

Predicting NBA Player Salaries

HOW EFFECTIVELY CAN A PLAYER'S PERFORMANCE AND ACHIEVEMENTS PREDICT HIS SALARY?

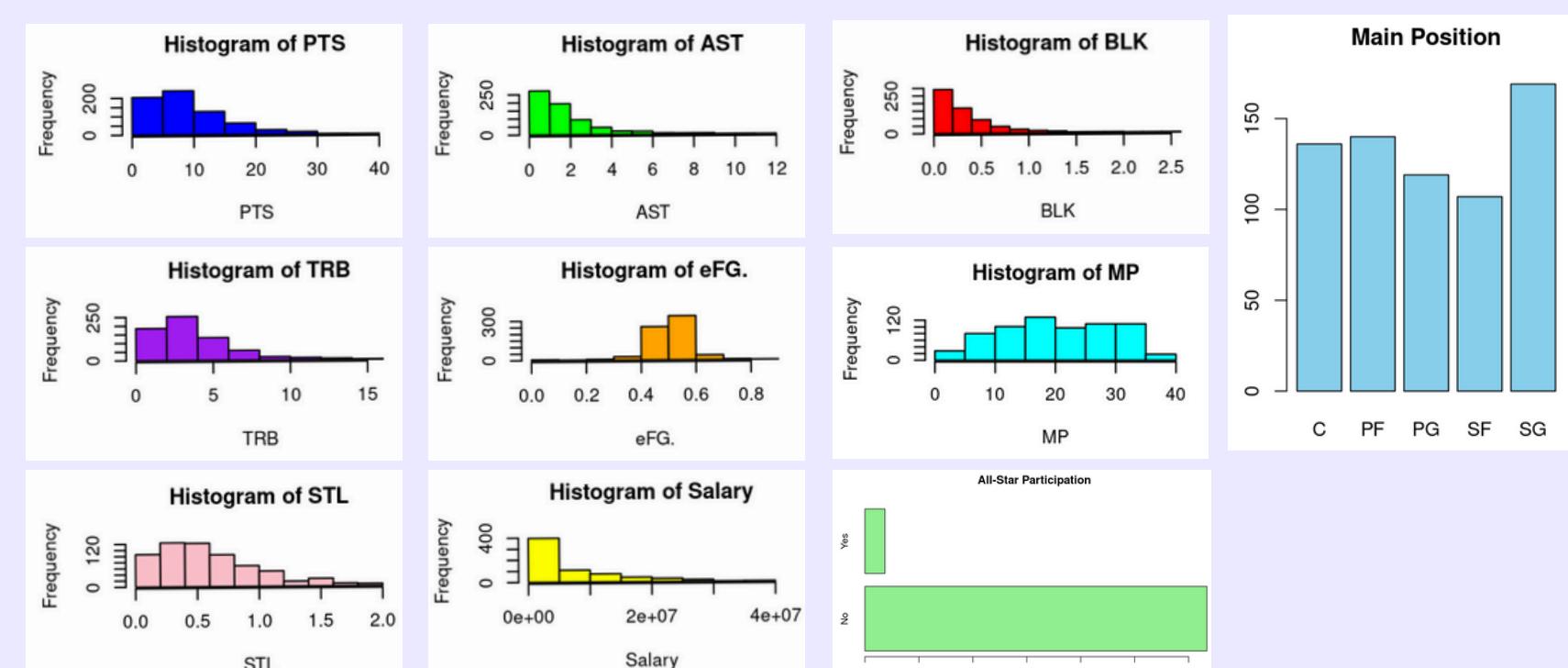
Motivation

This study examines how player performance metrics (points, assists, etc.), positional roles, and all-star participation predict NBA player salaries using linear regression modelling. Previous research has shown strong connections between performance and compensation.

- Rosen et al. (2013) found scoring components most significant (R-squared of 0.613)
- Sigler and Sackley (2000) proved both offensive and defensive attributes matter.
- Bodvarsson and Brastow (1998) highlighted the importance of All-Star participation and positional factors in salary determination.

Data Collection

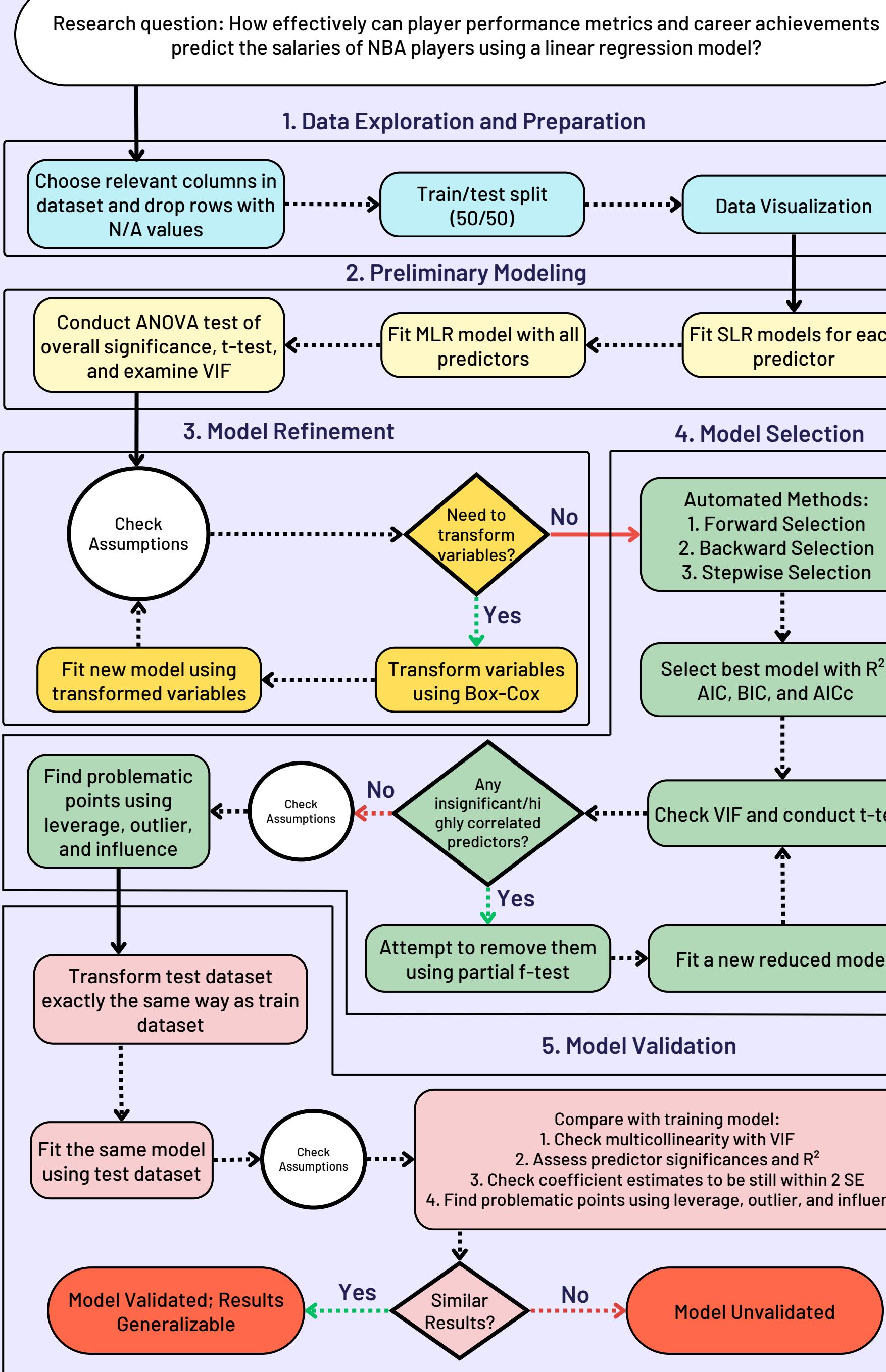
The data is taken from basketball-reference.com, covering NBA player statistics from 2016-2019 seasons. The dataset includes official NBA records with various performance metrics (points, assists, rebounds, steals, blocks, minutes played, efficiency), main position, All-Star participation, and player salaries.



References

- Ratto, Davide. (2019). NBA Players 2016-2019. [Data set] <https://www.kaggle.com/davra98/nba-players-20162019>
 Bodvarsson, O. B., & Brastow, R. T. (1998). Do employers pay for consistent performance?: evidence from the NBA. *Economic Inquiry*, 36(1).
 Sigler, K. J., & Sackley, W. H. (2000). NBA players: Are they paid for performance?. *Managerial Finance*, 26(7), 46-51.
 Lyons Jr., R., Jackson Jr., E. N., & Livingston, A. (2015). Determinants of NBA player salaries. *The Sport Journal*.

Method of Analysis



Results & Conclusions

- 1 Removed 66 observations with missing values in eFG. or Salary
- 2 Initial full model violated constant variance and normality, use Box-Cox transformation + powerTransform to fix
- 3 Automated selection method results:
 - Forward: PTS, AST, BLK, eFG., MP, Pos1, Play
 - Backward/Stepwise: PTS, AST, TRB, eFG., MP, Pos1, Play
- 4 Model 2 was chosen
 - Better adj. R²(0.462), AIC (3139.3), BIC (3188.9), AICc (3139.8)
 - All predictors were statistically significant except TRB
- 5 Removed MP due to severe VIF
Removed TRB from partial F-test
- 6 Final test model has an adjusted R-squared of 0.44
Every predictor (transformed PTS, AST, eFG., Pos1, PLay) is statistically significant

Final Model

$$\sqrt{\text{Salary}} = \beta_0 + \beta_1 \log(\text{PTS} + 1) + \beta_2 \left(\frac{1}{\sqrt{\text{AST} + 1}} \right) + \beta_3 ((\text{eFG.} + 1)^4) + \beta_4 I_{\text{Pos1} = \text{PF}} + \beta_5 I_{\text{Pos1} = \text{PG}} + \beta_6 I_{\text{Pos1} = \text{SF}} + \beta_7 I_{\text{Pos1} = \text{SG}} + \beta_8 I_{\text{PlayYes}}$$

| Coefficients | Estimate | Std. Error | T-value | P-value |
|--|----------|------------|---------|---------|
| Intercept | 46.7853 | 5.8911 | 7.942 | < 0.001 |
| $\log(\text{PTS} + 1)$ | 9.8242 | 1.2061 | 8.146 | < 0.001 |
| $\left(\frac{1}{\sqrt{\text{AST} + 1}} \right)$ | -19.4321 | 5.3472 | -3.634 | < 0.001 |
| $(\text{eFG.} + 1)^4$ | -0.9147 | 0.428 | -2.137 | 0.033 |
| Pos1PF | -5.3281 | 1.282 | 8.146 | < 0.01 |
| Pos1PG | -8.918 | 1.627 | -5.481 | < 0.001 |
| Pos1SF | -3.9817 | 1.3801 | -2.885 | 0.004 |
| Pos1SG | -8.0479 | 1.2697 | -6.339 | < 0.001 |
| PlayYes | 6.2993 | 1.94 | 3.247 | 0.0012 |

- ✓ NBA player salaries are primarily driven by scoring ability, followed by position and All-Star status
- ✓ Centers command higher salaries compared to other positions
- ✓ All-Star participation significantly boosts salary potential
- ✓ Model is validated using the test dataset with adjusted R-squared of 0.48.

The model has an adjusted R² of 0.47

Limitations

- ✗ NBA rookie salary cap constraints.
- ✗ Inconsistent player performances and injuries.
- ✗ Box-cox transformation interpretation issues.
- ✓ Future research could explore nonlinear models and incorporate more contextual factors like team dynamics to improve prediction accuracy.