Portfolio Risk Assessment & 1-Day 95% VaR Calculation

Welcome to this presentation on Portfolio Risk Assessment and the 1-Day 95% Value at Risk (VaR) calculation. We will cover the key concepts of portfolio risk, data sourcing, statistical analysis, and VaR estimation to provide a comprehensive understanding for portfolio risk management. The objective is to equip you with methods to measure and manage financial risk effectively using real-world stock data.

Objective & Overview

Objective

- Assess portfolio risk using historical stock data
- Calculate 1-day 95% Value at Risk (VaR)
- Portfolio won't lost more then 2.9 to 3.1 %

Overview

- Fetch stock data from trusted financial sources
- Construct portfolio with equal weighting
- Perform statistical metrics on returns
- Estimate VaR to understand maximum loss potential

Data Collection & Stock Selection

Data Sources

Data was collected for Apple, Microsoft, Google, and Amazon from 2020 to present.

Primary source is Yahoo Finance, with Stooq as fallback for reliability.

Data Consistency

We used automated scripts for fetching adjusted close prices to ensure data consistency.

A robust process fills missing data by forward and backward filling methods.

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from pandas_datareader import data as pdr
import datetime as dt
from scipy import stats
import yfinance as yf  ### this is for fetching our data
import time

sns.set_style('whitegrid')  ## provide grid structure
%matplotlib inline
companie = ['AAPL','MSFT','GOOGL','AMZN']
weights = np.array([0.25,0.25,0.25,0.25])
start = dt.datetime(2020,1,1)
end = dt.datetime.today()
price = pd.DataFrame(index=pd.date_range(start,end))
```

Portfolio Construction & Returns

Equal Weighting

Each stock assigned 25% weight to diversify exposure evenly across Apple, Microsoft, Google, and Amazon

Return Computation

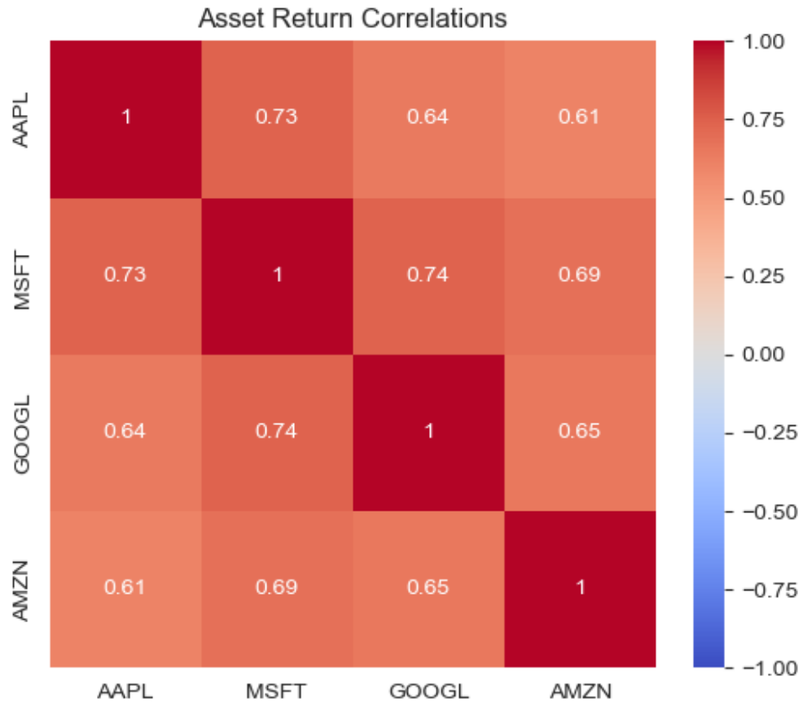
Calculate daily logarithmic returns for each stock to capture relative percentage changes accurately and stabilize variance

Statistical Summary

- Mean returns indicate average performance
- Variance, skewness, and kurtosis capture distribution characteristics


```
plt.figure(figsize=(10,4))
plt.plot(cum_port, label='Cumulative')
plt.fill_between(drawdown.index, cum_port,
rolling_max,
                 where=drawdown<0, color='red',
alpha=0.3)
plt.title('Portfolio Cumulative Return & Drawdown')
plt.legend()
plt.show()
```

Portfolio Risk Metrics



Portfolio Returns

Weighted sum of individual stock returns producing daily portfolio returns for risk measurement

1

2

3

Mean Return

Average portfolio return over the sampled period, reflecting expected gain

Standard Deviation

Portfolio volatility measuring risk magnitude and return variability

1-Day 95% VaR Calculation

VaR Definition

Quantifies the maximum expected loss at a 95% confidence level over one trading day

Assumptions

Portfolio returns assumed to follow a normal distribution for analytical VaR computation

Calculation Formula

VaR_{95} = Mean return − 1.645 × Standard deviation, where 1.645 is the z-score for 5% left-tail risk

Conclusion & Insights

Key Insight

Portfolio VaR effectively quantifies risk exposure and informs on potential losses

On most days, the portfolio is unlikely to lose more than **2.9% to 3.1%** of its value.

Diversification Benefit

Equal weighting across major tech stocks balances risk contributors and lowers idiosyncratic risk

Next Steps

Explore advanced VaR methods such as historical simulation and Monte Carlo to capture non-normality and tail risk more accurately

Summary & Actionable Takeaways

Data Integrity

Ensure thorough data collection and preprocessing for reliable risk calculations

Risk Measurement

Leverage VaR as a core metric but consider its limitations and regulatory requirements

Continuous Improvement

Regularly update portfolio data, refine models, and validate results with alternative risk metrics

Strategic Implementation

Incorporate findings into risk management frameworks to support informed decision-making and portfolio optimization