

Are Tesla's Shares Overpriced

In our previous notebook, we created a dataframe with our key financial ratios that we will use to analyse Tesla's shareprice.

The ratios used are based on investopedias article on determining over or undervalued stocks found here:

<https://www.investopedia.com/articles/investing/101316/how-tell-if-stock-overvalued-or-undervalued.asp> (<https://www.investopedia.com/articles/investing/101316/how-tell-if-stock-overvalued-or-undervalued.asp>)

The Ratios we are interested in are:

- P/E, P/B, and EV/EBITDA Ratios
- Price-to-Sales ratio (P/S)
- Price-to-Dividend (P/D)
- Enterprise Value-to-Sales (EV/S) Ratio
- Price/Earnings to Growth (PEG) Ratio

Reading And Exploring The Dataframe

References:

<https://www.investopedia.com/terms/p/price-to-salesratio.asp> (<https://www.investopedia.com/terms/p/price-to-salesratio.asp>)

<https://www.investopedia.com/terms/p/price-to-bookratio.asp> (<https://www.investopedia.com/terms/p/price-to-bookratio.asp>)

<https://www.investopedia.com/terms/e/ev-ebitda.asp> (<https://www.investopedia.com/terms/e/ev-ebitda.asp>)

```
In [16]: import numpy as np
import pandas as pd

import chart_studio.plotly as py
import plotly.graph_objs as go
from plotly.subplots import make_subplots
from plotly.offline import ipplot, init_notebook_mode
import plotly.express as px

import cufflinks
cufflinks.go_offline(connected=True)
init_notebook_mode(connected=True)
```

```
In [17]: df = pd.read_csv("company_fin_ratios.csv", index_col=0)
df.head()
```

Out[17]:

	ticker	company	sector	price_to_book_ratio	price_to_sales_ratio	price
0	TSLA	Tesla	Consumer Discretionary	17.138617	4.614833	
1	MMM	3M Company	Industrials	9.318123	2.917858	
2	ABT	Abbott Laboratories	Health Care	5.070602	4.940913	
3	ABBV	AbbVie Inc.	Health Care	-14.820874	3.640840	
4	ABMD	ABIOMED Inc	Health Care	16.684694	20.315925	

```
In [18]: df.describe()
```

Out[18]:

	price_to_book_ratio	price_to_sales_ratio	price_earnings_ratio	price_earnings
count	496.000000	496.000000	496.000000	
mean	-0.124999	5.859739	18.967322	
std	132.915949	52.840341	304.078772	
min	-1991.763043	-624.518114	-6465.525181	
25%	1.662408	1.305301	13.130291	
50%	3.115174	2.769245	20.627869	
75%	6.052460	5.088207	32.427480	
max	1353.873275	877.076883	1098.688175	

In [19]: `df.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 503 entries, 0 to 502
Data columns (total 9 columns):
ticker                    503 non-null object
company                  503 non-null object
sector                   503 non-null object
price_to_book_ratio      496 non-null float64
price_to_sales_ratio     496 non-null float64
price_earnings_ratio     496 non-null float64
price_earnings_to_growth_ratio 496 non-null float64
dividend_yield           418 non-null float64
enterprise_value_multiple 499 non-null float64
dtypes: float64(6), object(3)
memory usage: 39.3+ KB
```

In [20]: `df.shape`

Out[20]: (503, 9)

In [21]: `df['sector'].value_counts()`

```
Out[21]: Information Technology    71
          Industrials              69
          Financials              66
          Consumer Discretionary  64
          Health Care             60
          Consumer Staples        33
          Real Estate             31
          Materials               28
          Utilities               28
          Energy                  27
          Communication Services  26
          Name: sector, dtype: int64
```

Visualising Our Data With Plotly

We have over 500 companies in our dataset which will make visual comparisons challenging. We will therefore look to filter and visualise by sector.

Subplotting Our Data

```
In [35]: cd = df[df['sector'] == 'Consumer Discretionary']

fig = make_subplots(
    rows=6, cols=2,
    subplot_titles=('P/B Ratio', 'Frequency Distributions (%)',
                    'P/S Ratio', '',
                    'P/E Ratio', '',
                    'Price Earnings To Growth Ratio', '',
                    'Dividend Yield', '',
                    'Enterprise Value Multiple', ''))

fig.add_trace(go.Scatter(
    x=cd['ticker'],
    y=cd['price_to_book_ratio'],
    mode='markers',
    name='P/B'),
    row=1,col=1)

fig.add_trace(go.Histogram(
    x=cd['price_to_book_ratio'],
    histnorm='percent',
    name='P/B'),
    row=1, col=2)

fig.add_trace(go.Scatter(
    x=cd['ticker'],
    y=cd['price_to_sales_ratio'],
    mode='markers',
    name='P/S'),
    row=2,col=1)

fig.add_trace(go.Histogram(
    x=cd['price_to_sales_ratio'],
    histnorm='percent',
    name='P/S'),
    row=2, col=2)

fig.add_trace(go.Scatter(
    x=cd['ticker'],
    y=cd['price_earnings_ratio'],
    mode='markers',
    name='P/E'),
    row=3,col=1)

fig.add_trace(go.Histogram(
    x=cd['price_earnings_ratio'],
    histnorm='percent',
    name='P/E'),
    row=3, col=2)

fig.add_trace(go.Scatter(
    x=cd['ticker'],
```

```
y=cd[ 'price_earnings_to_growth_ratio' ],
mode= 'markers' ,
name= 'PE/G' ),
row=4,col=1)

fig.add_trace(go.Histogram(
x=cd[ 'price_earnings_to_growth_ratio' ],
histnorm= 'percent' ,
name= 'PE/G' ),
row=4, col=2)

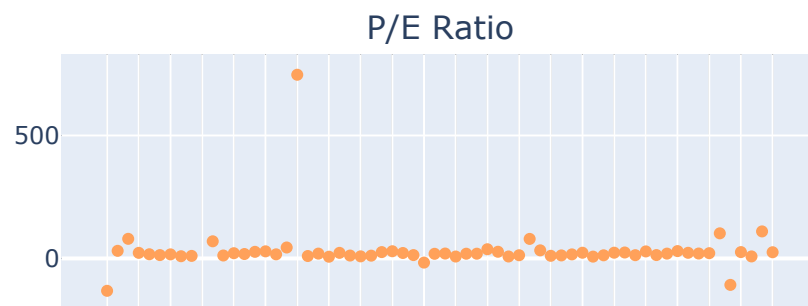
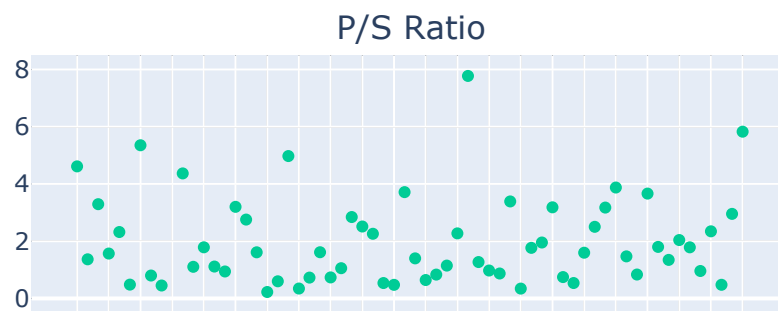
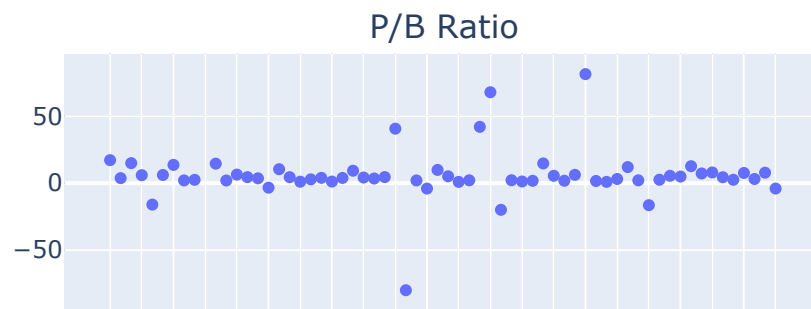
fig.add_trace(go.Scatter(
x=cd[ 'ticker' ],
y=cd[ 'dividend_yield' ],
mode= 'markers' ,
name= 'Yield' ),
row=5,col=1)

fig.add_trace(go.Histogram(
x=cd[ 'dividend_yield' ],
histnorm= 'percent' ,
name= 'Yield' ),
row=5, col=2)

fig.add_trace(go.Scatter(
x=cd[ 'ticker' ],
y=cd[ 'enterprise_value_multiple' ],
mode= 'markers' ,
name= 'EMM' ),
row=6,col=1)

fig.add_trace(go.Histogram(
x=cd[ 'enterprise_value_multiple' ],
histnorm= 'percent' ,
name= 'EMM' ),
row=6, col=2)

fig.update_xaxes(showticklabels=False, col=1)
fig.update_layout(showlegend=False,width=1000,
height=1500)
```



In [38]: `cd.describe()`

Out[38]:

	price_to_book_ratio	price_to_sales_ratio	price_earnings_ratio	price_earnings
count	63.000000	63.000000	63.000000	
mean	5.894515	1.992853	31.203343	
std	18.950001	1.535871	97.499705	
min	-79.954564	0.225224	-131.581636	
25%	1.954954	0.834305	12.147589	
50%	3.900057	1.598084	19.627489	
75%	7.654794	2.800421	26.349066	
max	81.352146	7.775772	747.074043	

Price To Sales Ratio

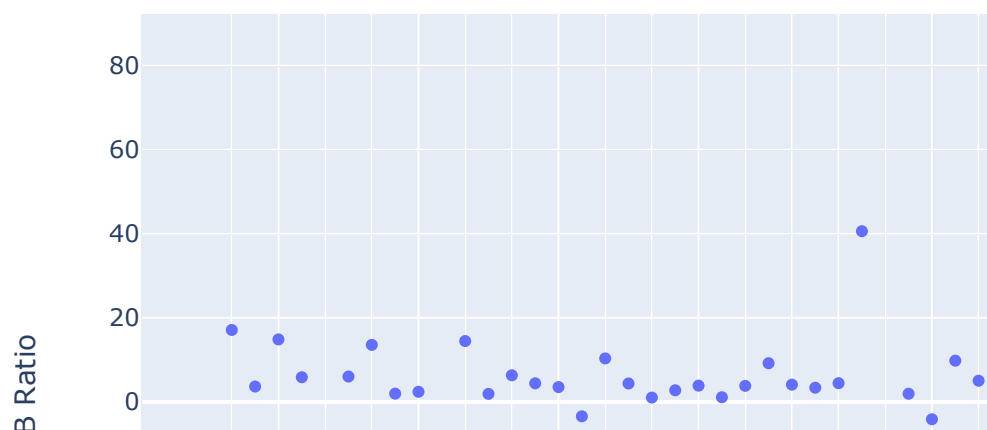
```
In [37]: fig = px.scatter(df[df['sector'] == 'Consumer Discretionary'],
                        x='ticker',
                        y='price_to_book_ratio',
                        hover_name = 'company',
                        labels={'price_to_book_ratio': 'P/B Ratio',
                              'ticker': 'Company'},

                        )

fig.update_xaxes(showticklabels=False)
fig.update_layout(title_text='Consumer Discretionary Sector - P/B Ratio')

fig.show()
```

Consumer Discretionary Sector - P/B Ratio



Investopedia: The price-to-book ratio compares a company's market value to its book value. The market value of a company is its share price multiplied by the number of outstanding shares. The book value is the net assets of a company.

The P/B ratio has been favored by value investors for decades and is widely used by market analysts. Traditionally, any value under 1.0 is considered a good P/B for value investors, indicating a potentially undervalued stock. However, value investors may often consider stocks with a P/B value under 3.0 as their benchmark.

Out of the 64 companies in this sector, Tesla has the 5th highest P/B ratio at 17.14 which is considerably higher than the traditional rule of thumb, and is in the top quartile of the frequency distribution although not an outlier.

Tesla's P/E ratio shows that their share price approx. 17 times higher than its book value which would suggest that the company's fundamentals do not support the high share price.

Price To Sales Ratio

Investopedia: The price-to-sales (P/S) ratio is a valuation ratio that compares a company's stock price to its revenues. It is an indicator of the value placed on each dollar of a company's sales or revenues.

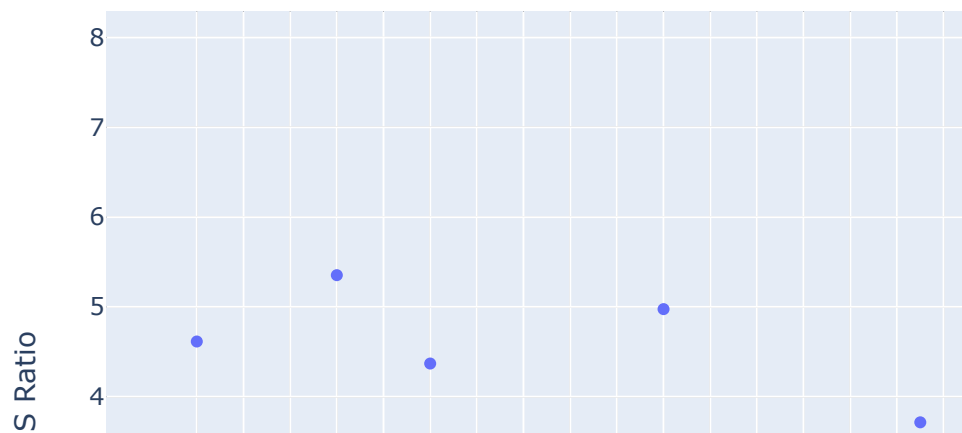
The ratio shows how much investors are willing to pay per dollar of sales. Like all ratios, the P/S ratio is most relevant when used to compare companies in the same sector. A low ratio may indicate the stock is undervalued, while a ratio that is significantly above the average may suggest overvaluation.

The P/S ratio doesn't take into account whether the company makes any earnings or whether it will ever make earnings.

```
In [25]: fig = px.scatter(df[df['sector'] == 'Consumer Discretionary'],
                        x='ticker',
                        y='price_to_sales_ratio',
                        hover_name = 'company',
                        labels={'price_to_sales_ratio': 'P/S Ratio',
                              'ticker': 'Company'},
                        )

fig.update_xaxes(showticklabels=False)

fig.show()
```



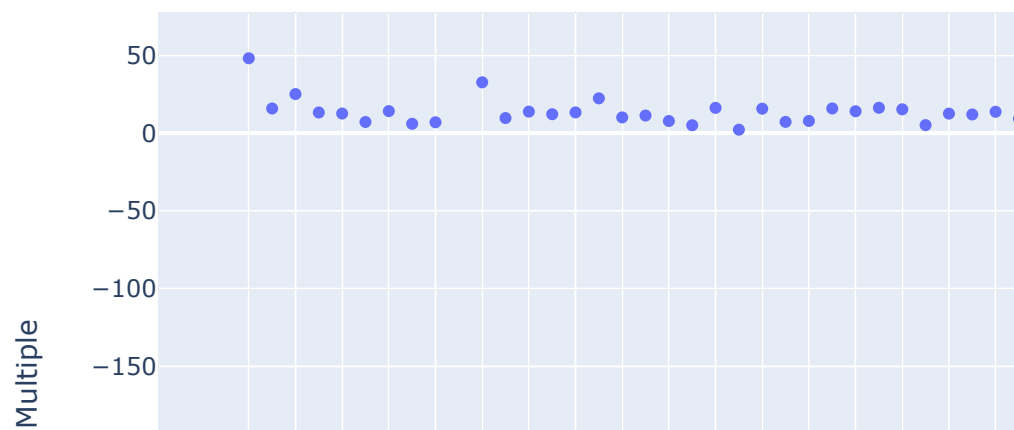
We once again see a the same trend when comparing Tesla's P/S ratio with other companies in this sector. Given that Tesla is a growth company and currently lacks consistent profits the P/S ratio would be a more realistic metric when analysing Tesla's current share price. The relatively high P/S ratio would however suggest that Tesla's stock price per dollar of sales would not offer good value for someone with a value investing strategy.

Enterprise Value Multiple

```
In [40]: fig = px.scatter(df[df['sector'] == 'Consumer Discretionary'],
                        x='ticker',
                        y='enterprise_value_multiple',
                        hover_name = 'company',
                        labels={'enterprise_value_multiple': 'EV Mul
tiple',
                              'ticker': 'Company'},
                        )

fig.update_xaxes(showticklabels=False)

fig.show()
```



We will disregard Newell Brands as it is a clear outlier which skews our data.

Investopedia: Enterprise multiple, also known as the EV multiple, is a ratio used to determine the value of a company. The enterprise multiple looks at a firm in the way that a potential acquirer would by considering the company's debt. Stocks with an enterprise multiple of less than 7.5x based on the last 12 months (LTM) is generally considered a good value. However, using a strict cutoff is generally not appropriate because this is not an exact science.

Unlike many other common measures, the enterprise multiple takes into account a company's debt and cash levels in addition to its stock price and relates that value to the firm's cash profitability (e.g. the price-to-earnings [P/E] ratio).

Investors mainly use a company's enterprise multiple to determine whether a company is undervalued or overvalued. A low ratio indicates that a company might be undervalued and a high ratio indicates that the company might be overvalued.

Tesla's EV multiple of 48 makes it the highest EV multiple of any company in the consumer discretionary sector. Higher EV multiples are generally seen in higher growth industries which is indicative of Tesla and their stage in the business life cycle.

Findings

We started this analysis with Elon Musk's quote suggesting that Tesla's stock price was overvalued. After comparing fundamental ratios with companies in the consumer discretionary sector of the S&P 500. We haven't found any evidence of underlying value that would make Tesla an attractive choice for value investors.

Tesla's rapid share price growth is indicative of a speculative bubble and given the growing competition in the electric car market by established brands, it is questionable whether Tesla will be able to ramp up production and become profitable given the resources of their competitors.

Of course Tesla's brand currently holds the same status as the most popular tech brands but how long will this continue.

Next Steps

- Comparison with other auto brands i.e VW etc.
- Share Price comparison with other autobrands using ochl data.