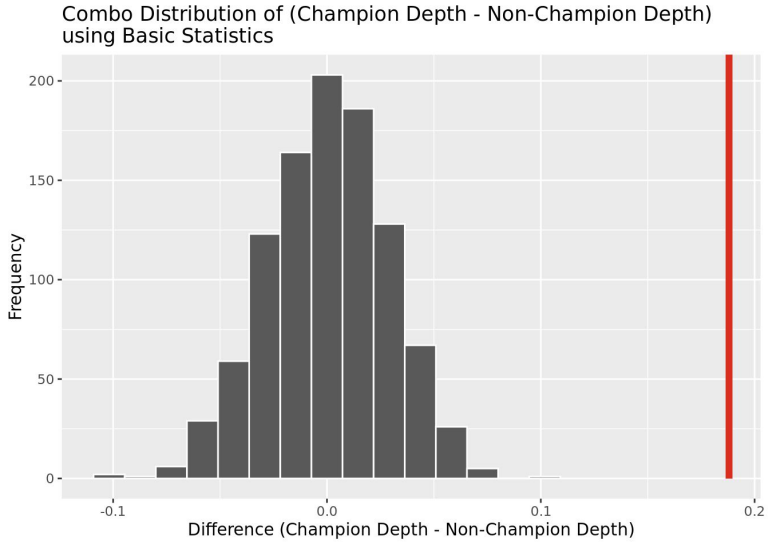
Combined Squad Depth Approach

Combined Squad Depth: $\frac{(\#\text{ Quality Basic \& Advanced Stats Players})}{\#\text{ Rotational Players}}$

```
# A tibble: 2 × 2
  Championship `mean(Combo_depth)`
  <chr>                       <dbl>
1 Champ                       0.627
2 Not Champ                   0.439
```

Point Estimate: $\bar{x_c} - \bar{x_n} = 0.188$

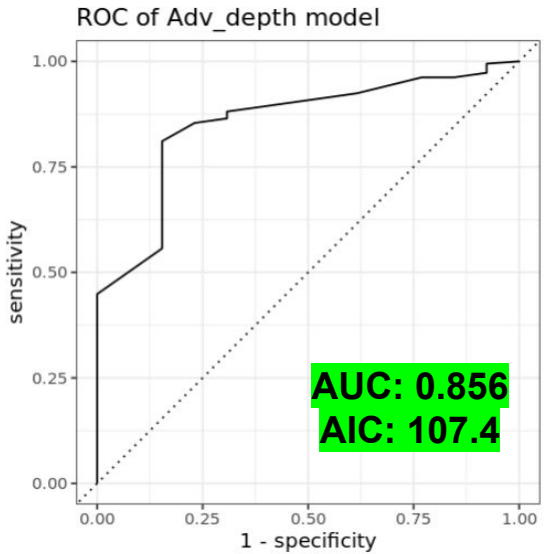




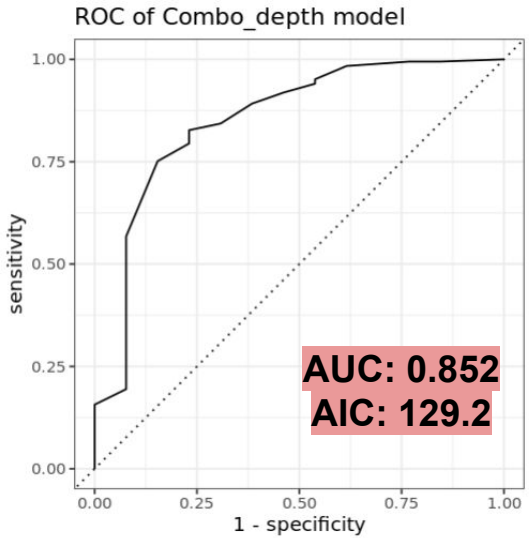
Model

Both advanced and combined squad depth are significantly higher in championship teams → evaluate both models

Advanced Squad Depth Model



Combined Squad Depth Model



- Advanced squad depth model is the best model both in terms of AIC and AUC
- High AUC → strong predictive power of advanced team depth
- Formula of the best model:

Specific: $\log\left(\frac{p}{1-p}\right) = 8.69 - 9.55 \times Adv\_depth$

Conclusion + Future work + Limitations

Findings & Significance:

- Combo and Adv squad depth significantly higher → good predictive value of squad depth
- High AUC of logistic model → good prediction models

Higher squad depths is associated with championship winning teams.

Future Work/Implication: Variables that are filtered into the meaning of squad depth can be monitored and manipulated by NBA data scientists to make better predictions regarding what teams will win championships.

Limitations: Limited predictive power because many factors beyond team strength determine championship wins. (both measurable and unmeasurable)