A Novel Basketball Performance Metric: The Turnover Score

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BACKGROUND

Current NBA turnover metrics, such as *Turnover Percentage (TO%)* and *Assist-to-Turnover Ratio (AST:TO)*, evaluate turnovers relative to possession usage or assists. However, these fail to account for key contextual factors:

- **TO%** ignores playmaking responsibilities (e.g., passes leading to high-value shots may increase turnover risk).
- **AST:TO** neglects shot creation burden (e.g., self-created shots vs. assisted attempts) and assisted shot quality (higher-risk passes may correlate with turnovers).

OUR SOLUTION

We derive an **expected turnover (xTO)** metric based on a player's shot creation profile. We then use this in comparison to actual turnovers to determine player ball security in shot creation, creating the **Turnover Score**.
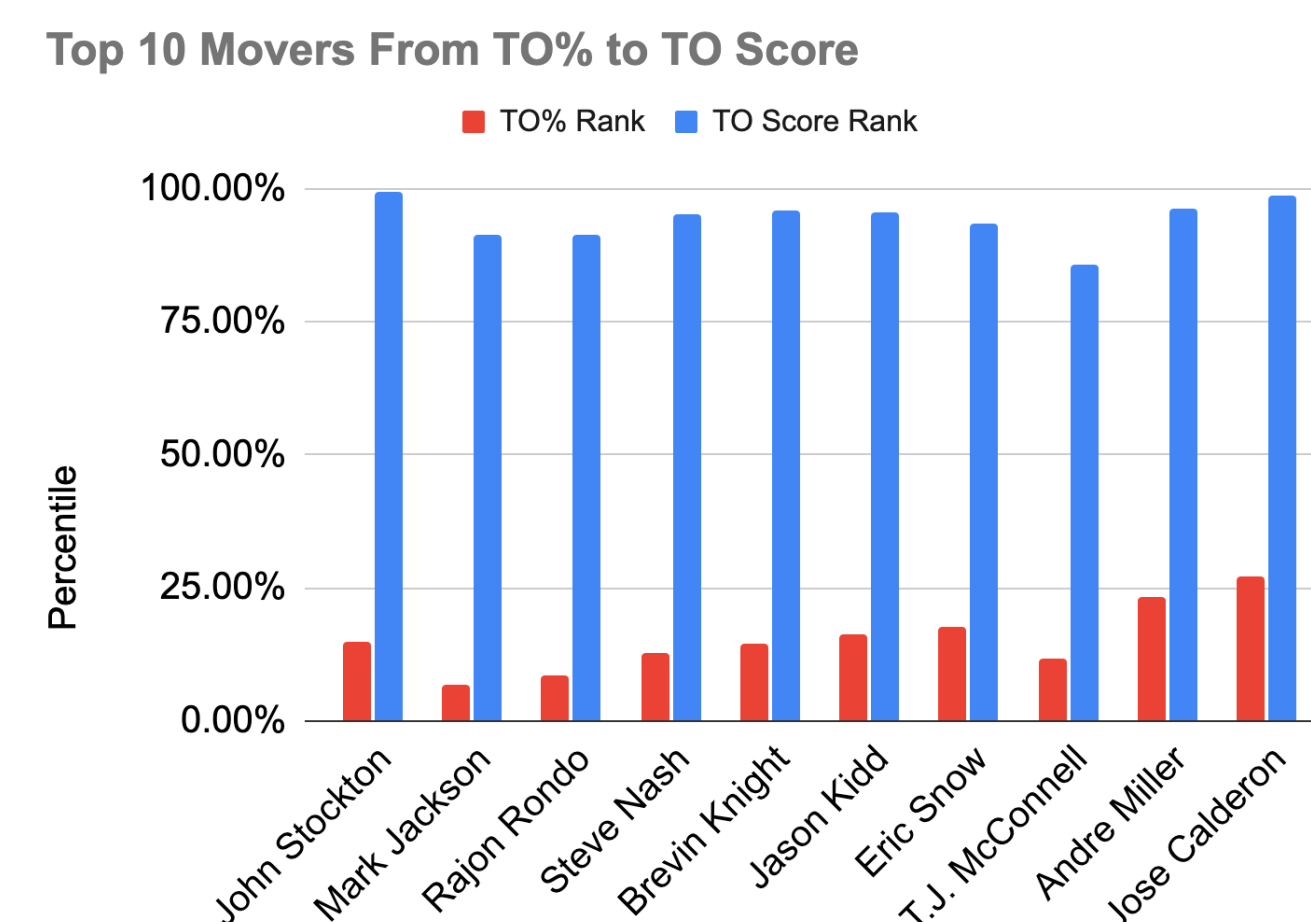
FORMULAE & EQUATIONS

The project used a Linear Regression model to determine coefficients for various shot attempts.

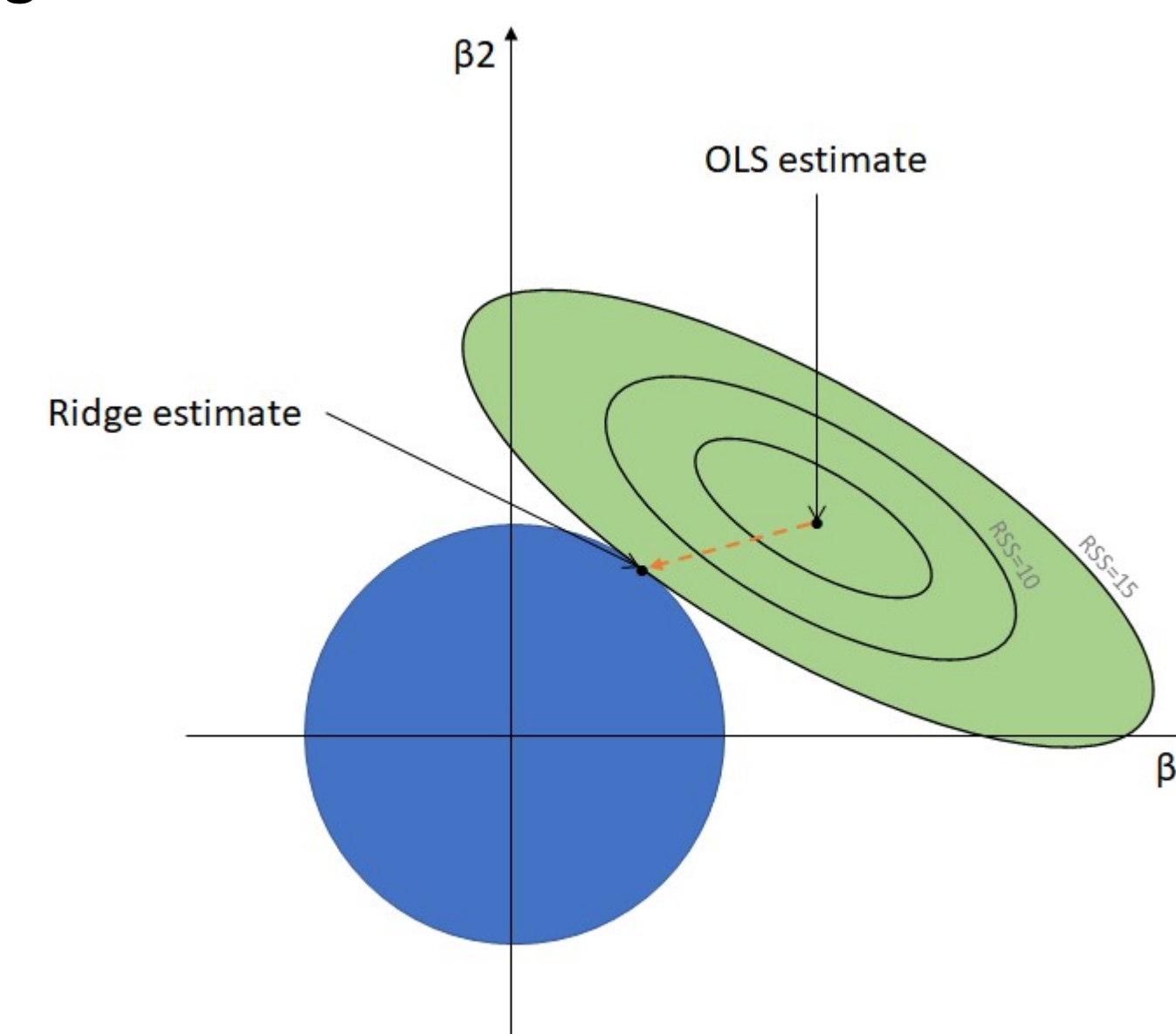$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \varepsilon$$

Where:

- Dependent Variable = Turnovers
- Independent Variables = Various Shot Attempts
- Slope Coefficient + Y intercept = Estimated Turnovers per Shot Attempt

Top 10 Movers From TO% to TO Score

ADDITIONAL CONSIDERATIONS

Due to small sample sizes, Ridge Regression was chosen to be the most valuable tool for regularization.

Additionally, top-volume shooters (often elite players) exhibit lower turnover rates, skewing coefficients. This acts as a confounder, dampening the effect of attempting more shot attempts across the board.

To account for this, shot profiles were normalized to the total number of makes, with a weight applied to the regression.

OTHER RESOURCES

The sites below provide the final results of the Turnover Score as well as other resources to compare against.

https://public.tableau.com/app/profile/riley.gisseman/viz/TheTurnoverScore/TheTurnoverScore
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https://www.basketball-reference.com/leaders/tov_pct_career.html

REFERENCES

- All data retrieved through NBA's public API
- Data Collection, Transformation, and Regression performed in Python