# 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 squad 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 the rest of the field? 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



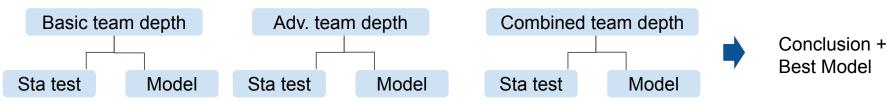
Squad depth = #Quality Players / #Rotation Players

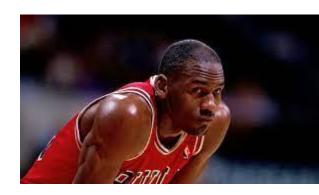
- Rotation player >= 10 mpg
- 0-1 scale

#### **Strategies**

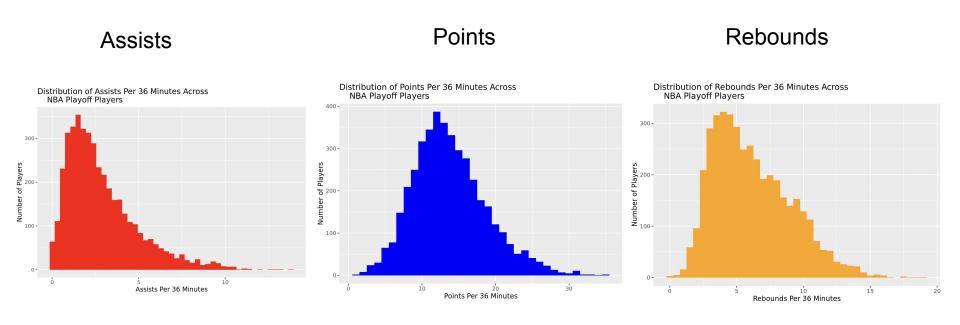
- Simple
  - Points, Rebounds, OR Assists threshold met
- Advanced
  - PER OR WS/48 thresholds met
- Combo
  - Simple AND Advanced thresholds met

Compare Championship and Non-Champ teams by each strategy



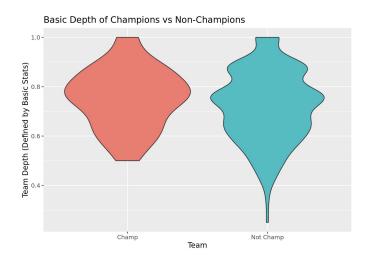


## EDA: Stats Accounted For In Basic Squad Depth

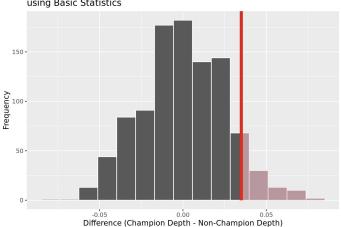


# Basic Squad Depth Approach

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:  $2 \times 2$ 

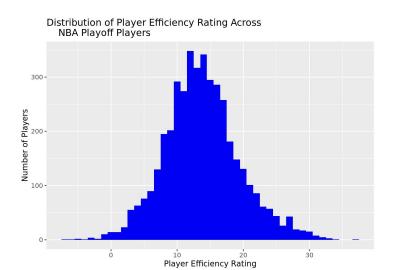
Championship `mean(Basic depth)`

<chr>> <dbl> 1 Champ 0.755 2 Not Champ 0.720 p value <dbl> 0.078

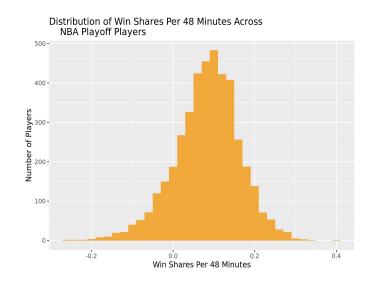
Point Estimate:  $\bar{x_c} - \bar{x_n} = 0.035$ 

## EDA: Stats Accounted For In Advanced Squad Depth

### Player Efficiency Rating



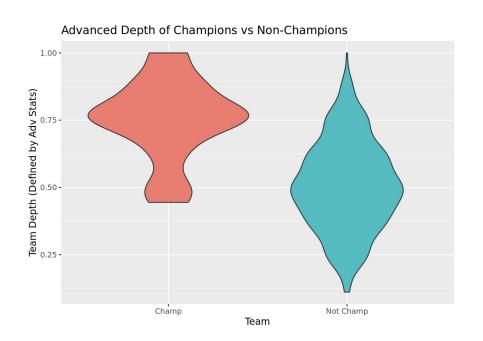
#### Win Shares

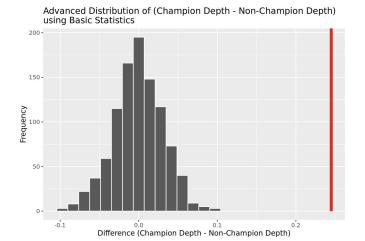


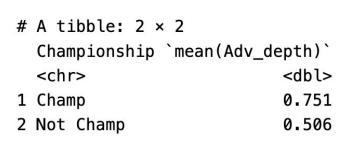
# Advanced Squad Depth Approach

(number of players above PER threshold | above win share threshold)

#### number of rotation players







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

# Combined Squad Depth Approach

Combined Squad Depth:

# A tibble:  $2 \times 2$ 

Championship `mean(Combo\_depth)`

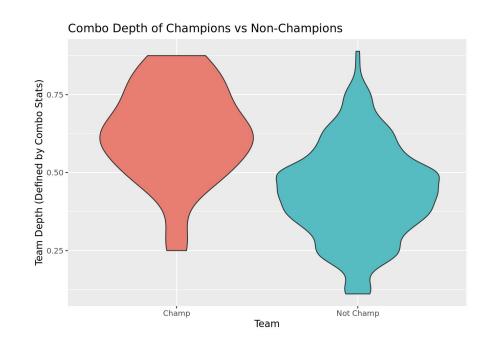
<chr>
1 Champ

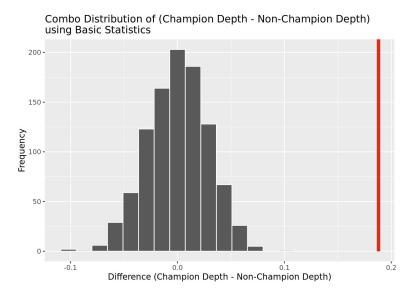
<dbl>

2 Not Champ

0.439

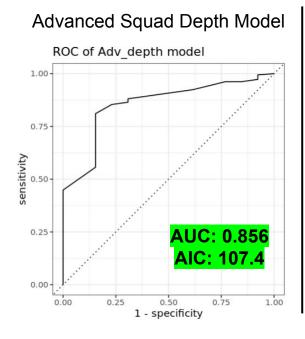
Point Estimate:  $\bar{x_c} - \bar{x_n} = 0.188$ 



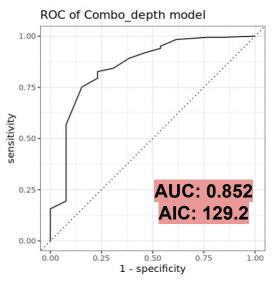


## Model

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



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

## 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**: 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)