

# Data Analytics Project 2: Stock Market Analysis Using Statistics

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# AGENDA

1. INTRODUCTION
2. STOCK MARKET
3. DATASET
4. COMPERATIVE DESCRIPTIVE ANALYSIS
5. CONCLUSION



# Introduction

- ❖ In this project, we will conduct an in-depth analysis of the stock performance of prominent companies, including Microsoft, Tesla, and Apple, and benchmark them against the S&P 500 index. The study will encompass a comparative and descriptive analysis of stock trends, performance metrics, and market dynamics. Additionally, we will undertake a comprehensive risk analysis to evaluate the volatility and potential financial risks associated with these investments.



# Stock Market

## ❖ Key Components

1. **Stocks:** Represent ownership in a company.
2. **Exchanges:** Platforms like the NYSE or NASDAQ where trading occurs.
3. **Investors:** Buyers and sellers of stocks, including individuals, institutions, and traders.

## ❖ How It Works

### 1. Initial Public Offering (IPO):

A company goes public by offering shares for the first time to raise funds.

### 1. Trading:

- Buyers bid for stocks at a certain price.
- Sellers ask for a certain price.
- When the bid and ask prices match, a trade happens.

### 2. Price Movement:

Stock prices fluctuate based on supply and demand, influenced by factors like company performance, news, and market trends.

## ❖ Purpose

- **For Companies:** Raise money to grow operations or fund new projects.
- **For Investors:** Generate returns through price appreciation or dividends.



# S&P 500

- ❖ S&P 500 is a stock market index, tracking the stock performance of 500 large companies listed on the stock exchange in the United States including (Microsoft, Apple, Tesla, etc).
- ❖ According to capital Asset Pricing Model, the slope coefficient Beta (B1) in a simple regression of the excess return on the stock (eg. AAPL % change) vs. the stock return on the market
- ❖ S&P % change is a measure of relative risk of the stock.
- ❖ Stocks with higher Betas are more risky and therefore should have higher returns in the market.

# Dataset

The screenshot shows a Microsoft Excel spreadsheet titled "oeson stats project". The ribbon menu is visible at the top, and the "Table" tab is selected. The main content is a data table with the following columns:

	MSFT	MS%change	Tesla	Tesl%change	Apple	App%change	SP500	SP%change
13	89.800003	0.008082633	23.044666	0.015272976	44.842499	0.018279899	2802.40	0.00625120
14	90.139999	0.003786147	23	-0.001938236	44.6525	-0.00423703	2802.60	7.136700
15	90	-0.001553128	23.293333	0.012753609	44.325001	-0.007334393	2809.16	0.00234066
16	91.900002	0.021111133	24	0.030337737	44.325001	0	2835.05	0.00921627
17	92.550003	0.007072916	23.638666	-0.015055583	44.3125	-0.0002803	2845.42	0.00365778
18	92.470001	-0.000864419	23.218	-0.017795674	43.627499	-0.015458415	2846.24	0.00028818
19	93.120003	0.007029328	22.766666	-0.01943897	43	-0.014383107	2847.48	0.00043566
20	95.139999	0.021692396	22.656668	-0.004831537	42.540001	-0.010697651	2867.23	0.00693595
21	93.300003	-0.019339878	23.009333	0.015565616	41.3825	-0.027209708	2832.74	-0.01202903
22	93.75	0.004823119	23.167334	0.006866822	41.717499	0.008095185	2832.41	-0.00011649
23	94.790001	0.011093344	23.4	0.010042847	41.7925	0.001797831	2816.45	-0.00563471
24	93.639999	-0.012132102	23.229334	-0.007293419	41.5	-0.006998863	2808.92	-0.00267351
25	90.559998	-0.032891938	22.531334	-0.030048214	39.775002	-0.041566217	2741.06	-0.02415875
26	86.889999	-0.040525608	21.680668	-0.0377548	38.7075	-0.026838515	2614.78	-0.04606976
27	90.489998	0.041431684	22.599333	0.042372541	40.772499	0.053348808	2690.95	0.02913055
28	89.709999	-0.008619726	22.887333	0.012743739	40.072498	-0.01716846	2685.01	-0.00220739
29	86.300003	-0.038011326	21.328667	-0.068101688	39.267502	-0.020088491	2601.78	-0.03099802

The live data stock values of 3 major companies Microsoft, Apple and Tesla.

Their live data have been extracted from the website of Yahoo Finance. The dataset contains their stock values between 2018 and 2023 on daily basis. The dataset also contain S&P 500 values as well, during the same time period. Here the percentage change in stock values has been calculated for each stock and is presented in the table as %change variable.

Standardized names have been assigned to the %change of each company, like MS%change. (source: Oeson)

# DESCRIPTIVE STATISTICS

Descriptive statistics are the statistics that summarize or describe the features of a dataset such as central tendency or dispersion

$$S^2 = \frac{\sum(x_i - \bar{x})^2}{n - 1}$$

Variance,  $s = \text{stdv}$

Volatility : a tendency to change quickly and unpredictably. (price volatility. the volatility of the stock market) **Volatility =  $\sigma\sqrt{T}$**

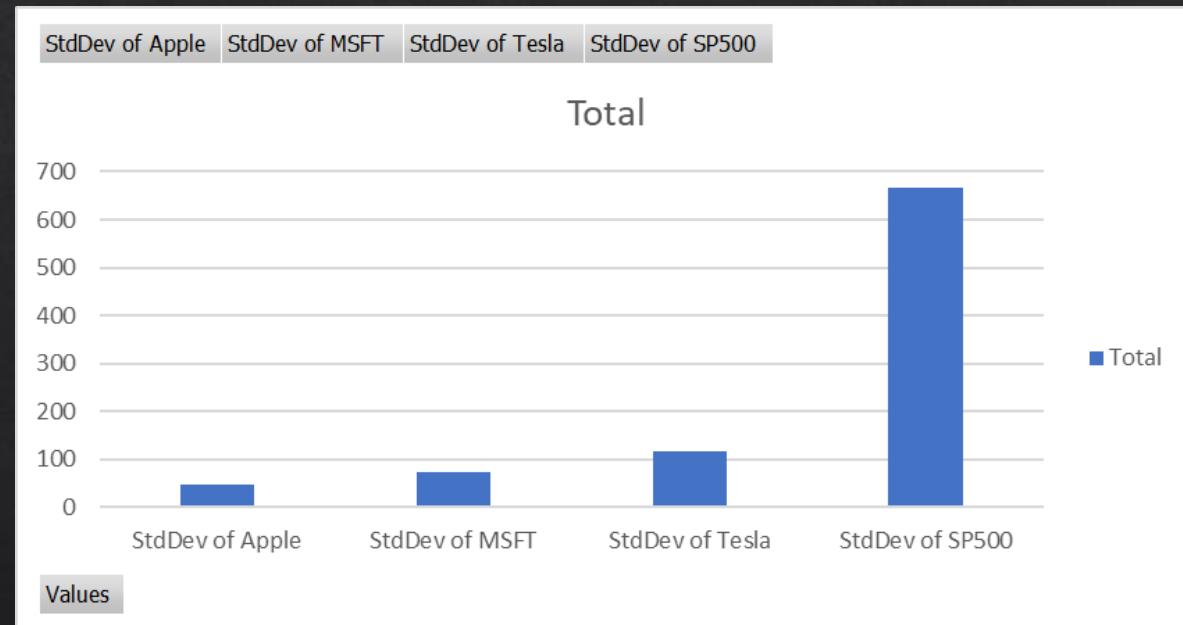
- Microsoft, Tesla, Apple, S&P 500 respectively

mean	194,4709	131,8952	98,5741	3457,03
median	203,58	96,57333	95,0875	3294,67
mode	95,14	24	127,82	2832,41
variance	5510,449	13728,01	2132,236	444300,9
range	258,56	399,3967	146,635	2513,80
count	1279	1279	1279	1279
max	344,62	411,47	182,63	4804,51
min	86,06	12,07333	35,995	2290,71
stdv	74,2324	117,1666	46,17614	666,559

As we will see later, higher volatility means high risk but higher possibilities for gain.

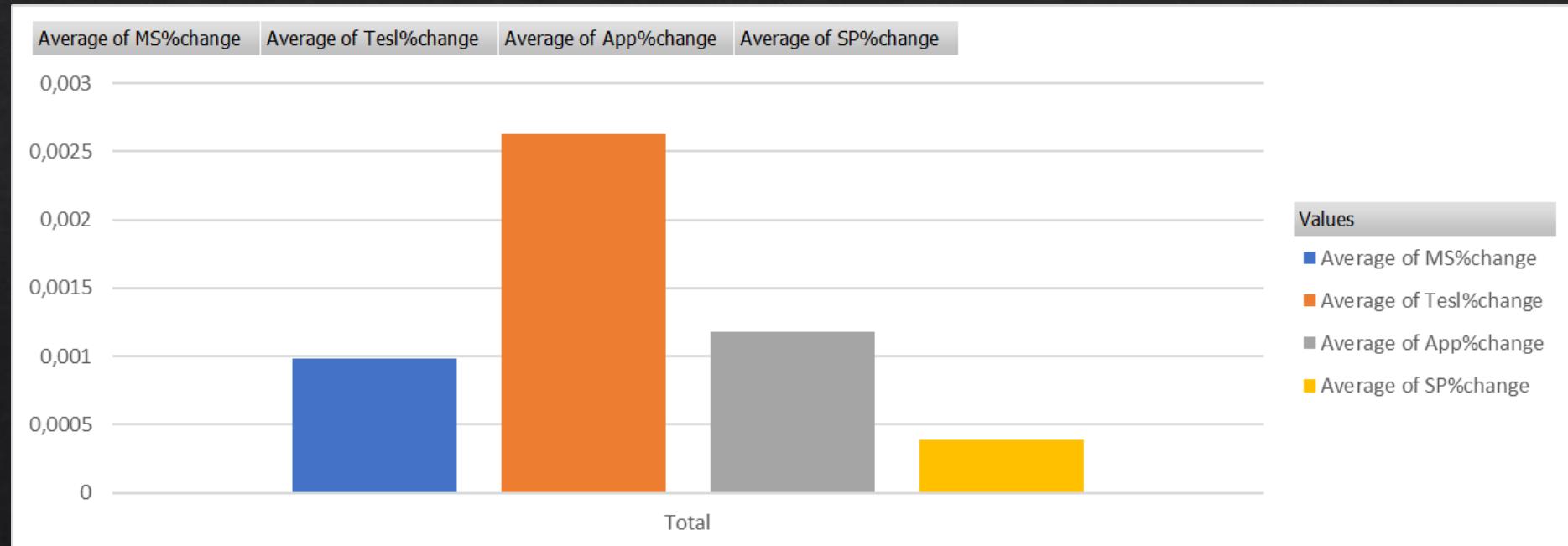
# Standard Deviation of the Stocks

- ❖ Standard deviations and the stocks, also indicating the volatility as stdv is related to variance and volatility.
- ❖ Investing in MSFT and TESLA is slightly riskier than Apple, but prospects to win more is higher.

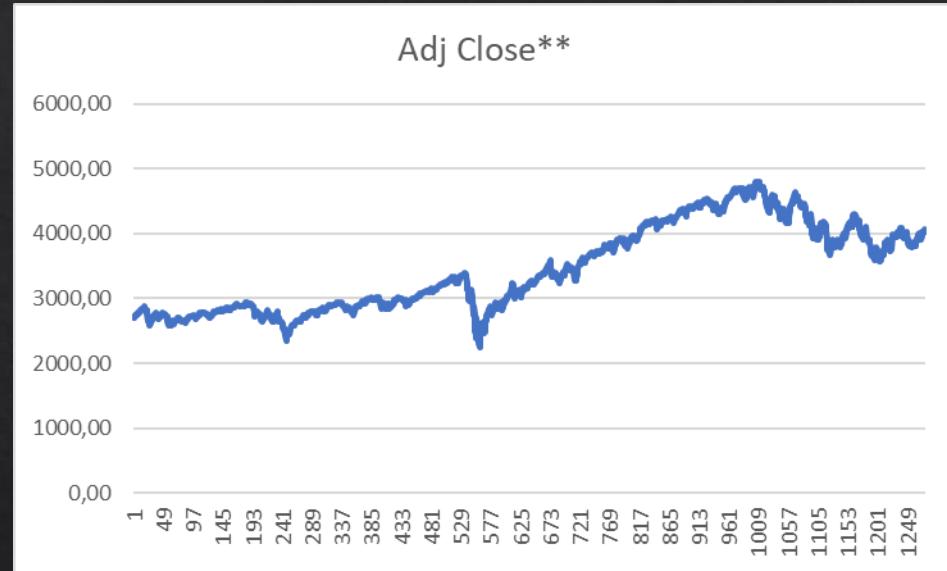
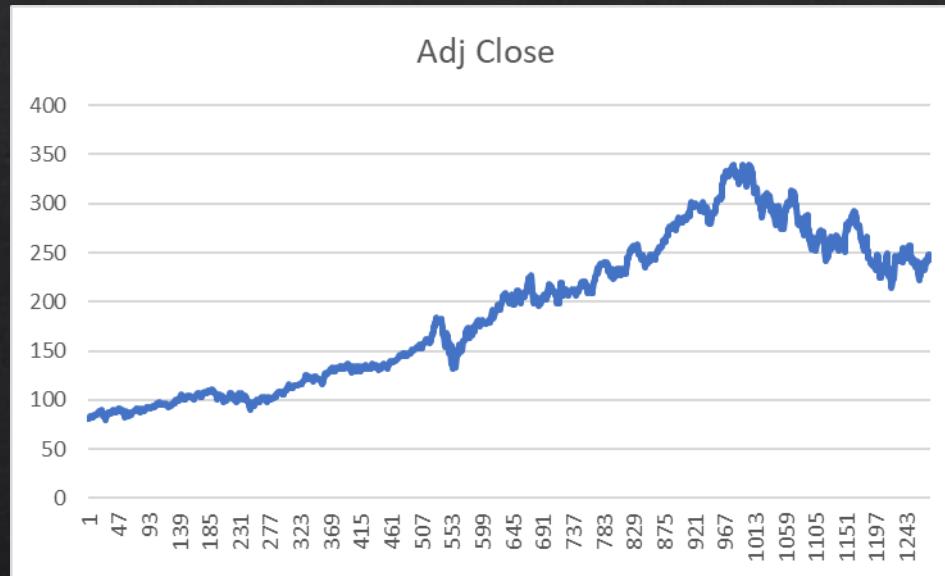


# Average of changes and comperation to S&P 500

- ❖ The average of changes can be seen on the graph, so that Tesla has the most change compared to S&P 500

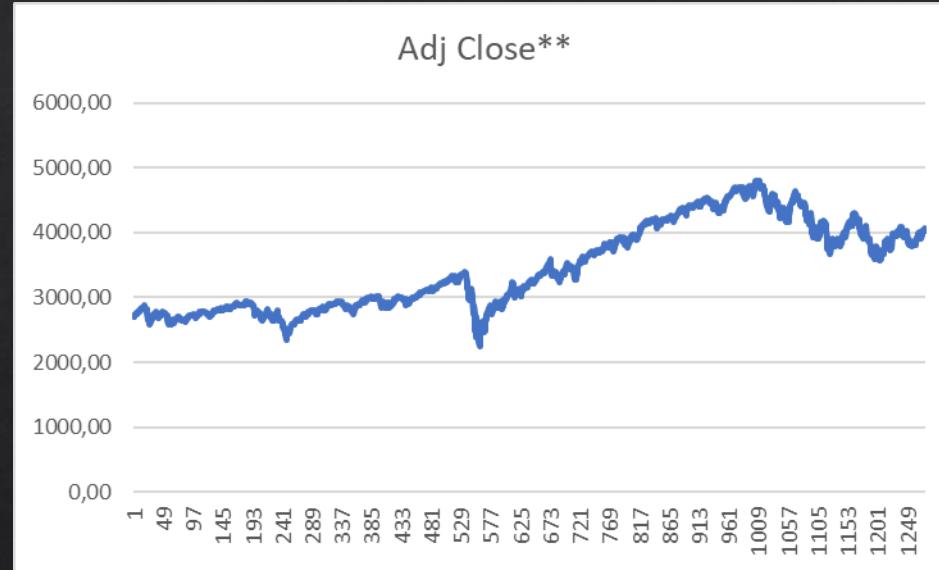
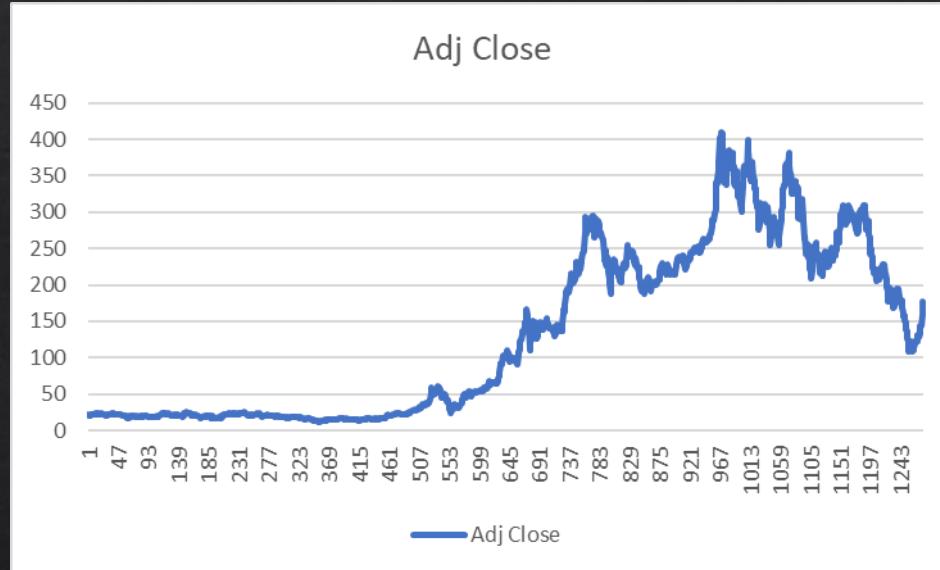


# Comparative Analysis of Microsoft and S&P 500



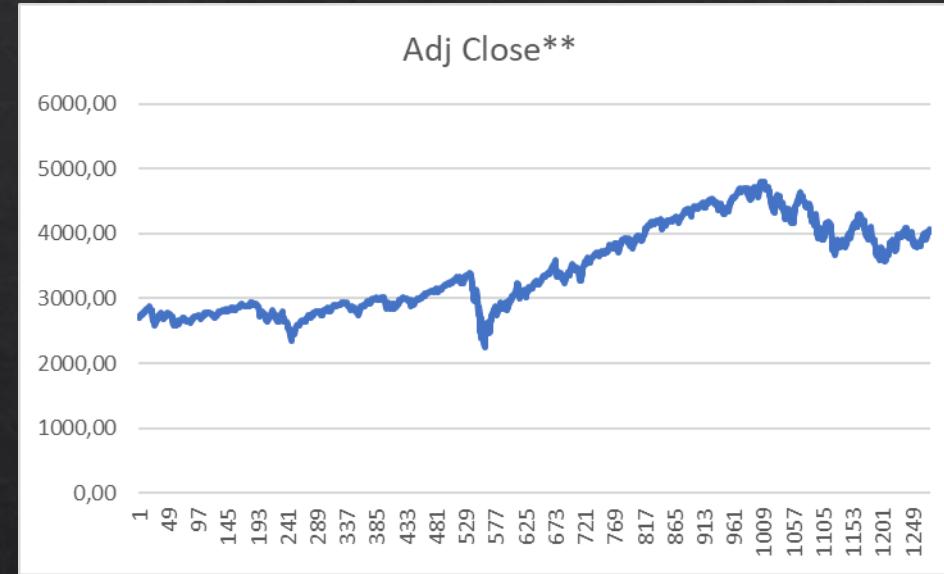
- ❖ Microsoft and S&P 500 has overlapping volatility trends in several time periods, indicating correlation. It seems to be the market behaviour affected the Microsoft prices.

# Comparative Analysis of Tesla and S&P 500

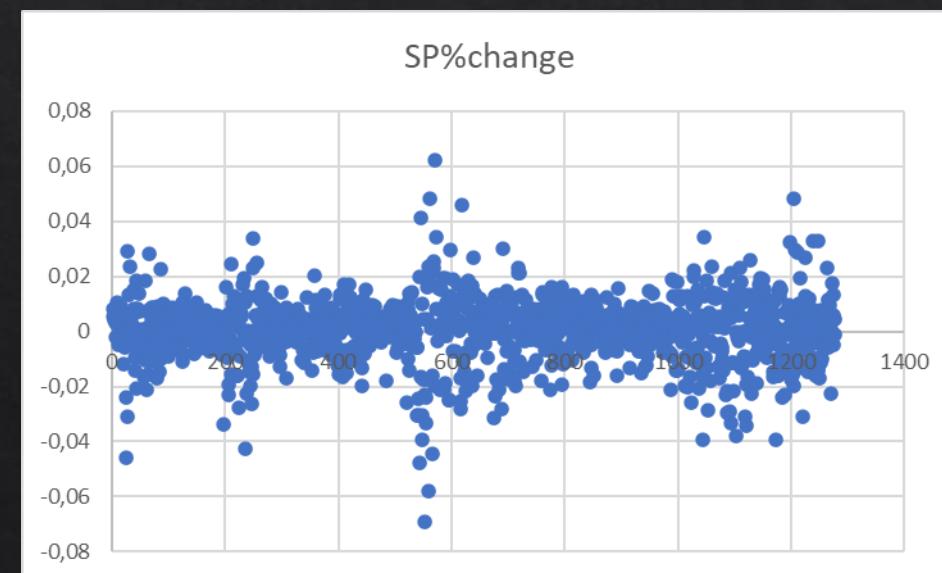
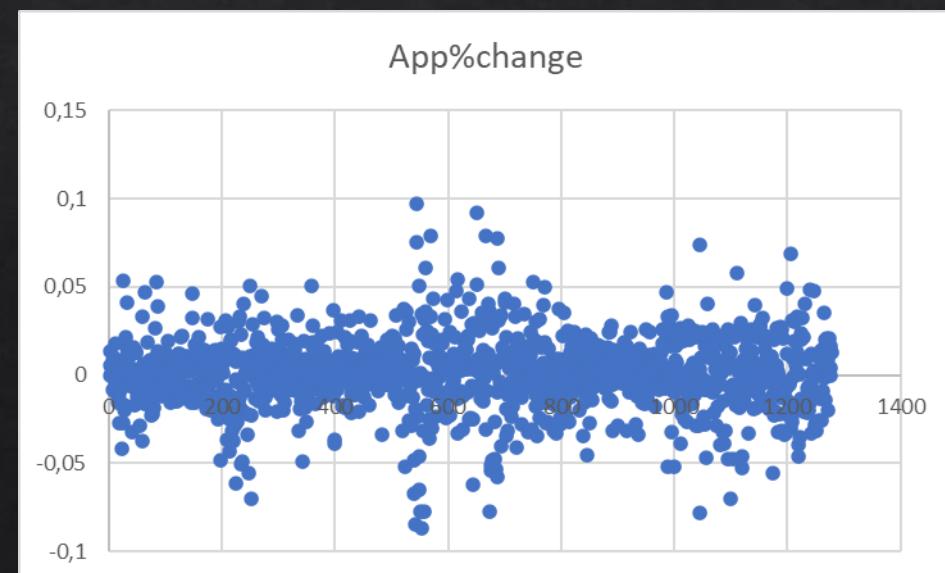
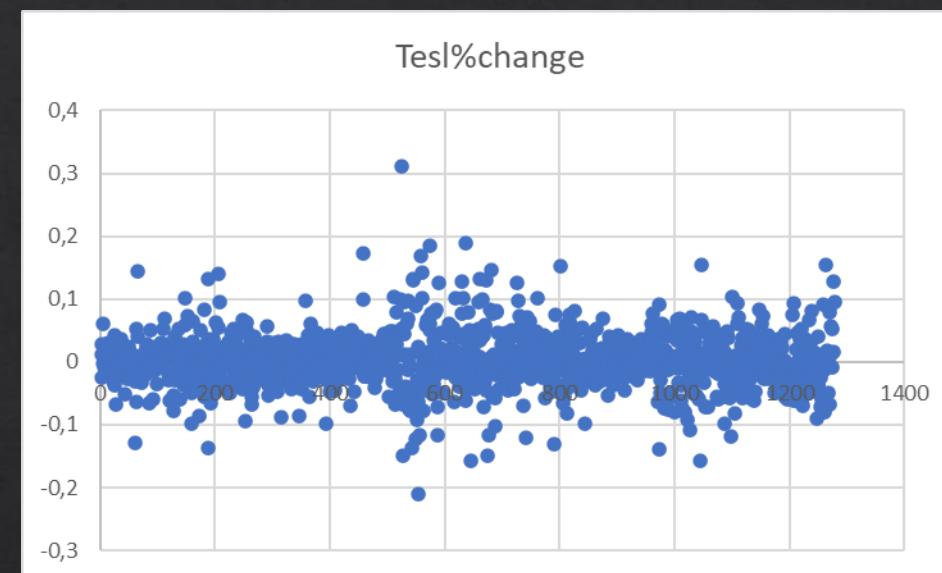
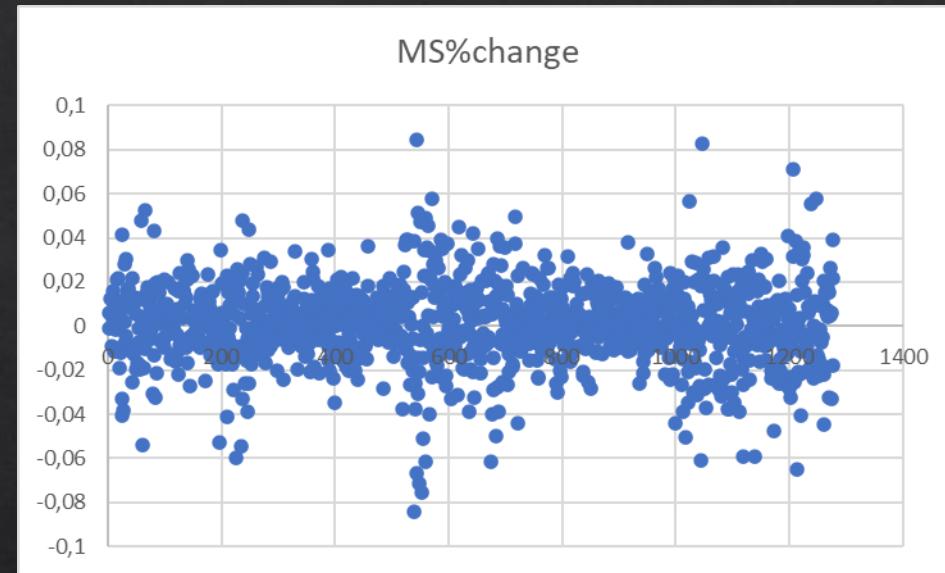


- ❖ We can see the stock price volatilities in Tesla's values indicating higher risk and higher profitability, it has a more swinging course than the S&P stocks.
- ❖ The variance is pretty high compared to other companies, indicating risks as mentioned before. So there is a higher chance to win but the risk increases too.

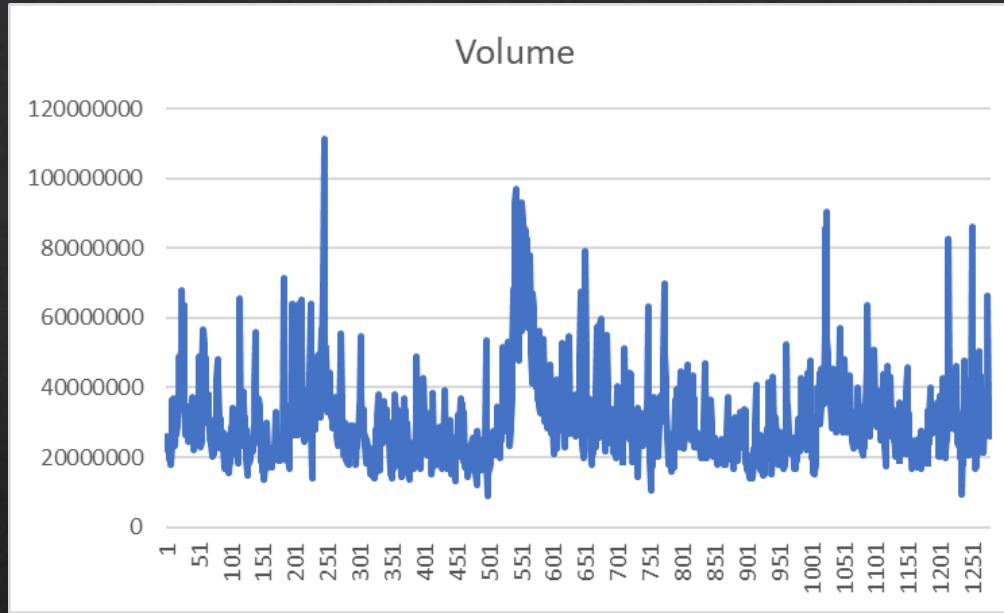
# Comparative Analysis of Apple and S&P 500



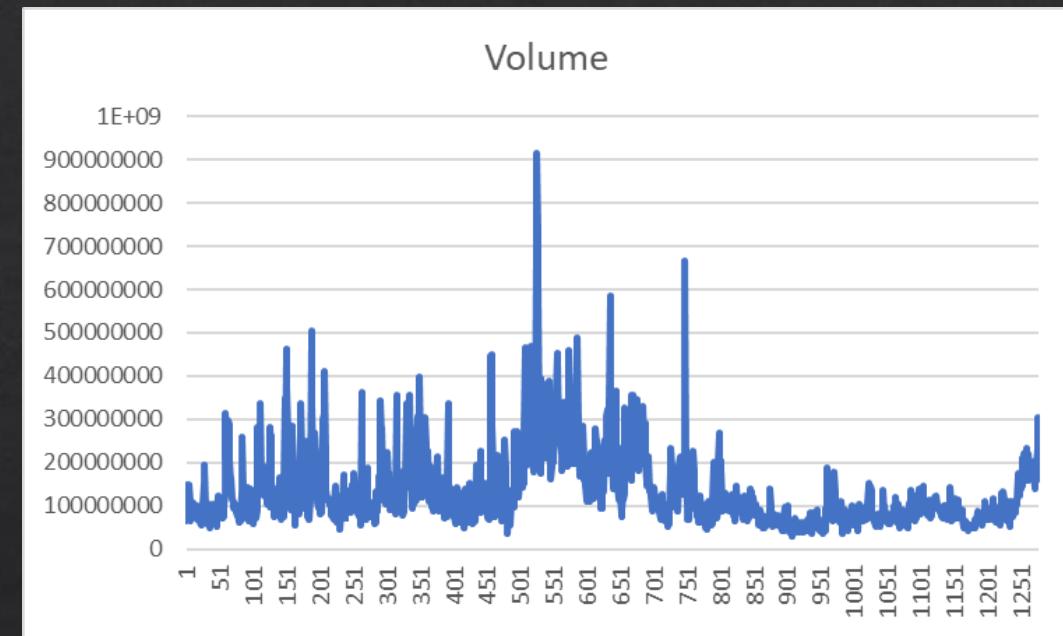
- ❖ Apple has a rising trend over time, has a stronger stock price per time period than S&P after count ca. 600.
- ❖ Next we will see the change rates of the stocks respectively.



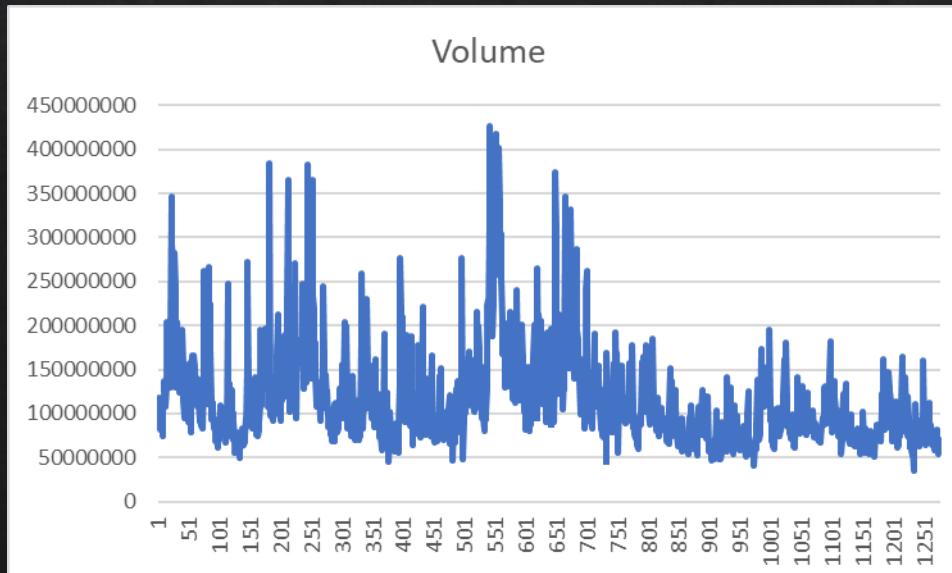
# MICROSOFT



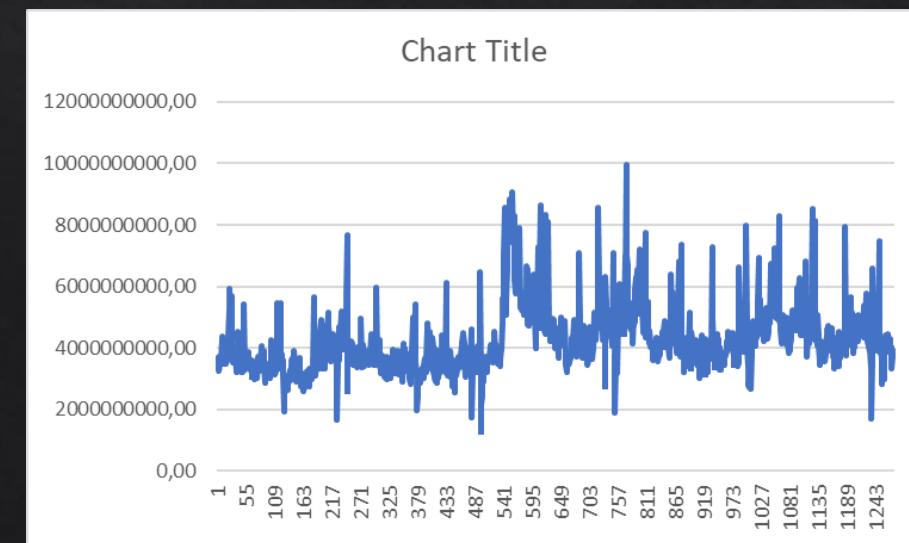
# TESLA



# APPLE

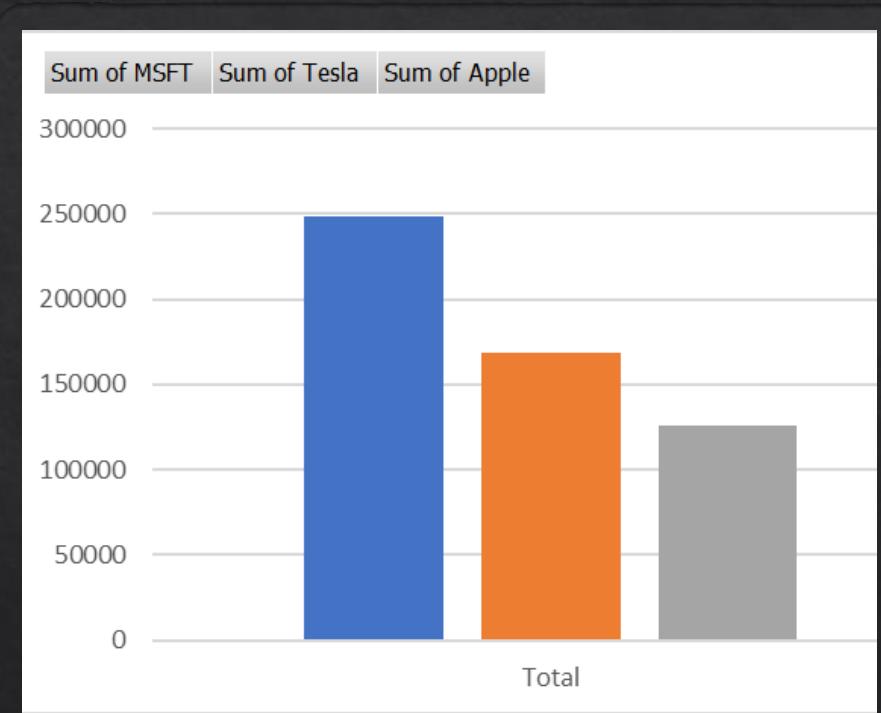


# S&P 500



# CONCLUSION

- ❖ Tesla with the highest volatility rates compared to market indicates higher possibilities for gain but also possibility for higher loses, Apple and Microsoft are more stable for investments.
- ❖ Standard deviations are related to kurtosis
- ❖ Mean, mode and median indicates the kurtosis and skewness.



# Resources

- ❖ <https://www.investopedia.com/ask/answers/021215/what-difference-between-standard-deviation-and-variance.asp>
- ❖ Finance.yahoo.com
- ❖ Corporate Finance Institute.com
- ❖ <https://www.investopedia.com/terms/s/stockmarket.asp>

# About me

- ❖ Currently pursuing a BS in Computer Engineering at RWTH Aachen University, doing an internship at Oeson in field of data analytics.
- ❖ Certified in Python for Data Science and AI Development and Data Based Marketing, Marketing Science and Strategy, Neuromarketing and MBA Essentials, also in B2B software sales and logic.



THANK YOU