NBA ANALYSIS

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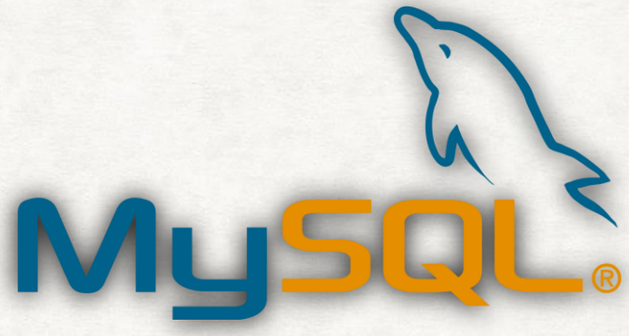
TOPICS

- Big Three (but failed)
- Age vs. Experience
- Who is the "MONEY STEALER"?!
- Which team makes the greatest deal?
- W%/Pace vs. Attendance
- Is Western Conference better than Eastern Conference?
- Change of Styles

INTRODUCTION

ANALYSIS & VISUALIZATION



- Age vs. Experience
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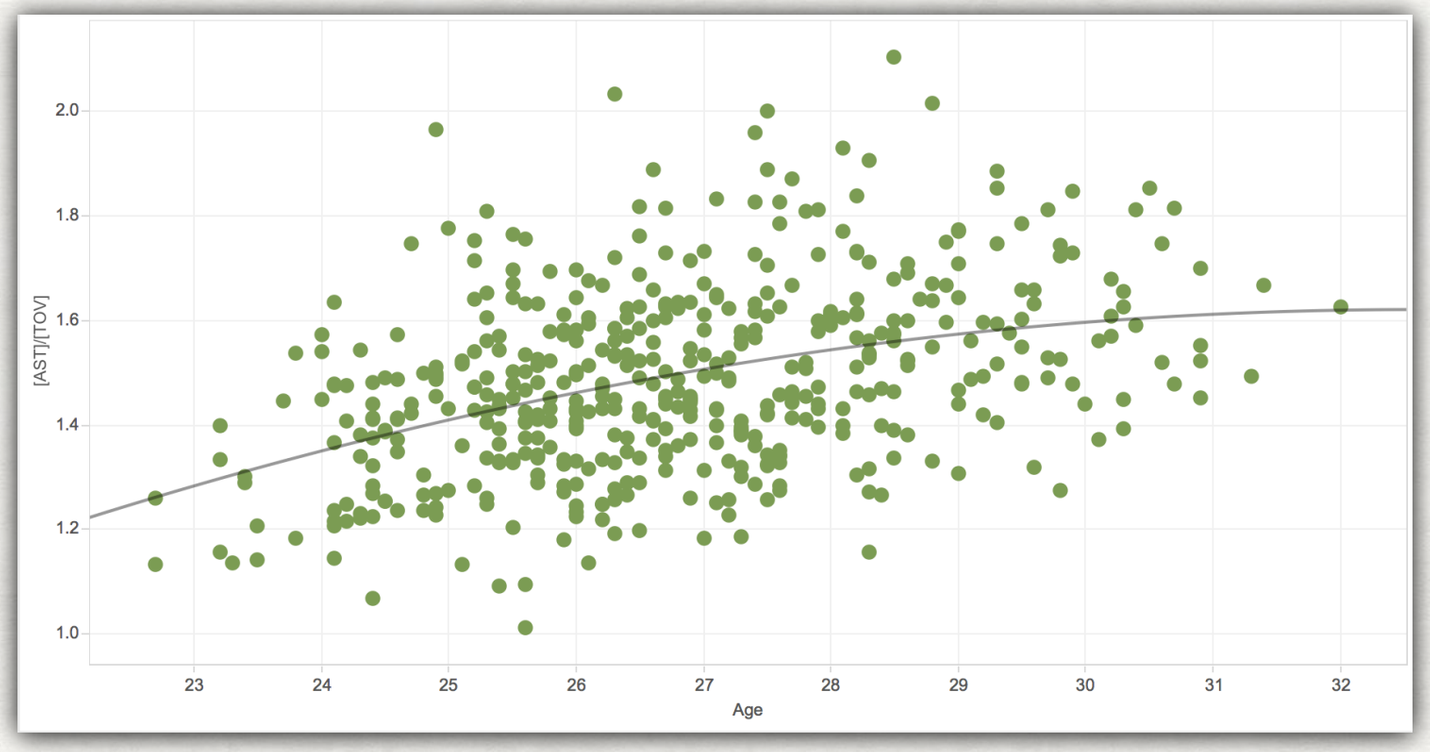
AGE VS. EXPERIENCE

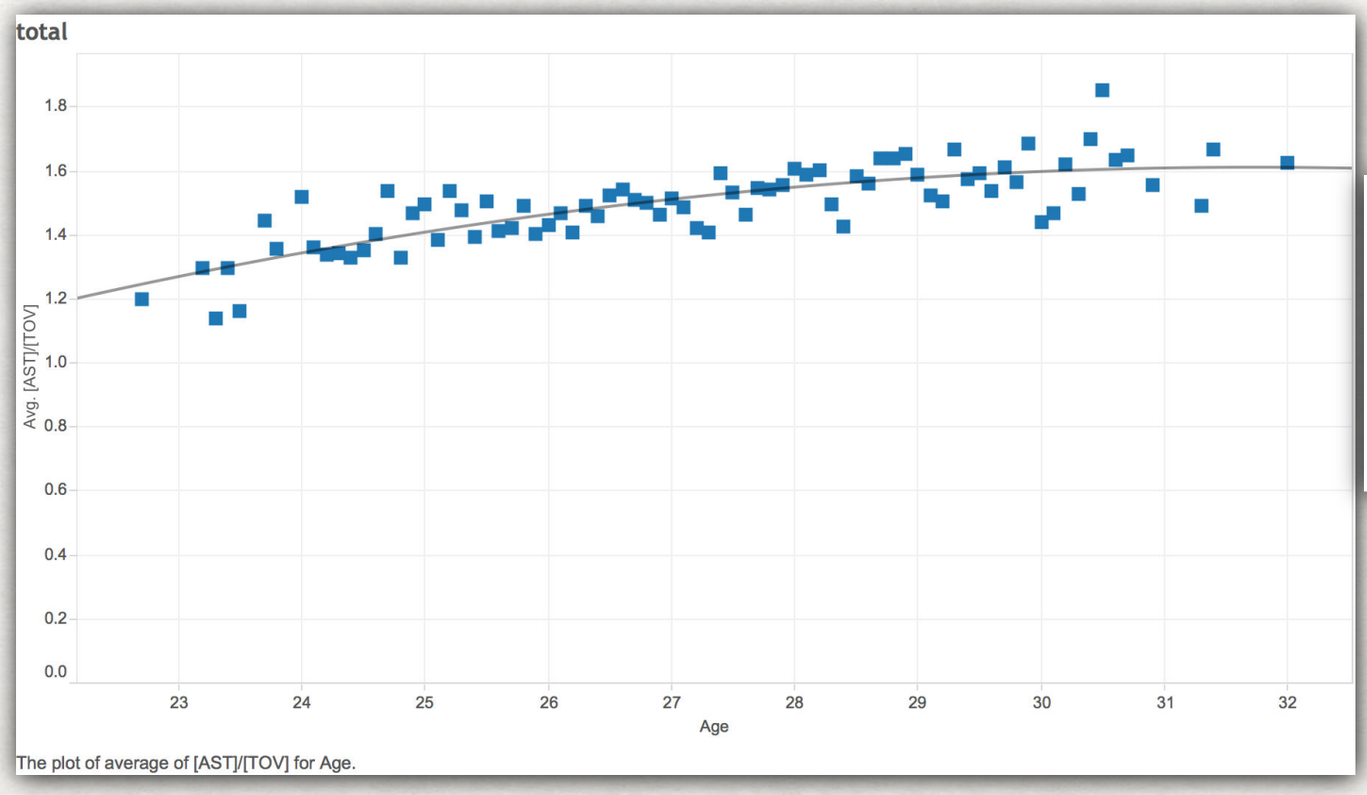
- Data Source
  The whole league stats since 2000 (year by year)

- How to calculate?
  Using the data of assists per game and turnovers per game (AST/TOV)

Season	Lg	Tm	W	L	Finish	Age	Ht.	Wt.	G	MP	FG	FGA	FG%	3P	3PA	3P%	2P	2PA	2P%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS
2015-16	NBA	BOS	23	21	2	25.4	6-5	221	44	241.7	38.7	89.0	.434	9.0	27.3	.329	29.7	61.8	.481	17.5	22.6	.777	11.8	33.1	44.9	24.0	9.5	4.	14.5	22.3	103.8
2014-15	NBA	BOS	40	42	2	25.0	6-6	221	82	242.4	38.9	87.9	.443	8.0	24.6	.327	30.9	63.3	.488	15.4	20.5	.754	11.1	32.7	43.8	24.5	8.2	3.	13.8	21.2	101.4
2013-14	NBA	BOS	25	57	4	25.4	6-6	221	82	240.6	36.5	83.9	.435	7.0	21.1	.333	29.5	62.9	.470	16.2	20.8	.777	12.0	30.5	42.5	21.0	7.1	4.	15.4	21.3	96.2
2012-13	NBA	BOS	41	40	3	29.1	6-6	214	81	244.9	37.0	79.7	.465	6.1	17.2	.358	30.9	62.6	.494	16.3	21.0	.776	8.1	31.3	39.3	22.8	8.2	4.	14.6	21.2	96.5
2011-12	NBA	BOS	39	27	1	29.3	6-6	213	66	241.5	35.5	77.1	.460	5.5	15.0	.367	30.0	62.1	.483	15.4	19.8	.778	7.7	31.1	38.8	23.6	7.5	5.	14.8	19.9	91.8
2010-11	NBA	BOS	56	26	1	29.5	6-6	223	82	241.2	36.9	75.8	.486	5.0	13.6	.365	31.9	62.2	.513	17.8	23.1	.770	7.8	31.0	38.8	23.4	8.2	4.	14.6	20.5	96.5
2009-10	NBA	BOS	50	32	1	29.4	6-6	219	82	241.2	37.1	76.8	.483	6.1	17.5	.348	31.0	59.3	.523	19.0	25.5	.746	8.7	29.9	38.6	23.5	8.5	4.	14.9	22.1	99.2
2008-09	NBA	BOS	62	20	1	27.8	6-6	222	82	242.4	37.5	77.2	.486	6.6	16.5	.397	30.9	60.7	.510	19.4	25.3	.765	10.6	31.5	42.1	22.7	7.6	4.	15.6	23.1	100.9
2007-08	NBA	BOS	66	16	1	27.9	6-6	220	82	240.9	36.4	76.7	.475	7.3	19.1	.381	29.1	57.6	.506	20.5	26.5	.771	10.1	31.9	42.0	22.4	8.5	4.	15.2	22.7	100.5
2006-07	NBA	BOS	24	58	5	23.5	6-6	221	82	242.1	34.9	78.7	.443	5.7	15.6	.367	29.1	63.1	.462	20.4	26.6	.767	11.2	29.2	40.4	19.9	7.2	4.	16.5	24.0	95.8
2005-06	NBA	BOS	33	49	3	25.3	6-7	227	82	242.4	36.0	77.1	.467	5.7	15.7	.362	30.3	61.4	.494	20.3	26.9	.755	9.9	29.7	39.6	20.9	7.0	5.	16.6	24.8	98.0
2004-05	NBA	BOS	45	37	1	27.1	6-7	218	82	242.4	37.1	79.4	.468	5.3	15.3	.349	31.8	64.1	.496	21.6	28.3	.764	11.1	29.7	40.8	22.1	8.1	5.	15.8	24.4	101.3
2003-04	NBA	BOS	36	46	4	26.4	6-7	218	82	240.3	34.7	78.2	.443	6.7	19.5	.346	27.9	58.7	.475	19.2	25.5	.750	10.4	29.8	40.1	20.5	9.4	4.	16.2	22.4	95.3
2002-03	NBA	BOS	44	38	3	26.9	6-6	218	82	241.8	32.9	79.4	.415	8.8	26.3	.334	24.2	53.1	.455	18.0	24.3	.742	10.4	30.1	40.5	19.2	8.8	3.	14.0	21.4	92.7
2001-02	NBA	BOS	49	33	2	26.2	6-6	220	82	241.8	34.8	82.1	.424	8.5	23.7	.359	26.3	58.4	.450	18.3	23.9	.764	10.9	31.3	42.2	21.0	9.7	3.	13.6	21.7	96.4
2000-01	NBA	BOS	36	46	5	25.9	6-6	221	82	241.8	33.8	79.1	.428	7.2	19.9	.363	26.6	59.2	.450	19.8	26.7	.740	10.9	28.9	39.8	20.8	9.4	4.	15.7	23.8	94.6

VISUALIZATION





P-value: < 0.0001
Equation: Avg. [AST]/[TOV] = -0.00449717*Age^2 + 0.285277*Age + -2.91195

Coefficients

Term	Value	StdErr	t-value	p-value
Age^2	-0.0044972	0.0015581	-2.88622	0.0050731
Age	0.285277	0.0849067	3.35989	0.0012219
intercept	-2.91195	1.15015	-2.53181	0.0134119

WHO IS THE MONEY STEALER ?!

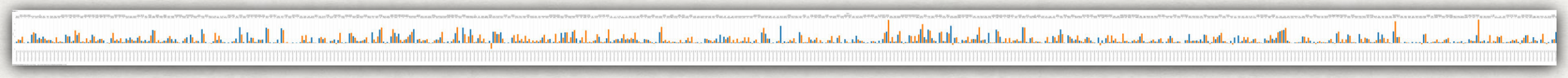
- Data Source
  Contracts of Players (2015-16), Players Advanced Stats

```
ALTER TABLE `Total Players`
ADD CONSTRAINT PlayerTm PRIMARY KEY (`Player`, `Tm`);
ALTER TABLE `Total Players`
DROP PRIMARY KEY;
SELECT COUNT(Distinct Player) FROM `Total Players`;

CREATE INDEX PIdx
ON `Total Players` (Player);

SELECT *
FROM `Total Players`
RIGHT OUTER JOIN `Salary`
ON `Total Players`.Player = Salary.Player;
```

Query Favorites Query History Run Previous

STL%	BLK%	TOV%	USG%	OWS	DWS	WS	WS/48	OBPM	DBPM	BPM	VORP	Tm	Rk	Player	Tm	Salary
1.6	0.4	10.4	30.8	-0.8	0.2	-0.6	-0.035	-0.3	-3.2	-3.5	-0.3	LAL	1	Kobe Bryant	LAL	$25,000,000
1.1	0.1	13.8	17.8	-0.5	0.3	-0.2	-0.009	-1.6	-1.1	-2.7	-0.2	BRK	2	Joe Johnson	BRK	$24,894,863
2.1	1.5	13	33.5	2.9	2	4.9	0.218	5.7	2.7	8.4	2.8	CLE	3	LeBron James	CLE	$22,971,000
1.3	1.1	11.5	30.5	1.7	1	2.7	0.118	2.8	-0.7	2	1.1	NYK	4	Carmelo Anthony	NYK	$22,875,000
1.5	4.1	18.2	18.4	1.7	1.1	2.8	0.142	-0.5	1.8	1.2	0.8	HOU	5	Dwight Howard	HOU	$22,359,364
1.2	1.8	7.8	24.2	2.9	1.6	4.5	0.203	3.1	0.5	3.6	1.5	MIA	6	Chris Bosh	MIA	$22,192,730
3	0.1	14.1	26	3	1.1	4.1	0.205	5.3	-0.6	4.7	1.6	LAC	7	Chris Paul	LAC	$21,468,696
1.2	2.9	12.9	28.5	4.7	1.4	6	0.288	6.5	0.6	7.2	2.3	OKC	8	Kevin Durant	OKC	$20,158,622
1	0.6	13.6	25.4	-0.9	0.9	-0.1	-0.004	-2.7	-1.2	-3.9	-0.4	CHI	9	Derrick Rose	CHI	$20,093,063
1.9	1.2	11.8	31.8	1.4	1.1	2.5	0.131	2	-0.2	1.8	0.9	MIA	10	Dwyane Wade	MIA	$20,000,000
1.1	5.1	11.4	27	1.8	1.1	2.9	0.125	0.4	0.9	1.3	0.9	BRK	11	Brook Lopez	BRK	$20,000,000
1.1	3.3	13.7	23	1.5	1.3	2.8	0.111	-0.3	1.7	1.4	1.1	MEM	12	Marc Gasol	MEM	$19,700,000
0.6	2.7	8.7	25.5	1.6	2.2	3.7	0.184	-1.3	1	-0.3	0.4	SAS	13	LaMarcus Aldridge	SAS	$19,500,000
0.9	5.5	11.9	14.2	2.8	2.2	4.9	0.207	-0.1	3.3	3.1	1.5	LAC	14	DeAndre Jordan	LAC	$19,500,000
1.3	1.1	11.8	23.8	2	1.9	3.9	0.186	2.2	1.6	3.8	1.5	CLE	15	Kevin Love	CLE	$19,500,000
2.7	2.9	12.5	24.4	2.9	1.9	4.8	0.203	2.9	2.5	5.4	2.1	ATL	16	Paul Millsap	ATL	$19,000,000
1	1.3	10.1	29.9	2.7	1.2	3.9	0.179	3.1	1.2	4.3	1.7	LAC	17	Blake Griffin	LAC	$18,907,725
2.4	0.4	15.3	31.4	2	2	4	0.163	3.9	0.7	4.6	2	IND	18	Paul George	IND	$17,120,106

VISUALIZATION



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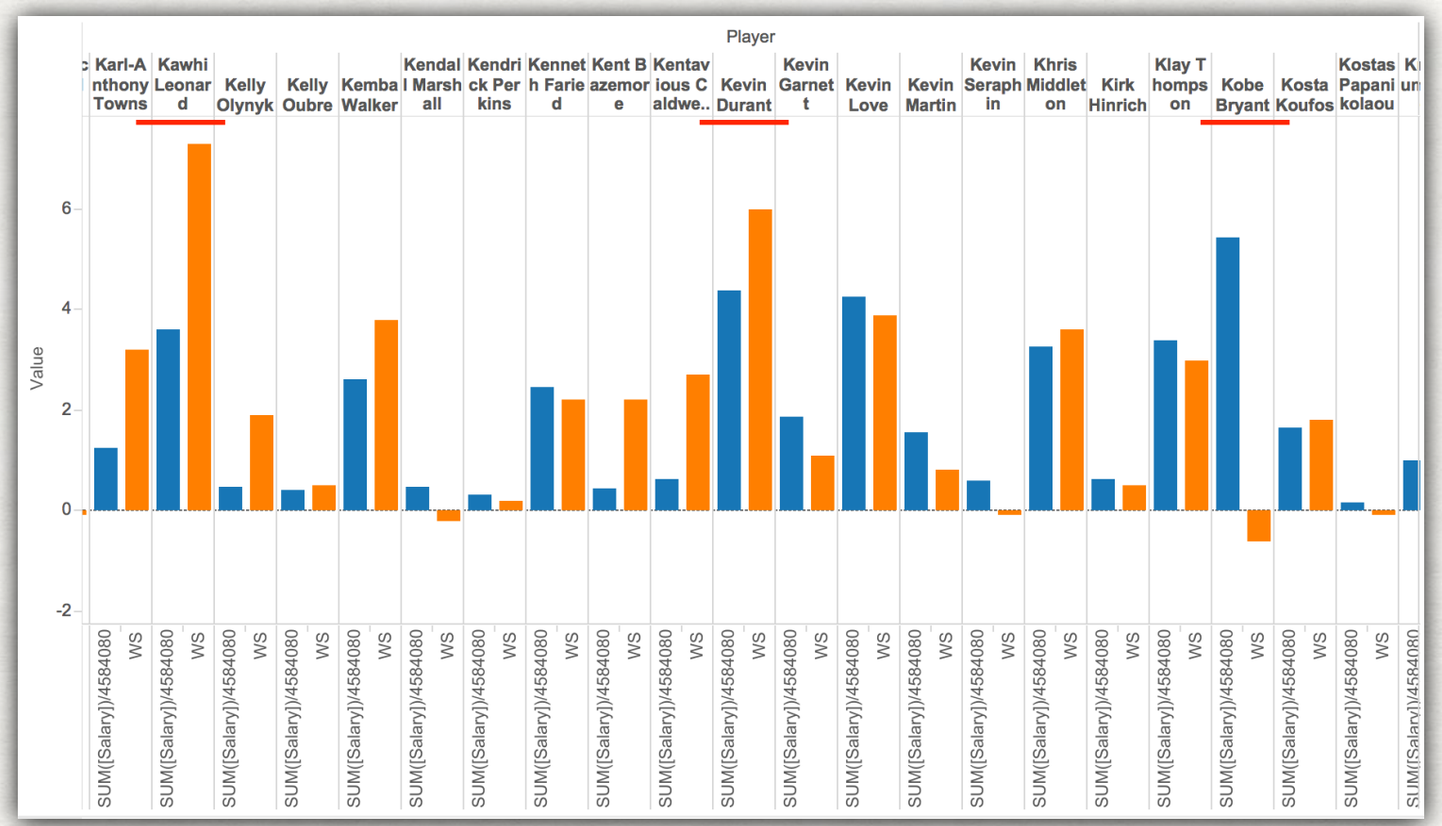

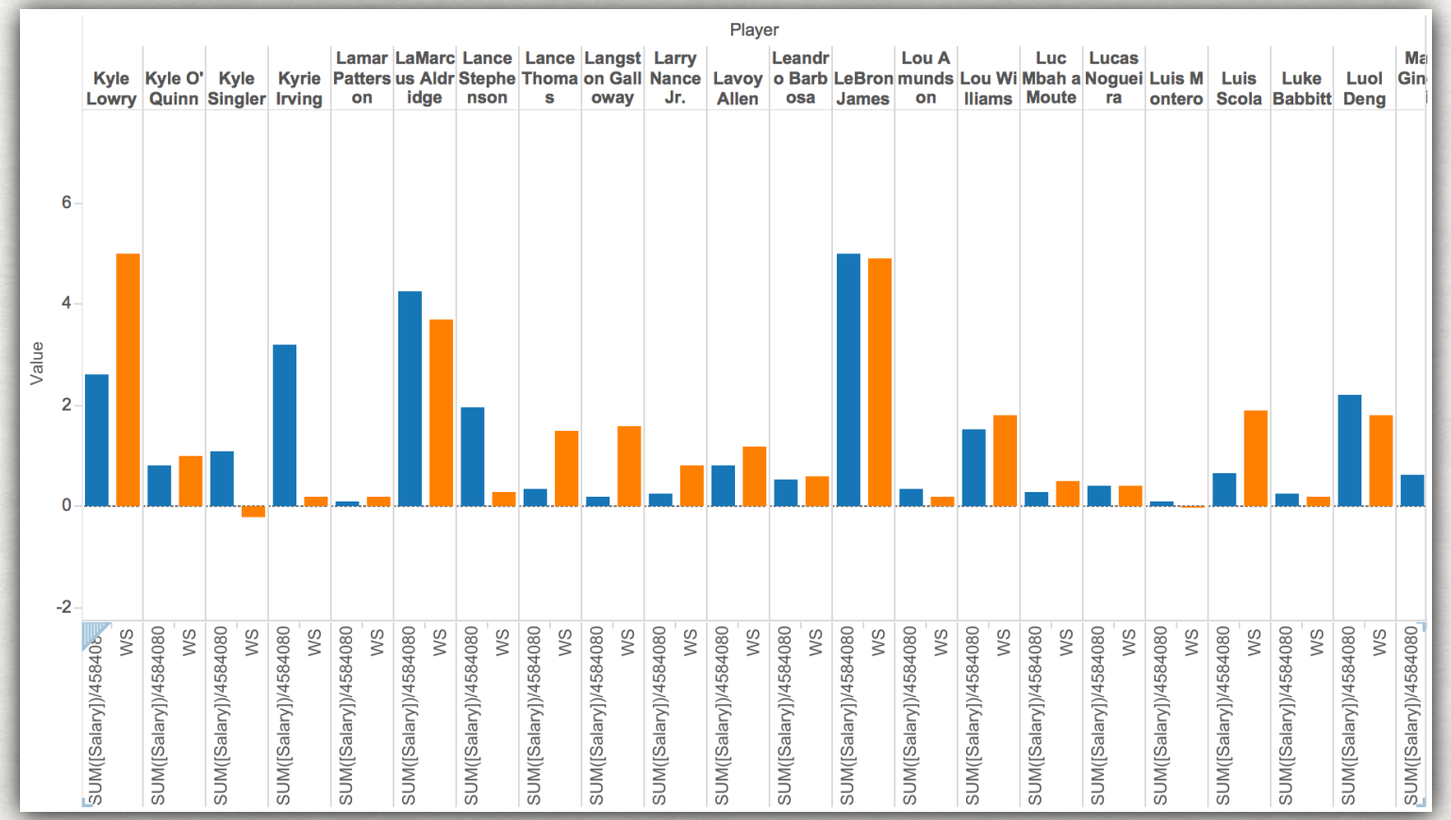

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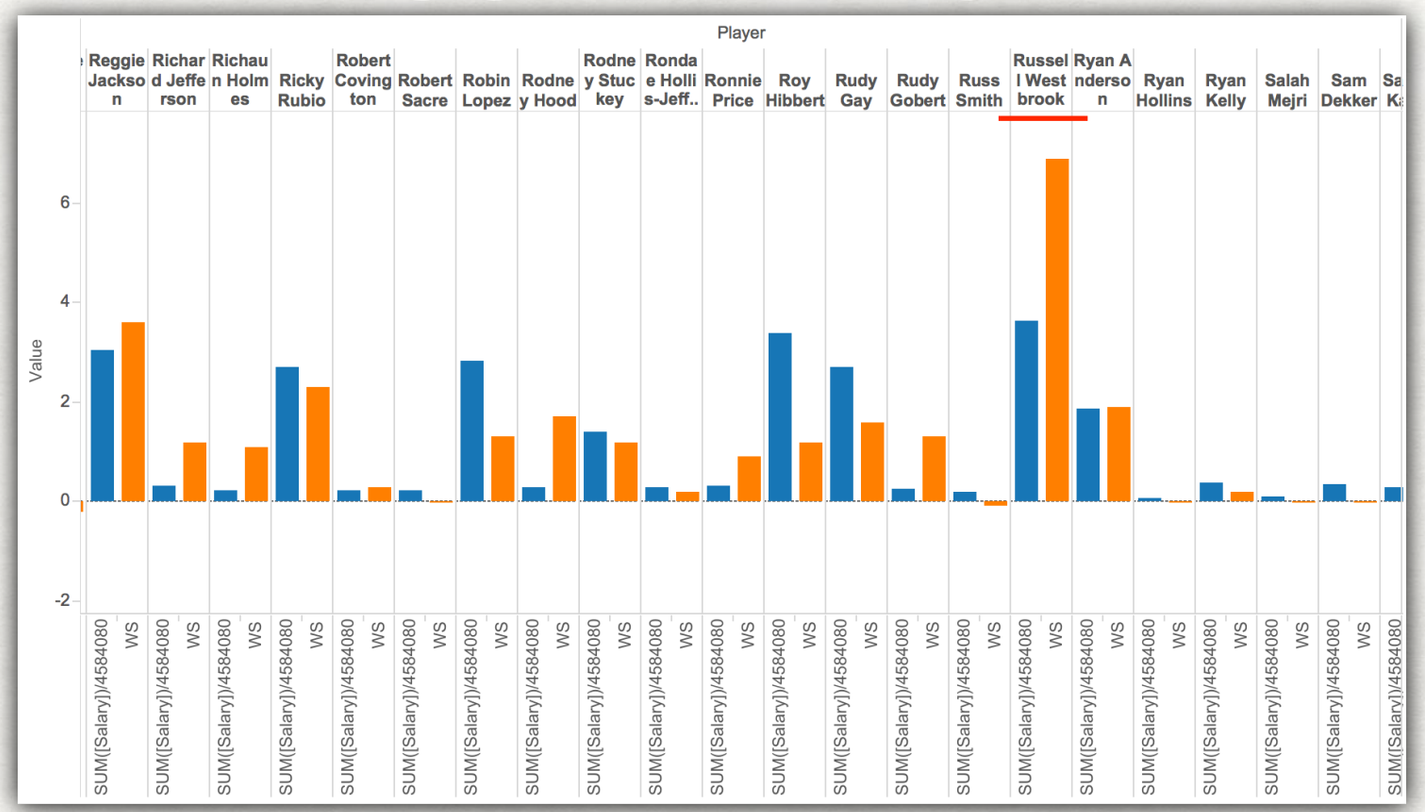
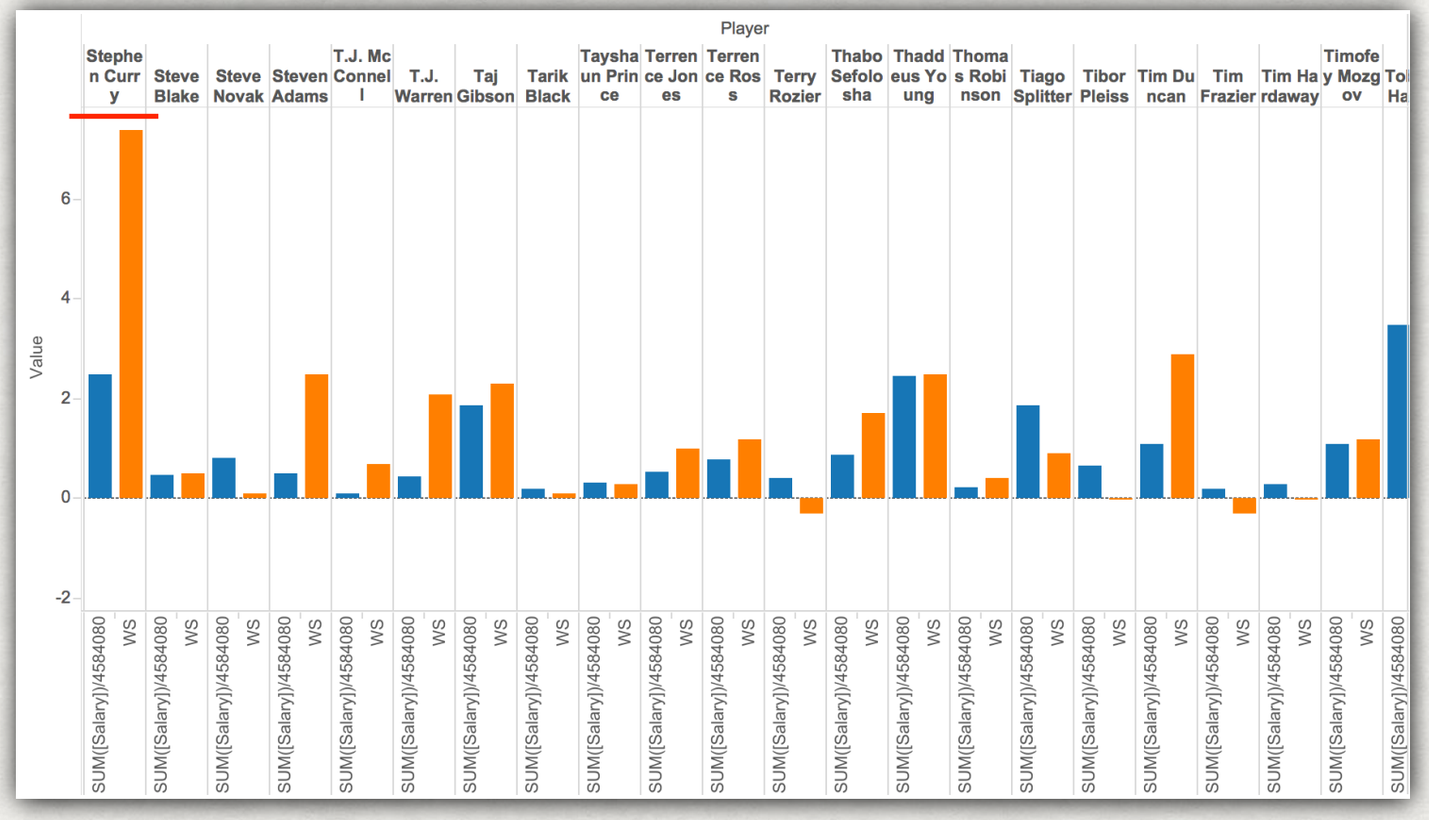




WHICH TEAM MAKES
THE GREATEST DEAL ?

- Data Source
  Season Stats, Player Stats

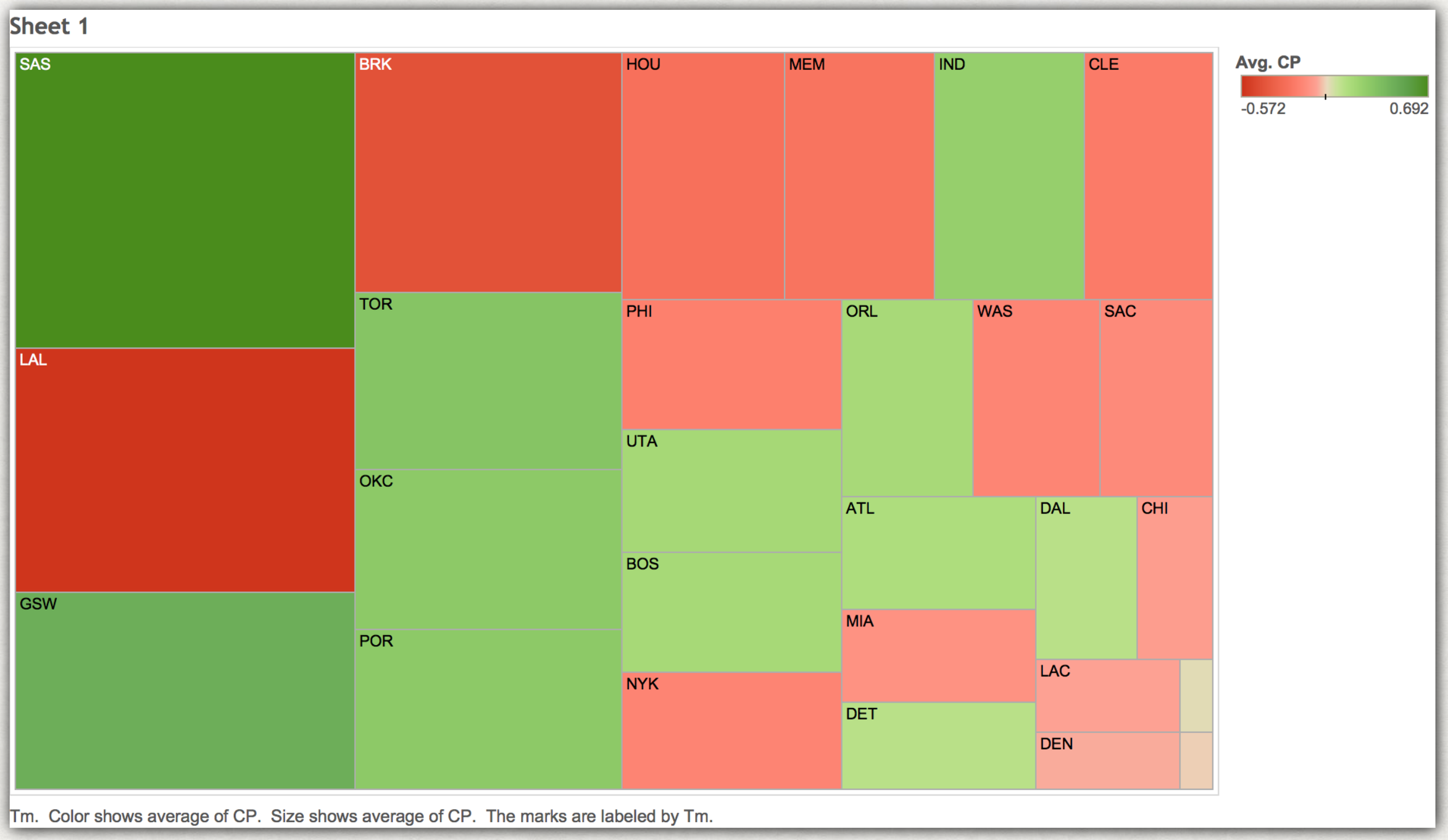
- How to calculate?
  Normalize the WS (Win Share) and Salary

```
SELECT *
FROM `all team`
WHERE Season = '2015-16';

SELECT Tm, ROUND(AVG(WS), 2) AS "Tm Average Win Share"
FROM `Total Players`
GROUP BY Tm;

SELECT ROUND(AVG(WS), 2) AS "Average WinShare"
FROM `Total Players`;

SELECT AVG(Salary), AVG(WS)
FROM Salary;

SELECT AVG(Salary), AVG(WS), STDDEV_SAMP(Salary), STDDEV_SAMP(WS)
FROM Salary;

SELECT Tm, ROUND(AVG(WS), 2)
FROM Salary
GROUP BY Tm;5
```

Query Favorites Query History Run Current

AVG(Salary)	AVG(WS)	STDDEV_SAMP(Salary)	STDDEV_SAMP(WS)
5047743.4103	1.1661434977578469	5240632.992021729	1.324801250148802

VISUALIZATION



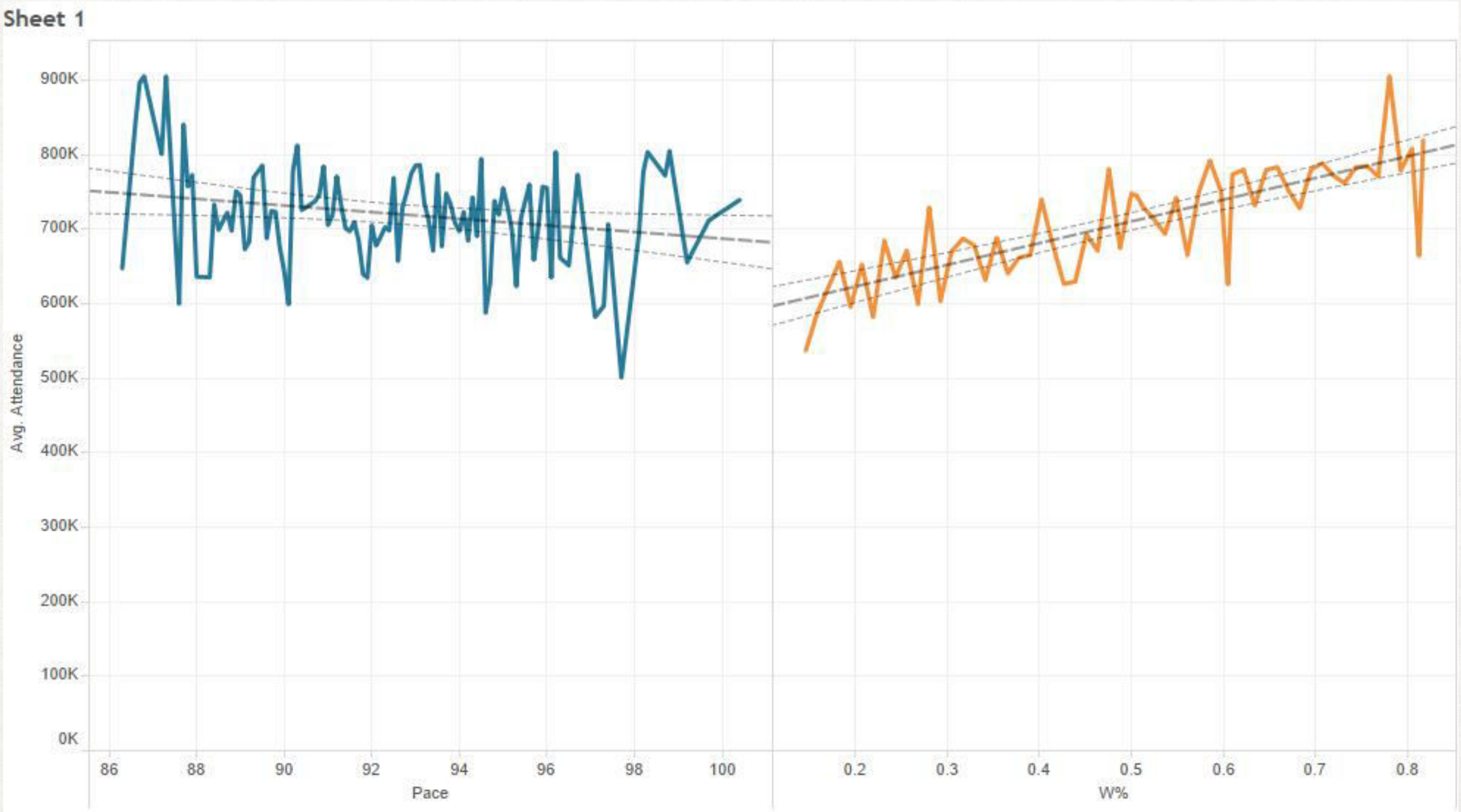
W%/PACE VS. ATTENDANCE

- Data Source
  Miscellaneous Stats from 2005 to 2015

Miscellaneous Stats Playoff teams are marked with an asterisk (*) · Glossary · SHARE · Embed · CSV · Export · PRE · LINK · ?

											Advanced			Offense Four Factors				Defense Four Factors					
Rk	Team	Age	PW	PL	MOV	SOS	SRS	ORtg	DRtg	Pace	FTr	3PAr	TS%	eFG%	TOV%	ORB%	FT/FGA	eFG%	TOV%	DRB%	FT/FGA	Arena	Attendance
1	San Antonio Spurs	30.5	39	5	14.50	-1.64	12.86	111.0	95.5	94.0	.235	.223	.568	.533	12.7	23.5	.186	.462	14.0	80.4	.176	AT&T Center	442,345
2	Golden State Warriors	27.5	36	8	12.14	-1.12	11.02	114.5	102.4	99.3	.267	.348	.591	.560	13.6	24.9	.201	.466	12.7	75.1	.204	Oracle Arena	391,920
3	Oklahoma City Thunder	25.8	34	11	8.53	-1.18	7.35	112.2	103.4	96.1	.296	.257	.563	.520	13.8	30.2	.232	.476	12.7	75.4	.201	Chesapeake Energy Arena	473,278
4	Cleveland Cavaliers	28.5	28	14	5.21	-0.67	4.54	107.8	102.2	92.7	.271	.338	.542	.509	13.0	25.5	.195	.488	13.0	79.2	.202	Quicken Loans Arena	390,678
5	Toronto Raptors	26.7	28	15	4.14	-0.51	3.63	107.9	103.4	93.1	.313	.285	.545	.496	12.9	24.4	.249	.492	13.6	78.0	.196	Air Canada Centre	397,063
6	Los Angeles Clippers	29.5	27	16	3.91	-0.37	3.54	108.4	104.4	96.1	.325	.304	.553	.519	12.0	21.1	.226	.483	13.6	74.0	.232	STAPLES Center	421,207
7	Boston Celtics	25.4	27	17	3.07	-0.11	2.96	105.0	101.9	98.2	.254	.306	.525	.485	12.8	25.2	.197	.474	14.9	74.1	.240	TD Garden	400,641
8	Indiana Pacers	27.2	26	18	2.43	0.00	2.43	104.5	102.0	97.2	.284	.283	.536	.496	13.6	23.2	.213	.488	15.0	74.5	.201	Bankers Life Fieldhouse	315,327
9	Atlanta Hawks	28.2	26	19	2.29	-0.47	1.82	105.4	103.0	96.7	.241	.321	.551	.514	13.8	20.0	.190	.491	15.2	73.5	.194	Philips Arena	362,890
10	Detroit Pistons	25.1	24	20	1.57	-0.16	1.41	105.0	103.4	95.4	.286	.298	.511	.483	12.3	28.9	.186	.497	13.6	78.4	.194	The Palace of Auburn Hills	337,415
11	Charlotte Hornets	25.7	23	21	0.86	0.43	1.30	105.3	104.4	95.6	.283	.344	.535	.490	11.9	20.2	.225	.499	12.9	79.5	.195	Time Warner Cable Arena	414,217
12	Chicago Bulls	27.8	23	20	0.67	0.38	1.06	103.8	103.2	96.1	.258	.240	.519	.476	13.0	25.8	.203	.466	10.5	74.3	.165	United Center	522,165
13	Utah Jazz	24.2	22	21	0.21	0.28	0.49	106.0	105.8	90.8	.292	.289	.536	.495	14.1	26.7	.221	.501	14.0	75.8	.229	EnergySolutions Arena	405,349
14	Dallas Mavericks	30.3	22	23	-0.04	0.15	0.11	104.8	104.8	95.0	.262	.332	.537	.496	12.3	20.3	.206	.496	13.0	76.6	.189	American Airlines Center	422,454
15	Miami Heat	28.3	21	23	-0.34	-0.04	-0.38	103.0	103.3	92.0	.285	.249	.537	.499	13.9	22.2	.210	.480	12.4	77.2	.181	AmericanAirlines Arena	473,228
16	Sacramento Kings	26.8	20	23	-1.09	0.60	-0.50	105.7	106.8	99.7	.300	.264	.544	.508	14.5	24.5	.216	.513	13.9	76.2	.208	Sleep Train Arena	397,699
17	Washington Wizards	27.4	18	23	-1.63	0.65	-0.99	104.9	106.6	97.4	.256	.285	.544	.508	13.6	21.0	.194	.522	15.3	76.1	.208	Verizon Center	405,995
18	Houston Rockets	27.6	21	24	-1.02	-0.15	-1.17	106.7	107.7	96.8	.350	.366	.549	.509	14.8	25.3	.250	.518	14.5	73.5	.206	Toyota Center	445,040
19	Portland Trail Blazers	24.2	21	25	-1.02	-0.32	-1.34	106.8	107.9	94.9	.248	.332	.536	.505	13.5	26.7	.179	.502	11.9	77.6	.236	Moda Center	405,172
20	Orlando Magic	23.9	20	22	-0.50	-0.87	-1.37	103.4	103.9	94.1	.212	.257	.527	.494	13.5	23.4	.163	.496	14.0	76.9	.214	Amway Center	404,077
21	New York Knicks	27.2	20	26	-1.57	-0.26	-1.82	105.2	106.9	93.4	.265	.254	.529	.483	12.9	24.4	.215	.480	10.9	74.5	.217	Madison Square Garden (IV)	435,864

VISUALIZATION



The trends of average of Attendance for Pace and W%.

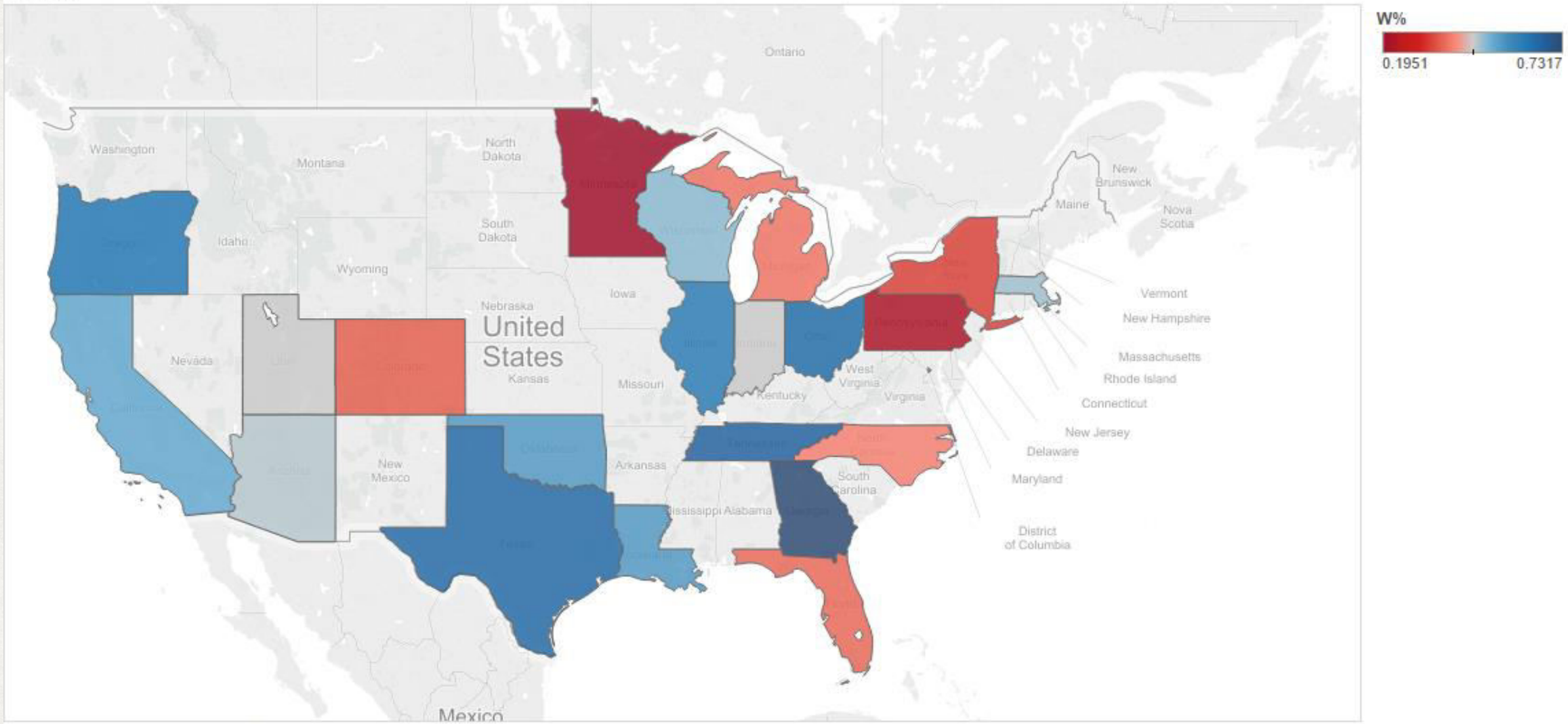
IS WESTERN CONFERENCE BETTER THAN EASTERN CONFERENCE?

SEASON	EAST WIN	WEST WIN
2015	577	653
2014	556	674
2013	577	653
2011	579	651

VISUALIZATION

2014-15

Sheet 1

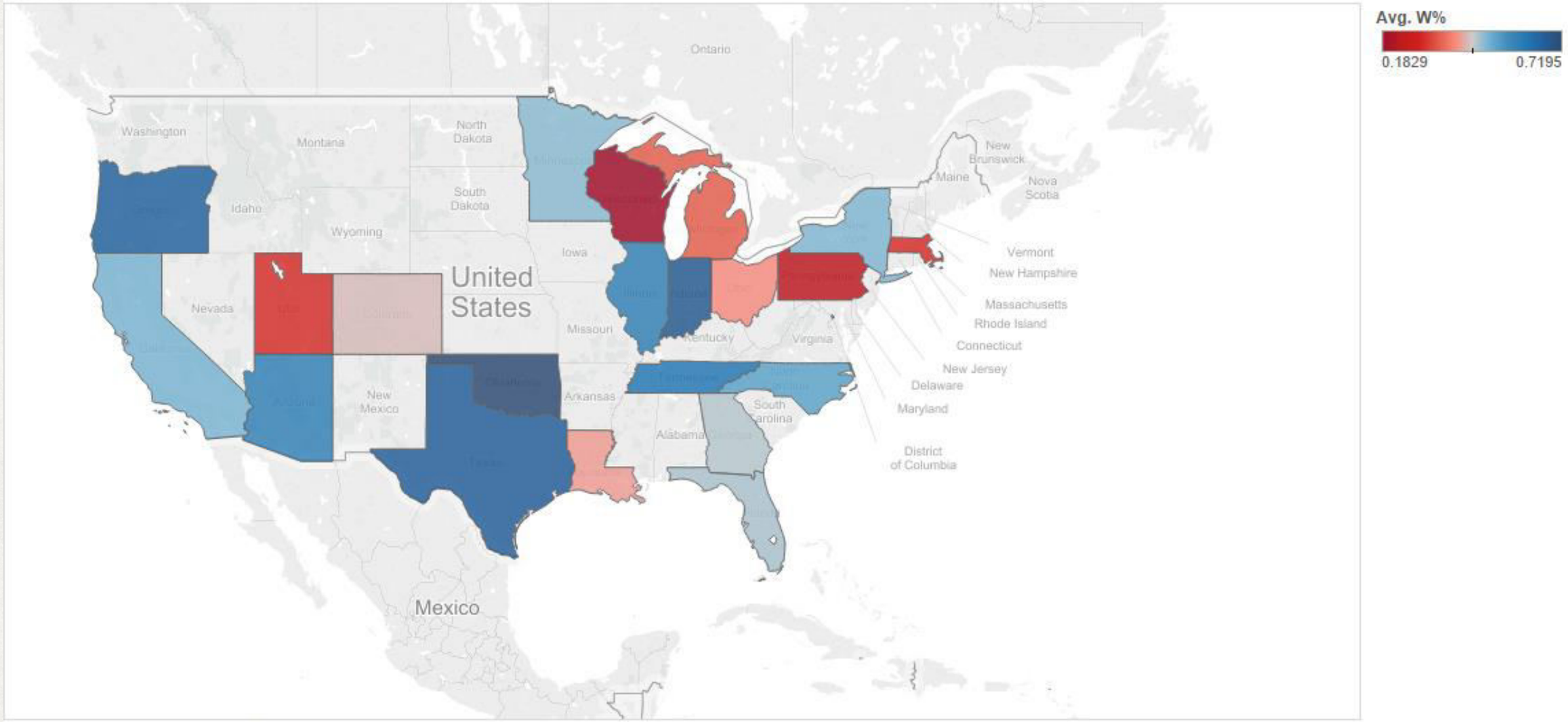


Map based on Longitude (generated) and Latitude (generated). Color shows sum of W%. Details are shown for State.

VISUALIZATION

2013-14

Sheet 1

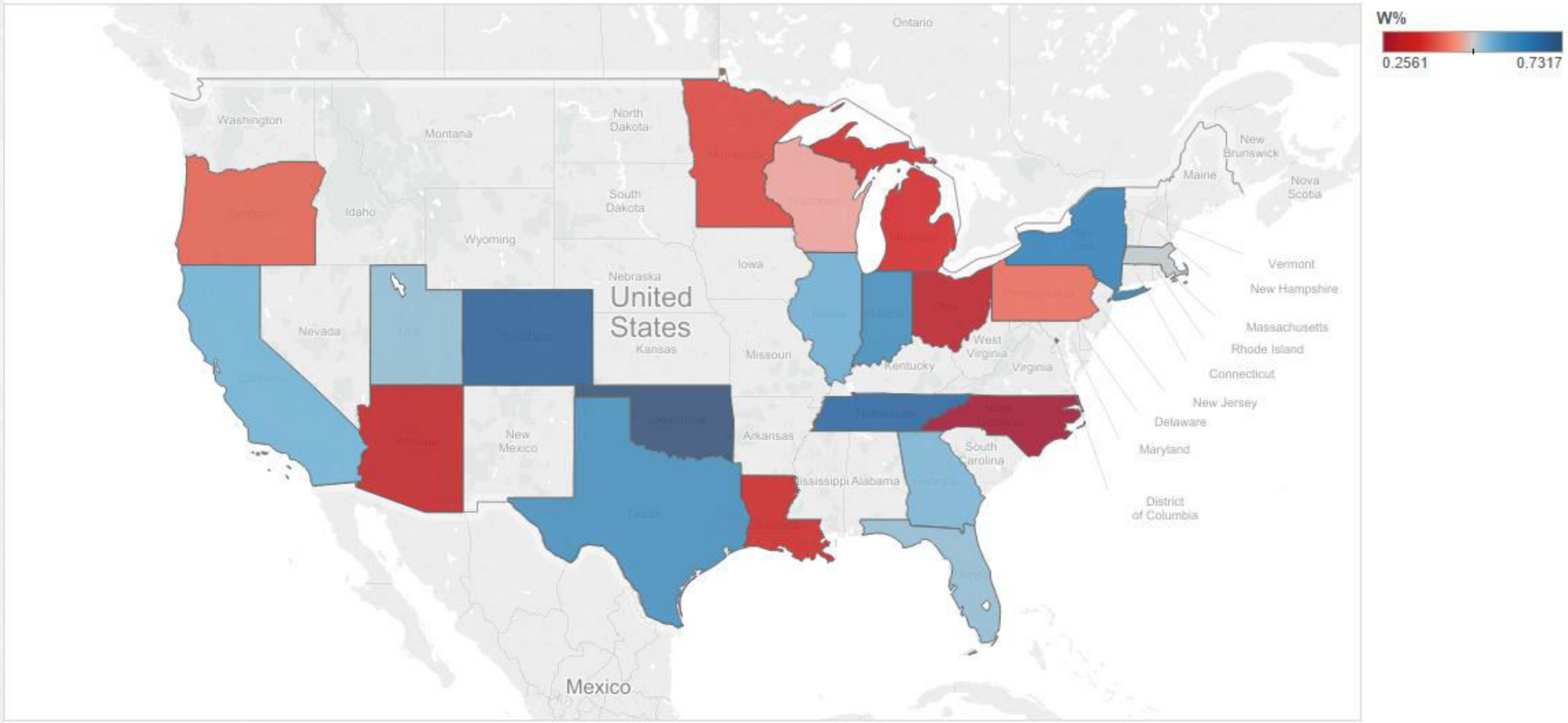


Map based on Longitude (generated) and Latitude (generated). Color shows average of W%. Details are shown for State.

VISUALIZATION

2012-13

Sheet 1

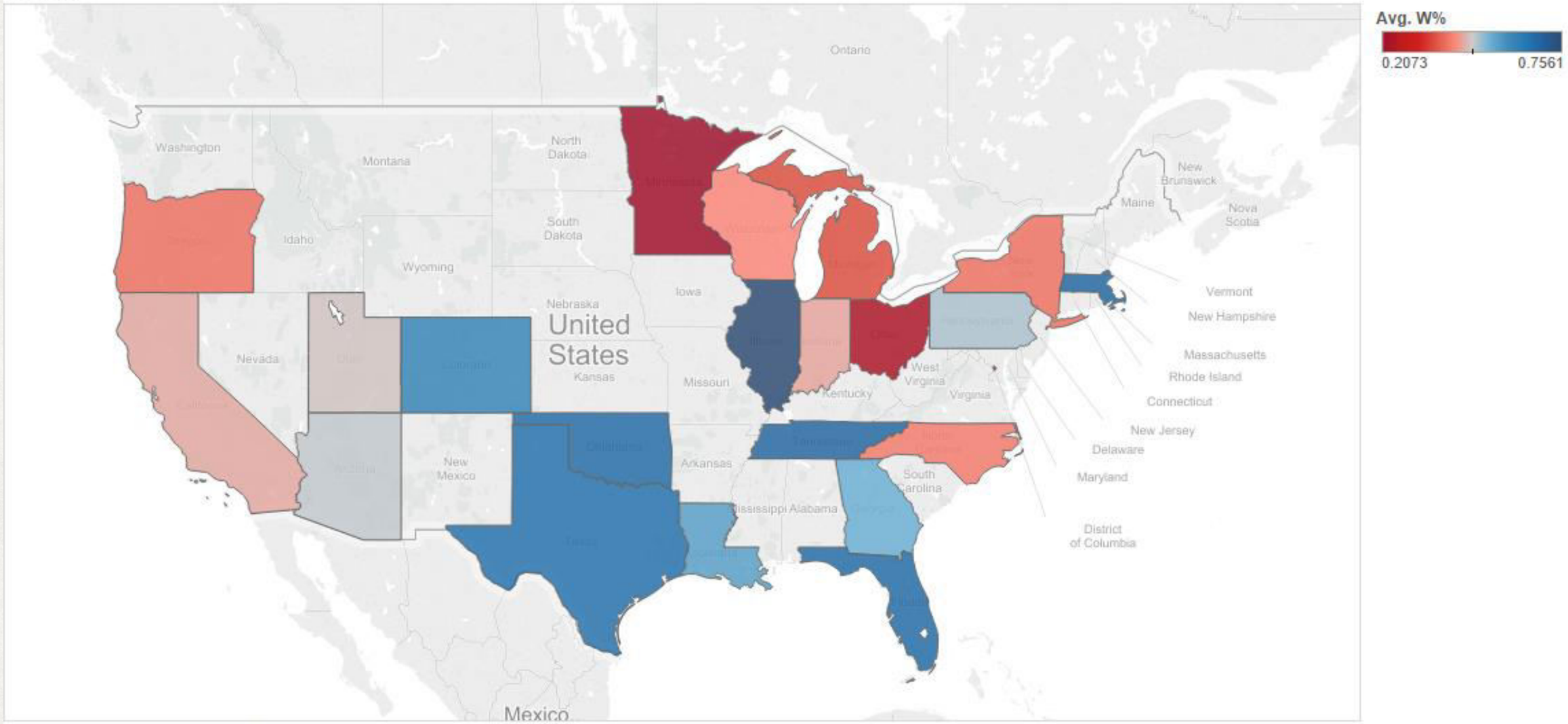


Map based on Longitude (generated) and Latitude (generated). Color shows sum of W%. Details are shown for State.

VISUALIZATION

2010-11

Sheet 1



Map based on Longitude (generated) and Latitude (generated). Color shows average of W%. Details are shown for State.

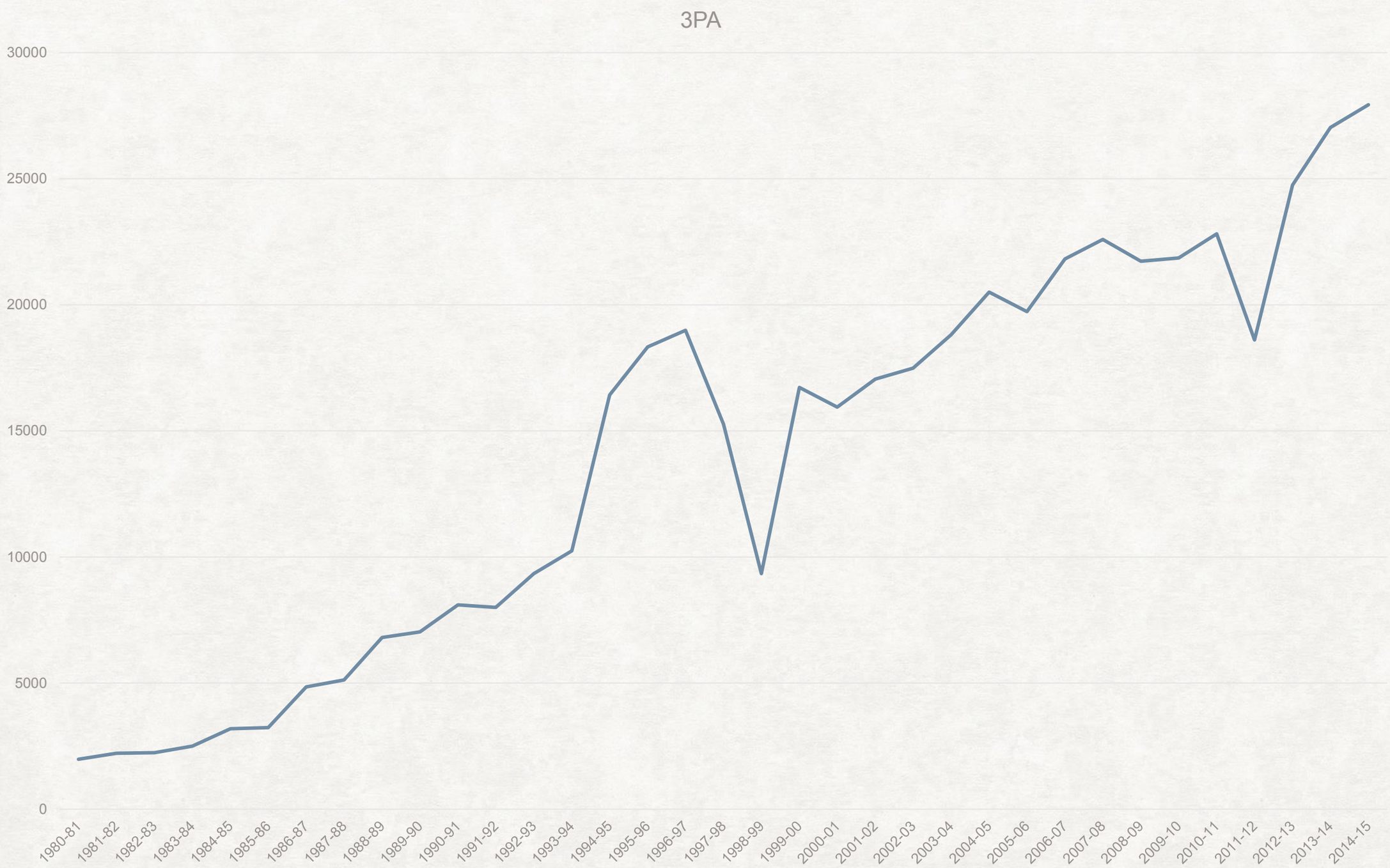
CHANGE OF STYLES

CHANGE OF THE NUMBER OF THREE POINTERS

SEASON	2PA	3PA
1980-81	85449	1981
1981-82	85911	2218
1982-83	87133	2242
1983-84	86043	2502
1984-85	84646	3185
1985-86	84374	3234
1986-87	84001	4847
1987-88	83248	5127
1988-89	82167	6807
1989-90	85586	7032
1990-91	85817	8104
1991-92	85042	8002
1992-93	82447	9344
1993-94	80354	10241
1994-95	71352	16429
1995-96	74658	18331
1996-97	72234	18987
1997-98	76486	15262
1998-99	46435	9340
1999-00	78192	16722
2000-01	77225	15942
2001-02	77322	17052
2002-03	82377	17486
2003-04	80022	18810
2004-05	78383	20501
2005-06	77490	19731
2006-07	76820	21816
2007-08	78614	22590
2008-09	78003	21725
2009-10	79714	21856
2010-11	78113	22816
2011-12	62640	18603
2012-13	76393	24747
2013-14	75900	27031
2014-15	75628	27932

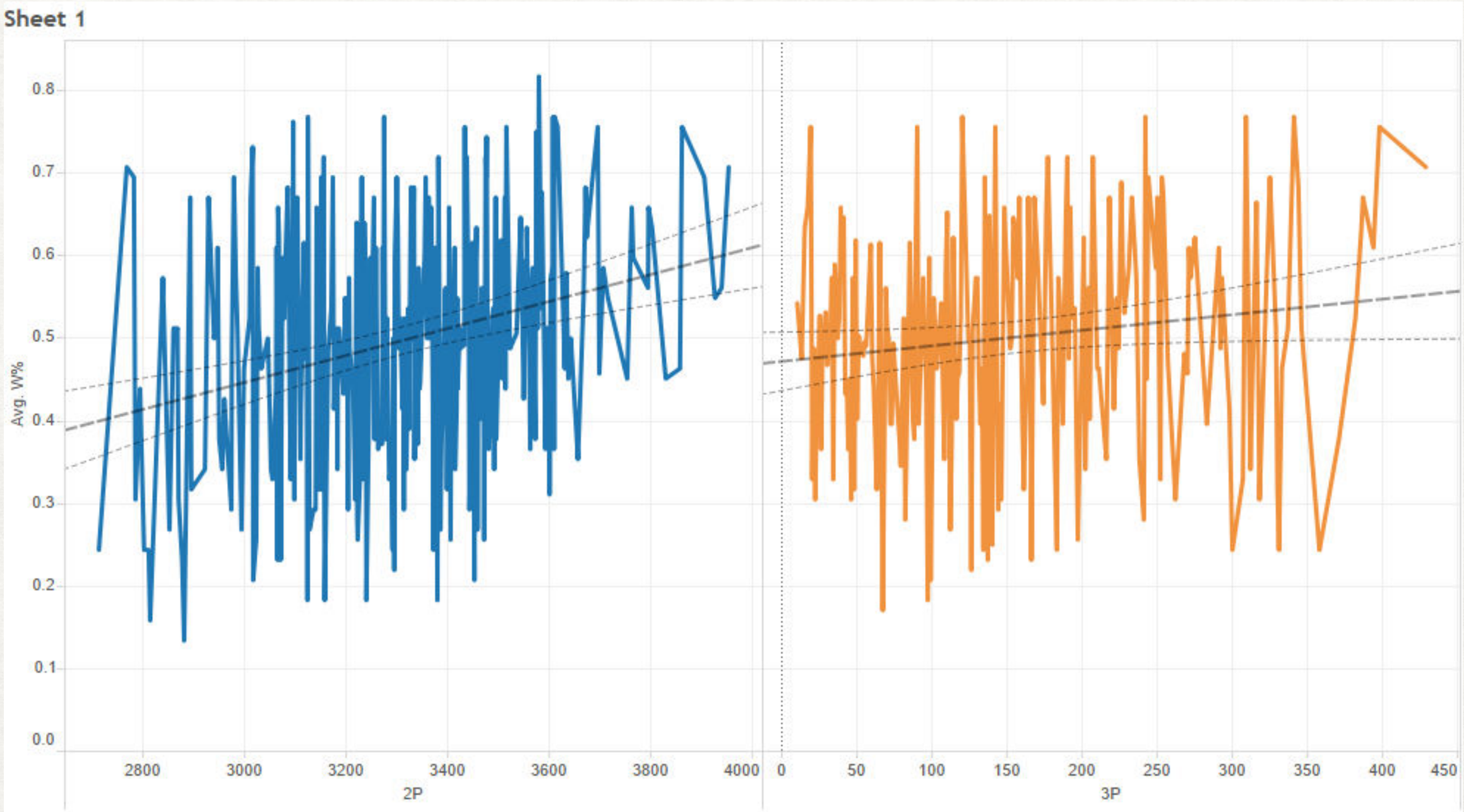
VISUALIZATION

VISUALIZATION



CHANGE OF STYLES

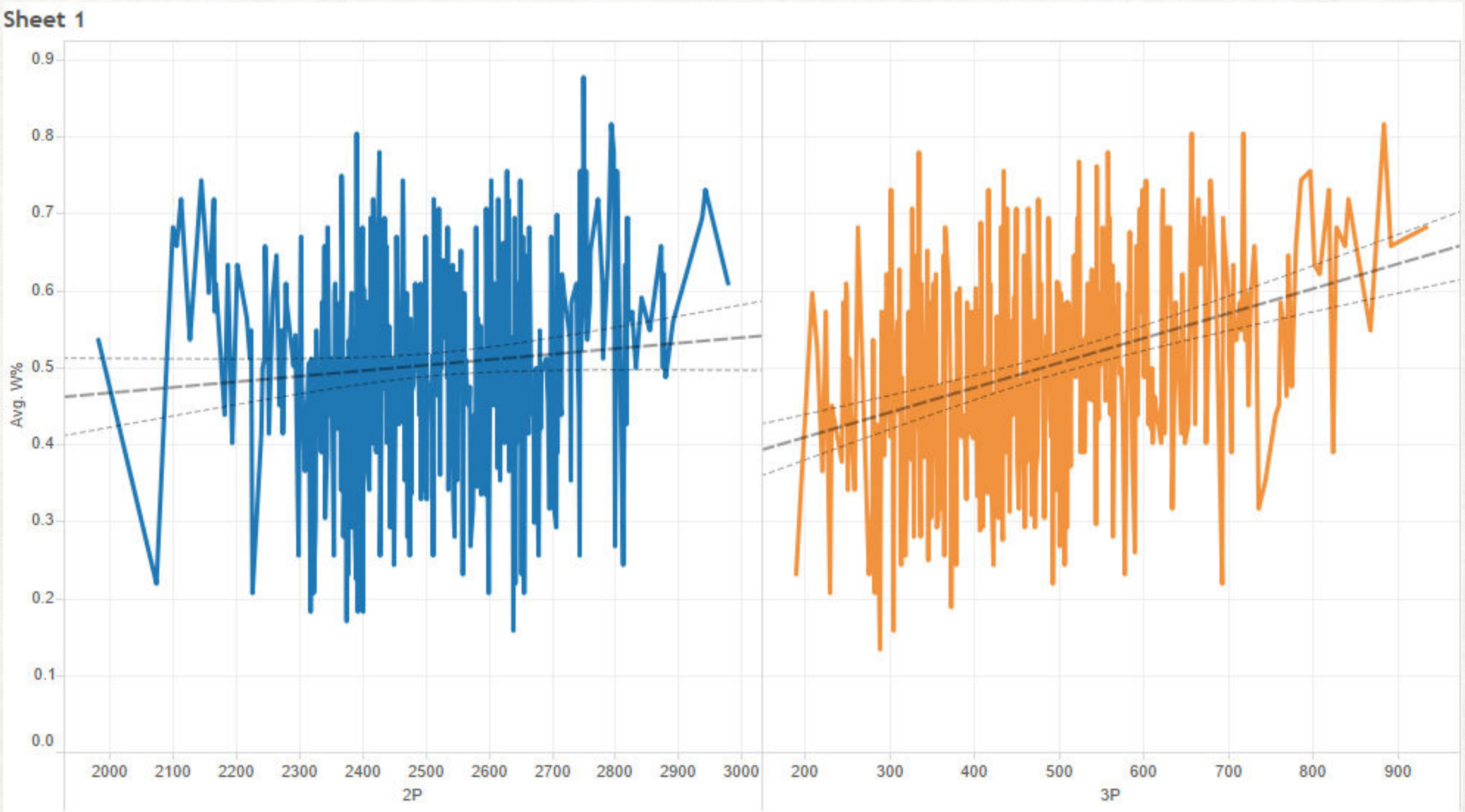
W% VS. 2P/3P(BEFORE 1994-95)



The trends of average of W% for 2P and 3P.

CHANGE OF STYLES

W% VS. 2P/3P(AFTER 1994-95)



The trends of average of W% for 2P and 3P.

EXTENSION

- Find 2P/FG, 3P/FG, 2P%, 3P% for different period of time to maximize W%
- Identify players who are suitable for the current style of NBA

EXTENSION: FAIL

- Reason:
- 1. Only find the trend, not the relation
- 2. Winning percentage is too complicated, which is

  not only related to 3P/FG, 3P%...

  -> need some machine learning skill

CHALLENGES WE FACED

- 1. Many data, but don’t know how to start
- 2. Exporting the data
- 3. Extra spaces, missing columns, redundant data…
- 4. Some problems when using the tools
- 5. Fail in analysis

CONCLUSION

WHAT WE'VE LEARNED FROM THE PROJECT

- 1. Choosing topics that are suitable for data analytics
- 2. Data cleaning and data integration
- 3. Tools for data analytics(Excel, MySQL, Tableau)
- 4. Some tips for data visualization
- 5. Hope to learn machine learning to do some more accurate analysis

REFERENCE

Basketball Reference

THANKS FOR LISTENING