Low-Level Documentation

Investment Analytics - FDI data.

Document Version Control

Version	Date	Author	Comments
0.0.1	23-07-22	Sri Venkatesh	First Document prepared

Tableau Server is essentially a communication tool that shares data connections and visualizations with the end-users or clients. So, now that we have learned about the functioning of each component in a Tableau server. Let us understand how all these components work in tandem. For this, we will club the server components into layers or tiers. So, we have five layers or sections in the Tableau Server; customer data, data connectors, main components, gateway, and clients.

The customer data layer contains all sorts of data sources available for a Tableau user like data warehouses, data marts, flat files, and multi-dimensional cubes, relational databases. Next lies the data connectors layers which consist of a data engine, repository, SQL Connector, and MDX Connector. These components interact directly with the data sources. The Data engine processes the data requested by the user and assigns the data type, decides whether it is a measure or a dimension, and creates TDEs (data extracts). In the background of the data, the engine runs an SQL Connector which creates an SQL query for all the user requests and interacts with the data sources. The SQL Connector primarily deals with data marts and flat files. Similarly, the MDX Connector deals with multi-dimensional cubes.

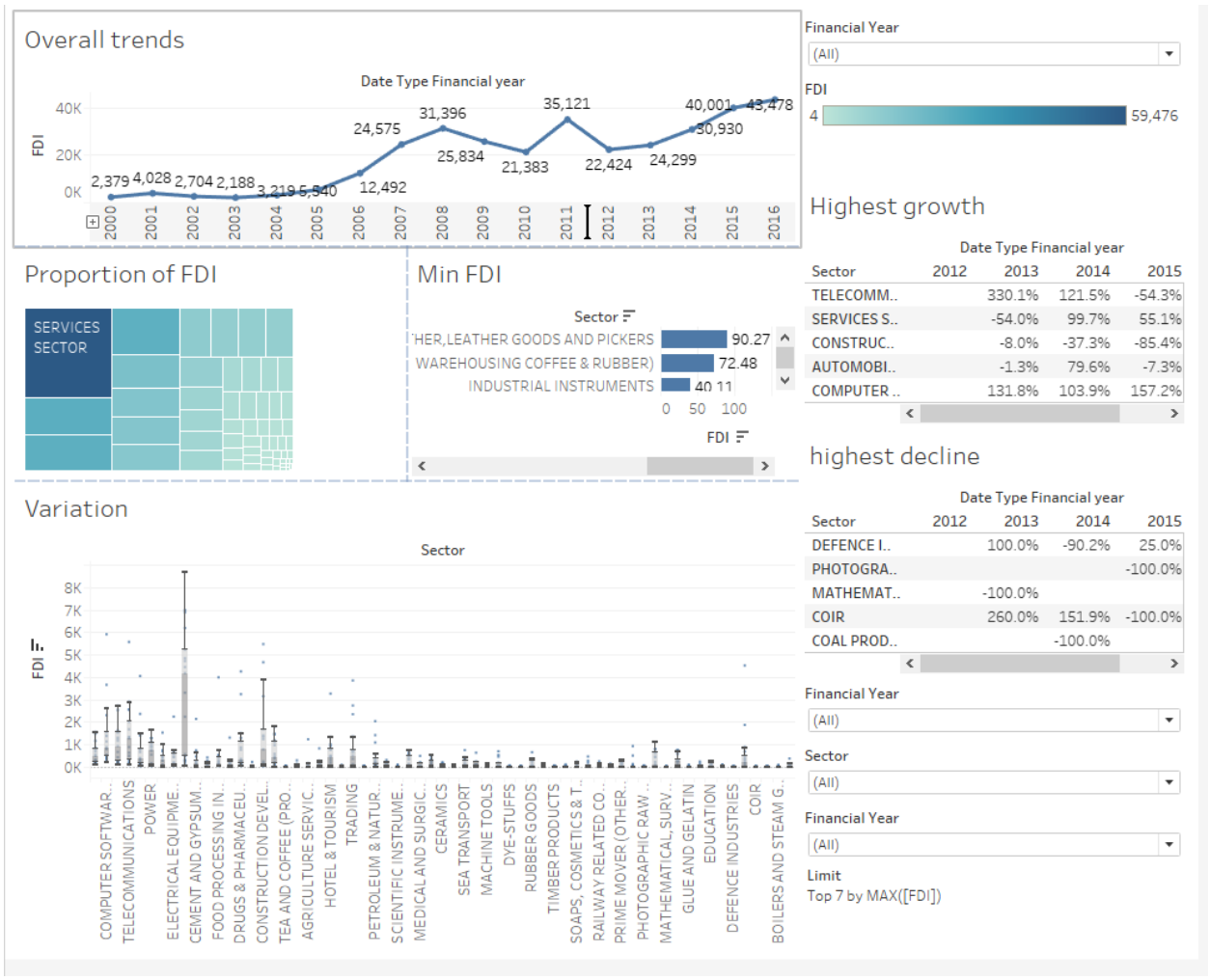
The next layer comprises all the main components, essentially the data server which regulates and monitors the functioning of the components of the data connector layer. Along with this, it includes a VizQL Server and Application Server. The application server takes all the user requests coming from Tableau Desktop, mobile, or browser for accessing the visualization. It processes the requests and detects the type of request, checks user authorization and grants access accordingly. The VizQL Server is a patented component of Tableau, where VizQL stands for Visualization Query language. It works behind the logic of Tableau visualization and creates the visualization as per your instructions on the dashboard.

The gateway acts as a gatekeeper of the Tableau Server and any request or query sent by the client first hits the gateway or load balancer. A gateway is nothing but a primary server that receives the queries and redirects them to an appropriate and available secondary server, known as a worker server.

Data Description

The data comprises FDI data of India from the period: 2000-2001 to 2016-2017. In order to construct the dashboard, we created a pivot view of the columns under years, since having the horizontal data was not very effective for generating views on Tableau.

Here is the Tableau Dashboard:



The Colab Notebook has been attached:

https://colab.research.google.com/drive/14gZ8AzdTCd7ZEu4Y4Sb0NtVKC2bq2k43?usp=sharing

INeuron_data_analytics_FDI_data.pdf

FDI_DATA

Required libraries:

1. Pandas
2. Matplotlib

```
#import libs

import pandas as pd
import matplotlib.pyplot as plt

#import data
df = pd.read_csv('FDI_in_India.csv')

!ls
```

```
FDI_in_India.csv  sample_data
```

###Generate descriptive statistics.

```
df.describe()
```

```
          2000-01     2001-02     2002-03     2003-04     2004-05  \
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

           2005-06      2006-07      2007-08      2008-09      2009-10
\
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


           2010-11      2011-12      2012-13      2013-14      2014-15
\
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


           2015-16      2016-17
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
```

###Output the shape and first 5 rows of the dataframe

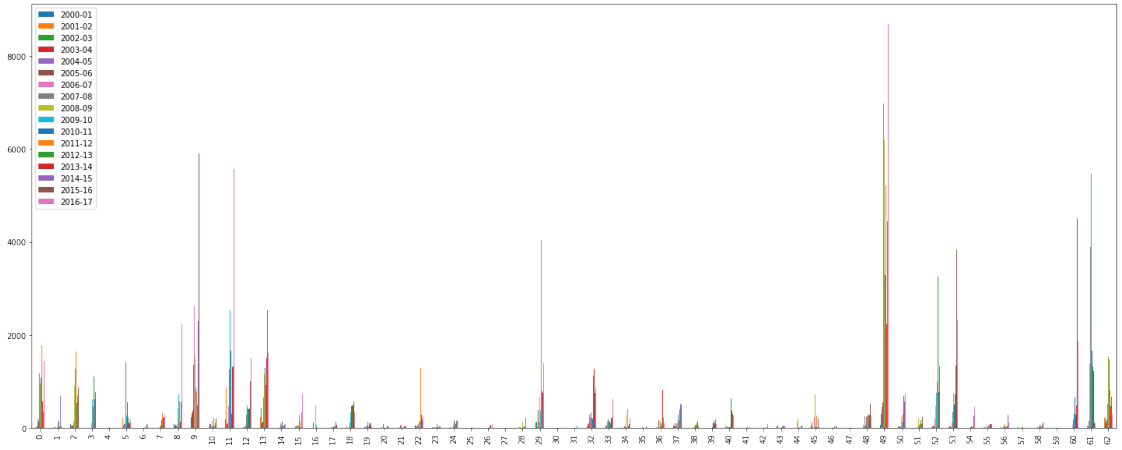
```
print(df.shape)
df.head()
```

```
(63, 18)

                     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
```

```
df.plot(figsize=(25,10), kind='bar')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7dd4d4f610>
```



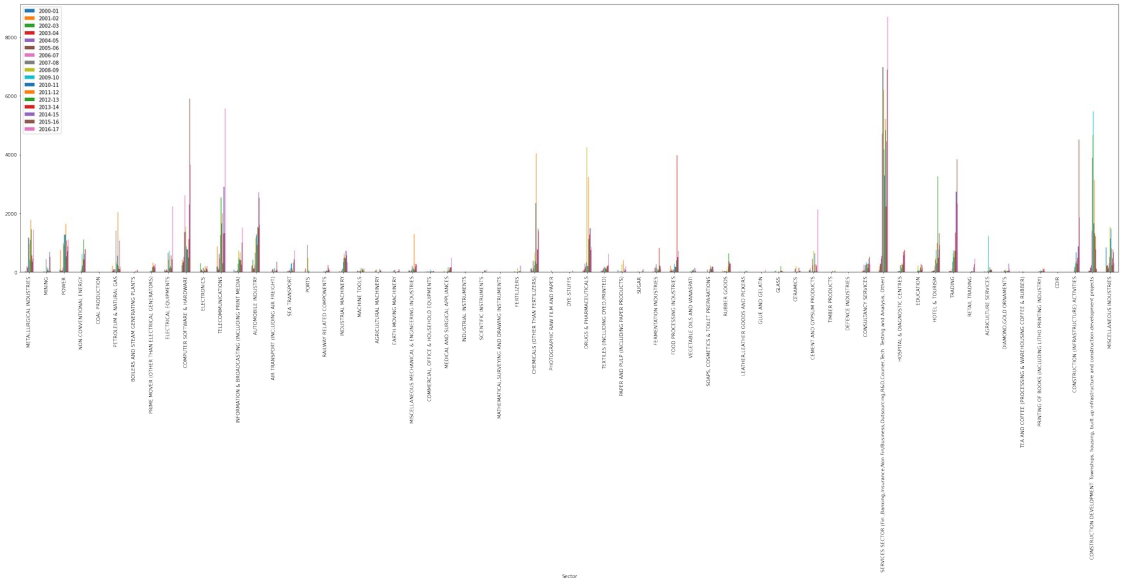
Setting the index

```
df.set_index('Sector',inplace=True)
```

Plotting the data after setting the index

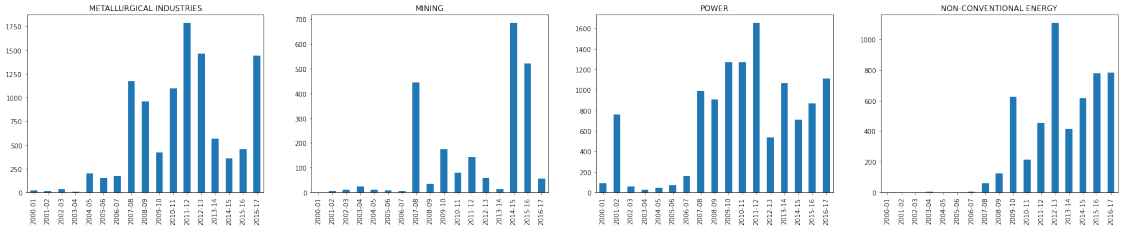
```
df.plot(kind='bar', figsize = (40,10))
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7dd4100b90>
```



Plotting the first 4 rows

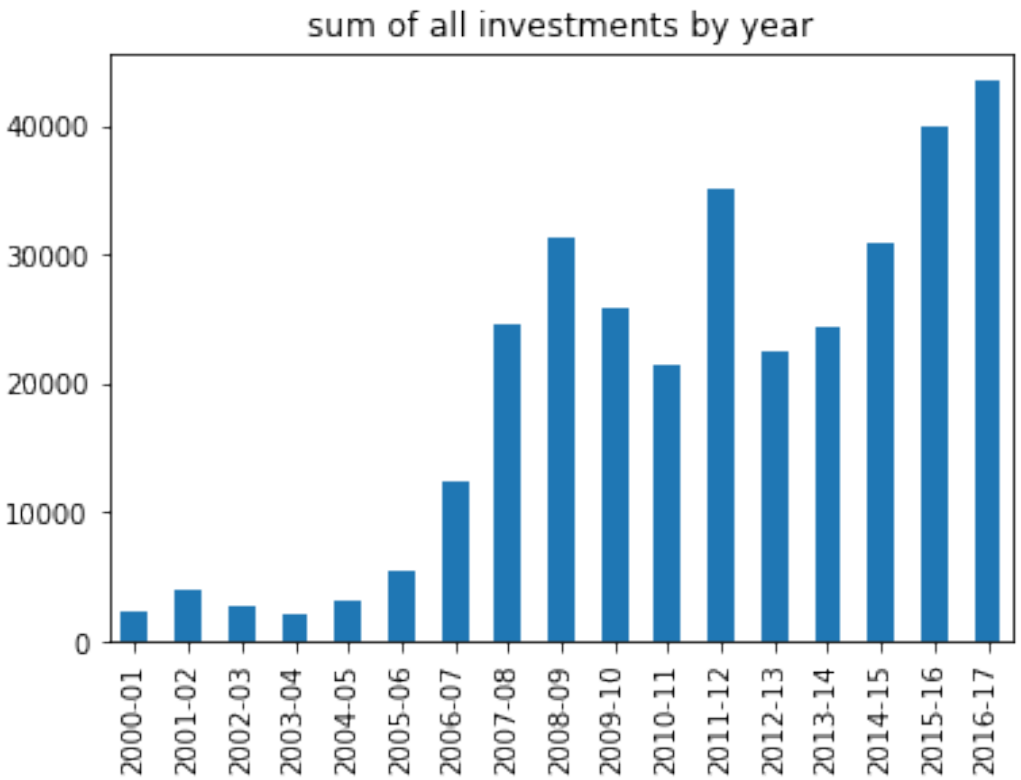
```
fig, axes = plt.subplots(nrows=1, ncols=4)

for i in range(0,4):
  df.iloc[i].plot(kind='bar',title=df.iloc[i].name, ax = axes[i],
figsize=(30,5))
```



Looking at the sum of investments in all sectors by year

```
df.sum().plot(kind='bar', title='sum of all investments by year')
```

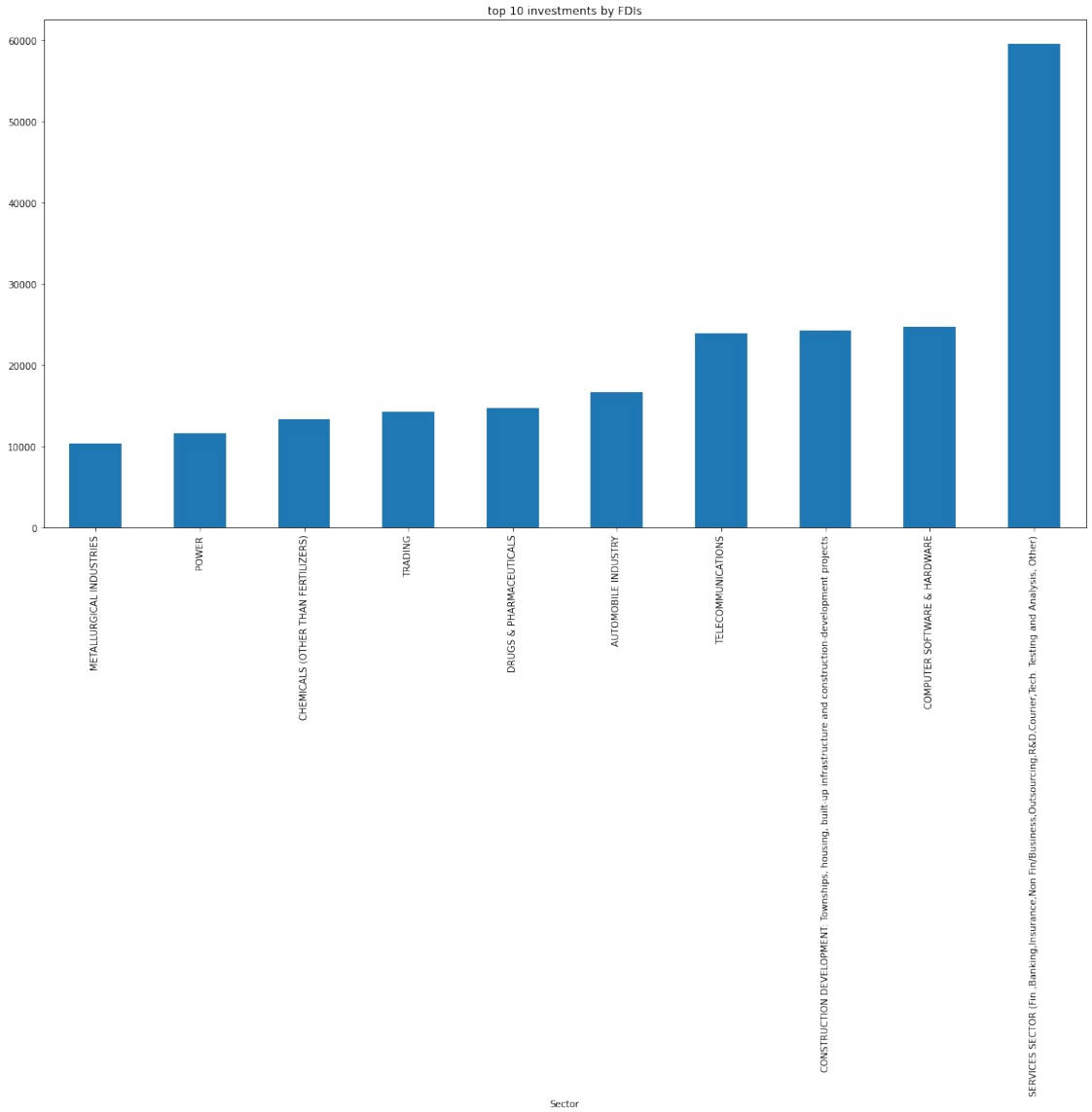
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7dd126a8d0>
```



Plotting the sum of invesments of all years by their sector (top 10 sectors)

```
df_trans = df.transpose()
df_trans.sum().sort_values()[-10:].plot(figsize=(20,10),kind='bar',
title ='top 10 investments by FDIs')
```

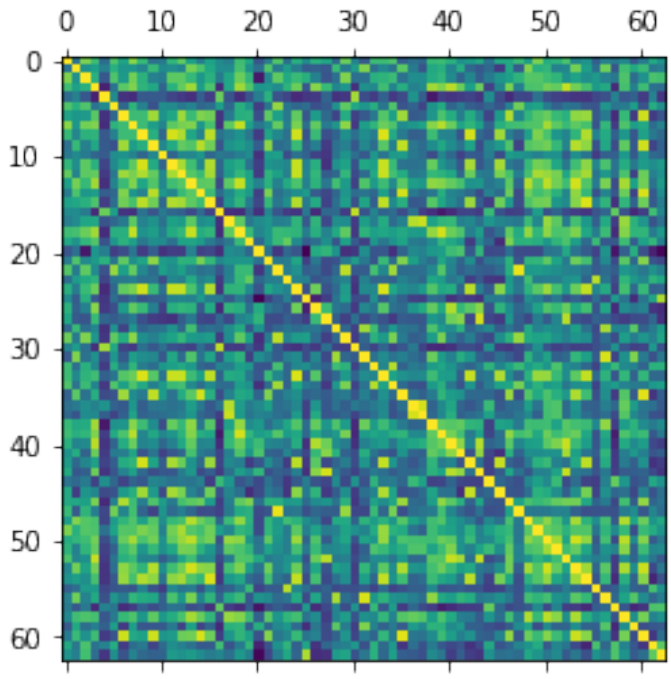
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7dd1190c50>
```



Visualizing the correlation among sectors

```
corr = df_trans.corr()
plt.matshow(corr)
```

```
<matplotlib.image.AxesImage at 0x7f7dd10d4ed0>
```



Lets look at the top 10 correlated sectors

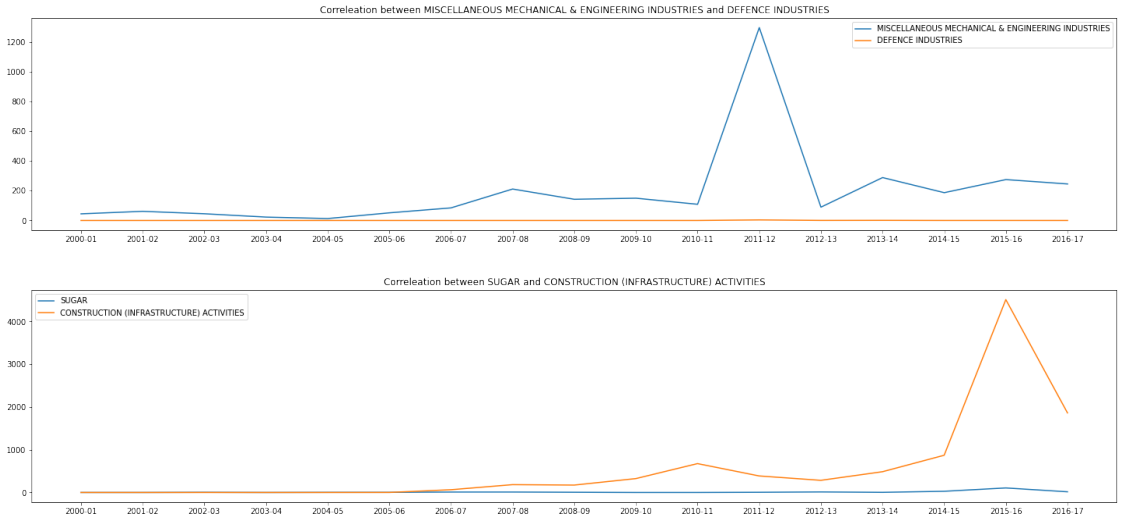
```
def get_redundant_pairs(df):
    pairs_to_drop = set()
    cols = df.columns
    for i in range(0, df.shape[1]):
        for j in range(0, i+1):
            pairs_to_drop.add((cols[i], cols[j]))
    return pairs_to_drop

def get_top_abs_correlations(df, n=5):
    au_corr = df.corr().abs().unstack()
    labels_to_drop = get_redundant_pairs(df)
    au_corr =
au_corr.drop(labels=labels_to_drop).sort_values(ascending=False)
    return au_corr[0:n]

print("Top Absolute Correlations")
get_top_abs_correlations(df_trans,10)
```

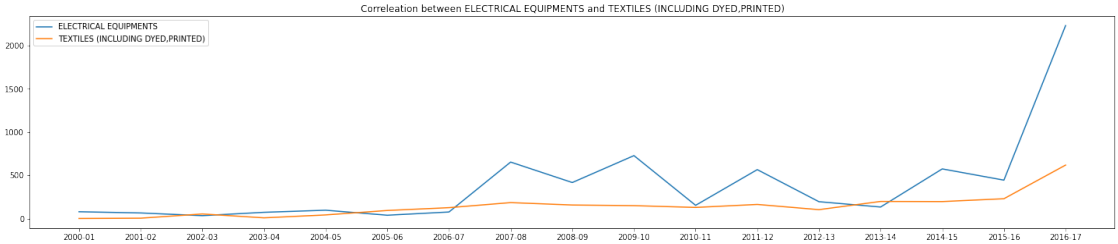
```
Top Absolute Correlations

Sector                                                  Sector

MISCELLANEOUS MECHANICAL & ENGINEERING INDUSTRIES  DEFENCE INDUSTRIES
0.958449
SUGAR                                                   CONSTRUCTION
(INFRASTRUCTURE) ACTIVITIES    0.937258
ELECTRICAL EQUIPMENTS                                   TEXTILES (INCLUDING
DYED,PRINTED)           0.926705
```

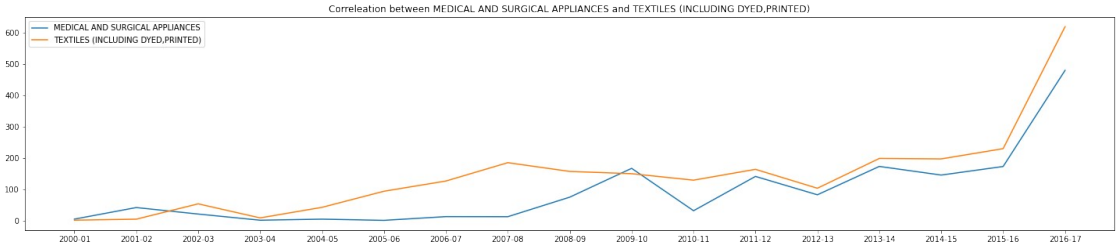
```
MEDICAL AND SURGICAL APPLIANCES                          TEXTILES (INCLUDING
DYED,PRINTED)           0.919642
SEA TRANSPORT                                            RETAIL TRADING
0.918936
DYE-STUFFS                                               DIAMOND,GOLD
ORNAMENTS                          0.916723
AIR TRANSPORT (INCLUDING AIR FREIGHT)                    CONSTRUCTION
(INFRASTRUCTURE) ACTIVITIES    0.916622
FERMENTATION INDUSTRIES                                  FOOD PROCESSING
INDUSTRIES                    0.910990
ELECTRICAL EQUIPMENTS                                    GLUE AND GELATIN
0.908833
MATHEMATICAL,SURVEYING AND DRAWING INSTRUMENTS           GLASS
0.908687
dtype: float64
```

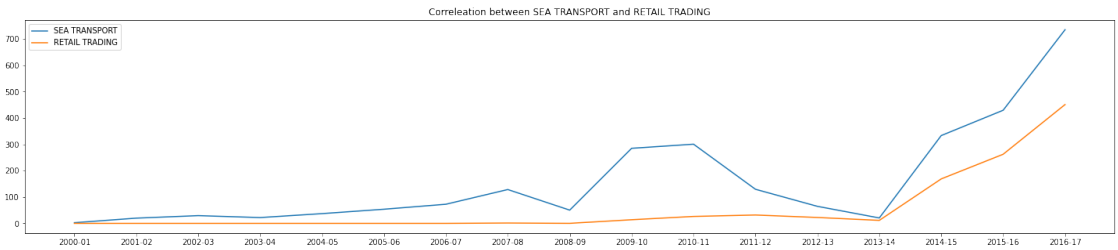
Plotting the Correlated Sectors

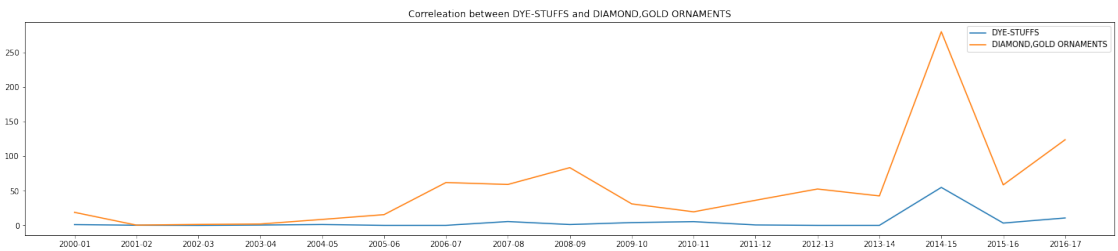
```
abs_corr = get_top_abs_correlations(df_trans,10)
plt.rcParams['figure.figsize'] = [25, 5]
for i in range(10):
  plt.plot(df.loc[abs_corr.index[i][0]], label = abs_corr.index[i][0])
  plt.plot(df.loc[abs_corr.index[i][1]], label = abs_corr.index[i][1])
  plt.title(f'Correleation between {abs_corr.index[i][0]} and
{abs_corr.index[i][1]}')
  plt.legend()
  plt.show()
```

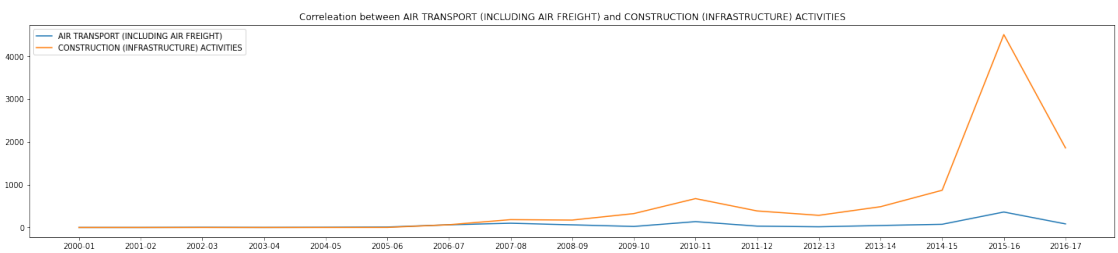


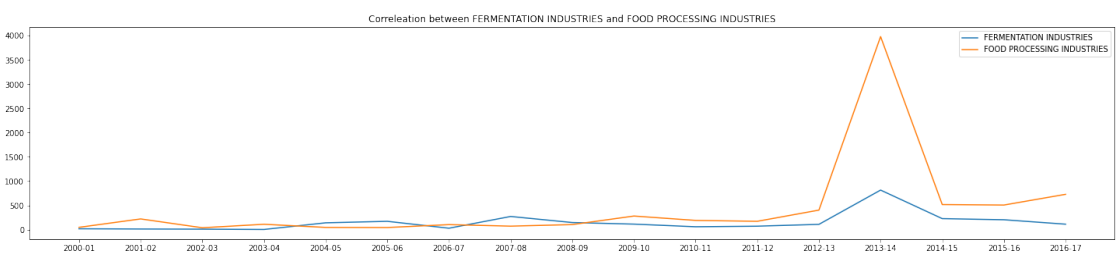

Correleation between ELECTRICAL EQUIPMENTS and TEXTILES (INCLUDING DYED,PRINTED)
ELECTRICAL EQUIPMENTS
TEXTILES (INCLUDING DYED,PRINTED)
2000
1500
1000
500
0
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17

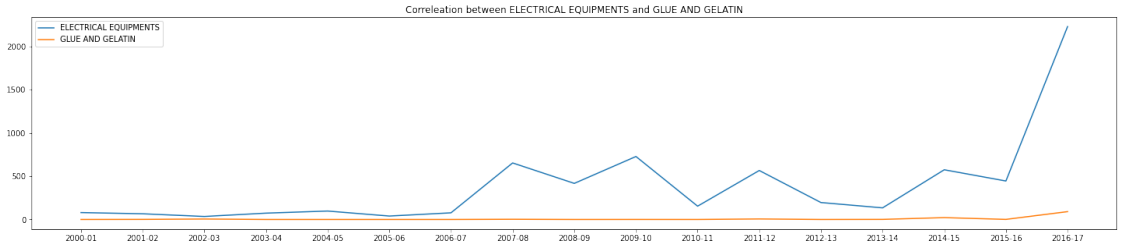

Correleation between MEDICAL AND SURGICAL APPLIANCES and TEXTILES (INCLUDING DYED,PRINTED)
MEDICAL AND SURGICAL APPLIANCES
TEXTILES (INCLUDING DYED,PRINTED)
600
500
400
300
200
100
0
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17

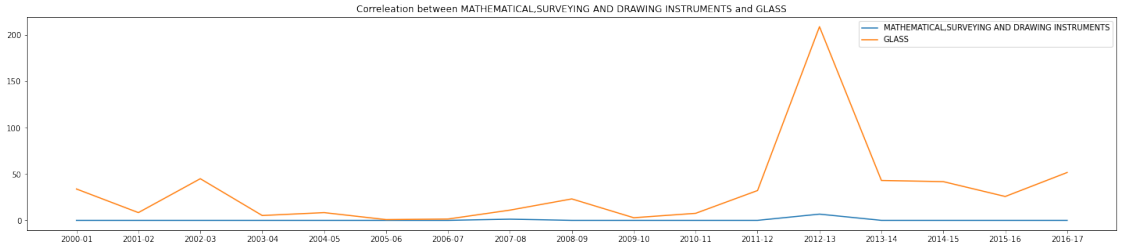

Correleation between SEA TRANSPORT and RETAIL TRADING
SEA TRANSPORT
RETAIL TRADING
700
600
500
400
300
200
100
0
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17


Correleation between DYE-STUFFS and DIAMOND,GOLD ORNAMENTS
DYE-STUFFS
DIAMOND,GOLD ORNAMENTS
250
200
150
100
50
0
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


Correleation between AIR TRANSPORT (INCLUDING AIR FREIGHT) and CONSTRUCTION (INFRASTRUCTURE) ACTIVITIES
AIR TRANSPORT (INCLUDING AIR FREIGHT)
CONSTRUCTION (INFRASTRUCTURE) ACTIVITIES
4000
3000
2000
1000
0
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


Correleation between FERMENTATION INDUSTRIES and FOOD PROCESSING INDUSTRIES
FERMENTATION INDUSTRIES
FOOD PROCESSING INDUSTRIES
4000
3500
3000
2500
2000
1500
1000
500
0
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





Lets look at the 3 most correlated years

```
abs_corr = get_top_abs_correlations(df,3)
abs_corr
for i in range(3):
  plt.plot(df_trans.loc[abs_corr.index[i][0]], label =
abs_corr.index[i][0])
  plt.plot(df_trans.loc[abs_corr.index[i][1]], label =
abs_corr.index[i][1])
  plt.title(f'Correleation between {abs_corr.index[i][0]} and
{abs_corr.index[i][1]}')
  plt.legend()
  plt.show()
```