

```
In [1]: import numpy as np
```

Seasons

```
In [2]: 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

```
In [3]: Players =
["KobeBryant", "JoeJohnson", "LeBronJames", "CarmeloAnthony", "DwightHoward", "ChrisBosh", "ChrisPaul", "KevinDurant", "DerrickRose", "WayneGardner", "DwyaneWade"]

Pdict =
{"KobeBryant":0, "JoeJohnson":1, "LeBronJames":2, "CarmeloAnthony":3, "DwightHoward":4, "ChrisBosh":5, "ChrisPaul":6, "KevinDurant":7, "DerrickRose":8, "WayneGardner":9, "DwyaneWade":10}
```

Salaries

```
In [4]: 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]
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

```
In [5]: Salary = np.array([KobeBryant_Salary, JoeJohnson_Salary, LeBronJames_Salary, CarmeloAnthony_Salary,
DwightHoward_Salary, ChrisBosh_Salary, ChrisPaul_Salary, KevinDurant_Salary, DerrickRose_Salary,
DwayneWade_Salary])
```

Games

```
In [6]: 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

```
In [7]: Games = np.array([KobeBryant_G, JoeJohnson_G, LeBronJames_G, CarmeloAnthony_G, DwightHoward_G, ChrisBosh_G,
ChrisPaul_G, KevinDurant_G, DerrickRose_G, DwayneWade_G])
```

Total Minutes Played

```
In [8]: 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

```
In [9]: 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

```
In [10]: 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

```
In [12]: 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

```
In [13]: 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

```
In [14]: FieldGoalAttempts = np.array([KobeBryant_FGA, JoeJohnson_FGA, LeBronJames_FGA, CarmeloAnthony_FGA,
DwightHoward_FGA, ChrisBosh_FGA, ChrisPaul_FGA, KevinDurant_FGA, DerrickRose_FGA, DwayneWade_FGA])
```

Points

```
In [15]: 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

```
In [16]: Points = np.array([KobeBryant_PTS, JoeJohnson_PTS, LeBronJames_PTS, CarmeloAnthony_PTS, DwightHoward_PTS,
ChrisBosh_PTS, ChrisPaul_PTS, KevinDurant_PTS, DerrickRose_PTS, DwayneWade_PTS])
```

```
In [18]: Salary
```

```
Out[18]: 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 [19]: Points
```

```
Out[19]: 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 [20]: Games
```

```
Out[20]: 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 [21]: my_data = np.arange(0,20)
```

```
In [22]: my_data
```

```
Out[22]: array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
17, 18, 19])
```

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

```
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]: Matrix1 = np.reshape(my_data,(5,4),order='c')
```

```
In [26]: Matrix1
```

```
Out[26]: array([[ 0,  1,  2,  3],
          [ 4,  5,  6,  7],
          [ 8,  9, 10, 11],
          [12, 13, 14, 15],
          [16, 17, 18, 19]])
```

```
In [28]: Matrix1[4,3]
```

```
Out[28]: 19
```

```
In [30]: Matrix1[-2,-4]
```

```
Out[30]: 12
```

```
In [31]: Matrix1[-3,3]
```

```
Out[31]: 11
```

```
In [32]: Matrix1
```

```
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]: Matrix2=np.reshape(my_data,(5,4),order='f')
```

```
In [34]: Matrix2
```

```
Out[34]: array([[ 0,  5, 10, 15],
          [ 1,  6, 11, 16],
          [ 2,  7, 12, 17],
          [ 3,  8, 13, 18],
          [ 4,  9, 14, 19]])
```

```
In [35]: Matrix2[0,2]
```

```
Out[35]: 10
```

```
In [36]: Matrix2[4,3]
```

```
Out[36]: 19
```

```
In [37]: Matrix2[-3,-4]
```

```
Out[37]: 2
```

```
In [38]: Matrix3=np.reshape(my_data,(5,4),order='A')
```

```
In [39]: Matrix3
```

```
Out[39]: array([[ 0,  1,  2,  3],
          [ 4,  5,  6,  7],
          [ 8,  9, 10, 11],
          [12, 13, 14, 15],
          [16, 17, 18, 19]])
```

```
In [40]: Matrix3[0,2]
```

```
Out[40]: 2
```

```
In [41]: Matrix3[4,3]
```

Out[41]: 19

In [42]: Matrix3[-3,-4]

Out[42]: 8

In [43]: a1 = ['welcome', 'to', 'datascience']

In [44]: a2 = ['required', 'hard', 'work']

In [45]: a3 = [1,2,3]

In [46]: [a1,a2,a3]

Out[46]: [['welcome', 'to', 'datascience'], ['required', 'hard', 'work'], [1, 2, 3]]

In [47]: np.array([a1,a2,a3])

Out[47]: array(['welcome', 'to', 'datascience'],
 ['required', 'hard', 'work'],
 ['1', '2', '3']], dtype='<U11')

In [48]: Games

Out[48]: 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 [49]: Games[0]

Out[49]: array([80, 77, 82, 82, 73, 82, 58, 78, 6, 35])

In [50]: Games[5]

Out[50]: array([70, 69, 67, 77, 70, 77, 57, 74, 79, 44])

In [51]: Games[3,5]

Out[51]: 77

In [52]: Games[-2,4]

Out[52]: 78

In [53]: Points

Out[53]: 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 [54]: Points[3]

Out[54]: array([2122, 1881, 1978, 1504, 1943, 1970, 1245, 1920, 2112, 966])

In [55]: Points[-4]

Out[55]: array([1258, 1104, 1684, 1781, 841, 1268, 1189, 1186, 1185, 1564])

In [56]: Points[-3,4]

```
Out[56]: 2472

In [57]: dict1 = {'key1':'val1', 'key2':'val2', 'key3':'val3'}

In [58]: dict1

Out[58]: {'key1': 'val1', 'key2': 'val2', 'key3': 'val3'}

In [60]: dict1['key1']

Out[60]: 'val1'

In [62]: dict1['key2']

Out[62]: 'val2'

In [63]: dict2 = {'bang':2,'hyd':'we are hear', 'pune':True}

In [64]: dict2

Out[64]: {'bang': 2, 'hyd': 'we are hear', 'pune': True}

In [65]: dict2['bang']

Out[65]: 2

In [66]: dict2['hyd']

Out[66]: 'we are hear'

In [68]: dict2['pune']

Out[68]: True

In [69]: dict3 = {'Germany':'I have been here', 'France':2, 'Spain': True}

In [70]: dict3

Out[70]: {'Germany': 'I have been here', 'France': 2, 'Spain': True}

In [71]: Games

Out[71]: 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 [72]: Pdict['KobeBryant']

Out[72]: 0

In [73]: Games[0]

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

In [74]: Points[0]

Out[74]: array([2832, 2430, 2323, 2201, 1970, 2078, 1616, 2133,  83,  782])

In [75]: Salary[0]

Out[75]: array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
 25244493, 27849149, 30453805, 23500000])

In [76]: Pdict['DerrickRose']
```

```
Out[76]: 8

In [77]: Games[8]

Out[77]: array([40, 40, 40, 81, 78, 81, 39,  0, 10, 51])

In [78]: Points[8]

Out[78]: array([ 597,  597,  597, 1361, 1619, 2026,  852,    0,  159,  904])

In [79]: Salary[8]

Out[79]: array([    0,    0,    0, 4822800, 5184480, 5546160,
        6993708, 16402500, 17632688, 18862875])

In [80]: Games[Pdict['DerrickRose']]

Out[80]: array([40, 40, 40, 81, 78, 81, 39,  0, 10, 51])

In [81]: Points[Pdict['DerrickRose']][Sdict['2012']]

Out[81]: 0

In [82]: Points[Pdict['DerrickRose']][Sdict['2011']]

Out[82]: 852

In [83]: print(Pdict['LeBronJames']) # the row he is in
print(Sdict['2009']) # the column he is in

2
4

In [84]: Salary[Pdict['LeBronJames'],Sdict['2009']]

Out[84]: 15779912

In [85]: FieldGoals

Out[85]: 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]])

In [87]: FieldGoals/Games

C:\Users\abhin\AppData\Local\Temp\ipykernel_25544\4263131536.py:1: RuntimeWarning: invalid value encountered in true_divide
  FieldGoals/Games

Out[87]: 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]])

In [88]: np.round(FieldGoals/Games)
```



```
C:\Users\abhin\AppData\Local\Temp\ipykernel_25544\2187621624.py:1: RuntimeWarning: invalid value encountered in true_divide
np.round(FieldGoals/Games)
```

```
Out[88]: array([[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.]])
```

Visualization

```
In [89]: import numpy as np
```

```
In [90]: import matplotlib.pyplot as plt
```

```
In [91]: %matplotlib inline
```

```
In [92]: Salary
```

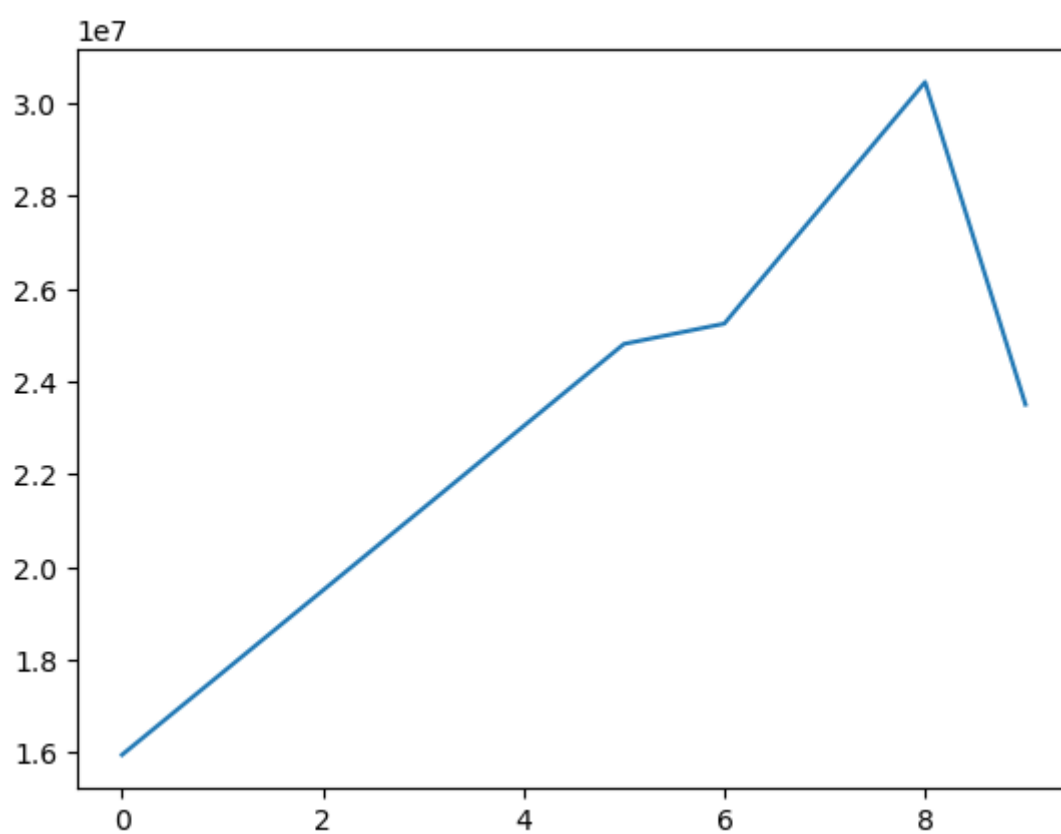
```
Out[92]: array([[15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
        25244493, 27849149, 30453805, 23500000],
       [12000000, 12744189, 13488377, 14232567, 14976754, 16324500,
        18038573, 19752645, 21466718, 23180790],
       [ 4621800,  5828090, 13041250, 14410581, 15779912, 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 [93]: Salary[0]
```

```
Out[93]: array([15946875, 17718750, 19490625, 21262500, 23034375, 24806250,
        25244493, 27849149, 30453805, 23500000])
```

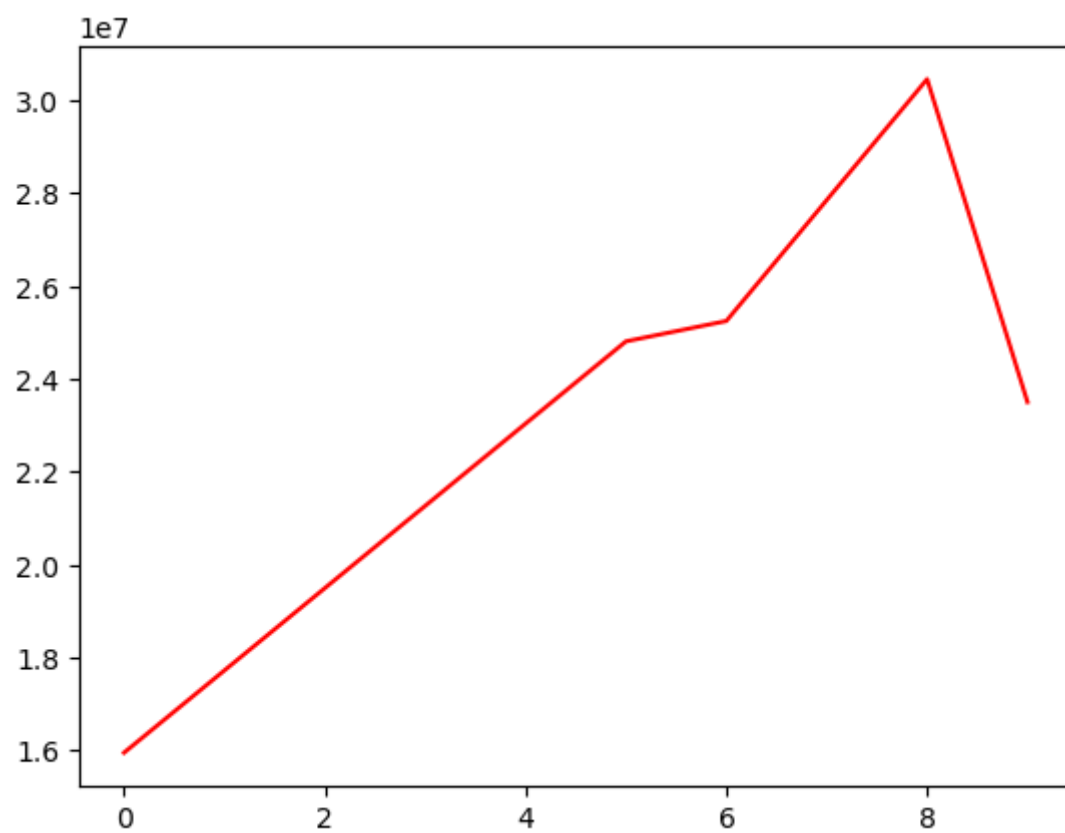
```
In [95]: plt.plot(Salary[0])
```

```
Out[95]: [<matplotlib.lines.Line2D at 0x1e7dda61070>]
```




```
In [96]: plt.plot(Salary[0], c='red')
```

```
Out[96]: [<matplotlib.lines.Line2D at 0x1e7ddc95cd0>]
```



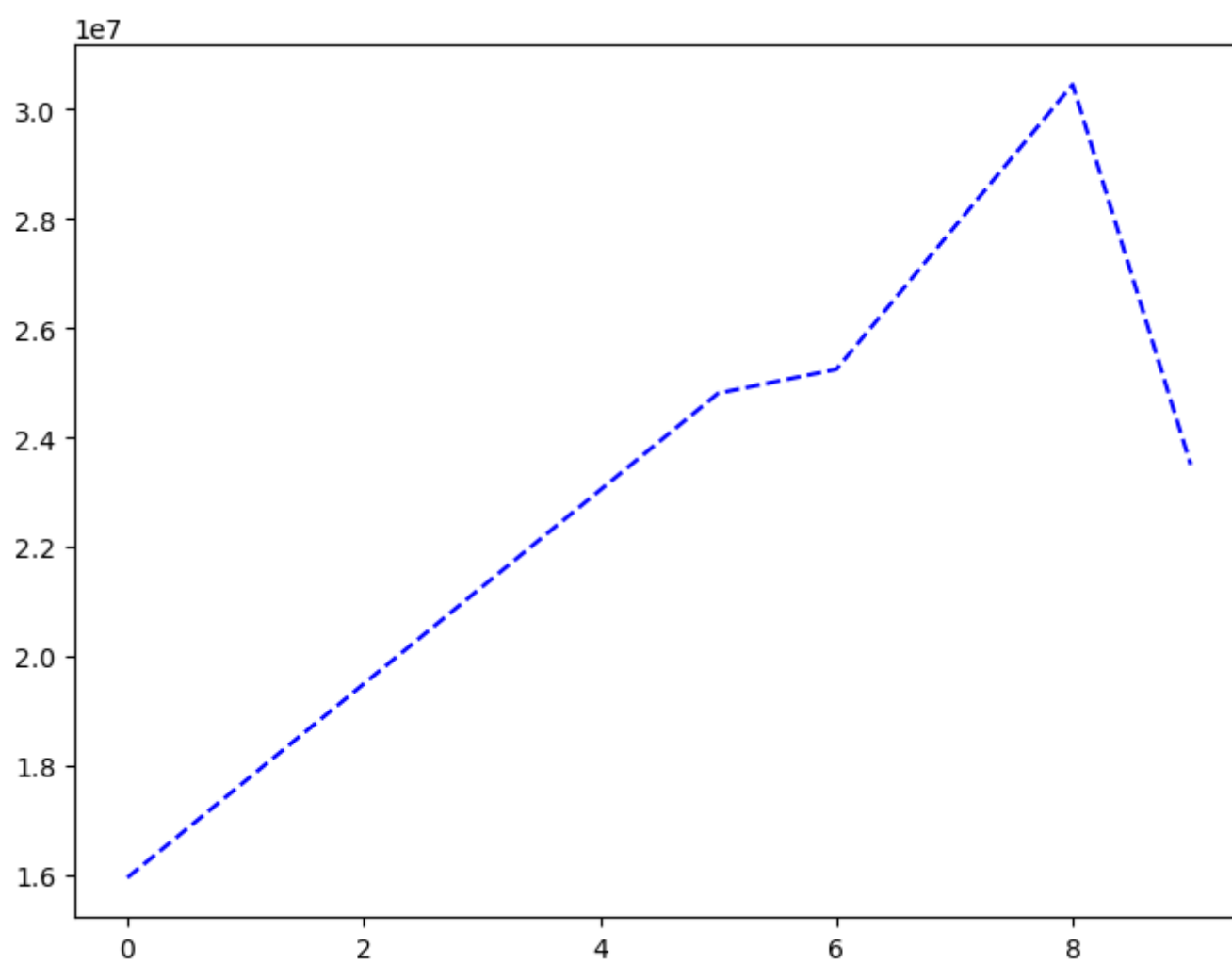
Changing Plot Size

```
In [97]: plt.rcParams['figure.figsize'] = 8,6
```

To change the line Style (ls="solid", "dotted", "dashed" or "dashdot".)

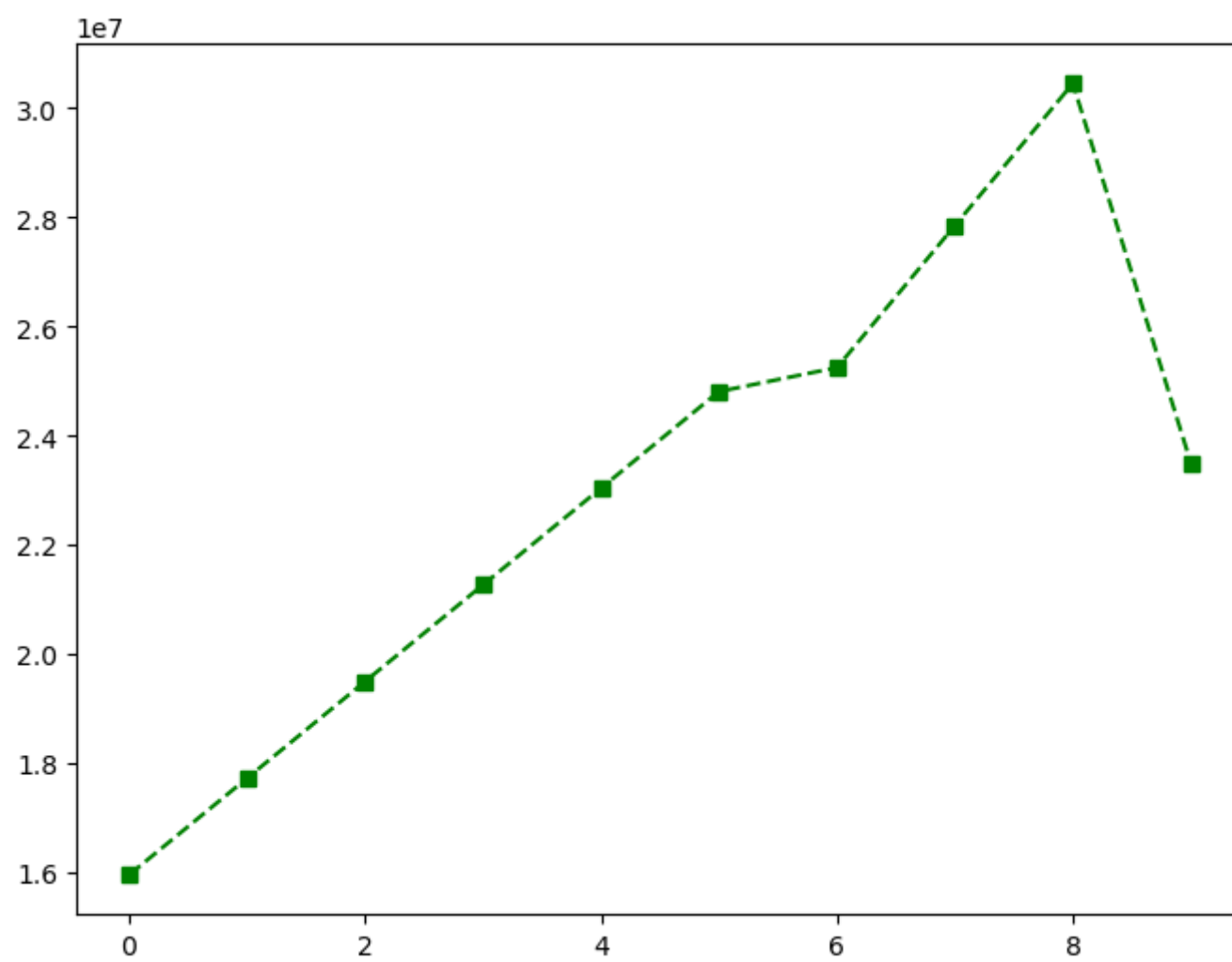
```
In [98]: plt.plot(Salary[0], c='Blue', ls = '--')
```

```
Out[98]: [<matplotlib.lines.Line2D at 0x1e7ddb04c70>]
```



```
In [99]: plt.plot(Salary[0], c='Green', ls = '--', marker = 's')
```

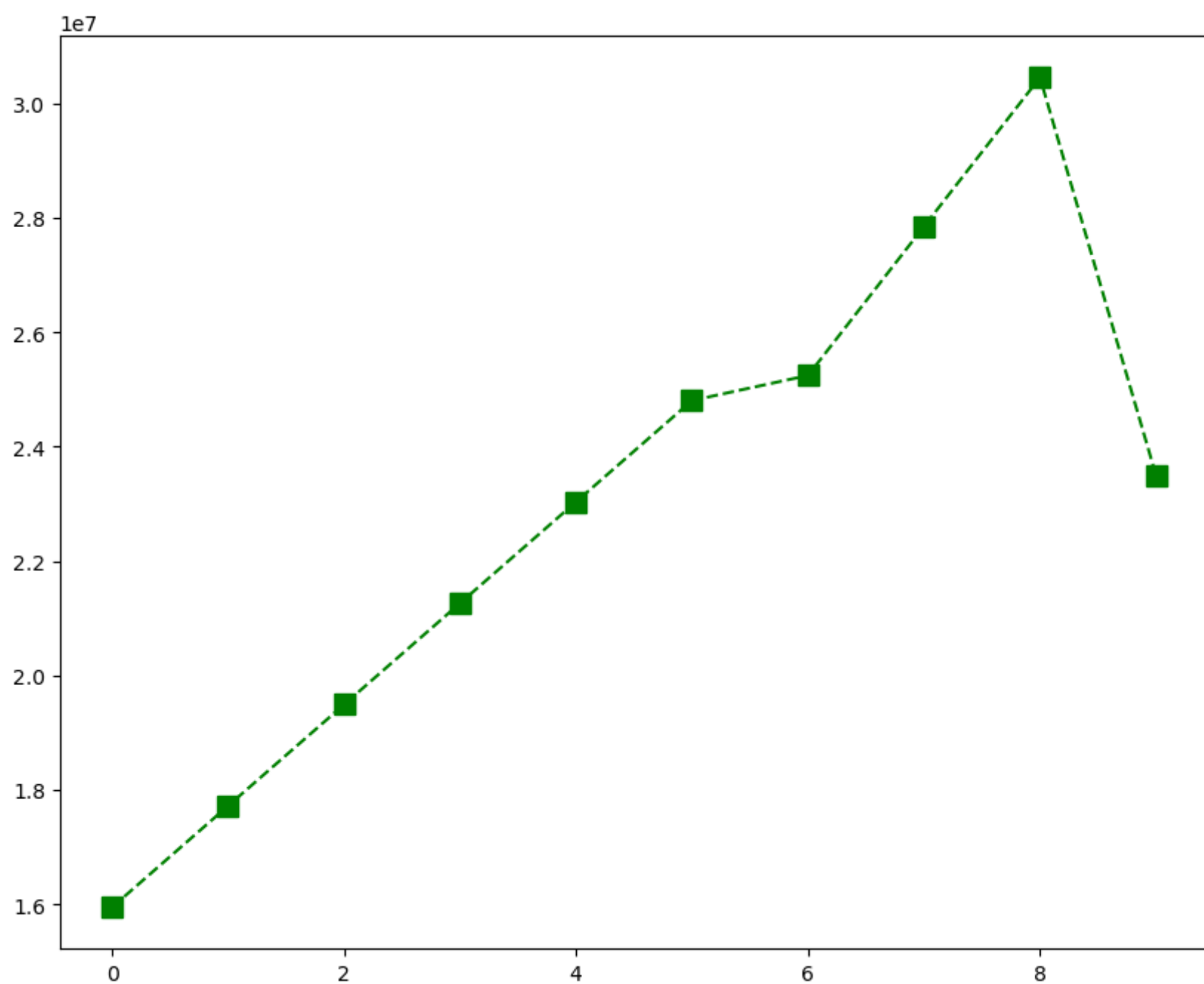
```
Out[99]: [<matplotlib.lines.Line2D at 0x1e7ddb63f40>]
```



```
In [100]: plt.rcParams['figure.figsize'] = 10,8 #runtime configuration parameter
```

```
In [101]: plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 10) #ms=Marker Size
```

```
Out[101]: [<matplotlib.lines.Line2D at 0x1e7ddb1550>]
```



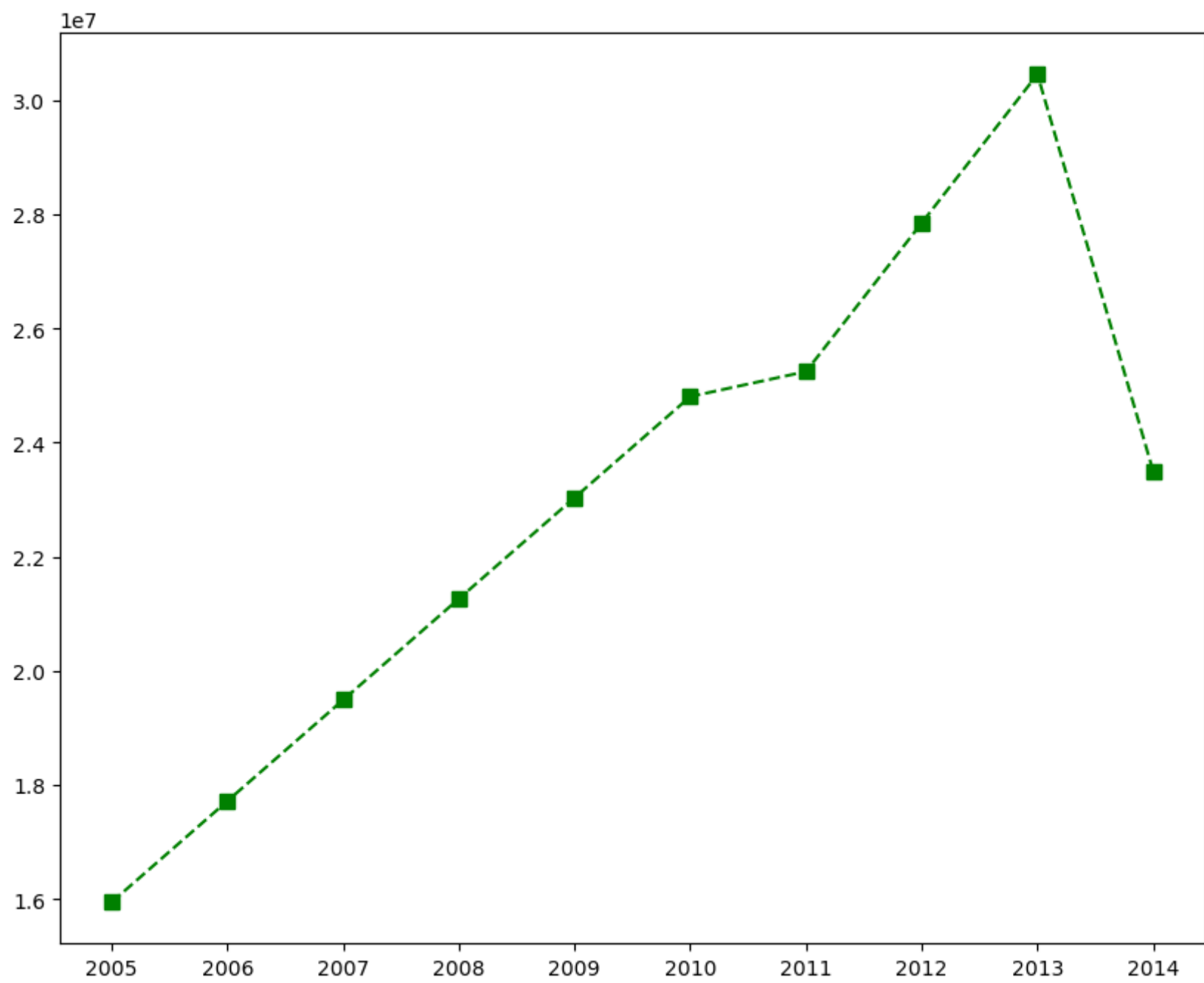
```
In [104]: plt.show
```

```
Out[104]: <function matplotlib.pyplot.show(close=None, block=None)>
```

```
In [107]: plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7)
plt.xticks(list(range(0,10)), Seasons)
```

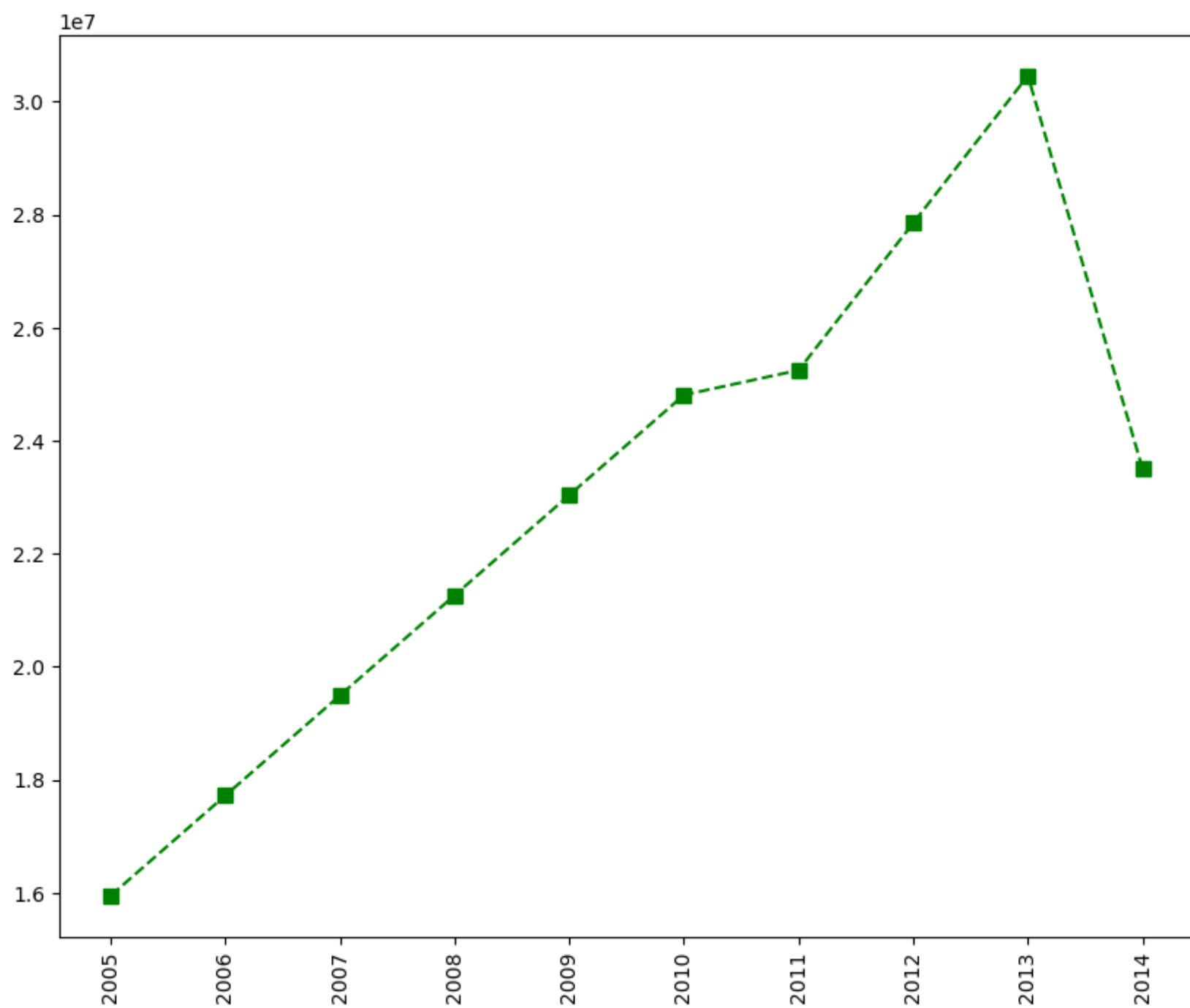
```
plt.show
```

Out[107]: `<function matplotlib.pyplot.show(close=None, block=None)>`



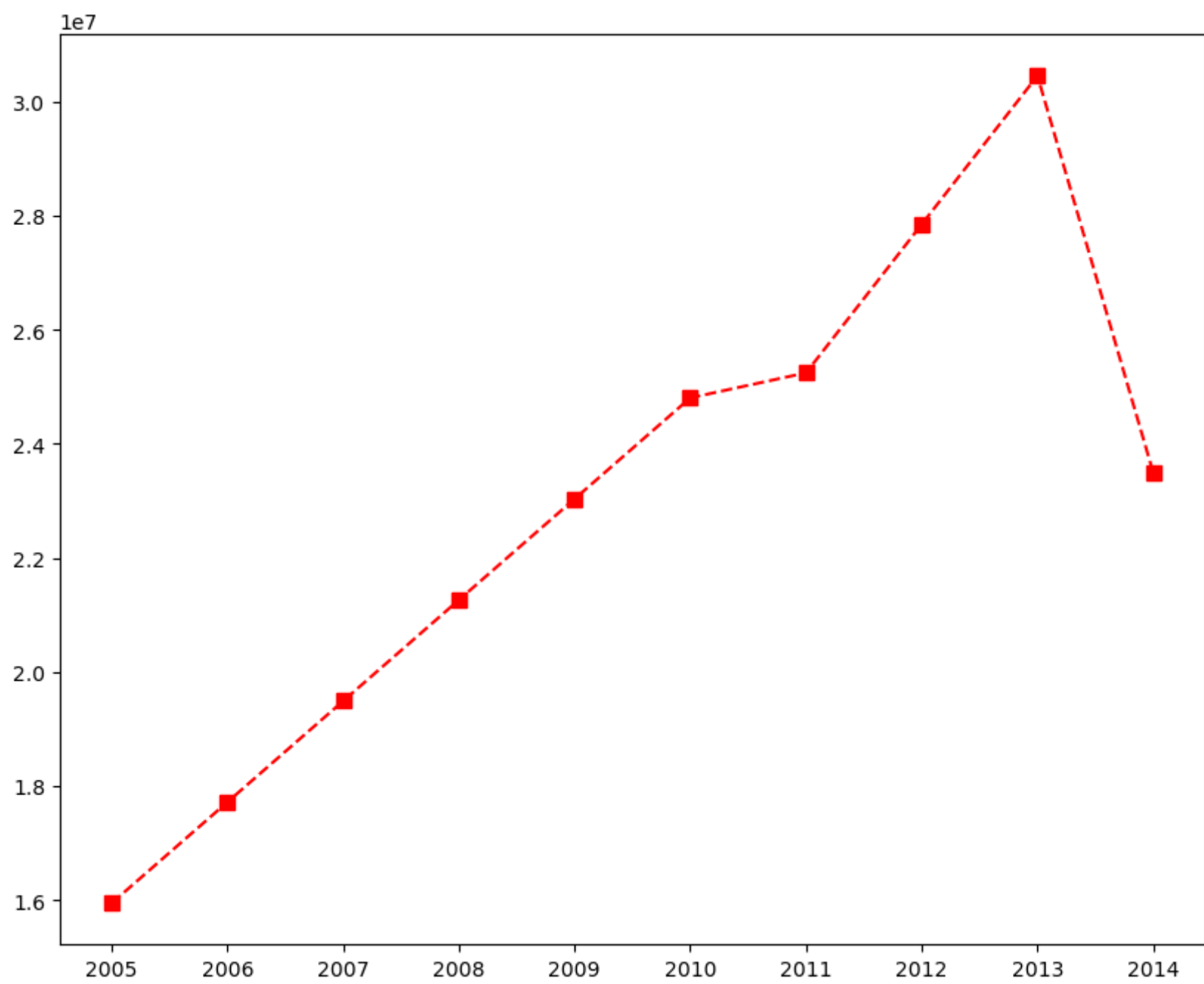
In [108... `plt.plot(Salary[0], c='green', ls='--', marker='s', ms=7)`
`plt.xticks(list(range(0,10)), Seasons, rotation='vertical')`
`plt.show`

Out[108]: `<function matplotlib.pyplot.show(close=None, block=None)>`



```
In [109]: plt.plot(Salary[0],c='red',ls='--',marker='s',ms='7')
plt.xticks(list(range(0,10)),Seasons,rotation='horizontal')
plt.show
```

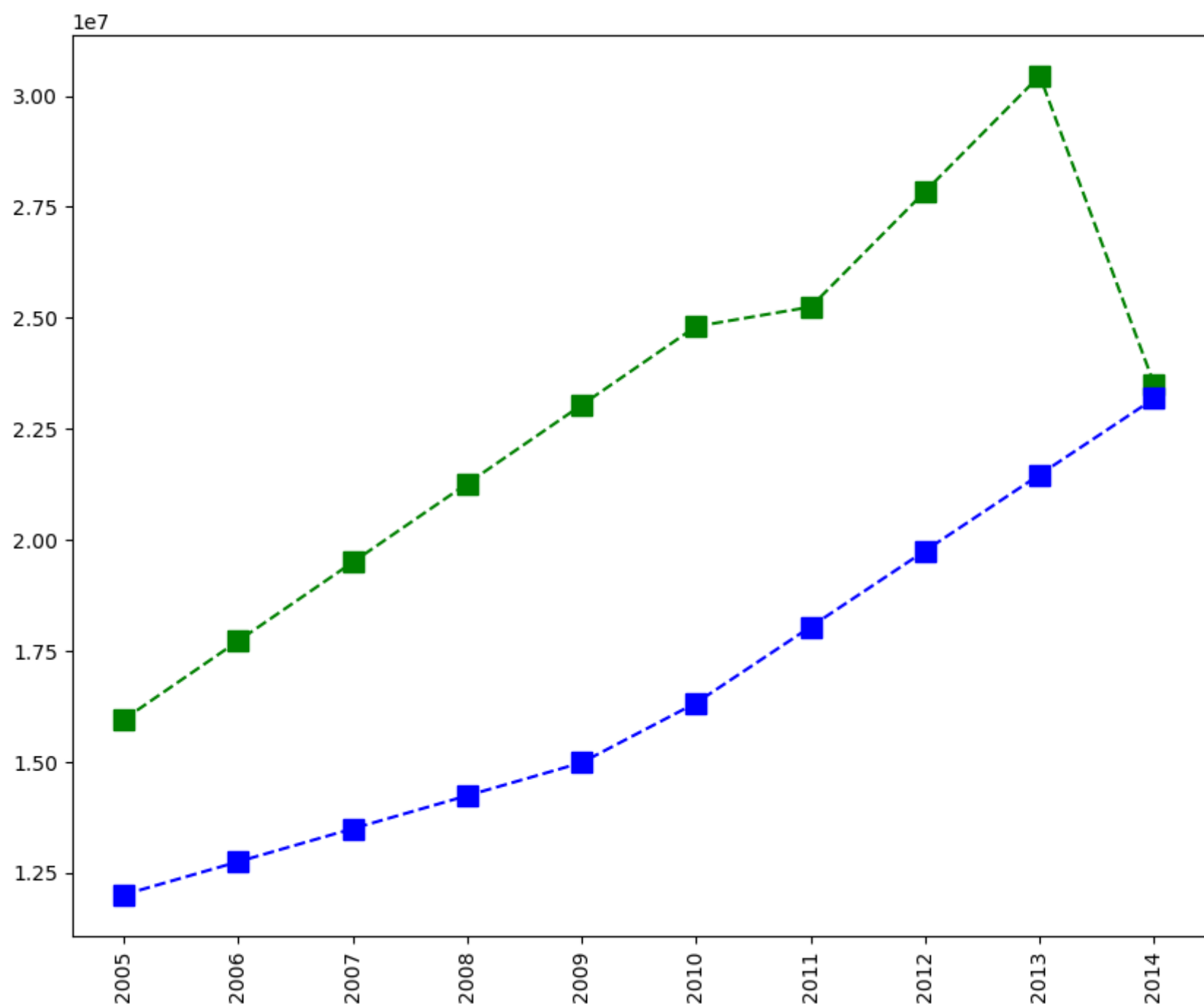
```
Out[109]: <function matplotlib.pyplot.show(close=None, block=None)>
```



```
In [110... plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 10, label = Players[0])
plt.plot(Salary[1], c='Blue', ls = '--', marker = 's', ms = 10, label = Players[1])

plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

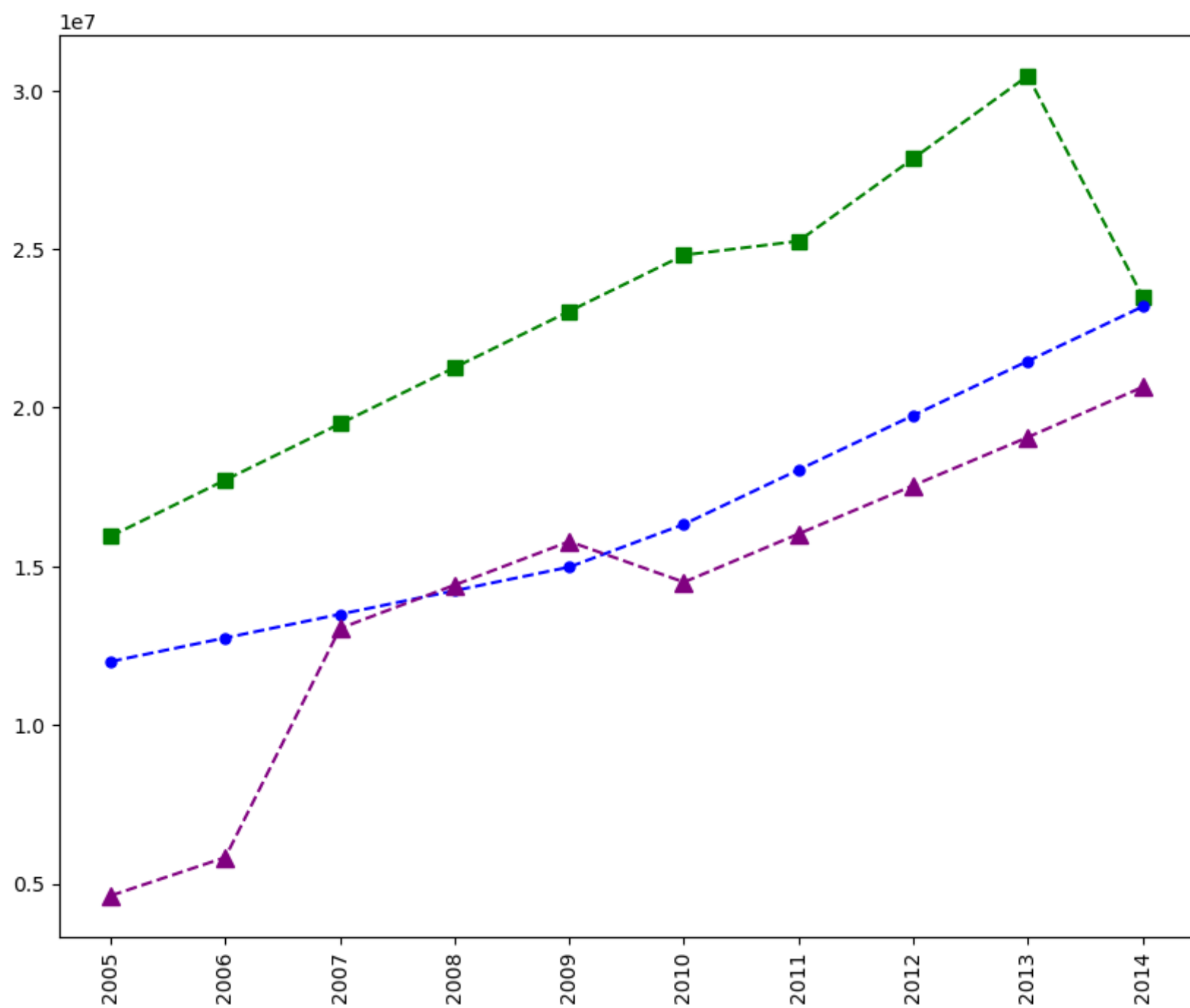
plt.show()
```



```
In [111... plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0])
plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1])
plt.plot(Salary[2], c='purple', ls = '--', marker = '^', ms = 8, label = Players[2])

plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

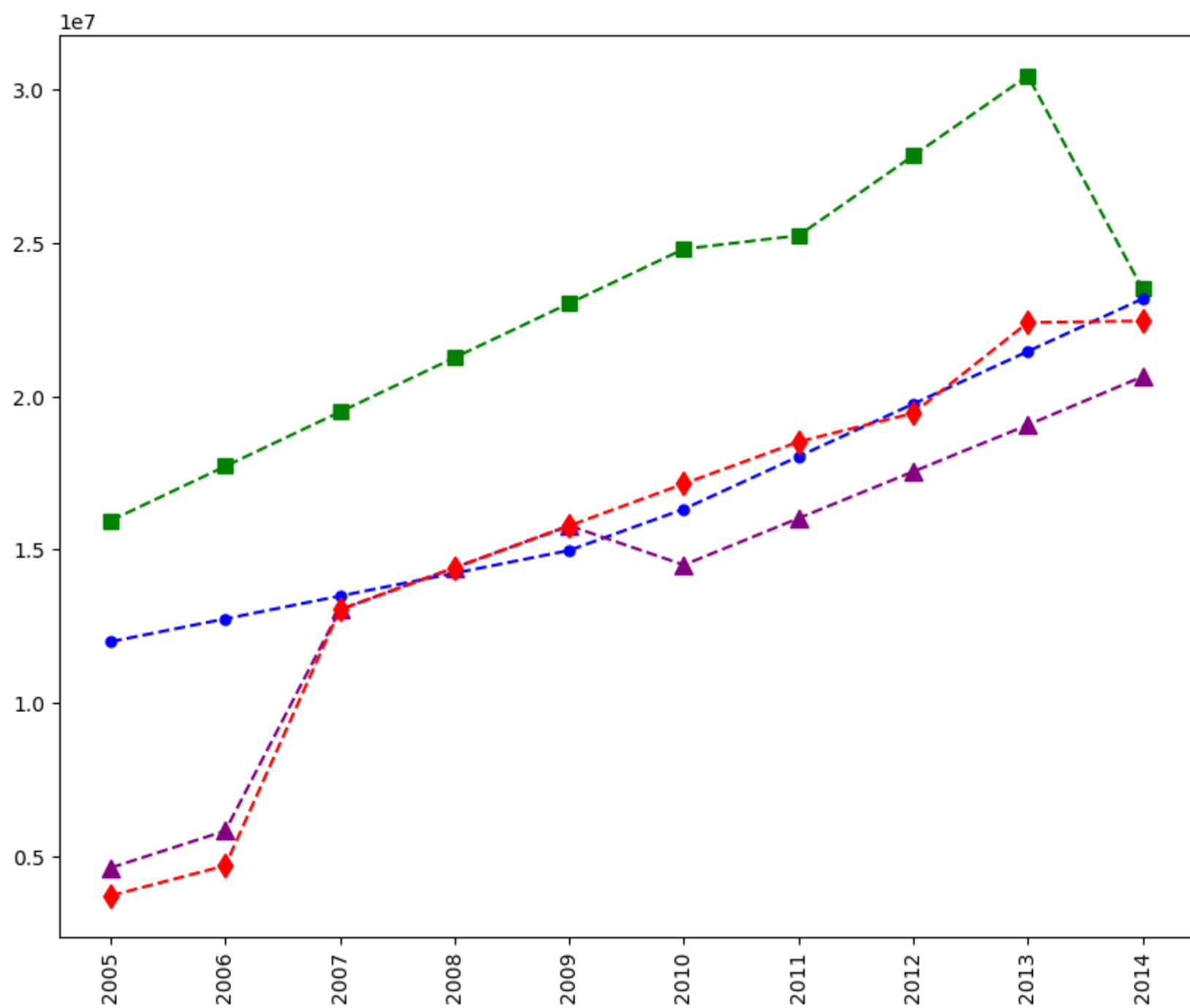
plt.show()
```



```
In [112... plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0])
plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1])
plt.plot(Salary[2], c='purple', ls = '--', marker = '^', ms = 8, label = Players[2])
plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3])

plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```

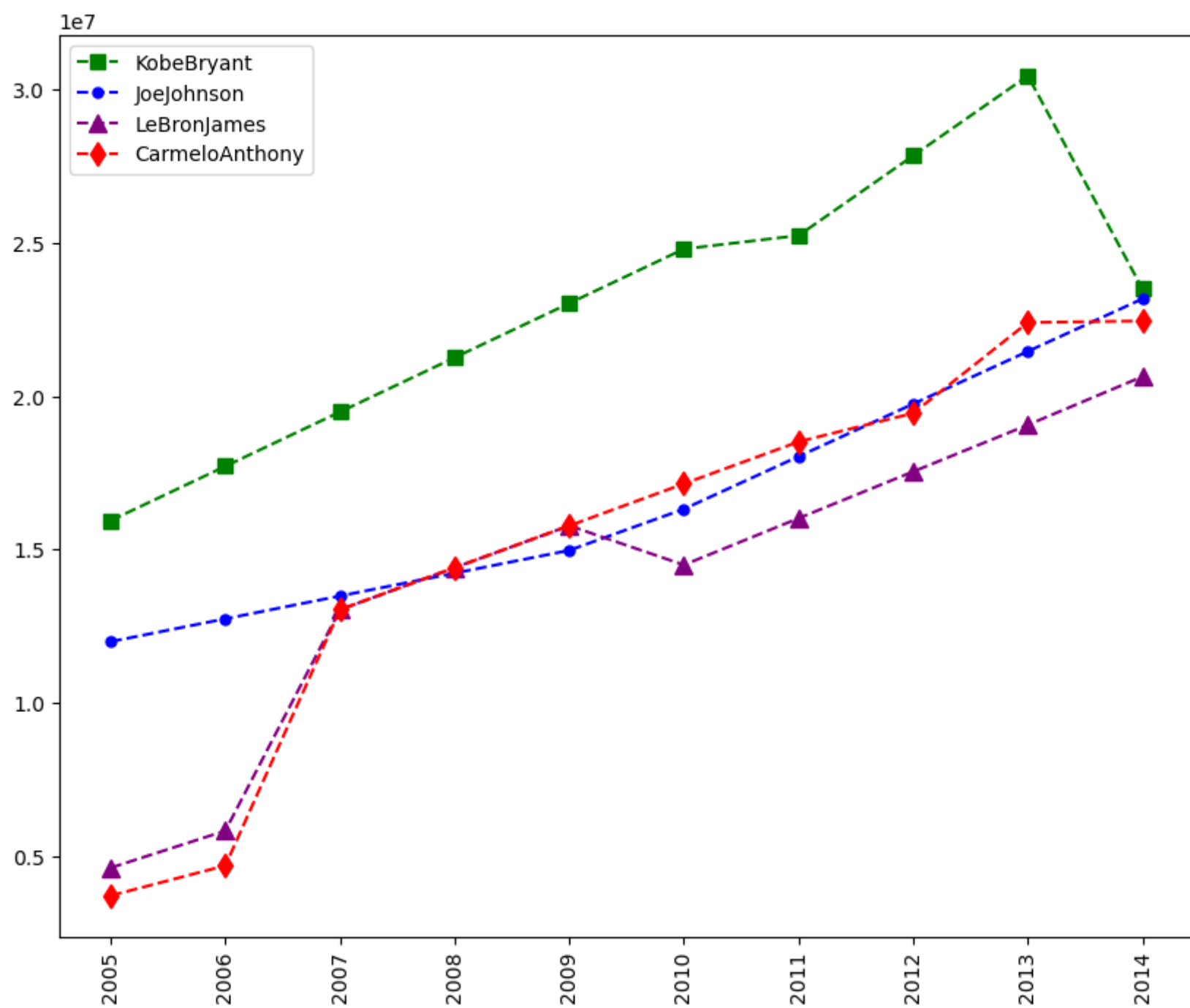
Legend()

In [113...

```
# how to add legend in visualisation
```

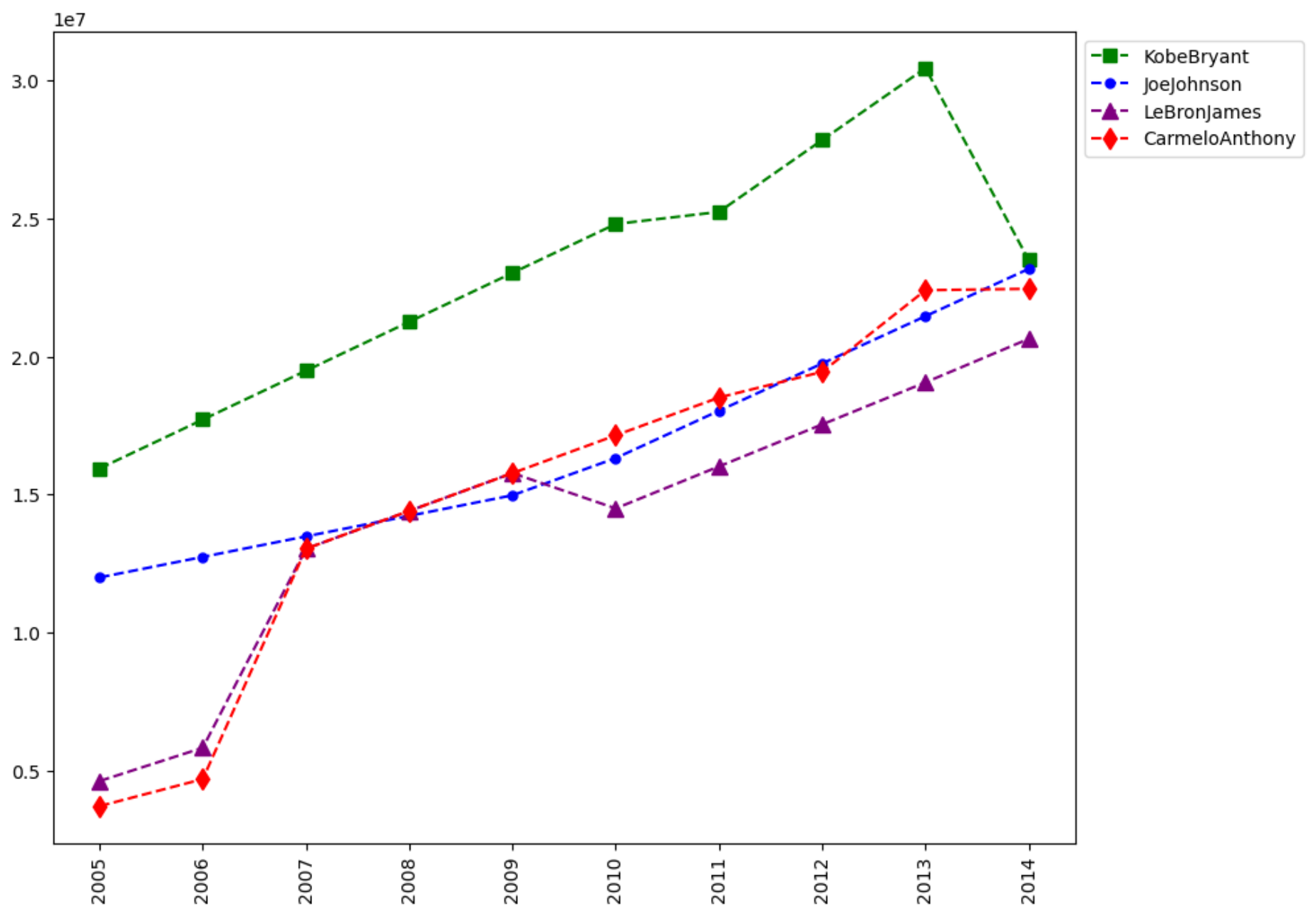
```
plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0])
plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1])
plt.plot(Salary[2], c='purple', ls = '--', marker = '^', ms = 8, label = Players[2])
plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3])
plt.legend()
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```



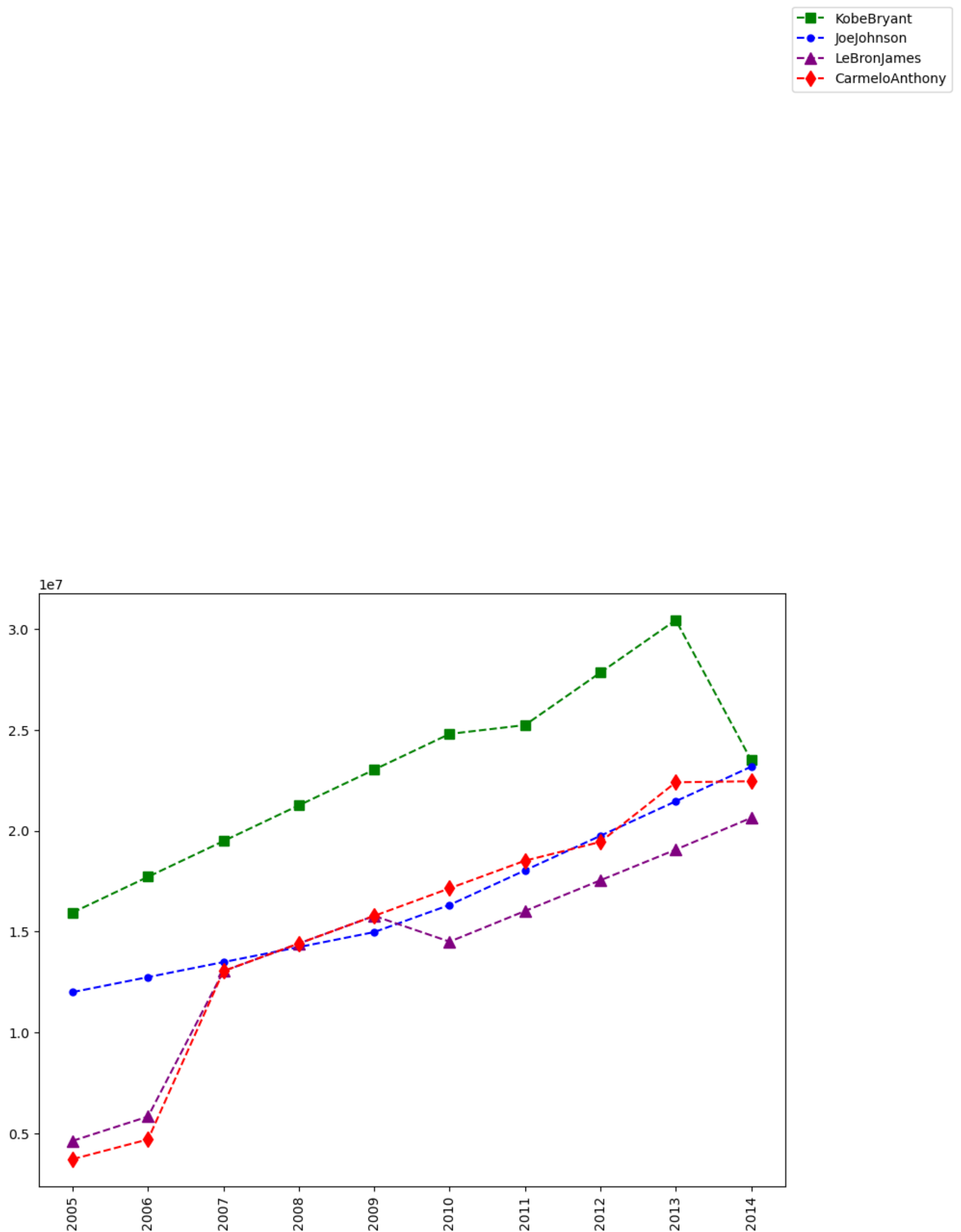
```
In [114... plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0])
plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1])
plt.plot(Salary[2], c='purple', ls = '--', marker = '^', ms = 8, label = Players[2])
plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3])
plt.legend(loc = 'upper left',bbox_to_anchor=(1,1) ) #bbox_to_anchor (1,1). Left hand is to zoom out, Right hand
is to keep distance of Legend from fig
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```



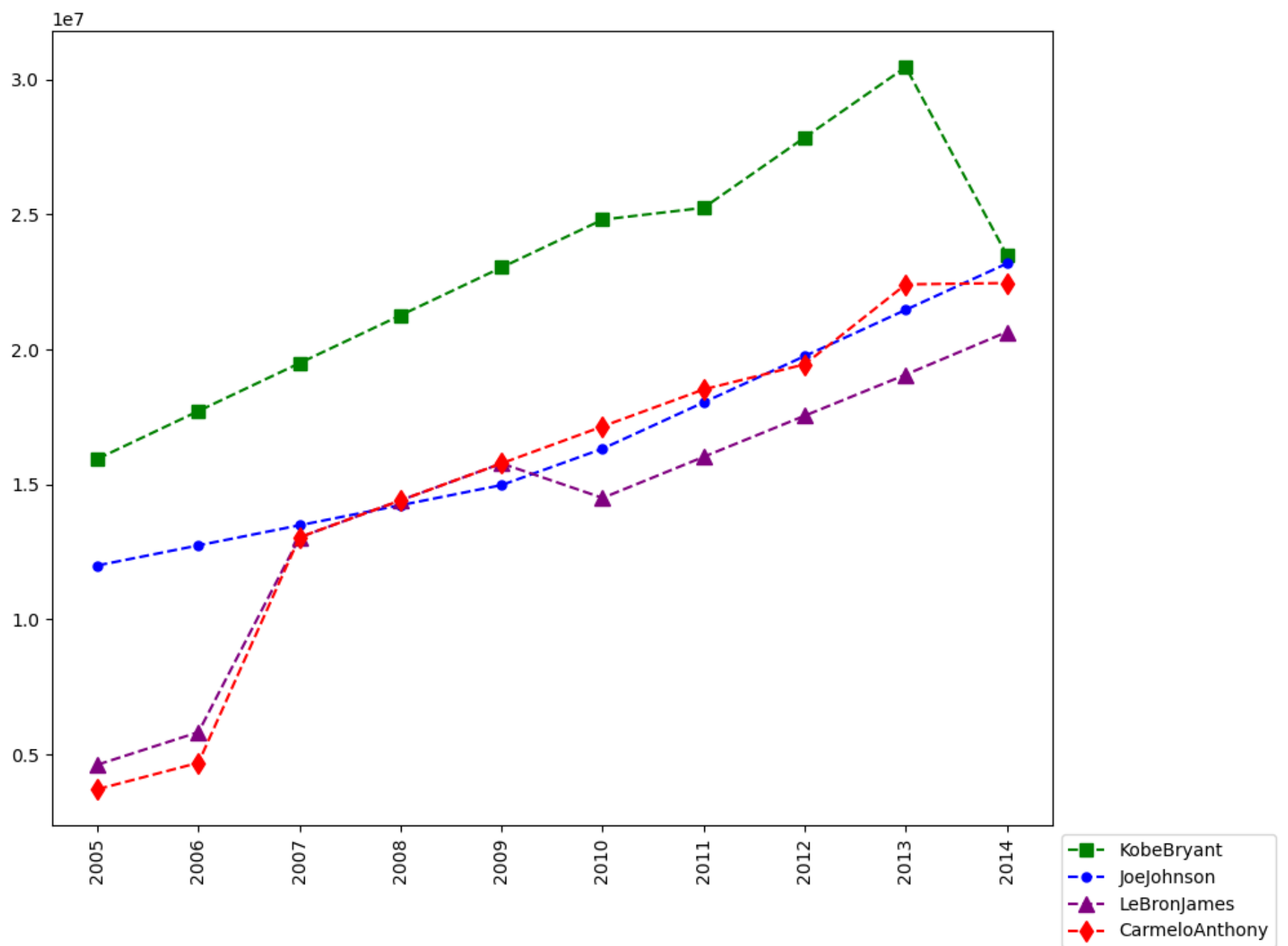
```
In [115... plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0])
plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1])
plt.plot(Salary[2], c='purple', ls = '--', marker = '^', ms = 8, label = Players[2])
plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3])
plt.legend(loc = 'upper left',bbox_to_anchor=(1,2) )
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```



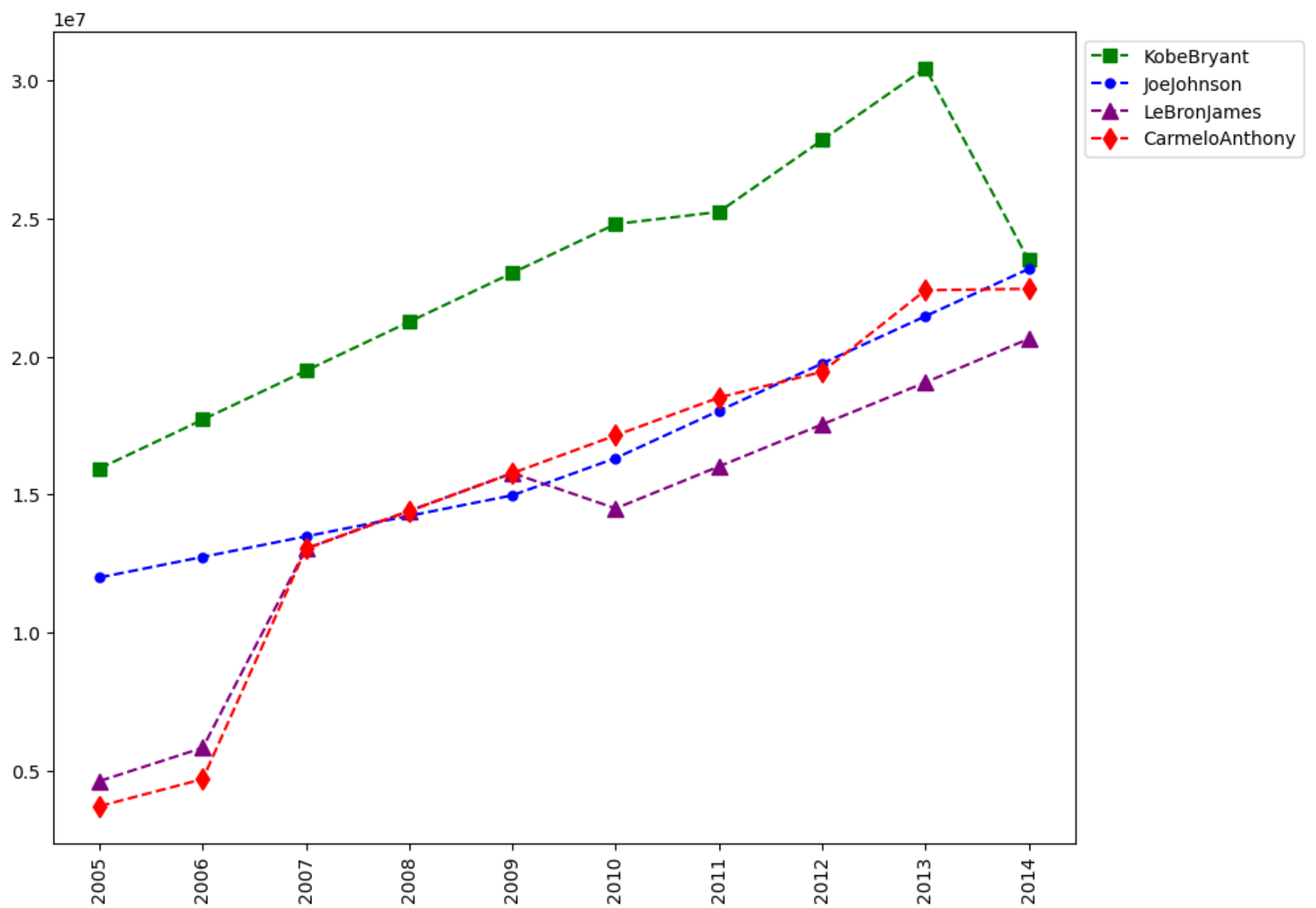
```
In [116... plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0])
plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1])
plt.plot(Salary[2], c='purple', ls = '--', marker = '^', ms = 8, label = Players[2])
plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3])
plt.legend(loc = 'upper left',bbox_to_anchor=(1,0) )
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```



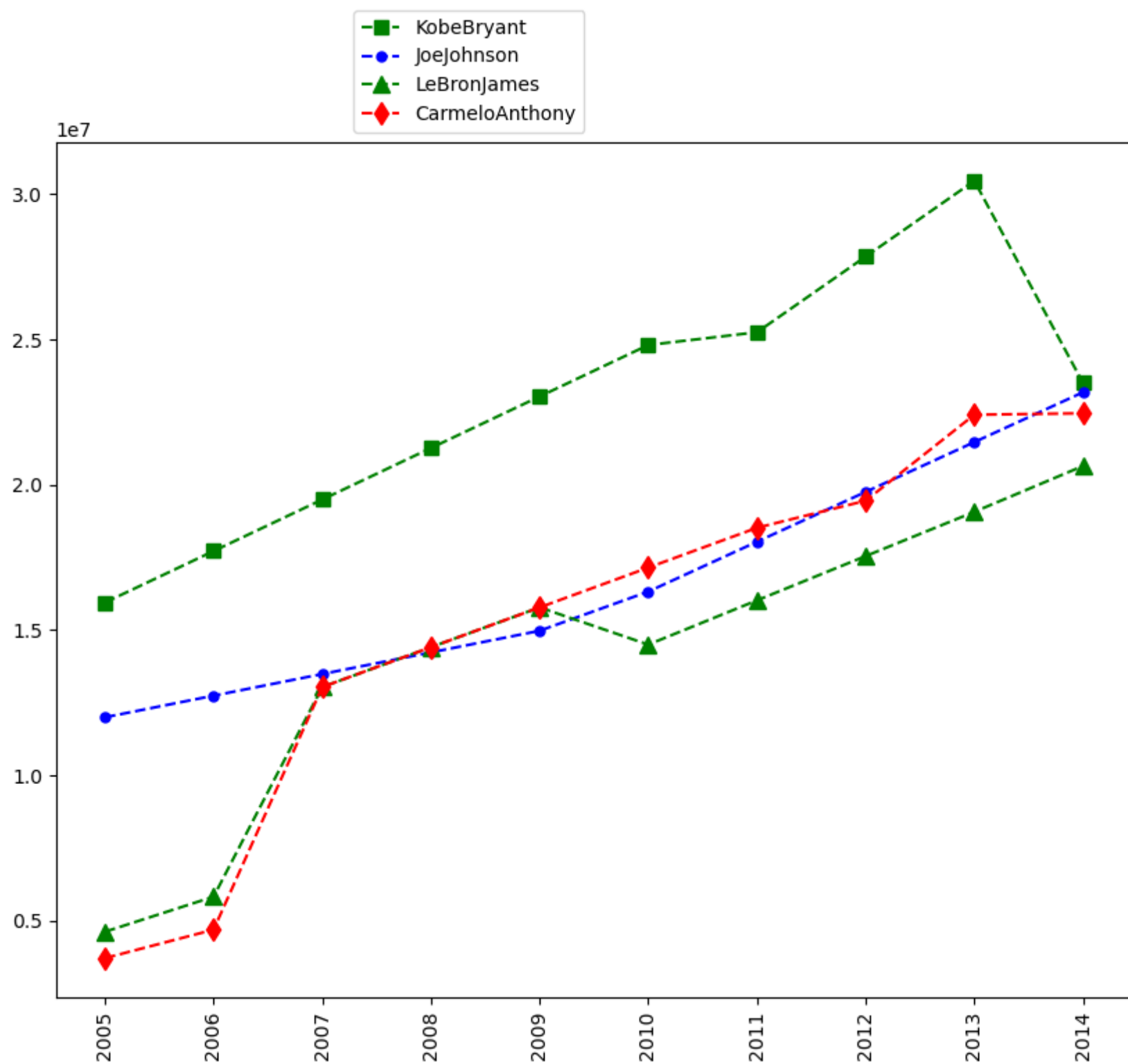
```
In [117... plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0])
plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1])
plt.plot(Salary[2], c='purple', ls = '--', marker = '^', ms = 8, label = Players[2])
plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3])
plt.legend(loc = 'upper left',bbox_to_anchor=(1,1) )
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```



```
In [118... plt.plot(Salary[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0])
plt.plot(Salary[1], c='Blue', ls = '--', marker = 'o', ms = 5, label = Players[1])
plt.plot(Salary[2], c='Green', ls = '--', marker = '^', ms = 8, label = Players[2])
plt.plot(Salary[3], c='Red', ls = '--', marker = 'd', ms = 8, label = Players[3])
plt.legend(loc = 'lower right',bbox_to_anchor=(0.5,1) )
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

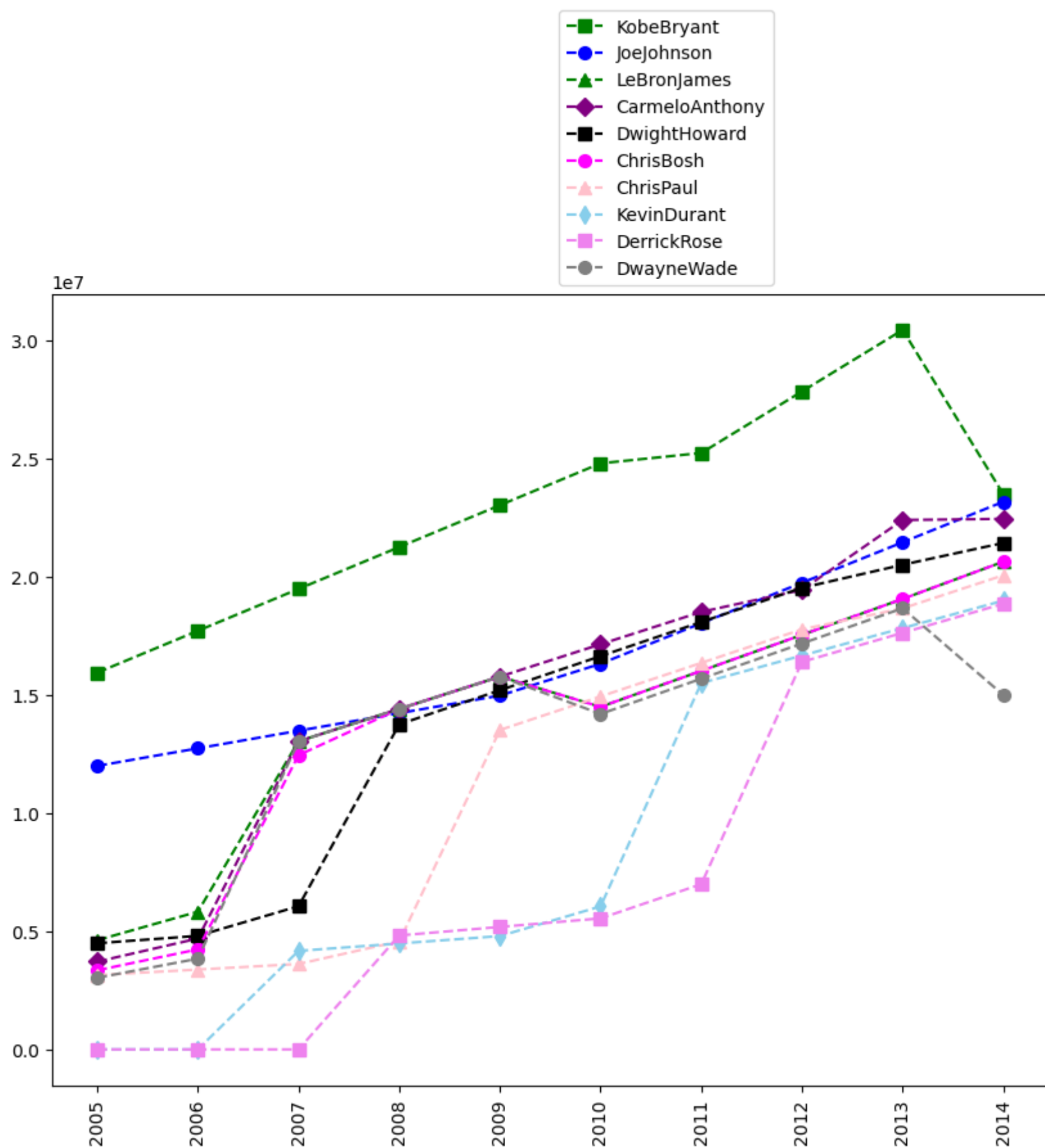
plt.show()
```



```
In [125... plt.plot(Salary[0], c='Green', 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='Green', ls = '--', marker = '^', ms = 7, label = Players[2])
plt.plot(Salary[3], c='Purple', ls = '--', marker = 'D', ms = 7, label = Players[3])
plt.plot(Salary[4], c='Black', ls = '--', marker = 's', ms = 7, label = Players[4])
plt.plot(Salary[5], c='Magenta', ls = '--', marker = 'o', ms = 7, label = Players[5])
plt.plot(Salary[6], c='Pink', ls = '--', marker = '^', ms = 7, label = Players[6])
plt.plot(Salary[7], c='SkyBlue', ls = '--', marker = 'd', ms = 7, label = Players[7])
plt.plot(Salary[8], c='Violet', ls = '--', marker = 's', ms = 7, label = Players[8])
plt.plot(Salary[9], c='Grey', ls = '--', marker = 'o', ms = 7, label = Players[9])

plt.legend(loc = 'best',bbox_to_anchor=(0.5,1) )
#loc are = best
#    upper right
#    upper left
#    lower left
#    lower right
#    right
#    center left
#    center right
#    lower center
#    upper center
#    center
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

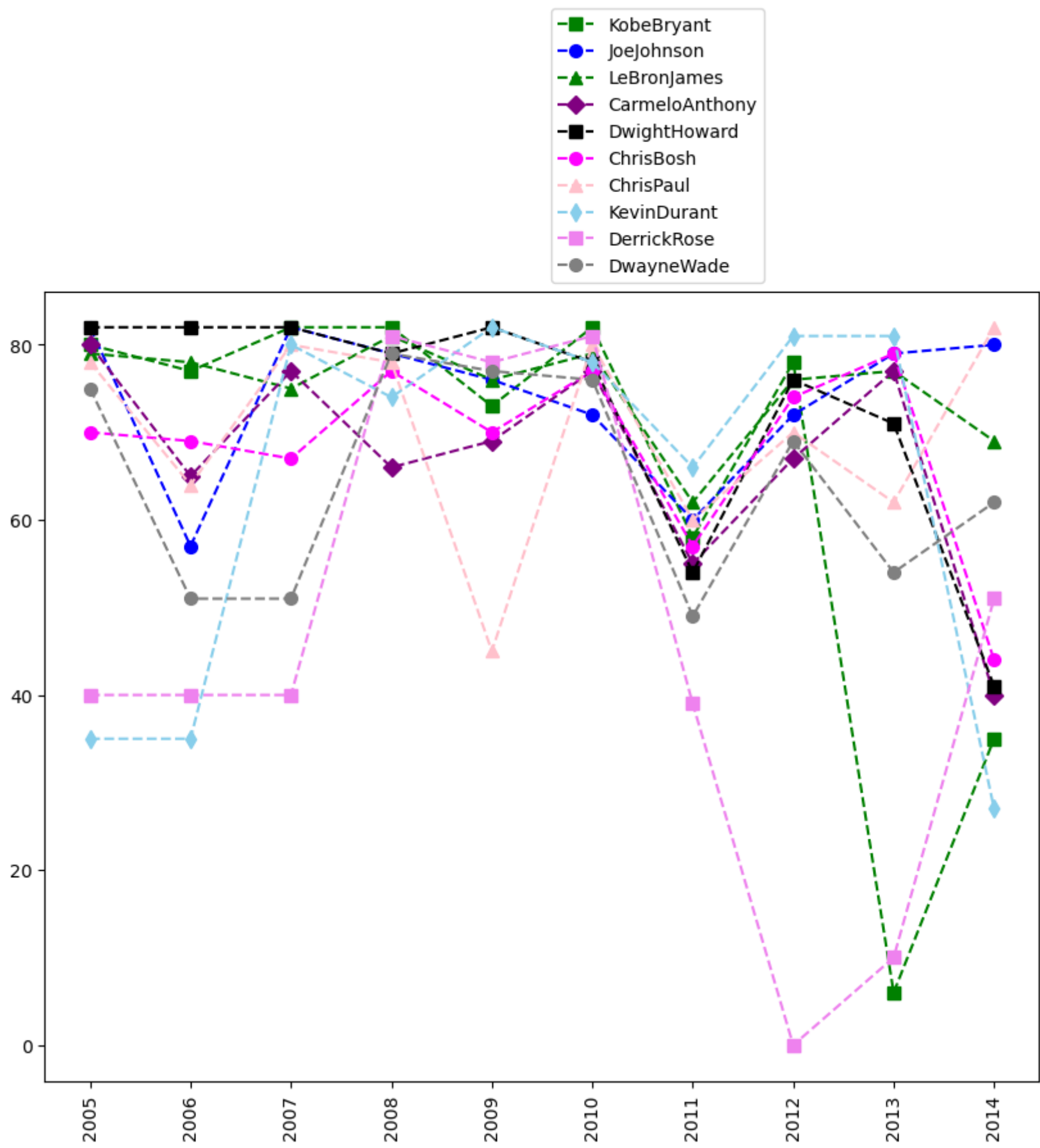
plt.show()
```

```
In [126... # we can visualize the how many games played by a player
plt.plot(Games[0], c='Green', ls = '--', marker = 's', ms = 7, label = Players[0])
plt.plot(Games[1], c='Blue', ls = '--', marker = 'o', ms = 7, label = Players[1])
plt.plot(Games[2], c='Green', ls = '--', marker = '^', ms = 7, label = Players[2])
plt.plot(Games[3], c='Purple', ls = '--', marker = 'D', ms = 7, label = Players[3])
plt.plot(Games[4], c='Black', ls = '--', marker = 's', ms = 7, label = Players[4])
plt.plot(Games[5], c='Magenta', ls = '--', marker = 'o', ms = 7, label = Players[5])
plt.plot(Games[6], c='Pink', ls = '--', marker = '^', ms = 7, label = Players[6])
plt.plot(Games[7], c='SkyBlue', ls = '--', marker = 'd', ms = 7, label = Players[7])
plt.plot(Games[8], c='Violet', ls = '--', marker = 's', ms = 7, label = Players[8])
plt.plot(Games[9], c='Grey', ls = '--', marker = 'o', ms = 7, label = Players[9])

plt.legend(loc = 'best',bbox_to_anchor=(0.5,1) )
plt.xticks(list(range(0,10)), Seasons,rotation='vertical')

plt.show()
```



In []: