



# 2011 Italian Stata Users Group meeting

*Venice, 17-18 nov 2011*

## Evaluating individual player performance indexes in basketball with Stata

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*Sessione IV – 17 novembre 2011 ore 15.30  
“Studi applicativi usando Stata”*

# Statistical Analysis in Sport Performance

- ▶ Some of the earliest sport statistics papers in the Journal of the American Statistical Association (JASA) were about baseball and appeared in the 1950s
  - *"Sabermetrics"*
- ▶ Football, basketball, golf, tennis, ice hockey and track & field became to be addressed in research in sport statistics on the '60s,'70s and '80s
- ▶ In 1992 the Joint Statistical Meeting (JSM) saw the creation of a new section in the ASA
  - *Section on Statistics in Sport (SIS)*
    - Dedicated to promoting high professional standards in the application of statistics to sport and fostering statistical education in sports both within and outside the ASA

Albert J, Bennet J, Cochran JJ, *Anthology of Statistics in Sport, ASA-SIAM, 2005*



# Statistics in basketball

## ► Main topics

- *Factors influencing shooting percentage (the "hot hand phenomena")*
  - Tversky A, Gilovich T, The cold facts about the "hot hand" in Basketball, *Chance*, 2(1): 16-21, 1989
  - Larkey PD, Smith RA, Kadane JB, It's okay to believe in the "Hot Hand", *Chance*, 2(4): 22-30, 1989
  - Wardrop RL, Simpson's paradox in the hot hand in Basketball, *The American Statistician*, 49(1): 24-28, 1995
- *The home advantage and intermediate game score advantage*
  - Cooper H, DeNeve KM, Mosteller F, Predicting professional sports game outcomes from intermediate game scores, *Chance*, 5(3-4): 18-22, 1992
- *Linear weights for evaluating players*
  - Martin Manley's Basketball Heaven 1990, Doubleday, 1989
    - *Introducing the formula used today for the Player's Efficiency Stat by NBA, with all weights set to +1 or -1*
  - Clearbout D, The NBA Analyst: 1999, Taylor pub, 1998
  - Hollinger J, Pro Basketball Prospectus: 2003 Edition, Potomac Books, 2003
  - ...
- *The Four-factor model*
  - Oliver D, Basketball on paper, Potomac Books, 2004
  - Winston WL, Mathletics, Princeton University press, 2009



# Statistical consultants in NBA teams: a new professional perspective?

## ▶ Dean Oliver

- Author of "Basketball on Paper" (2004)
- Has served in front office roles with the Seattle Supersonics and Denver Nuggets of the NBA
- By October 2004, he was hired as the first full-time statistical analyst in the NBA
  - For the Nuggets, he provided insight for management on trades, free agency, draft analysis, and coaching issues
- By March 2011 he has joined ESPN as director, production analytics.
  - This new group, a subset of the stats and information area within ESPN's production department, is comprised of researchers who focus on creating evaluation metrics for all sport



## ▶ Wayne L. Winston

- Autor of "Mathletics" (2009)
- Professor of Decision Sciencs at Indiana University's Kelley School of Business
- He has been a consultant of Dallas Mavericks of the NBA
  - Along with his former MIT classmate Jeff Sagarin, an American sports statistician well-known for his development of a methodology for ranking and rating sports teams in a variety of sports, he advises the Dallas Mavericks about which lineups to use during games and which free agents to sign using a system called Winval. Winval is modeled after hockey's plus/minus system. The pair are paid over \$100,000 for use of the system [[http://en.wikipedia.org/wiki/Jeff\\_Sagarin](http://en.wikipedia.org/wiki/Jeff_Sagarin)]



# Dean Oliver, Basketball on Paper, 2004

## *Main contributions*

- ▶ Possession-based analysis
  - *Where possessions are defined as the period between when one team gets the ball to when the other team gets it. Teams are evaluated based on how many points per 100 possessions they score and allow, also called "**offensive ratings**" and "**defensive ratings**." The percentage of possessions on which a team scores Oliver calls "**floor percentage**", though it is a concept little used since what is ultimately most important is how many points are scored, not how often any points are scored.*
- ▶ Four Factor Analysis
  - *From possession-based analysis, there are four statistical team factors that summarize most of what matters in terms of winning or losing: **effective field goal percentage**, offensive **rebouncing** percentage, **turnovers** per possession, and **free throws made** per field goal attempted.*
- ▶ Individual possession-based analysis
  - *Evaluating the **efficiency of individuals** with their possessions. Oliver has presented his version of individual offensive and defensive ratings using a complex set of formulas and rough simplifying assumptions to parse credit among individuals.*

# The Basketball game box score

Table 16.1. Box Score for Charlotte–Milwaukee, May 20, 2001

## Charlotte

Player	Pos	Min	FGs		3-Ptrs		FTs		Rebounds			AST	PF	ST	TO	BS	Pts	
			M	A	M	A	M	A	O	D	T							
Mashburn	F	41	7	25	1	2	6	8	1	3	4	9	5	0	1	1	21	
Brown	F	39	2	4	0	0	2	2	7	2	9	0	6	0	0	1	6	
Campbell	C	33	8	15	0	0	2	2	3	7	10	2	4	1	3	2	18	
Davis	G	45	10	16	5	8	4	9	1	1	2	6	4	2	1	2	29	
Wesley	G	43	7	17	0	4	1	1	1	1	2	5	5	1	0	0	15	
Robinson		17	1	2	0	0	0	0	0	4	4	0	2	0	1	0	2	
Magloire		13	1	3	0	0	2	6	1	4	5	1	3	0	0	1	4	
Thorpe		9	0	0	0	0	0	0	0	1	1	0	1	0	1	0	0	
Coleman																	DNP	
Recasner																	DNP	
Hawkins																	DNP	
Burrell																	DNP	
<b>TOTAL</b>		<b>240</b>	<b>36</b>	<b>82</b>	<b>6</b>	<b>14</b>	<b>17</b>	<b>28</b>	<b>14</b>	<b>23</b>	<b>37</b>	<b>23</b>	<b>30</b>	<b>4</b>	<b>8</b>	<b>7</b>	<b>95</b>	
				44%		43%		61%		Tm Reb: 9							Total TO: 8	(10 Pts)

## Milwaukee

Player	Pos	Min	FGs		3-Ptrs		FTs		Rebounds			AST	PF	ST	TO	BS	Pts	
			M	A	M	A	M	A	O	D	T							
Robinson	F	40	10	17	3	5	6	6	1	4	5	1	4	0	1	1	29	
Williams	F	27	4	8	0	0	5	6	1	7	8	2	4	0	1	3	13	
Johnson	C	37	2	2	0	0	0	1	3	8	11	1	3	0	2	4	4	
Allen	G	46	10	18	2	6	6	6	2	4	6	5	4	0	4	2	28	
Cassell	G	36	4	12	1	3	8	8	0	3	3	13	3	0	2	1	17	
Thomas		29	0	3	0	0	8	8	1	4	5	1	2	0	3	2	8	
Hunter		14	1	6	1	3	0	0	0	1	1	2	1	1	0	0	3	
Caffey		11	1	2	0	0	0	0	0	3	3	1	2	1	0	0	2	
Ham																	DNP	
Przybilla																	DNP	
Pope																	DNP	
Alston																	DNP	
<b>TOTAL</b>		<b>240</b>	<b>32</b>	<b>68</b>	<b>7</b>	<b>17</b>	<b>33</b>	<b>35</b>	<b>8</b>	<b>34</b>	<b>42</b>	<b>26</b>	<b>23</b>	<b>2</b>	<b>14</b>	<b>13</b>	<b>104</b>	
				47%		41%		94%		Tm R: 7							Total TO: 14	(16 Pts)

	Period				Total
	1	2	3	4	
Hornets	26	21	17	31	95
Bucks	23	21	29	31	104

**Technical:** None  
**Disqualifications:** Charlotte: Brown, Brown  
**Officials:** Don Vaden, Bennett Salvatore, Steve Javie  
**Location:** Bradley Center  
**Attendance:** 18,717  
**Time:** 2:27



# Individual offensive ratings and floor percentages: principles

- ▶ One important and difficult issues is how to distribute “credits” among cooperating players in basketball
- ▶ This leads to the concept of “Individual points produced”, calculated on “credits”
  - *Ex. 1 -> On an assist to a big man underneath the basket,*
    - the passer deserves relatively more credit, because he saw an open pass which normally is not let by defense
      - And the shot is relatively easy for the big man
        - 2 points -> 1.4 credits to the passer, 0.6 to the shooter
  - *Ex. 2 -> On a fluke assist to a big man who has no 3-pts range but makes a wide-open trey because the defense does not respect him*
    - the passer deserve little credit, because his pass was lightly defended
      - Whereas the made shot was quite unlikely
        - 2 points: 0 credits to the passer, 2 to the shooter



# Individual offensive ratings and floor percentages by Oliver

- ▶ Individual floor percentage
  - *Is an individual's scoring possessions divided by his total possessions*
    - It answers the question: "What percentage of the time that a player wants to score does he actually score?"
- ▶ Individual offensive rating
  - *Is the number of points produced by a player per hundred total individual possessions*
    - "How many points is a player likely to generate when he tries?"





# Elements to be calculated

- ▶ Individual scoring possessions (ScPoss)
  - *Reflect a player's contributions to a team's scoring possessions*
    - Field goals part (FG Part)
    - Player's own assists (AST Part)
    - Free throws (FT Part)
    - Offensive rebounds (OREB)
      - *Remove credit for the OREB allowed by the team but add back OREB caught by the player...*
- ▶ Individual total possessions (Poss)
  - *Total number of team possessions that a player can be considered responsible for*
    - Scoring possessions
    - Missed field goals that aren't rebounded (Missed FG Part)
    - Missed free throws that aren't rebounded (Missed FT Part)
    - Turnovers (TOV)
- ▶ Individual points produced (PtsProd)
  - *The number of points a player produces through*
    - Scoring possessions
      - *Accounting for the 3-point shots and how well he does at the foul line*
- ▶ Percentage of team possessions (% TMPoss)
  - *Percentage of team possessions a player contributes to when he's in the game*
    - $\text{Individual total possessions (Poss)} / \text{Total team possessions (TMPoss)}$



# Individual scoring possessions: formulas (i)

$$\text{FG Part} = \text{FGM} \times \left( 1 - \frac{1}{2} \times \frac{\text{PTS} - \text{FTM}}{2 \times \text{FGA}} \times q_{AST} \right)$$

where

$$q_{AST} = \frac{\text{MIN}}{\text{TMMIN}/5} q_5 + \left( 1 - \frac{\text{MIN}}{\text{TMMIN}/5} \right) q_{12}$$

where

$$q_5 = \sum_{i \neq n} \frac{\text{AST}_i}{\sum_{k \neq i} \text{FGM}_k}$$

$$q_{12} = \frac{\frac{\text{TMAST}}{\text{TMMIN}} \times \text{MIN} \times 5 - \text{AST}}{\frac{\text{TMFGM}}{\text{TMMIN}} \times \text{MIN} \times 5 - \text{FGM}}$$

(A simplified approximate equation for  $q_5$  is  $q_5 \approx 1.14 \times \frac{\text{TMAST} - \text{AST}}{\text{TMFGM}}$ .)

$$\text{AST Part} = \frac{1}{2} \times \frac{(\text{TMPTS} - \text{TMFTM}) - (\text{PTS} - \text{FTM})}{2 \times (\text{TMFGA} - \text{FGA})} \times \text{AST}$$

$$\text{FT Part} = \left[ 1 - (1 - \text{FT}\%)^2 \right] \times 0.4 \times \text{FTA}$$

# Individual scoring possessions: formulas (ii)

$$\begin{aligned} \text{Scoring Possessions} &= (\text{FG Part} + \text{AST Part} + \text{FT Part}) \\ &\times \left( 1 - \frac{\text{TMOREB}}{\text{TMScPoss}} \times \text{TMOREB weight} \times \text{TMPlay\%} \right) \\ &+ \text{OREB} \times \text{TMOREB weight} \times \text{TMPlay\%} \end{aligned}$$

$$\text{TMOREB weight} = \frac{(1 - \text{TMOR\%}) \times \text{TMPlay\%}}{(1 - \text{TMOR\%}) \times \text{TMPlay\%} + \text{TMOR\%} \times (1 - \text{TMPlay\%})}$$

# Individual total possessions: formulas

$$\text{Possessions} = \text{Scoring Possessions} + \text{Missed FG Part} + \text{Missed FT Part} + \text{TOV}$$

$$\text{Missed FG Part} = (\text{FGA} - \text{FGM}) \times (1 - 1.07 \times \text{TMOR}\%)$$

$$\text{Missed FT Part} = (1 - \text{FT}\%)^2 \times 0.4 \times \text{FTA}$$

# Individual points produced: formulas

$$\text{Points Produced} = (\text{FG Part} + \text{AST Part} + \text{FT Part}) \times \left( 1 - \frac{\text{TMOR}}{\text{TMScPoss}} \times \text{TMOR weight} \times \text{TMPlay\%} \right) + \text{OR part}$$

The “parts” are different here than for scoring possessions, though. They are different almost exclusively in that they are scaled up by the number of points each scoring possession creates.

$$\text{FG Part} = 2 \times \left( \text{FGM} + \frac{1}{2} \times \text{FG3M} \right) \times \left( 1 - \frac{1}{2} \times \frac{\text{PTS} - \text{FTM}}{2 \times \text{FGA}} \times q_{AST} \right)$$

$$\text{AST Part} = 2 \times \frac{\text{TMFGM} - \text{FGM} + \frac{1}{2} (\text{TMFG3M} - \text{FG3M})}{(\text{TMFGM} - \text{FGM})} \times \frac{1}{2} \times \frac{(\text{TMPTS} - \text{TMFTM}) - (\text{PTS} - \text{FTM})}{2 \times (\text{TMFGA} - \text{FGA})} \times \text{AST}$$

$$\text{FT Part} = \text{FTM}$$

$$\text{OR part} = \text{OR} \times \text{TMOR weight} \times \text{TMPlay\%}$$

$$\times \frac{\text{TMPTS}}{\text{TMFGM} + [1 - (1 - \text{TMFT\%})^2] \times 0.4 \times \text{TMFTA}}$$

**Montepaschi Siena****Pepsi Caserta****91** 15 35 65 91 **Arbitri:** Enrico Sabetta - Roberto Chiari - Renato Capurro**87** 17 41 68 87 **Impianto:** PalaEstra

Montepaschi Siena		Falli		Tiri da 2			Sc	Tiri da 3			Tiri Liberi			Rimbalzi			Stoppate		Palle		Ass	Valutaz.		+/-		
All. Pianigiani Simone		Pt	Min	C	S	R		T	%	R	T	%	R	T	%	Off	Dif	Tot	Dat	Sub		Per	Rec		Lega	OER
■ 4	<b>Mc Calebb Lester Bo</b>	17	29	3	5	4	5	80.0	1	2	2	100.0	3	6	50.0	1	3	4	0	0	0	3	3	25	1.70	16
6	<b>Zisis Nikolaos</b>	2	17	1	3	0	2	0.0	0	0	2	0.0	2	2	100.0	0	1	1	0	0	1	0	4	4	0.33	-6
9	<b>Carraretto Marco</b>	0	7	3	0	0	0	0.0	0	0	2	0.0	0	0	0.0	0	1	1	0	0	0	0	0	-4	0.00	-7
■ 11	<b>Rakovic Milovan</b>	8	16	2	0	4	5	80.0	0	0	0	0.0	0	0	0.0	2	3	5	0	0	2	2	0	10	1.14	0
12	<b>Lavrinovic Ksistof</b>	33	23	4	8	8	12	66.7	0	2	2	100.0	11	11	100.0	4	5	9	0	1	1	2	1	43	1.61	11
■ 13	<b>Kaukenas Rimantas</b>	14	27	2	7	1	8	12.5	0	1	3	33.3	9	10	90.0	0	1	1	0	1	2	0	3	10	0.78	0
14	<b>Ress Tomas</b>	3	8	0	0	0	0	0.0	0	1	2	50.0	0	0	0.0	0	2	2	1	0	0	0	0	5	1.50	0
15	<b>Michelori Andrea</b>	0	5	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.00	-7
19	<b>Monaldi Diego</b>	0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.00	0
■ 20	<b>Stonerook Shaun</b>	4	28	4	3	1	2	50.0	1	0	0	0.0	2	2	100.0	1	3	4	0	0	2	2	0	6	0.80	4
21	<b>Aradori Pietro</b>	2	8	0	1	1	2	50.0	0	0	0	0.0	0	2	0.0	0	0	0	0	0	0	0	0	0	0.67	-1
■ 34	<b>Moss David</b>	8	32	4	3	3	6	50.0	0	0	1	0.0	2	2	100.0	0	1	1	1	0	2	2	3	8	0.80	10
Squadra		0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	1	1	0	0	0	5	0	6	0.00	
Totali		91	200	23	30	22	42	52.4	2	6	14	42.9	29	35	82.9	8	21	29	2	2	10	16	14	113	1.09	
Pepsi Caserta		Falli		Tiri da 2			Sc	Tiri da 3			Tiri Liberi			Rimbalzi			Stoppate		Palle		Ass	Valutaz.		+/-		
All. Sacripanti Stefano		Pt	Min	C	S	R		T	%	R	T	%	R	T	%	Off	Dif	Tot	Dat	Sub		Per	Rec		Lega	OER
4	<b>Marzaioli Domenico</b>	0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.00	0
7	<b>Kozzarek Lukasz</b>	0	5	2	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	1	1	0	0.00	3
10	<b>Colussi Martin</b>	11	14	2	1	3	3	100.0	0	1	2	50.0	2	2	100.0	0	0	0	0	0	0	0	1	10	1.83	0
11	<b>Parrillo Salvatore</b>	0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.00	0
■ 13	<b>Di Bella Fabio</b>	2	33	4	2	1	2	50.0	0	0	2	0.0	0	0	0.0	0	2	2	0	0	2	1	6	4	0.33	-11
■ 14	<b>Bowers Tim</b>	14	32	3	4	4	8	50.0	0	0	0	0.0	6	6	100.0	3	4	7	0	0	2	1	3	20	1.08	-3
■ 15	<b>Garri Luca</b>	6	14	5	1	3	4	75.0	0	0	0	0.0	0	1	0.0	1	3	4	1	0	2	1	0	4	0.92	-6
■ 23	<b>Ere Ebi</b>	28	36	5	4	5	12	41.7	0	5	7	71.4	3	3	100.0	2	6	8	0	1	4	3	3	27	1.14	-1
25	<b>Martin Philip</b>	2	12	2	2	1	3	33.3	0	0	0	0.0	0	2	0.0	0	2	2	0	1	0	0	0	-1	0.50	3
31	<b>Williams Eric</b>	7	19	4	6	1	3	33.3	0	0	0	0.0	5	6	83.3	0	0	0	0	0	3	1	0	4	0.78	0
■ 33	<b>Jones Jumaine</b>	17	35	3	3	4	4	100.0	0	2	9	22.2	3	5	60.0	3	6	9	1	0	3	2	0	17	0.92	-5
Squadra		0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	1	1	2	0	0	0	1	0	3	0.00	
Totali		87	200	30	23	22	39	56.4	0	8	20	40.0	19	25	76.0	10	24	34	2	2	16	11	14	88	0.99	

■ N Quintetto iniziale

OER Rendimento Offensivo

R Tiri Realizzati

T Tiri Tentati

Sc Schiacciate

# The Italian A league box-score

<http://www.legabasket.it/>

# Main issues in application of Oliver's indexes

- ▶ The formulas to calculate indexes are rather complicated, and in particular
  - *To calculate individual percentages you need calculated team's statistics*
    - TMOReb, TMScPoss, TMOR%, TMPlay%, TMAst, TMMin, TMFga, TMFta
  - *To calculate individual ratings you have to evaluate opponent team's statistics, too*
    - You need opponent's team Defensive Rebounds to calculate percentages of non-rebounded shots (TMOR%)
      - *Because you don't know if a single offensive rebound is on a 3-, 2- or 1-point shot*

# Data from League imported on spreadsheet with some addition

Game ID	Date	Home Team	H/V	Visitor Team	Data Type	ID_Team	Starter	N°	Player	Pts	Minutes	Pfm	Pfr	Fg2m	Fg2a	Fg2_Perc	Dunk	Fg3m	Fg3a	Fg3_Perc	Ftm	Fta	Ft_Perc	Or	Dr	Tr	Bsm	Bsr	To	St	Ast	Oer_Lega	Score_Lega	+ / -
1011_A01_04	07/11/10	MPS	H	CAS	player	1	1	4	Mc Calebb Lester Bo	17	29	3	5	4	5	80.0	1	2	2	100.0	3	6	50.0	1	3	4	0	0	0	3	3	25	0.090	16
1011_A01_04	07/11/10	MPS	H	CAS	player	2	0	6	Zisis Nikolaos	2	17	1	3	0	2	0.0	0	0	2	0.0	2	2	100.0	0	1	1	0	0	1	0	4	4	0.023	-6
1011_A01_04	07/11/10	MPS	H	CAS	player	3	0	9	Carraretto Marco	0	7	3	0	0	0	0.0	0	0	2	0.0	0	0	0.0	0	1	1	0	0	0	0	0	-4	0.000	-7
1011_A01_04	07/11/10	MPS	H	CAS	player	4	1	11	Rakovic Milovan	8	16	2	0	4	5	80.0	0	0	0	0.0	0	0	0.0	2	3	5	0	0	2	2	0	10	0.051	0
1011_A01_04	07/11/10	MPS	H	CAS	player	5	0	12	Lavrinovic Ksistof	33	23	4	8	8	12	66.7	0	2	2	100.0	11	11	100.0	4	5	9	0	1	1	2	1	43	0.080	11
1011_A01_04	07/11/10	MPS	H	CAS	player	6	1	13	Kaukenas Rimantas	14	27	2	7	1	8	12.5	0	1	3	33.3	9	10	90.0	0	1	1	0	1	2	0	3	10	0.050	0
1011_A01_04	07/11/10	MPS	H	CAS	player	7	0	14	Ress Tomas	3	8	0	0	0	0	0.0	0	1	2	50.0	0	0	0.0	0	2	2	1	0	0	0	0	5	0.076	0
1011_A01_04	07/11/10	MPS	H	CAS	player	8	0	15	Michelori Andrea	0	5	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.000	-7
1011_A01_04	07/11/10	MPS	H	CAS	player	9	0	19	Monaldi Diego	0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.000	0
1011_A01_04	07/11/10	MPS	H	CAS	player	10	1	20	Stonerook Shaun	4	28	4	3	1	2	50.0	1	0	0	0.0	2	2	100.0	1	3	4	0	0	2	2	0	6	0.050	4
1011_A01_04	07/11/10	MPS	H	CAS	player	11	0	21	Aradori Pietro	2	8	0	1	1	2	50.0	0	0	0	0.0	0	2	0.0	0	0	0	0	0	0	0	0	0	0.040	-1
1011_A01_04	07/11/10	MPS	H	CAS	player	12	1	34	Moss David	8	32	4	3	3	6	50.0	0	0	1	0.0	2	2	100.0	0	1	1	1	0	2	2	3	8	0.050	10
1011_A01_04	07/11/10	MPS	H	CAS	team	88			SIENA	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0	0	1	1	0	0	0	5	0	6	0		
1011_A01_04	07/11/10	MPS	H	CAS	total	99				91	200	23	30	22	42	52.4	2	6	14	42.9	29	35	82.9	8	21	29	2	2	10	16	14	113	0.048	
1011_A01_04	07/11/10	MPS	V	CAS	player	1	0	4	Marzaioli Domenico	0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.000	0
1011_A01_04	07/11/10	MPS	V	CAS	player	2	0	7	Koszarek Lukasz	0	5	2	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	1	1	0	0.000	3
1011_A01_04	07/11/10	MPS	V	CAS	player	3	0	10	Colussi Martin	11	14	2	1	3	3	100.0	0	1	2	50.0	2	2	100.0	0	0	0	0	0	0	0	1	10	0.090	0
1011_A01_04	07/11/10	MPS	V	CAS	player	4	0	11	Parrillo Salvatore	0	0	0	0	0	0	0.0	0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	0	0	0	0.000	0
1011_A01_04	07/11/10	MPS	V	CAS	player	5	1	13	Di Bella Fabio	2	33	4	2	1	2	50.0	0	0	2	0.0	0	0	0.0	0	2	2	0	0	2	1	6	4	0.023	-11
1011_A01_04	07/11/10	MPS	V	CAS	player	6	1	14	Bowers Tim	14	32	3	4	4	8	50.0	0	0	0	0.0	6	6	100.0	3	4	7	0	0	2	1	3	20	0.047	-3
1011_A01_04	07/11/10	MPS	V	CAS	player	7	1	15	Garri Luca	6	14	5	1	3	4	75.0	0	0	0	0.0	0	1	0.0	1	3	4	1	0	2	1	0	4	0.060	-6
1011_A01_04	07/11/10	MPS	V	CAS	player	8	1	23	Ere Ebi	28	36	5	4	5	12	41.7	0	5	7	71.4	3	3	100.0	2	6	8	0	1	4	3	3	27	0.051	-1
1011_A01_04	07/11/10	MPS	V	CAS	player	9	0	25	Martin Philip	2	12	2	2	1	3	33.3	0	0	0	0.0	0	2	0.0	0	2	2	0	1	0	0	0	-1	0.035	3
1011_A01_04	07/11/10	MPS	V	CAS	player	10	0	31	Williams Eric	7	19	4	6	1	3	33.3	0	0	0	0.0	5	6	83.3	0	0	0	0	0	3	1	0	4	0.050	0
1011_A01_04	07/11/10	MPS	V	CAS	player	11	1	33	Jones Jumaine	17	35	3	3	4	4	100.0	0	2	9	22.2	3	5	60.0	3	6	9	1	0	3	2	0	17	0.060	-5
1011_A01_04	07/11/10	MPS	V	CAS	team	88			CASERTA	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0	1	1	2	0	0	0	1	0	3	0		
1011_A01_04	07/11/10	MPS	V	CAS	total	99				87	200	30	23	22	39	56.4	0	8	20	40.0	19	25	76.0	10	24	34	2	2	16	11	14	88	0.060	





# Stata do file

- ▶ See on Stata do file editor the file:
  - *Indexes\_indiv\_explained*



. list gameid hometeam pts199 possess199 offrate199 visitorteam pts299 possess299 offrate299

	gameid	hometeam	pts199	pos~s199	offr~199	visito~m	pts299	pos~s299	offr~299
1.	0910_A01_01AVEPES	AVE	88	69.95454	125.796	PES	77	74.10696	103.9039
2.	0910_A01_01BOLMGR	BOL	76	68.93462	110.2494	MGR	68	67.06895	101.3882
3.	0910_A01_01CASBIE	CAS	77	65.28333	117.9474	BIE	68	66.46833	102.3044
4.	0910_A01_01CNTTRV	CNT	68	70.45	96.52236	TRV	72	66.88214	107.6521
5.	0910_A01_01FERTER	FER	90	75.84545	118.6624	TER	83	74.97	110.711
6.	0910_A01_01ROMCRM	ROM	94	75.36	124.7346	CRM	79	77.56	101.8566
7.	0910_A01_01VARMIL	VAR	73	75.90069	96.17831	MIL	66	77.41719	85.25238
8.	0910_A01_02BIEBOL	BIE	79	66.1775	119.3759	BOL	76	65.23793	116.4966
9.	0910_A01_02CRMCNT	CRM	103	91.04	113.1371	CNT	104	90.123	115.3978
10.	0910_A01_02MGRCAS	MGR	86	74.17375	115.944	CAS	84	77.84	107.9137
11.	0910_A01_02MILFER	MIL	71	71.57813	99.19231	FER	66	72.22195	91.38496
12.	0910_A01_02PESMPS	PES	67	66.53677	100.6962	MPS	80	68.49	116.8054
13.	0910_A01_02TERVAR	TER	84	69.11154	121.5426	VAR	58	69.83	83.05885
14.	0910_A01_02TRVROM	TRV	92	77.4375	118.8055	ROM	85	79.79166	106.5274
15.	0910_A01_03CASMIL	CAS	104	83.79652	124.1102	MIL	100	85.35	117.1646
16.	0910_A01_03CNTMGR	CNT	79	75.17455	105.0888	MGR	75	75.48923	99.35192
17.	0910_A01_03FERCRM	FER	82	78.14051	104.9392	CRM	91	74.975	121.3738
18.	0910_A01_03MPSTER	MPS	94	74.85786	125.5713	TER	70	76.91757	91.00652
19.	0910_A01_03ROMAVE	ROM	74	65.229	113.4465	AVE	78	60.5	128.9256
20.	0910_A01_03TRVPES	TRV	86	75.1404	114.4524	PES	84	75.07858	111.8828
21.	0910_A01_03VARBIE	VAR	78	68.369	114.0868	BIE	87	69.41734	125.3289

## Results: Team statistics per game



```
. by gameid: list squad home number player minutes floor_perc pts pts_produc diff_pts if id_inteam!=88 & player!="" , sepby(home)
```

```
-> gameid = 1011_A01_04MPSCAS, squad = CAS
```

	home	player	minutes	offrate	floor_~c	pts	pts_pr~c	teampo~c
1.	0	Marzaioli Domenico	0	.	.	0	.	.
2.	0	Koszarek Lukasz	5	.	1.000	0	.	3
3.	0	Colussi Martin	14	195.8	0.851	11	8.6	17
4.	0	Parrillo Salvatore	0	.	.	0	.	.
5.	0	Di Bella Fabio	33	85.3	0.391	2	5.6	11
6.	0	Bowers Tim	32	135.4	0.612	14	16.1	20
7.	0	Garri Luca	14	90.1	0.445	6	5.0	21
8.	0	Ere Ebi	36	125.9	0.512	28	25.5	30
9.	0	Martin Philip	12	57.0	0.285	2	1.7	13
10.	0	Williams Eric	19	85.5	0.406	7	6.3	21
11.	0	Jones Jumaine	35	105.0	0.477	17	15.9	23

```
-> gameid = 1011_A01_04MPSCAS, squad = MPS
```

	home	player	minutes	offrate	floor_~c	pts	pts_pr~c	teampo~c
1.	1	Mc Calebb Lester Bo	29	180.8	0.840	17	15.1	16
2.	1	Zisis Nikolaos	17	74.2	0.319	2	4.3	19
3.	1	Carraretto Marco	7	0.0	0.000	0	0.0	12
4.	1	Rakovic Milovan	16	114.6	0.560	8	7.1	21
5.	1	Lavrinovic Ksistof	23	174.0	0.757	33	28.2	39
6.	1	Kaukenas Rimantas	27	98.0	0.421	14	14.6	30
7.	1	Ress Tomas	8	148.2	0.494	3	2.1	10
8.	1	Michelori Andrea	5	.	.	0	.	0
9.	1	Monaldi Diego	0	.	.	0	.	.
10.	1	Stonerook Shaun	28	92.6	0.415	4	4.3	9
11.	1	Aradori Pietro	8	67.7	0.338	2	1.6	16
12.	1	Moss David	32	96.3	0.450	8	8.6	15

# Results: Individual statistics per game



# Team stats: season (09/10+half 10/11)

## *Pepsi Juvecaserta - Caserta*

Player	Games	Sc Poss	Poss	Floor %	sd	Off. Rating	sd	Points prod	% Team poss	sd	Pts Prod/game
Ere Ebi	43	241.9	545.9	0.433	0.130	101.4	32.5	567.6	22.0	5.0	13.2
Jones Jumaine	43	238.1	517.0	0.463	0.120	110.8	31.4	565.3	19.0	4.2	13.1
Di Bella Fabio	43	244.3	483.6	0.495	0.136	111.2	33.0	549.3	21.0	5.5	12.8
Bowers Tim	40	231.6	484.0	0.467	0.125	103.2	30.1	510.0	20.0	4.6	12.8
Hite Robert	3	13.7	24.1	0.570	0.103	138.3	31.2	32.6	16.0	3.0	10.9
Michelori Andrea	28	137.1	250.2	0.544	0.128	112.4	29.1	282.4	22.0	5.7	10.1
Williams Eric	13	63.6	121.6	0.509	0.146	101.3	29.1	126.4	22.0	6.7	9.7
Garri Luca	15	54.4	102.3	0.484	0.212	103.8	43.5	117.1	20.0	6.1	7.8
Kavaliauskas Antanas	5	16.2	29.2	0.565	0.119	119.4	21.5	34.2	19.0	4.2	6.8
Koszarek Lukasz	43	97.5	195.7	0.481	0.249	107.2	57.0	224.3	15.0	4.7	5.2
Marquis Claude	21	52.2	102.5	0.457	0.202	93.1	39.9	103.5	23.0	13.1	4.9
Colussi Martin	15	28.2	60.7	0.416	0.222	106.5	49.2	67.6	17.0	6.0	4.5
Doornekamp Aaron	30	54.2	115.3	0.434	0.211	105.1	47.4	125.6	14.0	5.7	4.2
Martin Philip	43	41.4	111.9	0.321	0.222	68.1	44.4	89.8	22.0	15.0	2.1
Zamo Antonio	25	1.3	1.3	1.000		200.0		2.6	24.0	41.8	0.1
Parrillo Salvatore	37	0.5	1.7	0.365	0.517			0.0	10.0	21.6	0.0
Cardinale Antonio	23	0.0	0.6	0.000		0.0		0.0	11.0	19.1	0.0
Marzaioli Domenico	20	0.0	0.0					0.0	0.0	0.0	0.0
Porfido Alessandro	7	0.0	0.0					0.0			0.0
Cefarelli Dario	5	0.0	0.0					0.0			0.0
D'Isep Adriano	2	0.0	0.0					0.0			0.0
Cucco Marco	1	0.0	0.0					0.0			0.0

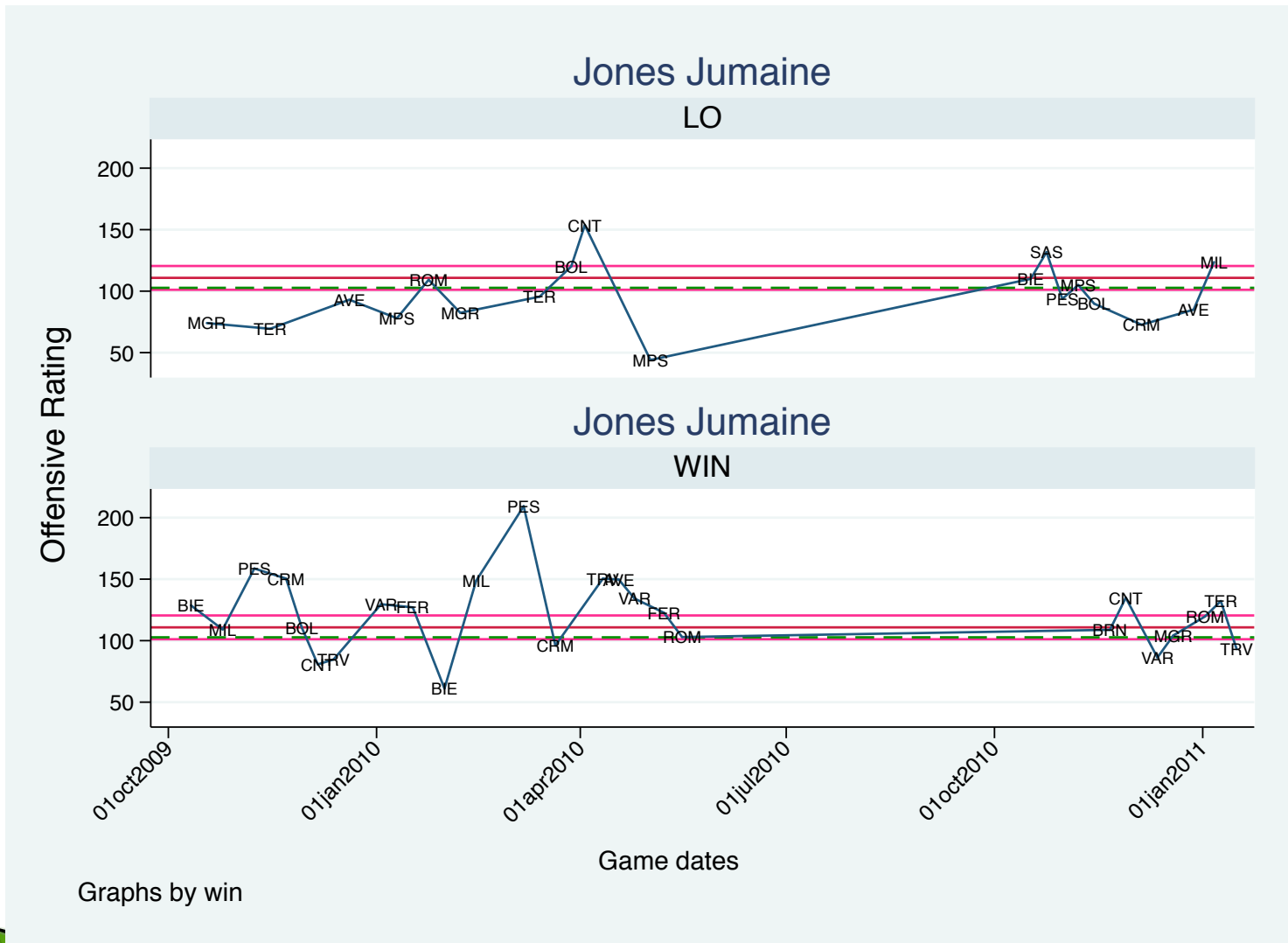
# Team stats: season (09/10+half 10/11)

## Montepaschi Mens Sana - Siena

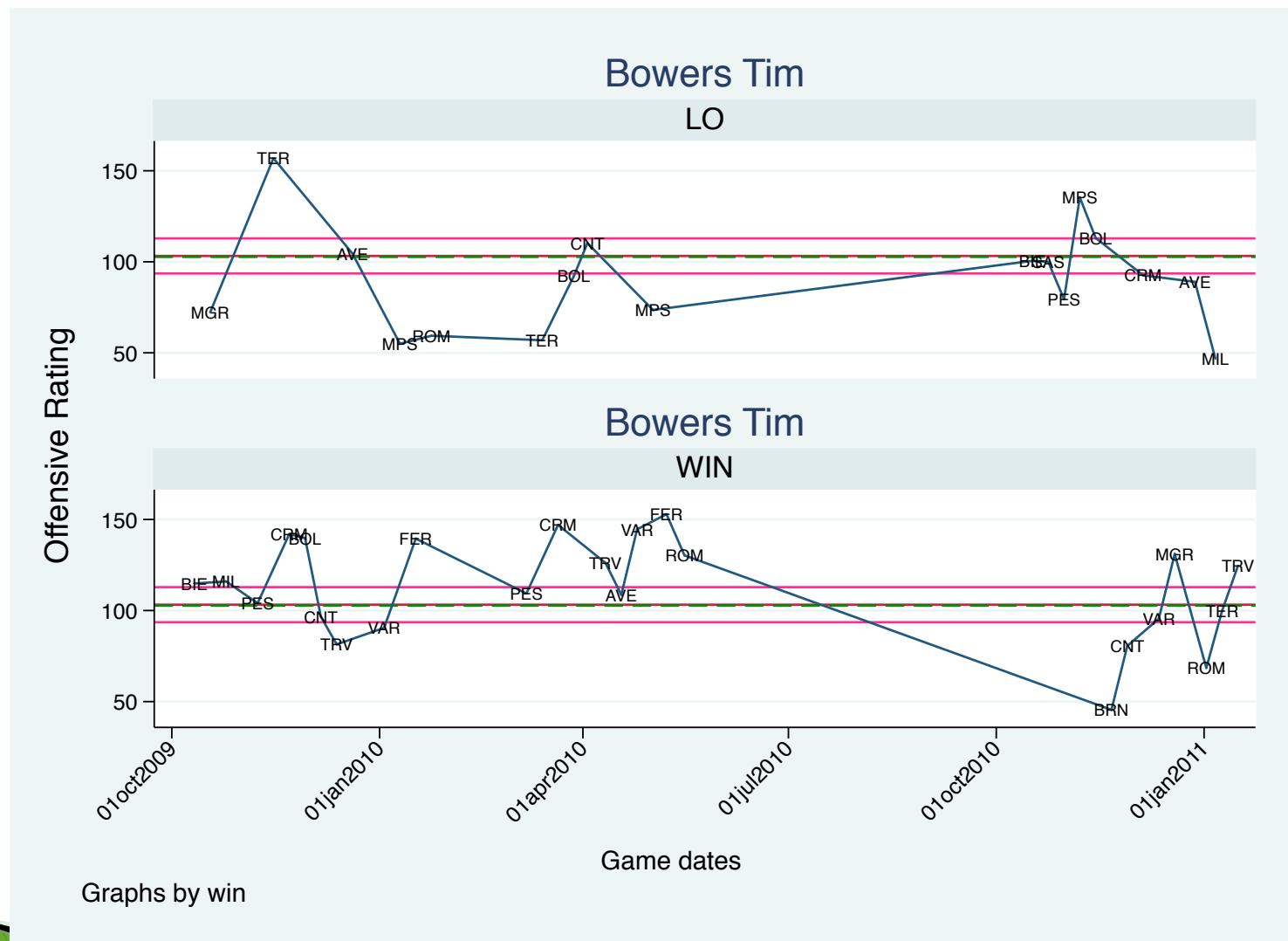
Player	Games	Sc Poss	Poss	Floor %	sd	Off. Rating	sd	Points prod	% Team poss	sd	Pts Prod/game
Mc Calebb Lester Bo	14	91.7	144.3	0.647	0.177	138.2	37.2	195.9	24.0	5.2	14.0
Lavrinovic Ksistof	35	219.9	368.8	0.591	0.132	129.5	31.1	482.9	27.0	6.9	13.8
Kaukenas Rimantas	14	82.7	157.8	0.534	0.098	119.5	24.4	185.2	24.0	6.8	13.2
Sato Romain	28	157.6	281.7	0.558	0.132	128.7	31.9	365.1	21.0	4.5	13.0
Mc Intyre Terrell	27	131.7	265.4	0.490	0.113	121.2	29.5	327.0	23.0	5.6	12.1
Hawkins David	28	139.1	255.0	0.549	0.144	123.7	34.1	314.7	21.0	5.4	11.2
Zisis Nikolaos	43	157.6	299.4	0.538	0.176	118.6	39.5	352.7	20.0	5.9	8.2
Moss David	14	48.3	108.6	0.437	0.132	103.3	32.0	112.7	17.0	3.1	8.1
Hairston Malik	4	14.1	24.5	0.561	0.170	119.1	40.8	29.8	21.0	7.5	7.4
Domercant Henry	28	86.2	166.1	0.504	0.209	119.3	48.8	203.9	20.0	5.1	7.3
Rakovic Milovan	14	49.3	93.9	0.535	0.155	109.4	32.9	100.7	22.0	8.6	7.2
Eze Benjamin	28	95.4	187.0	0.514	0.108	105.0	22.5	195.0	18.0	6.3	7.0
Stonerook Shaun	43	117.2	251.1	0.463	0.173	113.9	37.2	275.9	15.0	5.1	6.4
Aradori Pietro	15	39.8	66.6	0.540	0.238	121.9	58.6	88.3	16.0	7.3	5.9
Carraretto Marco	43	64.6	138.9	0.418	0.275	106.1	64.6	156.2	13.0	6.0	3.6
Ress Tomas	43	62.1	118.6	0.517	0.280	125.9	60.4	140.5	15.0	9.1	3.3
Michelori Andrea	15	19.9	37.6	0.415	0.243	95.9	41.0	41.1	16.0	12.0	2.7
Slokar Uros	5	6.3	9.3	0.630	0.324	133.7	75.9	13.5	18.0	4.1	2.7
Monaldi Diego	7	6.1	9.7	0.517	0.440	136.7	124.9	16.2	114.0	66.8	2.3
Marconato Denis	28	26.4	49.9	0.547	0.347	113.7	64.6	54.2	16.0	14.3	1.9
D'Ercole Lorenzo	27	9.7	15.8	0.569	0.476	120.9	123.8	20.8	29.0	42.9	0.8
Ingresso Tommaso	4	0.0	2.1	0.000		0.0		0.0	60.0		0.0
Metreveli Nika	4	0.0	2.5	0.000		0.0		0.0	25.0	35.0	0.0
Severini Giovanni	3	0.0	0.6	0.000		0.0		0.0	15.0	21.2	0.0
Spina Cristiano	2	0.0	0.0					0.0			0.0



# Results: Offensive rating time series



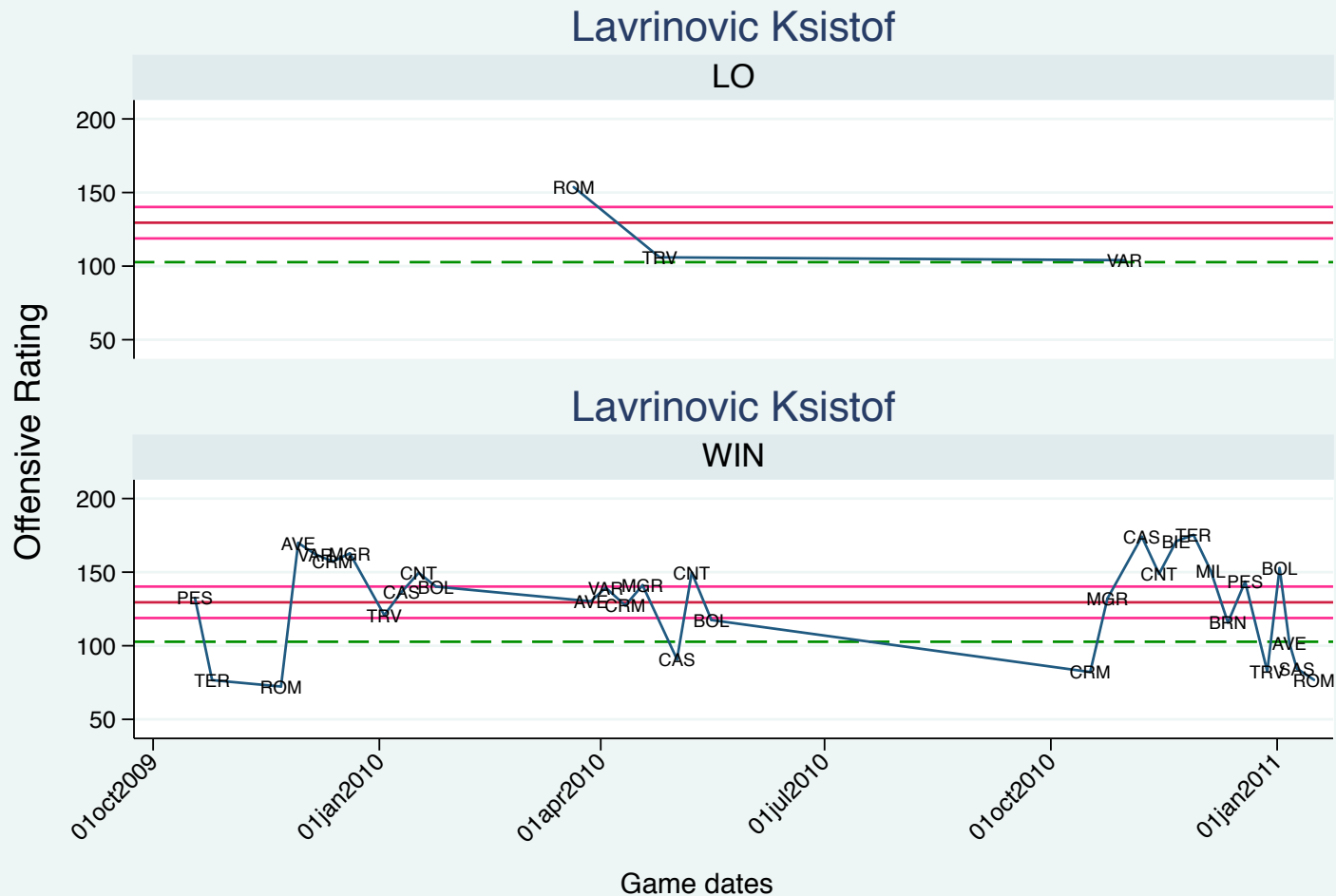
# Results: Offensive rating time series



Graphs by win



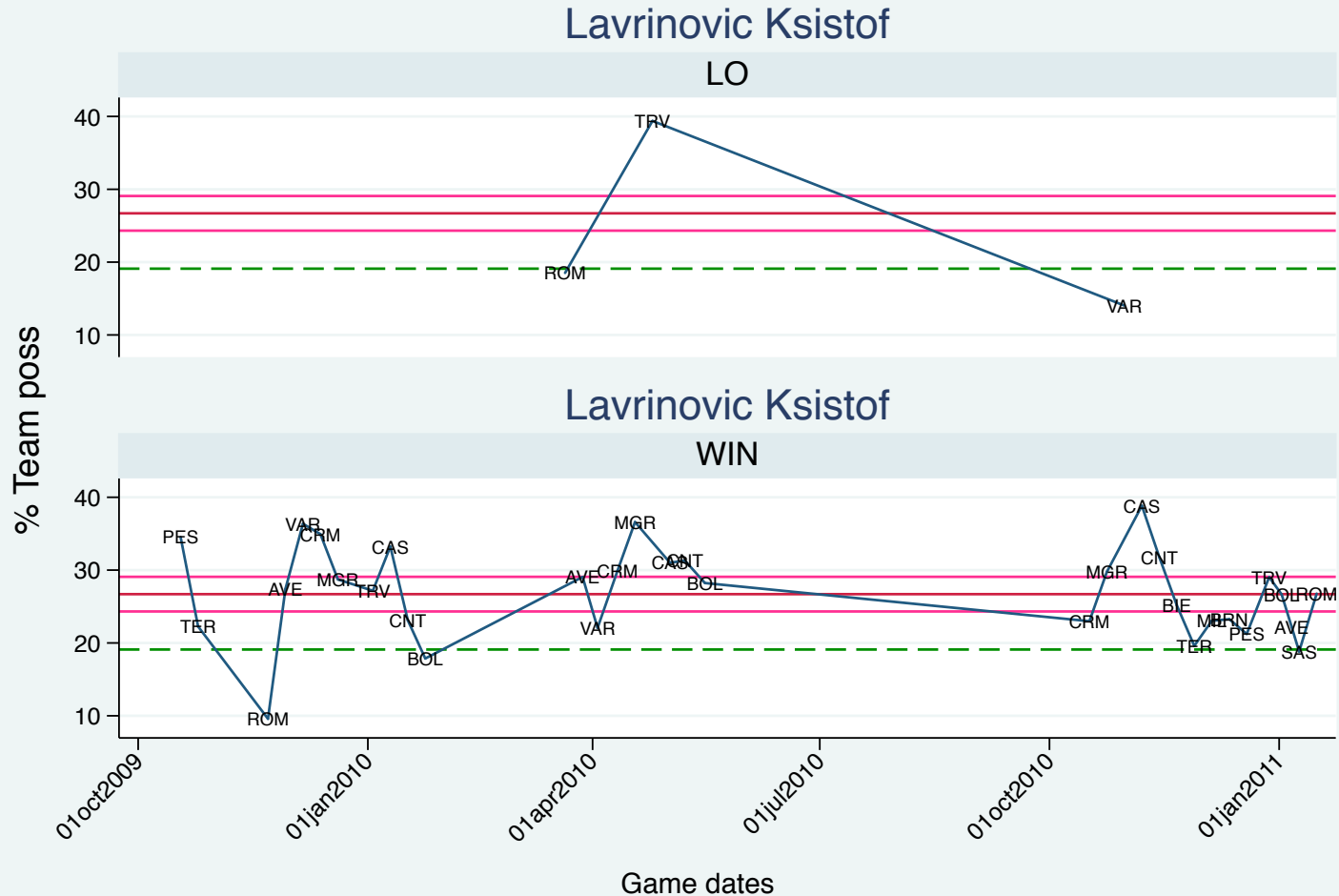
# Results: Offensive rating time series



Graphs by win



# Results: % of team possessions

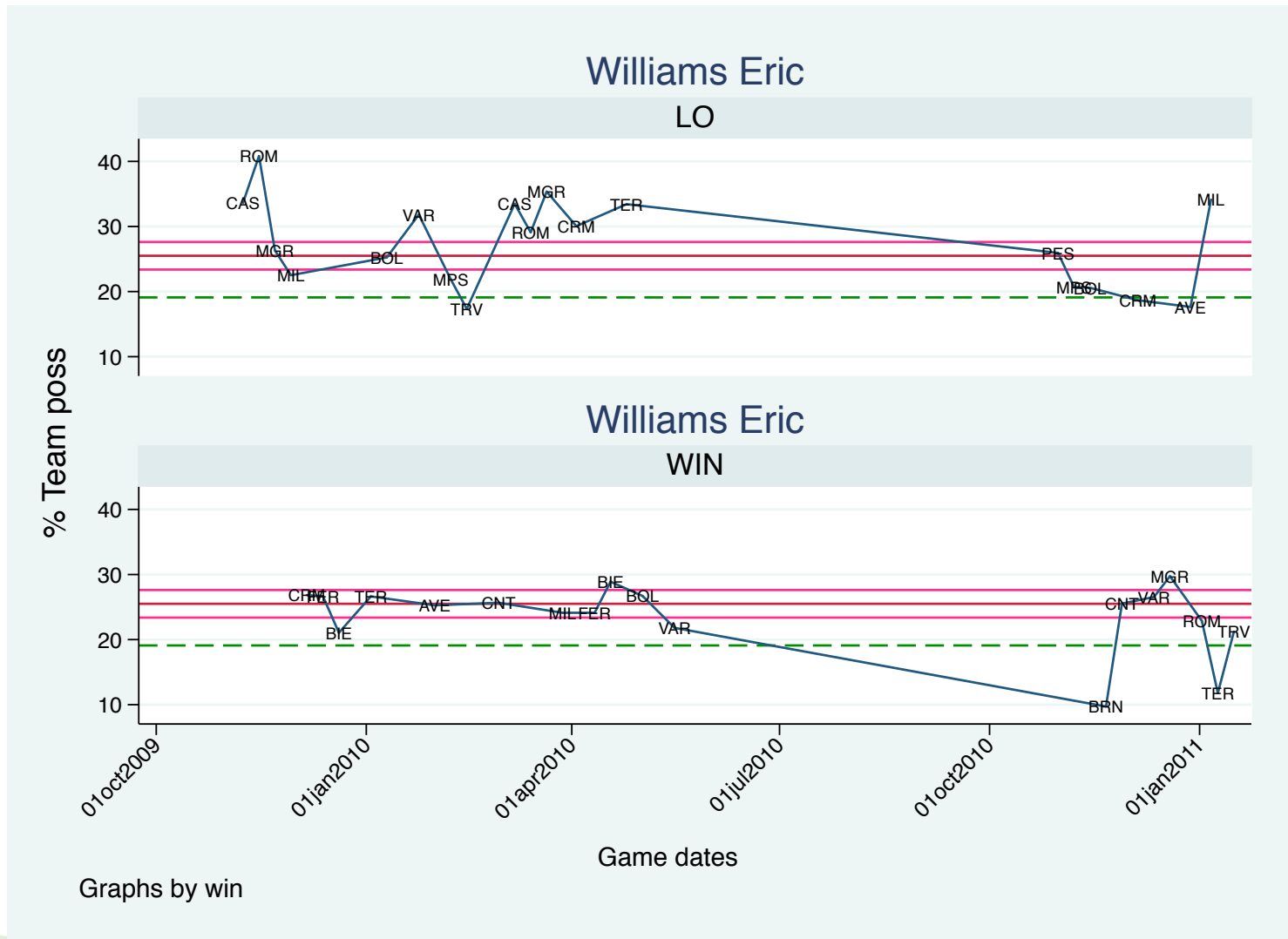


Graphs by win

Center – Siena



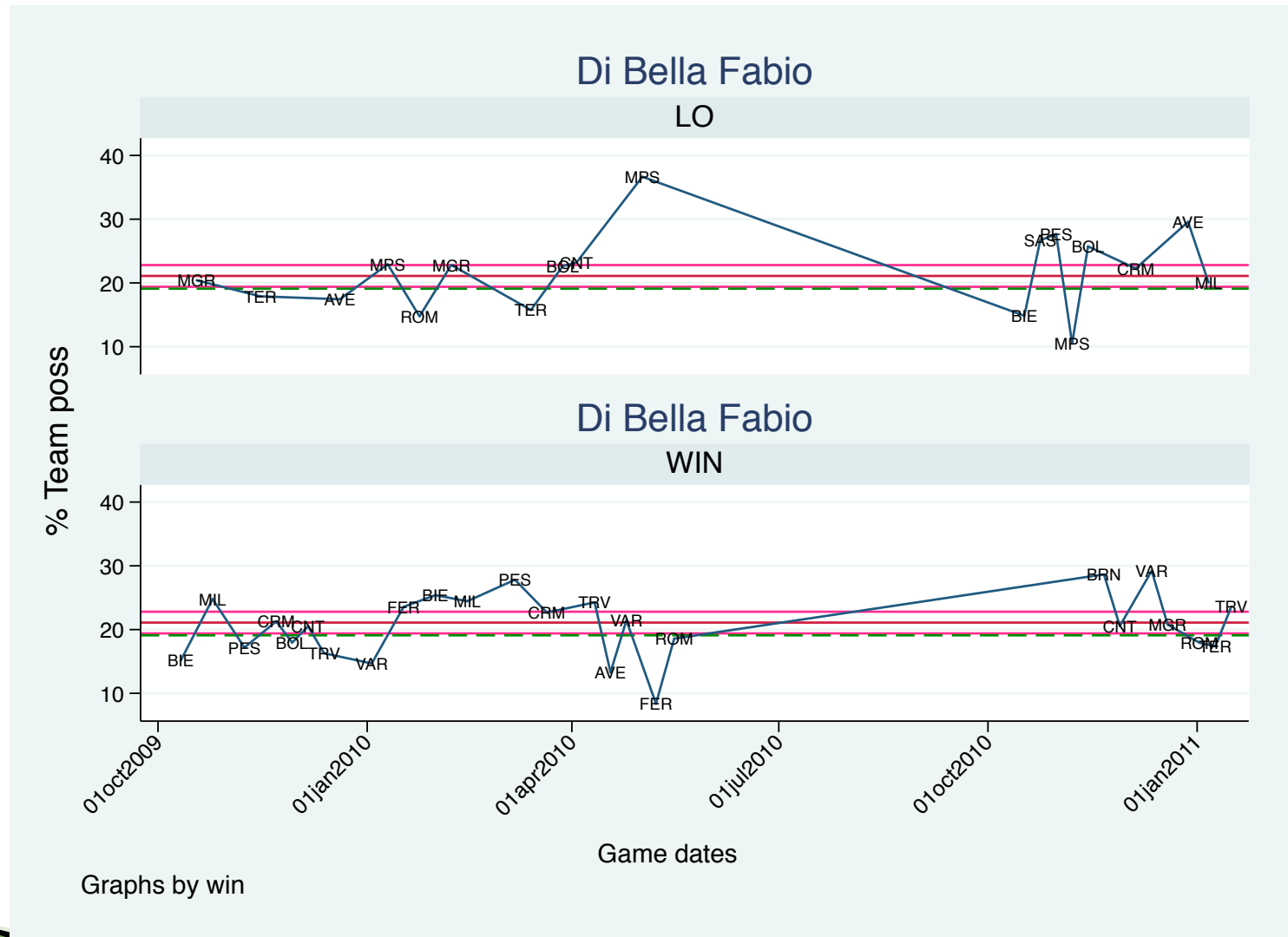
# Results: % of team possessions



Center – Pesaro + Caserta



# Results: % of team possessions



Graphs by win

Playmaker – Starting five CAS





