Stock Analysis and Portfolio Management

CAPSTONE PROJECT (DS-46)

- SACHIN JANGID

- PRIYAL GAURAV

- ANUSHREE V

- GANESH SHINDE

AGENDA

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Objective

Data Exploration

CAPM & Stock selection Criteria

Model forecasting and stock level assessment

Recommendations & Reference

- -Understanding the stocks movement
- Volatility with respect to base index

- -Understanding the client
- - Personalized portfolio expectation

- -Expected returns, Annualized risk, beta, sharpe ratio and expected returns

- stock level Analysis
- Expected returns from forecasted model

Objective

What are we offering ?

- A well **diversified** portfolio of stocks offering stable returns with a forecasted average return of **16.9%**
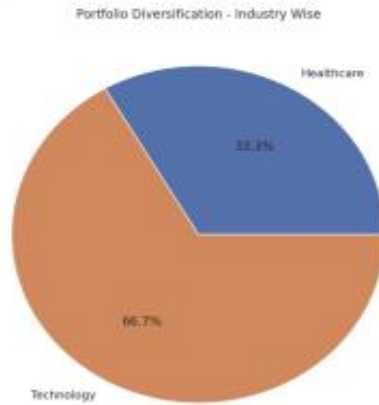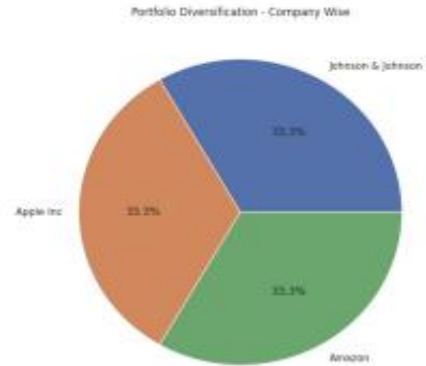
Understanding the Client

- 5W + How's analysis for understanding client persona
- Client Financials and future Goals

What is the available data ?

- 12 leading stocks data listed in NYSE & S&P500 index data
- These 12 stocks are from 4 different sectors

A Diverse Portfolio offering Stable returns with moderate risks

- Proven Track record of returns on a long term basis. This portfolio **beats the market returns by 100%** on an annualised basis

- Better Risk Adjusted return with *~100% better sharpe ratio* than the market. The portfolio is also less volatile in comparison with the market with a beta value of ~.*90*

- Portfolio risk and expected returns are comparable to the market.
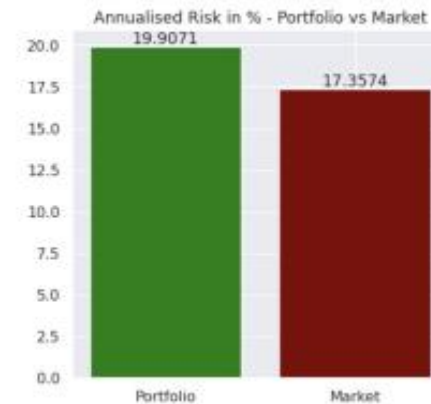
Airline & Pharmaceuticals Stock trends - Significant Volatility & Downtrend (Normalised stock prices)
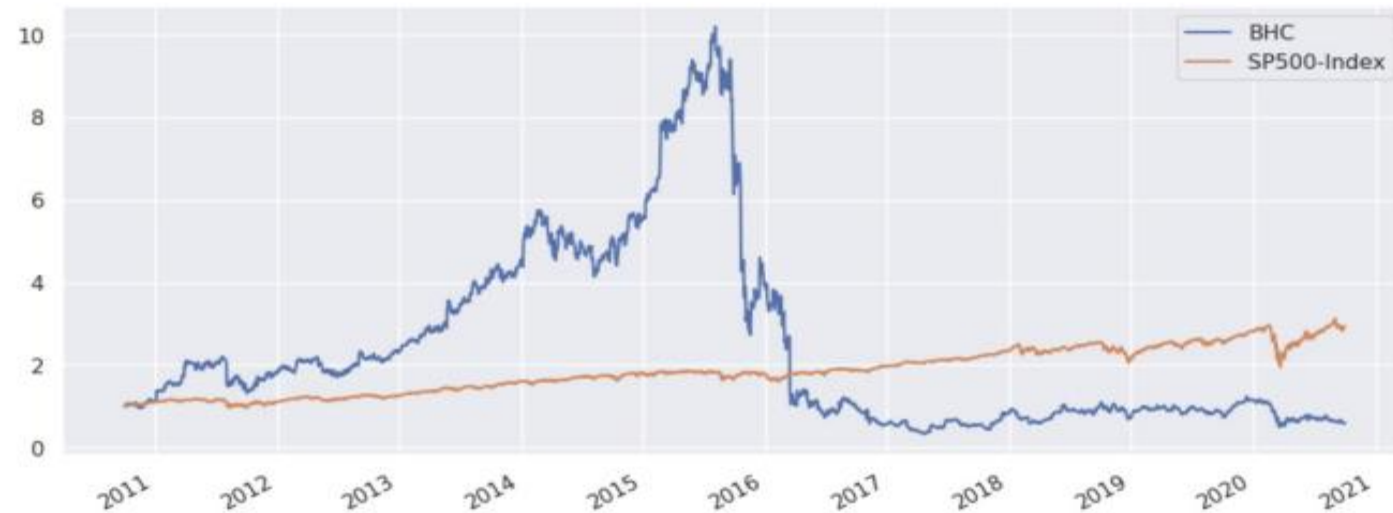
- All the Airline stocks move in-tandem. They are highly volatile and have taken a significant downturn after 2017

- BHC, the only pharma company in the list is also showing very high volatility and a complete price break-down since mid 2015

- Both the industries are underperforming the market in the last 3-5 years

Finance Stock trends - Significant Underperformance and Downtrend (Normalised stock prices)

Credit Suisse and Deutsche bank have been on a **downtrend** since 2014 and have offered negative returns in the long term

Goldman Sachs has been relatively stable. However, has not offered any returns in the last 5 years. Charts show **sidewards movements** for the over the long term

All Stocks in the finance sector have significantly underperformed the market

Healthcare Stocks trends - Stable performance with low Volatility (Normalised stock prices)

Johnson and Johnson has tracked the market trend with a **slight underperformance** over market. However, it is offering a stable return with low volatility

Merk and co is offering similar returns, however is slightly more volatile than the index and JNJ

Both stocks show slightly upward trend and form a good candidate for diversification

Technology Stocks - Significant Overperformance over Market (Normalised stock prices)

Legend:
- AAPL
- AMZN
- GOOG
- SP500-Index

Amazon has significantly **outperformed** all the stocks and the market since early 2016 and continues to show **uptrend**

Apple and google have offered a **steady outperformance** over the market since early 2016. **Apple** is showing a **significant uptrend** from late 2020

All Stocks in the Technology sector have significantly outperformed the market over long term
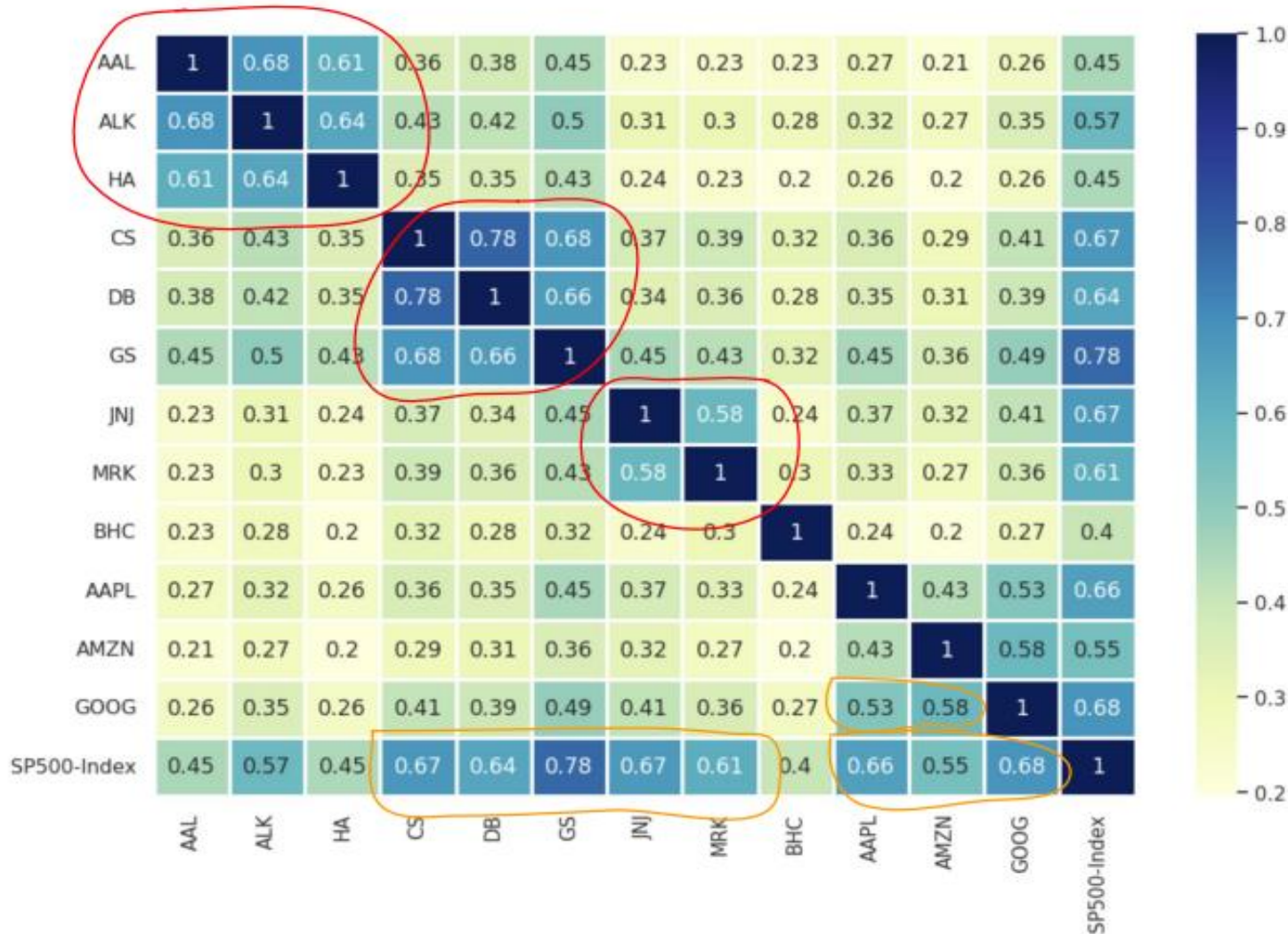
Correlation of Daily movement of stocks prices - Need for Diversification

Carryout Data Exploration → Determine CAPM Metrics → Create Stock Selection Criteria → Apply Stock Selection Criteria

	AAL	ALK	HA	CS	DB	GS	JNJ	MRK	BHC	AAPL	AMZN	GOOG	SP500-Index
AAL	1	0.68	0.61	0.36	0.38	0.45	0.23	0.23	0.23	0.27	0.21	0.26	0.45
ALK	0.68	1	0.64	0.43	0.42	0.5	0.31	0.3	0.28	0.32	0.27	0.35	0.57
HA	0.61	0.64	1	0.35	0.35	0.43	0.24	0.23	0.2	0.26	0.2	0.26	0.45
CS	0.36	0.43	0.35	1	0.78	0.68	0.37	0.39	0.32	0.36	0.29	0.41	0.67
DB	0.38	0.42	0.35	0.78	1	0.66	0.34	0.36	0.28	0.35	0.31	0.39	0.64
GS	0.45	0.5	0.43	0.68	0.66	1	0.45	0.43	0.32	0.45	0.36	0.49	0.78
JNJ	0.23	0.31	0.24	0.37	0.34	0.45	1	0.58	0.24	0.37	0.32	0.41	0.67
MRK	0.23	0.3	0.23	0.39	0.36	0.43	0.58	1	0.3	0.33	0.27	0.36	0.61
BHC	0.23	0.28	0.2	0.32	0.28	0.32	0.24	0.3	1	0.24	0.2	0.27	0.4
AAPL	0.27	0.32	0.26	0.36	0.35	0.45	0.37	0.33	0.24	1	0.43	0.53	0.66
AMZN	0.21	0.27	0.2	0.29	0.31	0.36	0.32	0.27	0.2	0.43	1	0.58	0.55
GOOG	0.26	0.35	0.26	0.41	0.39	0.49	0.41	0.36	0.27	0.53	0.58	1	0.68
SP500-Index	0.45	0.57	0.45	0.67	0.64	0.78	0.67	0.61	0.4	0.66	0.55	0.68	1

- Stocks within an industry are highly correlated e.g Airline stocks AAL,ALK,HA show a high degree of correlation amongst themselves

- Stocks showing higher degree of correlation between each other tend to be subject to same set of risks (e.g higher crude oil price impacts all the airline companies)

- Stocks belonging to Finance,Healthcare and technology show a higher degree of correlation with the market

CAPM Assessment for individual stocks

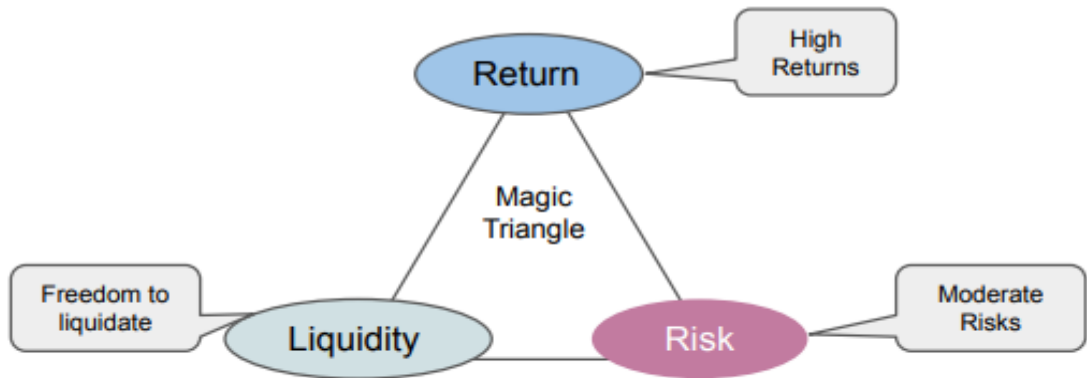| Carryout Data Exploration	Determine CAPM Metrics	Create Stock Selection Criteria	Apply Stock Selection Criteria

Ticker	Daily Returns	Annualised Returns	Cumulative Returns	Annualised Risk	Beta	Sharpe Ratio	Expected Returns
AAL	0.06	16.05	32.29	51.95%	1.35	0.30	16.62
ALK	0.07	17.88	194.28	37.40%	1.23	0.46	15.13
HA	0.08	19.28	116.28	47.86%	1.23	0.39	15.15
CS	-0.03	-8.19	-76.39	35.25%	1.37	-0.25	16.82
DB	-0.04	-9.61	-84.03	41.87%	1.54	-0.24	18.87
GS	0.03	7.32	36.07	29.10%	1.30	0.23	15.98
JNJ	0.04	10.30	141.10	17.22%	0.66	0.57	8.17
MRK	0.04	10.34	126.64	20.71%	0.73	0.47	9.04
BHC	0.05	11.70	-39.65	56.67%	1.32	0.20	16.16
AAPL	0.11	28.42	1047.77	28.13%	1.06	0.99	13.07
AMZN	0.14	35.22	1948.49	31.57%	1.00	1.10	12.28
GOOG	0.08	20.60	461.28	25.86%	1.01	0.78	12.46
SP500-Index	0.05	12.30	193.39	17.36%	1.00	0.68	12.30

Create and Apply Stock Selection Criteria

Carryout Data Exploration → Determine CAPM Metrics → **Create Stock Selection Criteria** → **Apply Stock Selection Criteria**

Outcome of Investor Profile

Return — High Returns

Magic Triangle

Freedom to liquidate — Liquidity

Risk — Moderate Risks

Filter Criteria

- Ensure more than one industry forms a part of the portfolio to reduce overall risk
- Remove stocks offering lower returns than market at a higher risk
- Remove stocks having lower sharpe ratio and higher risks

Final Portfolio Chosen for the investor

Ticker	Annualised Returns	Cumulative Returns	Annualised Risk	Beta	Sharpe Ratio	Expected Returns
JNJ	10.30	141.10	17.22%	0.66	0.57	8.17
AAPL	28.42	1047.77	28.13%	1.06	0.99	13.07
AMZN	35.22	1948.49	31.57%	1.00	1.10	12.28

Forecasting Stock Returns - Trend and potential returns validated

Models Considered for Forecasting			

MAPE			
	J&J	**Apple**	**Amazon**
Holt Winters	6.91	19.6	35.99
Auto Regression	12.41	13.11	20.82
Moving Average	12.57	13.24	21.04
ARMA	12.57	13.22	21.06
ARIMA	12.06	13.11	21.06
Prophet Baseline	1.93	6.68	2.92
Prophet Fine Tuned	1.47	3.61	2.53

- A Fine tuned Prophet model using hyper parameter tuning has forecasted returns with very low error rate (MAPE)
- This has been used as the model of choice for forecasting stock returns

Forecasted Returns of Stocks
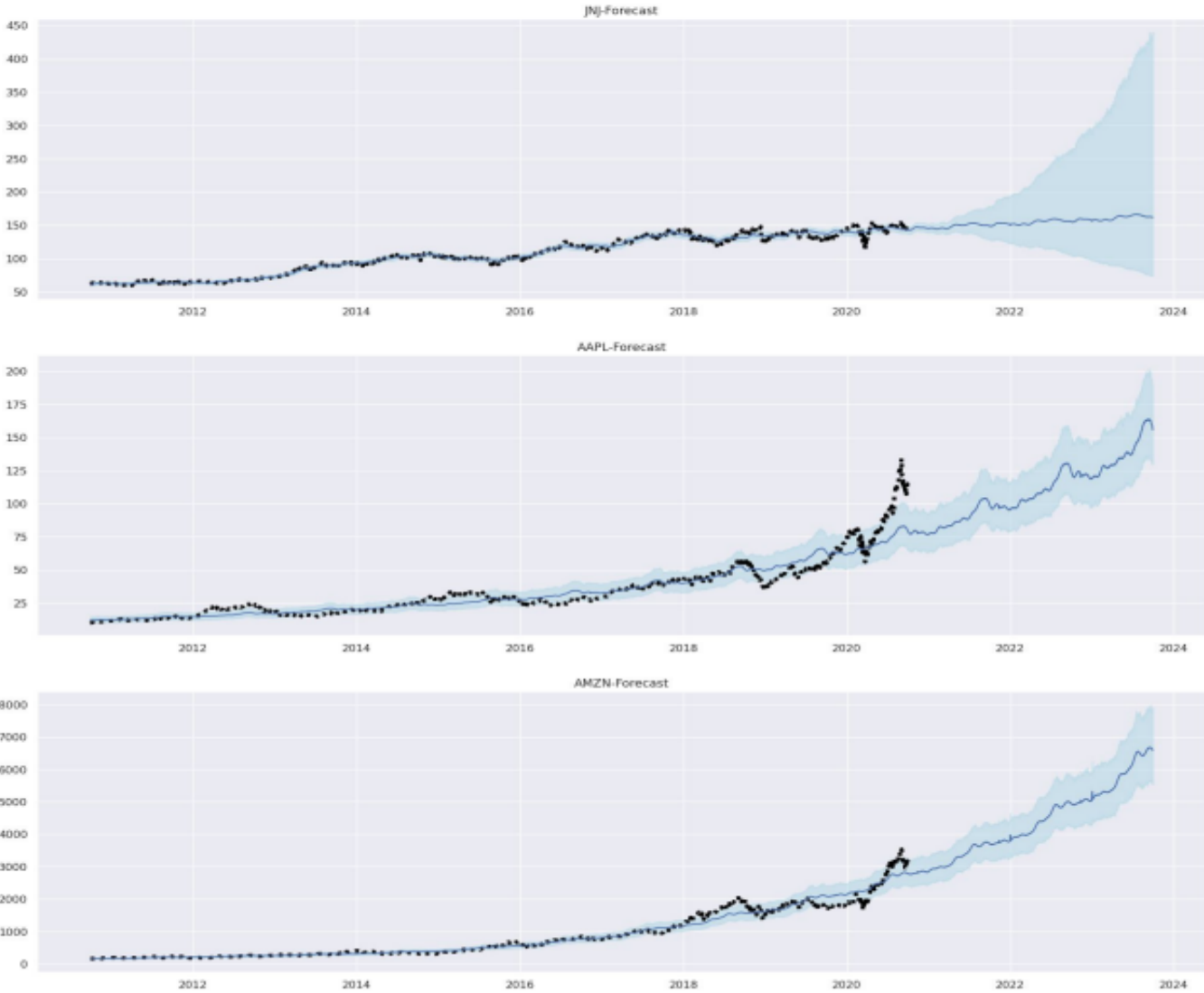
Summary

- Invested Fund   : 100,000 USD

- Investment Period   : 3 Years

- Matured Amount   : 159,915 USD

- Annual ROI Portfolio   : 16.94%

Total Savings

Legend: Future Value (16.94%) — Total Contributions

		Initial Investment Price	Final Investment Forecast	Cumulative Returns Forecast	Average Returns Forecast
0	JNJ	148.88	161.84	8.70	2.90
1	AAPL	115.81	155.80	34.53	11.51
2	AMZN	3148.73	6588.22	109.23	36.41

1. The volatility of all the stocks are not much alarming and are almost on par with the index SP500.
2. All the tech stocks give an expected return which is more than that of Index SP500 with low-risk potential.
3. As the stocks show a balanced volatility and expected returns with low risk, hence it can be selected for the portfolio.

-Thank You