

# Case Study - Stock Analysis and Portfolio Management



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# Objective

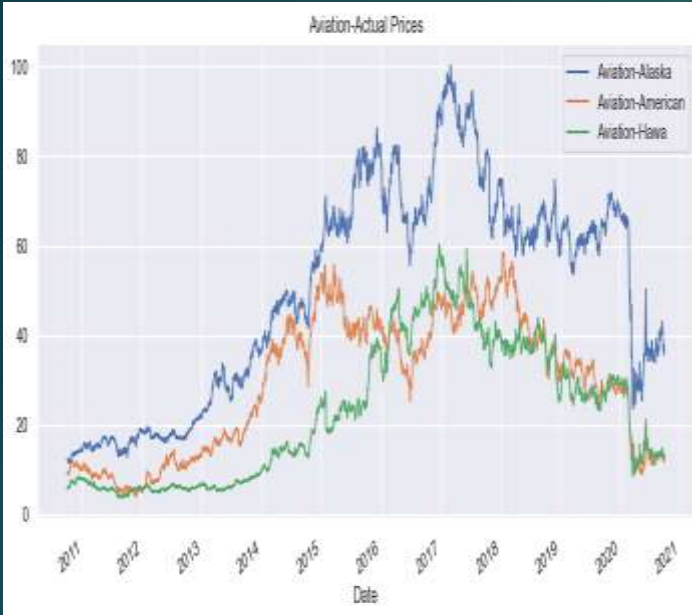
## **Objectives:**

- Explore the stock performance based on price, trend, correlation between the stocks
- Evaluate the stocks based on Capital Asset Pricing Metrics
- Suggest investment strategy to the client to achieve financial goal of getting good but stable returns to fund the NGO

## **Data Available:**

- The stocks data are from 4 Sectors
  - Aviation,
  - Healthcare,
  - Finance and
  - Technology industries.
- Three stocks from each of these industries
- 12 stocks in the US market and the index SP500

# Stock Analysis – Aviation and Finance



## Aviation sector:

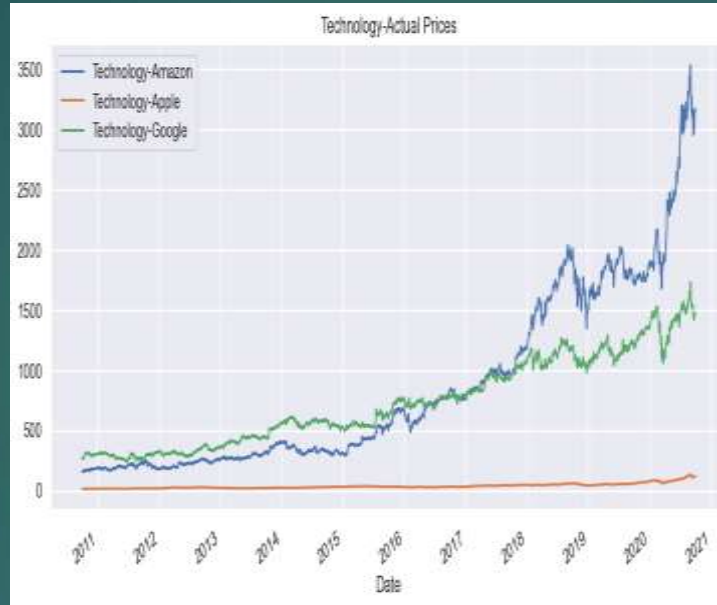
- All 3 stocks in this sector showed increasing trend till 2017-18.
- Decline in prices post 2018
- In March 2020, the steep fall in prices may be attributed to the Covid outbreak.
- The stocks likely to behave in sink with the index SP500 from March 2020 onwards.

## Finance sector:

- Significant price variation between Goldman Sachs vs Credit Suisse and Deutsche.
- Goldman Sachs is overall positive.
- Credit Suisse and Deutsche show declining trend.
- In March 2020, the steep fall in prices due to the Covid outbreak After March, the recovery of Goldman is in line with the index.



# Stock Analysis – Healthcare and Technology



## Healthcare sector:

- Bausch started low, reached its peak in mid 2015 followed steep fall through 2016;
- Jhonson & Jhonson ("J&J") and Merck grow steadily.
- J&J recovered swiftly after the Covid outbreak. Bausch is yet to recover.

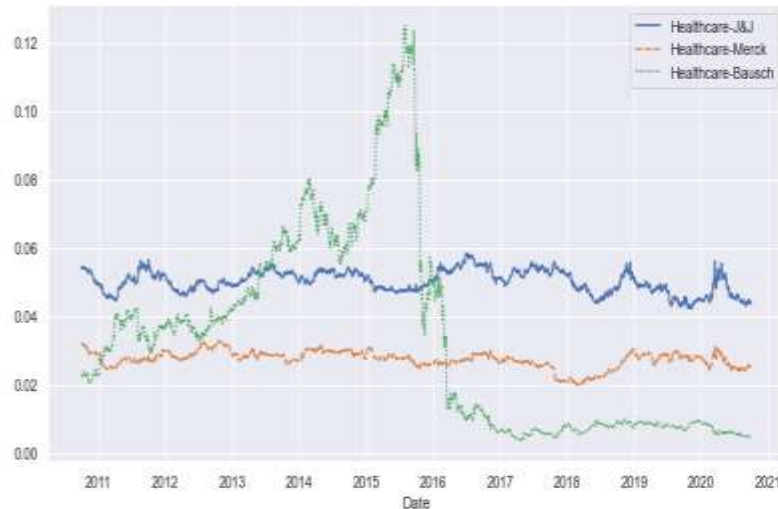
## Technology sector:

- All stocks show a clear uptrend, Amazon being the mostly sought after.
- Amazon's growth is phenomenal compared to Apple's steady growth.
- Amazon overtook Google share price post 2018
- Price levels among these stocks vary widely. Apple's prices are the lowest and hence traded more than Google



# Stock Analysis – Relative Strength Index

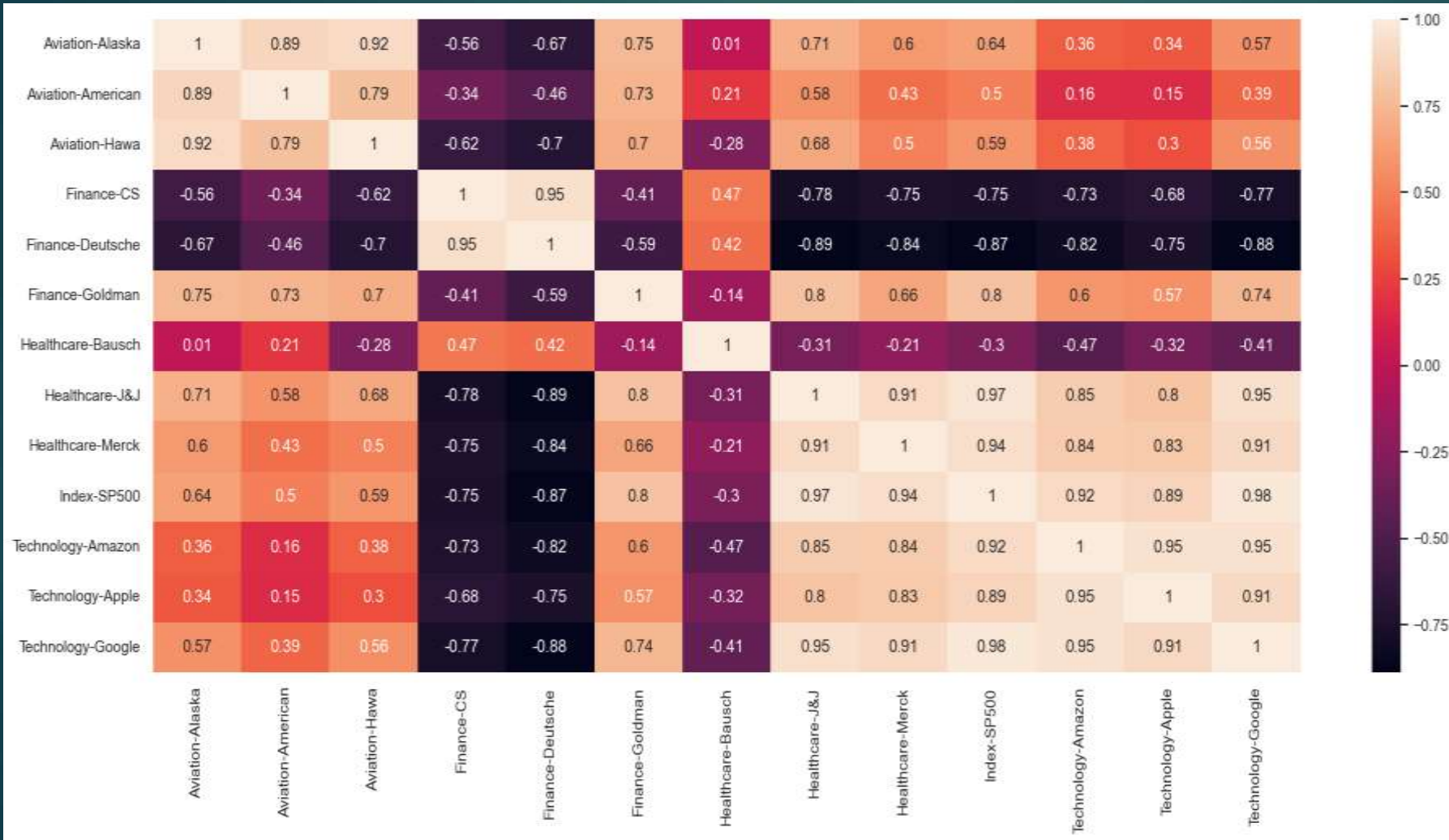
Relative Strength Index of Stock Price



The relative strength Index (“RSI”) also confirms the earlier findings.

- Technology sector
  - Stocks prices are in Up-trend;
  - Price levels are significantly different
- Healthcare sector,
  - J&J and Bausche move parallelly with the index.
- Aviation sector;
  - Stock prices are in declining trend
- Finance sector;
  - Stock prices are in declining trend
  - Price levels are significantly different

# Stock Analysis – Price correlation



- Stocks with Strong Positive Correlation (0.6 to 1): Apple, Amazon, Google, Goldman Sachs, J&J, Merck & Co & Alaska
- Stocks with Weak Positive Correlation (0 to 0.6): American Airlines, Hawaiian Holdings.
- Stocks with Negative Correlation (0 to -1): Bausch Health, Credit Suisse, Deutsche Bank.
- Stocks with negative correlation with Index (S&P 500) should be avoided in the portfolio as they may prove to be very risky.



# Stock Analysis – Volume correlation



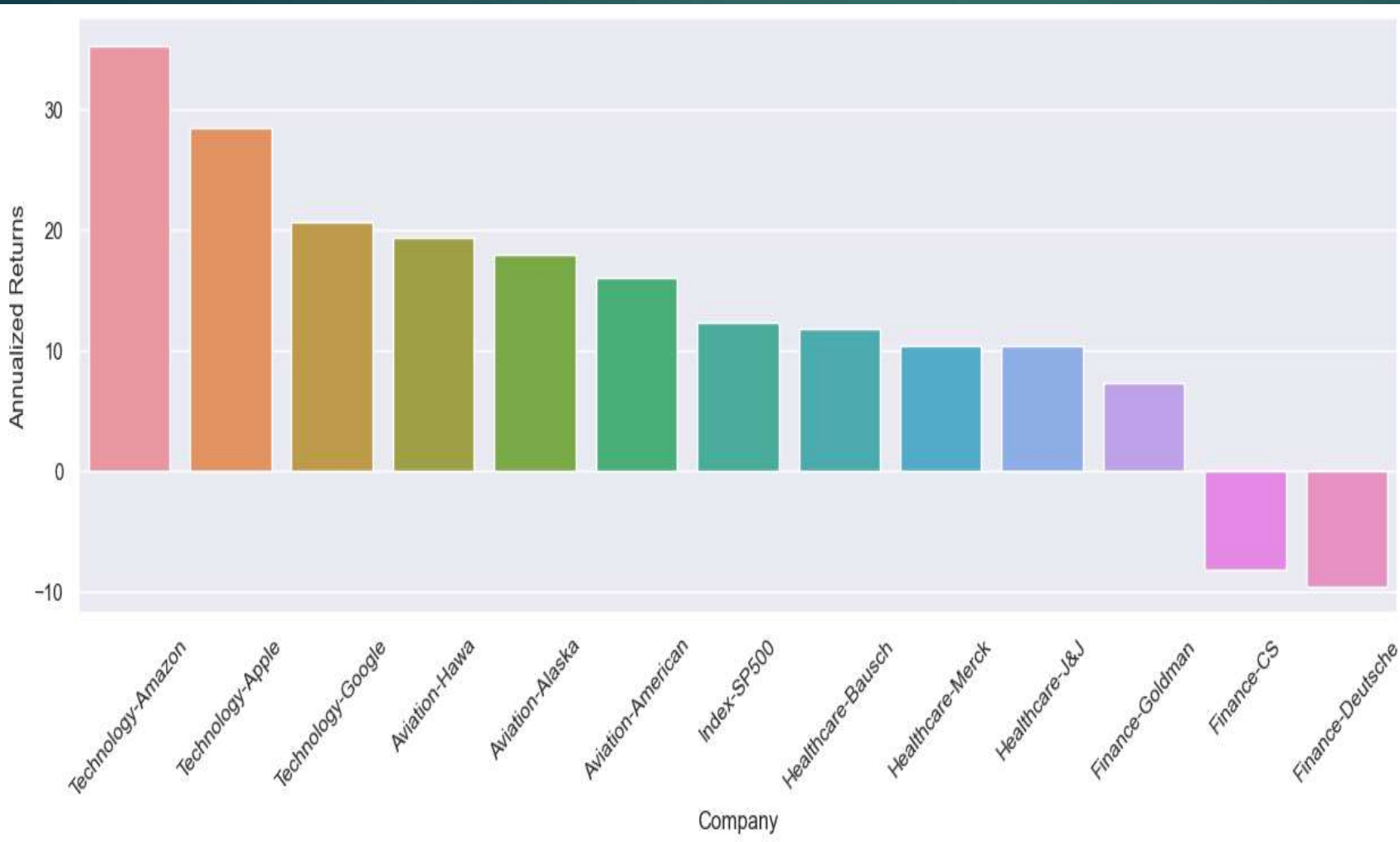
- All the stocks have a positive correlation with S&P500.
- However, all stocks have a weak positive correlation with Index S&P 500 - the highest being 0.46 with American Air

# CAPM Metrics for Stock Selection

- ▶ Annualized Return
- ▶ Cumulative Return
- ▶ Annualized Risk
- ▶ Sharpe Ratio
- ▶ Beta
- ▶ Expected Return

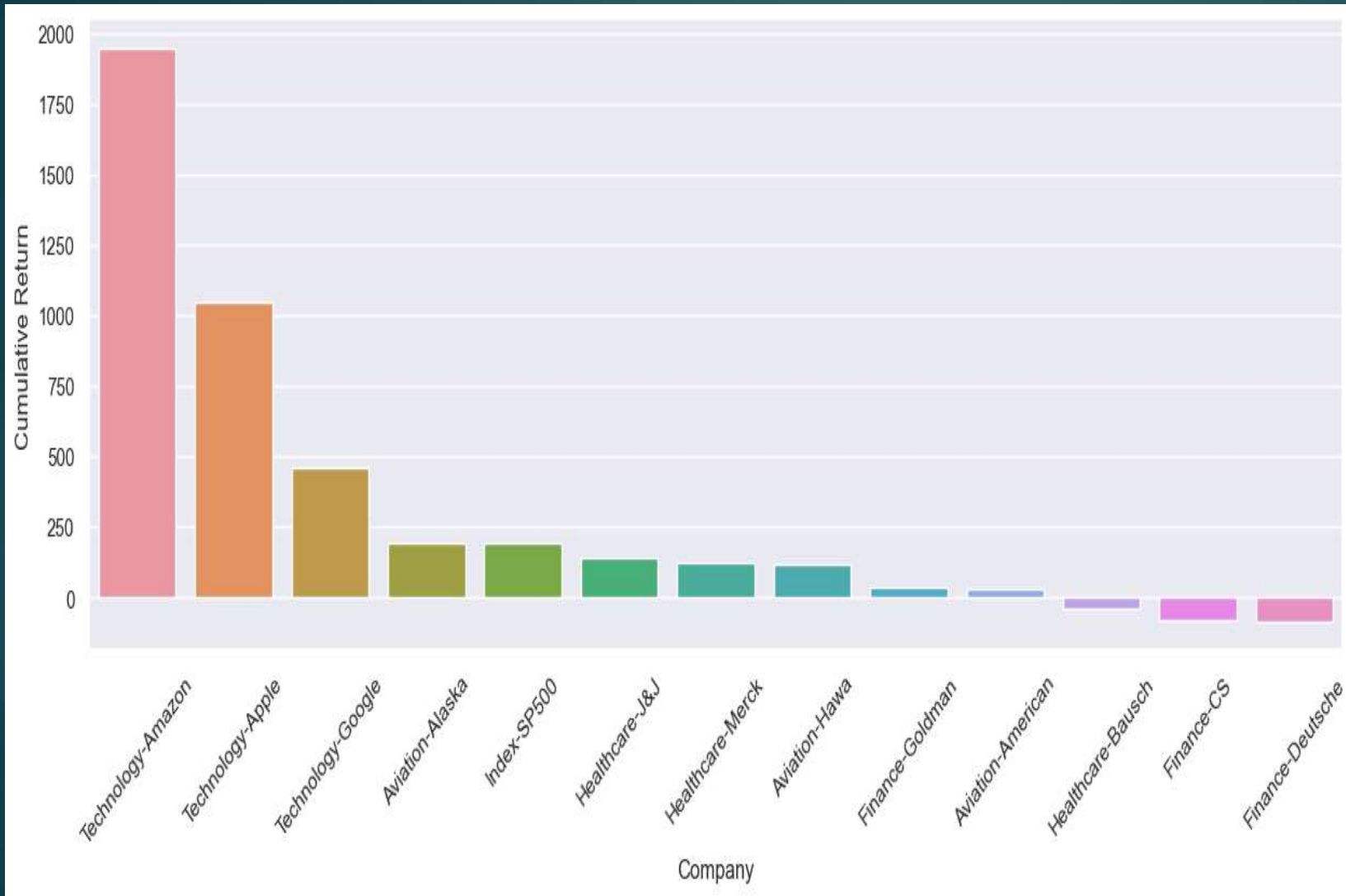


# CAPM – Annualized return



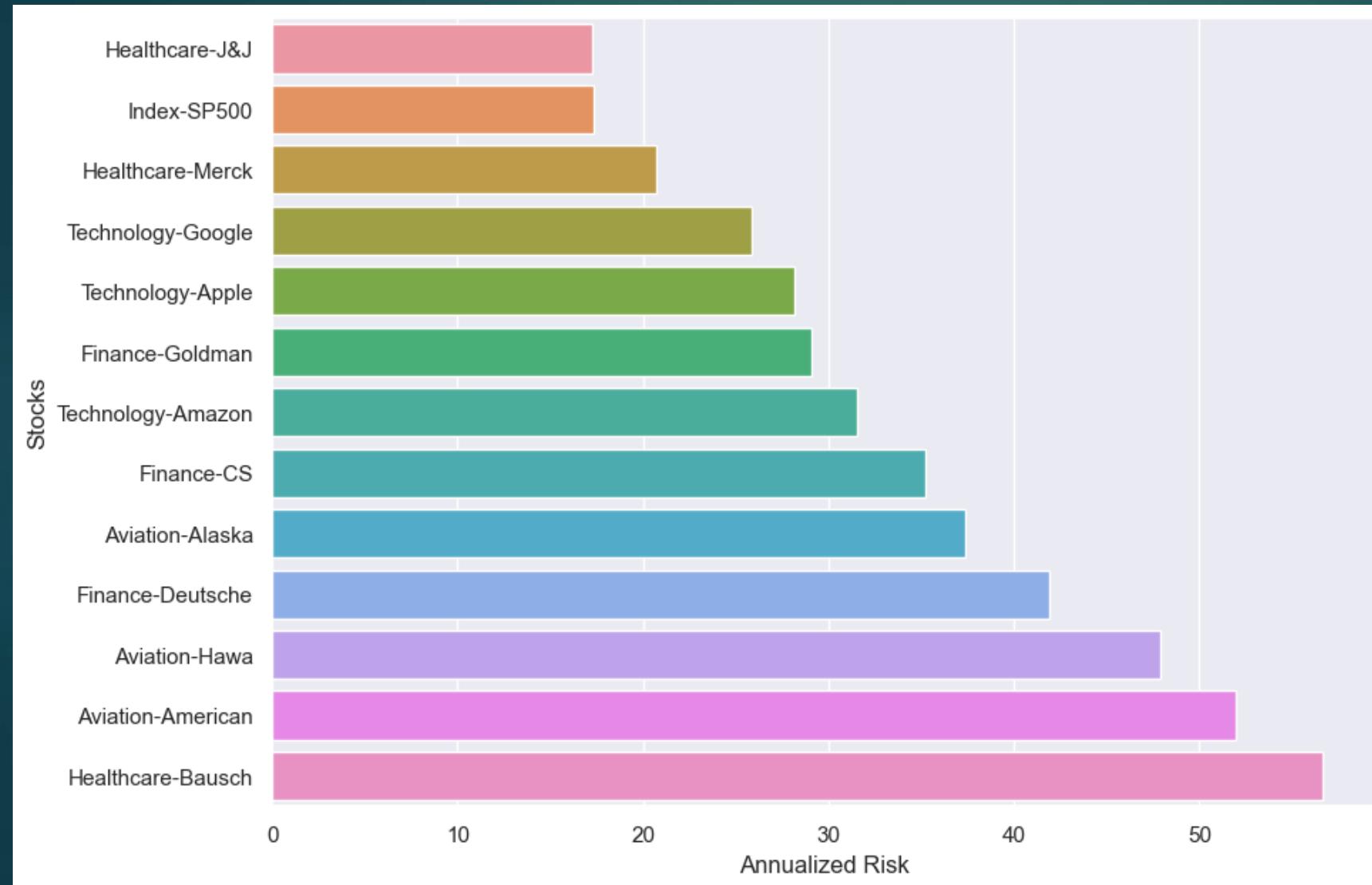
- All technology stocks have given positive returns; The highest returns have been from Amazon followed by Apple and Google.
- Aviation stocks performed better next to technology companies; all are positive and above the S&P500 index.
- Healthcare stocks also show positive annualized (daily) return; however, the returns are lesser than S&P500.
- Under finance sector, except Goldman, the other two stocks gave negative returns.

# CAPM – Cumulative return



- Highest cumulative returns have been provided by technology stocks.
- There are three stocks with negative returns two from finance and one from finance.
- To meet the investment goals of the client, we will not include any stocks giving negative returns in the portfolio.

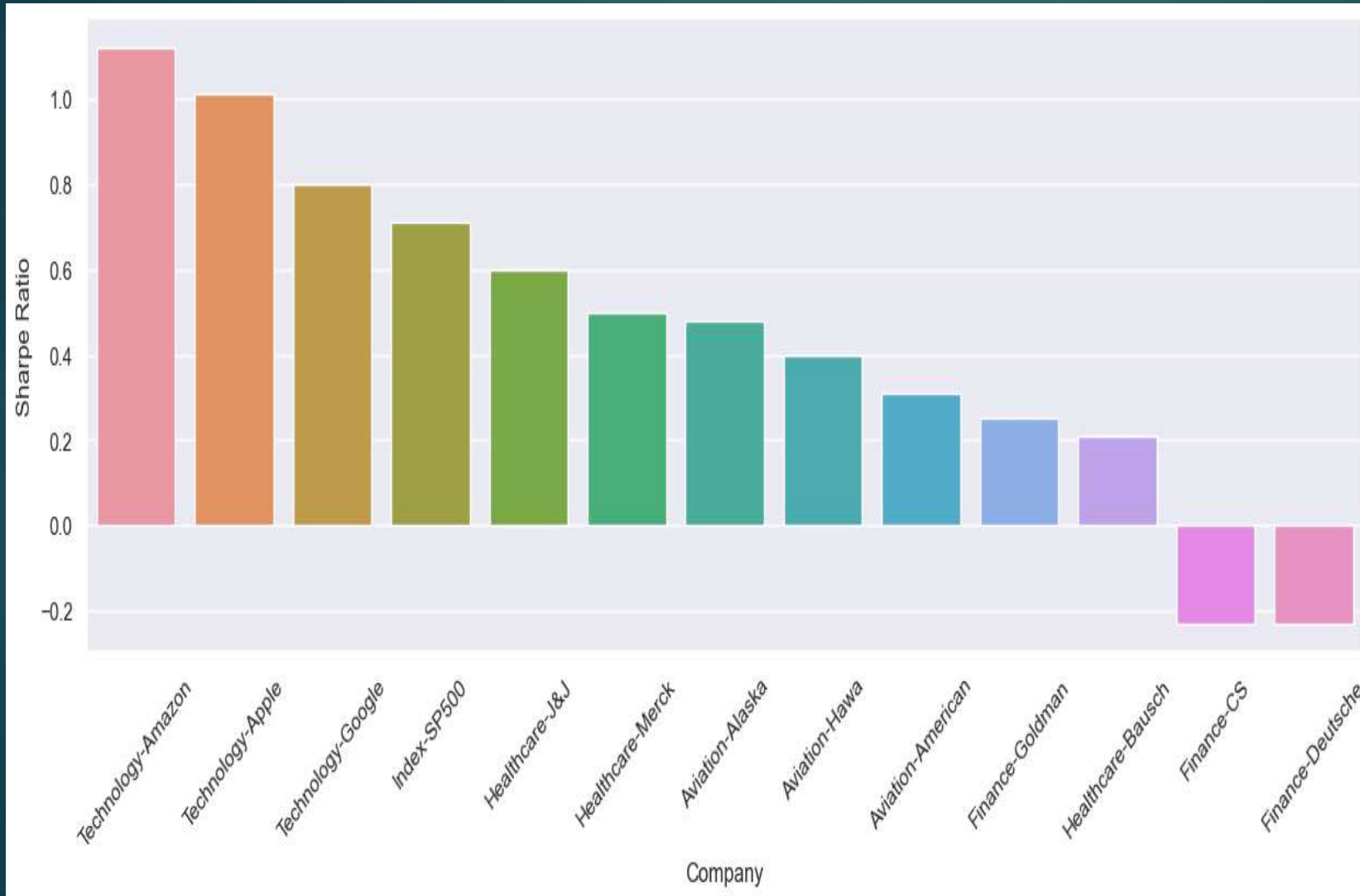
# CAPM – Annualized risk



- Risk is high among all the stocks of aviation industry.
- In Finance sector, all stocks are riskier than the index;
- 3. Healthcare sector has the most risky and least risky stocks; Bausch is the riskiest among all the stocks in other industry as well while Jhonson &Jhonson is has the least annualised risk and the only stock which is less riskier than the index among all.
- 4. All the three stocks in Technology sector stocks have moderate risk.

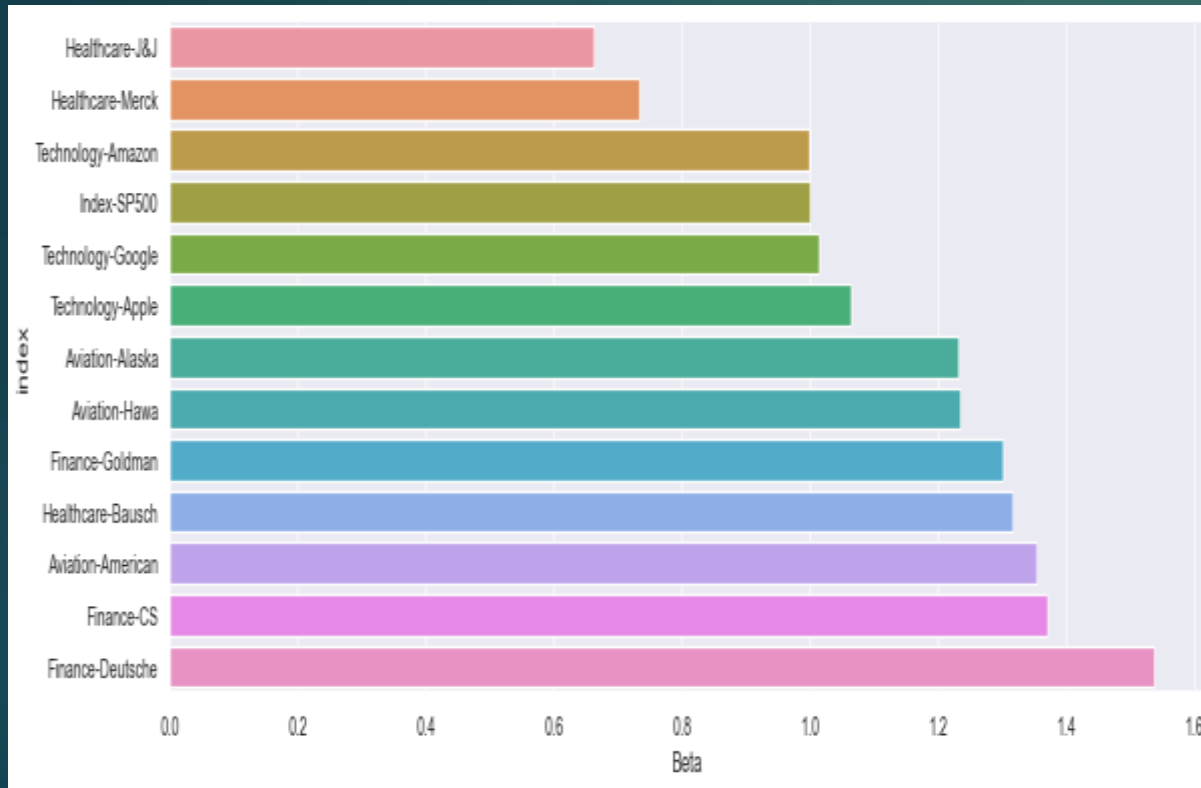


# CAPM – Sharpe ratio



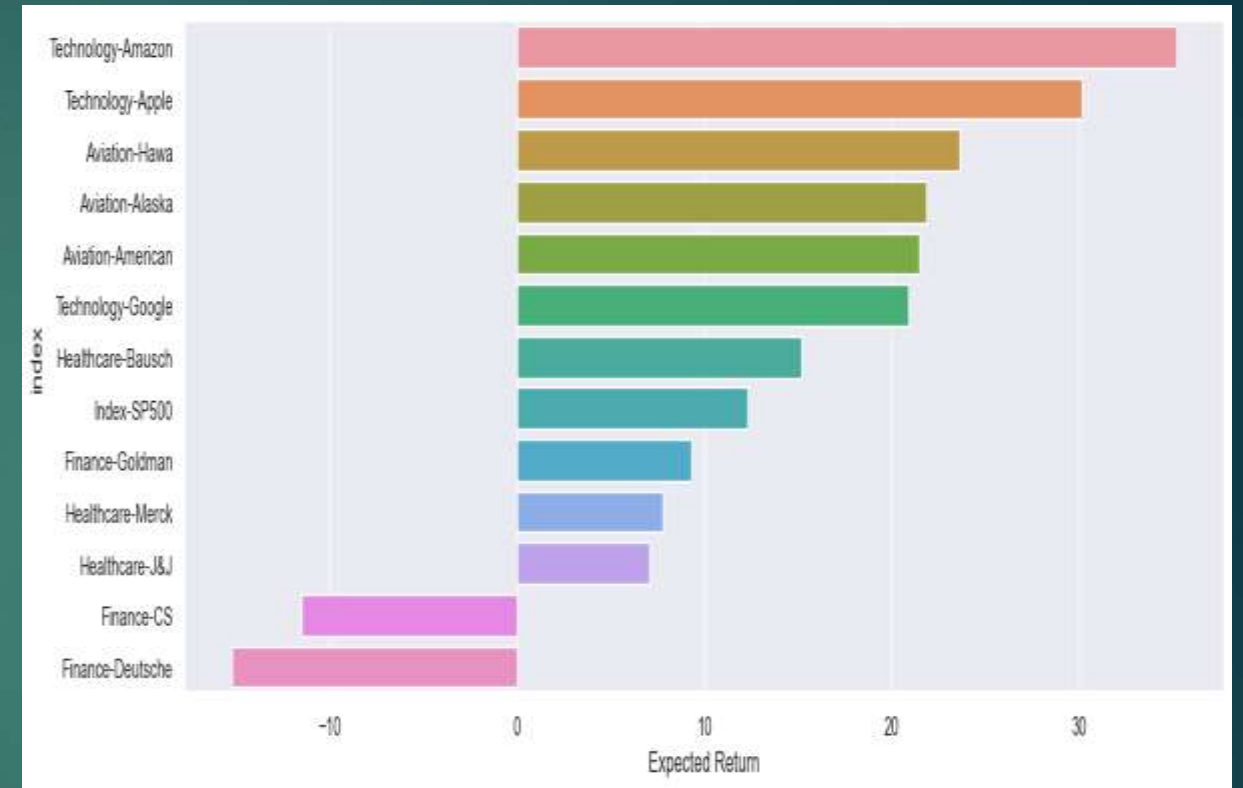
- All stocks in Technology sector stocks have good Sharpe ratio.
- All stocks of Healthcare sector have sharpe ratio of greater than 0.5, however their sharpe ratio is less than sharpe ratio of Technology sector
- All stocks of Aviation sector have sharpe ratio of less than 0.5
- Finance\_CS and Finance\_Deutsche is having Negative Sharpe ratio.

# CAPM – Beta and Expected return



## Beta Analysis

- Less volatile stocks (Beta < 1) : J&J, Merck and Amazon show lesser volatility than the market
- High volatile stocks (Beta > 1) : All other stocks. However, Apple and Google are only marginally higher than the market' volatility.



## Expected return Analysis

- Finance-CS and Finance Deutsche are having negative expected returns
- Other stocks have positive expected returns
- Apple and Google are only marginally higher than the market' volatility.

# CAPM Results & Recommendation

	Annualized Returns	Cumulative Return	Annualized Risk	Sharpe Ratio	Beta	Expected Return
Aviation-Alaska	17.87	194.28	37.40	0.48	1.231484	21.833014
Aviation-American	16.03	32.29	51.95	0.31	1.353639	21.433601
Aviation-Hawa	19.29	116.28	47.86	0.40	1.233664	23.622139
Finance-CS	-8.19	-76.39	35.25	-0.23	1.369945	-11.497310
Finance-Deutsche	-9.62	-84.03	41.87	-0.23	1.537556	-15.194451
Finance-Goldman	7.32	36.07	29.10	0.25	1.301359	9.299929
Healthcare-Bausch	11.71	-39.65	56.67	0.21	1.315965	15.172980
Healthcare-J&J	10.30	141.10	17.22	0.60	0.662243	7.074421
Healthcare-Merck	10.34	126.64	20.72	0.50	0.733472	7.783995
Index-SP500	12.29	193.39	17.36	0.71	1.000000	12.290000
Technology-Amazon	35.22	1948.49	31.57	1.12	0.998854	35.180504
Technology-Apple	28.40	1047.77	28.13	1.01	1.063317	30.150706
Technology-Google	20.60	461.28	25.86	0.80	1.013406	20.866111

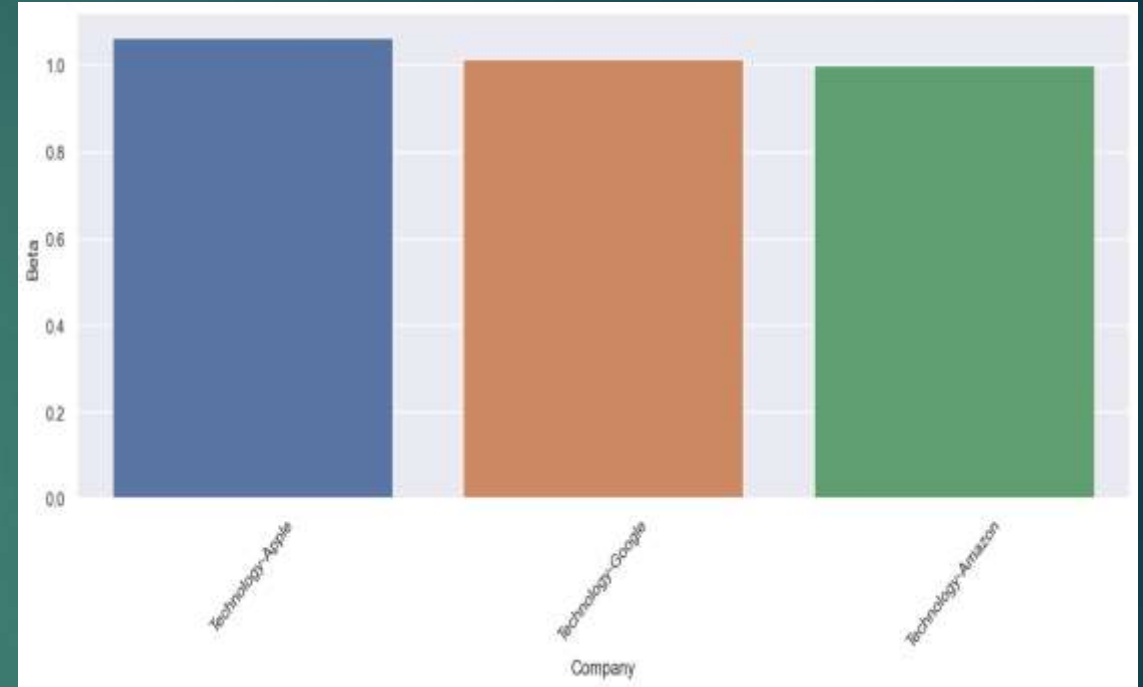
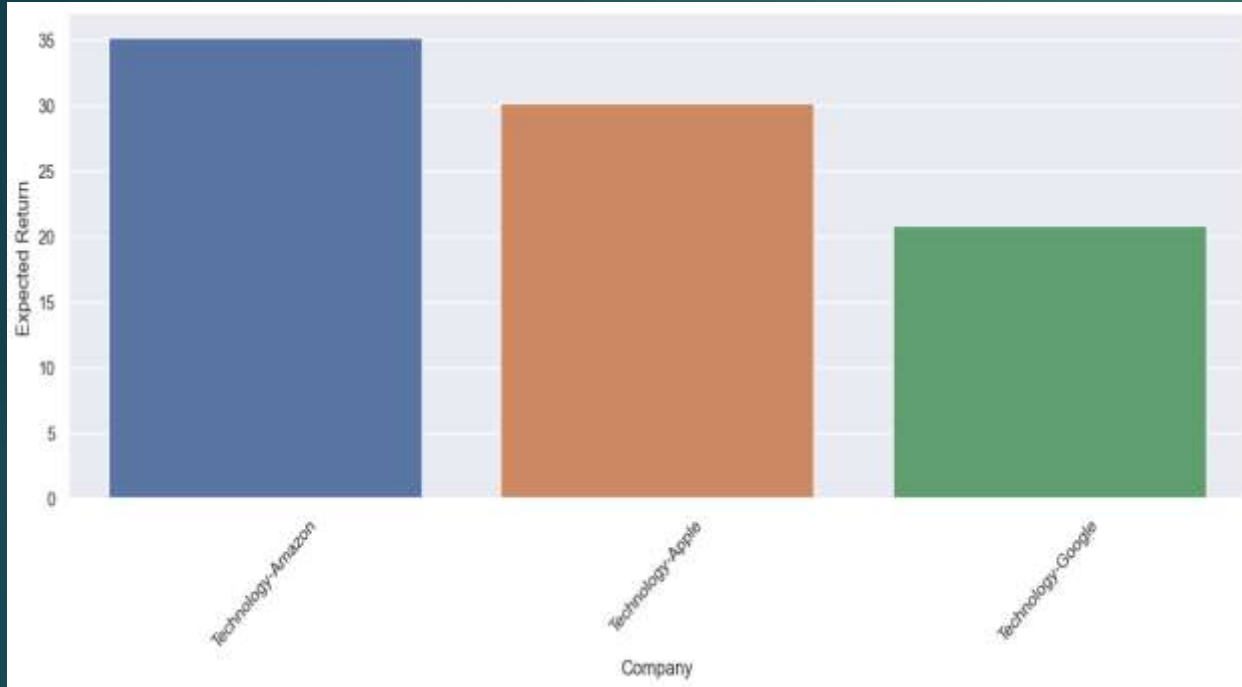
## Recommendation:

On consideration of the all the parameters of the CAPM Metrics, its recommended to invest in the following stocks of the Technology sector

- Amazon
- Apple
- Google



# CAPM Results & Recommendation - contd



## Results:

- The volatility of all the technology stocks are not much alarming and are almost on par with the index SP500.
- All the technology stocks give an expected return which is more than or equal to that of Index SP500
- As the technology stocks show a balanced volatility and expected returns and hence can be selected for the portfolio.

# Results of analysis of the recommended stocks (From 1<sup>st</sup> October 2010 to 30<sup>th</sup> September 2020)

## Investment Information

- Invested Fund - USD 500,000
- Investment period – 5 Years
- Stock portfolio to be invested in
  - Amazon
  - Apple
  - Google
- Investment ratio – Equally in all three stocks

## Expected returns

- Return expected – USD 1,201,833
- Annual Portfolio return – 19%
- Annual portfolio risk – 28.52%

### 4.2.2. Find the overall value of the Portfolio

```
# Calculate return from the chosen portfolio
# The investment amount is assumed to be $500000 USD
investment=500000
portfolio_stocklist=["Technology-Amazon","Technology-Apple","Technology-Google"]
weight = 1/len(portfolio_stocklist)

portfolio["Stock Return"] = portfolio["Annualized Returns"]*5
portfolio["Invested Amount"] = investment*weight
portfolio["Stock Value"] = round(portfolio["Invested Amount"] * (1+portfolio["Stock Return"]/100),2)
portfolio
```

	level_0	Annualized Returns	Cumulative Return	Annualized Risk	Sharpe Ratio	Beta	Expected Return	Stock Return	Invested Amount	Stock Value
index										
Technology-Amazon	10	30.22	1543.49	31.87	1.12	0.998854	35.163504	176.1	100000.000007	460166.67
Technology-Apple	11	28.40	1347.77	28.13	1.01	1.063317	30.163706	142.8	100000.000007	403333.33
Technology-Google	12	20.80	481.28	25.88	0.80	1.015406	20.866111	103.8	100000.000007	358333.33

```
# Value of Portfolio in 5 years
portfolio_val = portfolio["Stock Value"].sum()
print(portfolio_val)
```

1201833.33

```
portfolio["Stock Value"]
```

```
0    460166.67
1    403333.33
2    358333.33
Name: Stock Value, dtype: float64
```

```
# Calculate the return on investment for 5 years
roi = ((portfolio_val - investment)/investment).round(2)
roi
```

1.4

```
# Annualized rate of return for the 5 years
period = 5
roi_annual=((1+roi)**(1/period)-1).round(2)
roi_annual
```

0.19

```
#portfolio risk
portfolio_risk = (portfolio["Annualized Risk"]*weight).sum().round(2)
print(portfolio_risk)
```

28.52



Thank You