Comprehensive Financial Due Diligence Analysis

Tech Stock Portfolio

Author: AKSHAT KUMAR

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Abstract

This report presents a comprehensive financial due diligence analysis of a technology stock portfolio. It integrates technical indicators, fundamental ratios, valuation models, risk assessment, and portfolio optimization. Each financial term and model is defined and explained in detail to ensure clarity for readers unfamiliar with finance. The findings are supported by graphical evidence and are benchmarked against the S&P 500 to assess relative performance.

Chapter 1

Introduction

Financial due diligence is the systematic process of evaluating the health, risks, and opportunities of potential investments. This report analyzes a basket of technology stocks, explaining both financial concepts and their application in practice. The methodology includes:

- Collection of market and financial statement data.
- Exploration of return distributions and correlations.
- Technical and fundamental financial ratio analysis.
- Valuation models (Discounted Cash Flow and Multiples).
- Risk assessment using Beta, Volatility, and Value-at-Risk.
- Portfolio optimization via the Markowitz mean-variance framework.
- Machine learning augmentation for predictive insights.
- Performance benchmarking against the S&P 500.

Chapter 2

Data Extraction and Preprocessing

The first step in financial due diligence is gathering reliable data. For each stock, we collected:

- **Price Data:** Opening, closing, high, low, and adjusted close prices.
- **Volume Data:** Number of shares traded daily.
- **Financial Statements:** Income statement, balance sheet, and cash flow statement.
- **Benchmark:** Returns of the S&P 500 index.

The daily stock return is calculated as:

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}$$

where $R_{i,t}$ is the return of stock i at time t, and $P_{i,t}$ is the closing price. This formula captures the percentage change in price from one day to the next.

Preprocessing involved handling missing values, removing outliers, and aligning stock data with the market index.

Chapter 3

Exploratory Data Analysis

3.1 Return Distribution

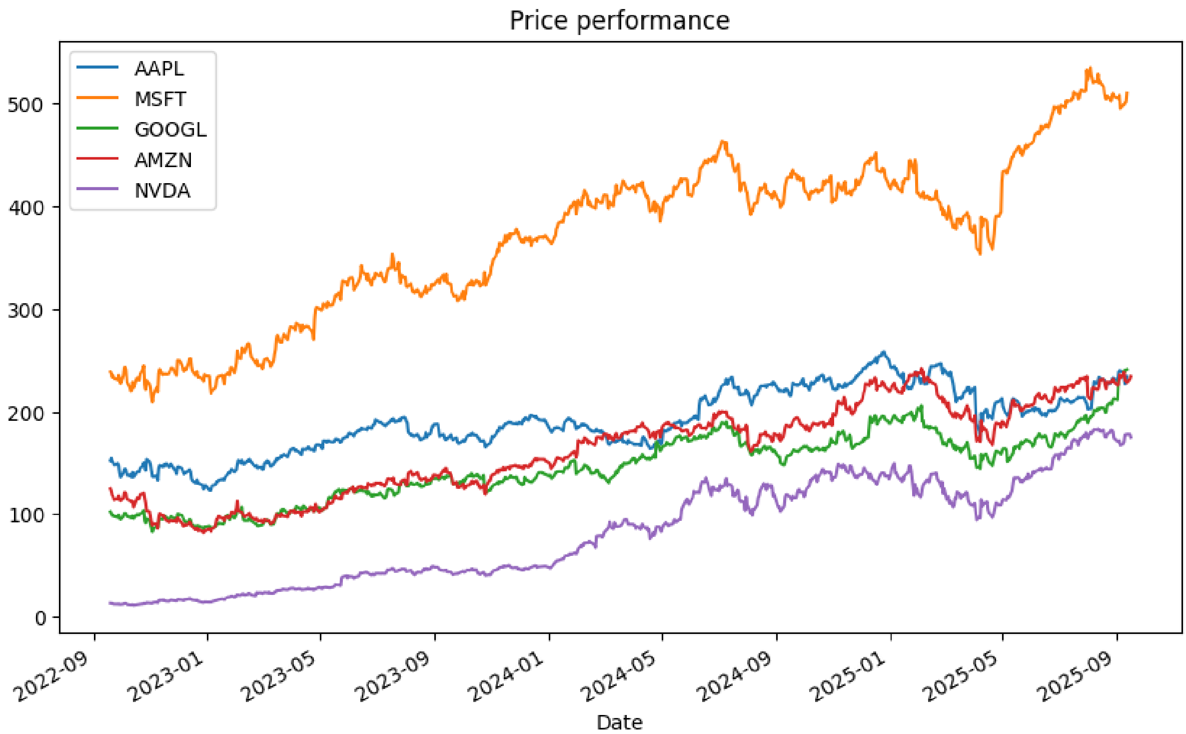

Figure 3.1: Distribution of daily returns for portfolio stocks.

The graph shows that daily stock returns are not normally distributed. The presence of **fat tails** (extreme spikes in probability) indicates that large losses or gains occur more often than expected under a normal distribution. This highlights higher risk in tech stocks compared to stable sectors.

3.2 Correlation Analysis

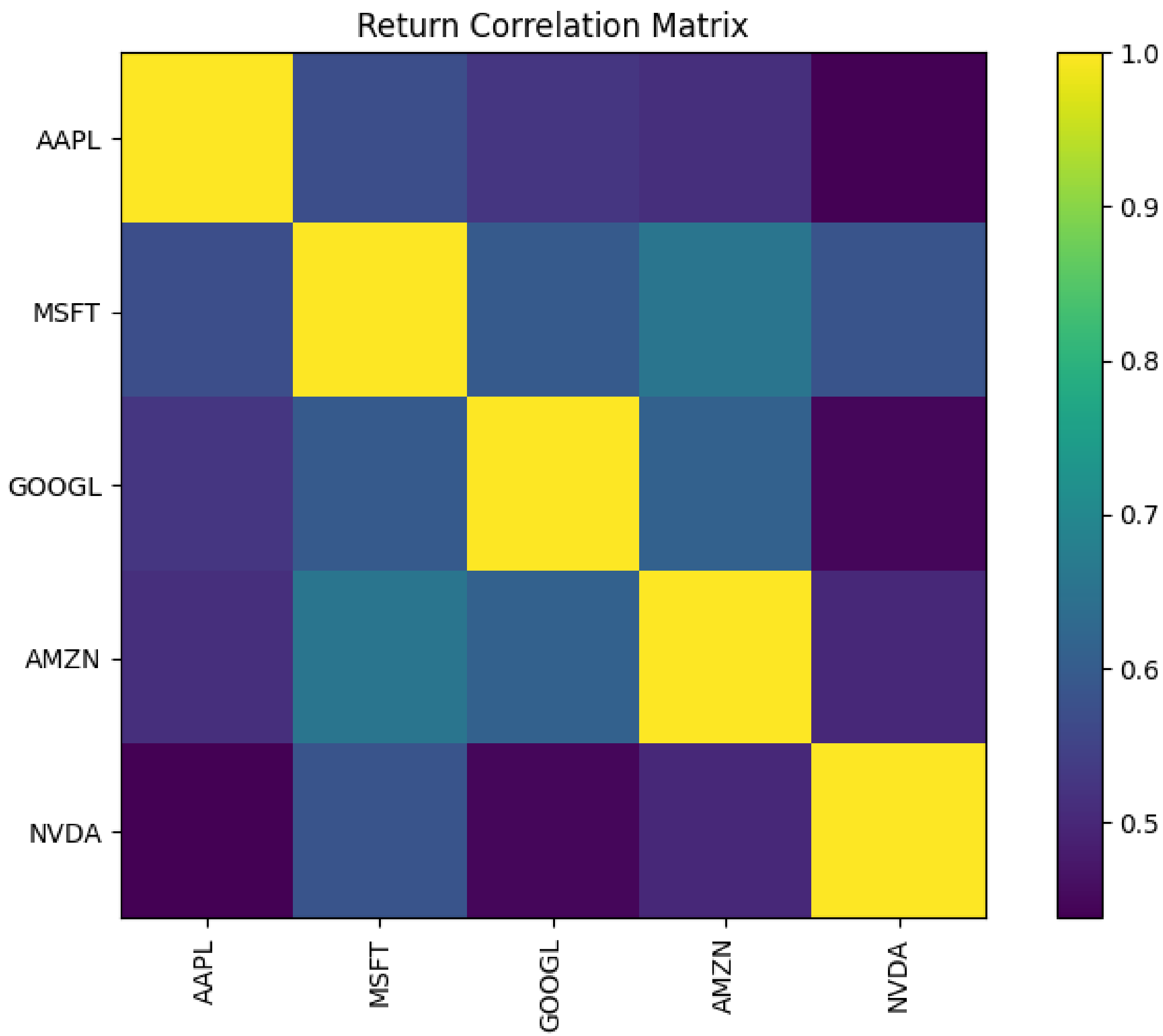

Figure 3.2: Correlation matrix of stock returns.

Correlation (ρ) measures how two stocks move together:

$$\rho_{ij} = \frac{\mathrm{Cov}(R_i, R_j)}{\sigma_i \sigma_j}$$

where σ_i and σ_j are standard deviations of returns. A value close to 1 means strong co-movement. Here, many technology stocks exhibit high correlations, meaning diversification benefits within the portfolio are limited.

Chapter 4

Technical and Fundamental Analysis

4.1 Technical Indicators

Technical indicators help assess price momentum and trends.

- **Simple Moving Average (SMA):**

$$SMA_t^{(n)} = \frac{1}{n}\sum_{k=0}^{n-1} P_{t-k}$$

  This smooths short-term fluctuations over n days.

- **Relative Strength Index (RSI):**

$$RSI = 100 - \frac{100}{1+RS}, \quad RS = \frac{\text{Avg Gain}}{\text{Avg Loss}}$$

  RSI values above 70 indicate overbought conditions; below 30 indicate oversold.

- **Bollinger Bands:**

$$BB_{upper} = SMA_t^{(n)} + k\sigma_t, \quad BB_{lower} = SMA_t^{(n)} - k\sigma_t$$

  They represent dynamic support and resistance levels around price.

4.2 Fundamental Ratios

- **Net Profit Margin:**

$$\text{NPM} = \frac{\text{Net Income}}{\text{Revenue}}$$

  Measures profitability after all expenses.

- **Debt-to-Equity Ratio:**

$$D/E = \frac{\text{Total Debt}}{\text{Shareholder Equity}}$$

Indicates leverage risk.

- **Return on Equity (ROE):**

$$ROE = \frac{\text{Net Income}}{\text{Equity}}$$

Shows how effectively equity generates profits.

	Market Cap	**Trailing PE**	**Price to Book**	**Debt to Equity**	**Return on Equity**	**Beta**	**Health Score**
GOOGL	3.038936e+12	26.804697	8.376747	11.481	0.34829	1.011	3.023055
AMZN	2.496120e+12	35.732822	7.475009	47.808	0.24770	1.309	1.262804
MSFT	3.783781e+12	37.319650	11.017228	32.661	0.33281	1.040	1.245514
NVDA	4.257804e+12	49.681820	42.518845	10.584	1.09417	2.102	-0.576686
AAPL	3.534241e+12	36.083332	53.746330	154.486	1.49814	1.109	-1.433577

Table 4.1: Financial Metrics and Computed Health Scores for Selected Tech Stocks

Chapter 5

Valuation Models

5.1 Discounted Cash Flow (DCF)

The intrinsic value of a stock is the present value of expected future cash flows:

$$V = \sum_{t=1}^{T} \frac{FCF_t}{(1+r)^t} + \frac{TV}{(1+r)^T}$$

where:

- FCF_t = Free Cash Flow at time t.
- r = Discount rate (WACC).
- TV = Terminal Value.

5.2 Relative Valuation

Valuation multiples such as Price-to-Earnings (P/E) and EV/EBITDA compare a firm's valuation with peers. For example:

$$P/E = \frac{\text{Price per Share}}{\text{Earnings per Share}}$$

Chapter 6

Risk Analysis

6.1 Definitions

- **Volatility (σ)**: Measures variability of returns. High volatility = higher risk.
- **Beta (β)**: Sensitivity of a stock to market returns.

$$\beta_i = \frac{\mathrm{Cov}(R_i, R_m)}{\mathrm{Var}(R_m)}$$

  A beta > 1 implies the stock is more volatile than the market.
- **Value-at-Risk (VaR)**: Maximum potential loss over a period at a given confidence.

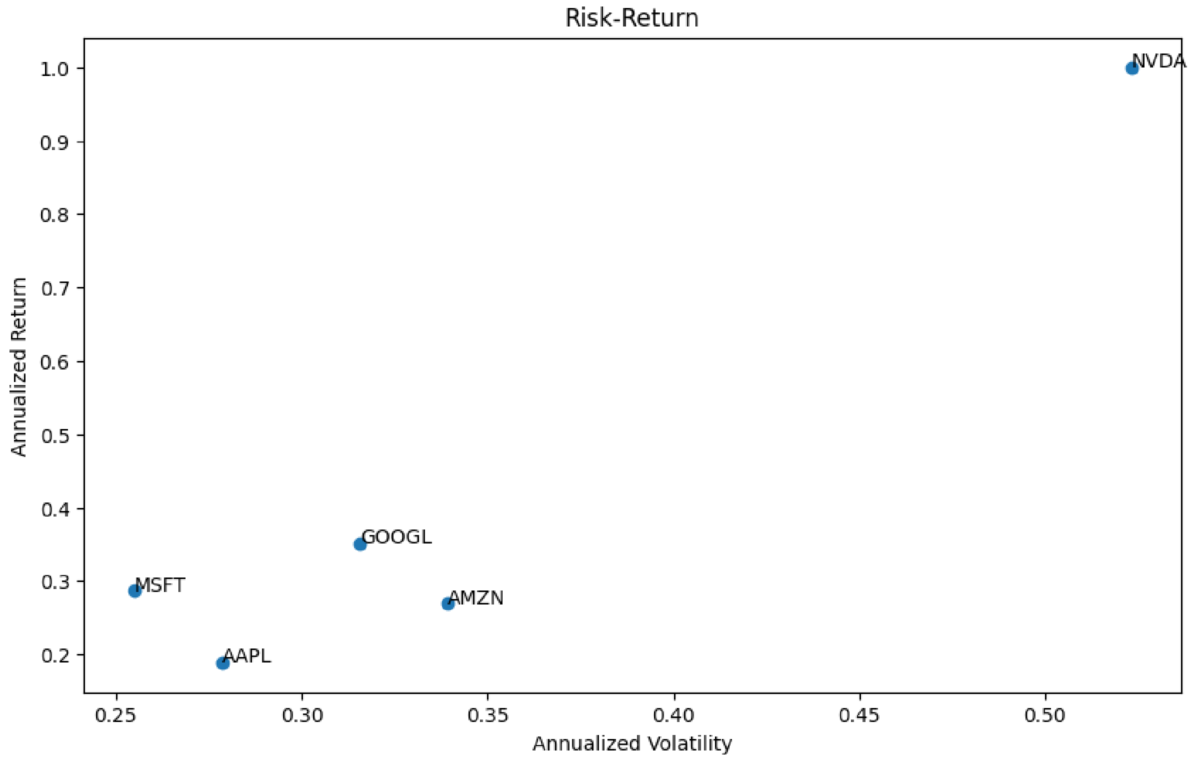

Figure 6.1: Volatility analysis of portfolio components.

Inference: The graph highlights that certain stocks exhibit significantly higher volatility, implying they dominate risk exposure in the portfolio.

Chapter 7

Portfolio Construction

Portfolio optimization follows the Markowitz mean-variance framework:

$$R_p = \sum_{i=1}^{n} w_i R_i, \quad \sigma_p^2 = \mathbf{w}^T \Sigma \mathbf{w}$$

where w_i are portfolio weights and Σ is the covariance matrix.

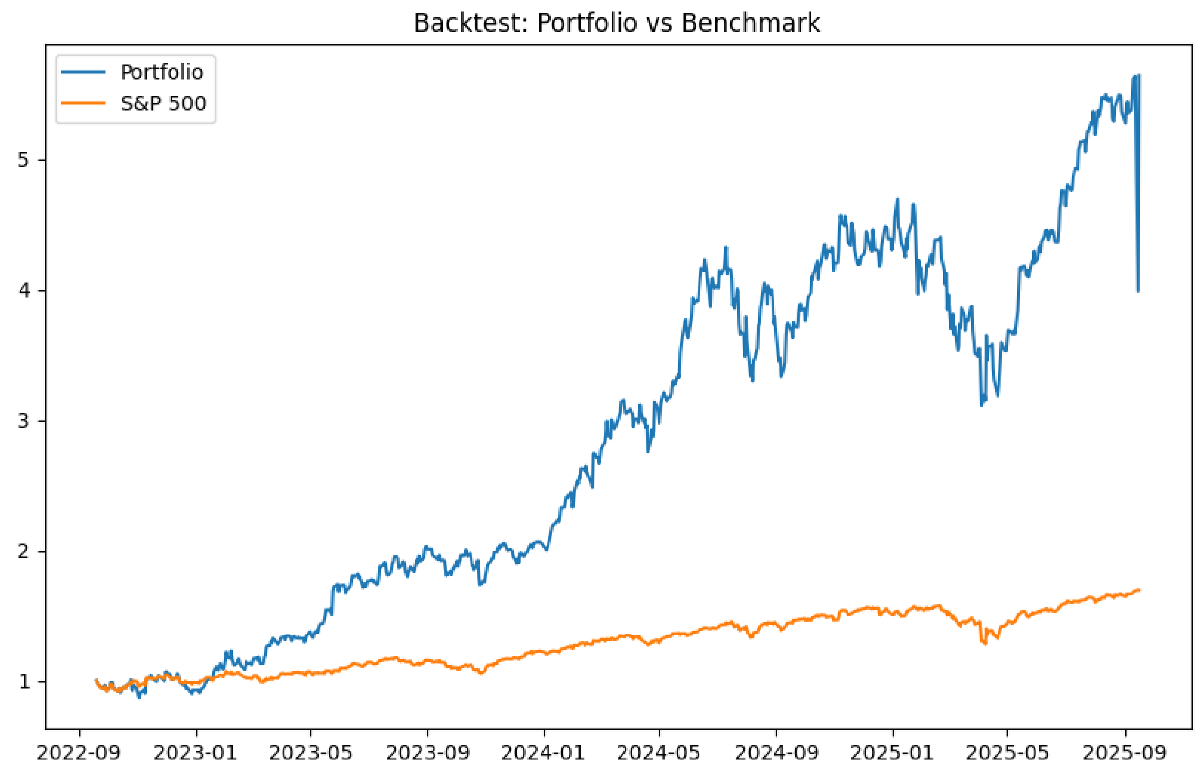

Figure 7.1: Efficient frontier of portfolio returns versus risk.

Inference: The efficient frontier shows combinations of stocks that maximize return for a given level of risk. Portfolios lying below the frontier are inefficient.

Chapter 8

Machine Learning Augmentation

Machine learning techniques such as regression and classification can be used to forecast stock returns. Input features include lagged returns, volatility indicators, and technical ratios. Output targets may be:

- Continuous returns (regression).
- Up/Down movements (classification).

Performance is evaluated using accuracy, precision, recall, and RMSE.

	Composite Score	**Recommendation**
GOOGL	3.327053	Buy
MSFT	0.194995	Hold
AMZN	-0.297915	Hold
AAPL	-1.425799	Hold
NVDA	-1.798334	Sell

Table 8.1: Composite Scores and Final Investment Recommendations

Chapter 9

Performance Benchmarking

Performance of the optimized portfolio is evaluated against the S&P 500 benchmark. Key risk-adjusted performance metrics are defined below:

- **Sharpe Ratio:**
$$S = \frac{R_p - R_f}{\sigma_p}$$
where R_p = portfolio return, R_f = risk-free rate, and σ_p = portfolio volatility. A higher Sharpe ratio implies better risk-adjusted performance.

- **Jensen's Alpha:**
$$\alpha_p = R_p - (R_f + \beta_p(R_m - R_f))$$
Measures abnormal excess return relative to the market. Positive values indicate superior performance after accounting for systematic risk.

- **Information Ratio:**
$$IR = \frac{R_p - R_b}{\sigma(R_p - R_b)}$$
where R_b = benchmark return. This metric evaluates the consistency of outperformance relative to the benchmark.

Metric	**Portfolio**	**Benchmark (S&P 500)**
CAGR (Compound Annual Growth Rate)	78.69%	19.35%
Sharpe Ratio	1.43	–
Maximum Drawdown	-33.76%	–

Table 9.1: Performance Benchmarking of Optimized Portfolio vs. S&P 500

Chapter 10

Conclusion

This due diligence study reveals that technology stocks exhibit both strong growth potential and elevated risk. Return distributions show fat tails, correlations reduce diversification, and volatility is significant. DCF and multiples suggest strong intrinsic value but valuations remain sensitive to assumptions. The efficient frontier demonstrates the benefits of portfolio optimization, though diversification is limited by correlation. Machine learning enhances forecasting but requires robust validation.

Overall, the portfolio is suitable for investors with higher risk tolerance seeking above-average returns.