

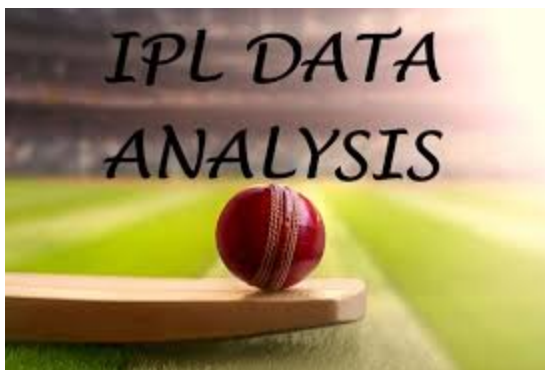
IPL Data Analysis

The primary objective of this IPL data analysis is to explore and understand the relationship between player salaries, games played, and performance (points scored) across multiple IPL seasons. The goal is to:

1. Identify high-value players by analyzing the correlation between player salaries and their contributions in games.
2. Evaluate performance consistency by examining the number of games played and points scored each season.
3. Determine patterns and trends in player salaries over the years to understand how investments align with player output.
4. Provide actionable insights that can assist teams in making more data-driven decisions for future player acquisitions and team strategies.

```
In [5]: #Import the necessary libraries
import numpy as np
```

```
In [7]: import warnings
warnings.filterwarnings('ignore')
```



```
In [9]: #Seasons
Seasons = ["2010","2011","2012","2013","2014","2015","2016","2017","2018","2019"]
Sdict = {"2010":0,"2011":1,"2012":2,"2013":3,"2014":4,"2015":5,"2016":6,"2017":7,"2018":8,"2019":9}

#Players
Players = ["Sachin","Rahul","Smith","Sami","Pollard","Morris","Samson","Dhoni","Kohli","Virat"]
Pdict = {"Sachin":0,"Rahul":1,"Smith":2,"Sami":3,"Pollard":4,"Morris":5,"Samson":6,"Dhoni":7,"Kohli":8,"Virat":9}

#Salaries
Sachin_Salary = [15946875,17718750,19490625,21262500,23034375,24806250,25244493,27800000,29000000,30000000]
Rahul_Salary = [12000000,12744189,13488377,14232567,14976754,16324500,18038573,19750000,21000000,22000000]
```

```

Smith_Salary = [4621800,5828090,13041250,14410581,15779912,14500000,16022500,175450
Sami_Salary = [3713640,4694041,13041250,14410581,15779912,17149243,18518574,1945000
Pollard_Salary = [4493160,4806720,6061274,13758000,15202590,16647180,18091770,19536
Morris_Salary = [3348000,4235220,12455000,14410581,15779912,14500000,16022500,17545
Samson_Salary = [3144240,3380160,3615960,4574189,13520500,14940153,16359805,1777945
Dhoni_Salary = [0,0,4171200,4484040,4796880,6053663,15506632,16669630,17832627,1899
Kohli_Salary = [0,0,0,4822800,5184480,5546160,6993708,16402500,17632688,18862875]
Sky_Salary = [3031920,3841443,13041250,14410581,15779912,14200000,15691000,17182000
#Matrix
Salary = np.array([Sachin_Salary, Rahul_Salary, Smith_Salary, Sami_Salary, Pollard_

#Games
Sachin_G = [80,77,82,82,73,82,58,78,6,35]
Rahul_G = [82,57,82,79,76,72,60,72,79,80]
Smith_G = [79,78,75,81,76,79,62,76,77,69]
Sami_G = [80,65,77,66,69,77,55,67,77,40]
Pollard_G = [82,82,82,79,82,78,54,76,71,41]
Morris_G = [70,69,67,77,70,77,57,74,79,44]
Samson_G = [78,64,80,78,45,80,60,70,62,82]
Dhoni_G = [35,35,80,74,82,78,66,81,81,27]
Kohli_G = [40,40,40,81,78,81,39,0,10,51]
Sky_G = [75,51,51,79,77,76,49,69,54,62]
#Matrix
Games = np.array([Sachin_G, Rahul_G, Smith_G, Sami_G, Pollard_G, Morris_G, Samson_G

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

```

In [8]: Salary #matrix format

```
Out[8]: array([[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]])
```

```
In [9]: Games #Matrix format
```

```
Out[9]: 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]])
```

```
In [11]: Points #create points in array format
```

```
Out[11]: array([[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]])
```

```
In [11]: Salary/Games
```

```

Out[11]: array([[ 199335.9375      ,  230113.63636364,  237690.54878049,
                  259298.7804878 ,  315539.38356164,  302515.24390244,
                  435249.87931034,  357040.37179487,  5075634.16666667,
                  671428.57142857],
                [ 146341.46341463,  223582.26315789,  164492.40243902,
                  180159.07594937,  197062.55263158,  226729.16666667,
                  300642.88333333,  274342.29166667,  271730.60759494,
                  289759.875      ],
                [  58503.79746835,   74719.1025641 ,  173883.33333333,
                  177908.40740741,  207630.42105263,  183544.30379747,
                  258427.41935484,  230855.26315789,  247629.87012987,
                  299194.20289855],
                [  46420.5      ,   72216.01538462,  169366.88311688,
                  218342.13636364,  228694.37681159,  222717.44155844,
                  336701.34545455,  290298.50746269,  291006.15584416,
                  561450.      ],
                [  54794.63414634,   58618.53658537,   73917.97560976,
                  174151.89873418,  185397.43902439,  213425.38461538,
                  335032.77777778,  257057.36842105,  288918.      ,
                  522835.87804878],
                [  47828.57142857,   61380.      ,  185895.52238806,
                  187150.4025974 ,  225427.31428571,  188311.68831169,
                  281096.49122807,  237094.59459459,  241360.75949367,
                  469190.90909091],
                [  40310.76923077,   52815.      ,   45199.5      ,
                  58643.44871795,  300455.55555556,  186751.9125      ,
                  272663.41666667,  253992.25714286,  301103.72580645,
                  244738.57317073],
                [      0.      ,      0.      ,   52140.      ,
                  60595.13513514,   58498.53658537,   77611.06410256,
                  234948.96969697,  205797.90123457,  220155.88888889,
                  703541.62962963],
                [      0.      ,      0.      ,      0.      ,
                  59540.74074074,   66467.69230769,   68471.11111111,
                  179325.84615385,      inf, 1763268.8      ,
                  369860.29411765],
                [  40425.6      ,   75322.41176471,  255710.78431373,
                  182412.41772152,  204933.92207792,  186842.10526316,
                  320224.48979592,  249014.49275362,  345796.2962963 ,
                  241935.48387097]])

```

```

In [13]: np.round(Salary/Games)

```

```
Out[13]: array([[ 199336.,  230114.,  237691.,  259299.,  315539.,  302515.,
                  435250.,  357040.,  5075634.,  671429.],
                [ 146341.,  223582.,  164492.,  180159.,  197063.,  226729.,
                  300643.,  274342.,  271731.,  289760.],
                [  58504.,   74719.,  173883.,  177908.,  207630.,  183544.,
                  258427.,  230855.,  247630.,  299194.],
                [  46420.,   72216.,  169367.,  218342.,  228694.,  222717.,
                  336701.,  290299.,  291006.,  561450.],
                [  54795.,   58619.,   73918.,  174152.,  185397.,  213425.,
                  335033.,  257057.,  288918.,  522836.],
                [  47829.,   61380.,  185896.,  187150.,  225427.,  188312.,
                  281096.,  237095.,  241361.,  469191.],
                [  40311.,   52815.,   45200.,   58643.,  300456.,  186752.,
                  272663.,  253992.,  301104.,  244739.],
                [    0.,    0.,   52140.,   60595.,   58499.,   77611.,
                  234949.,  205798.,  220156.,  703542.],
                [    0.,    0.,    0.,   59541.,   66468.,   68471.,
                  179326.,   inf,  1763269.,  369860.],
                [  40426.,   75322.,  255711.,  182412.,  204934.,  186842.,
                  320224.,  249014.,  345796.,  241935.]])
```

```
In [22]: mydata=np.arange(0,20)
```

```
In [19]: mydata
```

```
Out[19]: array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
                 17, 18, 19])
```

```
In [20]: print(mydata)
```

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

```
In [24]: np.reshape(mydata,(4,5))
```

```
Out[24]: array([[ 0,  1,  2,  3,  4],
                [ 5,  6,  7,  8,  9],
                [10, 11, 12, 13, 14],
                [15, 16, 17, 18, 19]])
```

```
In [25]: mydata
```

```
Out[25]: array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
                 17, 18, 19])
```

```
In [29]: MATR1=np.reshape(mydata,(5,4), order='c')
MATR1
```

```
Out[29]: array([[ 0,  1,  2,  3],
                [ 4,  5,  6,  7],
                [ 8,  9, 10, 11],
                [12, 13, 14, 15],
                [16, 17, 18, 19]])
```

```
In [30]: MATR1[4,3]
```

Out[30]: 19

```
In [31]: MATR1[3,3]
```

Out[31]: 15

```
In [32]: MATR1
```

```
Out[32]: array([[ 0,  1,  2,  3],
                [ 4,  5,  6,  7],
                [ 8,  9, 10, 11],
                [12, 13, 14, 15],
                [16, 17, 18, 19]])
```

```
In [33]: MATR1[-3,-1]
```

Out[33]: 11

```
In [35]: MATR1[-4,-2]
```

Out[35]: 6

```
In [36]: MATR1[-5,-3]
```

Out[36]: 1

```
In [37]: mydata
```

```
Out[37]: array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
                17, 18, 19])
```

```
In [38]: MATR2=np.reshape(mydata,(5,4),order='F')
MATR2
```

```
Out[38]: array([[ 0,  5, 10, 15],
                [ 1,  6, 11, 16],
                [ 2,  7, 12, 17],
                [ 3,  8, 13, 18],
                [ 4,  9, 14, 19]])
```

```
In [39]: MATR2[4,3]
```

Out[39]: 19

```
In [41]: MATR2[0,2]
```

Out[41]: 10

```
In [43]: MATR2[0:2]
```

```
Out[43]: array([[ 0,  5, 10, 15],
                [ 1,  6, 11, 16]])
```

```
In [45]: MATR2[1:2]
```

```
Out[45]: array([[ 1,  6, 11, 16]])
```

```
In [46]: MATR2[1,2]
```

```
Out[46]: 11
```

```
In [47]: MATR2
```

```
Out[47]: array([[ 0,  5, 10, 15],
                [ 1,  6, 11, 16],
                [ 2,  7, 12, 17],
                [ 3,  8, 13, 18],
                [ 4,  9, 14, 19]])
```

```
In [48]: MATR2[-2,-1]
```

```
Out[48]: 18
```

```
In [49]: MATR2[-3,-3]
```

```
Out[49]: 7
```

```
In [51]: MATR2[0:2]
```

```
Out[51]: array([[ 0,  5, 10, 15],
                [ 1,  6, 11, 16]])
```

```
In [52]: mydata
```

```
Out[52]: array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
                17, 18, 19])
```

```
In [53]: MATR3=np.reshape(mydata,(5,4),order='A')
MATR3
```

```
Out[53]: array([[ 0,  1,  2,  3],
                [ 4,  5,  6,  7],
                [ 8,  9, 10, 11],
                [12, 13, 14, 15],
                [16, 17, 18, 19]])
```

```
In [55]: MATR1 #C shaped
```

```
Out[55]: array([[ 0,  1,  2,  3],
                [ 4,  5,  6,  7],
                [ 8,  9, 10, 11],
                [12, 13, 14, 15],
                [16, 17, 18, 19]])
```

```
In [56]: MATR2 #F shaped
```

```
Out[56]: array([[ 0,  5, 10, 15],
               [ 1,  6, 11, 16],
               [ 2,  7, 12, 17],
               [ 3,  8, 13, 18],
               [ 4,  9, 14, 19]])
```

```
In [57]: MATR3 #A shape
```

```
Out[57]: array([[ 0,  1,  2,  3],
               [ 4,  5,  6,  7],
               [ 8,  9, 10, 11],
               [12, 13, 14, 15],
               [16, 17, 18, 19]])
```

```
In [75]: a1= ['welcome','to','datascience']
a2= ['required', 'hard', 'work']
a3=['1','2','4']
```

```
In [76]: [a1, a2 ,a3] #List same datatype
```

```
Out[76]: [['welcome', 'to', 'datascience'],
          ['required', 'hard', 'work'],
          ['1', '2', '4']]
```

```
In [78]: np.array([a1,a2,a3]) #u11-unicode 11 charcter 3*3 matrix
```

```
Out[78]: array(['welcome', 'to', 'datascience'],
               ['required', 'hard', 'work'],
               ['1', '2', '4']], dtype='<U11')
```

```
In [79]: Games
```

```
Out[79]: 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]])
```

```
In [80]: Games[0]
```

```
Out[80]: array([80, 77, 82, 82, 73, 82, 58, 78,  6, 35])
```

```
In [81]: Games[5]
```

```
Out[81]: array([70, 69, 67, 77, 70, 77, 57, 74, 79, 44])
```

```
In [82]: Games[0:5]
```



```
Out[82]: 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]])
```

```
In [84]: Games[0,5]
```

```
Out[84]: 82
```

```
In [85]: Games[0,2]
```

```
Out[85]: 82
```

```
In [86]: Games[0:2]
```

```
Out[86]: array([[80, 77, 82, 82, 73, 82, 58, 78, 6, 35],
               [82, 57, 82, 79, 76, 72, 60, 72, 79, 80]])
```

```
In [87]: Games[2:4,3:5]
```

```
Out[87]: array([[81, 76],
               [66, 69]])
```

```
In [89]: Games[1:2]
```

```
Out[89]: array([[82, 57, 82, 79, 76, 72, 60, 72, 79, 80]])
```

```
In [90]: Games[2]
```

```
Out[90]: array([79, 78, 75, 81, 76, 79, 62, 76, 77, 69])
```

```
In [91]: Games
```

```
Out[91]: 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]])
```

```
In [92]: Games[2,8]
```

```
Out[92]: 77
```

```
In [93]: Games[-3:-1]
```

```
Out[93]: array([[35, 35, 80, 74, 82, 78, 66, 81, 81, 27],
               [40, 40, 40, 81, 78, 81, 39, 0, 10, 51]])
```

```
In [94]: Games[-7:-3]
```

```
Out[94]: array([[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]])
```

```
In [95]: Points
```

```
Out[95]: array([[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]])
```

```
In [96]: Points[0]
```

```
Out[96]: array([2832, 2430, 2323, 2201, 1970, 2078, 1616, 2133, 83, 782])
```

```
In [98]: Points[6,1]
```

```
Out[98]: 1104
```

```
In [99]: Points[3:6]
```

```
Out[99]: array([[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]])
```

```
In [101... Points
```

```
Out[101... array([[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]])
```

```
In [102... Points[-6,-1]
```

```
Out[102... 646
```

```
In [103... dict1={'key1':'value1','key2':'value2','key3':'value3'}
dict1
```

```
Out[103... {'key1': 'value1', 'key2': 'value2', 'key3': 'value3'}
```

```
In [104... dict1['key2']
```

```
Out[104... 'value2'
```

```
In [105... dict3={'Germany':'I have been here','france':1,'spain':True}  
dict3
```

```
Out[105... {'Germany': 'I have been here', 'france': 1, 'spain': True}
```

```
In [106... dict3['Germany']
```

```
Out[106... 'I have been here'
```

```
In [108... #If we check the seasons and players objects both are dictionary type of data  
#sdict ,pdict are used to specify the dictionary datatype. playernames and season  
#dictionary can guide us which player at which level and which row
```

```
In [109... Games
```

```
Out[109... 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]])
```

```
In [113... Pdict
```

```
Out[113... {'Sachin': 0,  
            'Rahul': 1,  
            'Smith': 2,  
            'Sami': 3,  
            'Pollard': 4,  
            'Morris': 5,  
            'Samson': 6,  
            'Dhoni': 7,  
            'Kohli': 8,  
            'Sky': 9}
```

```
In [114... Sdict
```

```
Out[114...] {'2010': 0,  
            '2011': 1,  
            '2012': 2,  
            '2013': 3,  
            '2014': 4,  
            '2015': 5,  
            '2016': 6,  
            '2017': 7,  
            '2018': 8,  
            '2019': 9}
```

```
In [117...] Pdict['Sachin']
```

```
Out[117...] 0
```

```
In [119...] Pdict['Dhoni']
```

```
Out[119...] 7
```

```
In [121...] Sdict.values()
```

```
Out[121...] dict_values([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

```
In [122...] Sdict.keys()
```

```
Out[122...] dict_keys(['2010', '2011', '2012', '2013', '2014', '2015', '2016', '2017', '2018',  
                        '2019'])
```

```
In [124...] Pdict.keys()
```

```
Out[124...] dict_keys(['Sachin', 'Rahul', 'Smith', 'Sami', 'Pollard', 'Morris', 'Samson', 'Dho  
ni', 'Kohli', 'Sky'])
```

```
In [125...] Pdict.values()
```

```
Out[125...] dict_values([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

```
In [129...] Pdict['Kohli']
```

```
Out[129...] 8
```

```
In [130...] Games[1]
```

```
Out[130...] array([82, 57, 82, 79, 76, 72, 60, 72, 79, 80])
```

```
In [131...] Games[Pdict['Rahul']]
```

```
Out[131...] array([82, 57, 82, 79, 76, 72, 60, 72, 79, 80])
```

```
In [132...] Games[Pdict['Dhoni']]
```

```
Out[132...] array([35, 35, 80, 74, 82, 78, 66, 81, 81, 27])
```

In [135...

Points

Out[135...

```
array([[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]])
```

In [136...

Salary

Out[136...

```
array([[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]])
```

In [137...

Salary[2,4]

Out[137...

15779912

In [141...

Salary[Pdict['Sky']][Sdict['2019']]

Out[141...

15000000

In [143...

Salary[Pdict['Sachin']][Sdict['2013']]

Out[143...

21262500

In [144...

Salary[Pdict['Rahul']][Sdict['2015']]

Out[144...

16324500

In [145...

Salary

```
Out[145...] array([[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]])
```

In [146...] Games

```
Out[146...] 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]])
```

In [147...] Salary/Games

C:\Users\LakshmiSrinivas\AppData\Local\Temp\ipykernel_18640\3709746658.py:1: Runtime Warning: divide by zero encountered in divide
Salary/Games

```

Out[147... array([[ 199335.9375      , 230113.63636364, 237690.54878049,
 259298.7804878 , 315539.38356164, 302515.24390244,
 435249.87931034, 357040.37179487, 5075634.16666667,
 671428.57142857],
 [ 146341.46341463, 223582.26315789, 164492.40243902,
 180159.07594937, 197062.55263158, 226729.16666667,
 300642.88333333, 274342.29166667, 271730.60759494,
 289759.875      ],
 [ 58503.79746835, 74719.1025641 , 173883.33333333,
 177908.40740741, 207630.42105263, 183544.30379747,
 258427.41935484, 230855.26315789, 247629.87012987,
 299194.20289855],
 [ 46420.5      , 72216.01538462, 169366.88311688,
 218342.13636364, 228694.37681159, 222717.44155844,
 336701.34545455, 290298.50746269, 291006.15584416,
 561450.      ],
 [ 54794.63414634, 58618.53658537, 73917.97560976,
 174151.89873418, 185397.43902439, 213425.38461538,
 335032.77777778, 257057.36842105, 288918.      ,
 522835.87804878],
 [ 47828.57142857, 61380.      , 185895.52238806,
 187150.4025974 , 225427.31428571, 188311.68831169,
 281096.49122807, 237094.59459459, 241360.75949367,
 469190.90909091],
 [ 40310.76923077, 52815.      , 45199.5      ,
 58643.44871795, 300455.55555556, 186751.9125      ,
 272663.41666667, 253992.25714286, 301103.72580645,
 244738.57317073],
 [      0.      ,      0.      , 52140.      ,
 60595.13513514, 58498.53658537, 77611.06410256,
 234948.96969697, 205797.90123457, 220155.88888889,
 703541.62962963],
 [      0.      ,      0.      ,      0.      ,
 59540.74074074, 66467.69230769, 68471.11111111,
 179325.84615385,      inf, 1763268.8      ,
 369860.29411765],
 [ 40425.6      , 75322.41176471, 255710.78431373,
 182412.41772152, 204933.92207792, 186842.10526316,
 320224.48979592, 249014.49275362, 345796.2962963 ,
 241935.48387097]])

```

```

In [148... np.round(Salary/Games) #This matrix has lot of decimal values warning msg will co

```

C:\Users\LakshmiSrinivas\AppData\Local\Temp\ipykernel_18640\3232172828.py:1: Runtime Warning: divide by zero encountered in divide
 np.round(Salary/Games)

```
Out[148...] array([[ 199336.,  230114.,  237691.,  259299.,  315539.,  302515.,
        435250.,  357040.,  5075634.,  671429.],
       [ 146341.,  223582.,  164492.,  180159.,  197063.,  226729.,
        300643.,  274342.,  271731.,  289760.],
       [  58504.,   74719.,  173883.,  177908.,  207630.,  183544.,
        258427.,  230855.,  247630.,  299194.],
       [  46420.,   72216.,  169367.,  218342.,  228694.,  222717.,
        336701.,  290299.,  291006.,  561450.],
       [  54795.,   58619.,   73918.,  174152.,  185397.,  213425.,
        335033.,  257057.,  288918.,  522836.],
       [  47829.,   61380.,  185896.,  187150.,  225427.,  188312.,
        281096.,  237095.,  241361.,  469191.],
       [  40311.,   52815.,   45200.,   58643.,  300456.,  186752.,
        272663.,  253992.,  301104.,  244739.],
       [    0.,    0.,   52140.,   60595.,   58499.,   77611.,
        234949.,  205798.,  220156.,  703542.],
       [    0.,    0.,    0.,   59541.,   66468.,   68471.,
        179326.,   inf,  1763269.,  369860.],
       [  40426.,   75322.,  255711.,  182412.,  204934.,  186842.,
        320224.,  249014.,  345796.,  241935.]])
```

```
In [149...] import warnings                                     # If we import warnings warming me
warnings.filterwarnings('ignore')
```

```
In [150...] np.round(Salary/Games)
```

```
Out[150...] array([[ 199336.,  230114.,  237691.,  259299.,  315539.,  302515.,
        435250.,  357040.,  5075634.,  671429.],
       [ 146341.,  223582.,  164492.,  180159.,  197063.,  226729.,
        300643.,  274342.,  271731.,  289760.],
       [  58504.,   74719.,  173883.,  177908.,  207630.,  183544.,
        258427.,  230855.,  247630.,  299194.],
       [  46420.,   72216.,  169367.,  218342.,  228694.,  222717.,
        336701.,  290299.,  291006.,  561450.],
       [  54795.,   58619.,   73918.,  174152.,  185397.,  213425.,
        335033.,  257057.,  288918.,  522836.],
       [  47829.,   61380.,  185896.,  187150.,  225427.,  188312.,
        281096.,  237095.,  241361.,  469191.],
       [  40311.,   52815.,   45200.,   58643.,  300456.,  186752.,
        272663.,  253992.,  301104.,  244739.],
       [    0.,    0.,   52140.,   60595.,   58499.,   77611.,
        234949.,  205798.,  220156.,  703542.],
       [    0.,    0.,    0.,   59541.,   66468.,   68471.,
        179326.,   inf,  1763269.,  369860.],
       [  40426.,   75322.,  255711.,  182412.,  204934.,  186842.,
        320224.,  249014.,  345796.,  241935.]])
```

```
In [151...] Salary
```



```
Out[151...] array([[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]])
```

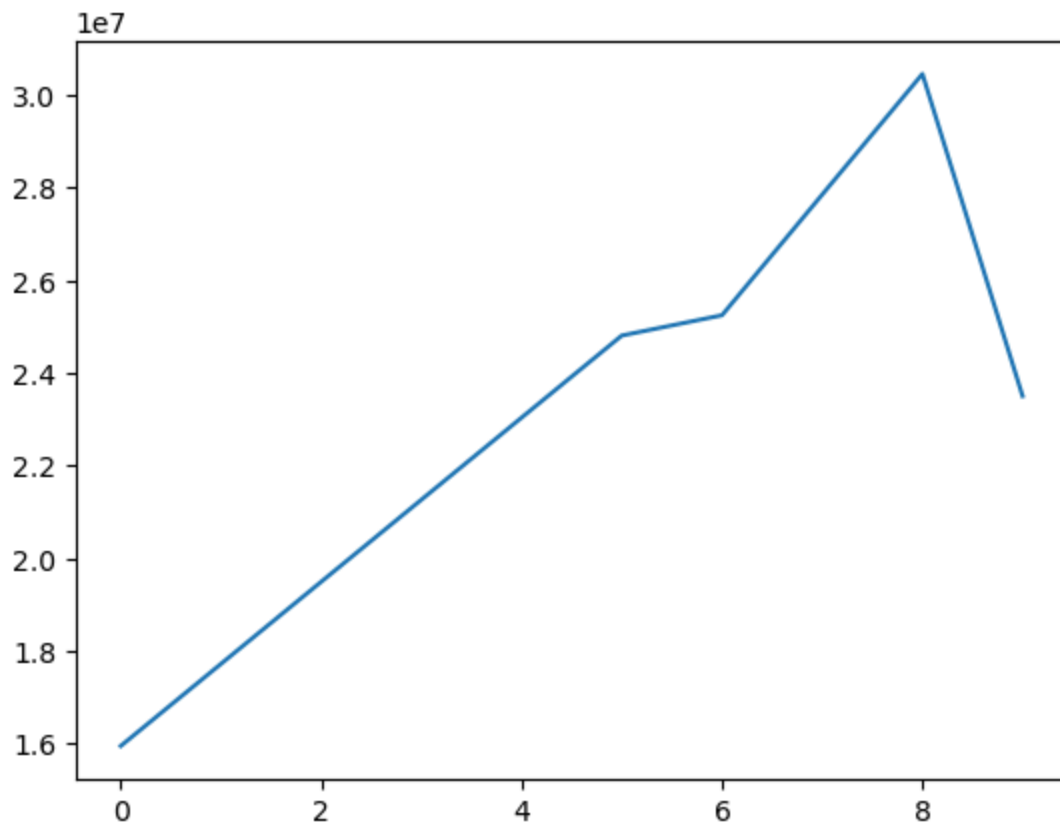
```
In [153...] Salary[0]
```

```
Out[153...] array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
        25244493, 27849149, 30453805, 23500000])
```

```
In [2]: import numpy as np
import matplotlib.pyplot as plt
```

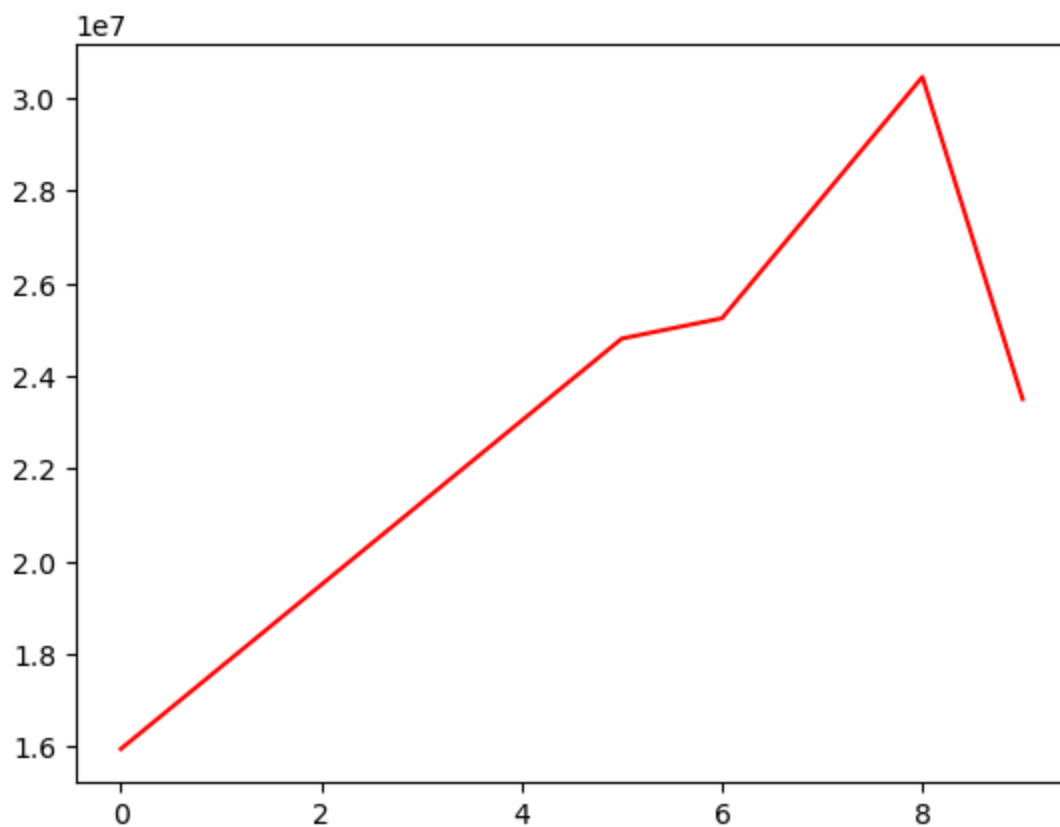
```
In [156...] plt.plot(Salary[0])
```

```
Out[156...] [<matplotlib.lines.Line2D at 0x2ac326ff3d0>]
```



In [157... `plt.plot(Salary[0],c='r')`

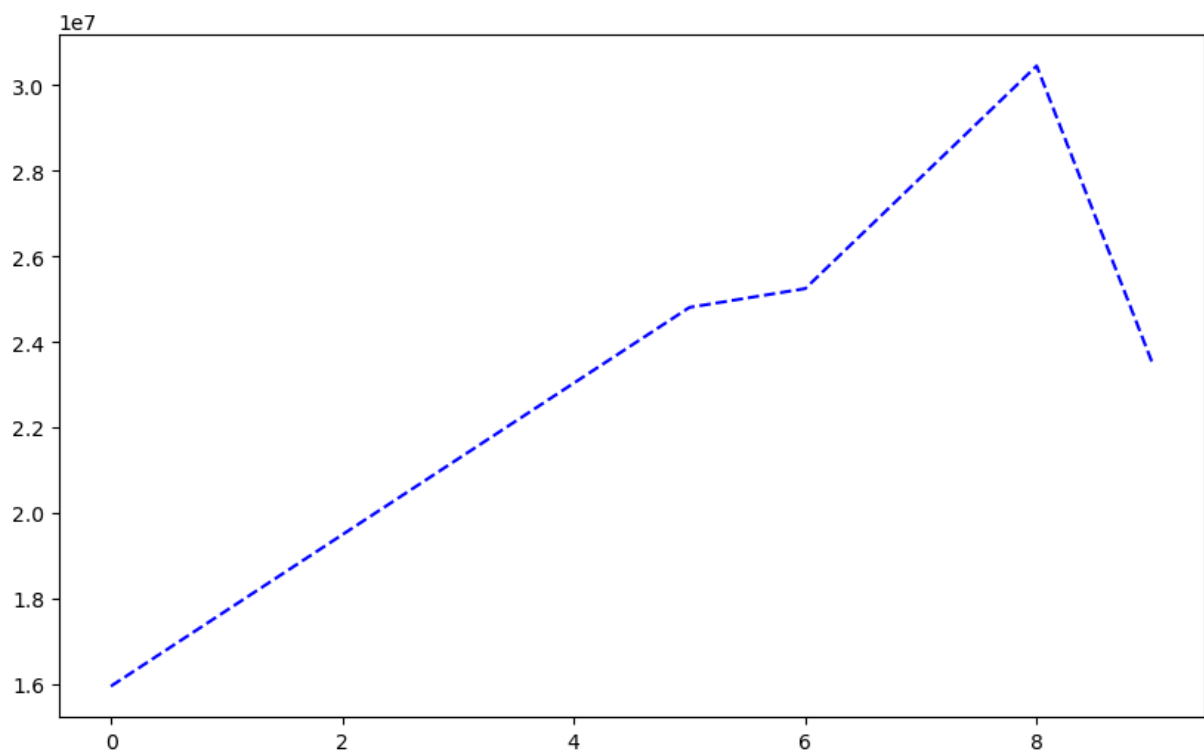
Out[157... [`<matplotlib.lines.Line2D at 0x2ac32fbf250>`]



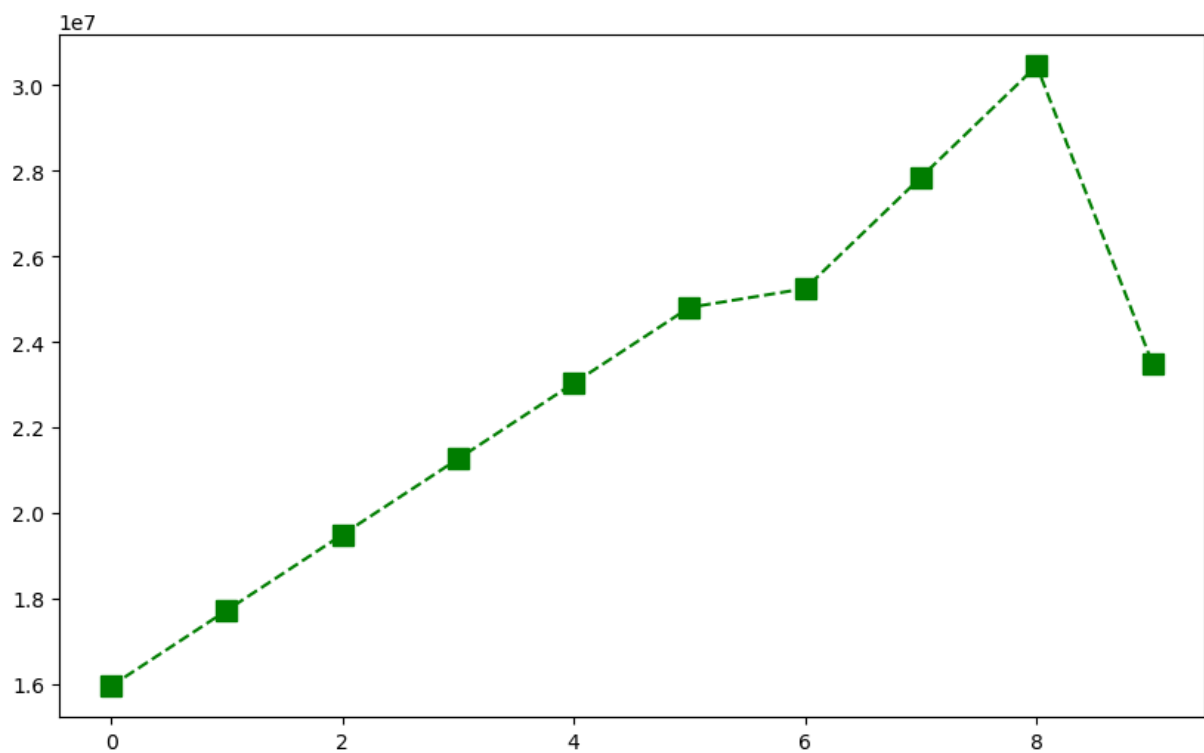
```
In [164... plt.rcParams['figure.figsize']=10,6
```

```
In [166... plt.plot(Salary[0],c='blue',ls='dashed')
```

```
Out[166... [<matplotlib.lines.Line2D at 0x2ac345bde10>]
```



```
In [175... plt.plot(Salary[0], c='green', ls='--', marker='s', ms=10)  
plt.show()
```



```
In [178... list(range(10))
```

```
Out[178... [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
```

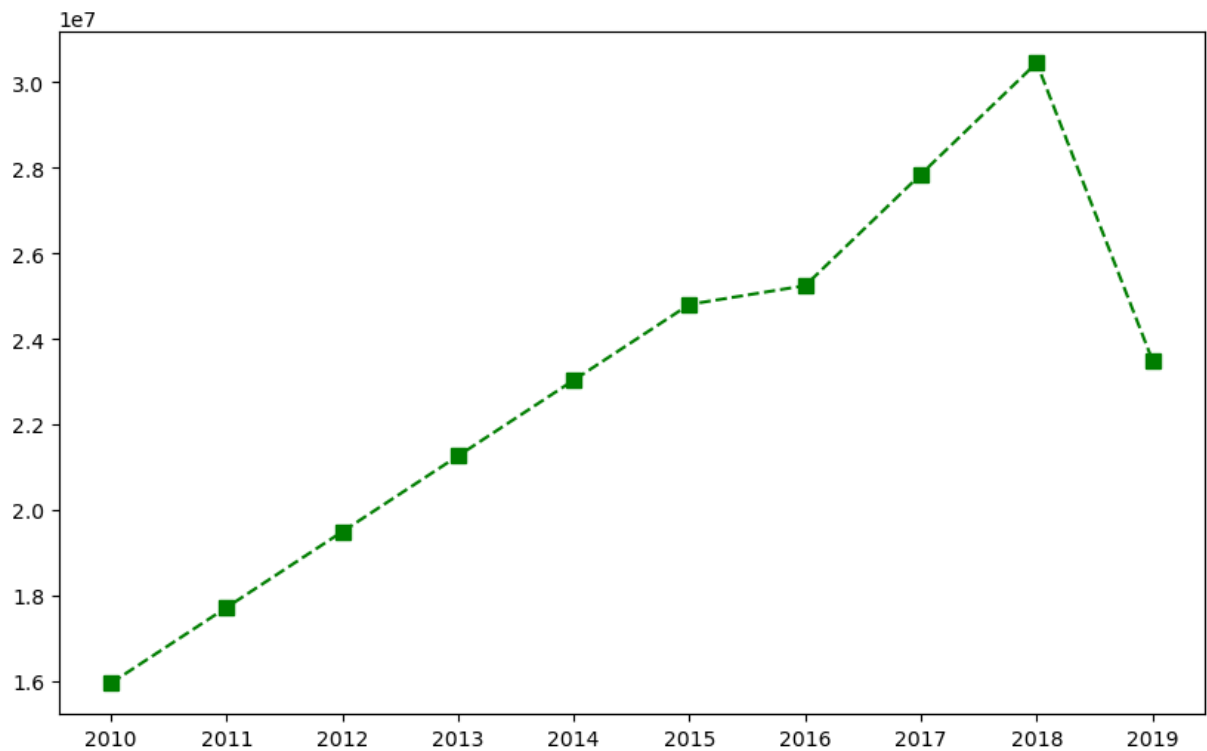
```
In [179... Sdict
```

```
Out[179... {'2010': 0,  
            '2011': 1,  
            '2012': 2,  
            '2013': 3,  
            '2014': 4,  
            '2015': 5,  
            '2016': 6,  
            '2017': 7,  
            '2018': 8,  
            '2019': 9}
```

```
In [180... Pdict
```

```
Out[180... {'Sachin': 0,  
            'Rahul': 1,  
            'Smith': 2,  
            'Sami': 3,  
            'Pollard': 4,  
            'Morris': 5,  
            'Samson': 6,  
            'Dhoni': 7,  
            'Kohli': 8,  
            'Sky': 9}
```

```
In [191... plt.plot(Salary[0], c='Green', ls='--', marker='s', ms=7)  
plt.xticks(list(range(10)),Seasons)  
plt.show()
```



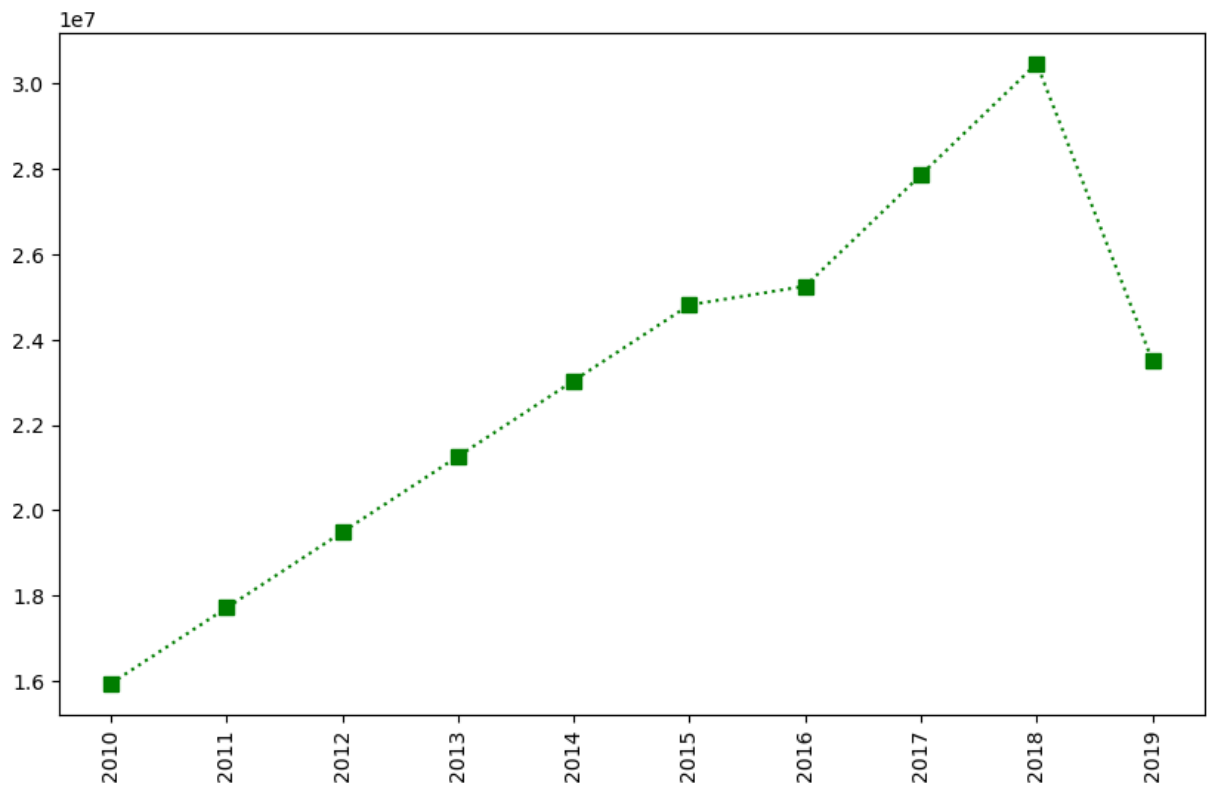
In [192...

Games

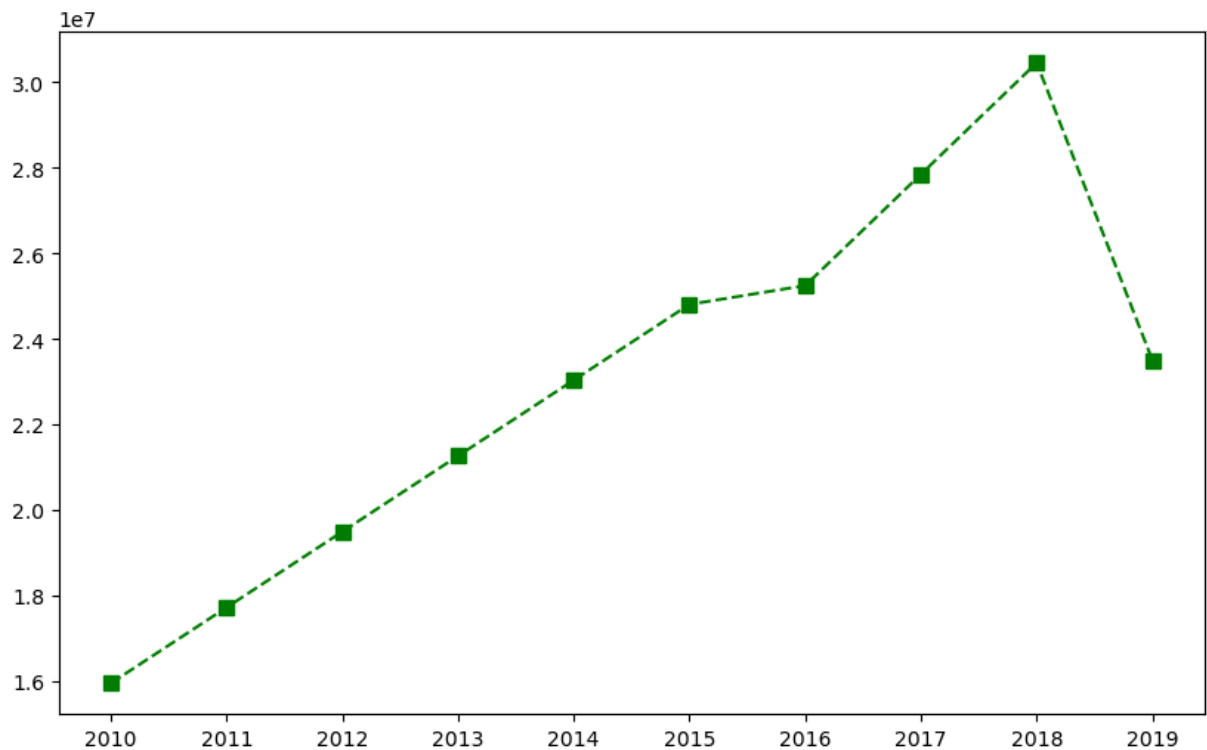
Out[192... array([[80, 77, 82, 82, 73, 82, 58, 78, 6, 35],
 [82, 57, 82, 79, 76, 72, 60, 72, 79, 80],
 [79, 78, 75, 81, 76, 79, 62, 76, 77, 69],
 [80, 65, 77, 66, 69, 77, 55, 67, 77, 40],
 [82, 82, 82, 79, 82, 78, 54, 76, 71, 41],
 [70, 69, 67, 77, 70, 77, 57, 74, 79, 44],
 [78, 64, 80, 78, 45, 80, 60, 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]])

In [195...

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



```
In [196... plt.plot(Salary[0],c='green',ls='--',marker='s',ms=7,label=Players[0])
plt.xticks(list(range(10)),Seasons,rotation='horizontal')
plt.show()
```



```
In [197... Salary[0]
```

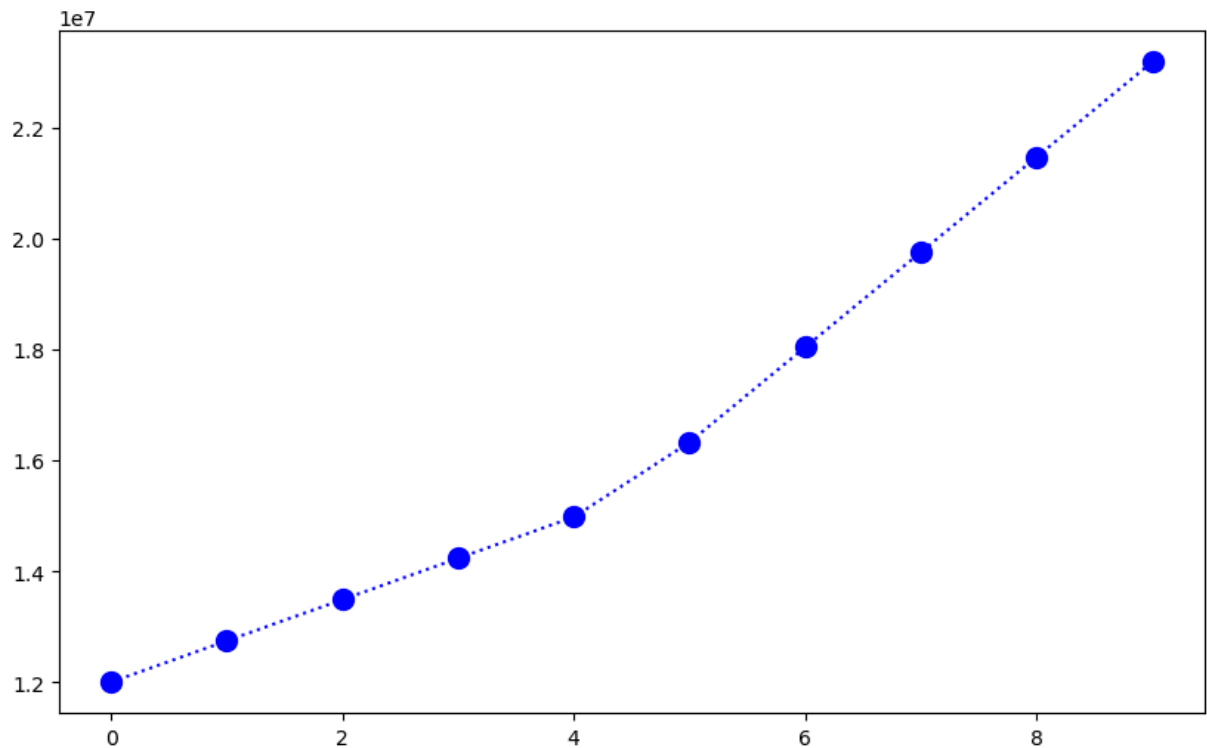
```
Out[197... array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
        25244493, 27849149, 30453805, 23500000])
```

In [198... Salary[1]

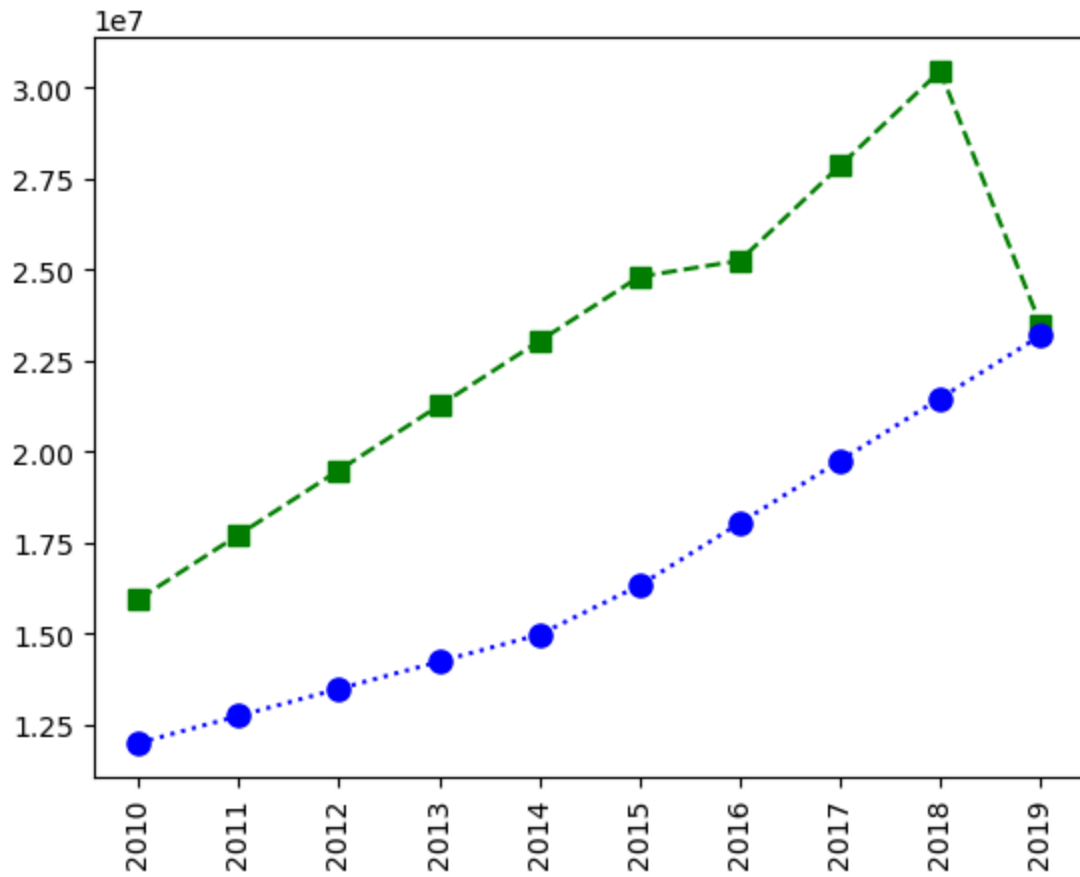
Out[198... array([12000000, 12744189, 13488377, 14232567, 14976754, 16324500,
18038573, 19752645, 21466718, 23180790])

In [200... plt.plot(Salary[1],c='blue',ls=':',marker='o',ms=10, label=Players[1])

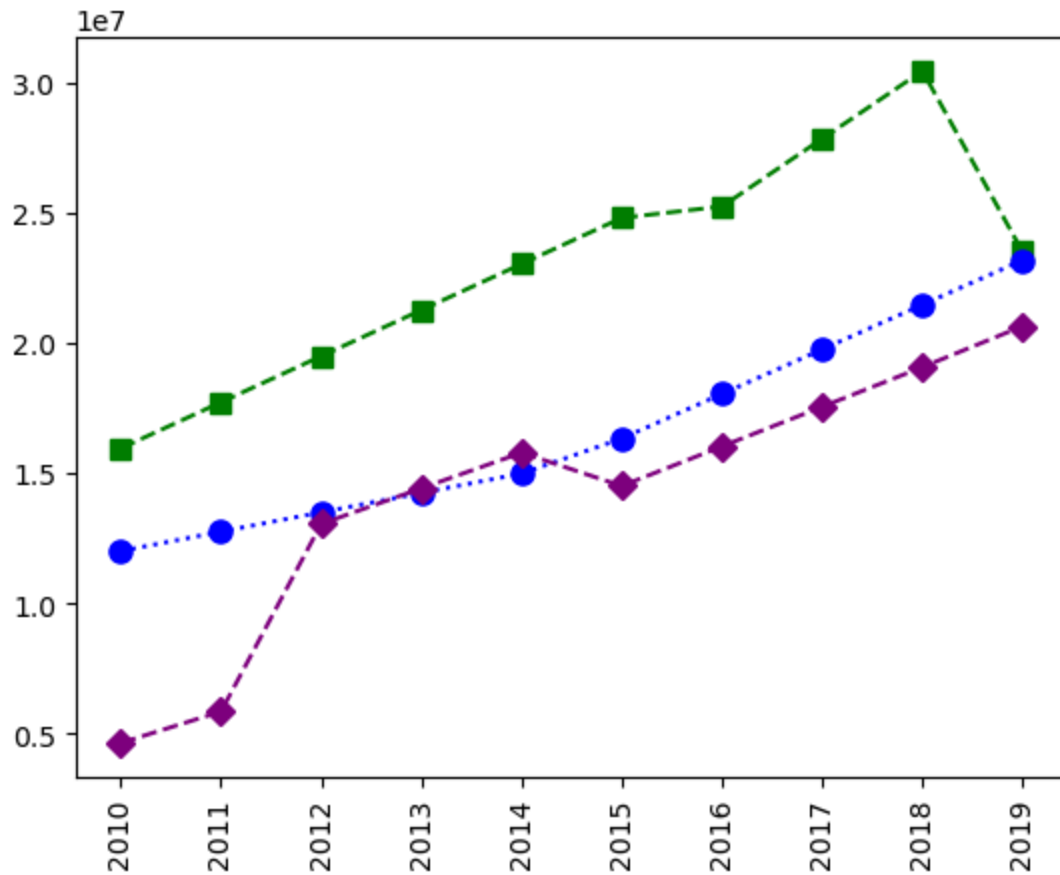
Out[200... [<matplotlib.lines.Line2D at 0x2ac39f60f10>]



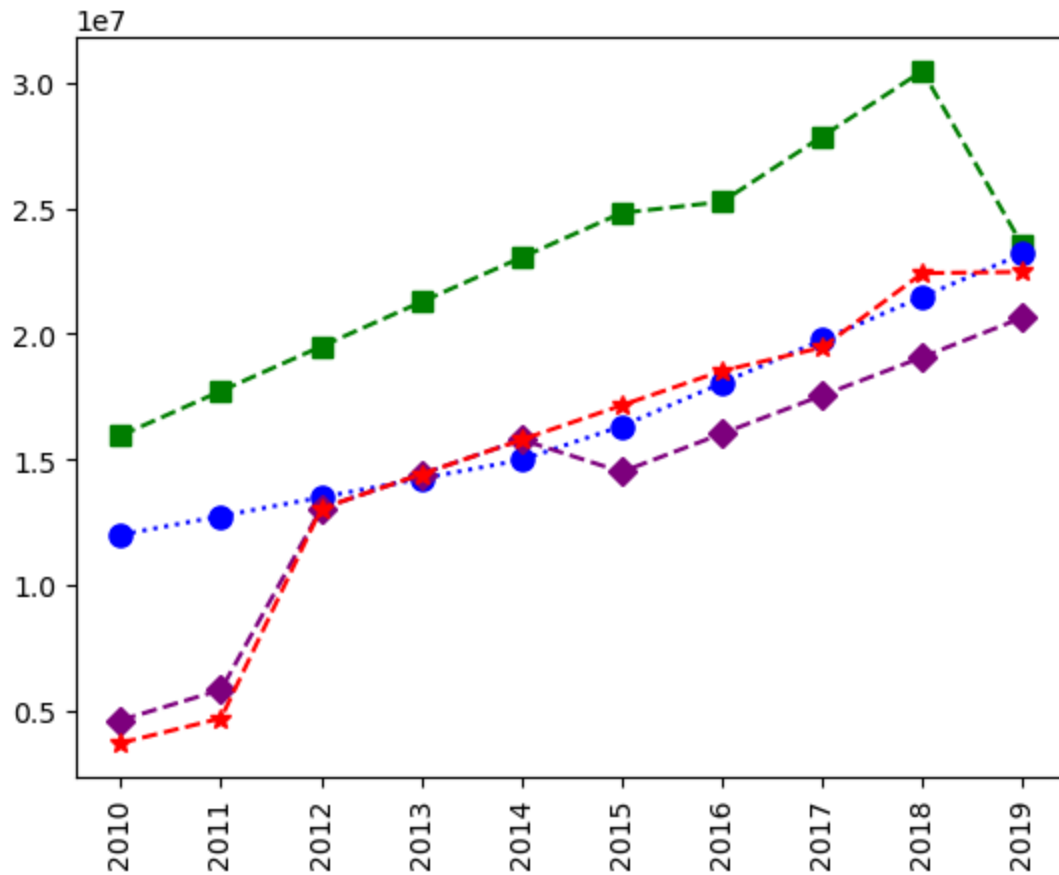
In [7]: plt.plot(Salary[0],c='green',ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Salary[1],c='blue',ls=':',marker='o',ms=8, label=Players[1])
plt.xticks(list(range(10)),Seasons,rotation='vertical')
plt.show()



```
In [9]: plt.plot(Salary[0],c='green',ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Salary[1],c='blue',ls=':',marker='o',ms=8, label=Players[1])
plt.plot(Salary[2],c='purple',ls='--',marker='D',ms=7, label=Players[2])
plt.xticks(list(range(10)),Seasons,rotation='vertical')
plt.show()
```

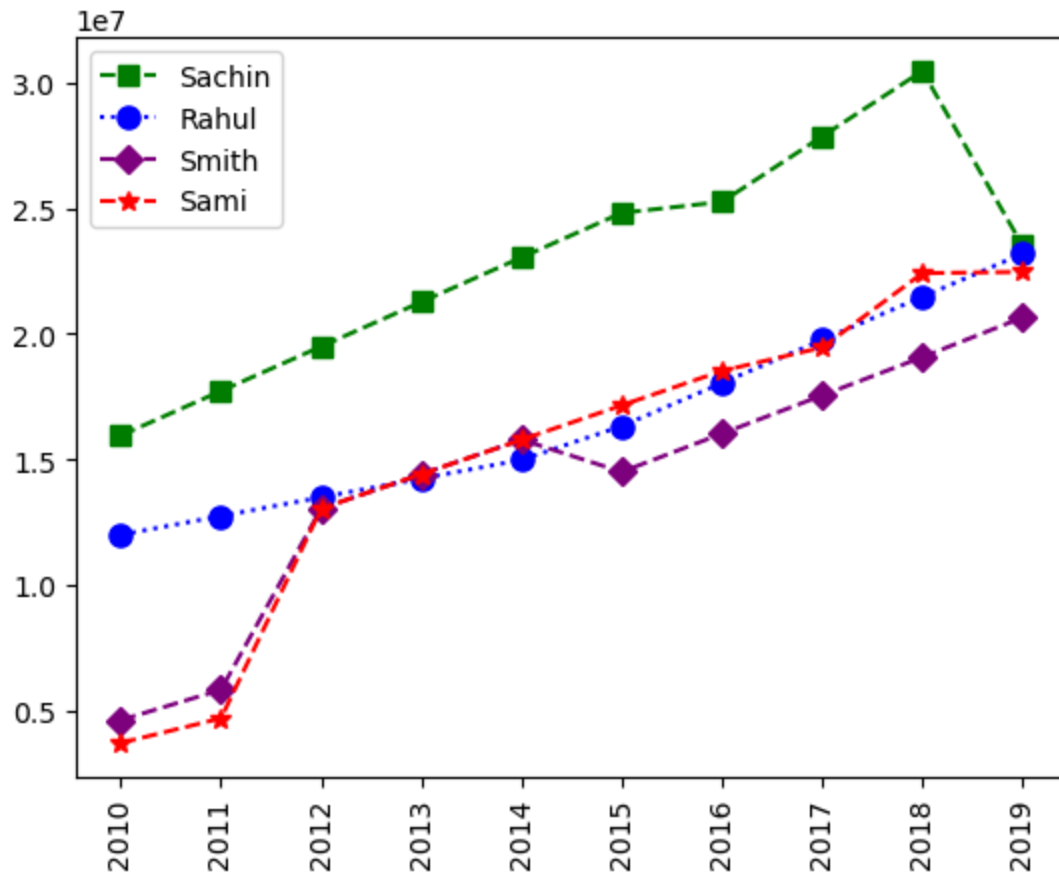



```
In [10]: plt.plot(Salary[0],c='green',ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Salary[1],c='blue',ls=':',marker='o',ms=8, label=Players[1])
plt.plot(Salary[2],c='purple',ls='--',marker='D',ms=7, label=Players[2])
plt.plot(Salary[3],c='red',ls='--',marker='*',ms=7, label=Players[2])
plt.xticks(list(range(10)),Seasons,rotation='vertical')
plt.show()
```



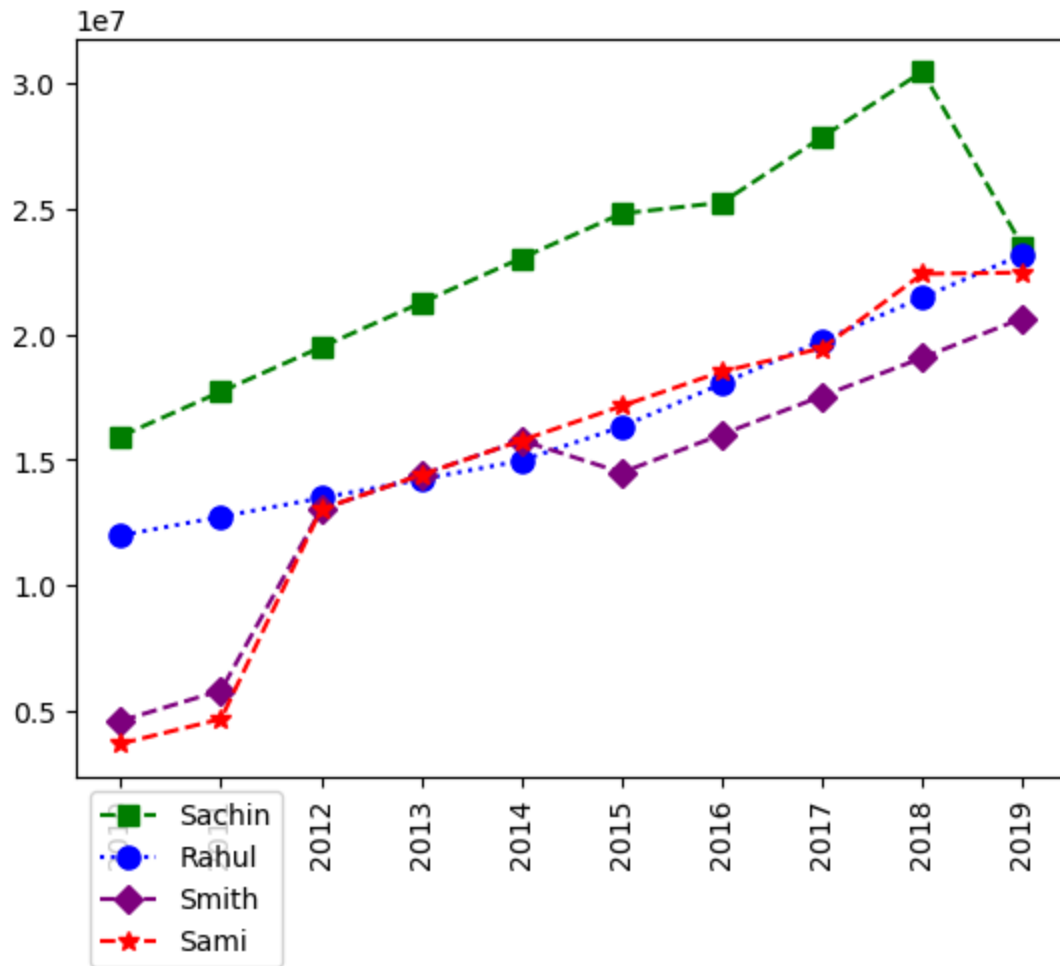
In []: *#add legend visulaization*

```
In [13]: plt.plot(Salary[0],c='green',ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Salary[1],c='blue',ls=':',marker='o',ms=8, label=Players[1])
plt.plot(Salary[2],c='purple',ls='--',marker='D',ms=7, label=Players[2])
plt.plot(Salary[3],c='red',ls='--',marker='*',ms=7, label=Players[3])
plt.xticks(list(range(10)),Seasons,rotation='vertical')
plt.legend()
plt.show()
```

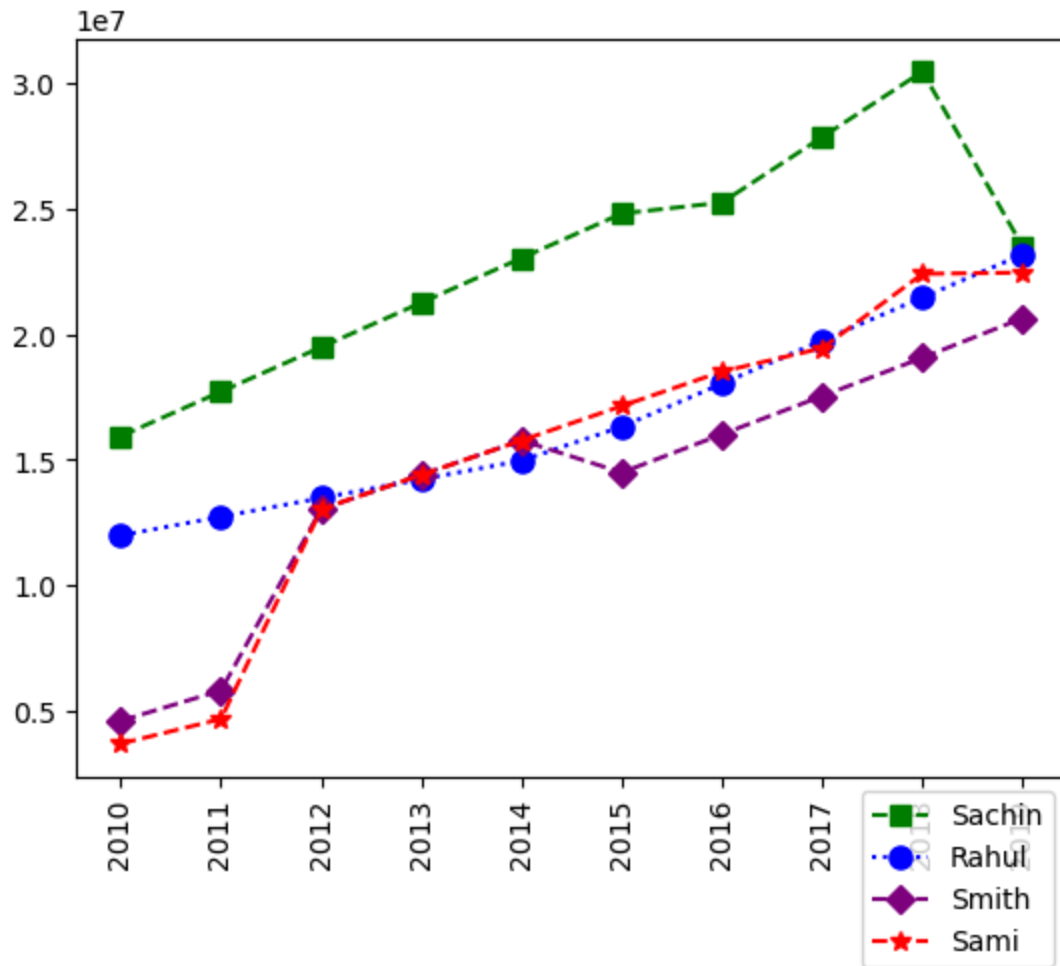


In []: *#Legend in specified location*

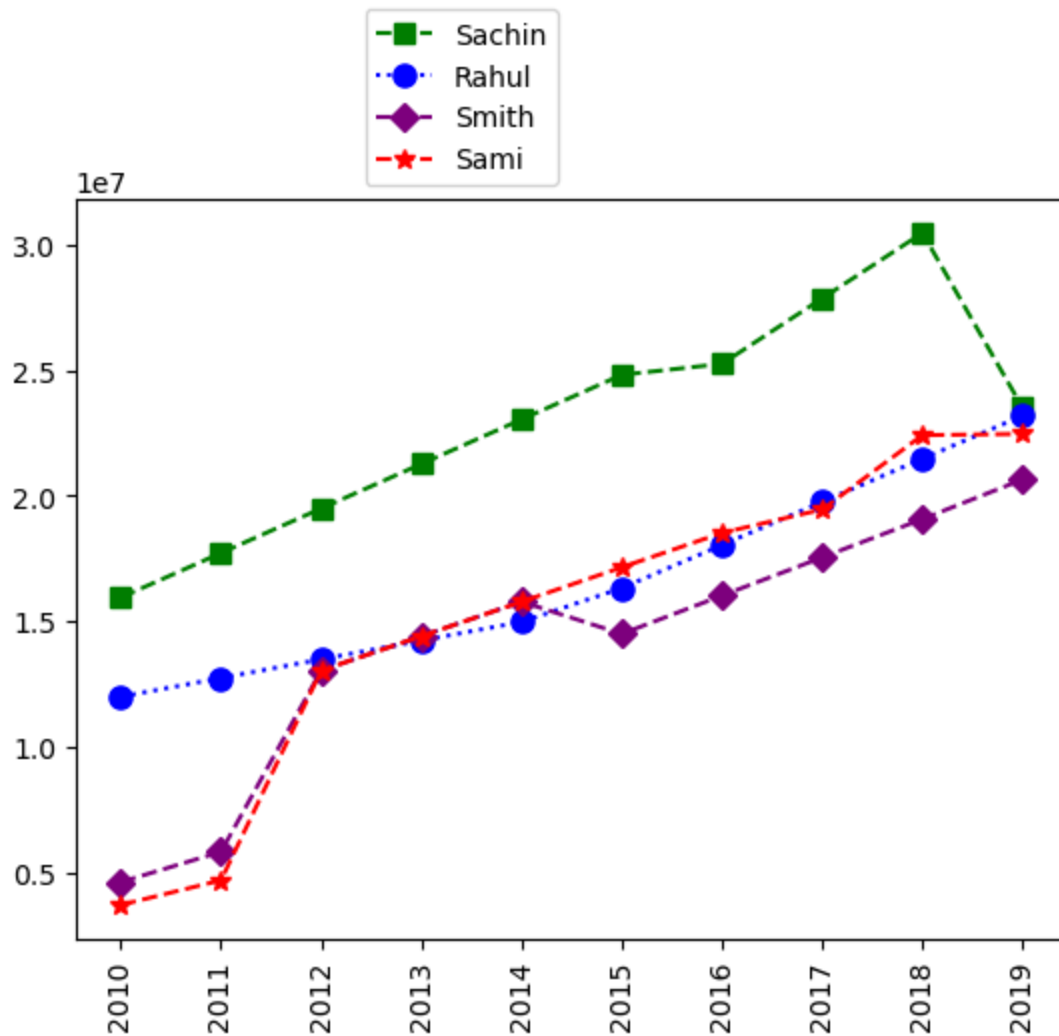
```
In [16]: plt.plot(Salary[0],c='green',ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Salary[1],c='blue',ls=':',marker='o',ms=8, label=Players[1])
plt.plot(Salary[2],c='purple',ls='--',marker='D',ms=7, label=Players[2])
plt.plot(Salary[3],c='red',ls='--',marker='*',ms=7, label=Players[3])
plt.xticks(list(range(10)),Seasons,rotation='vertical')
plt.legend(loc='upper left',bbox_to_anchor=(0,0))
plt.show()
```



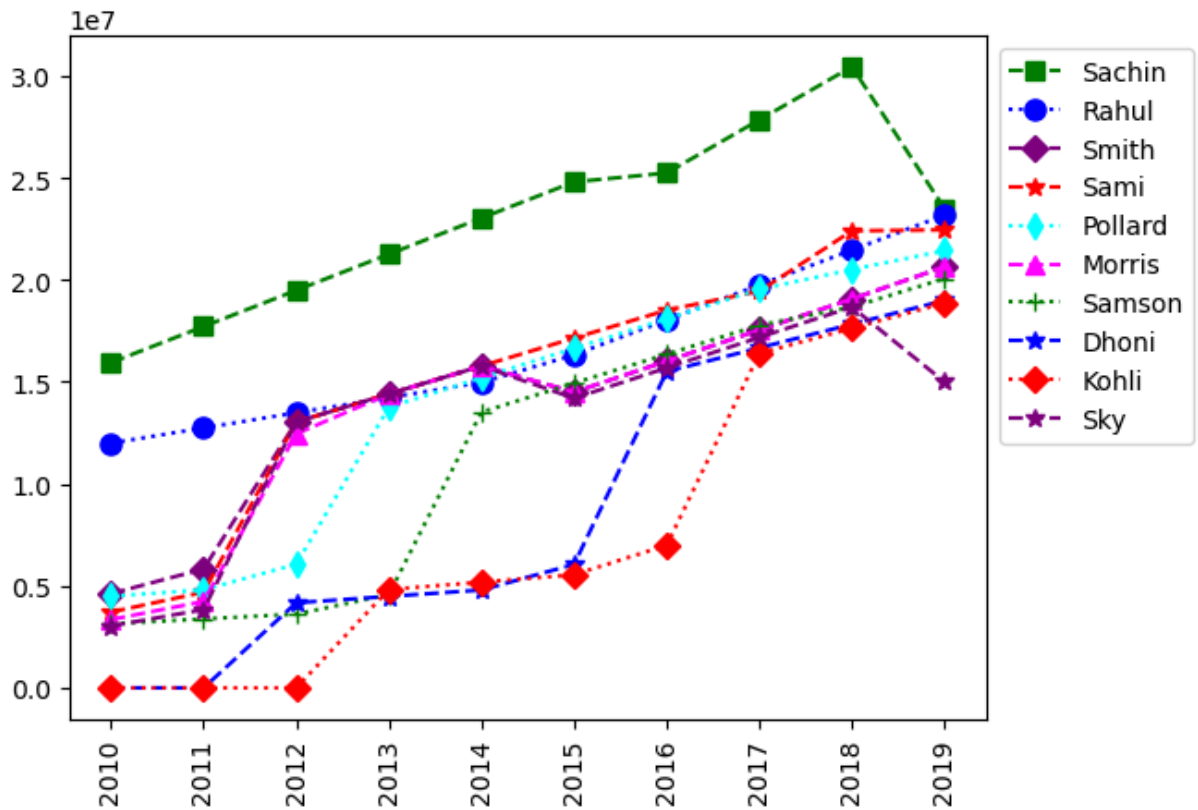
```
In [18]: plt.plot(Salary[0],c='green',ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Salary[1],c='blue',ls=':',marker='o',ms=8, label=Players[1])
plt.plot(Salary[2],c='purple',ls='--',marker='D',ms=7, label=Players[2])
plt.plot(Salary[3],c='red',ls='--',marker='*',ms=7, label=Players[3])
plt.xticks(list(range(10)),Seasons,rotation='vertical')
plt.legend(loc='upper right',bbox_to_anchor=(1,0))
plt.show()
```



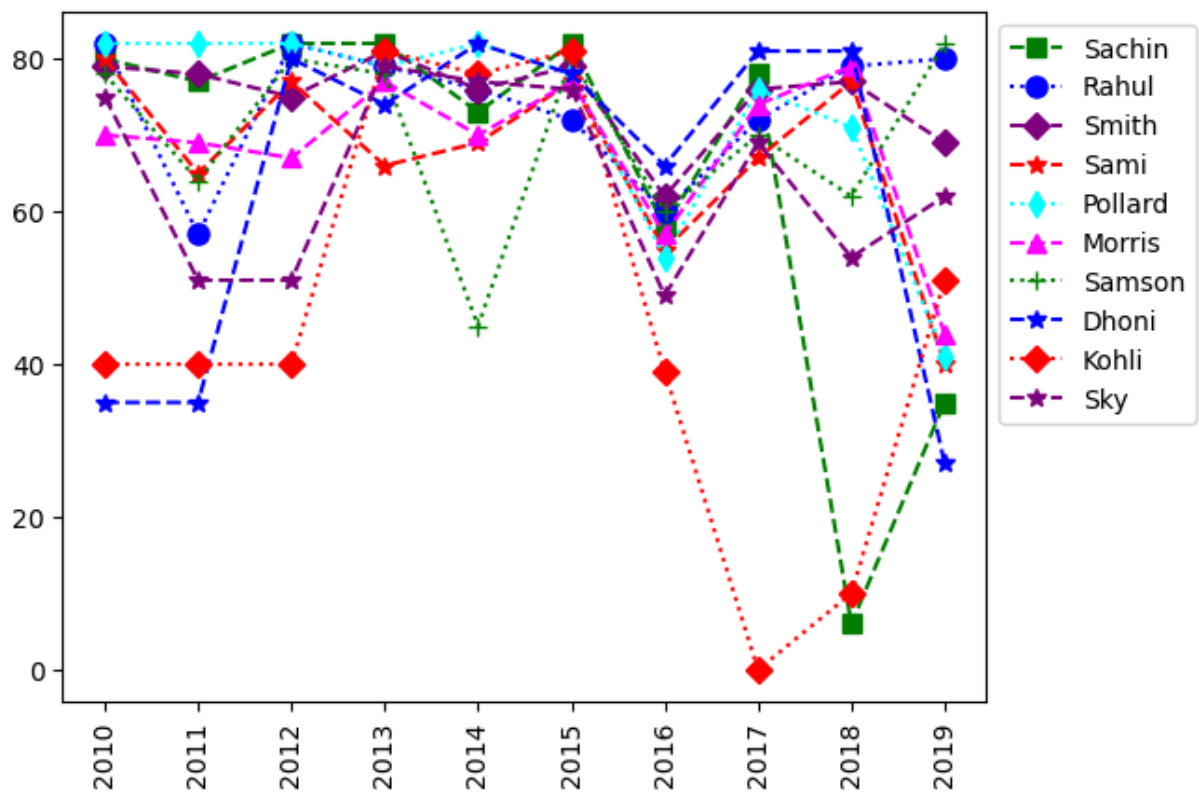
```
In [24]: plt.plot(Salary[0],c='green',ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Salary[1],c='blue',ls=':',marker='o',ms=8, label=Players[1])
plt.plot(Salary[2],c='purple',ls='--',marker='D',ms=7, label=Players[2])
plt.plot(Salary[3],c='red',ls='--',marker='*',ms=7, label=Players[3])
plt.xticks(list(range(10)),Seasons,rotation='vertical')
plt.legend(loc='lower right',bbox_to_anchor=(0.5,1))
plt.show()
```



```
In [28]: plt.plot(Salary[0],c='green', ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Salary[1],c='blue', ls=':',marker='o',ms=8, label=Players[1])
plt.plot(Salary[2],c='purple',ls='--',marker='D',ms=7, label=Players[2])
plt.plot(Salary[3],c='red',ls='--',marker='*',ms=7, label=Players[3])
plt.plot(Salary[4],c='cyan',ls=':',marker='d',ms=7, label=Players[4])
plt.plot(Salary[5],c='magenta',ls='--',marker='^',ms=7, label=Players[5])
plt.plot(Salary[6],c='green', ls=':',marker='+',ms=7, label=Players[6])
plt.plot(Salary[7],c='blue', ls='--',marker='*',ms=7, label=Players[7])
plt.plot(Salary[8],c='red', ls=':',marker='D',ms=7, label=Players[8])
plt.plot(Salary[9],c='purple', ls='--',marker='*',ms=7, label=Players[9])
plt.xticks(list(range(10)),Seasons,rotation='vertical')
plt.legend(loc='upper left',bbox_to_anchor=(1,1))
plt.show()
```



```
In [29]: plt.plot(Games[0],c='green',ls='--',marker='s',ms=7,label=Players[0])
plt.plot(Games[1],c='blue',ls=':',marker='o',ms=8, label=Players[1])
plt.plot(Games[2],c='purple',ls='--',marker='D',ms=7, label=Players[2])
plt.plot(Games[3],c='red',ls='--',marker='*',ms=7, label=Players[3])
plt.plot(Games[4],c='cyan',ls=':',marker='d',ms=7, label=Players[4])
plt.plot(Games[5],c='magenta',ls='--',marker='^',ms=7, label=Players[5])
plt.plot(Games[6],c='green',ls=':',marker='+',ms=7, label=Players[6])
plt.plot(Games[7],c='blue',ls='--',marker='*',ms=7, label=Players[7])
plt.plot(Games[8],c='red',ls=':',marker='D',ms=7, label=Players[8])
plt.plot(Games[9],c='purple',ls='--',marker='*',ms=7, label=Players[9])
plt.xticks(list(range(10)),Seasons,rotation='vertical')
plt.legend(loc='upper left',bbox_to_anchor=(1,1))
plt.show()
```



In []: