WNBA Adjusted Plus-Minus Models

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Abbreviated abstract: Athletes are acquired and offered contracts based on individual performance, but for team sports, the athletes' performance is impacted by the other players on the court or field. Sports like basketball and football are difficult to determine the value of individual players because of the interactions between many different players at one time. Adjusted plus-minus models have been implemented in the NBA to evaluate individual player worth independent of a player's teammates. Similar models are not widespread for the WNBA and we implement adjusted plus-minus models for WNBA teams for the 2019 season to determine which players are the most valuable.

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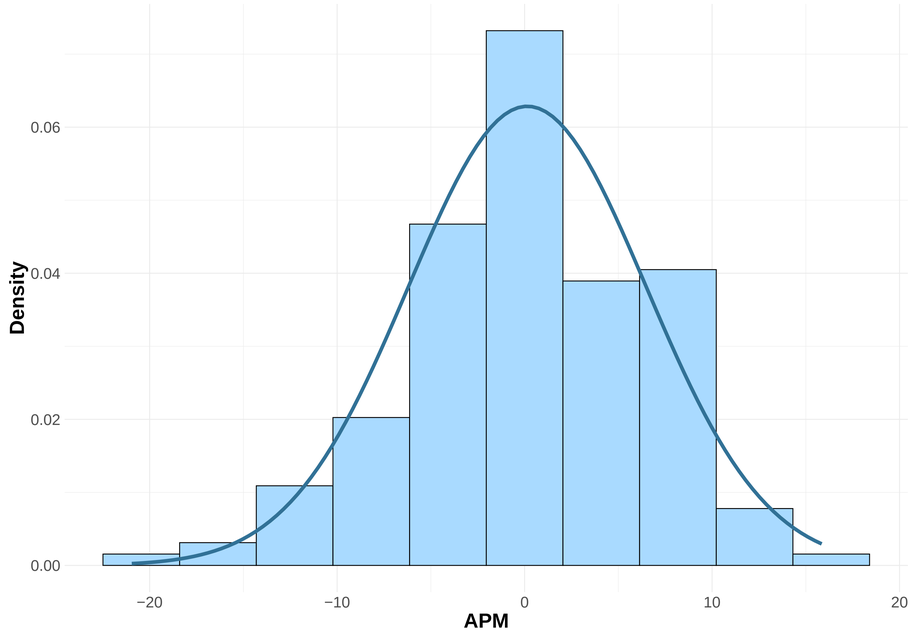
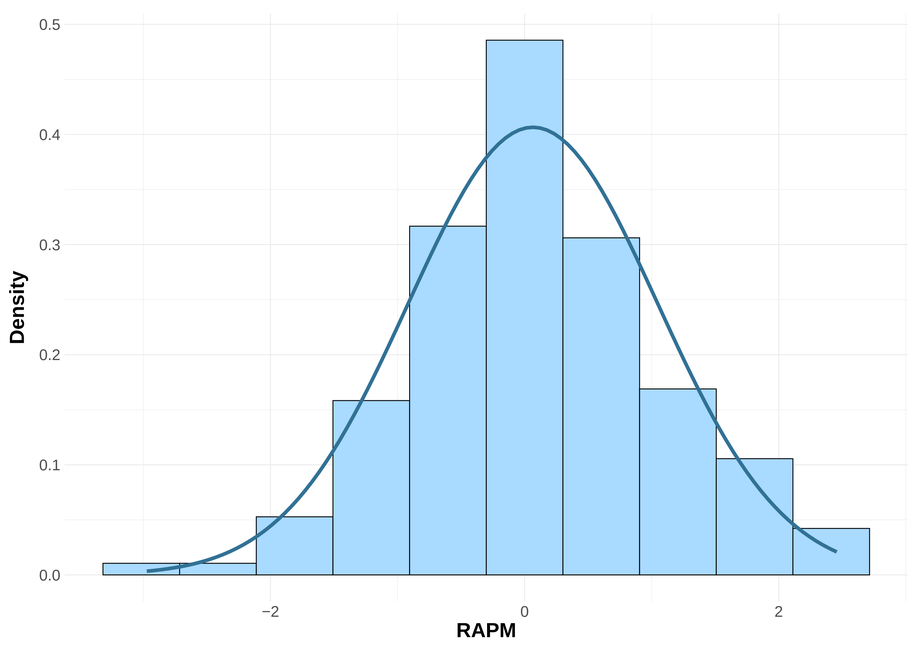
Problem and Data

- In the WNBA, unlike the NBA, there has not been a lot of work done to evaluate individual player value
- Plus-minus is a commonly cited statistic that is the total difference between a team's score and the opposing team's score while on the court. Adjusted plus-minus (APM) builds on that idea, but also accounts for the quality of the teammates a player plays with. Regularized adjusted plus-minus (RAPM) is another advanced statistic that improves upon adjusted plus-minus by providing more stable estimates for players and needing less data to provide stable estimates.
- The play by play data for all 2019 WNBA games was gathered from ESPN and Basketball Reference

Models

- APM Model
  - Multiple linear regression with binary variables for each player indicated if they were on the court for the possession
  - Requires players to play enough minutes to provide stable coefficient estimates
- RAPM Model
  - Ridge regression shrinking the player estimates towards 0
  - Accounts for multicollineary between players and provides more stable estimates





Results

Player	APM	APM Variance
Ashley Walker	15.848	34.767
Asia Taylor	13.393	7.870
Candace Parker	11.381	5.352
Brionna Jones	11.001	6.811
Jessica Breland	10.258	4.758

Table 1: Top 5 Players (APM)

Player	RAPM	RAPM Variance
Candace Parker	2.457	0.233
Danielle Robinson	2.367	0.239
Sydney Wiese	2.236	0.250
Courtney Vandersloot	2.131	0.181
Jonquel Jones	2.008	0.180

Table 2: Top 5 Players (RAPM)

- Variance for estimates is much smaller for RAPM model
- Future research includes expanding to multiple years and getting 3-5 RAPM estimates
- Fitting a Bayesian model
- Results can be explored with our **Shiny app**

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