#### Importing the necessary Modules

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
import plotly.express as px
import plotly.graph_objects as go
```

### Reading the Manually Extracted Dataset from SEC's EDGAR's database

### https://www.sec.gov/edgar/searchedgar/cik

```
data = pd.read csv('Manually extract.csv')
data
         Total Revenue
   Year
                        Net Income
                                    Total Assets
                                                  Total Liabilities
  2023
                211915
                             72361
                                          411976
                                                              205753
  2022
1
                             72738
                198270
                                          364840
                                                              198298
  2021
                168088
                             61271
                                          333779
                                                              191791
  2023
3
                                          106618
                 96773
                             14974
                                                               43009
4 2022
                 81462
                             12556
                                           82338
                                                               36440
5
  2021
                 53821
                              5519
                                           62131
                                                               30548
6
  2023
                383285
                             96995
                                          352583
                                                              290437
7
  2022
                394328
                             99803
                                          352755
                                                              302083
  2021
                365817
                             94680
                                          351002
                                                              287912
   Cash Flow from Operating Activities
                                          Company
0
                                        Microsoft
                                 87582
1
                                 89035 Microsoft
2
                                 76740 Microsoft
3
                                 13256
                                            Tesla
4
                                 14724
                                            Tesla
5
                                 11497
                                            Tesla
6
                                110543
                                            Apple
7
                                            Apple
                                122151
8
                                104038
                                            Apple
```

### Calculating Year-by-Year growth rates for Total Revenue and Net Income

```
data['Revenue Growth (%)'] = data.groupby('Company')['Total
Revenue'].pct_change() * 100
data['Net Income Growth (%)'] = data.groupby('Company')['Net
Income'].pct_change() * 100
data
```

0 1 2 3 4 5 6 7 8	Year 2023 2022 2021 2023 2022 2021 2023 2022 2021	Total	Revenue 211915 198270 168088 96773 81462 53821 383285 394328 365817	Net	Income 72361 72738 61271 14974 12556 5519 96995 99803 94680	Tota	Assets 411976 364840 333779 106618 82338 62131 352583 352755 351002	Total Li	abilitie 20575 19829 19179 4300 3644 3054 29043 30208 28791	3 8 1 9 9 0 8 7 3
\	Cash	Flow f	rom Opera	ting			Company	Revenue	Growth	
0					87	582	Microsoft			NaN
1					89	035	Microsoft		-6.438	902
2					76	740	Microsoft		-15.222	676
3					13	256	Tesla			NaN
4					14	724	Tesla		-15.821	.562
5					11	497	Tesla		-33.931	.158
6					110	543	Apple			NaN
7					122	151	Apple		2.881	.146
8					104	038	Apple		-7.230	275
0 1 2 3 4 5 6 7 8	Net I		Growth (% Nal 0.52099 -15.76480 Nal -16.14799 -56.04491 Nal 2.89499	N 9 0 N 0 9 N 5						

# Imputing Null/NaN values that result from pct\_change calculations with 0

```
data.fillna(0, inplace=True)
data
```

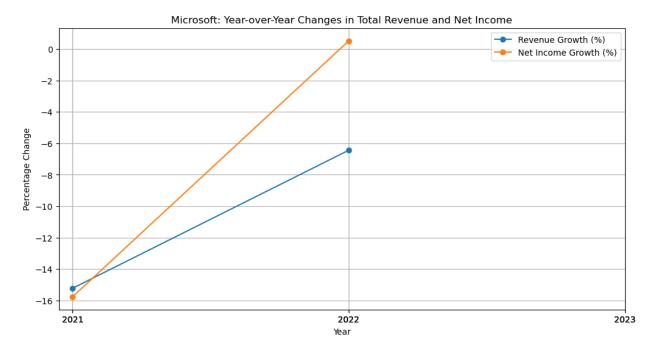
```
Year
         Total Revenue
                          Net Income
                                      Total Assets
                                                      Total Liabilities
0
   2023
                 211915
                               72361
                                             411976
                                                                  205753
1
  2022
                 198270
                               72738
                                             364840
                                                                  198298
2
   2021
                 168088
                               61271
                                             333779
                                                                  191791
3
  2023
                  96773
                               14974
                                             106618
                                                                   43009
4
  2022
                  81462
                               12556
                                              82338
                                                                   36440
5
  2021
                  53821
                                5519
                                              62131
                                                                   30548
6
   2023
                 383285
                               96995
                                             352583
                                                                  290437
7
   2022
                 394328
                               99803
                                             352755
                                                                  302083
8
  2021
                 365817
                               94680
                                             351002
                                                                  287912
   Cash Flow from Operating Activities
                                                      Revenue Growth (%)
                                             Company
\
0
                                   87582
                                           Microsoft
                                                                  0.000000
                                   89035
                                           Microsoft
                                                                 -6.438902
1
2
                                   76740
                                           Microsoft
                                                                -15.222676
3
                                   13256
                                               Tesla
                                                                  0.000000
                                   14724
                                               Tesla
                                                                -15.821562
                                                                -33.931158
5
                                   11497
                                               Tesla
6
                                  110543
                                               Apple
                                                                  0.000000
7
                                  122151
                                               Apple
                                                                  2.881146
8
                                  104038
                                               Apple
                                                                 -7.230275
   Net Income Growth (%)
0
                 0.000000
1
                 0.520999
2
               -15.764800
3
                 0.000000
4
               -16.147990
5
               -56.044919
6
                 0.000000
7
                 2.894995
8
                -5.133112
```

### Approach 1

```
# Calculate year-over-year changes
# Calculate year-over-year changes for each financial metric,
including 2023
data['Revenue Growth (%)'] = data.groupby('Company')['Total
Revenue'].pct_change(periods=1) * 100
```

```
data['Net Income Growth (%)'] = data.groupby('Company')['Net
Income'].pct change(periods=1) * 100
data['Total Assets Growth (%)'] = data.groupby('Company')['Total
Assets'].pct change(periods=1) * 100
data['Total Liabilities Growth (%)'] = data.groupby('Company')['Total
Liabilities'].pct_change(periods=1) * 100
data['Cash Flow Growth (%)'] = data.groupby('Company')['Cash Flow from
Operating Activities'].pct change(periods=1) * 100
# Display the results
print(data[['Company', 'Year', 'Revenue Growth (%)', 'Net Income
Growth (%)', 'Total Assets Growth (%)', 'Total Liabilities Growth
(%)', 'Cash Flow Growth (%)']])
     Company
              Year Revenue Growth (%)
                                        Net Income Growth (%) \
   Microsoft
              2023
0
                                   NaN
                                                           NaN
1
  Microsoft
              2022
                             -6.438902
                                                      0.520999
2
  Microsoft 2021
                            -15,222676
                                                    -15.764800
3
       Tesla
              2023
                                   NaN
                                                           NaN
4
       Tesla 2022
                            -15.821562
                                                    -16.147990
5
       Tesla 2021
                            -33.931158
                                                    -56.044919
6
       Apple 2023
                                   NaN
                                                           NaN
7
       Apple 2022
                              2.881146
                                                      2.894995
8
                             -7.230275
       Apple 2021
                                                     -5.133112
   Total Assets Growth (%) Total Liabilities Growth (%) Cash Flow
Growth (%)
                                                     NaN
                       NaN
NaN
                -11.441443
                                                -3.623276
1
1.659017
                 -8.513595
                                                -3.281425
13.809176
                       NaN
                                                      NaN
NaN
                -22.772890
                                               -15.273547
11.074231
                -24.541524
                                               -16.169045
21.916599
                                                     NaN
                       NaN
NaN
7
                  0.048783
                                                4.009820
10.500891
                 -0.496945
                                                -4.691095
8
14.828368
microsoft_df = data[data['Company'] == 'Microsoft']
# Plotting the year-over-year changes for Total Revenue and Net Income
```

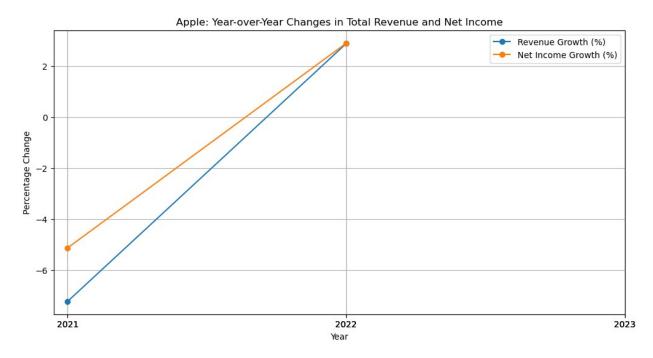
```
plt.figure(figsize=(12, 6))
plt.plot(microsoft_df['Year'], microsoft_df['Revenue Growth (%)'],
marker='o', label='Revenue Growth (%)')
plt.plot(microsoft_df['Year'], microsoft_df['Net Income Growth (%)'],
marker='o', label='Net Income Growth (%)')
plt.xlabel('Year')
plt.ylabel('Year')
plt.ylabel('Percentage Change')
plt.title('Microsoft: Year-over-Year Changes in Total Revenue and Net Income')
plt.legend()
plt.grid(True)
plt.xticks(data['Year'])
plt.show()
```



```
apple_df = data[data['Company'] == 'Apple']

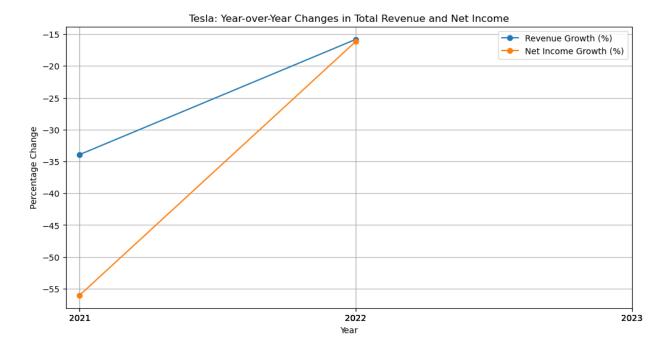
# Plotting the year-over-year changes for Total Revenue and Net Income
plt.figure(figsize=(12, 6))
plt.plot(apple_df['Year'], apple_df['Revenue Growth (%)'], marker='o',
label='Revenue Growth (%)')
plt.plot(apple_df['Year'], apple_df['Net Income Growth (%)'],
marker='o', label='Net Income Growth (%)')
plt.xlabel('Year')
plt.ylabel('Percentage Change')
plt.title('Apple: Year-over-Year Changes in Total Revenue and Net Income')
plt.legend()
plt.legend()
plt.grid(True)
```

```
plt.xticks(data['Year'])
plt.show()
```



```
Tesla_df = data[data['Company'] == 'Tesla']

# Plotting the year-over-year changes for Total Revenue and Net Income
plt.figure(figsize=(12, 6))
plt.plot(Tesla_df['Year'], Tesla_df['Revenue Growth (%)'], marker='o',
label='Revenue Growth (%)')
plt.plot(Tesla_df['Year'], Tesla_df['Net Income Growth (%)'],
marker='o', label='Net Income Growth (%)')
plt.xlabel('Year')
plt.ylabel('Year')
plt.ylabel('Percentage Change')
plt.title('Tesla: Year-over-Year Changes in Total Revenue and Net Income')
plt.legend()
plt.grid(True)
plt.xticks(data['Year'])
plt.show()
```



## Approach 2 Calculating Year-by-Year growth rates for Total Assets, Total Liabilities and Cash flow from Operations Activities

```
data['Assets Growth (%)'] = data.groupby('Company')['Total
Assets'].pct change() * 100
data['Liabilities Growth (%)'] = data.groupby('Company')['Total
Liabilities'].pct_change() * 100
data['Cash Flow from Operations Growth(%)'] = data.groupby('Company')
['Cash Flow from Operating Activities'].pct change() * 100
data
         Total Revenue
                         Net Income
                                      Total Assets
                                                     Total Liabilities
   Year
   2023
                 211915
                               72361
                                            411976
                                                                 205753
   2022
                               72738
1
                 198270
                                             364840
                                                                 198298
   2021
                 168088
                               61271
                                             333779
                                                                 191791
3
   2023
                  96773
                               14974
                                             106618
                                                                  43009
4
  2022
                                              82338
                  81462
                               12556
                                                                  36440
5
   2021
                                              62131
                  53821
                                5519
                                                                  30548
6
  2023
                 383285
                               96995
                                             352583
                                                                 290437
7
   2022
                 394328
                               99803
                                             352755
                                                                 302083
   2021
                 365817
                                             351002
                                                                 287912
                               94680
   Cash Flow from Operating Activities
                                                      Revenue Growth (%)
                                            Company
/
0
                                          Microsoft
                                                                 0.000000
                                   87582
                                   89035
                                          Microsoft
                                                                -6.438902
1
2
                                          Microsoft
                                                               -15,222676
                                   76740
```

		132	256 Tesl	.a	0.00000	00	
		147	'24 Tesl	.a	-15.821562		
		114	197 Tes1	.a	-33.931158		
		1105	543 Appl	.e	0.00000		
		1221	122151 Apple		2.881146		
		1046	)38 App1	.e	-7.230275		
	0.000000 0.520999 -15.764800 0.000000 -16.147990 -56.044919 0.000000 2.894995 -5.133112	-11 -8 -22 -24 ons Growth( 1.6596 -13.8091 N 11.0742 -21.9165	NaN 1.441443 3.513595 NaN 2.772890 4.541524 NaN 0.048783 0.496945 (%) laN 0.17 0.76 laN 0.31 0.99	abilities	Growth (%) NaN -3.623276 -3.281425 NaN -15.273547 -16.169045 NaN 4.009820 -4.691095		
ta.fillna( <mark>0</mark>	, inplace= <mark>T</mark> r	ue)					
ta							
Year Tota 2023 2022 2021 2023 2022 2021 2023 2022 2021	Revenue N 211915 198270 168088 96773 81462 53821 383285 394328 365817	et Income 72361 72738 61271 14974 12556 5519 96995 99803 94680	411976 364846 333779 106618 82338 62131 352583 352755	5 ) ) 3 3 L	Liabilities 205753 198298 191791 43009 36440 30548 290437 302083 287912	\	
	ta.fillna(0 ta  Year Tota 2023 2022 2021 2023 2022 2021 2023 2022 2021 2023 2022	0.520999 -15.764800 0.0000000 -16.147990 -56.044919 0.0000000 2.894995 -5.133112  Cash Flow from Operati  Ta  Year Total Revenue N 2023 211915 2022 198270 2021 168088 2023 96773 2022 81462 2021 53821 2023 383285 2022 394328	147 114 1105 1221 1046  Net Income Growth (%) Assets Growth (%) As	14724 Test  11497 Test  110543 Appl  122151 Appl  104038 Appl  104038 Appl  104038 Appl  Net Income Growth (%) Assets Growth (%) Lia  0.000000 NaN  0.520999 -11.441443  -15.764800 -8.513595  0.000000 NaN  -16.147990 -22.772890  -56.044919 -24.541524  0.0000000 NaN  2.894995 0.048783  -5.133112 -0.496945  Cash Flow from Operations Growth(%)  NaN  1.659017  -13.809176  NaN  11.074231  -21.916599  NaN  10.500891  -14.828368  ta.fillna(0, inplace=True)  ta  Year Total Revenue Net Income Total Assets 2023 211915 72361 411976 2022 198270 72738 364846 2021 168088 61271 333779 2023 96773 14974 106618 2022 198270 72738 364846 2021 168088 61271 333779 2023 96773 14974 106618 2022 81462 12556 82338 2021 53821 5519 62133 2023 383285 96995 352583 2022 394328 99803 352755	14724 Tesla  11497 Tesla  110543 Apple  122151 Apple  104038 Apple  104038 Apple  104038 Apple  Net Income Growth (%) Assets Growth (%) Liabilities  0.0000000 NaN 0.520999 -11.441443 -15.764800 -8.513595 0.0000000 NaN -16.147990 -22.772890 -56.044919 -24.541524 0.0000000 NaN 2.894995 0.048783 -55.133112 -0.496945  Cash Flow from Operations Growth(%) NaN 1.659017 -13.809176 NaN 11.074231 -21.916599 NaN 10.500891 -14.828368  ta.fillna(0, inplace=True)  ta  Year Total Revenue Net Income Total Assets Total 2023 211915 72361 411976 2022 198270 72738 364840 2021 168088 61271 333779 2023 96773 14974 106618 2022 81462 12556 82338 2021 53821 5519 62131 2023 383285 96995 352583 2022 394328 99803 352755	14724 Tesla -15.82156  11497 Tesla -33.93115  110543 Apple 0.000000  122151 Apple 2.88114  104038 Apple -7.23027  Net Income Growth (%) Assets Growth (%)	

```
Cash Flow from Operating Activities
                                                      Revenue Growth (%)
                                            Company
\
0
                                   87582
                                          Microsoft
                                                                 0.000000
                                   89035
                                          Microsoft
                                                                -6.438902
1
                                   76740
                                          Microsoft
                                                               -15.222676
                                   13256
                                               Tesla
                                                                 0.00000
                                   14724
                                               Tesla
                                                               -15.821562
                                   11497
                                               Tesla
                                                               -33.931158
                                  110543
                                               Apple
                                                                 0.000000
                                  122151
                                               Apple
                                                                 2.881146
8
                                  104038
                                               Apple
                                                                -7.230275
   Net Income Growth (%)
                            Assets Growth (%)
                                                Liabilities Growth (%)
0
                 0.000000
                                     0.00000
                                                               0.00000
                                   -11.441443
1
                 0.520999
                                                              -3.623276
2
               -15.764800
                                    -8.513595
                                                              -3.281425
3
                 0.000000
                                     0.000000
                                                               0.000000
4
               -16.147990
                                   -22.772890
                                                             -15.273547
5
               -56.044919
                                   -24.541524
                                                             -16.169045
6
                                     0.000000
                 0.000000
                                                               0.000000
7
                 2.894995
                                     0.048783
                                                               4.009820
8
                -5.133112
                                    -0.496945
                                                              -4.691095
   Cash Flow from Operations Growth(%)
0
                                0.000000
1
                                1.659017
2
                              -13.809176
3
                                0.000000
4
                               11.074231
5
                              -21.916599
6
                                0.000000
7
                               10.500891
8
                              -14.828368
data.to csv('final data report.csv')
summary = data.groupby('Company').agg({
    'Revenue Growth (%)': 'mean',
    'Net Income Growth (%)': 'mean',
    'Assets Growth (%)': 'mean',
    'Liabilities Growth (%)' : 'mean',
```

```
'Cash Flow from Operations Growth(%)' :'mean'
}).reset index()
print('Year-By-Year Average Growth Rates(%) :-')
print('
                    OR')
print("Overall Growth/Fall rate for Apple, Microsoft and Tesla from
Fiscal Year 2021 - 2023")
summary
Year-By-Year Average Growth Rates(%) :-
Overall Growth/Fall rate for Apple, Microsoft and Tesla from Fiscal
Year 2021 - 2023
     Company Revenue Growth (%) Net Income Growth (%) Assets Growth
(%)
       Apple
                       -1.449710
                                               -0.746039
0
0.149388
1 Microsoft
                       -7.220526
                                               -5.081267
6.651679
       Tesla
                      -16.584240
                                              -24.064303
15.771471
   Liabilities Growth (%) Cash Flow from Operations Growth(%)
0
                -0.227092
                                                      -1.442492
1
                -2.301567
                                                      -4.050053
2
               -10.480864
                                                      -3.614123
summary.to csv('Summary final report.csv')
```