BasketBall_2005 to 2014

July 5, 2023

[1]:
```
#Dear Student,
#
#Welcome to the world of Basketball Data!
#I'm sure you will enjoy this section of the Python Programming course.
#
#Instructions for this dataset:
# Simply copy ALL the lines in this script by pressing
# CTRL+A on Windows or CMND+A on Mac and run the Jupyter cell
# Once you have executed the commands the following objects
# will be created:
# Matrices:
# - Salary
# - Games
# - MinutesPlayed
# - FieldGoals
# - FieldGoalAttempts
# - Points
# Lists:
# - Players
# - Seasons
# Dictionaries:
# - Sdict
# - Pdict
#We will understand these inside the course.
#
#Sincerely,
#Kirill Eremenko
#www.superdatascience.com

#Copyright: These datasets were prepared using publicly available data.
#           However, theses scripts are subject to Copyright Laws.
#           If you wish to use these Python scripts outside of the Python␣
 ↪Programming Course
#           by Kirill Eremenko, you may do so by referencing www.
 ↪superdatascience.com in your work.

#Comments:
```

```
#Seasons are labeled based on the first year in the season
#E.g. the 2012-2013 season is preseneted as simply 2012

#Notes and Corrections to the data:
#Kevin Durant: 2006 - College Data Used
#Kevin Durant: 2005 - Proxied With 2006 Data
#Derrick Rose: 2012 - Did Not Play
#Derrick Rose: 2007 - College Data Used
#Derrick Rose: 2006 - Proxied With 2007 Data
#Derrick Rose: 2005 - Proxied With 2007 Data

#Import numpy
import numpy as np

#Seasons
Seasons =␣
↪["2005","2006","2007","2008","2009","2010","2011","2012","2013","2014"]
Sdict = {"2005":0,"2006":1,"2007":2,"2008":3,"2009":4,"2010":5,"2011":6,"2012":
↪7,"2013":8,"2014":9}

#Players
Players =␣
↪["KobeBryant","JoeJohnson","LeBronJames","CarmeloAnthony","DwightHoward","ChrisBosh","Chris
          "DerrickRose","DwayneWade"]
Pdict = {"KobeBryant":0,"JoeJohnson":1,"LeBronJames":2,"CarmeloAnthony":
↪3,"DwightHoward":4,"ChrisBosh":5,"ChrisPaul":6,
        "KevinDurant":7,"DerrickRose":8,"DwayneWade":9}

#Salaries
KobeBryant_Salary =␣
↪[15946875,17718750,19490625,21262500,23034375,24806250,25244493,27849149,30453805,23500000]
JoeJohnson_Salary =␣
↪[12000000,12744189,13488377,14232567,14976754,16324500,18038573,19752645,21466718,23180790]
LeBronJames_Salary =␣
↪[4621800,5828090,13041250,14410581,15779912,14500000,16022500,17545000,19067500,20644400]
CarmeloAnthony_Salary =␣
↪[3713640,4694041,13041250,14410581,15779912,17149243,18518574,19450000,22407474,22458000]
DwightHoward_Salary =␣
↪[4493160,4806720,6061274,13758000,15202590,16647180,18091770,19536360,20513178,21436271]
ChrisBosh_Salary =␣
↪[3348000,4235220,12455000,14410581,15779912,14500000,16022500,17545000,19067500,20644400]
ChrisPaul_Salary =␣
↪[3144240,3380160,3615960,4574189,13520500,14940153,16359805,17779458,18668431,20068563]
KevinDurant_Salary =␣
↪[0,0,4171200,4484040,4796880,6053663,15506632,16669630,17832627,18995624]
```

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DerrickRose_Salary =␣
↪[0,0,0,4822800,5184480,5546160,6993708,16402500,17632688,18862875]
DwayneWade_Salary =␣
↪[3031920,3841443,13041250,14410581,15779912,14200000,15691000,17182000,18673000,15000000]
#Matrix
Salary = np.array([KobeBryant_Salary, JoeJohnson_Salary, LeBronJames_Salary,␣
↪CarmeloAnthony_Salary, DwightHoward_Salary,
                   ChrisBosh_Salary, ChrisPaul_Salary, KevinDurant_Salary,␣
↪DerrickRose_Salary, DwayneWade_Salary])

#Games
KobeBryant_G = [80,77,82,82,73,82,58,78,6,35]
JoeJohnson_G = [82,57,82,79,76,72,60,72,79,80]
LeBronJames_G = [79,78,75,81,76,79,62,76,77,69]
CarmeloAnthony_G = [80,65,77,66,69,77,55,67,77,40]
DwightHoward_G = [82,82,82,79,82,78,54,76,71,41]
ChrisBosh_G = [70,69,67,77,70,77,57,74,79,44]
ChrisPaul_G = [78,64,80,78,45,80,60,70,62,82]
KevinDurant_G = [35,35,80,74,82,78,66,81,81,27]
DerrickRose_G = [40,40,40,81,78,81,39,0,10,51]
DwayneWade_G = [75,51,51,79,77,76,49,69,54,62]
#Matrix
Games = np.array([KobeBryant_G, JoeJohnson_G, LeBronJames_G, CarmeloAnthony_G,␣
↪DwightHoward_G, ChrisBosh_G, ChrisPaul_G,
                  KevinDurant_G, DerrickRose_G, DwayneWade_G])

#Minutes Played
KobeBryant_MP = [3277,3140,3192,2960,2835,2779,2232,3013,177,1207]
JoeJohnson_MP = [3340,2359,3343,3124,2886,2554,2127,2642,2575,2791]
LeBronJames_MP = [3361,3190,3027,3054,2966,3063,2326,2877,2902,2493]
CarmeloAnthony_MP = [2941,2486,2806,2277,2634,2751,1876,2482,2982,1428]
DwightHoward_MP = [3021,3023,3088,2821,2843,2935,2070,2722,2396,1223]
ChrisBosh_MP = [2751,2658,2425,2928,2526,2795,2007,2454,2531,1556]
ChrisPaul_MP = [2808,2353,3006,3002,1712,2880,2181,2335,2171,2857]
KevinDurant_MP = [1255,1255,2768,2885,3239,3038,2546,3119,3122,913]
DerrickRose_MP = [1168,1168,1168,3000,2871,3026,1375,0,311,1530]
DwayneWade_MP = [2892,1931,1954,3048,2792,2823,1625,2391,1775,1971]
#Matrix
MinutesPlayed = np.array([KobeBryant_MP, JoeJohnson_MP, LeBronJames_MP,␣
↪CarmeloAnthony_MP, DwightHoward_MP, ChrisBosh_MP,
                          ChrisPaul_MP, KevinDurant_MP, DerrickRose_MP,␣
↪DwayneWade_MP])

#Field Goals
KobeBryant_FG = [978,813,775,800,716,740,574,738,31,266]
JoeJohnson_FG = [632,536,647,620,635,514,423,445,462,446]
```

```
LeBronJames_FG = [875,772,794,789,768,758,621,765,767,624]
CarmeloAnthony_FG = [756,691,728,535,688,684,441,669,743,358]
DwightHoward_FG = [468,526,583,560,510,619,416,470,473,251]
ChrisBosh_FG = [549,543,507,615,600,524,393,485,492,343]
ChrisPaul_FG = [407,381,630,631,314,430,425,412,406,568]
KevinDurant_FG = [306,306,587,661,794,711,643,731,849,238]
DerrickRose_FG = [208,208,208,574,672,711,302,0,58,338]
DwayneWade_FG = [699,472,439,854,719,692,416,569,415,509]
#Matrix
FieldGoals  = np.array([KobeBryant_FG, JoeJohnson_FG, LeBronJames_FG,␣
 ↪CarmeloAnthony_FG, DwightHoward_FG, ChrisBosh_FG,
                        ChrisPaul_FG, KevinDurant_FG, DerrickRose_FG,␣
 ↪DwayneWade_FG])

#Field Goal Attempts
KobeBryant_FGA = [2173,1757,1690,1712,1569,1639,1336,1595,73,713]
JoeJohnson_FGA = [1395,1139,1497,1420,1386,1161,931,1052,1018,1025]
LeBronJames_FGA = [1823,1621,1642,1613,1528,1485,1169,1354,1353,1279]
CarmeloAnthony_FGA = [1572,1453,1481,1207,1502,1503,1025,1489,1643,806]
DwightHoward_FGA = [881,873,974,979,834,1044,726,813,800,423]
ChrisBosh_FGA = [1087,1094,1027,1263,1158,1056,807,907,953,745]
ChrisPaul_FGA = [947,871,1291,1255,637,928,890,856,870,1170]
KevinDurant_FGA = [647,647,1366,1390,1668,1538,1297,1433,1688,467]
DerrickRose_FGA = [436,436,436,1208,1373,1597,695,0,164,835]
DwayneWade_FGA = [1413,962,937,1739,1511,1384,837,1093,761,1084]
#Matrix
FieldGoalAttempts = np.array([KobeBryant_FGA, JoeJohnson_FGA, LeBronJames_FGA,␣
 ↪CarmeloAnthony_FGA, DwightHoward_FGA,
                               ChrisBosh_FGA, ChrisPaul_FGA, KevinDurant_FGA,␣
 ↪DerrickRose_FGA, DwayneWade_FGA])

#Points
KobeBryant_PTS = [2832,2430,2323,2201,1970,2078,1616,2133,83,782]
JoeJohnson_PTS = [1653,1426,1779,1688,1619,1312,1129,1170,1245,1154]
LeBronJames_PTS = [2478,2132,2250,2304,2258,2111,1683,2036,2089,1743]
CarmeloAnthony_PTS = [2122,1881,1978,1504,1943,1970,1245,1920,2112,966]
DwightHoward_PTS = [1292,1443,1695,1624,1503,1784,1113,1296,1297,646]
ChrisBosh_PTS = [1572,1561,1496,1746,1678,1438,1025,1232,1281,928]
ChrisPaul_PTS = [1258,1104,1684,1781,841,1268,1189,1186,1185,1564]
KevinDurant_PTS = [903,903,1624,1871,2472,2161,1850,2280,2593,686]
DerrickRose_PTS = [597,597,597,1361,1619,2026,852,0,159,904]
DwayneWade_PTS = [2040,1397,1254,2386,2045,1941,1082,1463,1028,1331]
#Matrix
Points = np.array([KobeBryant_PTS, JoeJohnson_PTS, LeBronJames_PTS,␣
 ↪CarmeloAnthony_PTS, DwightHoward_PTS, ChrisBosh_PTS,
                    ChrisPaul_PTS, KevinDurant_PTS, DerrickRose_PTS,␣
 ↪DwayneWade_PTS])
```

```
#Free Throws
KobeBryant_FT = [696,667,623,483,439,483,381,525,18,196]
JoeJohnson_FT = [261,235,316,299,220,195,158,132,159,141]
LeBronJames_FT = [601,489,549,594,593,503,387,403,439,375]
CarmeloAnthony_FT = [573,459,464,371,508,507,295,425,459,189]
DwightHoward_FT = [356,390,529,504,483,546,281,355,349,143]
ChrisBosh_FT = [474,463,472,504,470,384,229,241,223,179]
ChrisPaul_FT = [394,292,332,455,161,337,260,286,295,289]
KevinDurant_FT = [209,209,391,452,756,794,431,679,703,146]
DerrickRose_FT = [146,146,146,197,259,476,194,0,27,152]
DwayneWade_FT = [629,432,354,590,534,494,235,308,189,284]

#Matrix
FreeThrows = np.array([KobeBryant_FT, JoeJohnson_FT, LeBronJames_FT,␣
↪CarmeloAnthony_FT, DwightHoward_FT, ChrisBosh_FT,
                  ChrisPaul_FT, KevinDurant_FT, DerrickRose_FT, DwayneWade_FT])

#Free Throws Attempts
KobeBryant_FTA = [819,768,742,564,541,583,451,626,21,241]
JoeJohnson_FTA = [330,314,379,362,269,243,186,161,195,176]
LeBronJames_FTA = [814,701,771,762,773,663,502,535,585,528]
CarmeloAnthony_FTA = [709,568,590,468,612,605,367,512,541,237]
DwightHoward_FTA = [598,666,897,849,816,916,572,721,638,271]
ChrisBosh_FTA = [581,590,559,617,590,471,279,302,272,232]
ChrisPaul_FTA = [465,357,390,524,190,384,302,323,345,321]
KevinDurant_FTA = [156,256,448,524,840,675,501,750,805,171]
DerrickRose_FTA = [205,205,205,250,338,555,239,0,32,187]
DwayneWade_FTA = [803,535,467,771,702,652,297,425,258,370]

FreeThrowsAttempts = np.array([KobeBryant_FTA, JoeJohnson_FTA, LeBronJames_FTA,␣
↪CarmeloAnthony_FTA, DwightHoward_FTA, ChrisBosh_FTA,
                  ChrisPaul_FTA, KevinDurant_FTA, DerrickRose_FTA,␣
↪DwayneWade_FTA])
```

[2]:
```
import numpy as np
mydata=np.arange(0,20)
print(mydata)
```

```
[ 0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19]
```

[3]:
```
mart1=np.reshape(mydata,(5,4), order='c')
```

[4]:
```
print(mart1)
```

```
[[ 0  1  2  3]
 [ 4  5  6  7]
 [ 8  9 10 11]
```

```
 [12 13 14 15]
 [16 17 18 19]]
```

[5]:
```
mart2=np.reshape(mydata,(5,4),order='F')
```

[6]:
```
print(mart2)
```

```
[[ 0  5 10 15]
 [ 1  6 11 16]
 [ 2  7 12 17]
 [ 3  8 13 18]
 [ 4  9 14 19]]
```

[7]:
```
mart1[2,2]
```

[7]:
```
10
```

[8]:
```
mart2[0,2]
```

[8]:
```
10
```

[9]:
```
r1=[1,2,3]
r2=['A','B','C']
r3=[1.1,2.2,3.3]
[r1,r2,r3]
```

[9]:
```
[[1, 2, 3], ['A', 'B', 'C'], [1.1, 2.2, 3.3]]
```

[10]:
```
arraydata=np.array([r1,r2,r3])
```

[11]:
```
print(arraydata)
```

```
[['1' '2' '3']
 ['A' 'B' 'C']
 ['1.1' '2.2' '3.3']]
```

[12]:
```
print(Games)
```

```
[[80 77 82 82 73 82 58 78  6 35]
 [82 57 82 79 76 72 60 72 79 80]
 [79 78 75 81 76 79 62 76 77 69]
 [80 65 77 66 69 77 55 67 77 40]
 [82 82 82 79 82 78 54 76 71 41]
 [70 69 67 77 70 77 57 74 79 44]
 [78 64 80 78 45 80 60 70 62 82]
 [35 35 80 74 82 78 66 81 81 27]
 [40 40 40 81 78 81 39  0 10 51]
 [75 51 51 79 77 76 49 69 54 62]]
```

[13]:
```
print(Salary)
```

```
[[15946875 17718750 19490625 21262500 23034375 24806250 25244493 27849149
  30453805 23500000]
 [12000000 12744189 13488377 14232567 14976754 16324500 18038573 19752645
  21466718 23180790]
 [ 4621800  5828090 13041250 14410581 15779912 14500000 16022500 17545000
  19067500 20644400]
 [ 3713640  4694041 13041250 14410581 15779912 17149243 18518574 19450000
  22407474 22458000]
 [ 4493160  4806720  6061274 13758000 15202590 16647180 18091770 19536360
  20513178 21436271]
 [ 3348000  4235220 12455000 14410581 15779912 14500000 16022500 17545000
  19067500 20644400]
 [ 3144240  3380160  3615960  4574189 13520500 14940153 16359805 17779458
  18668431 20068563]
 [       0        0  4171200  4484040  4796880  6053663 15506632 16669630
  17832627 18995624]
 [       0        0        0  4822800  5184480  5546160  6993708 16402500
  17632688 18862875]
 [ 3031920  3841443 13041250 14410581 15779912 14200000 15691000 17182000
  18673000 15000000]]
```

[14]:
```
print(Points)
```

```
[[2832 2430 2323 2201 1970 2078 1616 2133   83  782]
 [1653 1426 1779 1688 1619 1312 1129 1170 1245 1154]
 [2478 2132 2250 2304 2258 2111 1683 2036 2089 1743]
 [2122 1881 1978 1504 1943 1970 1245 1920 2112  966]
 [1292 1443 1695 1624 1503 1784 1113 1296 1297  646]
 [1572 1561 1496 1746 1678 1438 1025 1232 1281  928]
 [1258 1104 1684 1781  841 1268 1189 1186 1185 1564]
 [ 903  903 1624 1871 2472 2161 1850 2280 2593  686]
 [ 597  597  597 1361 1619 2026  852    0  159  904]
 [2040 1397 1254 2386 2045 1941 1082 1463 1028 1331]]
```

[15]:
```
print(Sdict)
```

```
{'2005': 0, '2006': 1, '2007': 2, '2008': 3, '2009': 4, '2010': 5, '2011': 6,
'2012': 7, '2013': 8, '2014': 9}
```

[16]:
```
print(Pdict)
```

```
{'KobeBryant': 0, 'JoeJohnson': 1, 'LeBronJames': 2, 'CarmeloAnthony': 3,
'DwightHoward': 4, 'ChrisBosh': 5, 'ChrisPaul': 6, 'KevinDurant': 7,
'DerrickRose': 8, 'DwayneWade': 9}
```

[17]:
```
Pdict["KobeBryant"]
```

[17]: 0

[18]:
```
Sdict["2012"]
```

[18]:
```
7
```

[19]:
```
Salary[0]
```

[19]:
```
array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
       25244493, 27849149, 30453805, 23500000])
```

[20]:
```
Salary[7]
```

[20]:
```
array([       0,        0,  4171200,  4484040,  4796880,  6053663,
       15506632, 16669630, 17832627, 18995624])
```

[21]:
```
Salary[Pdict["KobeBryant"]]
```

[21]:
```
array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
       25244493, 27849149, 30453805, 23500000])
```

[22]:
```
Salary[Sdict["2012"]]
```

[22]:
```
array([       0,        0,  4171200,  4484040,  4796880,  6053663,
       15506632, 16669630, 17832627, 18995624])
```

[23]:
```
Salary[Pdict["KobeBryant"]][Sdict["2012"]]
```

[23]:
```
27849149
```

[24]:
```
FieldGoals
```

[24]:
```
array([[978, 813, 775, 800, 716, 740, 574, 738,  31, 266],
       [632, 536, 647, 620, 635, 514, 423, 445, 462, 446],
       [875, 772, 794, 789, 768, 758, 621, 765, 767, 624],
       [756, 691, 728, 535, 688, 684, 441, 669, 743, 358],
       [468, 526, 583, 560, 510, 619, 416, 470, 473, 251],
       [549, 543, 507, 615, 600, 524, 393, 485, 492, 343],
       [407, 381, 630, 631, 314, 430, 425, 412, 406, 568],
       [306, 306, 587, 661, 794, 711, 643, 731, 849, 238],
       [208, 208, 208, 574, 672, 711, 302,   0,  58, 338],
       [699, 472, 439, 854, 719, 692, 416, 569, 415, 509]])
```

[25]:
```
Games
```

[25]:
```
array([[80, 77, 82, 82, 73, 82, 58, 78,  6, 35],
       [82, 57, 82, 79, 76, 72, 60, 72, 79, 80],
       [79, 78, 75, 81, 76, 79, 62, 76, 77, 69],
       [80, 65, 77, 66, 69, 77, 55, 67, 77, 40],
       [82, 82, 82, 79, 82, 78, 54, 76, 71, 41],
```

```
        [70, 69, 67, 77, 70, 77, 57, 74, 79, 44],
        [78, 64, 80, 78, 45, 80, 60, 70, 62, 82],
        [35, 35, 80, 74, 82, 78, 66, 81, 81, 27],
        [40, 40, 40, 81, 78, 81, 39,  0, 10, 51],
        [75, 51, 51, 79, 77, 76, 49, 69, 54, 62]])
```

[26]:
```
import warnings
warnings.filterwarnings("ignore")
FieldGoals/Games
```

[26]:
```
array([[12.225     , 10.55844156,  9.45121951,  9.75609756,  9.80821918,
         9.02439024,  9.89655172,  9.46153846,  5.16666667,  7.6       ],
       [ 7.70731707,  9.40350877,  7.8902439 ,  7.84810127,  8.35526316,
         7.13888889,  7.05      ,  6.18055556,  5.84810127,  5.575     ],
       [11.07594937,  9.8974359 , 10.58666667,  9.74074074, 10.10526316,
         9.59493671, 10.01612903, 10.06578947,  9.96103896,  9.04347826],
       [ 9.45      , 10.63076923,  9.45454545,  8.10606061,  9.97101449,
         8.88311688,  8.01818182,  9.98507463,  9.64935065,  8.95      ],
       [ 5.70731707,  6.41463415,  7.1097561 ,  7.08860759,  6.2195122 ,
         7.93589744,  7.7037037 ,  6.18421053,  6.66197183,  6.12195122],
       [ 7.84285714,  7.86956522,  7.56716418,  7.98701299,  8.57142857,
         6.80519481,  6.89473684,  6.55405405,  6.2278481 ,  7.79545455],
       [ 5.21794872,  5.953125  ,  7.875     ,  8.08974359,  6.97777778,
         5.375     ,  7.08333333,  5.88571429,  6.5483871 ,  6.92682927],
       [ 8.74285714,  8.74285714,  7.3375    ,  8.93243243,  9.68292683,
         9.11538462,  9.74242424,  9.02469136, 10.48148148,  8.81481481],
       [ 5.2       ,  5.2       ,  5.2       ,  7.08641975,  8.61538462,
         8.77777778,  7.74358974,         nan,  5.8       ,  6.62745098],
       [ 9.32      ,  9.25490196,  8.60784314, 10.81012658,  9.33766234,
         9.10526316,  8.48979592,  8.24637681,  7.68518519,  8.20967742]])
```

[27]:
```
FieldGoalPerGames=np.matrix.round(FieldGoals/Games)
```

[28]:
```
print(FieldGoalPerGames)
```

```
[[12. 11.  9. 10. 10.  9. 10.  9.  5.  8.]
 [ 8.  9.  8.  8.  8.  7.  7.  6.  6.  6.]
 [11. 10. 11. 10. 10. 10. 10. 10. 10.  9.]
 [ 9. 11.  9.  8. 10.  9.  8. 10. 10.  9.]
 [ 6.  6.  7.  7.  6.  8.  8.  6.  7.  6.]
 [ 8.  8.  8.  8.  9.  7.  7.  7.  6.  8.]
 [ 5.  6.  8.  8.  7.  5.  7.  6.  7.  7.]
 [ 9.  9.  7.  9. 10.  9. 10.  9. 10.  9.]
 [ 5.  5.  5.  7.  9.  9.  8. nan  6.  7.]
 [ 9.  9.  9. 11.  9.  9.  8.  8.  8.  8.]]
```

[29]:
```
FieldGoalPerGames[Pdict["KobeBryant"]][Sdict["2013"]]
```

[29]: 5.0

[30]:
```
MinutesPlayedPerGame=np.matrix.round(MinutesPlayed/Games,2)
```

[31]:
```
print(MinutesPlayedPerGame)
```

```
[[40.96 40.78 38.93 36.1  38.84 33.89 38.48 38.63 29.5  34.49]
 [40.73 41.39 40.77 39.54 37.97 35.47 35.45 36.69 32.59 34.89]
 [42.54 40.9  40.36 37.7  39.03 38.77 37.52 37.86 37.69 36.13]
 [36.76 38.25 36.44 34.5  38.17 35.73 34.11 37.04 38.73 35.7 ]
 [36.84 36.87 37.66 35.71 34.67 37.63 38.33 35.82 33.75 29.83]
 [39.3  38.52 36.19 38.03 36.09 36.3  35.21 33.16 32.04 35.36]
 [36.   36.77 37.58 38.49 38.04 36.   36.35 33.36 35.02 34.84]
 [35.86 35.86 34.6  38.99 39.5  38.95 38.58 38.51 38.54 33.81]
 [29.2  29.2  29.2  37.04 36.81 37.36 35.26   nan 31.1  30.  ]
 [38.56 37.86 38.31 38.58 36.26 37.14 33.16 34.65 32.87 31.79]]
```

[32]:
```
AvgSalaryPerGame=np.matrix.round(Salary/Games,2)
```

[33]:
```
print(AvgSalaryPerGame)
```

```
[[ 199335.94  230113.64  237690.55  259298.78  315539.38  302515.24
   435249.88  357040.37 5075634.17  671428.57]
 [ 146341.46  223582.26  164492.4   180159.08  197062.55  226729.17
   300642.88  274342.29  271730.61  289759.88]
 [  58503.8    74719.1   173883.33  177908.41  207630.42  183544.3
   258427.42  230855.26  247629.87  299194.2 ]
 [  46420.5    72216.02  169366.88  218342.14  228694.38  222717.44
   336701.35  290298.51  291006.16  561450.  ]
 [  54794.63   58618.54   73917.98  174151.9   185397.44  213425.38
   335032.78  257057.37  288918.    522835.88]
 [  47828.57   61380.    185895.52  187150.4   225427.31  188311.69
   281096.49  237094.59  241360.76  469190.91]
 [  40310.77   52815.     45199.5    58643.45  300455.56  186751.91
   272663.42  253992.26  301103.73  244738.57]
 [      0.         0.     52140.     60595.14   58498.54   77611.06
   234948.97  205797.9   220155.89  703541.63]
 [      0.         0.         0.     59540.74   66467.69   68471.11
   179325.85        inf 1763268.8   369860.29]
 [  40425.6    75322.41  255710.78  182412.42  204933.92  186842.11
   320224.49  249014.49  345796.3   241935.48]]
```

[34]:
```
AccuracyPerGame=np.matrix.round(FieldGoals/FieldGoalAttempts,2)*100
```

[35]:
```
print(AccuracyPerGame)
```

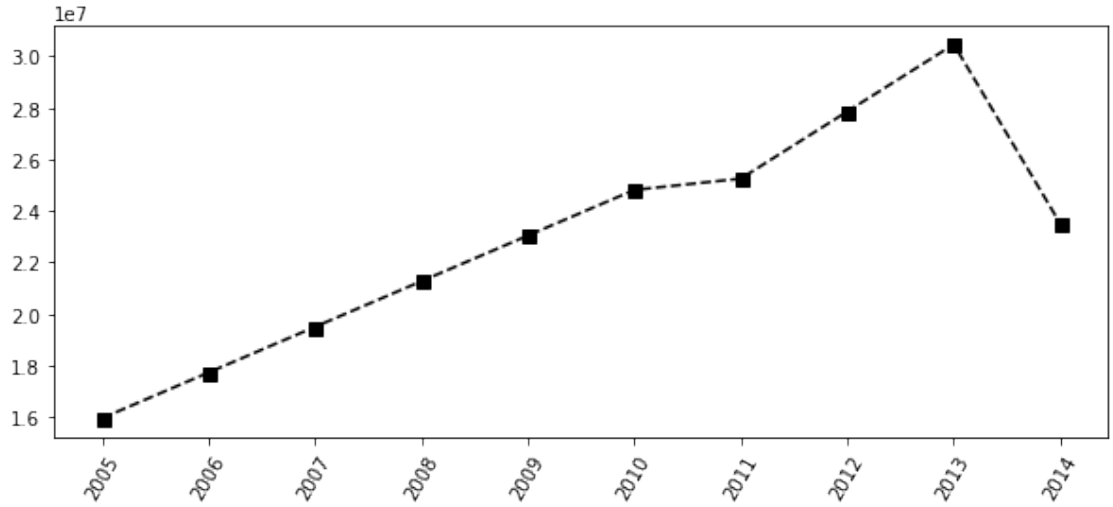
```
[[45. 46. 46. 47. 46. 45. 43. 46. 42. 37.]
 [45. 47. 43. 44. 46. 44. 45. 42. 45. 44.]
 [48. 48. 48. 49. 50. 51. 53. 56. 57. 49.]
```

```
[48. 48. 49. 44. 46. 46. 43. 45. 45. 44.]
[53. 60. 60. 57. 61. 59. 57. 58. 59. 59.]
[51. 50. 49. 49. 52. 50. 49. 53. 52. 46.]
[43. 44. 49. 50. 49. 46. 48. 48. 47. 49.]
[47. 47. 43. 48. 48. 46. 50. 51. 50. 51.]
[48. 48. 48. 48. 49. 45. 43. nan 35. 40.]
[49. 49. 47. 49. 48. 50. 50. 52. 55. 47.]]
```

1 Virtualization

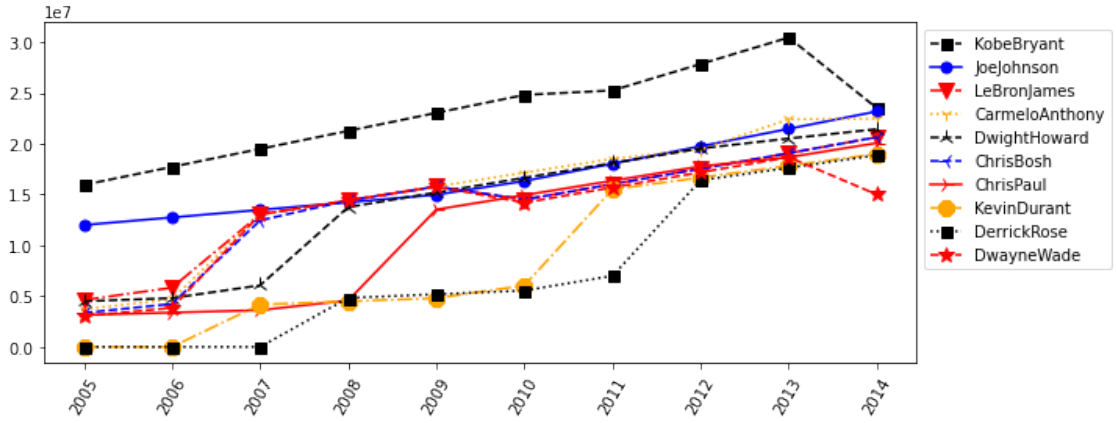
[36]:
```
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
plt.rcParams['figure.figsize']=10,4
```

[37]:
```
plt.plot(Salary[0],c='Black',ls='--',marker='s',ms=7,label=Players[0])
plt.xticks(list(range(0,10)),Seasons,rotation=60)
plt.show()
```



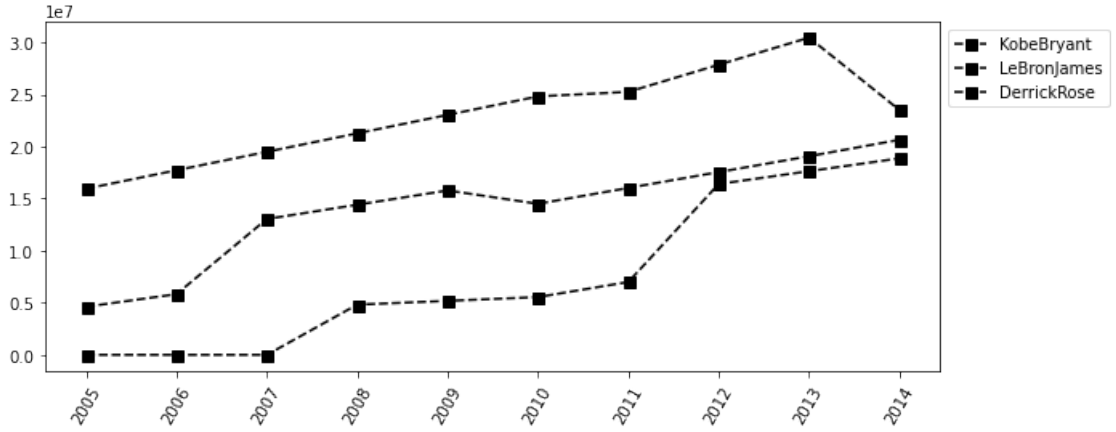
[38]:
```
plt.plot(Salary[0],c='Black',ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Salary[1],c='Blue',ls='-',marker='o',ms=7,label=Players[1])
plt.plot(Salary[2],c='Red',ls='-.',marker='v',ms=10,label=Players[2])
plt.plot(Salary[3],c='Orange',ls=':',ms=7,marker='1',label=Players[3])
plt.plot(Salary[4],c='Black',ls='--',ms=10,marker='2',label=Players[4])
plt.plot(Salary[5],c='Blue',ls='--',ms=10,marker='3',label=Players[5])
plt.plot(Salary[6],c='Red',ls='-',marker='4',ms=10,label=Players[6])
plt.plot(Salary[7],c='Orange',ls='-.',marker='8',ms=10,label=Players[7])
plt.plot(Salary[8],c='Black',ls=':',marker='s',ms=7,label=Players[8])
plt.plot(Salary[9],c='Red',ls='--',marker='*',ms=10,label=Players[9])
```

```
plt.xticks(list(range(0,10)),Seasons,rotation=60)
plt.legend(loc='upper left',bbox_to_anchor=(1,1))
plt.show()
```



[57]:
```
def myplot(PlayersList):
    for i in PlayersList:
        plt.
↪plot(Salary[Pdict[i]],c='Black',ls='--',marker='s',ms=7,label=Players[Pdict[i]])
    plt.xticks(list(range(0,10)),Seasons,rotation=60)
    plt.legend(loc='upper left',bbox_to_anchor=(1,1))
    plt.show()
```

[58]:
```
myplot(["KobeBryant","LeBronJames","DerrickRose"])
```



[59]:
```
col={"KobeBryant":'#5d8aa8',"JoeJohnson":'#e32636',"LeBronJames":
↪'#ffbf00',"CarmeloAnthony":'#a4c639',
```

```
     "DwightHoward":'#cd9575',"ChrisBosh":'#915c83',"ChrisPaul":'#fbceb1',
         "KevinDurant":'#e9d66b',"DerrickRose":'#007fff',"DwayneWade":'#f4c2c2'}

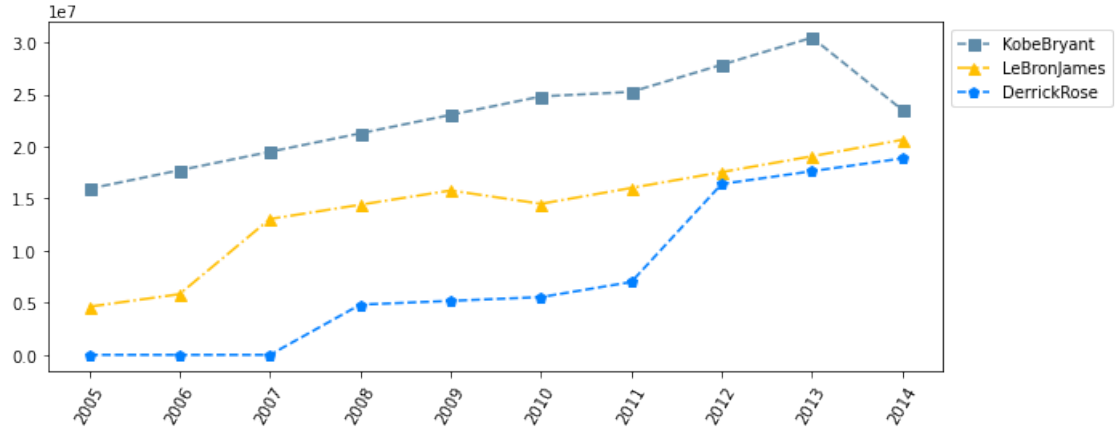
mkr={"KobeBryant":'s',"JoeJohnson":'o',"LeBronJames":'^',"CarmeloAnthony":'1',
     "DwightHoward":'2',"ChrisBosh":'3',"ChrisPaul":'4',
         "KevinDurant":'8',"DerrickRose":'p',"DwayneWade":'<'}

ls={"KobeBryant":'--',"JoeJohnson":'-',"LeBronJames":'-.',"CarmeloAnthony":':',
     "DwightHoward":'--',"ChrisBosh":'-',"ChrisPaul":'-.',
         "KevinDurant":':',"DerrickRose":'--',"DwayneWade":'-'}



def myplot(PlyersList):
    for i in PlyersList:
        plt.
 ↪plot(Salary[Pdict[i]],c=col[i],ls=ls[i],marker=mkr[i],ms=7,label=Players[Pdict[i]])
    plt.xticks(list(range(0,10)),Seasons,rotation=60)
    plt.legend(loc='upper left',bbox_to_anchor=(1,1))
    plt.show()
```

[60]:
```
myplot(["KobeBryant","LeBronJames","DerrickRose"])
```



[71]:
```
def myplot(data,PlyersList=Players):
    col={"KobeBryant":'#5d8aa8',"JoeJohnson":'#e32636',"LeBronJames":
 ↪'#ffbf00',"CarmeloAnthony":'#a4c639',
     "DwightHoward":'#cd9575',"ChrisBosh":'#915c83',"ChrisPaul":'#fbceb1',
         "KevinDurant":'#e9d66b',"DerrickRose":'#007fff',"DwayneWade":'#f4c2c2'}

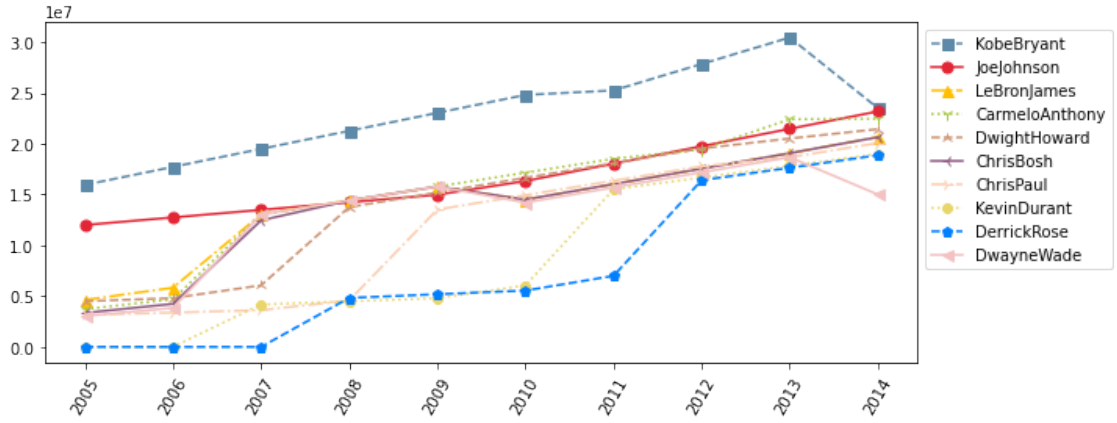
    mkr={"KobeBryant":'s',"JoeJohnson":'o',"LeBronJames":'^',"CarmeloAnthony":
 ↪'1',
```

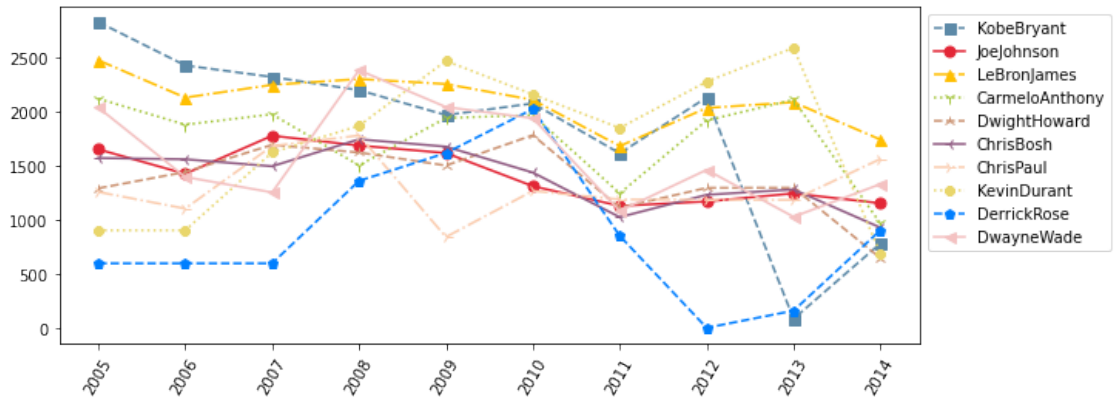
```
    "DwightHoward":'2',"ChrisBosh":'3',"ChrisPaul":'4',
        "KevinDurant":'8',"DerrickRose":'p',"DwayneWade":'<'}

    ls={"KobeBryant":'--',"JoeJohnson":'-',"LeBronJames":'-.',"CarmeloAnthony":
↪':',
    "DwightHoward":'--',"ChrisBosh":'-',"ChrisPaul":'-.',
        "KevinDurant":':',"DerrickRose":'--',"DwayneWade":'-'}

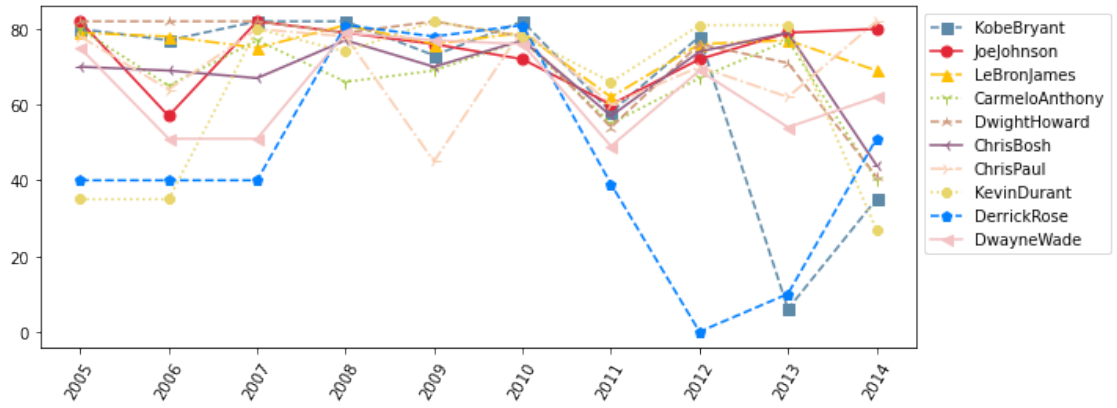

    for name in PlyersList:
        plt.
↪plot(data[Pdict[name]],c=col[name],ls=ls[name],marker=mkr[name],ms=7,label=Players[Pdict[na
    plt.xticks(list(range(0,10)),Seasons,rotation=60)
    plt.legend(loc='upper left',bbox_to_anchor=(1,1))
    plt.show()
```

[72]:
```
myplot(Salary)
myplot(Points)
```

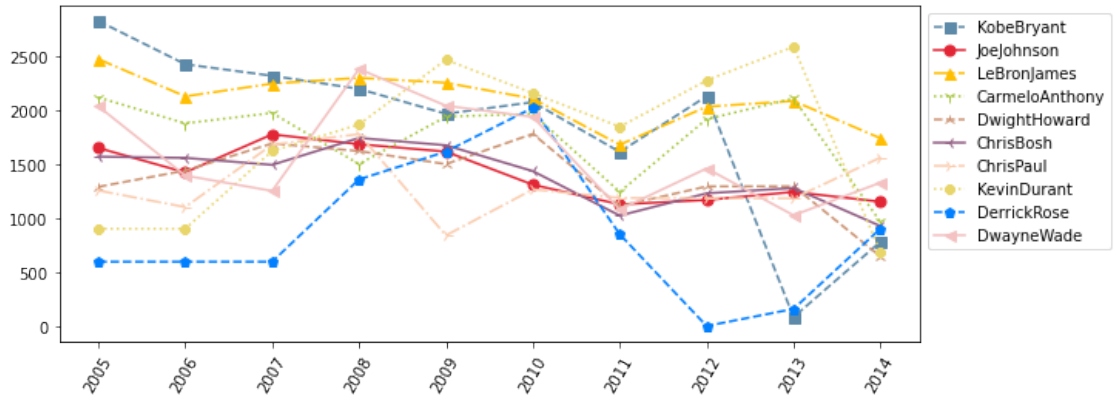




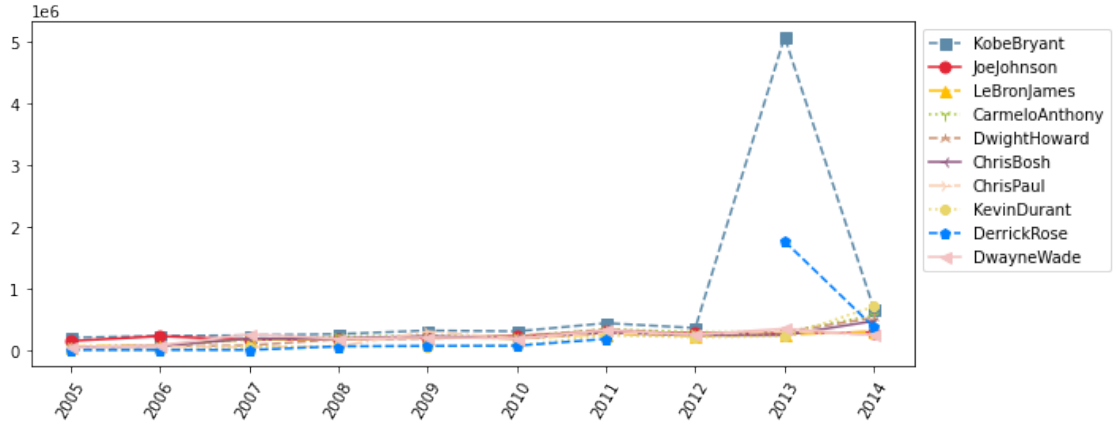
[73]:
```
myplot(Games)
```



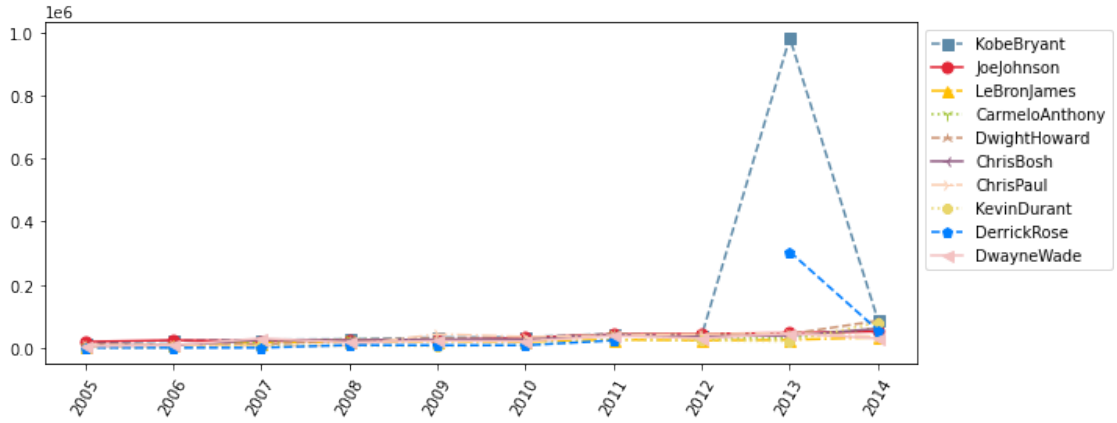
[74]:
```
myplot(Points)
```



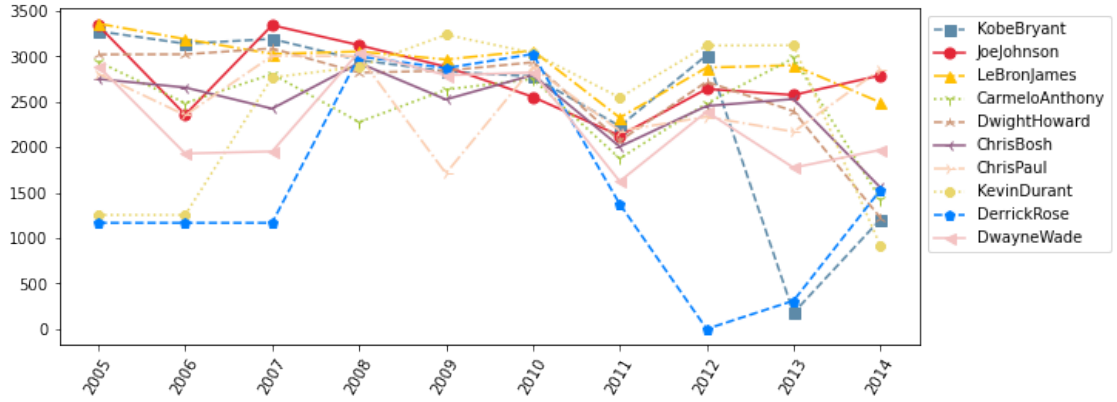
[75]:
```
myplot(Salary/Games)
```



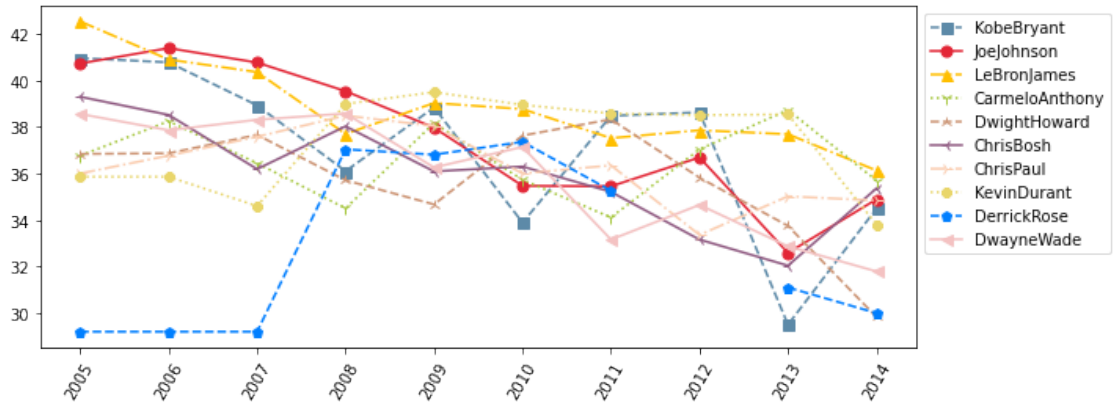
[76]:
```
myplot(Salary/FieldGoals)
```



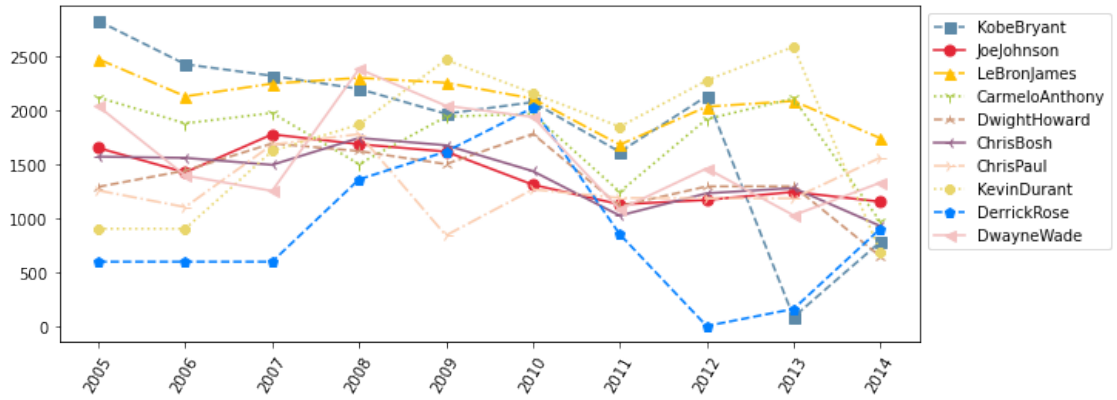
[77]:
```
myplot(MinutesPlayed)
```



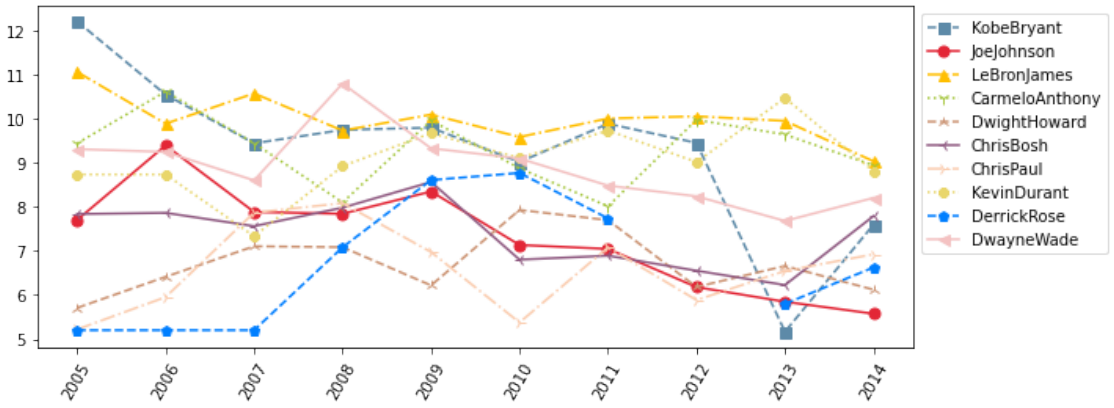
[78]:
```
myplot(MinutesPlayedPerGame)
```

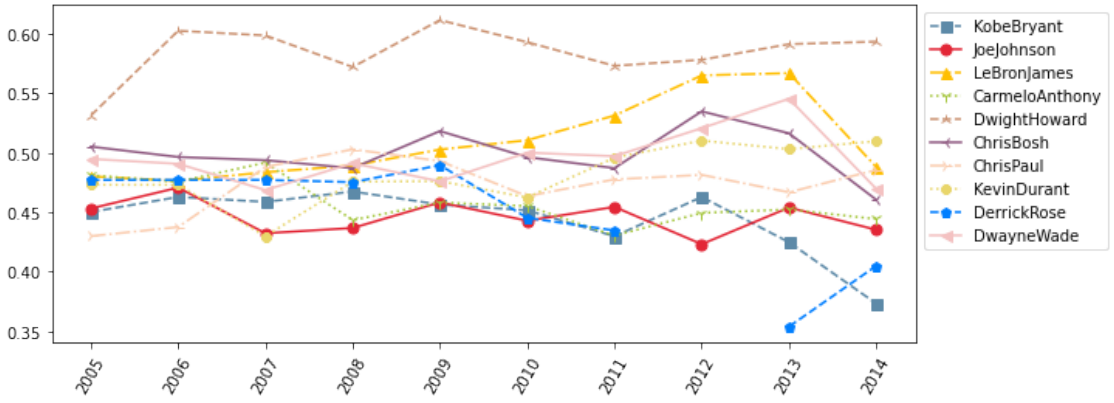


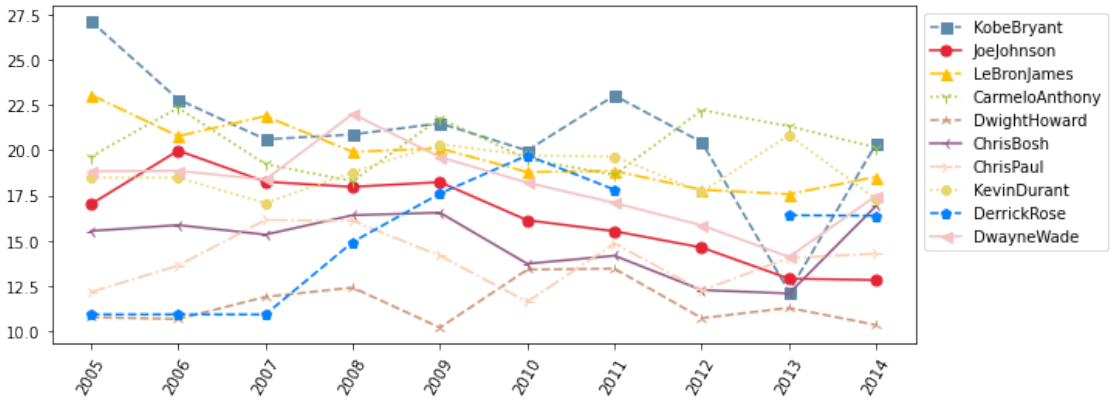
[79]:
```
myplot(Points)
```

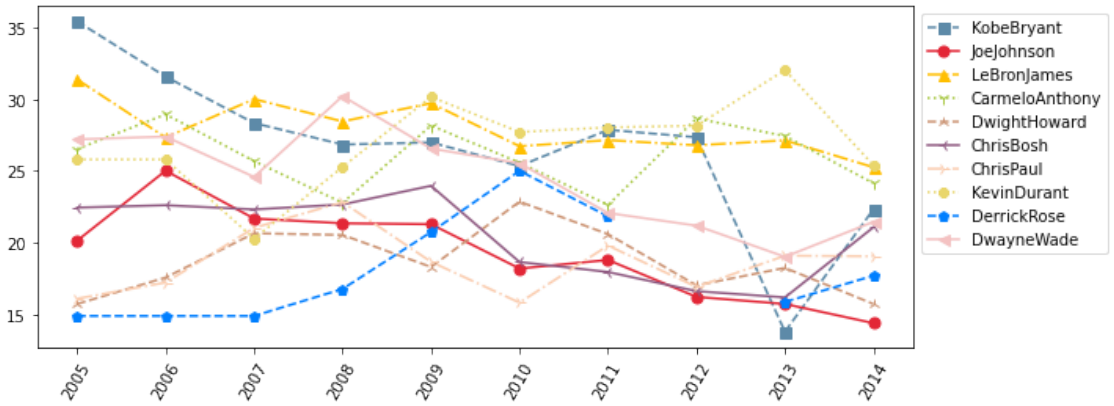


[80]:
```
myplot(FieldGoals/Games)
myplot(FieldGoals/FieldGoalAttempts)
myplot(FieldGoalAttempts/Games)
myplot(Points/Games)
plt.show()
```

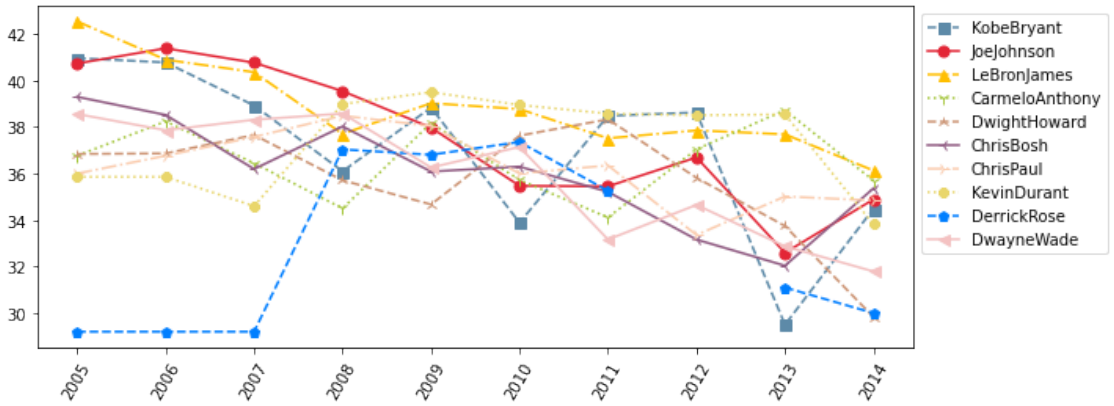

KobeBryant
JoeJohnson
LeBronJames
CarmeloAnthony
DwightHoward
ChrisBosh
ChrisPaul
KevinDurant
DerrickRose
DwayneWade
12
11
10
9
8
7
6
5
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

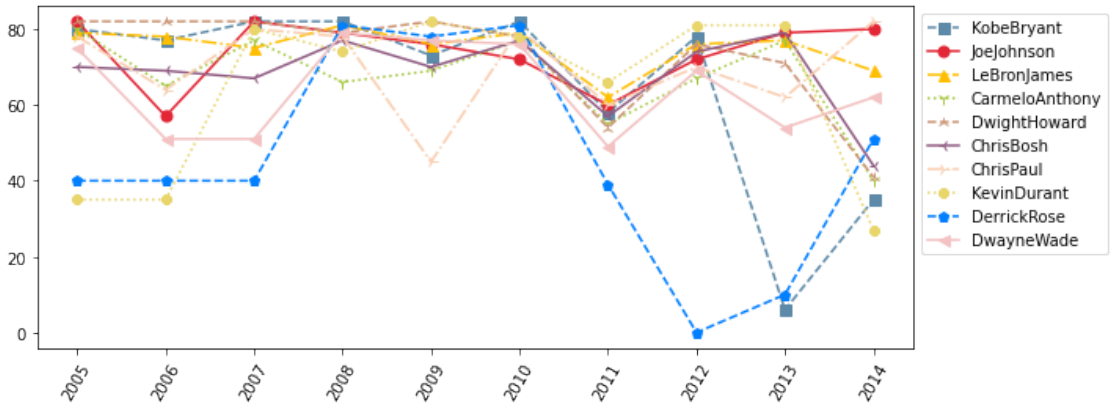

KobeBryant
JoeJohnson
LeBronJames
CarmeloAnthony
DwightHoward
ChrisBosh
ChrisPaul
KevinDurant
DerrickRose
DwayneWade
0.60
0.55
0.50
0.45
0.40
0.35
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014


KobeBryant
JoeJohnson
LeBronJames
CarmeloAnthony
DwightHoward
ChrisBosh
ChrisPaul
KevinDurant
DerrickRose
DwayneWade
27.5
25.0
22.5
20.0
17.5
15.0
12.5
10.0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

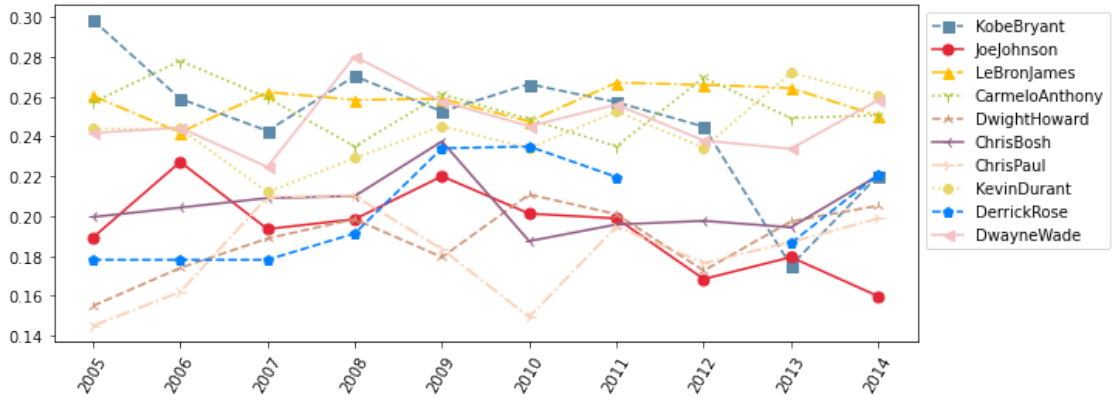


[81]:
```
myplot(MinutesPlayed/Games)
myplot(Games)
```

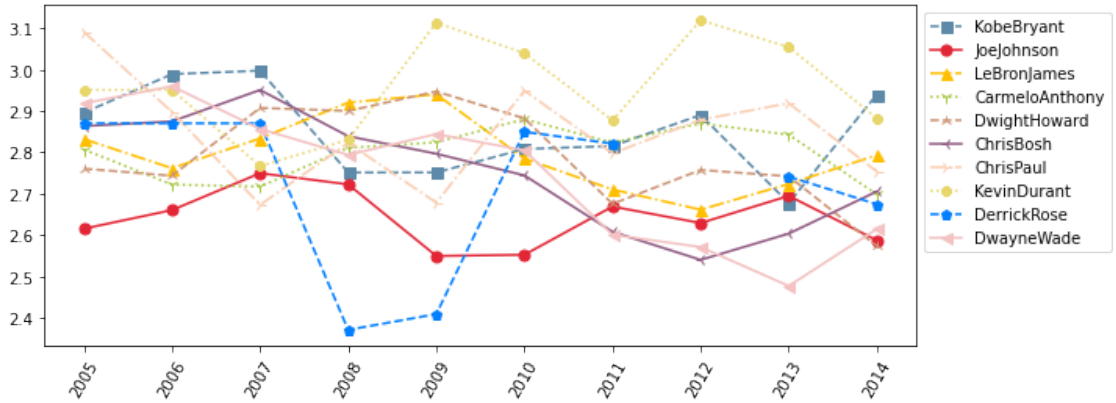




[82]:
```
myplot(FieldGoals/MinutesPlayed)
```



[83]:
```
myplot(Points/FieldGoals)
```



[ ]:
```

```