Mayur Sejpal (C2071044)

University of Law

Data Analysis for Business

Prof. Lars Jeschio

May 11th, 2023

Link for Jupyter notebook (Google drive)

https://drive.google.com/file/d/1ZTMK2ETBu96MDEepyjb-V1SPTMp83fWf/view?usp=sharing

Data Analysis for Business Assessment

This Assignment Topic is about Investment Analysis and taking Business decision to Include "TESLA Company" Share/Stock into JP Morgan newly launched Mutual fund portfolio or Not?

So in this Assignment I will do Analysis of "TESLA Company" dataset and will take decision based on the outcome generated in Python script. So, that JP Morgen fund manager can decided to buy Tesla Stock or not.

PART - 1

What business decision do you want to support with this solution, and how do you expect your answer to add value?

I wanted to know weather TESLA Compay's Stock or Share is good to purshase for JP Morgan newly introduced Hedged fund/mutule fund or not? So, I will do analyse of Business and financial data of Tesla Company based on my below provided datset and will perform varius mathemical analysis using Python script to take decision weather fund manger should buy Tesla Stock or not.

(Kindly note Tesla is single company and Nasdaq is Index which is basket of multiple company which plays major role in influencing US economy, Fed reserve and security exchange council. The growth and stability of the country and foreign trade - Import vs Export also depends on how top blue chip companies are performing to contibute to the growth of county (USA))

PART - 2

Why did you choose this as your preferred data-driven decision-making problem?

I have chosen this data-driven decision problem because recently JP Morgen announced it's profit released first-quarter earnings and revenue figures on Friday (14-04-2023) that have exceeded the forecasts made by the company and investor. The bank with headquarters in New York reported earnings of 12.6 billion doller. That represents an increase from 8.3 billion doller, during the same period last year. This was highest ever record made by JP Morgen as compared to other Investment bank after pandemic. Therefor most of other small financial Institution diverted their passive investment to JP Morgen newly launched fund.

Thus I have decided to help portfolio manager to take decision weather they should include/not to include this blue chip company stock - "TESLA" into their basket of new fund/investment or not?

After the fund is introduced in the market and suppose JP morgen fund performs good, then all the investor will benefit, company profit margin will increase and tax contributed to convernment will increase. Therefor it is very important to take right and accurate decision based on the fundamental business of the Tesla company.

PART - 3

What data will you use, and where will you get it? Note for this assignment; you can use one or more datasets

My Dataset include TESLA COMPANY STOCK detail and NASDAQ INDEX PRICE detail imported from Yahoo Finance Website live and extracted based as below.....

My dataset can be found in Yahoo Finance website under "TESLA Company Database":
https://query1.finance.yahoo.com/v7/finance/download/TSLA?period1=1514764800&period2=1680220800&interval=1mo&events=history&includeAdjustedClose=true

My dataset can be found in Yahoo Finance website under "NASDAQ Index Database":
https://query1.finance.yahoo.com/v7/finance/download/%5EIXIC?period1=1517356800&period2=1680220800&interval=1mo&events=history&includeAdjustedClose=true

Referance Information and supporting Dataset -** TESLA: https://fintel.io/so/us/tsla/jpmorgan-chase-

Referance Information and supporting Dataset -** JP Morgan:
https://markets.businessinsider.com/news/stocks/jpmorgan-raised-tesla-stake-600-percent-potential-1-billion-return-2020-2-1028914807

PART - 4

Explain all the steps towards developing your solution, including the data pipeline steps

In this assignment I wanted to take decison weather shall we Buy or not to Buy "TESLA" Company stock. So I have to perform few steps to come to an final conclusion.

STEP - 1: ***Install Yahoo Finance package, OLS and other packages in jupitor notebook terminal.***

STEP - 2: ***Import Live data using URL or using external file for "TESLA and Nasdaq" Comapny from Yahoo Finance website.***

STEP - 3: ***Perform Liner Regression to understand the relation between two dataset - "TESLA and Nasdaq" so as to analyse weather it is possible to carryon further analysis or not.***

STEP - 4: ***Do renaming of colums-headers of imported data OR prepare saperate combine excel file, so as to use data for scattered plot diagram for (OLS - Ordinary Least Squares) regression method inorder to analyse for estimating coefficients of linear regression equations in order to describe the relationship between one or more independent quantitative variables and a dependent variable (i.e "TESLA STOCK" - Independent variable / "NASDAQ INDEX" - Dependent variable).***

STEP - 5: ***Use above imported data of step:4 to draw a box plot to unnderstand the linearity of the dataset and to analyse weather TESLA stock is influenced by the moment of NASDAQ Index or TESLA stock is isolated function of its other dependent variable.***

STEP - 6: ***Import Live data chart (Line graph) for both TESLA and NASDAQ inorder to understand the price fluctuation and momentum in the graph using the output generated in OLS model.***

STEP - 7: ***Import Live data chart (Bi-liner Line graph) for Tesla and Nasdaq together to understand how Telsa functions in momentum with Nasdaq. Weather Tesla has major influence in the momentum of Nasdaq index or not.***

STEP - 8: ***Perform Financial Ratio analysis of "TESLA" company using audited financial data and take decision weather JP Morgen to buy or not to buy Tesla for its new investment.***

PART - 5

What are two data analytic tasks you can perform to solve the problem?

In my data Analytics I will doing data analysis using Regression analysis and would interpreat data using OLS and ANOVA table output generated via this model. OLS will help me to understand the degree of relationship and help me to identify the unidentified variables in a model. By reducing the sum of squared residuals between the actual and anticipated values. Also, ANOVA Table helps me to analyse whether or not the model fits the analysis's assumptions depends on whether variations between varable means are statistically significant or not.

Also, Financial ratio Analysis will be carries out based on the significance value of data ones Regrssion model generate higher R-squar and model is being sufficient explaind that Tesla has at leat more then 40% influence to the price momentum towqards Nasdaq Index.

PART - 6

What is your dataset, and what is your training data? For every modelling task, identify your target variable and explain why it is appropriate for your objective and how its characteristics lead you to consider the models.?

_My dataset is Financial data that is historical closing price on Monthly basis for Nasdaq index and Tesla stock imported from Yahoo Finance. For my model targetad variable is "Tesla stock price" as independent variable and "Nasdaq" Index as a dependent variable. The Tesla stock price (Tesla_close as header coloum in the dataset) is very appropriate for my objective because it will help me know how its relation exists with it's basket under which it falls (i.e is Nasdaq*Index) and help to know weather it has any influcing effor on the same or not?. If it has influcing effect then one must buy or include all the securities which are there in Nasdaq into JP Morgen portfolio if not the one must do analysis of isolated company (i.e how we did for Tesla) and analyse its financial outcomes to take final decision.*

The Tesla has been outperforming stock but due to some concern it need to be analysed deeply weather to buy or not?. The Tesla has traling data in the US Market and it has been playing major role in influcing the price momentum of various index in the past in the US global market. Therefor it was necessary for me consider past historical trends which has brought major influence in New York stock exchange in the year 2022, which make me to chose this variable as compared to other.

In [1]:
```
import pandas as pd              # For Data Structures so called Data Frames
```

```
import numpy as np                # Mathematical functionality of the Data Frames
import statsmodels.api as sm      # Statistical Functionality
import seaborn as sns             # Advanced Plotting
import matplotlib.pyplot as plt # Standard Plotting
import datetime
import pandas_datareader as pdr
from sklearn.decomposition import PCA
from sklearn import preprocessing
from sklearn.linear_model import LinearRegression
```

You can Import data online from Yahoo Finance website or Import dataset via download file from Yahoo Finance (Here I will show you the both the ways below)

TESLA STOCK PRICE DETAIL

This dataset consists of information about month end stock price of Tesla Stock which is indicated as header = "Close". This can be understood as a simple connection between the two values: Random stock price is recorded on monthly basis based on Market equilibrium.

In [2]:
```
## Data Imported from Yahoo Finance using URL for "TESLA STOCK PRICE"....


stockcode ='TSLA'

ts1 = str(int(datetime.datetime(2018, 1, 31).timestamp()))
ts2 = str(int(datetime.datetime(2023, 3, 31).timestamp()))

#interval = '1d'
interval = '1mo'
#interval = '1mo'

events = 'history'
#events = 'div'
#events = 'split'

url = 'https://query1.finance.yahoo.com/v7/finance/download/TSLA?period1=1515801600&peri

print(url)
print (ts1, ts2)

try:
    stockdata = pd.read_csv(url)
    print(stockdata)
except:
    print("Not able to fetch value for code : "+stockcode)
    print("Either stock code is not correct or could be connectivity issue..")
```

```
https://query1.finance.yahoo.com/v7/finance/download/TSLA?period1=1515801600&period2=168
0220800&interval=1mo&events=history&includeAdjustedClose=true
1517353200 1680213600
          Date        Open        High         Low       Close   Adj Close  \
0   2018-02-01   23.400000   23.999332   19.650667   22.870667   22.870667
1   2018-03-01   23.000668   23.244667   16.547333   17.742001   17.742001
2   2018-04-01   17.084000   20.633333   16.306000   19.593332   19.593332
3   2018-05-01   19.567333   20.865999   18.228001   18.982000   18.982000
4   2018-06-01   19.057333   24.915333   18.922667   22.863333   22.863333
..         ...         ...         ...         ...         ...         ...
57  2022-11-01  234.050003  237.399994  166.190002  194.699997  194.699997
58  2022-12-01  197.080002  198.919998  108.239998  123.180000  123.180000
59  2023-01-01  118.470001  180.679993  101.809998  173.220001  173.220001
```

```
60   2023-02-01  173.889999  217.649994  169.929993  205.710007  205.710007
61   2023-03-01  206.210007  207.789993  163.910004  207.460007  207.460007

        Volume
0   1637850000
1   2359027500
2   2854662000
3   2333671500
4   3201376500
..         ...
57  1885275300
58  2944247700
59  3897499400
60  3624845100
61  3311619900

[62 rows x 7 columns]
```

OR

In [3]:
```
## Data Imported using External Excel file for "Tesla" downloaded from Yahoo Finance web


data = pd.read_csv('TESLA historical price.csv')
data.head()
```

Out[3]:

	Date	Open	High	Low	Close	Adj Close	Volume
0	01-01-2018	20.8000	24.0333	20.3787	23.6207	23.6207	1864072500
1	01-02-2018	23.4000	23.9993	19.6507	22.8707	22.8707	1637850000
2	01-03-2018	23.0007	23.2447	16.5473	17.7420	17.7420	2359027500
3	01-04-2018	17.0840	20.6333	16.3060	19.5933	19.5933	2854662000
4	01-05-2018	19.5673	20.8660	18.2280	18.9820	18.9820	2333671500

NASDAQ INDEX PRICE DETAIL

This dataset consists of information about month end Index Value of Nasdaq Index which is indicated as header = "Close". This can be understood as a simple connection between the two values: Random Index Value is recorded on monthly basis based on actual stock price moment under the index due to Market equilibrium.

In [4]:
```
## Data Imported from Yahoo Finance using URL "For NASDAQ INDEX"....


stockcode ='IXIC'

ts1 = str(int(datetime.datetime(2018, 1, 31).timestamp()))
ts2 = str(int(datetime.datetime(2023, 3, 31).timestamp()))

#interval = '1d'
interval = '1mo'
#interval = '1mo'

events = 'history'
#events = 'div'
#events = 'split'

url = 'https://query1.finance.yahoo.com/v7/finance/download/%5EIXIC?period1=1517356800&p
```

```
print(url)
print (ts1, ts2)

try:
    stockdata = pd.read_csv(url)
    print(stockdata)
except:
    print("Not able to fetch value for code : "+stockcode)
    print("Either stock code is not correct or could be connectivity issue..")
```

```
https://query1.finance.yahoo.com/v7/finance/download/%5EIXIC?period1=1517356800&period2=
1680220800&interval=1mo&events=history&includeAdjustedClose=true
1517353200 1680213600
          Date          Open          High           Low         Close  \
0   2018-02-01   7377.169922   7441.089844   6630.669922   7273.009766
1   2018-03-01   7274.750000   7637.270020   6901.069824   7063.450195
2   2018-04-01   7016.169922   7319.580078   6805.959961   7066.270020
3   2018-05-01   7053.649902   7492.419922   6991.140137   7442.120117
4   2018-06-01   7487.660156   7806.600098   7419.560059   7510.299805
..         ...           ...           ...           ...           ...
57  2022-11-01  11154.740234  11492.620117  10262.929688  11468.000000
58  2022-12-01  11475.169922  11571.639648  10207.469727  10466.480469
59  2023-01-01  10562.059570  11691.889648  10265.040039  11584.549805
60  2023-02-01  11573.139648  12269.549805  11334.469727  11455.540039
61  2023-03-01  11447.580078  12227.929688  10982.799805  12221.910156

       Adj Close        Volume
0    7273.009766   44063140000
1    7063.450195   48760550000
2    7066.270020   43233040000
3    7442.120117   45761130000
4    7510.299805   48573740000
..           ...           ...
57  11468.000000  101572370000
58  10466.480469  100007430000
59  11584.549805  106732920000
60  11455.540039   99644100000
61  12221.910156  120323510000

[62 rows x 7 columns]
```

OR

In [5]:
```
## Data Imported using External Excel file for "Nasdaq Index" downloaded from Yahoo Fina


data = pd.read_csv('Nasdaq Index closing price.csv')
data.head()
```

Out[5]:

	Date	Open	High	Low	Close	Adj Close	Volume
0	2018-01-01	6937.649902	7505.770020	6924.080078	7411.479980	7411.479980	44694030000
1	2018-02-01	7377.169922	7441.089844	6630.669922	7273.009766	7273.009766	44063140000
2	2018-03-01	7274.750000	7637.270020	6901.069824	7063.450195	7063.450195	48760550000
3	2018-04-01	7016.169922	7319.580078	6805.959961	7066.270020	7066.270020	43233040000
4	2018-05-01	7053.649902	7492.419922	6991.140137	7442.120117	7442.120117	45761130000

Linear Regression....

Will do Liner Regression to find relation between Nasdaq and Tesla.

This dataset consists of information about month end stock price of Tesla Stock and Nasdaq Index. This can be understood as a simple connection between the two variable at given date: "Tesla stock closing price" VS "Nasdaq Index closing price" recorded on monthly basis.

Let's first do a simple regression to understand the connection of those two values. On the x-axis is the Nasdaq_Closing_Price , and on the y-axis is Tesla_Closing_Price.

In [24]:
```
## Here x = NASDAQ index closing price AND y = TESLA Company stock closing price

x = np.array([7411.48,7273.01,7063.45,7066.27,7442.12,7510.30,7671.79,8109.54,8046.35,73
y = np.array([23.6207,22.8707,17.742,19.5933,18.982,22.8633,19.876,20.1107,17.6513,22.48
```

In [25]:
```
linreg = LinearRegression()
```

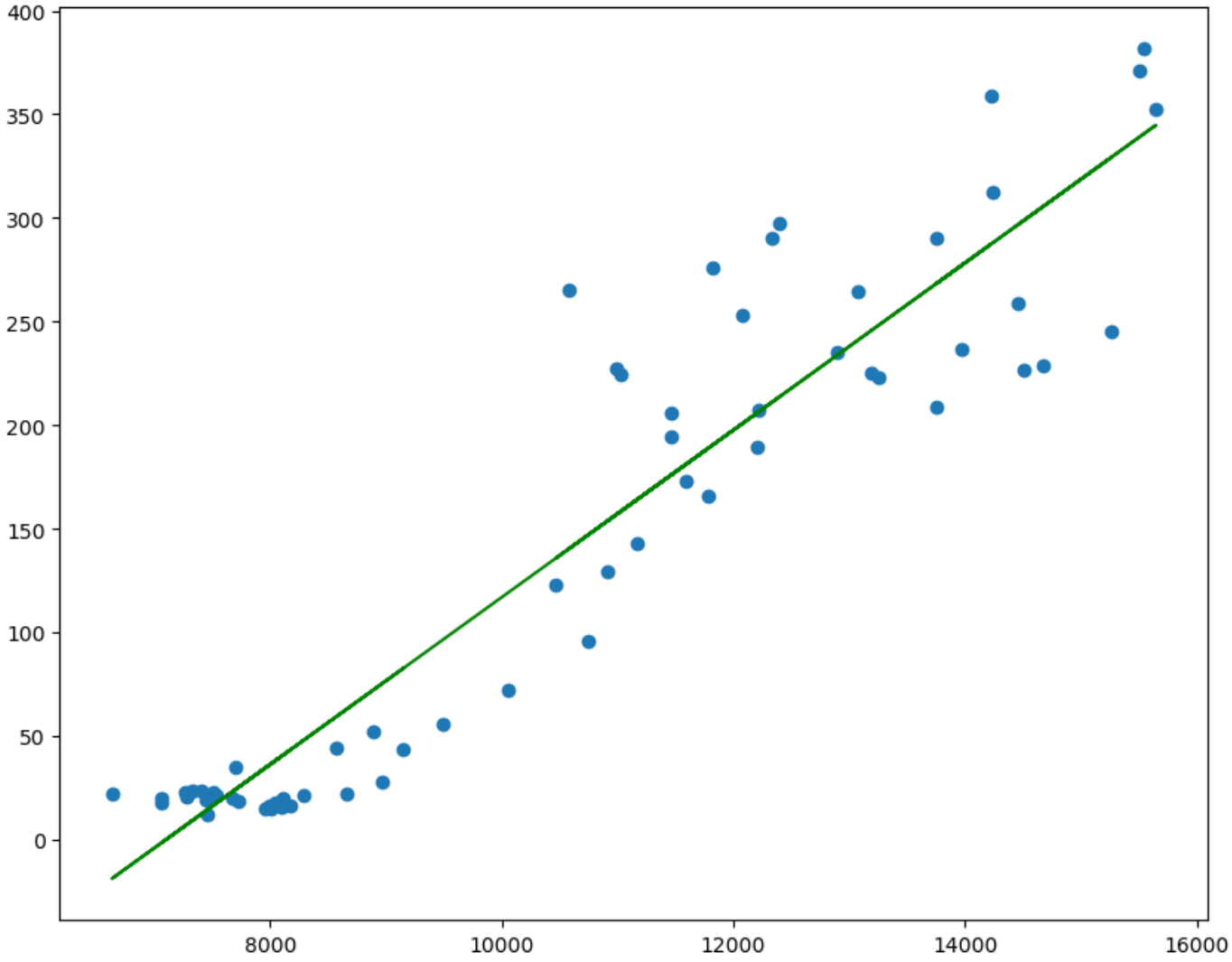
In [26]:
```
x = x.reshape(-1, 1)
```

In [27]:
```
linreg.fit(x, y)
```

Out[27]:
```
LinearRegression()
```

In [28]:
```
y_pred = linreg.predict(x)
```

In [30]:
```
plt.scatter(x,y)
plt.plot(x, y_pred, color="green")
plt.show()
```



As we can see standerd error is too high the dataset is highly scattered as there seems to be no much relationship between Tesla stock price performance as per the performance of the Nasdaq Index. Even though Tesla being the part of Nasdaq its has no much influence in the price movement of Nasdaq Index Price.

Performing OLS and ANOVA Table to understand more relationship between two variable through mathemetical number.

In [6]:
```
import pandas as pd
import statsmodels.api as sm
from statsmodels.formula.api import ols
```

In [7]:
```
# Renaming Coloums.....


dataframe1 = pd.read_csv('TESLA historical price.csv')
dataframe1.head()
header_names=['Tesla_Date','Tesla_open','Tesla_High','Tesla_Low','Tesla_Close','Tesla_Ad
filename1 = pd.read_csv('TESLA historical price.csv',header=None,skiprows=1,names=header
filename1.head()
```

Out[7]:

	Tesla_Date	Tesla_open	Tesla_High	Tesla_Low	Tesla_Close	Tesla_Adj Close	Tesla_Volume
0	01-01-2018	20.8000	24.0333	20.3787	23.6207	23.6207	1864072500
1	01-02-2018	23.4000	23.9993	19.6507	22.8707	22.8707	1637850000
2	01-03-2018	23.0007	23.2447	16.5473	17.7420	17.7420	2359027500
3	01-04-2018	17.0840	20.6333	16.3060	19.5933	19.5933	2854662000

4	01-05-2018	19.5673	20.8660	18.2280	18.9820	18.9820	2333671500

In [8]:
```
dataframe2 = pd.read_csv('Nasdaq Index closing price.csv')
dataframe2.head()
header_names=['Nasdaq_Date','Nasdaq_open','Nasdaq_High','Nasdaq_Low','Nasdaq_Close','Nas
filename2 = pd.read_csv('Nasdaq Index closing price.csv',header=None,skiprows=1,names=he
filename2.head()
```

Out[8]:

	Nasdaq_Date	Nasdaq_open	Nasdaq_High	Nasdaq_Low	Nasdaq_Close	Nasdaq_Adj Close	Nasdaq_Volume
0	2018-01-01	6937.649902	7505.770020	6924.080078	7411.479980	7411.479980	44694030000
1	2018-02-01	7377.169922	7441.089844	6630.669922	7273.009766	7273.009766	44063140000
2	2018-03-01	7274.750000	7637.270020	6901.069824	7063.450195	7063.450195	48760550000
3	2018-04-01	7016.169922	7319.580078	6805.959961	7066.270020	7066.270020	43233040000
4	2018-05-01	7053.649902	7492.419922	6991.140137	7442.120117	7442.120117	45761130000

In [9]:
```
# Combaning the Coloums.....

merged=filename1.merge(filename2, left_on='Tesla_Date', right_on='Nasdaq_Date')
merged.head()
```

Out[9]:

Tesla_Date	Tesla_open	Tesla_High	Tesla_Low	Tesla_Close	Tesla_Adj Close	Tesla_Volume	Nasdaq_Date	Nasdaq_open

"OR" Insted of renaming saperately each coloum other way is importing combined file...

In [10]:
```
# Combaning the Table....

dataframe3 = pd.read_csv('Tesla and Nasdaq stock price.csv')
dataframe3.head()
```

Out[10]:

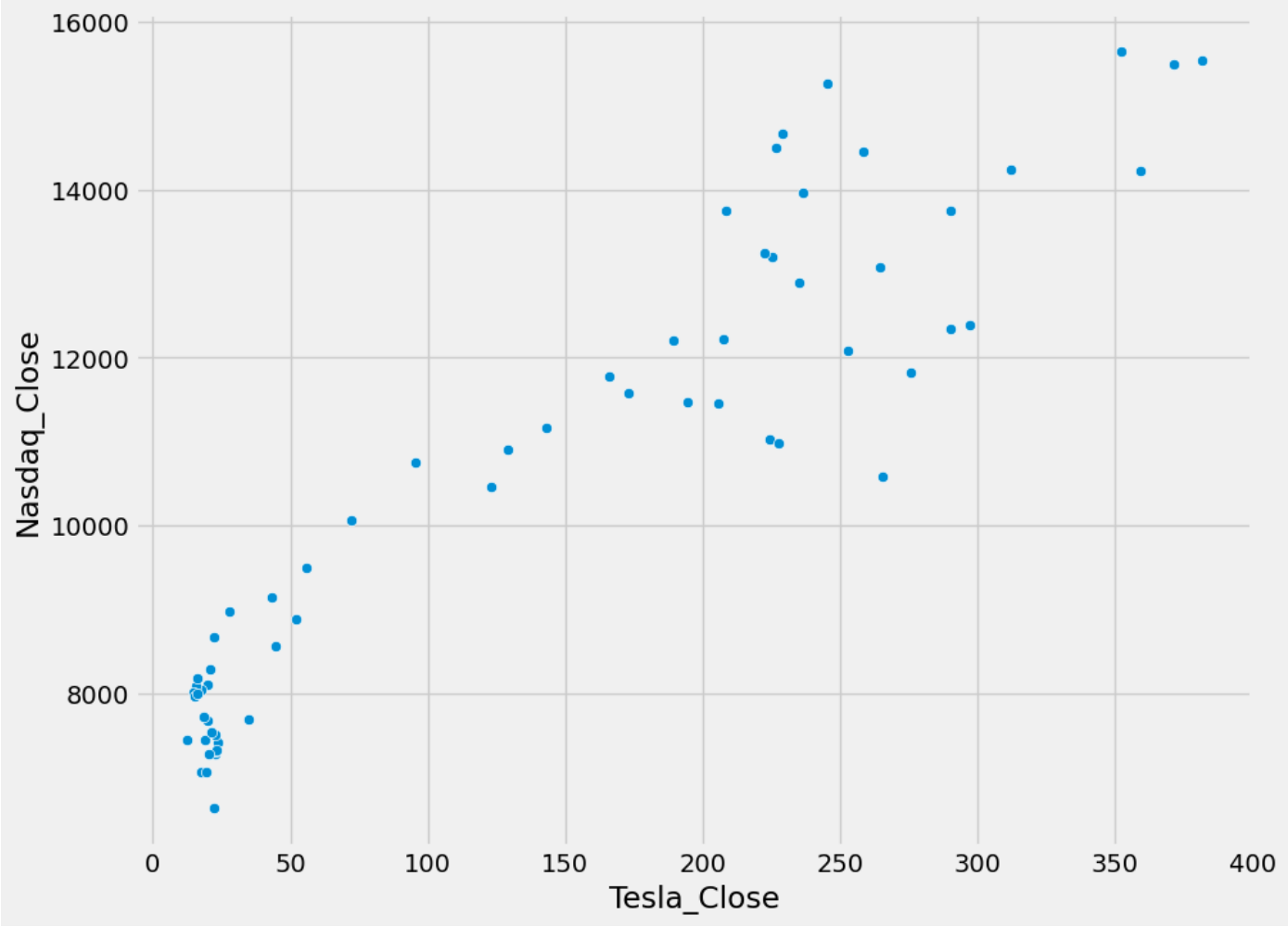
	Date	Tesla_Open	Tesla_High	Tesla_Low	Tesla_Close	Tesla_Adj Close	Tesla_Volume	Nasdaq_Open	Nasdaq_High	N
0	01-01-2018	20.80	24.03	20.38	23.62	23.62	1864072500	6937.65	7505.77	
1	01-02-2018	23.40	24.00	19.65	22.87	22.87	1637850000	7377.17	7441.09	
2	01-03-2018	23.00	23.24	16.55	17.74	17.74	2359027500	7274.75	7637.27	
3	01-04-2018	17.08	20.63	16.31	19.59	19.59	2854662000	7016.17	7319.58	
4	01-05-2018	19.57	20.87	18.23	18.98	18.98	2333671500	7053.65	7492.42	

This combine dataset consists of information about month end stock price of Tesla Stock and Nasdaq Index Value along with it's volume traded monthly basis. This can be understood as a simple connection between the two values at given date: Tesla

stock price VS Nasdaq Index price recorded on monthly basis from the year 2018.

Let's first draw a scatterplot to understand the connection of those two values. On the x-axis is the Tesla Closing price, and on the y-axis are Nasdaq Closing price: It is monthly basis begining from the year, 2018.

In [28]:
```
sns.scatterplot(x='Tesla_Close', y='Nasdaq_Close', data=dataframe3);
```



We can see that it holds true. There are almost no direct relation between the Tesla and Nasdaq stock price. The Tesla stock indipendetly functions to is demand and supply rather then price moment of Nasdaq Index. From the above regression model we will introduce the Intercept first and then build an OLS (least squares) under the above regression model.

In [13]:
```
dataframe3['Intercept'] = 1

ols_model = sm.OLS(dataframe3['Tesla_Close'], dataframe3[['Nasdaq_Close', 'Intercept']])

results = ols_model.fit()

results.summary()
```

Out[13]:

OLS Regression Results

Dep. Variable:	Tesla_Close	**R-squared:**	0.877
Model:	OLS	**Adj. R-squared:**	0.875
Method:	Least Squares	**F-statistic:**	434.9
Date:	Wed, 10 May 2023	**Prob (F-statistic):**	1.89e-29
Time:	01:06:49	**Log-Likelihood:**	-323.81
No. Observations:	63	**AIC:**	651.6
Df Residuals:	61	**BIC:**	655.9

Df Model:	1
Covariance Type:	nonrobust

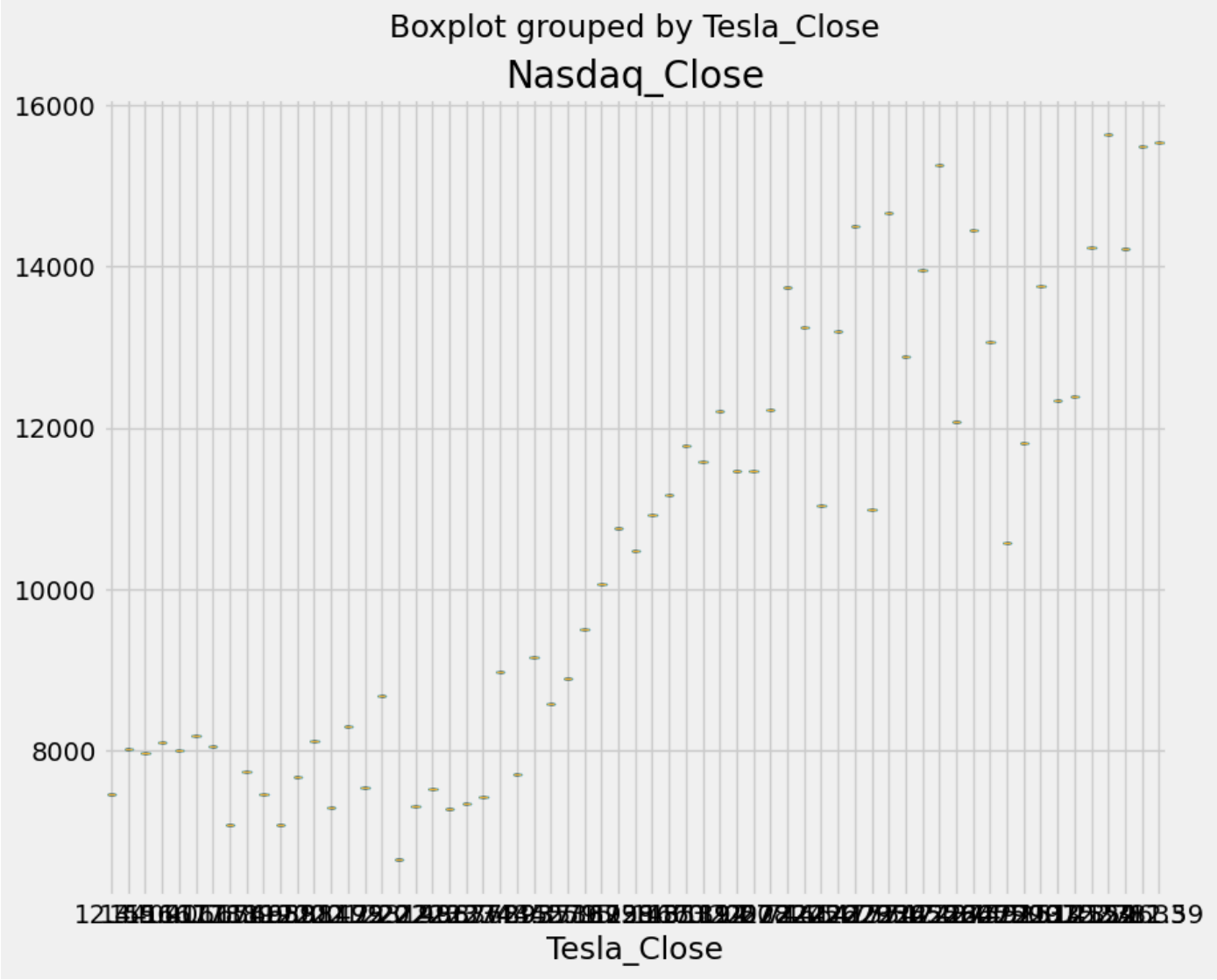
	coef	std err	t	P>|t|	[0.025	0.975]
Nasdaq_Close	0.0404	0.002	20.855	0.000	0.036	0.044
Intercept	-286.8232	21.017	-13.647	0.000	-328.849	-244.798

Omnibus:	5.111	**Durbin-Watson:**	0.329
Prob(Omnibus):	0.078	**Jarque-Bera (JB):**	4.204
Skew:	0.592	**Prob(JB):**	0.122
Kurtosis:	3.445	**Cond. No.**	4.31e+04

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 4.31e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

In [25]:
```
dataframe3.boxplot('Nasdaq_Close', by='Tesla_Close')
```

Out[25]:
```
<AxesSubplot:title={'center':'Nasdaq_Close'}, xlabel='Tesla_Close'>
```



Box plot will help us to understand data more efficiently as there is large dataset. Box plots is useful method as compared to scattered plot as it provides a visual summary of the data enabling us to quickly identify mean values, the dispersion of the data set, and signs of skewness. In this case we can see that Tesla and Nasdaq stock has performed in a similar trend (having positive corelation) at lower volume till "10000" and in the larger volume both tesla and Nasdaq index has (negative corelation) moving at different trend in isolation which is indicated via sctterness above"15000".

In [39]:
```
new=ols('Nasdaq_Close ~ Tesla_Close',data=dataframe3).fit()
aov_table=sm.stats.anova_lm(new,type=2)
```

In [40]:
```
aov_table
```

Out[40]:

	df	sum_sq	mean_sq	F	PR(>F)
Tesla_Close	1.0	4.123590e+08	4.123590e+08	434.920091	1.894688e-29
Residual	61.0	5.783569e+07	9.481260e+05	NaN	NaN

Based on ANOVA Table we can analyse that P-value is grater then "α" (alpha set at "1" digrees of freedom) which shows there no statical significant between Nasdaq_Index_Price and Tesla_Share_Price Whereas, the Sum squar seems to be at 4.030<5.743 (residual error - unexplain portion) this indicate that there is lot of variation which is attributed to variable factor. In the Mean squar we can see that residual error is much higher then actual mean_sq for Tesla stock. Thus, there is seems no much variation betwen sample mean of Tesla and Nasdaq. Bothe has statifically significant value at individual level but not cumulative.

Imported Yahoo Finance Package in Anconda Navigator and

now we would fitch TESLA stock price and will compare with Nasdaq Index so that JP Morgan Team can decide to take Investment decision.

TESLA Stock Price - LIVE data Chart

In [18]:
```
import yfinance
tsla = yfinance.Ticker('TSLA')
hist = tsla.history(period='5y')
hist.head()
```

Out[18]:

Date	Open	High	Low	Close	Volume	Dividends	Stock Splits
2018-05-10 00:00:00-04:00	20.500000	20.865999	20.274000	20.334667	84774000	0.0	0.0
2018-05-11 00:00:00-04:00	20.513332	20.591999	19.938667	20.070667	70194000	0.0	0.0
2018-05-14 00:00:00-04:00	20.221333	20.329332	19.441334	19.464666	109302000	0.0	0.0
2018-05-15 00:00:00-04:00	19.000668	19.130667	18.700001	18.945333	142788000	0.0	0.0
2018-05-16 00:00:00-04:00	18.922001	19.254000	18.770666	19.098667	85110000	0.0	0.0

In [17]:
```
import plotly.graph_objects as go
from plotly.subplots import make_subplots

fig2 = make_subplots(specs=[[{"secondary_y": True}]])
fig2.add_trace(go.Scatter(x=hist.index,y=hist['Close'],name='Price'),secondary_y=False)
fig2.add_trace(go.Bar(x=hist.index,y=hist['Volume'],name='Volume'),secondary_y=True)
fig2.show()
```

This is LIVE chart of Tesla stock based on daliy stock price moment. Comparasion is done below with Nasdaq Index price

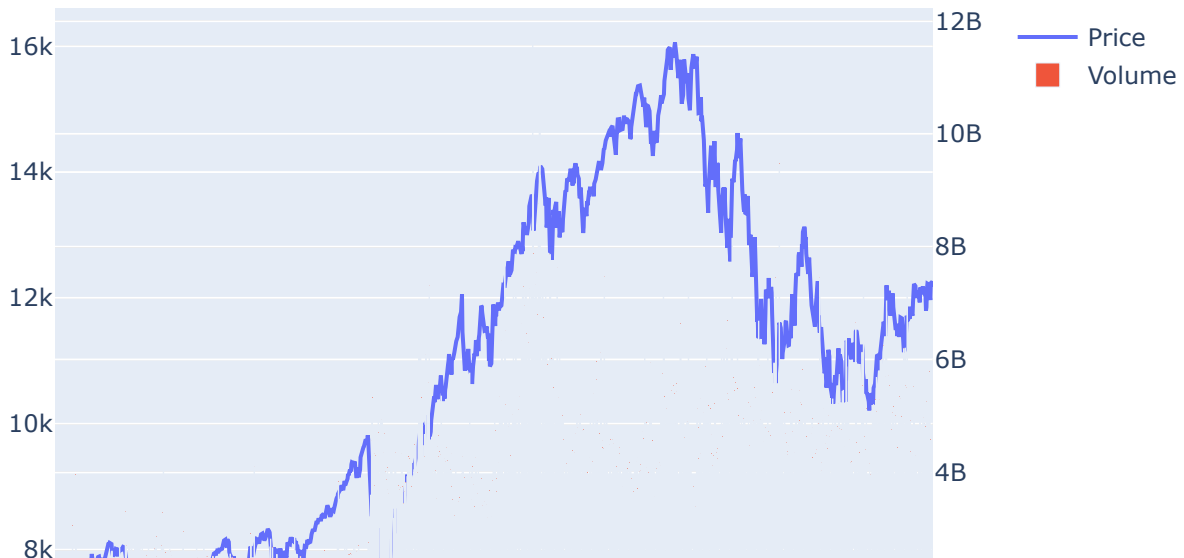
Nasdaq Index - LIVE Data Chart

In [19]:
```
### Extracting real time figure of Nasdaq from yahoo Finance website.

import yfinance
nasdaq = yfinance.Ticker('^IXIC')
hist = nasdaq.history(period='5y')
hist.head()
```

Out[19]:

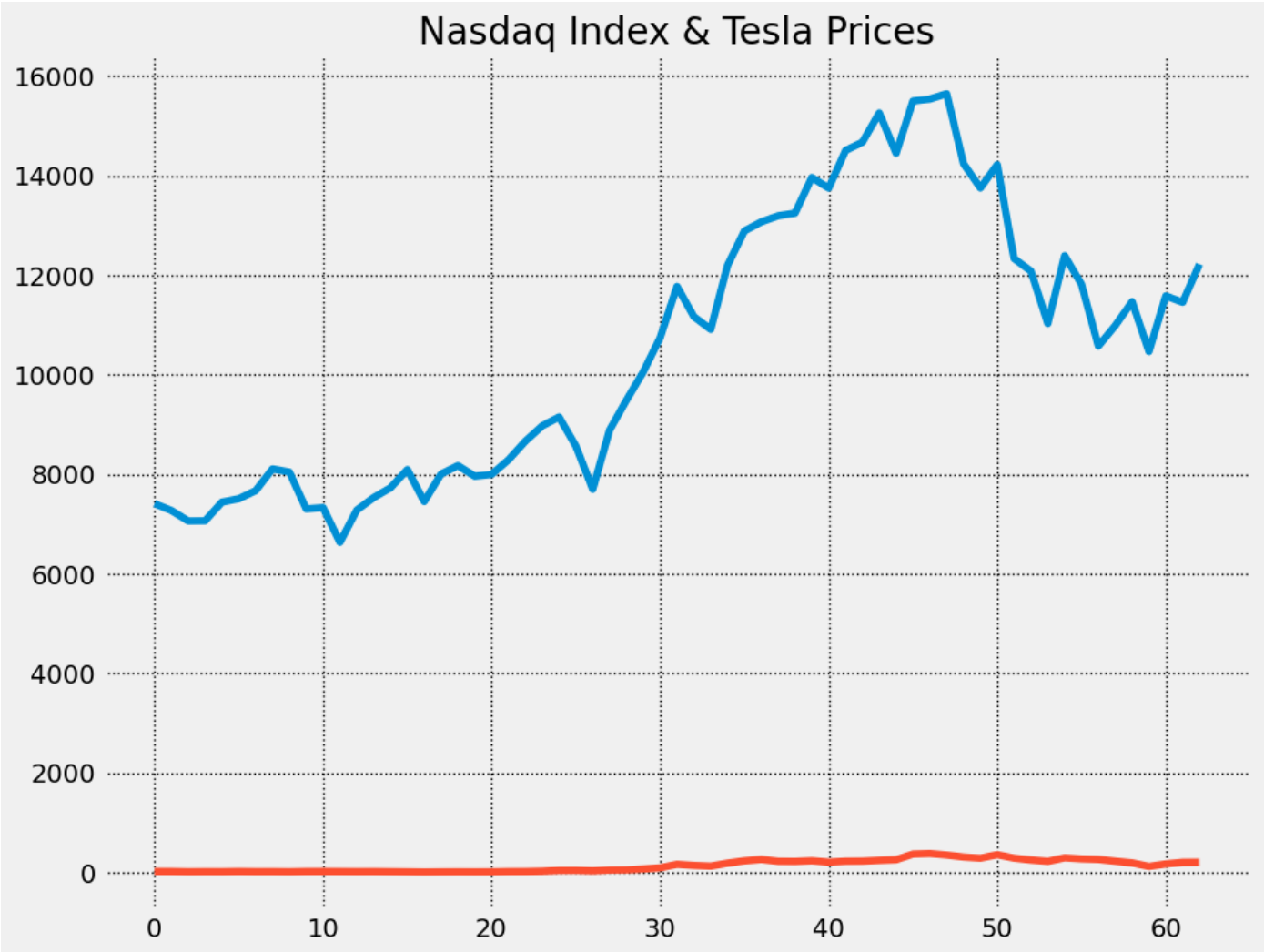
Date	Open	High	Low	Close	Volume	Dividends	Stock Splits
2018-05-10 00:00:00-04:00	7355.899902	7414.149902	7353.629883	7404.970215	2250450000	0.0	0.0
2018-05-11 00:00:00-04:00	7393.970215	7417.669922	7372.259766	7402.879883	2085350000	0.0	0.0
2018-05-14 00:00:00-04:00	7429.450195	7458.419922	7401.890137	7411.319824	2085850000	0.0	0.0
2018-05-15 00:00:00-04:00	7361.299805	7363.520020	7320.970215	7351.629883	2120380000	0.0	0.0
2018-05-16 00:00:00-04:00	7356.220215	7413.319824	7356.160156	7398.299805	2103060000	0.0	0.0

In [20]:
```
import plotly.graph_objects as go
from plotly.subplots import make_subplots

fig2 = make_subplots(specs=[[{"secondary_y": True}]])
fig2.add_trace(go.Scatter(x=hist.index,y=hist['Close'],name='Price'),secondary_y=False)
fig2.add_trace(go.Bar(x=hist.index,y=hist['Volume'],name='Volume'),secondary_y=True)
fig2.show()
```



This is LIVE chart of Nasdaq stock based on daliy stock price. Comparasion is done below with Tesla stock price

In [22]:
```
from matplotlib import rcParams

rcParams['figure.figsize'] = 10,8
plt.plot(dataframe3.Nasdaq_Close)
plt.plot(dataframe3.Tesla_Close)
plt.grid(True, color='k', linestyle=':')
plt.title("Nasdaq Index & Tesla Prices")
plt.style.use('fivethirtyeight')
plt.legend;
```



Here we can see that the line graph of tesla stock and Nasdaq Index. (Nasdaq_index is represented by = Blue) whereas (Tesla_Stock is represented by = Red) We can see in the graph that Tesla stock has not perform significantelly well as compared to Nasdaq_index even though it is part of it. There is rapid fluctuation in the price of Nasdaq_Index whereas (as it is basket of stock) whereas Tesla has not significantelly contributed to the Nasdaq. If we look overall the Tesla has been in dip in recent year when investment decision was taken by Elon Musk to acquire Twitter, invest in Rocket space - this both events led to Cash outflows from the company's income statement and recent COVID has also hit Tesla's performance.

"Ratio Analysis" OR ''Business Analysis'' of Tesla Stock to see its performance.

In [23]:
```
import pandas as pd
import statsmodels.api as sm
from statsmodels.formula.api import ols
from pandas import ExcelWriter
from pandas import ExcelFile
```

In [88]:
```
# This dataset is extracted from: https://www.stock-analysis-on.net/NASDAQ/Company/Tesla
# This is Income Statement of Tesla Company for the Financial year 2023, extracted from


df= pd.read_excel('Tesla Income-Statement.xlsx')
df.dropna(how='all', inplace=True)
print(df)
```

```
                  Tesla Consolidated Income Statement  Year - 31-12-2022
0                                   Automotive sales            67210.0
1                         Automotive regulatory credits             1776.0
2                                   Automotive leasing             2476.0
3                                 Automotive revenues            71462.0
4                         Energy generation and storage             3909.0
5                                   Services and other             6091.0
6                                             Revenues            81462.0
7                                   Automotive sales           -49599.0
8                                   Automotive leasing            -1509.0
9                           Automotive cost of revenues           -51108.0
10                        Energy generation and storage            -3621.0
11                                  Services and other            -5880.0
12                                    Cost of revenues           -60609.0
13                                        Gross profit            20853.0
14                           Research and development            -3075.0
15                  Selling, general and administrative            -3946.0
16                              Restructuring and other             -176.0
17                                   Operating expenses            -7197.0
18                         Income (loss) from operations            13656.0
19                                     Interest income              297.0
20                                   Interest expense             -191.0
21                           Other income (expense), net              -43.0
22                    Income (loss) before income taxes            13719.0
23                           Provision for income taxes            -1132.0
24                                 Net income (loss)               12587.0
25  Net (income) loss attributable to noncontrolli...                -31.0
26  Net income (loss) attributable to common stock...              12556.0
27                    Number of total share outstanding           316000.0
28  Source: https://www.stock-analysis-on.net/NASD...                   NaN
```

We will Caluclate Financial Ratio of Tesla Business to see Company performance...

1) Gross Profit Margin

2) Net Profit Margin

3) Operating profit Margin

4) Interest Coverage Ratio

5) Earning per Share

Based on this Financial Ratios we will see how Tesla has been performing and will compare this to Nasdaq to analyse the companys financial condition and this will also, help us to take the Investment decision.

In [57]:
```
## Gross Profit
listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[13])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[13])
/

## Revenue
listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[6])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[6])
/

## Net Income is considered as net profit
listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[24])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[24])
/

## Ooperating cost.... (Research and development + Selling,general and administrative +
listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[14])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[14])

listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[15])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[15])

listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[17])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[17])

listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[18])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[18])
/

## Earning before Interest and Tax
listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[22])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[22])
/

## Interest Expense
listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[20])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[20])
/

## Income attributed to common stock holder
```

```
listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[26])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[26])
/

## Total number of share outstanding
listSepalWidth = df['Tesla Consolidated Income Statement']
print(listSepalWidth[27])
listSepalWidth = df['Year - 31-12-2022']
print(listSepalWidth[27])
```

```
Gross profit
20853.0
Revenues
81462.0
Net income (loss)
12587.0
Research and development
-3075.0
Selling, general and administrative
-3946.0
Operating expenses
-7197.0
Income (loss) from operations
13656.0
Income (loss) before income taxes
13719.0
Interest expense
-191.0
Net income (loss) attributable to common stockholders
12556.0
Number of total share outstanding
316000.0
```

In [58]:
```
## Gross Profit Margin = (Gross Profit/Sales) * 100
## Net Profit Margin = (Net Profit/Sales) * 100
## Operating Profit Margin = (Operating Profit/Sales) * 100
## Interest Coverage Ratio = (Earning before Interest & Tax/Interest Expense) * 100
## Earning Per Share = (Net income available to common stock holder/total number of shar

## NOTE: Revenue means Sales figure...

gross_profit = 20853.0
revenue = 81462.0
net_income = 12587.0
research_and_development = -3075.0
selling_general_administration = -3946.0
operating_expenses = -7197.0
income_operation = 13656.0
interest_before_income_taxes = 13719.0
interest_expenses = -191.0
Net_income_or_loss_available_for_stockholders = 12556.0
Number_of_shares_outstanding = 316000.0
```

In [59]:
```
Gross_Profir_Margin = (gross_profit / revenue)*100

print(Gross_Profir_Margin)
```

```
25.598438535759005
```

When a company's senior management team takes into account the costs associated with manufacturing its goods and services, the gross profit margin shows how effective the team is at generating money. In other words, the higher the figure, the more profit is generated for every dollar spent by management. On the surface, a gross profit margin ratio of between 50% and 70% would be

seen as good. Here TESLA Gross Profit Margin is poor which less then 50% that means every doller that management spend on company the company many not be able to generate thatmuch profit to cover up that expenses.

In [60]:
```
## Net Income is considered as net profit

Net_Profit_Margin = (net_income / revenue)*100

print(Net_Profit_Margin)
```

```
15.451376101740689
```

The percentage of sales income a company retains after paying all of its expenses, including taxes and interest, is indicated by the net profit margin ratio. In general, a 10% net profit margin is regarded as typical, a 20% margin as high (or "excellent"), and a 5% margin as low. However, a decent margin will differ significantly per industry.

For Tesla the net profit margin is better as company could retain much amout to invest further after it has paid for all its expenses and additional costs

In [61]:
```
## Operating Profit Margin

Operating_profit = (research_and_development + selling_general_administration + income_o

Operating_profit_margin = (Operating_profit / revenue)*100

print(Operating_profit_margin)
```

```
-0.689892219685252
```

A company's operating profit margin, often known as a profitability or performance ratio, measures the portion of profit generated by its activities before taxes and interest expenses are deducted.

Ideally good Operating profit margin ratio for Automobile Industry is 7.5% but in case of Tesla it's negative. That means company is also generating addition rvenue from other source as it has good net profit margin. however company is not able to generate sufficient profit to cover it's expenses just from manufacturing (may be sales services, battery selling or income from other investment is helping them to generate addition revenue)

In [62]:
```
## Interest Coverage Ratio

Intetest_coverage_Ratio = (interest_before_income_taxes / interest_expenses)

print(Intetest_coverage_Ratio)
```

```
-71.82722513089006
```

An organization's solvency is checked by its interest coverage ratio. It enables the market, financial institutions, and investors to comprehend the company's existing capacity to pay off accrued obligations.

It is deemed healthy for a corporation to have an interest coverage ratio of 1.5. A higher interest coverage ratio often denotes that a business is making enough money to cover the interest owed on long-term loans, which means there is a very low likelihood of a financial default. But in case of Tesla it is negative which indicate red alert, but upon checking Balancesheet the Tesla has less debt as compared to other compitator. So, there is no much to worry about for Tesla

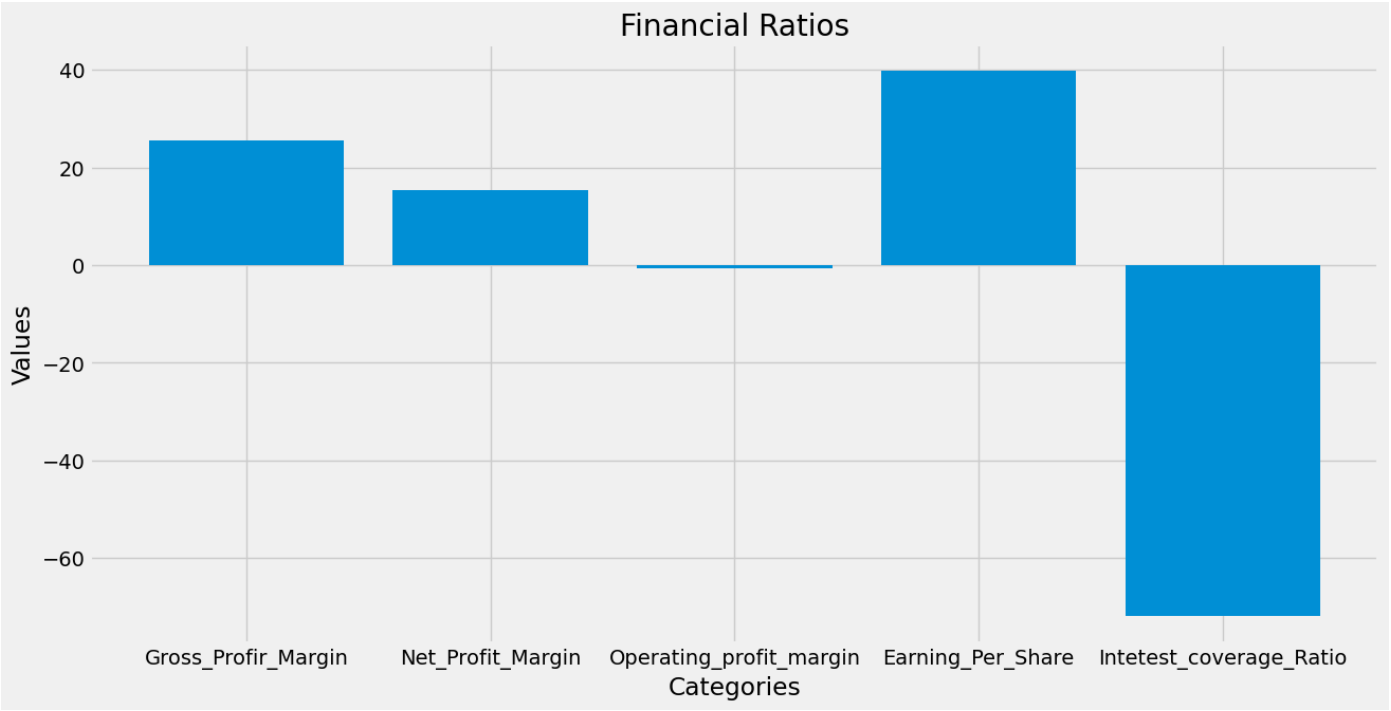
In [63]:
```
## Earning Per Share

Earning_Per_Share = (Net_income_or_loss_available_for_stockholders/Number_of_shares_outs

print(Earning_Per_Share)
```

```
39.734177215189874
```

EPS reveals the profitability of a corporation for each share of its stock. It also means how much money will you earn from each Tesla stock.

A corporation is more likely to have more profit to pay out as dividends to its shareholders if it has high earnings per share. But, in case of Tesla the EPS is not ideal as it is falling less then 50% category.

In [11]:
```
# Creating Bar charts of Financial Ratios....

x = ['Gross_Profir_Margin', 'Net_Profit_Margin', 'Operating_profit_margin','Earning_Per_
y = [25.598438535759005, 15.451376101740689, -0.689892219685252, 39.734177215189874, -71

fig = plt.figure(figsize=(14, 7))

plt.bar(x, y)

plt.xlabel('Categories')
plt.ylabel('Values')
plt.title('Financial Ratios')

plt.show()
```



***By This Bar chart we can understand that Tesla has not been performing good based on the financial ratios calculated for the recent year 2022. the Operating profit margin and Interest coverage ratio is negative which indicate the company revenue is not sufficient to generate sufficient profit to distribute to it's sharholder, however company is able to generate sufficient profit to keep surviveing in a short term. But, here JP Morgen investment team may not prefer to choose the TESLA Company for it's new investment fund as it find's there are other company's in market who would able to generate good return and can create more value to it's new investment fund.