

College Basketball Rating (CBR): A new body-of-work metric for NCAA tournament selection

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1. Introduction

College Basketball Rating (CBR) is a metric designed to compare bodies of work and determine which teams should be selected by the committee. CBR is unique because it requires only box score stats and sometimes gives more credit to the loser of a game than the winner.

The 2018-2019 NCAA men's basketball tournament featured 32 automatic qualifiers and 36 at-large selections. CBR agrees with 30 of the at-large selections but disagrees with the other six teams. In the most extreme case, CBR identifies 45 non-tournament teams more deserving of an at-large selection than St. John's.

2. Methodology

Logistic Model

- Response variable: win/loss
- Explanatory variables: offensive rebounds (ORB), defensive rebounds (DRB), assists (AST), steals (STL), blocks (BLK), turnovers (TOV), personal fouls (PF), field goals attempted (FGA), and free throws attempted (FTA).

Game Score Calculation

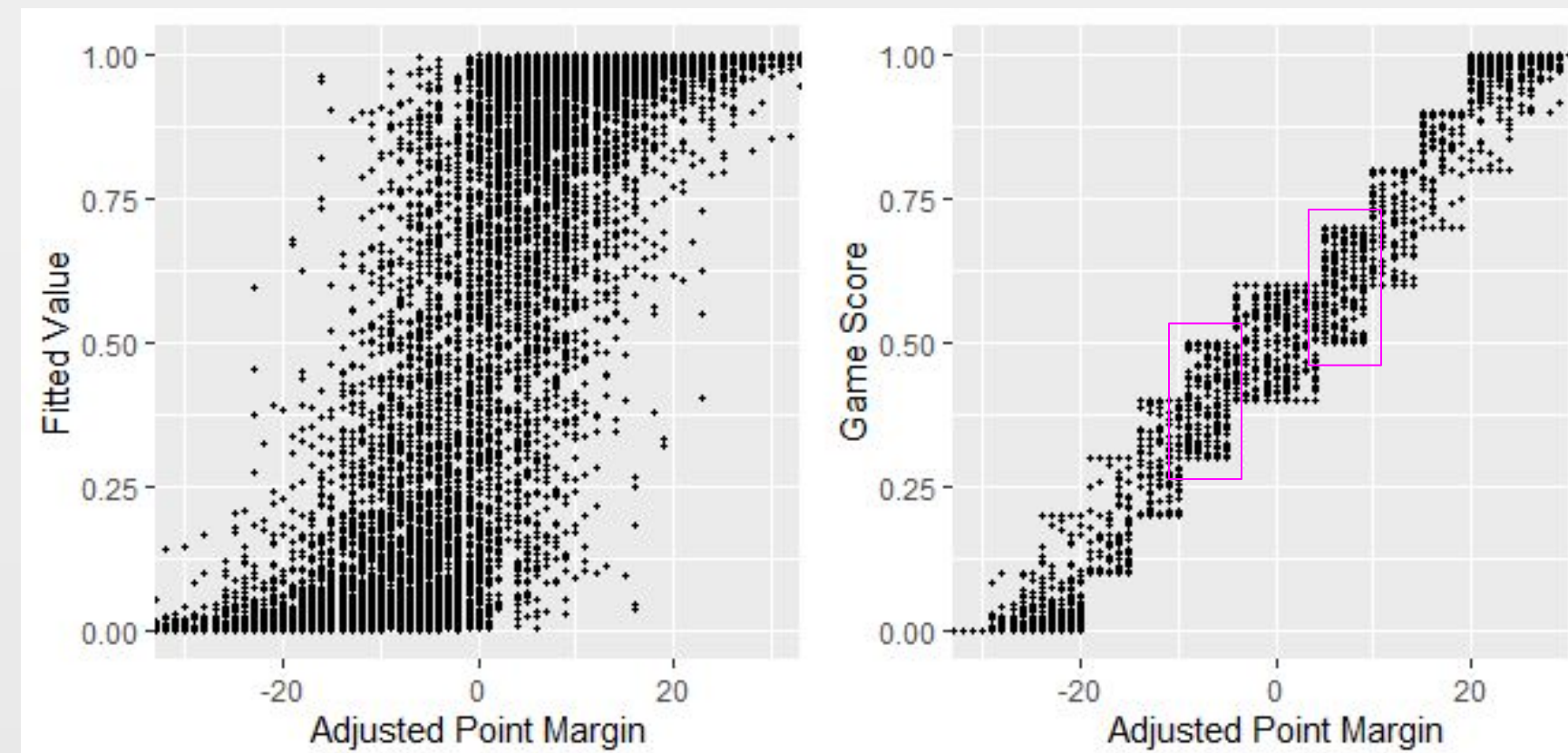
The logistic model generates a fitted value for each team per game. The fitted value is then forced into a specific range based on the location-adjusted point margin (+3 if away team; -3 if home team) and becomes a "game score".

Optimization of the System

CBR difference = $10 * \text{game score} - 5.00$. Optimization is performed iteratively until the error of the system is minimized. The final ratings are distributed roughly between -10.00 and 5.00.

3. Sample Calculation

Duke vs. Syracuse -- 1/14/2019		
Statistic	Duke	Syracuse
Score	91	95
Point Margin	-4	4
Home	1	0
ORB	3	-3
DRB	1	-1
AST	8	-8
STL	5	-5
BLK	7	-7
TOV	-3	3
PF	0	0
FGA	0	0
FTA	8	-8
Fitted Value	0.97	0.03
Adj. Point Margin	-7	7
Game Score	0.50	0.50



The deciding factor in this game was Duke going 9-43 (21%) from beyond the arc versus Syracuse's 11-25 (44%). Duke dominated the non-shooting categories but Syracuse won by four points on the road. The algorithm ultimately gives these teams equal credit for their performance in the game.

4. Results

At-Large Selection Discrepancies			
Team	Record	CBR Rank	Postseason
Clemson	19-13	32	1-1 in NIT
Texas	16-16	37	5-0 in NIT
Lipscomb	25-7	38	4-1 in NIT
Nebraska	18-16	39	1-1 in NIT
NC State	22-11	41	2-1 in NIT
TCU	20-13	49	3-1 in NIT
Minnesota	21-13	50	1-1 in NCAA
Baylor	19-13	51	1-1 in NCAA
Ole Miss	20-12	53	0-1 in NCAA
Seton Hall	20-13	62	0-1 in NCAA
Temple	23-9	72	0-1 in NCAA
St. John's	21-12	100	0-1 in NCAA

Of the six discrepancies, the CBR teams went 16-5 in the NIT tournament and the selection committee teams went 2-6 in the NCAA tournament. Texas defeated Lipscomb in the NIT final.

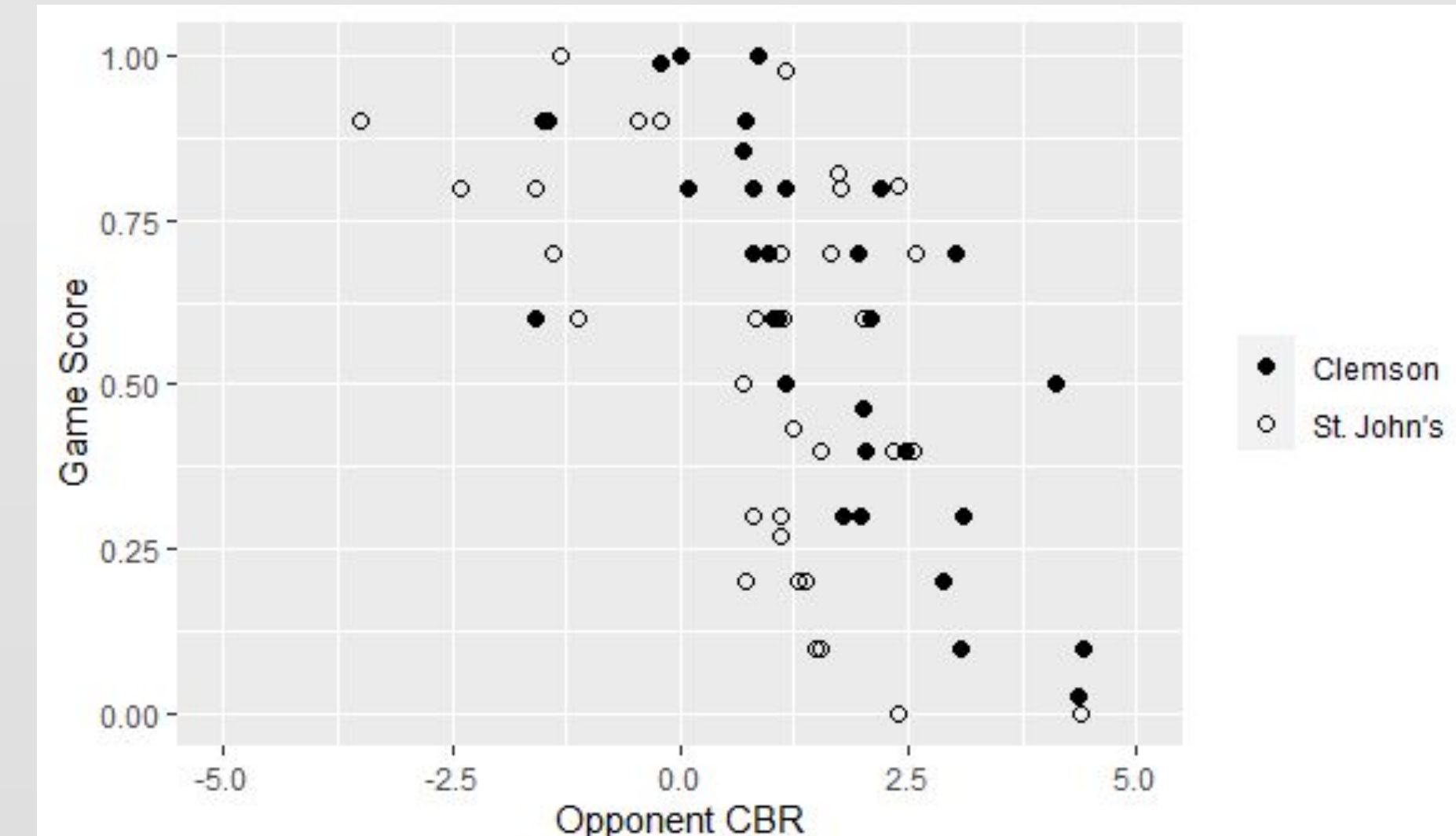
NET Top 12 -- Data Through 11/25/2018			
Team	Record	NET Rank	CBR Rank
Ohio State	6-0	1	5
Virginia	6-0	2	19
Texas Tech	6-0	3	1
Michigan	6-0	4	3
Gonzaga	6-0	5	2
Duke	5-1	6	4
Michigan State	5-1	7	17
Wisconsin	5-1	8	13
Virginia Tech	5-0	9	6
Loyola Marymount	7-0	10	24
Kansas	5-0	11	12
Belmont	5-0	12	60

NET does not properly account for strength of schedule. Its initial rankings had Loyola Marymount and Belmont too high. Will the redesigned NET be able to pass the eye test?

5. Clemson vs. St. John's

Using CBR, a strong case can be made in favor of Clemson (19-13, CBR #32) over St. John's (21-12, CBR #100). When their schedules are combined, Clemson played seven of the eight strongest opponents and St. John's played eight of the 11 weakest opponents. Against opponents in the CBR 0.00 to 2.50 range, Clemson's average game score is 0.65; St. John's is 0.45.

While the selection committee may have preferred St. John's due to its better overall, non-conference, and quadrant 1 records, CBR presents compelling evidence that Clemson played at a higher level against tougher competition.



6. Conclusion

CBR is a modern body-of-work metric. It places minimal emphasis on high-variance outcomes like win/loss and shots made/missed, and instead focuses on box score stats that good teams accumulate consistently. Empirical evidence supports the claim that CBR should be considered when discussing a team's body of work.