# RiskOptimix

# Portfolio Analysis Report

## Financial Analysis with DCC (Dynamic Conditional Correlation)

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|---|---|
| **Analysis ID** | #469387 |
| **Report Date** | August 27, 2025 |
| **Analysis Period** | 2015-07-31 to 2025-08-27 |
| **Portfolio Value** | $22,852.25 |
| **Number of Holdings** | 8 |
| **Data Points Analyzed** | 2,532 |
| **Modeling Approach** | Dynamic Conditional Correlation |
| **Ensemble Models Used** | 107 |
| **Average Correlation** | 0.490 |

## Executive Highlights

• Portfolio generated 33.3% annualized return (Strong performance)

• Risk-adjusted performance: Good (Sharpe ratio: 1.14)

• Maximum drawdown: -45.4% (portfolio resilience measure)

• Diversification across 8 holdings

• Modeling forecasts 1.4% portfolio volatility

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# Executive Summary

This portfolio analysis report examines your investment portfolio containing 8 holdings with a total value of $22,852.25. Our analysis spans 10.0 years of market data, from 2015-07-31 to 2025-08-27, incorporating 2,532 data points to provide robust statistical insights.

## Key Performance Metrics

Your portfolio has achieved an **annualized return of 33.34%** with **volatility of 27.57%**. The Sharpe ratio of **1.14** indicates good risk-adjusted performance. The maximum drawdown of **-45.36%** demonstrates the portfolio's resilience during market downturns.

## Modeling Insights

Our DCC (Dynamic Conditional Correlation) analysis provides risk assessment capabilities. This approach uses ensemble GARCH modeling to capture volatility clustering and correlation dynamics in your portfolio. We used 107 validated models across your holdings to ensure robust forecasting. Our models forecast portfolio volatility of **1.36%** going forward. The average correlation of **0.490** indicates **good** diversification benefits.

## Risk Assessment

Risk analysis reveals that on 95% of trading days, your portfolio historically has not lost more than **-2.90%** of its value (Value at Risk). In extreme market conditions (99% confidence), the maximum expected daily loss is **-4.71%**. Your portfolio's beta of **1.29** indicates high sensitivity to market movements.

## Portfolio Highlights

Your top performing holding, **NVDA**, has generated **71.46%** annualized returns and represents **12.3%** of your portfolio value. Your portfolio maintains balanced position sizing across holdings.

## Strategic Insights

Based on our analysis, the data indicates: 1. Analysis shows potential for adding more diversified assets 2. High drawdown risk - consider risk management 3. Increase number of holdings for better diversification 4. Portfolio optimization analysis indicates potential improvements through rebalancing to enhance risk-adjusted returns.

# Portfolio Overview & Composition

Your portfolio consists of 8 individual stock holdings with a combined market value of $22,852.25. This analysis is based on 10.0 years of historical market data, providing a foundation for our statistical analysis and forecasting models.

## Detailed Holdings Breakdown

| Stock | Current Price | Market Value | Portfolio Weight | Annual Return | Volatility |
|---|---|---|---|---|---|
| AAPL | $229.31 | $5,000.00 | 21.9% | 25.56% | 29.37% |
| AMZN | $228.71 | $4,200.75 | 18.4% | 26.73% | 32.85% |
| GOOGL | $207.14 | $3,500.50 | 15.3% | 22.50% | 28.68% |
| NVDA | $181.77 | $2,800.00 | 12.3% | 71.46% | 49.98% |
| MSFT | $502.04 | $2,750.25 | 12.0% | 28.76% | 27.13% |
| META | $754.10 | $1,900.50 | 8.3% | 28.24% | 38.44% |
| TSLA | $351.67 | $1,500.00 | 6.6% | 47.16% | 59.16% |
| NFLX | $1226.09 | $1,200.25 | 5.3% | 32.94% | 42.75% |
| TOTAL PORTFOLIO | - | $22,852.25 | 100.0% | 33.34% | 27.57% |

## Portfolio Composition Analysis

**Concentration Analysis:** Your portfolio's largest holding represents 21.9% of total value, while the smallest represents 5.3%. The weight distribution standard deviation of 0.054 indicates low concentration levels. **Diversification Benefits:** With 8 holdings, your portfolio provides moderate diversification. The correlation structure between holdings (average correlation: 0.523) indicates moderate diversification effectiveness.

# Performance Analysis

This section provides an analysis of your portfolio's performance characteristics over the 10.0-year analysis period.

## Return Analysis

**Total Return:** Your portfolio generated a cumulative return of **1842.02%** over the analysis period, translating to an annualized return of **33.34%**. **Volatility Profile:** The portfolio exhibited an annualized volatility of **27.57%**, indicating high price fluctuations. **Daily Performance:** The best single-day return was **13.72%**, while the worst daily loss was **-12.61%**. This range demonstrates the portfolio's daily volatility characteristics.

## Risk-Adjusted Performance Metrics

| Metric | Value | Interpretation |
|---|---|---|
| Sharpe Ratio | 1.137 | good |
| Sortino Ratio | 1.494 | Downside risk-adjusted return |
| Calmar Ratio | 0.735 | Return vs maximum drawdown |
| Maximum Drawdown | -45.36% | Largest peak-to-trough decline |
| Beta | 1.287 | high |
| Value at Risk (95%) | -2.90% | 1-day loss not exceeded 95% of time |
| Value at Risk (99%) | -4.71% | 1-day loss not exceeded 99% of time |

## Performance Attribution

**Top Contributor:** NVDA was your best performing holding with 71.46% annualized returns, contributing significantly to overall portfolio performance with its 12.3% allocation. **Underperformer:** GOOGL was the weakest performer with 22.50% annualized returns. Its 15.3% weight limited the negative impact on overall portfolio returns. **Diversification Impact:** The range in individual stock performance (71.46% to 22.50%) demonstrates the importance of diversification in smoothing overall portfolio returns.

# Risk Analysis

Risk analysis is important to understanding your portfolio's potential for loss and volatility. This section examines multiple risk dimensions including market risk, concentration risk, and downside risk to provide a risk profile.

## Market Risk Assessment

**Systematic Risk (Beta):** Your portfolio's beta of **1.287** indicates high sensitivity to market movements. This means when the market moves 1%, your portfolio typically moves 1.3%. **Total Volatility:** The portfolio's annualized volatility of **27.57%** represents high risk levels compared to typical equity portfolios. **Correlation Structure:** The average correlation of **0.523** between holdings indicates moderate diversification benefits.

## Value at Risk (VaR) Analysis

Value at Risk quantifies the potential loss your portfolio might experience under normal market conditions: **95% Confidence VaR: -2.90%** - Historically, on 19 out of 20 trading days, your portfolio has not lost more than this percentage of its value. **99% Confidence VaR: -4.71%** - This represents the loss that has only been exceeded on 1 out of 100 trading days, indicating extreme market stress scenarios. **Dollar Impact:** Based on your current portfolio value of $22,852.25, the 95% VaR represents a potential daily loss of $662.43, while the 99% VaR indicates potential losses up to $1,076.24.

## Drawdown Analysis

**Maximum Drawdown:** Your portfolio experienced a maximum drawdown of **-45.36%** during the analysis period. This represents the largest peak-to-trough decline and indicates concerning resilience during market stress. **Recovery Implications:** A 45.4% drawdown requires a 8302.4% gain to fully recover. This metric is important for understanding the portfolio's ability to recover from adverse market conditions.

## Risk-Return Efficiency

**Sharpe Ratio Analysis:** Your portfolio's Sharpe ratio of **1.137** indicates good risk-adjusted performance. This metric measures excess return per unit of risk taken. **Sortino Ratio:** The Sortino ratio of **1.494** focuses specifically on downside risk, providing insight into how well the portfolio compensates for negative volatility. **Risk Budget Utilization:** Your portfolio generates 33.34% annual return for 27.57% volatility, indicating good risk budget utilization.

# Individual Stock Analysis

This section provides detailed analysis of each holding in your portfolio. We examine individual performance metrics, risk characteristics, and contribution to overall portfolio behavior. Understanding individual stock dynamics is important for making informed rebalancing decisions.

## Stock Metrics

| Stock | Weight | Value | Ann. Return | Volatility | Sharpe | Beta | Max DD |
|-------|--------|-------|-------------|------------|--------|------|--------|
| AAPL | 21.9% | $5,000 | 25.6% | 29.4% | 0.80 | 1.00 | -38.5% |
| AMZN | 18.4% | $4,201 | 26.7% | 32.9% | 0.75 | 1.00 | -56.1% |
| GOOGL | 15.3% | $3,500 | 22.5% | 28.7% | 0.71 | 1.00 | -44.3% |
| NVDA | 12.3% | $2,800 | 71.5% | 50.0% | 1.39 | 1.00 | -66.3% |
| MSFT | 12.0% | $2,750 | 28.8% | 27.1% | 0.99 | 1.00 | -37.1% |
| META | 8.3% | $1,900 | 28.2% | 38.4% | 0.68 | 1.00 | -76.7% |
| TSLA | 6.6% | $1,500 | 47.2% | 59.2% | 0.76 | 1.00 | -73.6% |
| NFLX | 5.3% | $1,200 | 32.9% | 42.7% | 0.72 | 1.00 | -75.9% |

## Individual Performance Analysis

**Top Performer:** NVDA leads with 71.46% annualized returns, representing 12.3% of portfolio value. **Underperformer:** GOOGL shows 22.50% returns, but its 15.3% allocation limits portfolio impact. **Risk Characteristics:** TSLA exhibits the highest volatility at 59.16%, while MSFT is most stable at 27.13%. **Risk-Adjusted Performance:** When analyzing risk-adjusted returns (Sharpe ratios), the performance ranking may differ from absolute returns, highlighting the importance of considering both return and risk in investment analysis.

## Correlation and Diversification Impact

The average correlation between your holdings is 0.523, indicating moderate diversification benefits. Lower correlations provide better risk reduction through diversification, while higher correlations indicate holdings tend to move together during market stress. **Diversification Effectiveness:** Your 8 holdings provide moderate diversification. The correlation structure indicates that during market downturns, your holdings will likely show moderate co-movement, offering reasonable diversification.

# Portfolio Optimization

Our optimization analysis uses mathematical models to identify the optimal portfolio allocation that minimizes risk for a given level of expected return. This section presents the optimization results and provides specific rebalancing analytical insights based on current market conditions and risk forecasts.

## Allocation Analysis

| Asset | Current Weight | Optimal Weight | Weight Change | Change Type |
|---|---|---|---|---|
| MSFT | 12.0% | 52.7% | +40.7% | Increase |
| AAPL | 21.9% | 3.3% | -18.5% | Decrease |
| AMZN | 18.4% | 0.0% | -18.4% | Decrease |
| GOOGL | 15.3% | 23.5% | +8.2% | Increase |
| META | 8.3% | 0.7% | -7.6% | Decrease |
| NVDA | 12.3% | 19.4% | +7.1% | Increase |
| TSLA | 6.6% | 0.3% | -6.2% | Decrease |
| NFLX | 5.3% | 0.0% | -5.3% | Decrease |

## Rebalancing Analysis

**Portfolio Turnover:** The optimization analysis indicates a total portfolio turnover of **56.0%**, representing the percentage of the portfolio that would need to be traded to achieve the optimal allocation. **Significant Changes:** 8 holdings require changes greater than 5%: • **AAPL**: reduce allocation by 18.5% • **GOOGL**: increase allocation by 8.2% • **MSFT**: increase allocation by 40.7% • **TSLA**: reduce allocation by 6.2% • **AMZN**: reduce allocation by 18.4% • **NVDA**: increase allocation by 7.1% • **META**: reduce allocation by 7.6% • **NFLX**: reduce allocation by 5.3%

## Risk Impact Analysis

**Volatility Optimization:** The optimized portfolio targets a volatility of **1.36%**, which represents the expected annual portfolio risk under current market conditions. **Risk Reduction Potential:** By implementing the indicated allocation changes, the portfolio analysis shows improved risk-return efficiency through better diversification and optimal position sizing based on current volatility forecasts. **Correlation Benefits:** The optimization analysis considers the correlation structure between holdings to maximize diversification benefits and minimize portfolio-level risk.

# DCC (Dynamic Conditional Correlation) Modeling Analysis

Dynamic Conditional Correlation (DCC) modeling provides a robust risk analysis. Unlike traditional approaches that assume constant correlations, DCC models capture how correlations between assets change over time, providing more accurate risk forecasts during volatile market periods.

## Modeling Summary

Our analysis used **107 validated models** across your 8 holdings. Each stock was analyzed using multiple GARCH specifications to ensure robust forecasting. Models were validated through backtesting and only the best-performing models were retained for portfolio-level analysis.

## Risk Forecasting Results

**Portfolio Volatility Forecast:** Our models predict portfolio volatility of **1.36%** going forward. This forecast incorporates current market conditions and the dynamic relationships between your holdings. **Optimization Status:** Portfolio optimization was successful. This allows for specific rebalancing insights based on the analysis.

## Individual Stock Modeling Results

| Stock | Models Used | Best Model (Weight) | Volatility Forecast |
|-------|-------------|---------------------|---------------------|
| AAPL | 2 | GARCH(1,2)_ged (50.0%) | 3.39% |
| GOOGL | 15 | EGARCH(2,1)_normal (7.8%) | 1.74% |
| MSFT | 20 | GARCH(2,1)_normal (8.1%) | 1.52% |
| TSLA | 16 | GARCH(1,2)_ged (12.0%) | 2.29% |
| AMZN | 18 | EGARCH(1,1)_ged (8.6%) | 38.72% |
| NVDA | 5 | GARCH(2,2)_ged (25.9%) | 2.11% |
| META | 20 | GARCH(1,1)_normal (9.1%) | 2.30% |
| NFLX | 11 | GARCH(2,2)_ged (10.2%) | 3.09% |

## Risk Metrics

**Correlation Analysis:** The average correlation between holdings is 0.490, providing insight into diversification effectiveness. **Model Quality:** Our ensemble approach ensures robust forecasts by combining multiple model specifications and validation techniques.

This reduces model risk and improves forecast reliability.

This reduces model risk and improves forecast reliability.

# Modeling Charts & Visualizations

This section presents visual representations of our modeling results. These charts provide insights into volatility forecasts, correlation dynamics, and model performance.

## Portfolio Cumulative Returns Evolution

This chart shows how your portfolio value has evolved over time, highlighting the cumulative impact of returns and major market events.



## Daily Returns Time Series Analysis

Daily return series analysis revealing volatility patterns, outliers, and the distribution of daily performance.

Daily Returns Time Series (DCC Analysis)
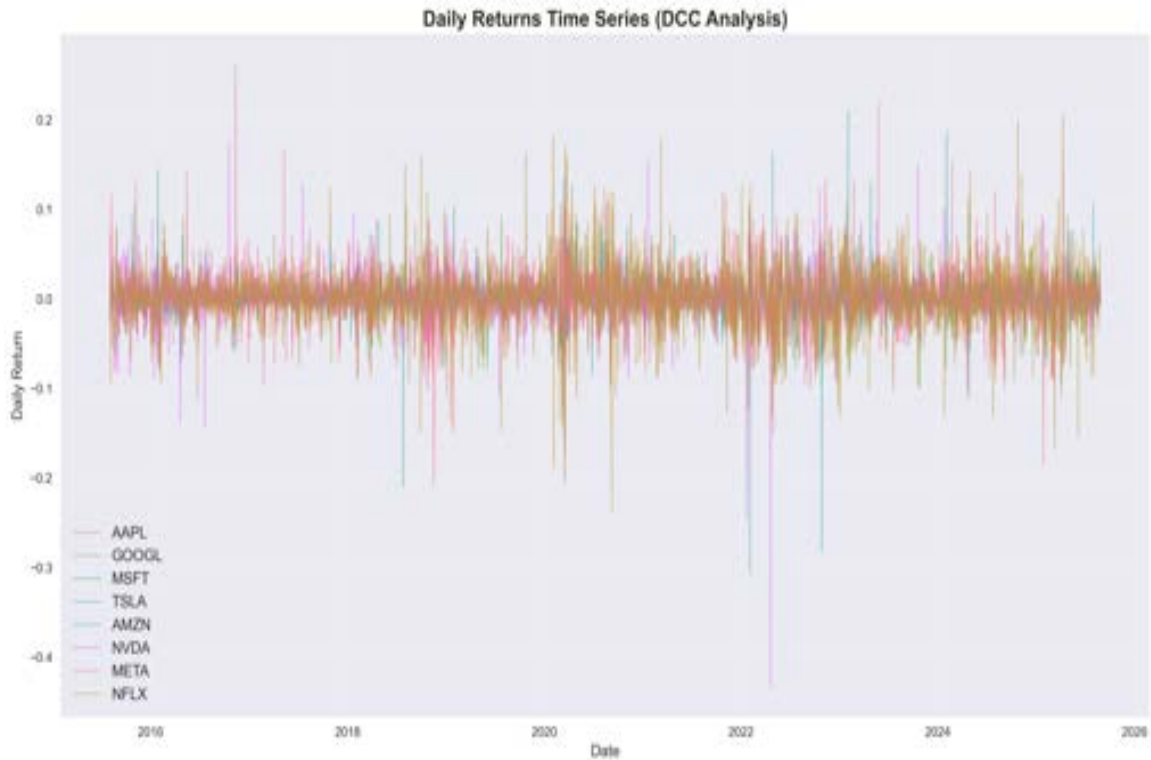
## Ensemble Conditional Volatilities

Conditional volatility forecasts from our ensemble GARCH models, showing how risk expectations change over time.



DCC Ensemble Conditional Volatilities
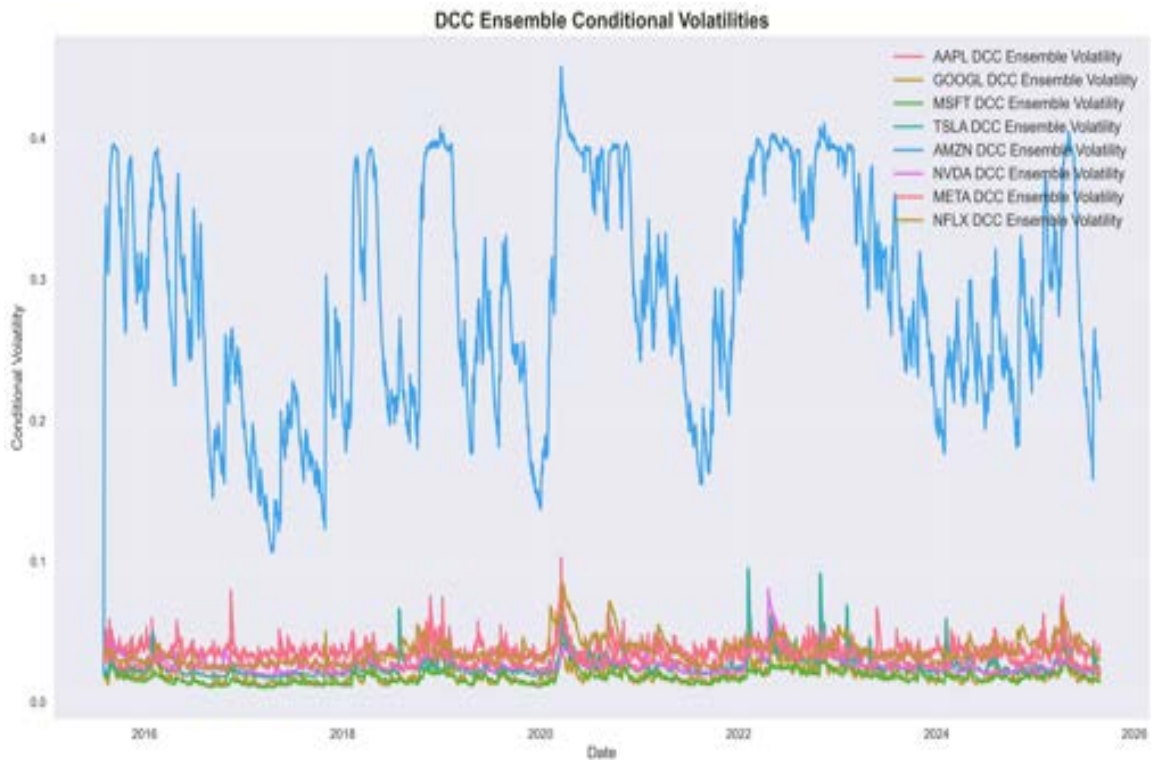
# Dynamic Correlation Evolution Over Time

Evolution of correlations between portfolio holdings, which can help with understanding how diversification benefits change during different market conditions.
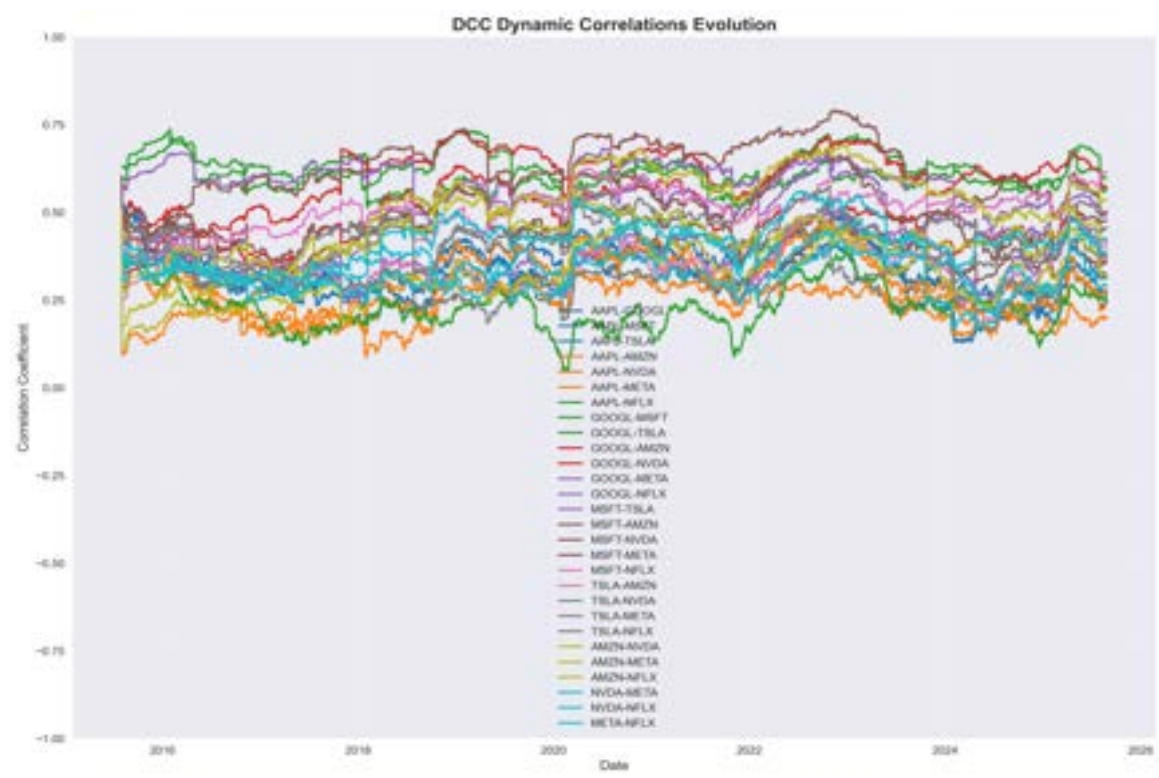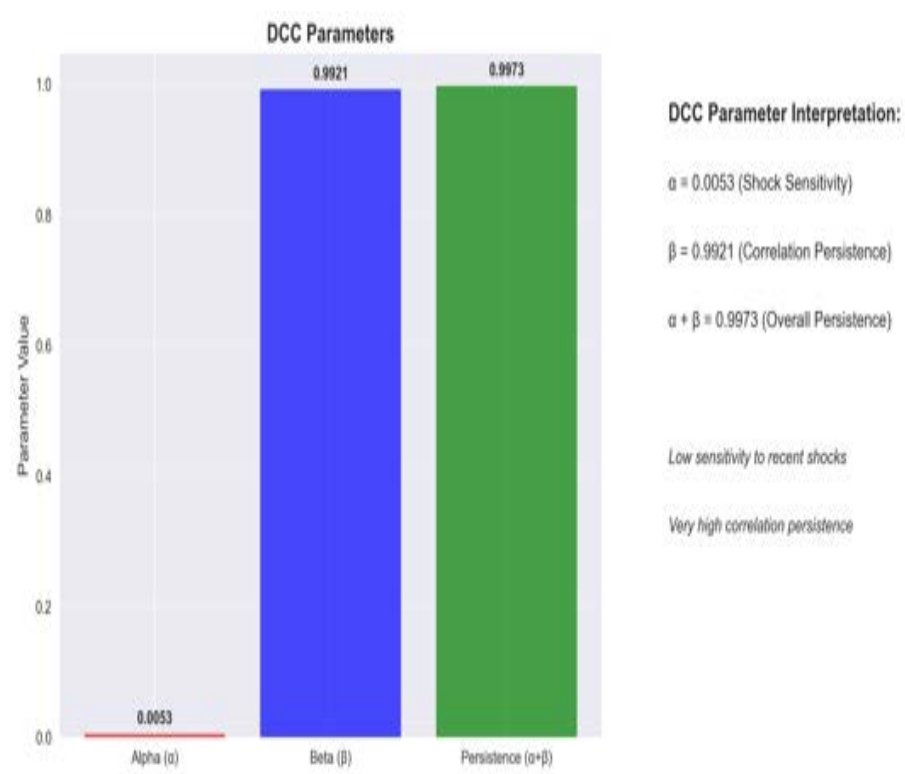


# Correlation Comparison Analysis

Comparison of correlation structures across different time periods and market regimes.

Unconditional Correlation Matrix / Final Period DCC Correlation Matrix
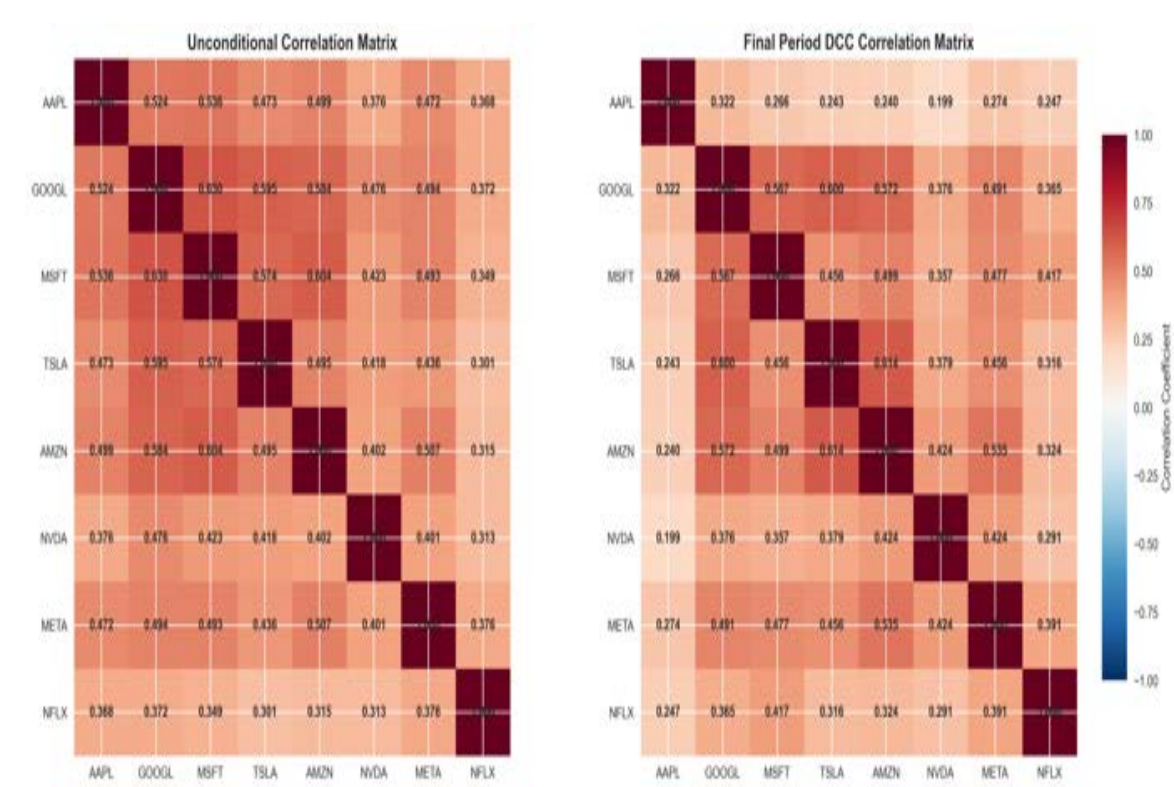
## DCC Model Parameters Evolution

Dynamic Conditional Correlation model parameters showing how quickly correlations respond to market shocks and their persistence.



**DCC Parameters**

**DCC Parameter Interpretation:**

α = 0.0053 (Shock Sensitivity)

β = 0.9921 (Correlation Persistence)

α + β = 0.9973 (Overall Persistence)

*Low sensitivity to recent shocks*

*Very high correlation persistence*

# Portfolio VaR Forecasts

Value at Risk forecasts at different confidence levels, providing forward-looking risk assessments.



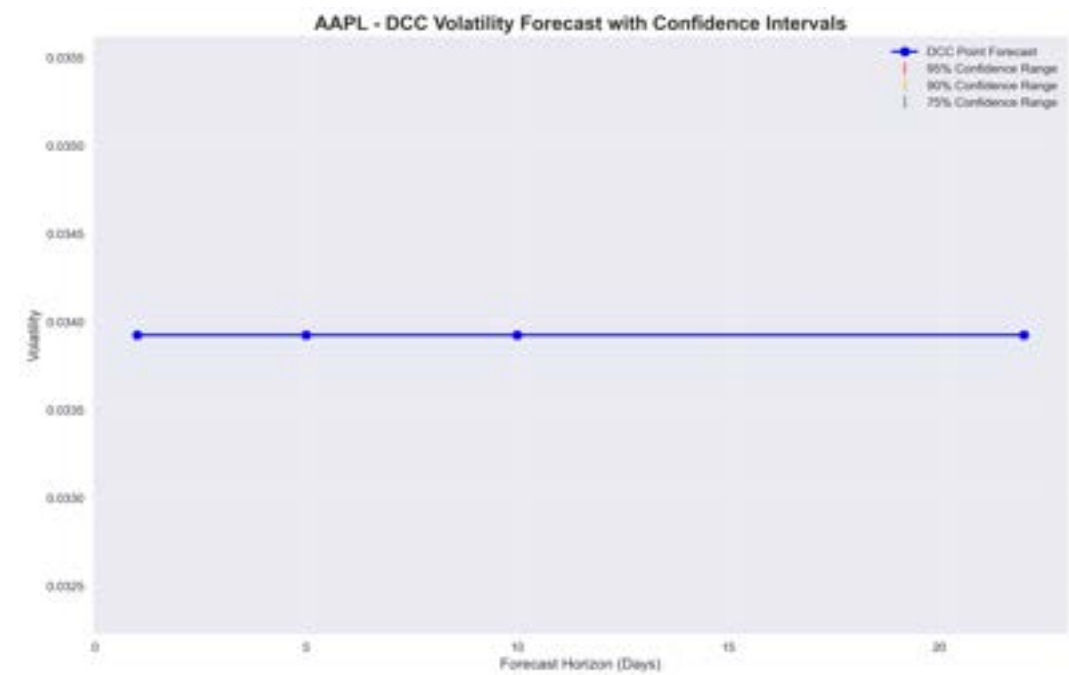Portfolio VaR Forecasts (DCC Model)
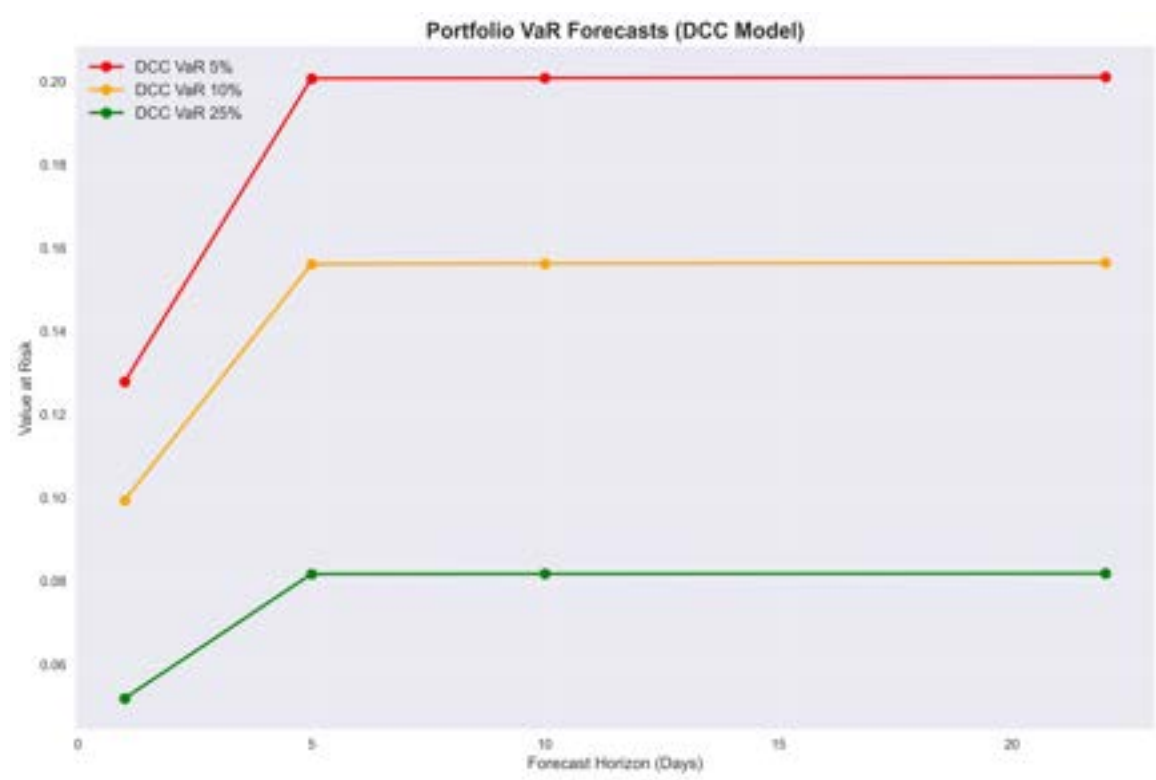
# Model Validation Summary

Model validation results showing backtesting performance and statistical adequacy of our ensemble approach.
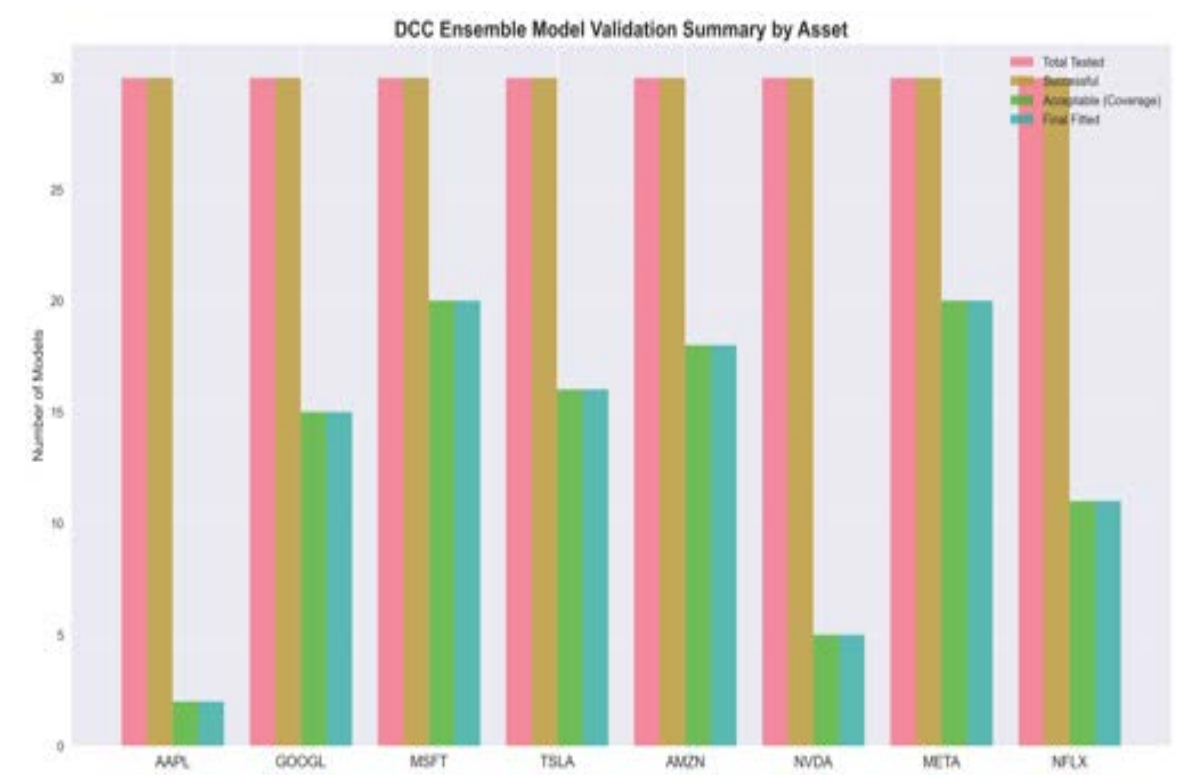
## Individual Stock Volatility Forecasts

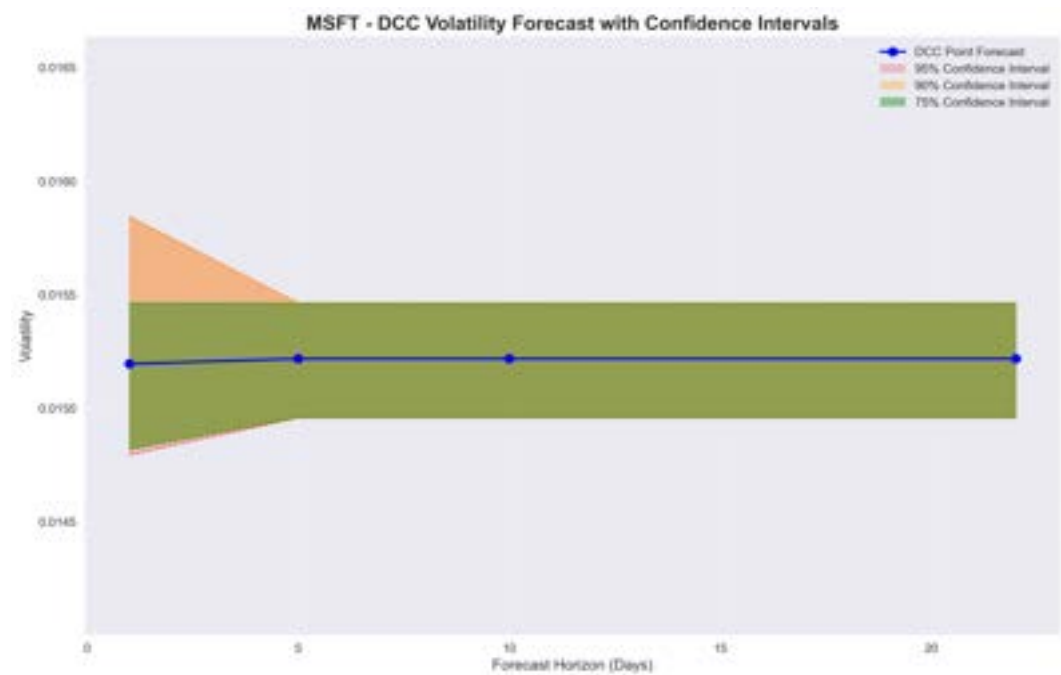Volatility forecasts for each stock in your portfolio, showing confidence intervals and model uncertainty.
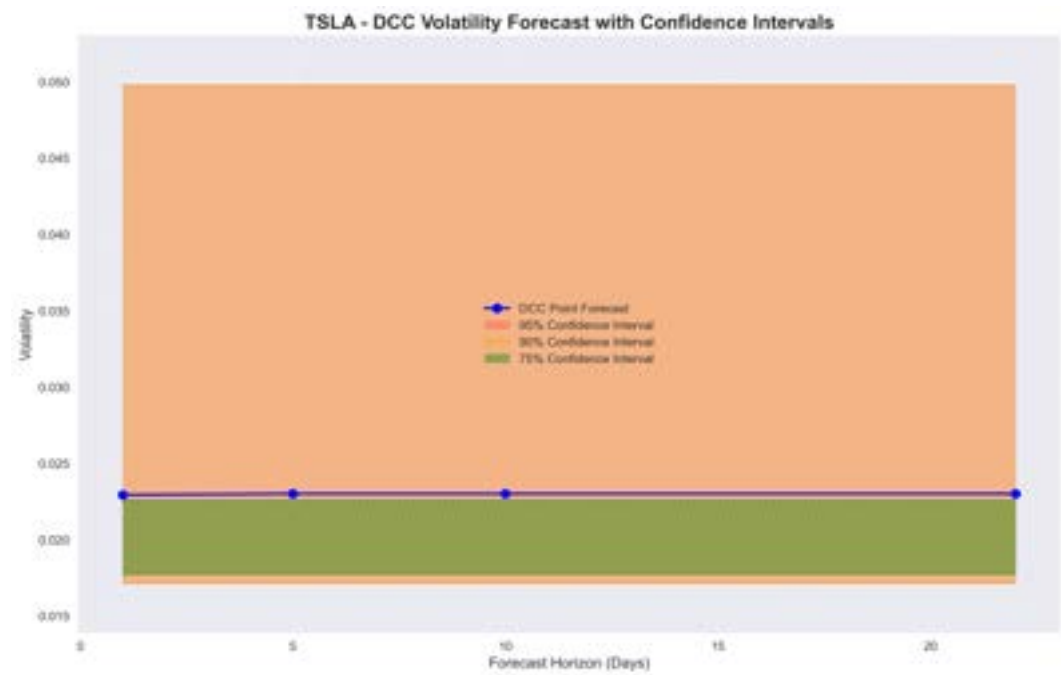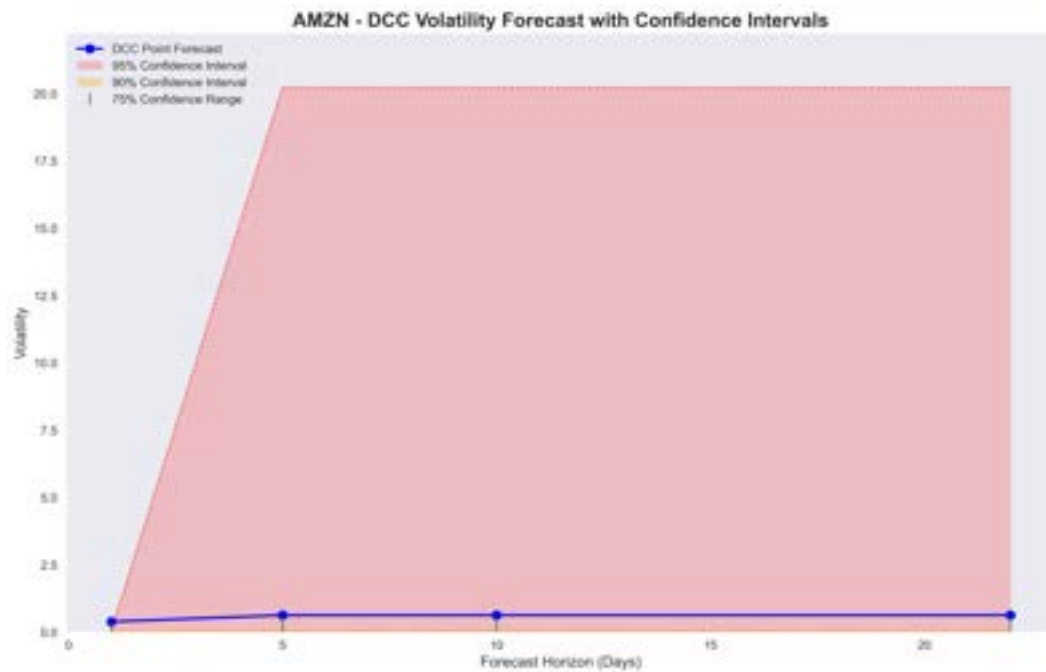
## AAPL - Volatility Forecast

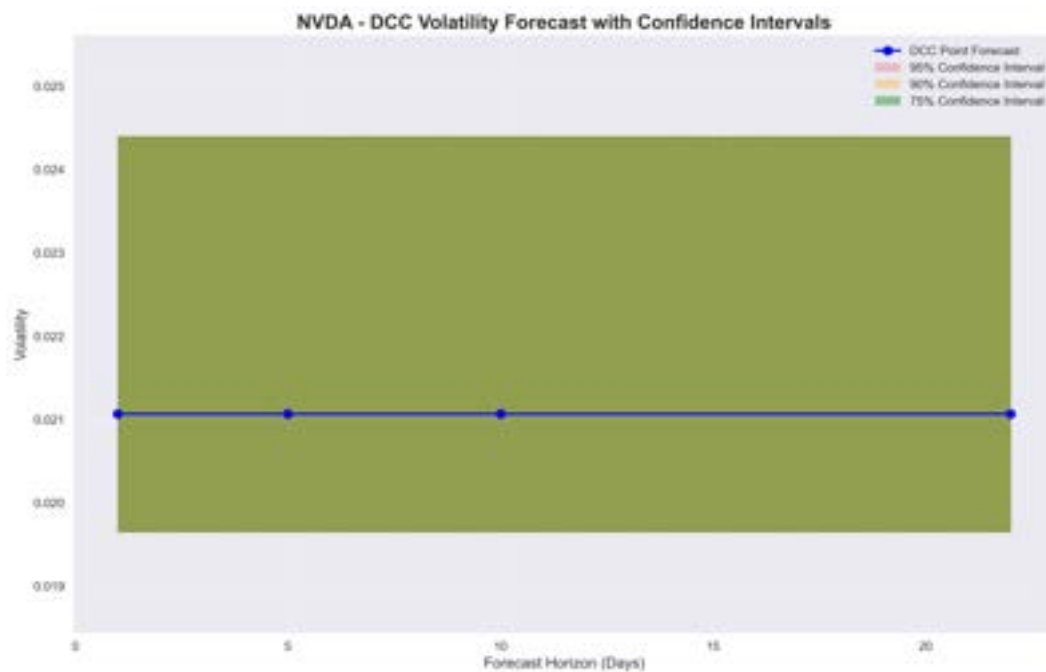## GOOGL - Volatility Forecast

## MSFT - Volatility Forecast



MSFT - DCC Volatility Forecast with Confidence Intervals

## TSLA - Volatility Forecast



TSLA - DCC Volatility Forecast with Confidence Intervals
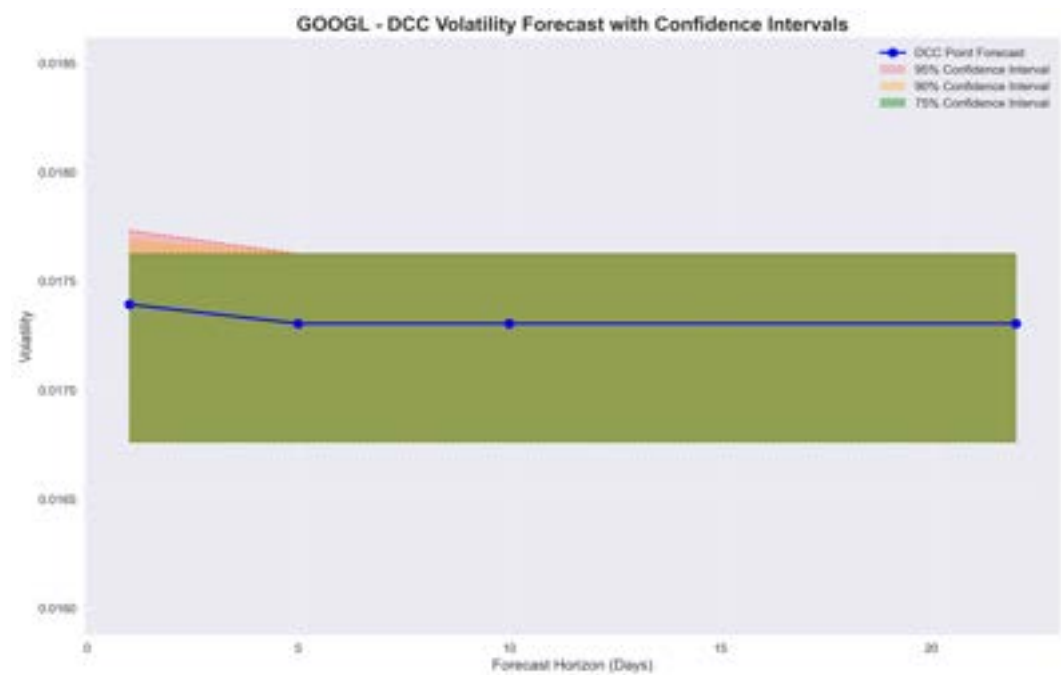
## AMZN - Volatility Forecast



## NVDA - Volatility Forecast

## META - Volatility Forecast


META - DCC Volatility Forecast with Confidence Intervals

## NFLX - Volatility Forecast


NFLX - DCC Volatility Forecast with Confidence Intervals

# Model Weights Analysis

Distribution of model weights in our ensemble approach, showing which models contribute most to forecasts.

## AAPL - Model Weights



## GOOGL - Model Weights



## MSFT - Model Weights

## TSLA - Model Weights



## AMZN - Model Weights

AMZN - DCC Ensemble Model Weights

## NVDA - Model Weights



NVDA - DCC Ensemble Model Weights

## META - Model Weights

META - DCC Ensemble Model Weights

## NFLX - Model Weights
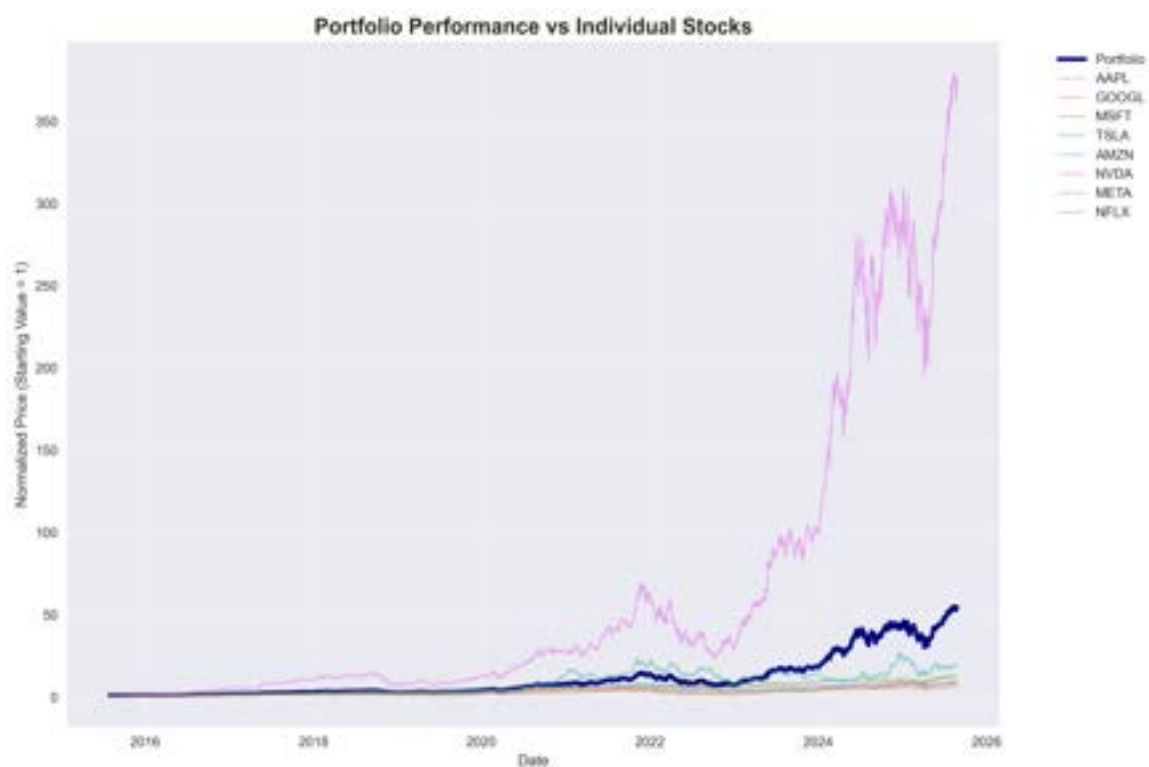


NFLX - DCC Ensemble Model Weights

# Charts & Visualizations

This section presents charts that illustrate your portfolio's performance, risk characteristics, and composition.

## Portfolio Performance Over Time

Shows portfolio value evolution over time, highlighting performance trends and major market events.



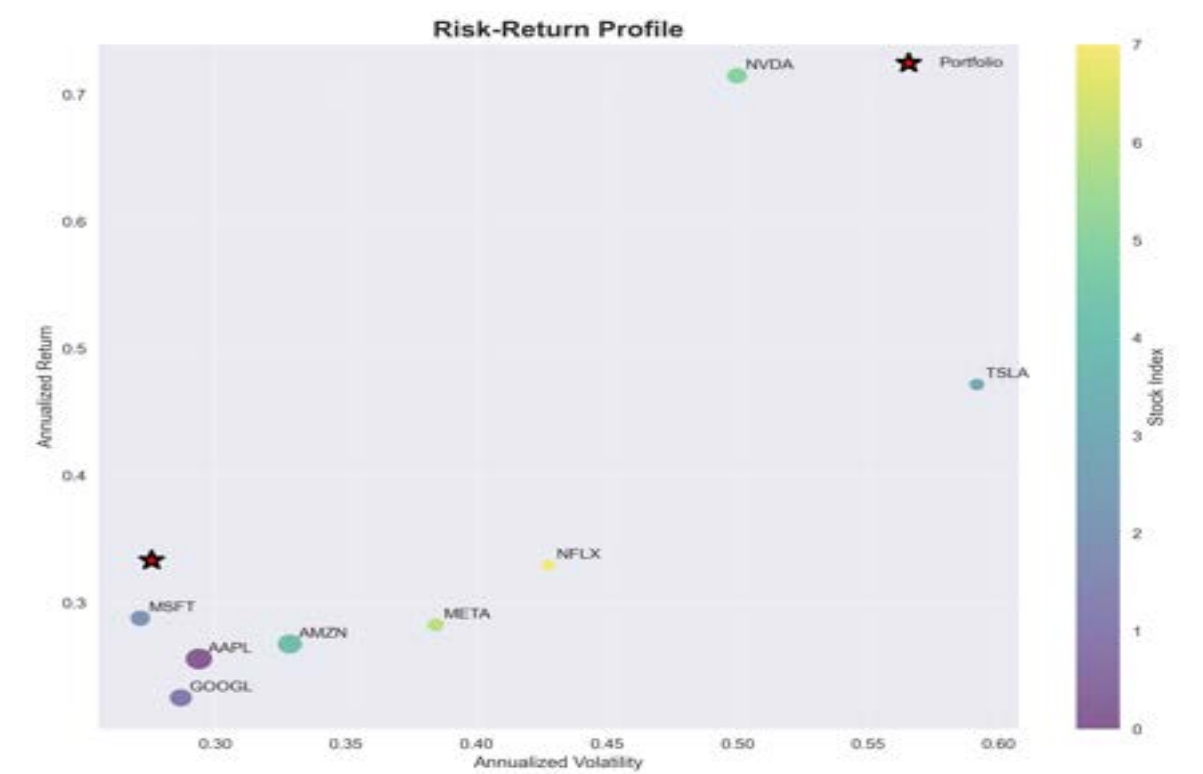Portfolio Performance vs Individual Stocks

## Returns Distribution Analysis

Displays the distribution of portfolio returns, revealing patterns in volatility and extreme events.
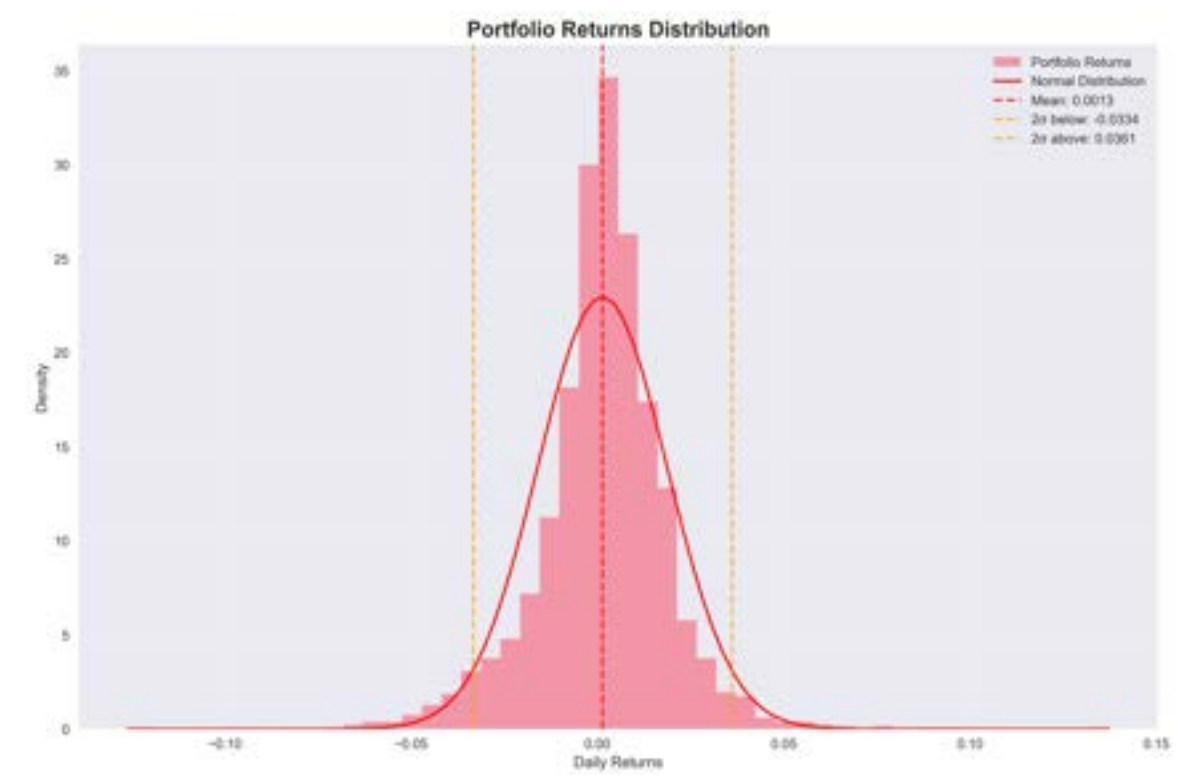
## Risk-Return Scatter Plot

Plots individual holdings by risk and return characteristics, identifying efficient and inefficient positions.

# Data-Driven Insights

Based on our analysis of your portfolio, including traditional financial metrics and modeling results, the following key insights emerge from the data.

## Strategic Portfolio Insights

### 1. Portfolio Optimization Analysis

Optimization analysis indicates potential improvements through rebalancing. The data shows specific allocation changes that could enhance portfolio efficiency.

**Data Significance: Medium | Potential Impact: Return Enhancement**

## Risk Management Insights

• Maximum drawdown analysis indicates historical exposure to significant declines; data suggests implementing risk controls could limit future drawdowns to 15-20%

# Methodology & Technical Notes

This section provides technical details about the methodologies used in this analysis. Understanding these approaches helps interpret results and assess the reliability of our conclusions and analytical findings.

## Data Sources and Processing

**Price Data:** Historical stock prices sourced from Yahoo Finance, providing market data including dividends and stock splits adjustments. **Return Calculation:** Returns calculated as logarithmic price changes to ensure statistical properties suitable for risk modeling and forecasting.

## Risk Metrics Methodology

**Value at Risk (VaR):** Calculated using the statistical approach with confidence levels of 95% and 99%. **Maximum Drawdown:** Computed as the largest peak-to-trough decline over the analysis period, providing insight into worst-case historical performance. **Sharpe Ratio:** Risk-adjusted return metric calculated as excess return divided by volatility, assuming a risk-free rate of 2% annually. **Beta Calculation:** Systematic risk measured against S&P; 500 index.

## Limitations and Assumptions

**Historical Data Dependency:** Analysis based on historical data which may not reflect future market conditions, especially during unprecedented market events. **Model Assumptions:** GARCH models assume certain statistical properties of returns that may not hold during extreme market stress or structural breaks. **Transaction Costs:** Analysis does not account for transaction costs, taxes, or market impact which may affect implementation feasibility. **Market Regime Changes:** Models may not capture sudden changes in market structure or regime shifts that could affect correlation and volatility patterns.

# Appendix

## Technical Analysis Details

| Parameter | Value |
|---|---|
| Analysis Period | 2015-07-31 to 2025-08-27 |
| Total Observations | 2,532 |
| Analysis Duration | 10.0 years |
| Risk-Free Rate Assumption | 2.0% |
| Confidence Levels (VaR) | 95%, 99% |
| Return Calculation Method | Logarithmic |
| Benchmark Index | S&P 500 |
| Advanced Models Used | 107 |
| Model Validation Method | Rolling Window Backtesting |
| Ensemble Approach | Multi-criteria Weighting |

## Glossary of Terms

**Alpha:** Excess return relative to benchmark after adjusting for systematic risk (beta)

**Beta:** Measure of systematic risk; sensitivity to market movements

**Calmar Ratio:** Risk-adjusted return metric using maximum drawdown as risk measure

**Correlation:** Statistical measure of how two assets move together (-1 to +1)

**Maximum Drawdown:** Largest peak-to-trough decline in portfolio value

**Sharpe Ratio:** Risk-adjusted return metric using volatility as risk measure

**Sortino Ratio:** Risk-adjusted return metric using downside volatility only

**Value at Risk (VaR):** Potential loss not exceeded with specified confidence level

**Volatility:** Statistical measure of price fluctuation (standard deviation of returns)

**DCC:** Dynamic Conditional Correlation - models time-varying correlations

**GARCH:** Generalized Autoregressive Conditional Heteroskedasticity model

**Ensemble Modeling:** Combining multiple models to improve forecast accuracy

## Report Information

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**Software:** RiskOptimix Portfolio Analysis Platform
**Contact:** For questions about this analysis, please contact riskoptimix@gmail.com or visit www.riskoptimix.com