fdi-project

May 3, 2023

FDI Analytics

Problem Statement:

Investment is a game of understanding historic data of investment objects under different events but it is still a game of chances to minimize the risk we apply analytics to find the equilibrium investment. To understand the Foreign direct investment in India for the last 17 years from 2000-01 to 2016-17. This dataset contains sector and financial year-wise data of FDI in India Sector-wise investment analysis Year-wise investment analysis. Find key metrics and factors and show the meaningful relationships between attributes. Do your own research and come up with your findings

[ ]:

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings("ignore")
import re
```

[ ]:

```
data = pd.read_csv("/content/FDI data.csv")  #,index_col='Sector')
```

[ ]:

```
data.head()
```

[ ]:

```
                     Sector  2000-01  2001-02  2002-03  2003-04  2004-05  \
0  METALLURGICAL INDUSTRIES    22.69    14.14    36.61     8.11   200.38
1                    MINING     1.32     6.52    10.06    23.48     9.92
2                     POWER    89.42   757.44    59.11    27.09    43.37
3   NON-CONVENTIONAL ENERGY     0.00     0.00     1.70     4.14     1.27
4           COAL PRODUCTION     0.00     0.00     0.00     0.04     0.00

   2005-06  2006-07  2007-08  2008-09  2009-10  2010-11  2011-12  2012-13  \
0   149.13   169.94  1175.75   959.94   419.88  1098.14  1786.14  1466.23
1     7.40     6.62   444.36    34.16   174.40    79.51   142.65    57.89
2    72.69   157.15   988.68   907.66  1271.79  1271.77  1652.38   535.68
3     1.35     2.44    58.82   125.88   622.52   214.40   452.17  1106.52
4     9.14     1.30    14.08     0.22     0.00     0.00     0.00     0.00
```

```
   2013-14  2014-15  2015-16  2016-17
0   567.63   359.34   456.31  1440.18
1    12.73   684.39   520.67    55.75
2  1066.08   707.04   868.80  1112.98
3   414.25   615.95   776.51   783.57
4     2.96     0.00     0.00     0.00
```

```
[ ]: data.columns
```

```
[ ]: Index(['Sector', '2000-01', '2001-02', '2002-03', '2003-04', '2004-05',
            '2005-06', '2006-07', '2007-08', '2008-09', '2009-10', '2010-11',
            '2011-12', '2012-13', '2013-14', '2014-15', '2015-16', '2016-17'],
           dtype='object')
```

```
[ ]: years = ['2000', '2001', '2002', '2003', '2004', '2005',
              '2006', '2007', '2008', '2009', '2010', '2011',
              '2012', '2013', '2014', '2015', '2016']
```

```
[ ]: data.columns= ['Sector']+years
```

```
[ ]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 63 entries, 0 to 62
Data columns (total 18 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Sector  63 non-null     object
 1   2000    63 non-null     float64
 2   2001    63 non-null     float64
 3   2002    63 non-null     float64
 4   2003    63 non-null     float64
 5   2004    63 non-null     float64
 6   2005    63 non-null     float64
 7   2006    63 non-null     float64
 8   2007    63 non-null     float64
 9   2008    63 non-null     float64
 10  2009    63 non-null     float64
 11  2010    63 non-null     float64
 12  2011    63 non-null     float64
 13  2012    63 non-null     float64
 14  2013    63 non-null     float64
 15  2014    63 non-null     float64
 16  2015    63 non-null     float64
 17  2016    63 non-null     float64
dtypes: float64(17), object(1)
memory usage: 9.0+ KB
```

```
[ ]: print(data.nunique())
```

```
Sector    63
2000      41
2001      46
2002      51
2003      53
2004      58
2005      57
2006      56
2007      61
2008      59
2009      59
2010      61
2011      60
2012      59
2013      61
2014      62
2015      59
2016      58
dtype: int64
```

```
[ ]: data.describe()
```

```
[ ]:           2000        2001        2002        2003        2004  \
count   63.000000   63.000000   63.000000   63.000000   63.000000
mean    37.757302   63.931587   42.925714   34.727778   51.090317
std    112.227860  157.878737   86.606439   67.653735  101.934873
min      0.000000    0.000000    0.000000    0.000000    0.000000
25%      0.000000    0.000000    0.200000    0.215000    0.715000
50%      4.030000    5.070000   11.010000    6.370000    9.090000
75%     23.510000   44.830000   36.555000   38.660000   43.205000
max    832.070000  873.230000  419.960000  368.320000  527.900000

              2005         2006         2007         2008         2009  \
count    63.000000    63.000000    63.000000    63.000000    63.000000
mean     87.932540   198.281905   390.085714   498.348571   410.069524
std     206.436967   686.783115  1026.249935  1134.649040   926.814626
min       0.000000     0.000000     0.000000     0.000000     0.000000
25%       1.230000     4.160000     9.950000    11.950000     7.880000
50%      22.620000    25.820000    58.820000    84.880000    69.740000
75%      63.855000   108.325000   279.270000   383.320000   341.595000
max    1359.970000  4713.780000  6986.170000  6183.490000  5466.130000

              2010         2011         2012         2013         2014  \
count    63.000000    63.000000    63.000000    63.000000    63.000000
mean    339.413810   557.472698   355.930000   385.703492   490.959841
```

```
std     627.141139  1031.474056   778.091368   658.429944   837.787060
min       0.000000     0.000000     0.000000     0.000000     0.000000
25%       8.430000    22.720000    15.115000    16.610000    33.800000
50%      58.070000   129.360000    95.410000   113.780000   177.220000
75%     304.280000   593.525000   288.025000   473.060000   595.390000
max    3296.090000  5215.980000  4832.980000  3982.890000  4443.260000

              2015         2016
count    63.000000    63.000000
mean    634.936349   690.131111
std    1335.307706  1411.965354
min       0.000000     0.000000
25%      30.000000    19.905000
50%     159.130000   110.860000
75%     519.070000   741.220000
max    6889.460000  8684.070000
```

[ ]:
```
data['Sector_total'] = data[years].sum(axis=1)
data.head()
```

[ ]:
```
                    Sector   2000    2001   2002   2003    2004    2005  \
0  METALLURGICAL INDUSTRIES  22.69   14.14  36.61   8.11  200.38  149.13
1                    MINING   1.32    6.52  10.06  23.48    9.92    7.40
2                     POWER  89.42  757.44  59.11  27.09   43.37   72.69
3    NON-CONVENTIONAL ENERGY   0.00    0.00   1.70   4.14    1.27    1.35
4           COAL PRODUCTION   0.00    0.00   0.00   0.04    0.00    9.14

     2006     2007    2008     2009     2010     2011     2012     2013  \
0  169.94  1175.75  959.94   419.88  1098.14  1786.14  1466.23   567.63
1    6.62   444.36   34.16   174.40    79.51   142.65    57.89    12.73
2  157.15   988.68  907.66  1271.79  1271.77  1652.38   535.68  1066.08
3    2.44    58.82  125.88   622.52   214.40   452.17  1106.52   414.25
4    1.30    14.08    0.22     0.00     0.00     0.00     0.00     2.96

     2014    2015     2016  Sector_total
0  359.34  456.31  1440.18      10330.54
1  684.39  520.67    55.75       2271.83
2  707.04  868.80  1112.98      11589.13
3  615.95  776.51   783.57       5181.49
4    0.00    0.00     0.00         27.74
```

[ ]:
```
annual_fdi = (data.loc[0 : ].sum(axis = 0))
annual_fdi
```

[ ]:
```
Sector          METALLURGICAL INDUSTRIESMININGPOWERNON-CONVENT…
2000                                                      2378.71
2001                                                      4027.69
```

```
2002                                                          2704.32
2003                                                          2187.85
2004                                                          3218.69
2005                                                          5539.75
2006                                                         12491.76
2007                                                          24575.4
2008                                                         31395.96
2009                                                         25834.38
2010                                                         21383.07
2011                                                         35120.78
2012                                                         22423.59
2013                                                         24299.32
2014                                                         30930.47
2015                                                         40000.99
2016                                                         43478.26
Sector_total                                                331990.99
dtype: object
```

[ ]:
```
data = data.append(annual_fdi, ignore_index=True)
```

[ ]:
```
data = data.replace({data.iloc[-1][0]: 'Annual_total'})
```

[ ]:
```
data
```

[ ]:
```
                                               Sector     2000     2001  \
0                             METALLURGICAL INDUSTRIES    22.69    14.14
1                                               MINING     1.32     6.52
2                                                POWER    89.42   757.44
3                               NON-CONVENTIONAL ENERGY     0.00     0.00
4                                      COAL PRODUCTION     0.00     0.00
..                                                 …       …       …
59                                                COIR     0.00     0.00
60              CONSTRUCTION (INFRASTRUCTURE) ACTIVITIES     0.00     0.00
61  CONSTRUCTION DEVELOPMENT: Townships, housing, …    24.33    51.75
62                            MISCELLANEOUS INDUSTRIES   832.07   221.37
63                                        Annual_total  2378.71  4027.69

      2002     2003     2004     2005      2006      2007      2008  \
0    36.61     8.11   200.38   149.13    169.94   1175.75    959.94
1    10.06    23.48     9.92     7.40      6.62    444.36     34.16
2    59.11    27.09    43.37    72.69    157.15    988.68    907.66
3     1.70     4.14     1.27     1.35      2.44     58.82    125.88
4     0.00     0.04     0.00     9.14      1.30     14.08      0.22
..     …       …       …       …        …        …        …
59    0.00     0.00     0.47     0.59      0.04      0.01      0.00
60    0.00     0.00     0.00     0.93     64.06    182.92    172.70
61   36.10    47.04   152.06   228.71   1392.95   3887.33   4657.51
```

```
62   218.76   235.48   121.83   164.76    304.87    528.42   1549.70
63  2704.32  2187.85  3218.69  5539.75  12491.76  24575.40  31395.96

        2009      2010      2011      2012      2013      2014      2015  \
0     419.88   1098.14   1786.14   1466.23    567.63    359.34    456.31
1     174.40     79.51    142.65     57.89     12.73    684.39    520.67
2    1271.79   1271.77   1652.38    535.68   1066.08    707.04    868.80
3     622.52    214.40    452.17   1106.52    414.25    615.95    776.51
4       0.00      0.00      0.00      0.00      2.96      0.00      0.00
..       …        …        …       …        …        …        …
59      0.25      0.10      0.55      0.15      0.54      1.36      0.00
60    324.56    675.07    386.28    283.89    485.37    870.25   4510.71
61   5466.13   1663.03   3140.78   1332.49   1226.05    769.14    112.55
62   1147.56   1475.97    813.38    229.49    468.74    765.88    668.77
63  25834.38  21383.07  35120.78  22423.59  24299.32  30930.47  40000.99

        2016  Sector_total
0    1440.18      10330.54
1      55.75       2271.83
2    1112.98      11589.13
3     783.57       5181.49
4       0.00         27.74
..       …            …
59      0.00          4.06
60   1860.73       9817.47
61    105.14      24293.09
62    296.40      10043.45
63  43478.26     331990.99

[64 rows x 19 columns]
```

[ ]:

```
def f(x, y, n):
    if x:return ((y/x)**(1/n))-1
    else: return np.nan
y_start = 2012
y_end = 2016
data['Cagr'] = data[['Sector',str(y_start),str(y_end)]].apply(lambda x:␣
 ↪f(x[str(y_start)],x[str(y_end)], y_end-y_start), axis=1)
```

[ ]:

```
data[['Sector','Cagr']].sort_values(by='Cagr',ascending=False)
```

[ ]:

```
                                      Sector      Cagr
45                 CEMENT AND GYPSUM PRODUCTS  2.621761
34  PAPER AND PULP (INCLUDING PAPER PRODUCTS)  1.496162
54                             RETAIL TRADING  1.120337
11                         TELECOMMUNICATIONS  1.068563
8                       ELECTRICAL EQUIPMENTS  0.837037
```

```
..                                         …       …
4                             COAL PRODUCTION       NaN
16                                      PORTS       NaN
30            PHOTOGRAPHIC RAW FILM AND PAPER       NaN
31                                 DYE-STUFFS       NaN
42                           GLUE AND GELATIN       NaN

[64 rows x 2 columns]
```

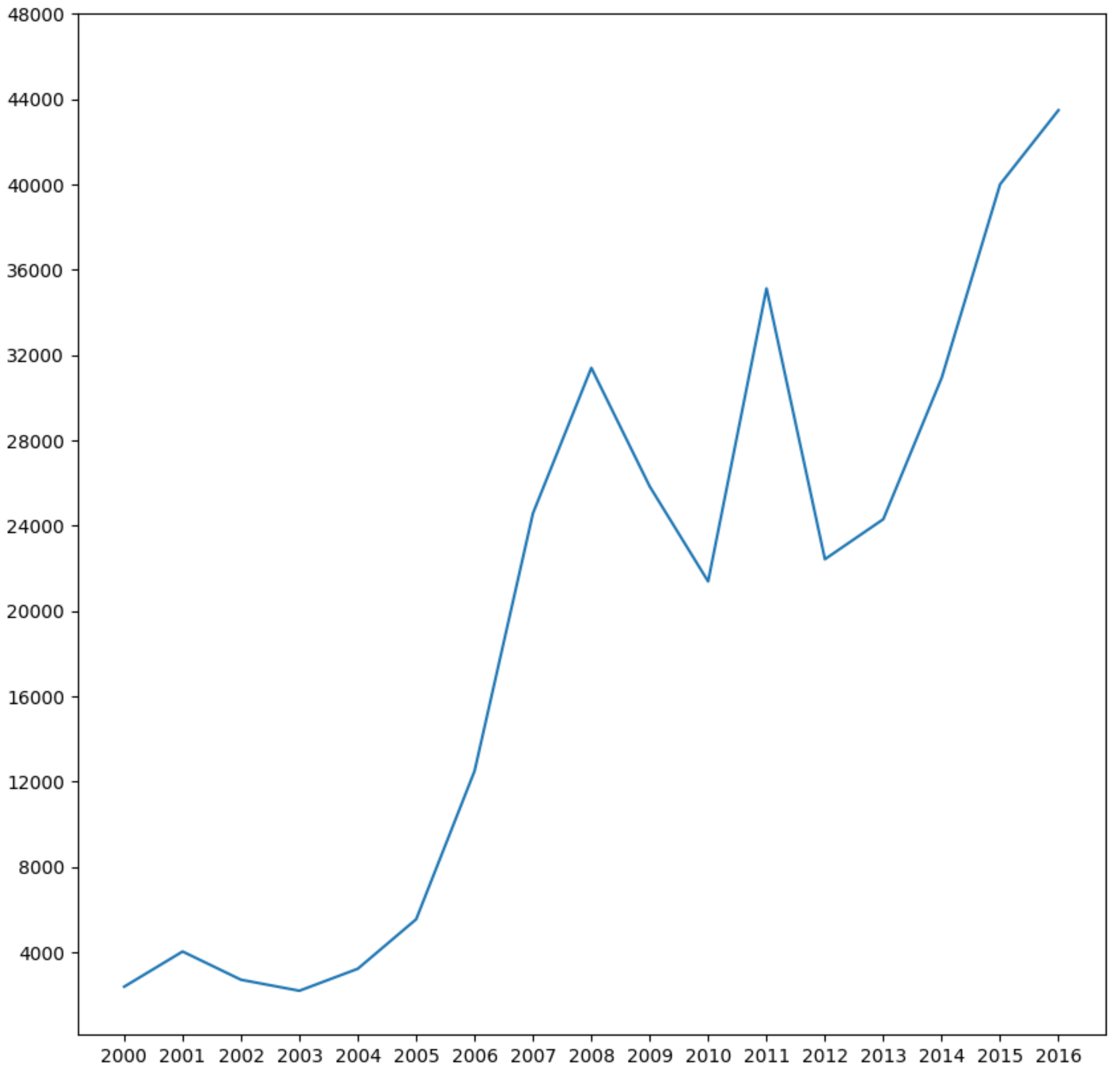
[ ]:
```
# data['Sector'] = data['Sector'].replace(" \(.*\):","")
```

[ ]:
```
data1 = data.dropna()
```

[ ]:
```
a = data.iloc[-1:,1:-2]
a = a.T
b = a.values.flatten()
c = a.index
```

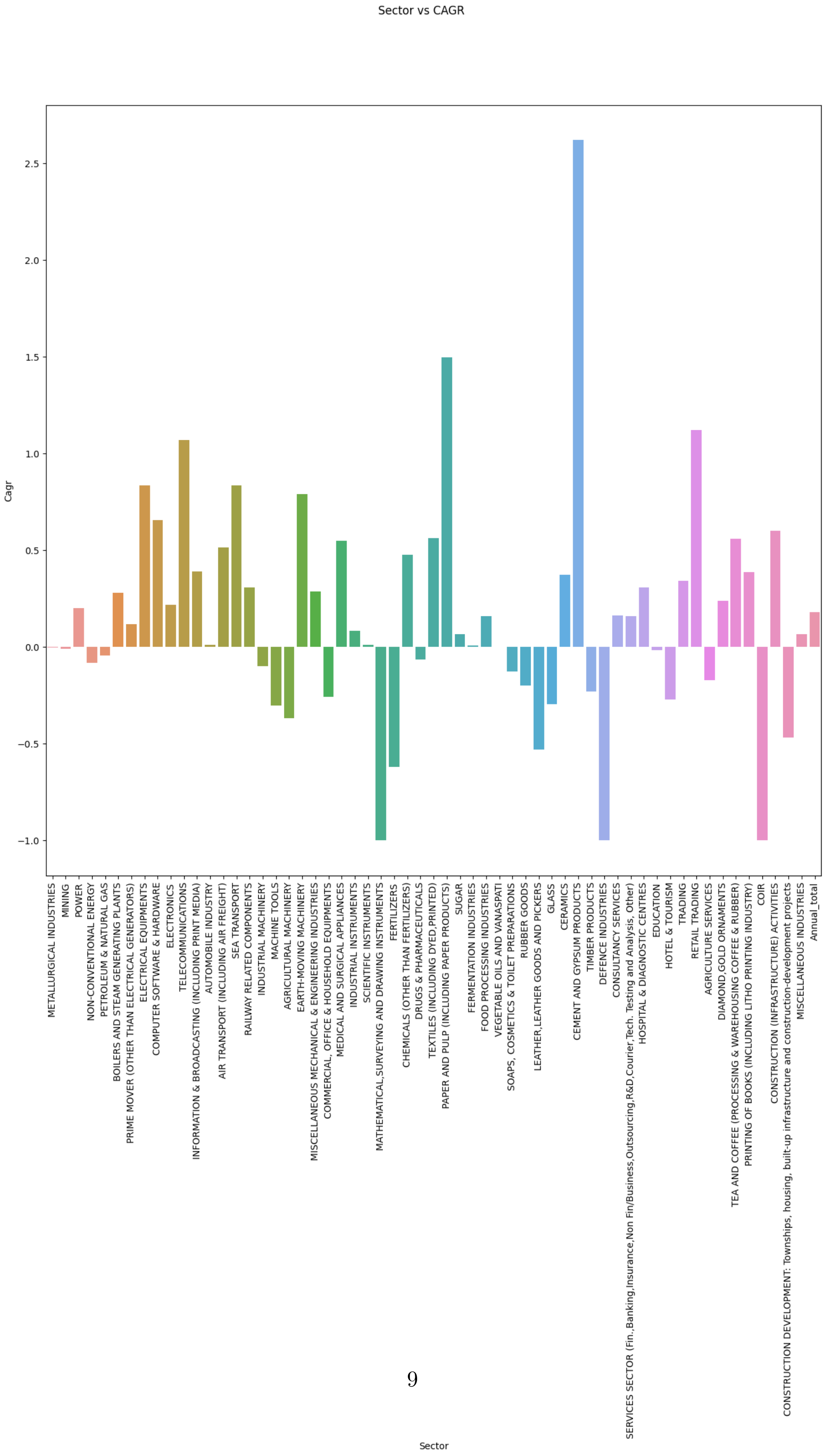
[ ]:
```
plt.figure(figsize=(10, 10))
sns.lineplot(x=c, y=b, markers=True)
plt.
 ↪yticks([4000,8000,12000,16000,20000,24000,28000,32000,36000,40000,44000,48000])
plt.xlabel ="Year"
plt.ylabel = "Annual FDI"
plt.title ='Year Vs Annual FDI'

plt.show()
```



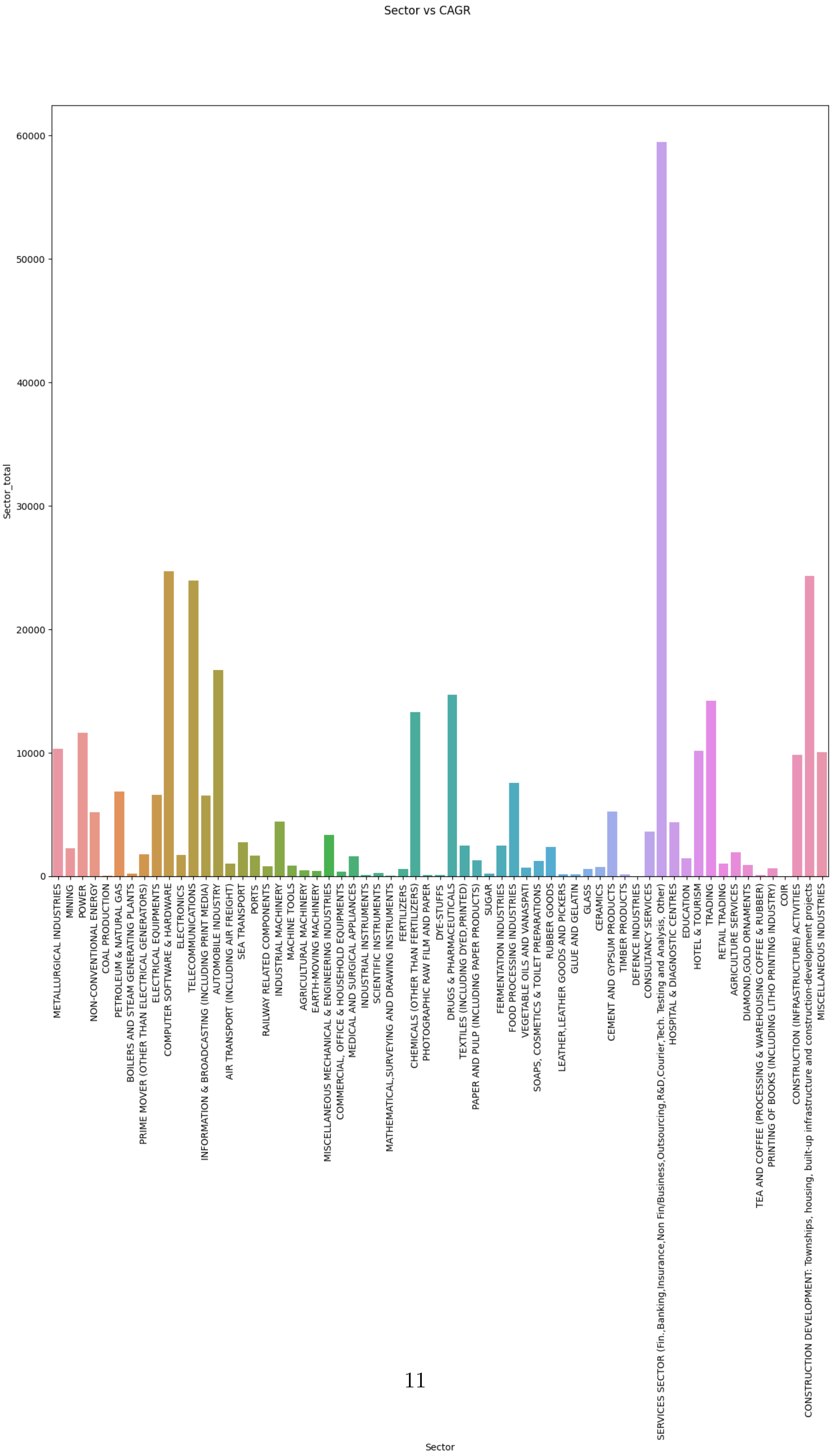
[ ]:

```
plt.figure(figsize=(15, 15))
sns.barplot(x = data1['Sector'], y = data1['Cagr'])
plt.xticks(rotation=90)
plt.suptitle("Sector vs CAGR")
plt.show()
```


Sector vs CAGR
Cagr
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
METALLURGICAL INDUSTRIES
MINING
POWER
NON-CONVENTIONAL ENERGY
PETROLEUM & NATURAL GAS
BOILERS AND STEAM GENERATING PLANTS
PRIME MOVER (OTHER THAN ELECTRICAL GENERATORS)
ELECTRICAL EQUIPMENTS
COMPUTER SOFTWARE & HARDWARE
ELECTRONICS
TELECOMMUNICATIONS
INFORMATION & BROADCASTING (INCLUDING PRINT MEDIA)
AUTOMOBILE INDUSTRY
AIR TRANSPORT (INCLUDING AIR FREIGHT)
SEA TRANSPORT
RAILWAY RELATED COMPONENTS
INDUSTRIAL MACHINERY
MACHINE TOOLS
AGRICULTURAL MACHINERY
EARTH-MOVING MACHINERY
MISCELLANEOUS MECHANICAL & ENGINEERING INDUSTRIES
COMMERCIAL, OFFICE & HOUSEHOLD EQUIPMENTS
MEDICAL AND SURGICAL APPLIANCES
INDUSTRIAL INSTRUMENTS
SCIENTIFIC INSTRUMENTS
MATHEMATICAL,SURVEYING AND DRAWING INSTRUMENTS
FERTILIZERS
CHEMICALS (OTHER THAN FERTILIZERS)
DRUGS & PHARMACEUTICALS
TEXTILES (INCLUDING DYED,PRINTED)
PAPER AND PULP (INCLUDING PAPER PRODUCTS)
SUGAR
FERMENTATION INDUSTRIES
FOOD PROCESSING INDUSTRIES
VEGETABLE OILS AND VANASPATI
SOAPS, COSMETICS & TOILET PREPARATIONS
RUBBER GOODS
LEATHER,LEATHER GOODS AND PICKERS
GLASS
CERAMICS
CEMENT AND GYPSUM PRODUCTS
TIMBER PRODUCTS
DEFENCE INDUSTRIES
CONSULTANCY SERVICES
SERVICES SECTOR (Fin.,Banking,Insurance,Non Fin/Business,Outsourcing,R&D,Courier,Tech. Testing and Analysis, Other)
HOSPITAL & DIAGNOSTIC CENTRES
EDUCATION
HOTEL & TOURISM
TRADING
RETAIL TRADING
AGRICULTURE SERVICES
DIAMOND,GOLD ORNAMENTS
TEA AND COFFEE (PROCESSING & WAREHOUSING COFFEE & RUBBER)
PRINTING OF BOOKS (INCLUDING LITHO PRINTING INDUSTRY)
COIR
CONSTRUCTION (INFRASTRUCTURE) ACTIVITIES
CONSTRUCTION DEVELOPMENT: Townships, housing, built-up infrastructure and construction-development projects
MISCELLANEOUS INDUSTRIES
Annual_total
Sector

[ ]:

```
plt.figure(figsize=(15, 15))
sns.barplot(x = data['Sector'][:-1], y = data['Sector_total'][:-1])
plt.xticks(rotation=90)
plt.suptitle("Sector vs CAGR")
plt.show()
```

Sector vs CAGR
Sector_total
60000
50000
40000
30000
20000
10000
0
METALLURGICAL INDUSTRIES
MINING
POWER
NON-CONVENTIONAL ENERGY
COAL PRODUCTION
PETROLEUM & NATURAL GAS
BOILERS AND STEAM GENERATING PLANTS
PRIME MOVER (OTHER THAN ELECTRICAL GENERATORS)
ELECTRICAL EQUIPMENTS
COMPUTER SOFTWARE & HARDWARE
ELECTRONICS
TELECOMMUNICATIONS
INFORMATION & BROADCASTING (INCLUDING PRINT MEDIA)
AUTOMOBILE INDUSTRY
AIR TRANSPORT (INCLUDING AIR FREIGHT)
SEA TRANSPORT
PORTS
RAILWAY RELATED COMPONENTS
INDUSTRIAL MACHINERY
MACHINE TOOLS
AGRICULTURAL MACHINERY
EARTH-MOVING MACHINERY
MISCELLANEOUS MECHANICAL & ENGINEERING INDUSTRIES
COMMERCIAL, OFFICE & HOUSEHOLD EQUIPMENTS
MEDICAL AND SURGICAL APPLIANCES
INDUSTRIAL INSTRUMENTS
SCIENTIFIC INSTRUMENTS
MATHEMATICAL,SURVEYING AND DRAWING INSTRUMENTS
FERTILIZERS
CHEMICALS (OTHER THAN FERTILIZERS)
PHOTOGRAPHIC RAW FILM AND PAPER
DYE-STUFFS
DRUGS & PHARMACEUTICALS
TEXTILES (INCLUDING DYED,PRINTED)
PAPER AND PULP (INCLUDING PAPER PRODUCTS)
SUGAR
FERMENTATION INDUSTRIES
FOOD PROCESSING INDUSTRIES
VEGETABLE OILS AND VANASPATI
SOAPS, COSMETICS & TOILET PREPARATIONS
RUBBER GOODS
LEATHER,LEATHER GOODS AND PICKERS
GLUE AND GELATIN
GLASS
CERAMICS
CEMENT AND GYPSUM PRODUCTS
TIMBER PRODUCTS
DEFENCE INDUSTRIES
CONSULTANCY SERVICES
SERVICES SECTOR (Fin.,Banking,Insurance,Non Fin/Business,Outsourcing,R&D,Courier,Tech. Testing and Analysis, Other)
HOSPITAL & DIAGNOSTIC CENTRES
EDUCATION
HOTEL & TOURISM
TRADING
RETAIL TRADING
AGRICULTURE SERVICES
DIAMOND,GOLD ORNAMENTS
TEA AND COFFEE (PROCESSING & WAREHOUSING COFFEE & RUBBER)
PRINTING OF BOOKS (INCLUDING LITHO PRINTING INDUSTRY)
COIR
CONSTRUCTION (INFRASTRUCTURE) ACTIVITIES
CONSTRUCTION DEVELOPMENT: Townships, housing, built-up infrastructure and construction-development projects
MISCELLANEOUS INDUSTRIES
Sector

[ ]:
```
# data.to_csv("/content/FDI data_1.csv")
```

[ ]:
```
# data1.to_csv("/content/FDI data_2.csv")
```

[ ]:
```
# final = {'Year': years,

#          'Annual Total': a.values.flatten()}
```

[ ]:
```
# q = pd.DataFrame(final)
```

[ ]:
```
# q
```

[ ]:
```
# q.to_csv("/content/FDI data_3.csv")
```

[ ]:
```

```