

The winning formula for an NBA team

Viraj Lohchab

IBDP student, Don Bosco International School, Mumbai, India

Abstract

This study identifies the critical game statistics that determine the regular-season win-loss percentage of National Basketball Association (NBA) teams. Utilizing box-score statistics from the past 20 years, a dataset comprising 600 team-season observations and 25 distinct variables was compiled. Multiple linear regression models were constructed using Ordinary Least Squares (OLS) estimation to evaluate predictive power and forecasting accuracy. In the concurrent descriptive model, point differential (PD), effective field goal percentage (eFG%), and turnover percentage (TO%) emerged as the most critical statistics, accurately explaining team performance ($\text{Adjusted } R^2 > 0.92$). However, predictive accuracy dropped significantly when forecasting a team's future win-loss percentage using prior-season data ($\text{Adjusted } R^2 = 0.44$), with a substantially higher standard error. Prior-season PD, average roster age, and total player salary bills were identified as the key forecasting variables. This inherent predictive volatility underscores the league's competitive balance, contributing to rising viewership, escalating league revenues, and growing team payrolls over the past decade. Finally, individual historical team performance trends are evaluated alongside a novel 'Return on Salary' metric, revealing distinct shifts in the modern strategic evolution of the game.

Introduction

NBA (National Basketball Association) in US is one of the biggest sports leagues in the world in terms of popularity and revenues. Every year 30 teams participate in league stages and top teams qualify to play playoffs to decide the eventual winners. Given the long history of the league and granular data available at a player and match level, I have attempted to decode which of the game statistics drive the success of an NBA team in each season and consequently derived a forecasting model to model the success rate (win-loss %) of a team in the next season. I have also analysed the data to assess the evolution of the league in last 20 years in terms of team performance and consistency, change in significance of critical factors, team comparisons on return on biggest cost line, i.e. team salary.

Methodology

The study involves only regular season matches and doesn't involve additional data from play-offs and play-ins to keep data points consistent across teams (given only 16 teams qualify out of 30 teams for play-offs. However, at regular season stage, each of the 30 teams play equal number of matches, 82, in a year). I downloaded the entire 20-year (2006-2025) data team wise in league stage from NBA website in MS Excel (NBA, 2026). I have used statistics per game for this study. **Details of statistics tracked and team names and abbreviations used for study are provided in the Appendix.** Further, this data was organized by years. Given 30 teams and 20 years, the excel had ~600 rows of data. Sample datasets are shown below in Fig. 1.

Fig 1: Sample data set (Teamwise stats over the years)

ATL- Atlanta Hawks	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total salary (mn)	38.198405	47.2337	47.0322	68.16584	65.48009	70.73359	70.89746	64.38234	53.95168	55.98656	72.90295	96.50914	73.89404	65.09406	110.6382	134.1284	150.34678	139.60738	138.43328	161.25575
Win loss %	31.70%	36.59%	45.12%	57.32%	64.63%	53.66%	60.61%	53.66%	46.34%	73.17%	58.54%	52.44%	29.27%	35.37%	29.85%	56.94%	52.44%	50.00%	43.90%	48.78%
Average Age	23.08	24.78	23.58	25.13	26.57	27.21	29.67	26.50	26.07	26.93	27.73	28.06	24.84	24.94	25.82	25.18	25.90	24.00	25.28	25.28
FG	35.98	35.12	34.29	36.09	38.84	35.07	36.64	37.79	34.59	37.26	39.47	41.03	32.56	38.73	38.83	42.66	39.89	48.30	42.84	43.80
FGA	79.14	79.36	75.38	78.67	83.04	74.95	80.73	81.72	74.64	79.34	86.32	91.60	72.91	85.77	88.63	91.59	84.38	100.89	92.05	92.29
FG%	45.46%	44.26%	45.49%	45.87%	46.78%	46.80%	45.39%	46.24%	46.35%	46.96%	45.73%	44.79%	44.66%	45.16%	43.81%	46.57%	47.27%	47.87%	46.54%	47.46%
3P	5.20	4.28	4.30	7.30	6.41	4.82	7.42	8.41	7.82	9.54	10.42	10.00	8.69	12.24	11.77	12.78	12.40	12.26	13.68	13.77
3PA	14.06	12.93	12.35	19.73	17.77	14.30	20.24	23.06	21.84	24.84	29.28	28.96	24.68	34.88	35.84	34.43	32.85	34.70	37.45	37.75
3P%	37.01%	33.08%	34.77%	36.99%	36.09%	33.69%	36.64%	36.49%	35.83%	38.40%	35.58%	34.52%	35.22%	35.08%	32.85%	37.12%	37.76%	35.34%	36.52%	36.46%
2P	30.62	30.80	29.89	28.91	32.43	30.17	29.31	29.31	26.58	27.57	29.03	31.38	23.74	26.46	27.10	29.96	27.62	35.95	29.11	30.07
2PA	65.01	66.41	63.04	58.66	65.04	60.67	60.70	58.58	52.83	54.58	57.09	62.46	48.23	51.00	52.92	57.25	51.59	66.19	54.76	54.50
2P%	47.10%	46.37%	47.42%	49.29%	49.86%	49.72%	48.29%	50.02%	50.32%	50.51%	50.85%	50.24%	49.23%	51.88%	51.21%	52.34%	53.54%	54.30%	53.15%	55.17%
FT	20.13	20.77	20.22	18.78	17.80	16.90	15.40	15.70	15.50	16.10	19.50	13.70	14.80	15.50	19.20	21.19	17.30	21.44	18.48	16.86
FTA	26.90	27.23	26.14	25.58	23.41	21.42	21.10	20.52	20.19	19.69	20.29	26.45	17.56	21.07	23.90	25.76	21.36	26.19	23.15	22.06
FT%	74.83%	76.26%	77.34%	73.43%	75.96%	78.96%	73.19%	72.17%	77.97%	78.48%	79.55%	73.71%	77.95%	73.62%	80.30%	82.24%	80.91%	81.84%	79.85%	76.43%
ORB	13.00	11.96	11.57	10.60	11.85	8.86	9.94	9.36	7.90	8.07	8.71	11.25	8.04	11.41	9.14	10.73	9.85	12.61	12.49	12.34
DRB	27.10	28.70	27.81	29.29	30.09	28.89	31.20	32.38	28.27	30.99	35.21	36.88	28.69	32.69	31.87	39.39	33.15	32.06	32.06	33.74
TRB	40.00	40.65	39.46	40.12	41.63	37.64	41.22	41.88	36.05	38.98	44.11	48.42	36.70	44.11	41.19	46.06	43.14	48.89	44.35	46.10
AST	19.80	20.14	19.55	20.23	21.69	21.59	22.51	24.67	23.62	25.14	26.06	24.62	21.56	23.46	25.75	24.79	23.93	26.18	26.39	31.26
STL	7.11	7.62	6.59	7.36	7.20	6.07	7.98	8.08	7.72	8.90	9.02	8.40	6.50	7.86	7.57	7.25	6.54	7.89	7.37	9.95
BLK	4.82	5.48	5.17	4.39	5.09	4.26	4.50	4.73	3.75	4.39	5.98	4.89	3.95	4.94	4.81	4.84	4.21	5.38	4.49	5.38
TOV	15.15	15.70	13.61	12.02	11.33	12.64	13.11	14.62	13.21	13.05	15.00	16.14	13.61	15.30	16.34	12.96	10.81	13.23	12.73	14.82
PF	25.03	24.72	18.34	19.65	20.11	17.81	17.98	18.66	16.81	16.49	20.17	20.02	17.46	22.08	23.31	19.70	17.98	20.54	18.44	19.98
PTS	97.30	95.57	93.04	98.20	101.64	91.67	96.56	98.92	92.62	99.32	105.13	111.64	87.38	105.32	109.13	119.41	109.38	129.61	117.97	118.16

BOS- Boston Celtics	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total salary (mn)	52.217925	53.29912	74.36	105.6618	87.12542	148.6796	79.01221	71.40595	64.15533	52.33502	57.39243	91.48492	94.48815	118.2802	110.8957	165.9099	158.88907	186.48715	151.00107	196.19379
Win loss %	40.20%	29.27%	80.49%	75.61%	60.98%	68.29%	59.09%	50.62%	30.49%	48.78%	58.54%	64.63%	67.07%	59.76%	66.67%	50.00%	62.20%	69.50%	78.05%	74.39%
Average Age	24.64	24.75	28.47	27.13	28.67	28.42	28.24	27.31	25.27	25.13	24.00	25.27	25.37	25.44	24.59	24.41	26.77	26.78	26.12	27.53
FG	33.42	34.76	38.71	38.05	37.87	39.25	36.02	38.03	33.87	37.45	38.09	38.72	39.81	42.11	41.41	40.15	39.63	43.28	45.12	41.84
FGA	71.47	78.66	81.61	78.29	78.11	81.25	78.20	82.27	78.59	84.42	87.00	85.21	87.36	90.40	89.71	86.68	84.84	91.28	93.01	90.02
FG%	46.76%	44.19%	47.44%	48.61%	48.48%	48.30%	46.06%	46.23%	43.09%	44.36%	43.78%	45.44%	45.57%	46.59%	46.16%	46.33%	46.71%	47.41%	48.51%	46.48%
3P	5.78	5.75	7.43	6.56	6.08	4.93	5.50	6.59	6.44	8.06	8.70	12.06	11.37	12.62	12.53	13.75	12.82	16.76	16.74	17.86
3PA	15.71	15.63	19.84	16.60	17.85	13.87	15.05	18.33	19.38	24.59	26.21	33.46	30.33	34.49	34.47	36.78	36.84	44.45	43.36	48.29
3P%	36.79%	36.80%	37.45%	39.51%	34.04%	35.58%	36.53%	35.96%	33.21%	32.77%	33.19%	36.05%	37.48%	36.60%	36.37%	37.39%	34.80%	37.71%	38.60%	36.99%
2P	27.55	29.21	31.19	31.44	31.68	34.35	30.52	31.39	27.63	29.35	29.55	26.68	28.30	29.34	28.67	26.38	26.72	26.63	28.44	23.91
2PA	55.85	62.93	61.77	61.76	60.30	67.33	63.19	63.59	59.07	59.90	60.84	51.68	57.00	56.00	55.09	49.92	47.97	47.00	49.83	41.70
2P%	49.32%	46.41%	50.50%	50.90%	52.54%	51.02%	48.30%	49.36%	46.77%	49.00%	48.56%	51.63%	49.64%	52.39%	52.04%	52.85%	55.72%	56.67%	57.07%	57.34%
FT	19.18	20.34	21.66	19.75	19.16	19.23	15.96	16.23	14.96	15.98	18.18	18.66	16.33	15.55	18.58	15.94	16.71	21.80	16.54	15.13
FTA	25.17	26.73	27.97	25.76	25.67	24.81	20.73	21.24	19.29	20.64	22.87	23.31	21.49	19.55	23.21	20.39	20.28	27.00	20.74	18.84
FT%	76%	76%	77%	77%	75%	77%	77%	76%	78%	77%	79%	80%	76%	80%	80%	78%	82%	81%	80%	80%
ORB	9.88	11.07	10.34	11.17	8.93	8.50	8.29	7.93	11.64	11.29	11.09	9.18	9.97	9.79	10.83	9.64	10.32	10.01	11.53	11.37
DRB	29.48	29.28	33.00	32.68	29.89	33.09	31.67	31.17	29.03	30.93	32.22	32.71	36.64	34.89	35.28	31.32	35.02	36.98	36.75	33.83
TRB	39.26	40.45	43.28	43.47	38.91	41.49	39.76	39.15	40.49	42.33	43.41	42.07	46.76	44.36	46.19	40.75	45.41	47.17	48.04	45.39
AST	18.48	19.84	24.41	22.95	24.24	23.11	23.70	23.57	18.78	22.56	23.35	25.34	23.02	26.30	22.98	22.66	25.15	27.21	27.71	26.16
STL	6.83	7.18	8.93	7.75	8.49	8.49	7.63	8.01	6.65	8.24	9.12	7.38	7.53	8.69	8.32	7.09	6.96	6.59	7.46	7.10
BLK	5.07	4.57	4.86	4.88	4.89	4.35	5.59	4.35	4.10	3.40	4.17	4.07	4.64	5.38	5.76	4.92	6.11	5.61	7.05	5.67
TOV	14.21	15.72	15.38	15.15	14.32	13.43	14.50	14.42	13.19	12.56	13.11	12.70	13.79	12.37	13.10	12.70	12.63	12.95	11.61	11.17
PF	23.71	23.99	23.60	24.11	22.27	20.87	20.97	20.10	20.52	21.80	21.33	20.48	20.28	20.33	21.63	18.44	18.23	19.69	17.13	15.82
PTS	92.17	95.78	106.35	102.41	100.61	102.78	93.78	99.01	89.55	99.17	103.06	107.95	107.34	112.35	113.55	109.81	108.63	121.23	123.43	116.46

The data was also organized by the years to run the regressions and correlations year-wise to come up with the regression model for success ratio of a team, or the winning formula. To control macroeconomic changes and the rising NBA salary cap, historical team payrolls were deflated to real values using the Consumer Price Index (CPIAUCSL) baseline. Some additional ratios were calculated which are part of game terminology to better represent the basic statistics. E.g. TO% (Turnover percentage) = $(TOV / (FGA + 0.44 * FTA + TOV)) * 100$ was used instead of turnover number as a better indicator of team performance (Sports Reference, 2026). eFG% (effective Field Goal percentage) was used a single shooting efficiency metric, $eFG\% = \{(FG + (0.5 * 3P)) / FGA\}$. PD (Point Differential) is the gap between total points a team scores and total points it allows. $PD = PTS$ (Points Scored) – Points Allowed. + sign indicates more points scored and a winning team while – indicates more points allowed and a losing team. A sample dataset (year 2006) for the year wise analysis of teams is appended below in Fig. 2.

Fig 2: Sample data for year wise analysis

	Win	Total salary (mn)	Average Age	FG	FGA	FG%	3P	3PA	3P%	2P	2PA	2P%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS	eFG%	ratio%	PD
2006																											
ATL- Atlanta Hawks	32%	38	23	36	79	45%	5	14	37%	31	65	47%	20	27	75%	13	27	40	20	7	5	15	25	97	49%	14%	-4.8
BOS- Boston Celtics	40%	52	25	33	71	47%	6	16	37%	28	56	49%	19	25	76%	10	29	39	18	7	5	14	24	92	51%	15%	-1.5
Brooklyn Nets	60%	61	28	40	91	44%	7	22	32%	33	70	47%	22	30	74%	12	37	49	30	8	4	18	31	109	47%	14%	1.4
Charlotte Hornets	32%	33	25	35	81	44%	5	14	34%	30	67	45%	19	26	73%	12	27	39	20	10	4	13	23	94	47%	13%	-4
Chicago Bulls	50%	34	26	37	82	45%	7	18	38%	30	64	46%	18	24	74%	11	32	43	22	6	4	15	25	98	49%	14%	0.6
Cleveland Cavalier:	61%	51	26	37	83	45%	6	19	34%	31	64	49%	22	30	73%	12	31	43	20	7	5	14	22	103	49%	13%	2.2
Dallas Mavericks	73%	74	27	36	78	46%	5	14	38%	31	64	48%	22	28	78%	13	30	42	18	7	6	13	22	99	50%	12%	6.1
Denver Nuggets	54%	61	28	39	84	47%	4	11	32%	36	73	49%	23	32	73%	13	32	46	23	9	6	15	24	105	49%	13%	0.2
Detroit Pistons	78%	65	28	36	80	45%	7	18	39%	30	63	48%	18	24	73%	12	29	41	24	7	6	11	19	97	49%	11%	6.7
Golden State Warri	42%	57	25	36	83	43%	8	22	34%	28	60	47%	19	27	72%	12	30	42	21	7	4	14	24	99	48%	13%	-1.4
Houston Rockets	42%	50	28	33	77	43%	6	18	33%	27	59	46%	18	24	76%	10	31	41	19	7	4	14	22	91	47%	13%	-1.6
Indiana Pacers	50%	73	27	35	79	44%	7	20	35%	28	59	47%	20	26	75%	11	32	43	20	7	5	15	23	96	49%	14%	1.9
Los Angeles Clippei	57%	51	27	37	81	46%	4	12	36%	33	68	48%	21	26	80%	10	33	43	21	7	6	14	23	99	48%	13%	1.6
Los Angeles Lakers	55%	56	25	37	82	45%	7	20	35%	30	62	48%	20	27	75%	12	31	43	22	8	4	14	24	101	49%	13%	2.5
Memphis Grizzlies	60%	69	27	34	77	45%	8	20	37%	27	56	47%	18	26	70%	10	29	40	20	7	5	13	22	94	50%	13%	3.7
Miami Heat	63%	60	28	38	80	47%	6	18	34%	31	61	51%	20	29	70%	11	34	44	21	7	6	14	23	102	51%	13%	3.9
Milwaukee Bucks	49%	56	27	36	80	45%	6	16	38%	30	64	47%	19	26	74%	11	30	41	22	7	3	14	23	98	49%	13%	-1
Minnesota Timberv	40%	55	26	37	81	46%	3	11	30%	34	70	48%	18	24	75%	10	29	39	23	7	6	15	23	96	48%	14%	-0.9
New Orleans Pelica	46%	42	26	35	80	44%	3	10	33%	32	70	46%	21	27	76%	12	30	41	19	7	4	13	23	95	46%	12%	-2.8
New York Knicks	28%	109	26	38	84	45%	4	13	35%	33	71	47%	27	36	74%	12	30	41	22	7	3	19	27	107	48%	16%	-6.4
Oklahoma City Thui	43%	48	26	35	75	46%	7	19	38%	28	56	49%	18	23	80%	11	25	36	20	7	4	13	22	95	51%	13%	-3
Orlando Magic	44%	49	26	31	66	48%	3	9	39%	28	57	49%	17	23	71%	10	27	37	15	6	4	12	21	83	50%	14%	-1.1
Philadelphia 76ers	46%	61	26	37	80	46%	5	13	37%	32	67	48%	22	28	76%	11	30	40	20	8	5	14	21	100	49%	13%	-2
Phoenix Suns	66%	60	27	41	86	48%	10	25	40%	31	61	51%	14	18	81%	9	32	41	26	7	5	12	20	107	54%	12%	5.5
Portland Trail Blaze	26%	50	25	32	72	44%	4	12	35%	28	60	46%	15	21	69%	10	26	36	18	6	5	13	21	83	47%	14%	-9.5
Sacramento Kings	54%	63	26	36	78	45%	5	16	34%	30	62	48%	21	27	77%	10	29	40	22	8	4	14	20	97	49%	13%	1.5
San Antonio Spurs	77%	62	29	37	77	47%	6	17	38%	30	61	50%	16	23	70%	10	31	41	21	7	6	13	21	96	51%	13%	6.8
Toronto Raptors	33%	48	27	35	77	46%	7	18	39%	28	59	48%	19	24	79%	11	27	39	18	6	3	12	24	96	50%	12%	-3
Utah Jazz	50%	56	25	33	76	44%	4	11	34%	30	64	46%	22	30	72%	13	29	42	22	6	6	15	25	92	46%	14%	-2.6
Washington Wizard	51%	49	26	35	79	45%	6	16	36%	30	63	47%	23	30	76%	12	28	41	18	8	4	13	22	99	48%	12%	1.9

Analysis and Results

a) Drivers of an NBA team's win-loss % in a season

I ran the Pearson correlation tests initially of each variable to remove the statistics that have very low correlation with win-loss percentage. Fig. 3 reveals very low correlation of win-loss % with FGA (Field Goal Attempts), 3PA (3-Pointer Attempts), FT (Free Throw Attempts), FTA (Free Throw, FT% (Free Throw Percentage = FT/FTA), ORB (Offensive Rebound), TOV (Turnover) and PF (Personal Fouls). A low R^2 results as well for these statistics leads us to remove them from the study.

Fig 3: Year-wise Pearson correlation coefficient of all tracked statistics with win-loss %

	Salary	Age	FG	FGA	FG%	3P	3PA	3P%	2P	2PA	2P%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS	eFG%	ratio	PD
2006	0.21	0.64	0.41	0.25	0.33	0.35	0.32	0.21	0.18	-0.02	0.46	-0.07	-0.05	-0.03	-0.00	0.50	0.38	0.02	0.45	-0.26	-0.31	0.37	0.42	-0.47	0.95	
2007	0.27	0.70	0.14	-0.02	0.44	0.35	0.28	0.37	-0.05	-0.23	0.48	-0.19	-0.20	0.11	-0.10	0.32	0.27	-0.05	0.31	-0.45	-0.28	0.11	0.54	-0.52	0.95	
2008	0.29	0.45	0.64	0.39	0.62	0.52	0.46	0.57	0.32	-0.04	0.63	0.37	0.28	0.33	0.07	0.49	0.64	0.31	0.37	-0.10	0.10	0.67	0.69	-0.38	0.96	
2009	0.44	0.34	0.30	0.07	0.63	0.31	0.24	0.40	0.15	-0.09	0.66	0.20	0.25	-0.12	0.09	0.50	0.43	0.33	0.23	-0.19	0.06	0.33	0.74	-0.28	0.99	
2010	0.56	0.51	0.01	-0.25	0.57	0.27	0.17	0.47	-0.14	-0.35	0.59	0.21	0.22	-0.02	-0.19	0.22	0.36	-0.09	0.23	-0.38	-0.33	0.13	0.63	-0.29	0.97	
2011	0.50	0.73	0.13	-0.06	0.66	0.32	0.26	0.41	0.01	-0.21	0.73	0.35	0.27	0.30	-0.36	0.32	0.18	0.18	0.06	-0.27	-0.23	0.23	0.69	-0.39	0.97	
2012	0.53	0.59	0.16	0.03	0.63	0.23	0.13	0.54	0.10	-0.04	0.60	0.12	0.10	0.10	-0.02	0.21	0.34	0.17	0.27	0.06	-0.14	0.17	0.66	0.04	0.92	
2013	0.64	0.50	0.10	-0.26	0.74	0.37	0.23	0.53	-0.07	-0.35	0.69	0.25	0.24	0.06	-0.23	0.20	0.21	0.49	0.30	-0.06	-0.22	0.22	0.75	0.14	0.97	
2014	0.53	0.65	0.61	0.46	0.61	0.56	0.52	0.53	0.44	0.23	0.54	0.36	0.27	0.42	-0.02	0.56	0.64	0.35	0.37	0.33	0.20	0.62	0.62	-0.16	0.93	
2015	0.47	0.54	0.67	0.52	0.75	0.68	0.59	0.69	0.41	0.16	0.80	0.34	0.27	0.27	-0.04	0.46	0.80	0.49	0.47	0.28	0.12	0.69	0.84	-0.14	0.96	
2016	0.66	0.48	0.56	0.31	0.65	0.48	0.35	0.63	0.32	0.05	0.65	0.30	0.21	0.17	0.08	0.55	0.50	0.22	0.39	-0.06	0.05	0.62	0.74	-0.32	0.96	
2017	0.51	0.46	0.64	0.54	0.64	0.64	0.55	0.64	0.38	0.19	0.61	0.47	0.46	0.14	0.22	0.54	0.61	0.37	0.38	0.25	0.19	0.68	0.72	-0.16	0.96	
2018	0.61	0.55	0.55	0.37	0.68	0.50	0.42	0.55	0.39	0.16	0.77	0.59	0.51	0.32	0.32	0.44	0.45	0.61	0.45	0.22	0.18	0.60	0.77	-0.17	0.96	
2019	0.70	0.42	0.74	0.66	0.61	0.63	0.51	0.57	0.49	0.33	0.62	0.49	0.42	0.28	0.37	0.68	0.74	0.43	0.54	0.29	0.42	0.76	0.78	-0.33	0.96	
2020	0.50	0.58	0.76	0.72	0.57	0.63	0.56	0.49	0.64	0.55	0.63	0.67	0.69	0.27	0.39	0.76	0.60	0.51	0.72	0.47	0.54	0.77	0.72	-0.33	0.96	
2021	0.58	0.68	0.53	0.40	0.66	0.61	0.43	0.80	0.24	0.11	0.45	0.34	0.15	0.53	-0.03	0.44	0.45	0.15	0.05	0.07	0.08	0.61	0.75	-0.24	0.95	
2022	0.55	0.55	0.50	0.32	0.40	0.40	0.23	0.64	0.33	0.18	0.42	0.19	0.09	0.29	0.10	0.35	0.57	0.47	0.10	-0.14	0.21	0.48	0.59	-0.40	0.95	
2023	0.60	0.60	0.40	0.45	0.59	0.57	0.50	0.66	0.30	0.11	0.56	0.36	0.33	0.19	0.10	0.64	0.55	0.25	0.37	0.07	0.20	0.62	0.70	-0.33	0.95	
2024	0.42	0.59	0.68	0.47	0.72	0.60	0.34	0.82	0.51	0.30	0.61	0.55	0.58	0.03	0.11	0.64	0.46	0.50	0.45	-0.37	0.04	0.73	0.80	-0.61	0.96	
2025	0.28	0.35	0.49	0.22	0.68	0.38	0.14	0.66	0.33	0.12	0.72	0.21	0.15	0.17	0.04	0.39	0.31	0.40	0.21	-0.55	-0.14	0.50	0.75	-0.71	0.98	
Average	0.49	0.55	0.46	0.28	0.61	0.47	0.36	0.56	0.26	0.06	0.61	0.31	0.26	0.19	0.04	0.46	0.47	0.31	0.34	-0.04	0.04	0.50	0.69	-0.30	0.96	

The table below, Fig. 4, are the 13 most critical statistics (out of 25 used in above table) for further analysis.

and eFG% are highly correlated which is expected as 2P% and 3P% combine to give FG%. Thus, it's best to include a single scoring efficiency metric, eFG%, for further study which combines the other 3 by its definition and adjusts for higher value of 3P. **eFG% also has high correlation with PTS (Points Scored), AST (Assist), and Salary** and thus will be capturing relevance of those as well in the regression model.

Fig 4: Year-wise Pearson correlation coefficient for key relevant statistics with win-loss %

	Salary	Age	3P%	2P%	ORB	DRB	AST	STL	BLK	PTS	eFG%	TO%	PD
2006	0.21	0.64	0.21	0.46	-0.00	0.50	0.38	0.02	0.45	0.37	0.42	-0.47	0.95
2007	0.27	0.70	0.37	0.48	-0.10	0.32	0.27	-0.05	0.31	0.11	0.54	-0.52	0.95
2008	0.29	0.45	0.57	0.63	0.07	0.49	0.64	0.31	0.37	0.67	0.69	-0.38	0.98
2009	0.44	0.34	0.40	0.66	0.09	0.50	0.43	0.33	0.23	0.33	0.74	-0.28	0.99
2010	0.56	0.51	0.47	0.59	-0.19	0.22	0.36	-0.09	0.23	0.13	0.63	-0.29	0.97
2011	0.50	0.73	0.41	0.73	-0.36	0.32	0.18	0.18	0.06	0.23	0.69	-0.39	0.97
2012	0.53	0.59	0.54	0.60	-0.02	0.21	0.34	0.17	0.27	0.17	0.66	0.04	0.92
2013	0.64	0.50	0.53	0.69	-0.23	0.20	0.21	0.49	0.30	0.22	0.75	0.14	0.97
2014	0.53	0.65	0.53	0.54	-0.02	0.56	0.64	0.35	0.37	0.62	0.62	-0.16	0.93
2015	0.47	0.54	0.69	0.80	-0.04	0.46	0.80	0.49	0.47	0.69	0.84	-0.14	0.98
2016	0.66	0.48	0.63	0.65	0.08	0.55	0.50	0.22	0.39	0.62	0.74	-0.32	0.98
2017	0.51	0.46	0.64	0.61	0.22	0.54	0.61	0.37	0.38	0.68	0.72	-0.16	0.96
2018	0.61	0.55	0.55	0.77	0.32	0.44	0.45	0.61	0.45	0.60	0.77	-0.17	0.96
2019	0.70	0.42	0.57	0.62	0.37	0.68	0.74	0.43	0.54	0.76	0.78	-0.33	0.98
2020	0.50	0.58	0.49	0.63	0.39	0.76	0.60	0.51	0.72	0.77	0.72	-0.33	0.96
2021	0.58	0.68	0.80	0.45	-0.03	0.44	0.45	0.15	0.05	0.61	0.75	-0.24	0.95
2022	0.55	0.55	0.64	0.42	0.10	0.35	0.57	0.47	0.10	0.48	0.59	-0.40	0.95
2023	0.60	0.60	0.66	0.56	0.10	0.64	0.55	0.25	0.37	0.62	0.70	-0.33	0.95
2024	0.42	0.59	0.82	0.61	0.11	0.64	0.46	0.50	0.45	0.73	0.80	-0.61	0.98
2025	0.28	0.35	0.66	0.72	0.04	0.39	0.31	0.40	0.21	0.50	0.75	-0.71	0.98

Fig 5: Correlation matrix of key statistics

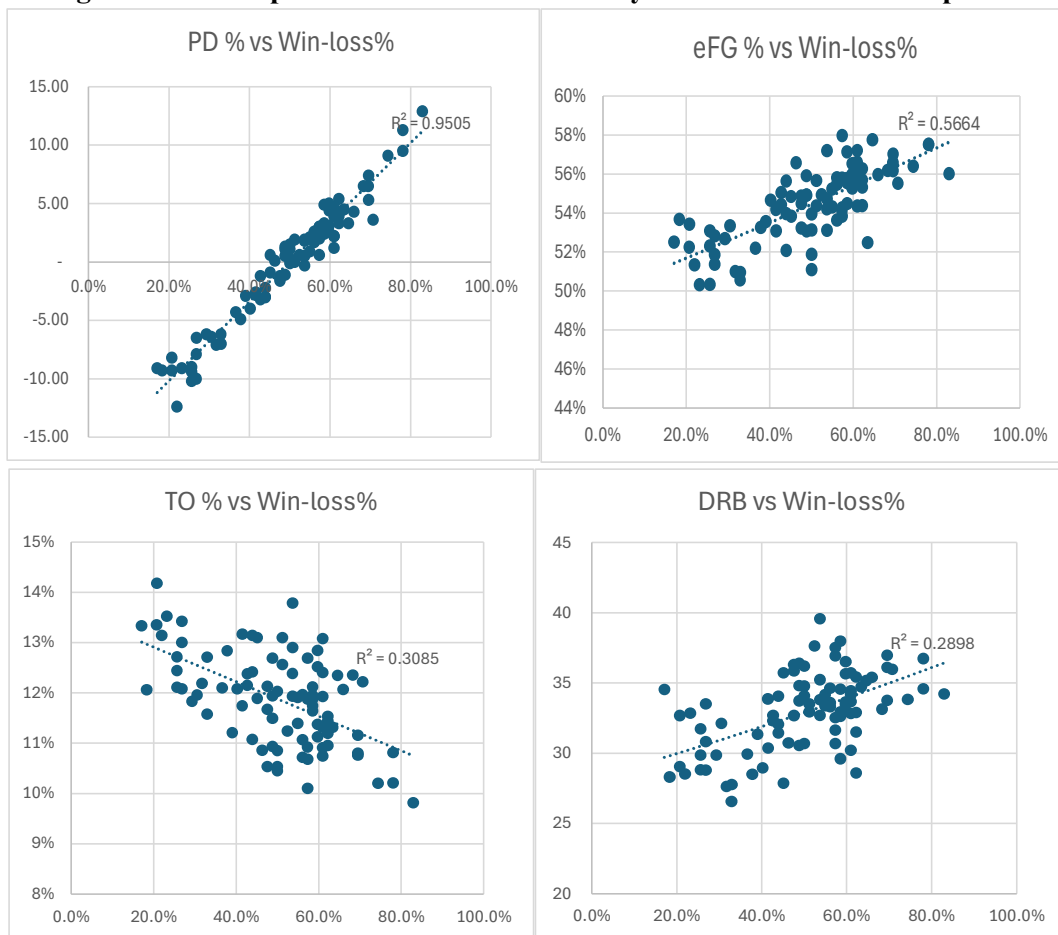
	Salary	Age	3P%	2P%	ORB	DRB	AST	STL	BLK	PTS	eFG%	TO%	PD
Salary	1.00	0.08	0.24	0.75	-0.12	0.45	0.61	0.18	0.10	0.63	0.72	-0.45	0.23
Age	0.08	1.00	0.27	0.03	-0.10	0.17	0.10	0.08	0.09	0.07	0.11	-0.04	0.49
3P%	0.24	0.27	1.00	0.32	-0.18	0.20	0.30	-0.02	0.09	0.31	0.57	-0.19	0.54
2P%	0.75	0.03	0.32	1.00	-0.26	0.41	0.65	0.15	0.13	0.65	0.95	-0.36	0.38
ORB	-0.12	-0.10	-0.18	-0.26	1.00	0.28	0.06	0.29	0.27	0.24	-0.30	0.05	0.04
DRB	0.45	0.17	0.20	0.41	0.28	1.00	0.66	0.41	0.43	0.82	0.42	-0.26	0.40
AST	0.61	0.10	0.30	0.65	0.06	0.66	1.00	0.46	0.29	0.82	0.65	-0.29	0.38
STL	0.18	0.08	-0.02	0.15	0.29	0.41	0.46	1.00	0.35	0.51	0.14	-0.06	0.30
BLK	0.10	0.09	0.09	0.13	0.27	0.43	0.29	0.35	1.00	0.36	0.13	-0.02	0.33
PTS	0.63	0.07	0.31	0.65	0.24	0.82	0.82	0.51	0.36	1.00	0.65	-0.40	0.41
eFG%	0.72	0.11	0.57	0.95	-0.30	0.42	0.65	0.14	0.13	0.65	1.00	-0.38	0.49
TO%	-0.45	-0.04	-0.19	-0.36	0.05	-0.26	-0.29	-0.06	-0.02	-0.40	-0.38	1.00	-0.27
PD	0.23	0.49	0.54	0.38	0.04	0.40	0.38	0.30	0.33	0.41	0.49	-0.27	1.00

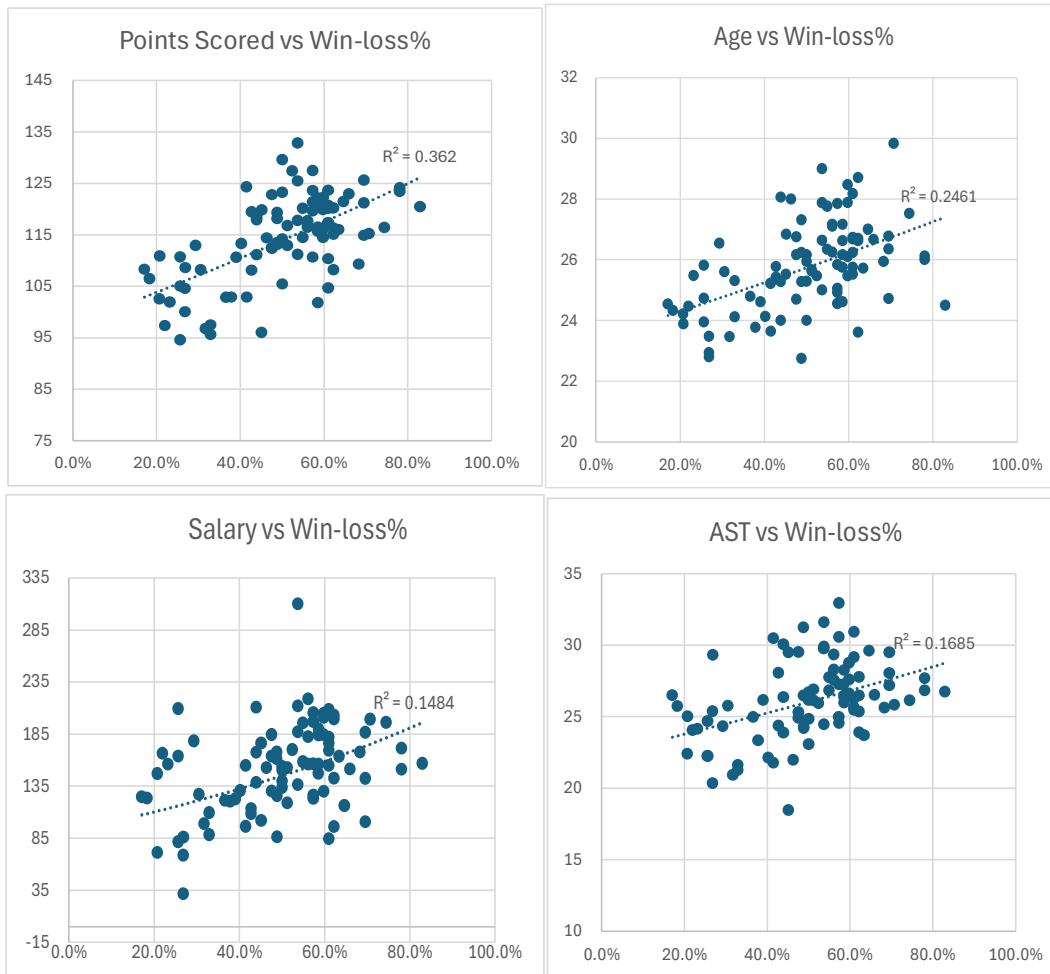
The scatter plot analysis over FY23-25 period as shown below (Fig. 6-13) highlights the R^2 values for each of the key variables and win-loss %. **Clearly, PD is the most relevant statistic ($R^2 = 0.95$) which explains the win-loss % of a team in a season** since PD captures both offense (PTS) and defense capabilities (Points Allowed). However, PD is more like an output variable in a way. **The other key input level or on-field statistics which can explain a game result are high scoring efficiency (captured through eFG%) and low turnover percentage**

(TO%). So, a team that can better convert the scoring attempts and not lose ball in their possession through turnovers is more likely to win. Other statistics which have **moderate significance seem to be DRB (Defensive Rebounds), PTS and Age (Average age of team)**. Salary has low R^2 basis the last 3 years data but prior to that, it had a better R^2 and correlation with win-loss %. **Salary and Age are more team-building strategy criteria before the season starts while eFG% and TO% are on-field delivery by**

the team. While Salary and Age have lower R^2 than on-field parameters, **it was worth noting in historical data that most teams delivered an improved win-loss % up waves along with increase in Age and Salary and down waves were usually characterized by decline in Age and Salary.** In other words, an increase in average team age and Salary are in some ways “a necessary but not sufficient” condition for sustained up wave in a team’s win-loss % over the years. Teams keep a mix of experience and young rookie players. Very young teams typically don’t have a high win-loss % as per historical data but if a team has a couple of experienced high-impact players along with a fast-upscaling rookie pool performers and team composition is maintained for few years, that produces a sustained improvement in a team’s win-loss %.

Fig 6-13: Scatter plots for win-loss % with key statistics over 2023-25 period





Running multi-variable linear regression models in MS excel, with all key variables (excluding PD) on 2025 season data, Adjusted R^2 comes to 0.68 as shown below in Fig. 14. Clearly, **only eFG% and TO % seem to be statistically significant**, given low p-values and high t-stat values above ± 2.5 and all others can be removed.

Fig 14: Six-factor regression model output for win-loss %

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.871573							
R Square	0.759639							
Adjusted R Square	0.683161							
Standard Error	0.091672							
Observations	30							
ANOVA								
	df	SS	MS	F	gnificance F			
Regression	7	0.584303	0.083472	9.932729	1.45E-05			
Residual	22	0.184882	0.008404					
Total	29	0.769185						
Coefficients		Standard Err	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.02517	0.869564	-1.17895	0.251014	-2.82853	0.778197	-2.82853	0.778197
eFG%	5.767612	1.453165	3.969	0.00065	2.753932	8.781291	2.753932	8.781291
TO ratio%	-8.426	2.368215	-3.55795	0.001761	-13.3374	-3.51462	-13.3374	-3.51462
Age	-0.01161	0.023358	-0.49686	0.624215	-0.06005	0.036837	-0.06005	0.036837
Salary	4.87E-05	0.001062	0.045913	0.963793	-0.00215	0.00225	-0.00215	0.00225
PTS	-0.004	0.00484	-0.82752	0.416827	-0.01404	0.006032	-0.01404	0.006032
DRB	0.012422	0.012789	0.971242	0.341986	-0.0141	0.038945	-0.0141	0.038945
AST	-0.00959	0.009712	-0.98706	0.334346	-0.02973	0.010555	-0.02973	0.010555

Keeping only top two variables in linear regression model (Fig. 15), Adjusted R^2 comes to 0.7 with a slightly lower standard error of 0.087 as well.

Adding PD, in linear regression model (Fig. 16), expectedly improve Adjusted R^2 significantly to 0.96 with standard error of 0.03. The significance of other variables is miniscule in its comparison. Running this model for entire 20 years combined data, Adjusted R^2 still remains very high at 0.92.

Fig 15: Two-factor regression model output for win-loss %

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.854078							
R Square	0.729448							
Adjusted R Square	0.709408							
Standard Error	0.087793							
Observations	30							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	2	0.561081	0.28054	36.39807	2.16E-08			
Residual	27	0.208104	0.007708					
Total	29	0.769185						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.9435	0.662578	-1.42398	0.165907	-2.303	0.415998	-2.303	0.415998
eFG%	4.457987	0.944828	4.718306	6.49E-05	2.51936	6.396614	2.51936	6.396614
TO %	-8.11368	2.01072	-4.03521	0.000403	-12.2393	-3.98802	-12.2393	-3.98802

$$\text{Win-loss \%} = -0.94 + 4.45 * \text{eFG\%} - 8.11 \text{ TO \%}$$

Fig 16: Three-factor regression model output with PD for win-loss %

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.983314							
R Square	0.966907							
Adjusted R Square	0.963089							
Standard Error	0.031289							
Observations	30							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	3	0.74373	0.24791	253.2217	2.35E-19			
Residual	26	0.025455	0.000979					
Total	29	0.769185						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.327895	0.253826	1.291809	0.207789	-0.19385	0.849643	-0.19385	0.849643
eFG%	0.537378	0.442474	1.214485	0.235478	-0.37214	1.446896	-0.37214	1.446896
TO ratio%	-0.99517	0.886093	-1.1231	0.271658	-2.81656	0.826216	-2.81656	0.826216
PD	0.024328	0.001781	13.6588	2.26E-13	0.020667	0.027989	0.020667	0.027989

$$\text{Win-loss \%} = 0.32 + 0.024 \text{ PD} + 0.53 * \text{eFG\%} - 0.99 \text{ TO \%}$$

b) Forecasting model for next season

Since now we know the critical statistics which determine a team's success in a season, it would be interesting to build a model with predictive ability to forecast a team's win-loss % in next season based on current season statistics. For this analysis, I used historical data with lead-lag implying using 2006 input variables values against 2007 win-loss % and so on. Thus, the new dataset has 19 years of data (starting in 2007 instead of 2006 with 570 excel rows in total instead of 600). The table below, Fig. 17, shows the correlation output. While relative importance of most variables remains the same, absolute

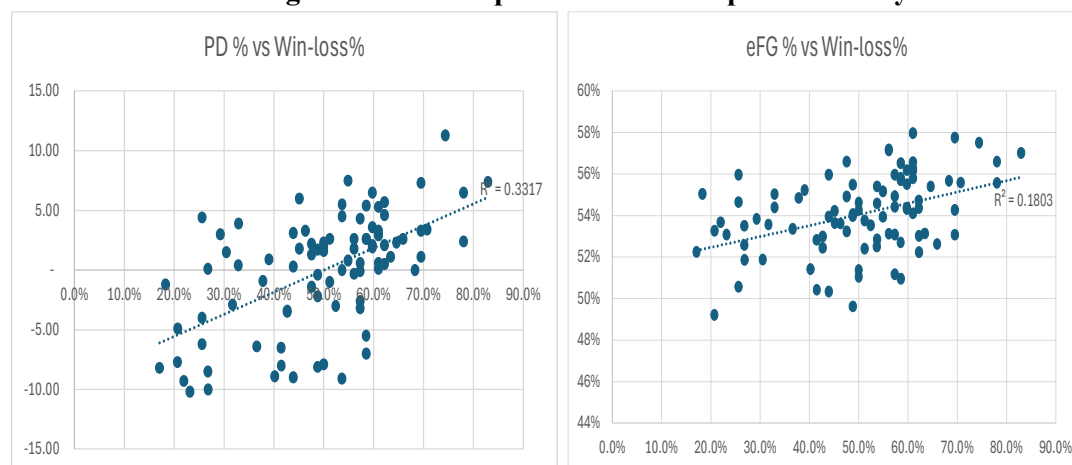
correlations decline, especially with PD. Salary and Age come close to last year's eFG% and PD in correlation as they are the available statistics at start of the season. Previous season's TO% correlation seems to have reduced significantly.

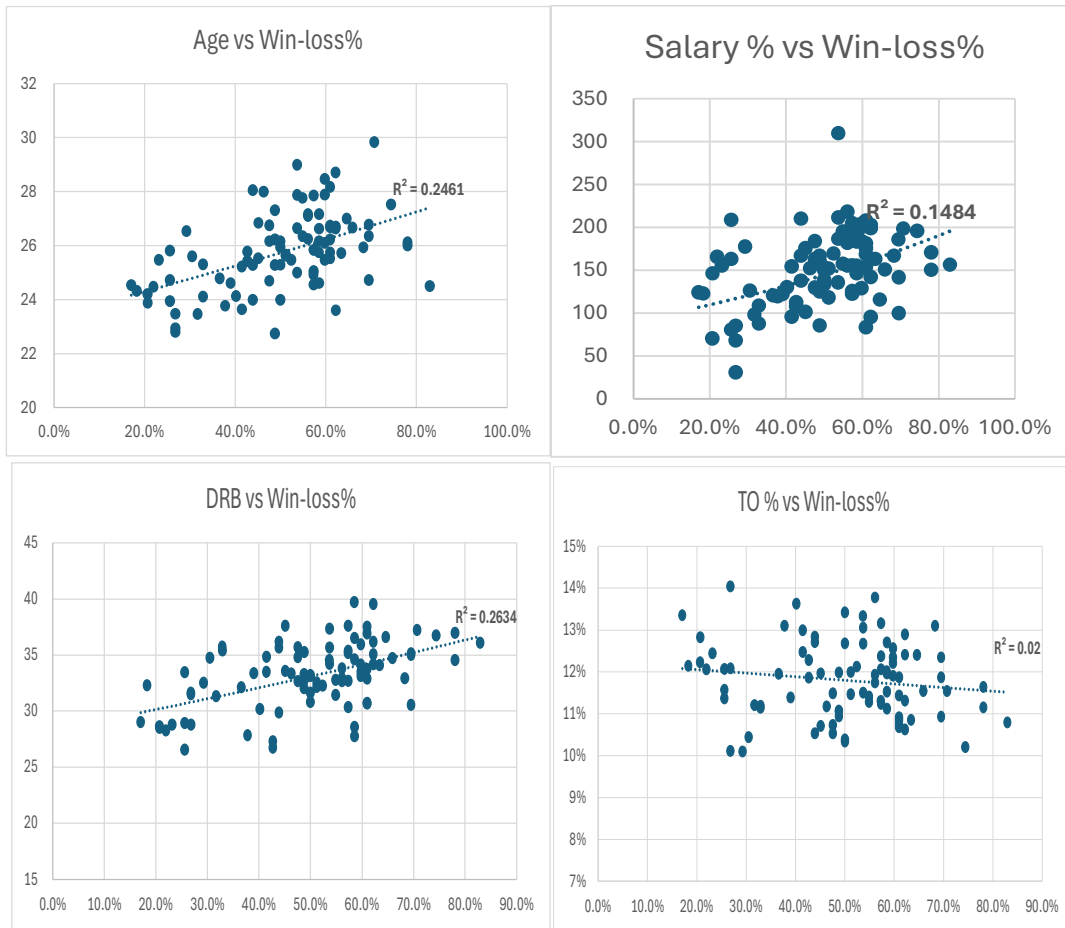
Fig 17: Pearson Correlation coefficient for year 'n' win-loss % against year 'n-1' stats

Year	Salary	Age	FT	FTA	FT%	ORB	DRB	AST	STL	BLK	TOV	PF	PTS	eFG%	TO%	PED
2007	0.27	0.70	-0.09	-0.11	0.13	0.17	0.30	0.16	-0.18	0.27	-0.27	-0.19	0.25	0.24	-0.44	0.55
2008	0.29	0.45	0.01	-0.02	0.09	0.06	0.08	0.06	-0.01	0.25	-0.19	-0.12	0.05	0.16	-0.24	0.53
2009	0.44	0.34	0.29	0.31	-0.02	0.15	0.58	0.51	0.14	0.37	0.02	-0.02	0.51	0.45	-0.22	0.65
2010	0.56	0.51	0.01	0.07	-0.14	-0.21	0.10	0.20	0.22	0.10	-0.15	-0.29	0.01	0.63	0.02	0.71
2011	0.50	0.73	0.13	0.06	0.29	-0.07	0.16	0.16	0.10	0.21	-0.22	-0.26	0.11	0.21	-0.29	0.56
2012	0.53	0.59	0.42	0.38	0.21	-0.20	0.47	0.19	0.13	0.21	0.06	-0.08	0.30	0.58	-0.05	0.76
2013	0.64	0.50	0.34	0.31	0.24	0.17	0.29	0.34	0.41	0.39	0.27	0.23	0.33	0.58	0.12	0.68
2014	0.53	0.65	0.33	0.19	0.43	-0.28	0.05	-0.07	0.11	0.12	-0.03	-0.07	0.03	0.36	0.28	0.59
2015	0.47	0.54	0.25	0.18	0.36	0.13	0.45	0.64	0.18	0.29	0.37	0.17	0.51	0.42	-0.06	0.54
2016	0.66	0.48	0.27	0.17	0.34	0.03	0.43	0.58	0.14	0.27	0.03	0.11	0.54	0.66	-0.29	0.78
2017	0.51	0.46	0.22	0.23	-0.02	0.00	0.28	0.38	0.33	0.37	-0.01	0.16	0.41	0.67	-0.11	0.84
2018	0.61	0.55	0.50	0.47	0.18	0.20	0.41	0.51	0.24	0.44	0.37	0.18	0.59	0.67	0.13	0.62
2019	0.70	0.42	0.26	0.22	0.14	0.15	0.14	0.09	0.36	0.45	-0.01	0.10	0.21	0.46	-0.13	0.69
2020	0.50	0.58	0.36	0.39	-0.08	0.05	0.43	0.49	0.44	0.34	0.35	0.37	0.47	0.37	-0.02	0.58
2021	0.58	0.68	0.24	0.24	0.12	0.31	0.32	0.42	-0.12	0.18	0.24	0.28	0.28	0.28	0.00	0.28
2022	0.55	0.55	0.09	-0.04	0.40	-0.10	0.16	0.51	0.32	-0.20	0.07	0.03	0.40	0.42	-0.14	0.60
2023	0.60	0.60	0.42	0.30	0.33	0.09	0.55	0.30	0.24	0.31	0.10	0.16	0.45	0.37	-0.14	0.58
2024	0.42	0.59	0.39	0.36	0.23	0.01	0.46	0.41	0.09	0.00	0.26	0.18	0.43	0.52	-0.02	0.60
2025	0.28	0.35	0.26	0.31	-0.12	0.17	0.59	0.36	0.36	0.38	-0.01	0.22	0.51	0.46	-0.27	0.59
Average	0.51	0.54	0.25	0.21	0.16	0.04	0.33	0.33	0.18	0.25	0.07	0.06	0.34	0.45	-0.10	0.62

Scatter plots in Fig. 18-23 seem to indicate R^2 of the key variables for building a multi-variable regression model. PD, Age and DRB have the highest R^2 followed by eFG% and Salary.

Fig 18-23: Scatter plots for FY23-25 period for key statistics





Based on above scatter plots, linear regression model for next year's forecast using just 2 variables, Age and Salary gives an Adjusted R^2 of only ~ 0.3 as seen in Fig. 24.

Fig 24: Next year's Two-factor win-loss % forecast regression model's output

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.549							
R Square	0.302							
Adjusted R Square	0.299							
Standard Error	0.127							
Observations	570							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	2	3.948711	1.974356	122.5452	5.86E-45			
Residual	567	9.135073	0.016111					
Total	569	13.08378						
	Coefficient	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.90772	0.095448	-9.51006	5.36E-20	-1.0952	-0.72024	-1.0952	-0.72024
Age	0.051175	0.003645	14.04174	1.18E-38	0.044017	0.058334	0.044017	0.058334
Salary	0.000699	0.000122	5.707805	1.85E-08	0.000458	0.000939	0.000458	0.000939

Adding the other variables, eFG%, PD, Salary and using different combinations, forecasting model's Adjusted R^2 goes only up to 0.44 with minor reduction in standard error as visible in Fig. 25

below. Thus, forecasting the game in next season (Adjusted R^2 of 0.44) has much lower accuracy than deciphering the current season's success formula (Adjusted R^2 of 0.92). This makes the game interesting and difficult to predict, leading to wild swings in team performances across the seasons. This also implies that key team statistics (eFG%, TO%, PD) for the same team are highly variable across seasons which could change due to even minor changes in team composition or opponent's composition. Draft pool, transfer changes and changes in player's form across seasons are some of the plausible reasons for the variations.

Fig 25: Next year's Four-factor win-loss % forecast regression model's output

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.667517							
R Square	0.44558							
Adjusted R Square	0.441654							
Standard Error	0.113308							
Observations	570							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	4	5.829867	1.457467	113.5206	5.47E-71			
Residual	565	7.253917	0.012839					
Total	569	13.08378						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.09162	0.193731	-0.47291	0.63646	-0.47214	0.288904	-0.47214	0.288904
eFG%	-0.34478	0.300788	-1.14627	0.25217	-0.93558	0.246016	-0.93558	0.246016
PD	0.01547	0.001418	10.90805	2.85E-25	0.012685	0.018256	0.012685	0.018256
Age	0.027409	0.003859	7.103108	3.69E-12	0.01983	0.034988	0.01983	0.034988
Salary	0.00052	0.000156	3.333267	0.000915	0.000214	0.000826	0.000214	0.000826

Next year's Win-loss % = -0.09 + 0.015 PD + 0.027 * Age + 0.0005 * Salary - 0.344 * eFG%

c) Team wise consistency trends and Return on Salary

It would be interesting to assess the 30 teams from the perspective of their consistency in the past, total salary spent (biggest cost item) and Return on Salary (Win-loss ratio / Total Salary). Fig. 26 below presents the output based on last 20 years' performance of various teams. Over the past 20 years, teams with highest win-loss % in regular season are BOS (Boston Celtics), SAS (San Antonio Spurs), DEN (Denver Nuggets), DAL (Dallas Mavericks) and MIA (Miami Heats). The worst performing teams have been CHO (Charlotte Hornets), MIN (Minnesota Timberwolves), SAC (Sacramento Kings), WAS (Washington Wizards) and DET (Detroit Pistons). Teams with best RoS (Return on Salary) are SAS, HOU (Houston Rockets), DEN, OKC (Oklahoma City Thunder) and DAL while the worst ones have been MIN, BRK (Brooklyn Nets), NYK (New York Knicks), SAC and WAS. Most consistent teams (teams with lowest standard deviation of win-loss %) have been SAC, IND (Indiana Pacers) and NOP (New Orleans Pelicans) while CLE (Cleveland Cavaliers), GSW (Golden State Warriors) and OKC have been most inconsistent.

Fig 26: Performance of teams in last 20 years (2006-25) based on regular season

Team	Rank on win-loss ratio %	Rank on RoS	Win-Loss %	Total salary	Return on Salary (RoS)	Std Dev
ATL	20	11	49.02%	1,725	28.4	12%
BOS	1	12	59.73%	2,119	28.2	15%
BRK	24	29	44.51%	1,919	23.2	14%
CHO	30	23	39.35%	1,557	25.3	12%
CHI	15	10	50.68%	1,715	29.6	12%
CLE	12	20	52.45%	2,006	26.1	19%
DAL	4	5	57.80%	1,840	31.4	13%
DEN	3	3	58.07%	1,698	34.2	9%
DET	26	17	42.66%	1,611	26.5	16%
GSW	6	18	55.97%	2,114	26.5	18%
HOU	9	2	54.56%	1,594	34.2	15%
IND	13	7	51.35%	1,725	29.8	10%
LAC	8	25	54.82%	2,222	24.7	14%
LAL	11	24	52.61%	2,110	24.9	16%
MEM	18	6	49.53%	1,657	29.9	14%
MIA	5	16	56.11%	2,118	26.5	13%
MIL	14	21	51.33%	2,017	25.4	15%
MIN	29	30	39.56%	1,846	21.4	14%
NOP	21	19	46.31%	1,756	26.4	11%
NYK	25	28	42.77%	1,822	23.5	14%
OKC	7	4	54.85%	1,677	32.7	17%
ORL	23	8	45.61%	1,535	29.7	15%
PHI	22	22	46.19%	1,825	25.3	16%
PHX	17	14	50.02%	1,815	27.6	17%
POR	19	13	49.35%	1,757	28.1	13%
SAC	28	27	40.12%	1,685	23.8	10%
SAS	2	1	59.60%	1,710	34.8	16%
TOR	16	15	50.53%	1,855	27.2	15%
UTA	10	9	52.99%	1,785	29.7	13%
WAS	27	26	41.04%	1,719	23.9	12%

Team performances go through sharp cycles as visible in Fig. 27. Over a 5-year period, wide variations can happen like rankings slipping from 4 to 28 for DET or improving from 30 to 1 for OKC pre and post 2010. **In the past 5 years (2021-25), most improved teams have been DAL, DEN, NYK, PHI (Philadelphia 76ers) and PHX (Phoenix Suns).** The teams which have slipped the most in regular season performance in past 5 years are SAS, HOU, TOR (Toronto Raptors), and WAS. This uncertainty and volatility in teams' performances have made the league so popular and kept it intriguing for audiences over the years.

Fig 27: Ranking of all teams' basis win-loss % in regular season

Team	Overall	2006-10	2011-15	2016-20	2021-25
ATL	20	22	9	15	21
BOS	1	11	13	6	1
BRK	24	14	25	27	18
CHO	30	26	26	19	28
CHI	15	13	5	21	22
CLE	12	5	24	9	13
DAL	4	2	4	21	9
DEN	3	9	6	16	3
DET	26	4	28	18	30
GSW	6	17	18	1	14
HOU	9	7	11	4	25
IND	13	18	10	11	15
LAC	8	24	12	5	4
LAL	11	6	7	28	6
MEM	18	27	8	17	11
MIA	5	15	2	14	8
MIL	14	25	21	12	2
MIN	29	28	29	24	16
NOP	21	12	22	20	23
NYK	25	29	15	30	12
OKC	7	30	1	7	10
ORL	23	10	17	26	24
PHI	22	16	23	24	7
PHX	17	3	19	29	5
POR	19	19	14	8	26
SAC	28	23	30	23	20
SAS	2	1	3	2	27
TOR	16	20	20	3	19
UTA	10	8	16	10	17
WAS	27	21	27	13	29

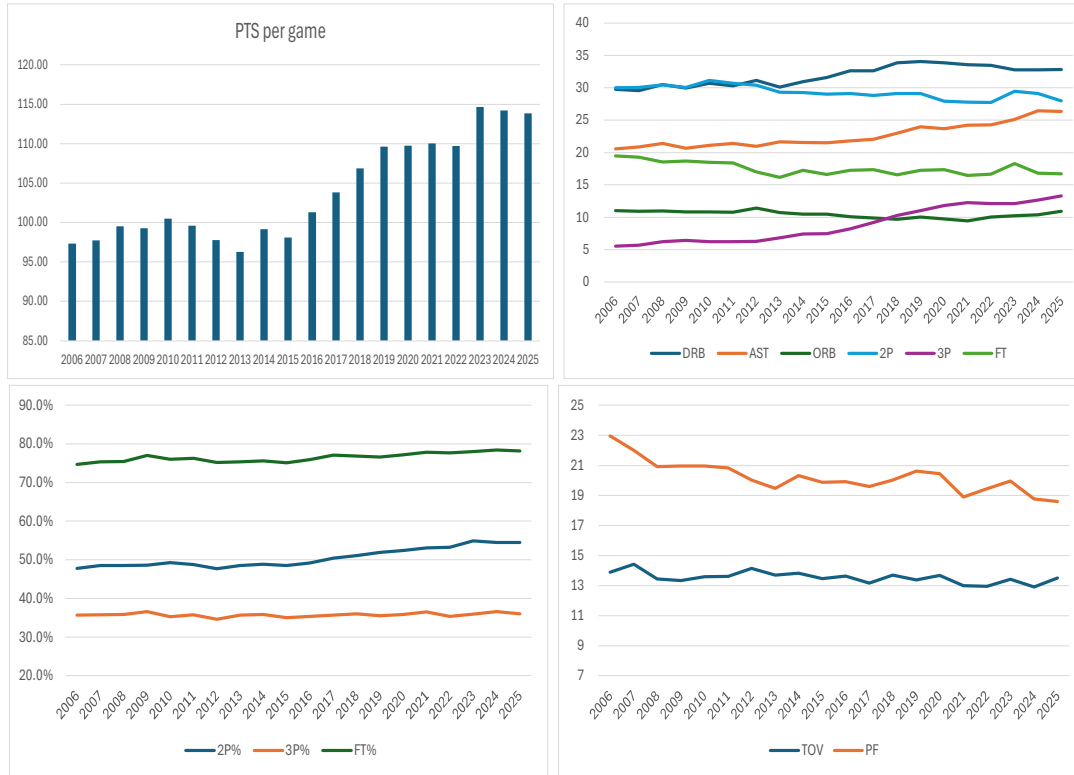
Through analysis of salary variations and win-loss % variation trends in Fig. 28, it is evident that while salary variations have increased across teams in last 5 years, but win-loss % variation has reduced, effectively implying that league has become more competitive despite salary gap widening across franchises.

Fig 28: Coefficient of variation of salary and win-loss % in different time periods

Years	Coefficient of Variation of salary	Coefficient of variation of win-loss %
2006-10	14.8%	22.6%
2011-15	15.6%	22.1%
2016-20	12.2%	23.4%
2021-25	20.5%	18.1%

Analysing combined statistics of all teams over the years in Fig. 29-32 below, the changes in games are quite visible, especially post 2015. NBA games have become more scoring with sharp rise in 3P and AST per game while 2P and FT have reduced. Negative stats like TOV and PF have also reduced over the years, making the game tighter. Shooting efficiency has gone up for 2P and FT while it has been maintained for 3P despite a lot higher 3PA per game.

Fig 29-32: Historical trend of various game statistics of all teams combined in regular season



NBA league total earnings have grown strongly at a CAGR of 7.6% in last 20 years from ~\$ 3.2 bn to \$ 12.5bn (Statista, 2025). This growth did beat the US inflation rate of ~2.5% CAGR over the same period by a wide margin as shown in Fig. 33 below (Federal Reserve Bank of St. Louis, 2026). Cumulative Salary bills of all teams have grown at a CAGR of 6% in the same period resulting in Salary/Revenue ratio falling to ~40% now vs ~50% at the start of the study period (Fig. 34 below). **In last 5 years, league's total salary bill has grown at 10% CAGR. However, higher salary bills alone don't guarantee a team's success** as seen in our analysis in previous section.

Fig 33: NBA total revenue vs salary trends

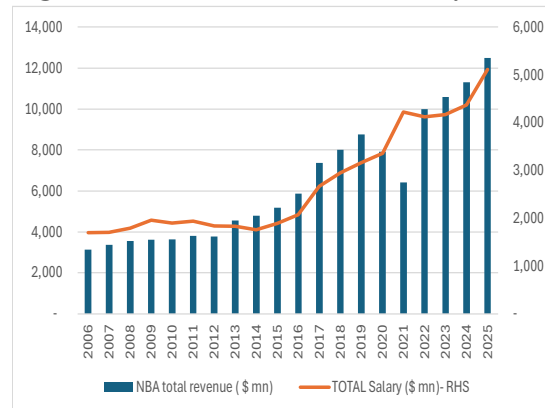
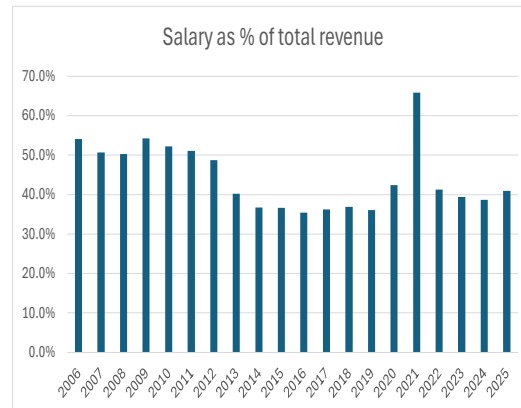


Fig 34: Salary as % of NBA Total revenue



Conclusion

The most revealing statistic determining a team's success or win-loss % in a season is PD (Points Differential or Points scored – Points Allowed) as it's highly correlated (~ 0.95) to win-loss %. High PD captures the offense and defence prowess of a team in a single metric. While PD is an output statistic, in-game statistics such as eFG%, a measure of shooting efficiency, and TO%, a measure of losing away possession, have high correlation to a team's win-loss ratio. Teams with high eFG% and low TO% tend to do better. A regression model using the above two inputs yields an Adjusted R^2 of ~ 0.7 in predicting win-loss %. Just adding PD to this model, takes adjusted R^2 to 0.92 with standard error of 0.03. Thus, it's possible to accurately ascertain a team's performance in a season using these three statistics. However, developing a forecasting model to predict a team's performance in next season based on current season statistics has a much lower accuracy. PD becomes a less powerful factor and a team's Age and Salary bill also has moderate correlation to output. However, none of the regression models can achieve Adjusted R^2 above 0.44 and standard error less than 0.11. PD of previous season and team's Age and Salary at start of the season are the most relevant statistics to forecast the team's win-loss record for the upcoming season. This low predictability and high volatility in a team's performance across seasons has kept the league alive which is visible in sharp changes in team rankings analysed over 5-year buckets. However, some franchises have been far more consistent at the top (BOS and SAS) and bottom of the pack (CHO and SAC) over the years than others. Games have become more scoring with increase in sharp rise in 3P and AST per game even though negative stats like PF, FT and TOV have reduced making the game tighter. NBA revenues have grown at 7.6% CAGR over past 20 years, significantly outpacing inflation. RoS (Return on Salary = win-loss %/ salary bill) can be a useful metric to measure a team management's spending efficiency and it clearly shows that being a top paying franchise doesn't guarantee top ranked performance even though NBA salary bills have grown at 10% CAGR in last 5 years. While salary gaps across teams have increased in last 5 years, but win-loss % difference has narrowed making the league more competitive.

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References

1. National Basketball Association. (2026). Team traditional statistics: 2004–05 to 2024–25 seasons [Data set]. NBA Stats. nba.com
2. Federal Reserve Bank of St. Louis. (2026). Consumer Price Index for All Urban Consumers: All Items in U.S. City Average (CPIAUCSL) [Data set]. FRED, Federal Reserve Bank of St. Louis. <https://fred.stlouisfed.org/series/CPIAUCSL>
3. Sports Reference. (2026). The four factors of basketball success. Basketball-Reference.com. <https://www.basketball-reference.com/about/factors.html>
4. Statista. (2025). Total league revenue of the National Basketball Association from 2005/06 to 2023/24 (in billion U.S. dollars) [Data set]. Statista Research Department. <https://www.statista.com/statistics/193467/total-league-revenue-of-the-nba-since-2005/>