FINDING THE MOST UNDERPAID (AND OVERPAID)

SMART BUYS: NBA

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UNDERSTANDING THE PROBLEM

▸ Motivation:

  ▸ Life as a Knicks fan

ClutchPoints

Presidential candidate Andrew Yang blasts Knicks, says roster is 'composed of 'overpaid role players'

Democratic presidential candidate Andrew Yang had some scathing words for the Knicks on Wednesday, with the entrepreneur blasting his ...

Jul 24, 2019

▸ Analogy:

  ▸ Buying a home, and using Zillow's 'Zestimate' as reference to make offer

▸ Goal:

  ▸ Create player salary 'Zestimate' based on stats

  ▸ Find most overpaid and underpaid players

DATA USED

| BASKETBALL-REFERENCE	ESPN	REALGM
Player Stats per game, per 36 min, per 100 possessions, total stats, advanced stats	Salaries	Salary Cap

▸ Salaries and salary cap increase every year, so new metric was used as **target**:

$$\text{player salary ratio} = \frac{\text{player salary}}{\text{team salary cap}}$$

▸ 2019 season used as **test data**

DATA INSIGHTS

▸ Play style evolution: correlation coefficients increased for offensive stats over seasons

    ▸ Use only recent years for training

▸ 2012 shortened season:

    ▸ Drop Total Stats features

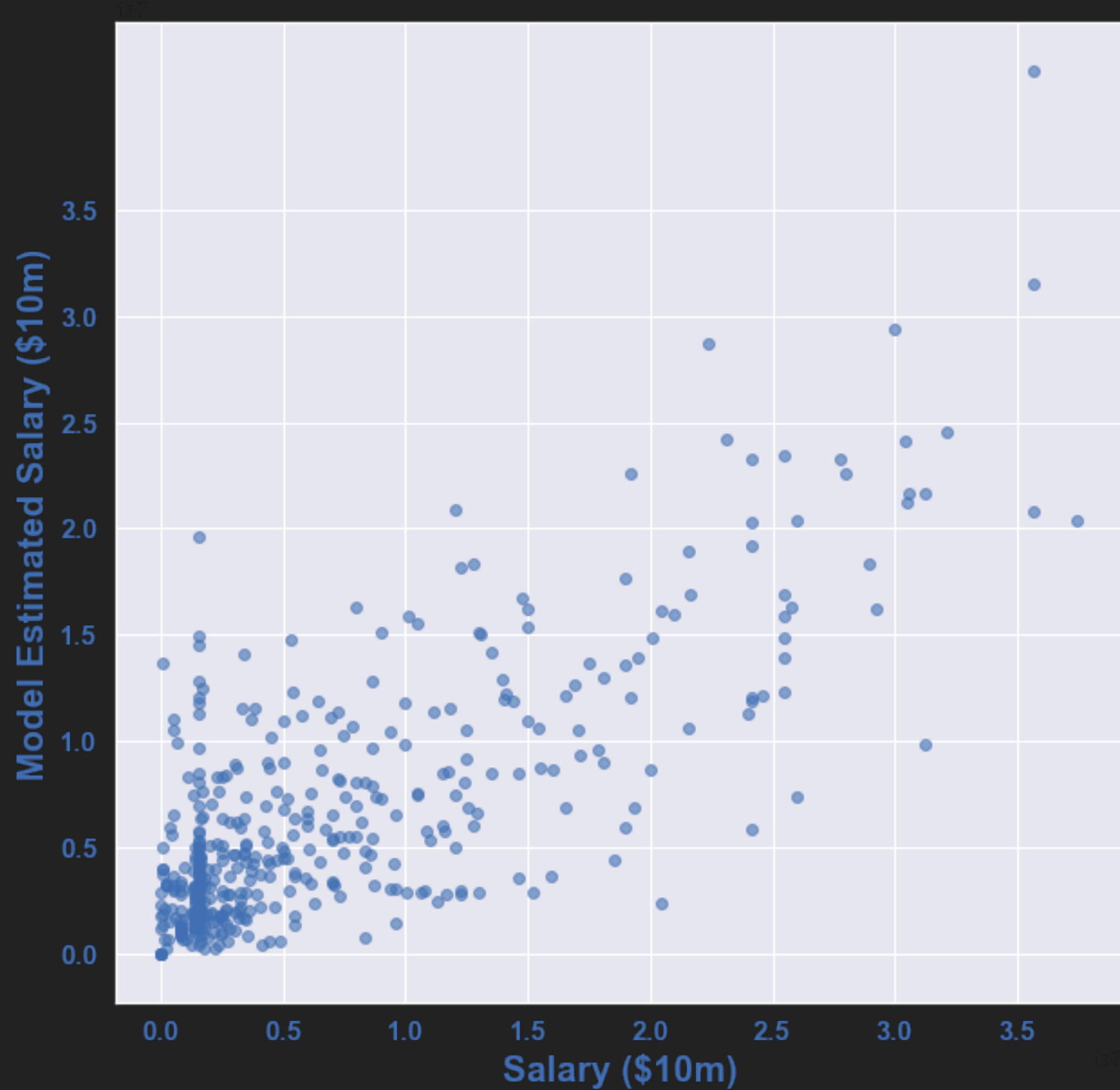▸ Drop features with low feature to salary correlation coefficient
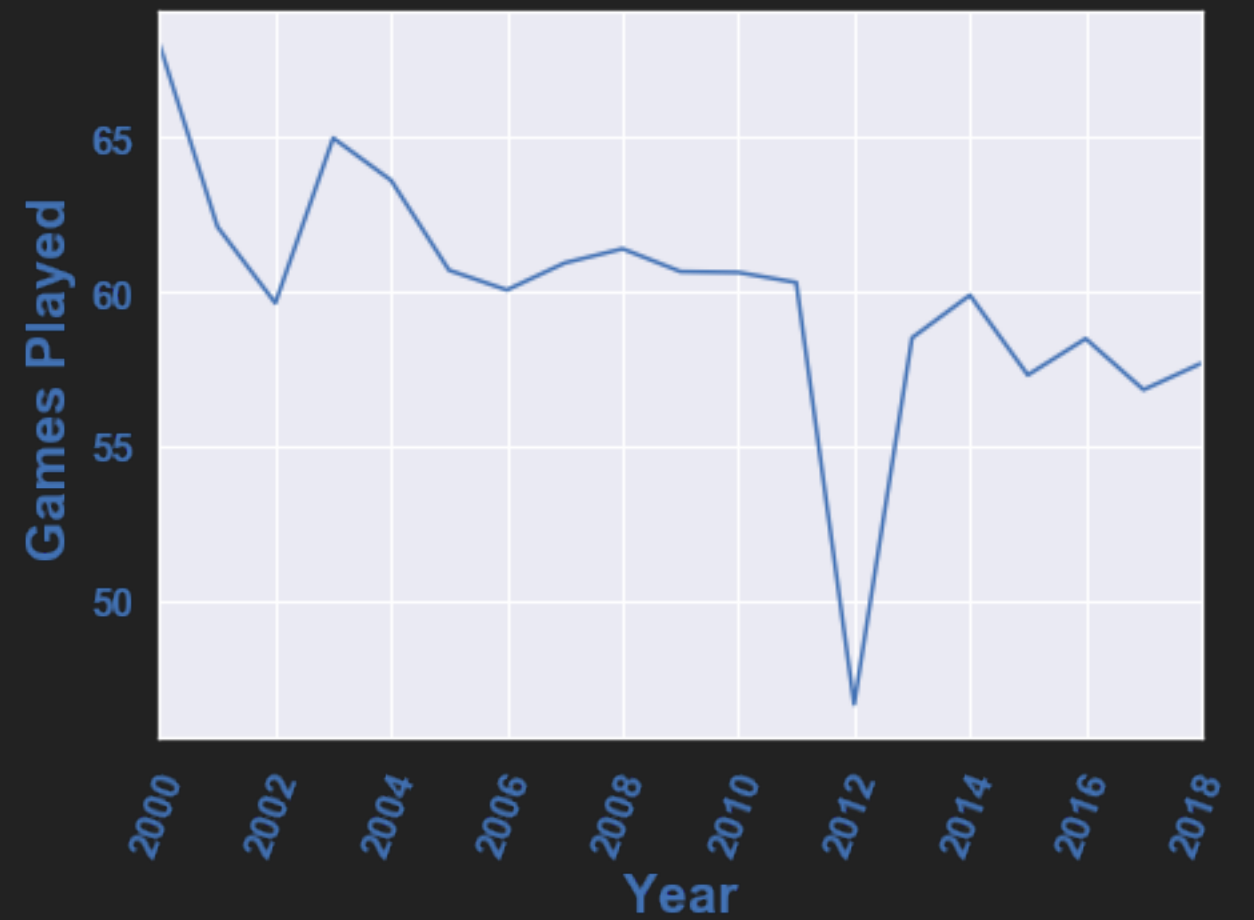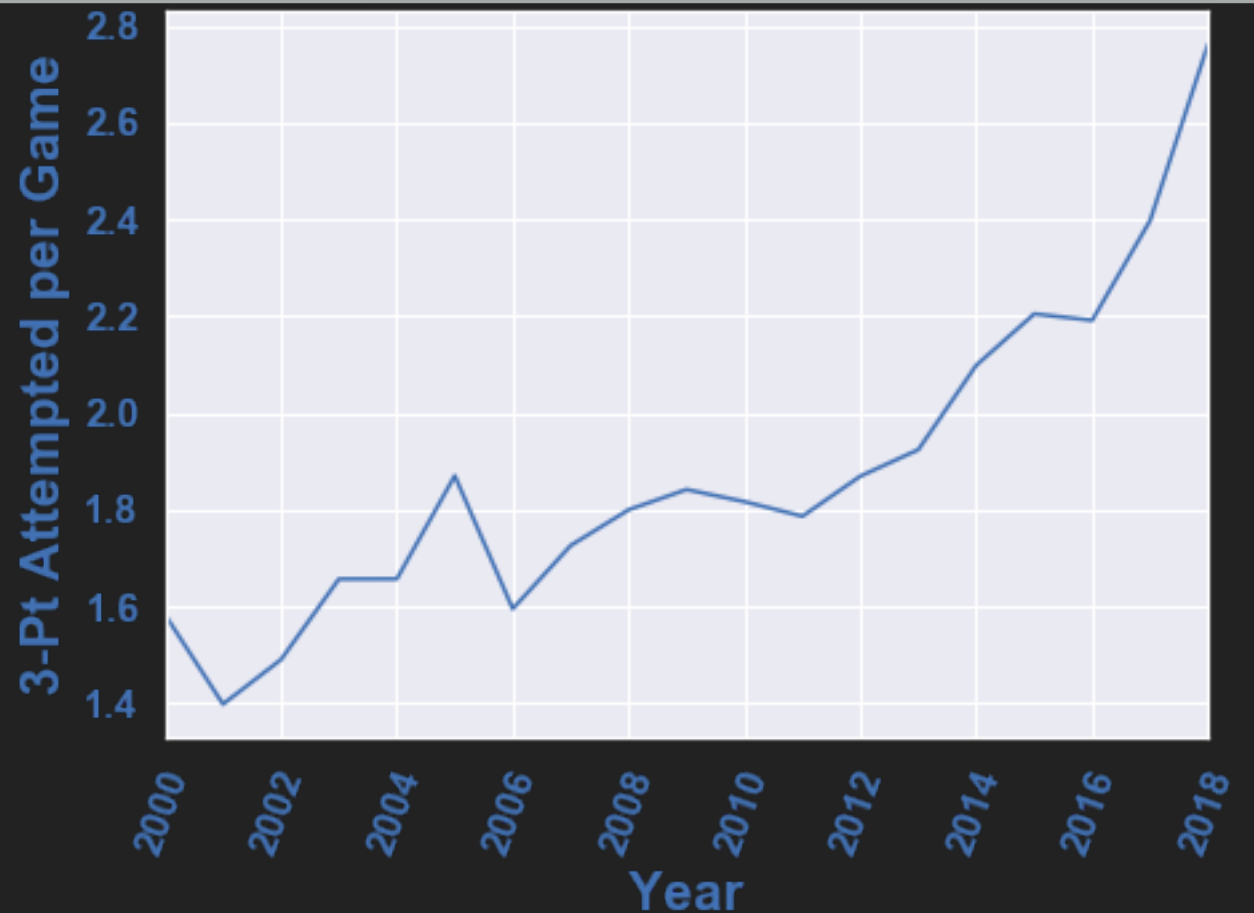
MODEL

▸ Cross-validation split, followed by:

    1. Polynomial Regression

    2. Standardization

    3. Lasso Regularization

▸ Training Data R^2 = 0.665

▸ Test Data R^2 = 0.570

▸ Mean Absolute Error = $3,649,385

    ▸ 0.0358 in terms of salary ratio

MODEL – RESULTS VISUALIZED

Ranking	Name	Salary	Predicted Salary	% Difference from Actual Salary
1	HARRY GILES	$2,207,040	$291,808	656%
2	GORGUI DIENG	$15,170,787	$2,930,291	418%
3	TROY BROWN	$2,749,080	$587,656	368%
4	MICHAEL KIDD-GILCHRIST	$13,000,000	$2,882,129	351%
5	MARCUS SMART	$11,660,716	$2,846,525	310%
6	MIKAL BRIDGES	$3,552,960	$899,560	295%
7	MEYERS LEONARD	$10,595,506	$2,893,924	268%
8	TONY SNELL	$10,807,143	$2,964,165	265%
9	OTTO PORTER	$26,011,913	$7,397,826	252%
10	GEORGE HILL	$19,000,000	$5,947,589	219%
11	GORDON HAYWARD	$31,214,295	$9,827,182	218%
12	NORMAN POWELL	$9,367,200	$3,080,000	204%
13	ELIE OKOBO	$1,238,464	$419,410	195%
14	TYLER JOHNSON	$19,356,932	$6,910,863	180%
15	CRISTIANO FELICIO	$8,740,980	$3,239,129	170%

THE 15 MOST OVERPAID

THE 15 MOST UNDERPAID

Ranking	Name	Salary	Predicted Salary	% Difference from Actual Salary
1	ENES KANTER	$487,109	$10,524,555	2,061%
2	WESLEY MATTHEWS	$512,746	$11,067,147	2,058%
3	TIM FRAZIER	$196,553	$3,257,044	1,557%
4	JEREMY LIN	$487,109	$6,545,834	1,244%
5	MARKIEFF MORRIS	$427,288	$5,603,475	1,211%
6	DWYANE WADE	$1,512,601	$19,626,522	1,198%
7	JAVALE MCGEE	$1,512,601	$14,990,894	891%
8	DERRICK ROSE	$1,512,601	$14,541,888	861%
9	JEFF GREEN	$1,512,601	$12,058,715	697%
10	PASCAL SIAKAM	$1,544,951	$11,787,122	663%
11	KYLE KUZMA	$1,689,840	$12,514,571	641%
12	MALCOLM BROGDON	$1,544,951	$11,294,529	631%
13	NIK STAUSKAS	$504,200	$3,266,528	548%
14	JAMAL CRAWFORD	$1,512,601	$9,666,812	539%
15	TYSON CHANDLER	$1,333,140	$7,509,966	463%

CONCLUSIONS

▸ Offensive-minded players consistently predicted to have higher salaries

▸ Model slightly undervalued players vs. their actual salaries

▸ Underpaid and overpaid lists generally make sense

▸ Predicted salary is a good start to NBA recruit hunting!

FUTURE WORK

▸ Narrow test data down to upcoming free agents

▸ Further feature engineering to emphasize value of defense-oriented players

APPENDIX

Year-By-Year Feature-to-Salary Ratio Correlation Coefficients (truncated)

	year	age	ast	ast_pct	ast_per_g	ast_per_mp	ast_per_poss	blk	blk_pct	blk_per_g	blk_per_mp	blk_per_poss	bpm	dbpm	def_rtg	drb	drb_pct	drb_per_g	drb_per_mp	drb_per_poss	dws	efg_pct	fg	fg2	fg2_pct	fg2_per_g
salary ratio	2000	0.220850	0.300246	0.160633	0.298761	0.121603	0.128468	0.332490	0.133729	0.329152	0.135556	0.133243	0.337007	0.257067	-0.173885	0.561343	0.257652	0.568517	0.240798	0.251098	0.515011	0.127974	0.537152	0.578608	0.199453	0.579503
salary ratio	2001	0.168519	0.325480	0.083644	0.306243	0.037918	0.042074	0.361821	0.194767	0.373586	0.195286	0.194878	0.412633	0.296711	-0.270803	0.515683	0.303083	0.558289	0.303961	0.310030	0.481841	0.152597	0.510779	0.523852	0.166815	0.551516
salary ratio	2002	0.252366	0.337492	0.088350	0.323941	0.057214	0.054728	0.301145	0.114241	0.308881	0.110365	0.111264	0.361435	0.209134	-0.090253	0.491913	0.224351	0.523184	0.227149	0.220808	0.426665	0.128313	0.516158	0.525457	0.129242	0.550975
salary ratio	2003	0.291858	0.253140	0.111361	0.267134	0.071930	0.069198	0.215334	0.076268	0.218215	0.072274	0.067976	0.325748	0.145333	-0.078389	0.377327	0.237412	0.406145	0.230996	0.229408	0.304145	0.165016	0.414784	0.423199	0.139446	0.453906
salary ratio	2004	0.335580	0.274708	0.171121	0.292534	0.131197	0.132809	0.208000	0.078863	0.217601	0.081465	0.092261	0.297513	0.087340	-0.021395	0.296616	0.151683	0.351612	0.169283	0.170384	0.215611	0.086775	0.388342	0.382856	0.087476	0.460367
salary ratio	2005	0.538320	0.228774	0.139509	0.214338	0.111978	0.113197	0.000779	-0.147968	-0.045603	-0.148588	-0.148260	0.085341	-0.155582	0.159628	0.141300	-0.083916	0.128373	-0.073567	-0.074773	0.030981	0.046590	0.294616	0.280655	-0.092506	0.290412
salary ratio	2006	0.308030	0.374262	0.173441	0.372613	0.112300	0.114129	0.375515	0.117331	0.351977	0.122789	0.124112	0.421062	0.187687	-0.127492	0.571058	0.259077	0.611202	0.264100	0.269168	0.511335	0.145200	0.585293	0.578292	0.144565	0.601808
salary ratio	2007	0.331185	0.329696	0.130906	0.329114	0.082050	0.082736	0.404003	0.146404	0.380078	0.149508	0.145017	0.435381	0.221609	-0.136651	0.567232	0.295519	0.606017	0.297139	0.297713	0.469083	0.149950	0.546572	0.544143	0.172004	0.567902
salary ratio	2008	0.253075	0.363513	0.143315	0.350171	0.090235	0.091087	0.389980	0.202816	0.397048	0.203279	0.200369	0.483776	0.299959	-0.191451	0.563273	0.283200	0.593871	0.285115	0.285509	0.529016	0.174883	0.582772	0.567356	0.170794	0.601687
salary ratio	2009	0.357998	0.334328	0.202959	0.378780	0.155013	0.157256	0.329324	0.046311	0.330471	0.045344	0.045527	0.421603	0.207217	-0.156163	0.518678	0.236500	0.586529	0.246269	0.244736	0.484995	0.171217	0.543344	0.535096	0.163959	0.598965
salary ratio	2010	0.329230	0.365949	0.181641	0.383137	0.132619	0.135848	0.370780	0.082520	0.340971	0.074650	0.080820	0.499404	0.246876	-0.236729	0.540732	0.248503	0.577188	0.257438	0.263137	0.530293	0.186583	0.580113	0.567396	0.161520	0.613411
salary ratio	2011	0.374173	0.415651	0.201738	0.401646	0.153333	0.158825	0.337969	0.069220	0.312614	0.069264	0.072656	0.463772	0.201777	-0.208371	0.532516	0.206881	0.533456	0.212321	0.218333	0.540889	0.162679	0.597892	0.582445	0.216011	0.603587
salary ratio	2012	0.300865	0.406219	0.162771	0.364569	0.106519	0.109631	0.377955	0.119801	0.378357	0.120746	0.122797	0.451355	0.207000	-0.241263	0.597855	0.306419	0.639508	0.314941	0.317635	0.572380	0.235151	0.634769	0.642531	0.217065	0.686112
salary ratio	2013	0.286851	0.419815	0.228713	0.421958	0.176460	0.178215	0.379445	0.139165	0.365202	0.139981	0.141934	0.451261	0.232233	-0.198679	0.539921	0.239822	0.573546	0.246465	0.247975	0.528630	0.145570	0.606785	0.611490	0.151480	0.660640
salary ratio	2014	0.318231	0.369827	0.253477	0.419058	0.196013	0.195140	0.314444	0.090925	0.317761	0.091202	0.092281	0.397195	0.194017	-0.159385	0.512349	0.236222	0.581856	0.234320	0.239440	0.453619	0.157162	0.556227	0.580213	0.205044	0.666030
salary ratio	2015	0.260624	0.478117	0.289389	0.474158	0.239566	0.239204	0.277782	0.098056	0.285257	0.096551	0.102968	0.494780	0.186558	-0.150672	0.485516	0.233139	0.553707	0.239661	0.241215	0.435092	0.203324	0.592147	0.586458	0.177293	0.651373
salary ratio	2016	0.216221	0.495134	0.296061	0.497530	0.244591	0.245218	0.405808	0.107042	0.373952	0.113643	0.110921	0.546219	0.245377	-0.198247	0.569155	0.194610	0.606148	0.206191	0.207147	0.574208	0.210048	0.646429	0.648393	0.167922	0.672388
salary ratio	2017	0.279930	0.504967	0.277254	0.480155	0.217918	0.217414	0.323985	0.024731	0.272543	0.024477	0.026407	0.479967	0.169846	-0.161523	0.574669	0.206630	0.575557	0.213201	0.215194	0.550835	0.168935	0.655955	0.632542	0.117328	0.628862
salary ratio	2018	0.312269	0.437280	0.263771	0.430243	0.224800	0.228452	0.347330	0.051170	0.322433	0.049978	0.053399	0.469756	0.149108	-0.158425	0.470326	0.177507	0.507666	0.177953	0.178400	0.488185	0.168455	0.551197	0.504228	0.091891	0.539611