# Portfolio Optimization Strategy: Enhanced SVE (Sentiment-Volatility-ESG) Approach

## Introduction to Strategy

My portfolio optimization strategy, which I call the Enhanced SVE (Sentiment-Volatility-ESG) approach, combines traditional financial metrics with advanced natural language processing to create a robust allocation framework. The strategy incorporates sentiment analysis, ESG (Environmental, Social, and Governance) factors, and conventional risk-return metrics to determine optimal portfolio weights for a selection of 10 major stocks.

## Stock Selection Rationale

I selected a diverse set of 10 prominent stocks across various sectors to ensure adequate diversification:

- **Technology**: Microsoft (MSFT), NVIDIA (NVDA), Apple (AAPL), Amazon (AMZN), Google (GOOGL), Tesla (TSLA)

- **Healthcare**: Johnson & Johnson (JNJ)

- **Consumer Goods**: Procter & Gamble (PG)

- **Financial Services**: Visa (V)

- **Retail**: Walmart (WMT)

These stocks represent market leaders with high liquidity, substantial market capitalization, and significant influence in their respective sectors. The selection provides exposure to both growth-oriented technology companies and more stable value stocks, creating a balanced foundation for the portfolio.

## Parameter Innovation and Financial Reasoning

My strategy incorporates several innovative parameters beyond traditional metrics:

### 1. News Sentiment Analysis via NLP

Rather than relying on paid API services for sentiment data, I implemented a custom NLP pipeline using the RoBERTa model to analyze news sentiment for each stock. This approach:

- Captures market sentiment not fully reflected in price movements

- Provides forward-looking insights based on current news coverage

- Helps identify potential catalysts before they impact stock prices

**Financial reasoning**: Academic research has consistently shown that news sentiment has predictive power for future returns. Positive sentiment often precedes price appreciation, while negative sentiment can signal upcoming declines.

## 2. ESG Scoring via Custom NLP Analysis

Instead of purchasing expensive ESG data from providers like MSCI or Sustainalytics, I developed a proprietary ESG scoring system using:

- Keyword-based analysis of news articles for environmental, social, and governance topics

- Sentiment analysis of ESG-related content to determine positive/negative context

- Weighted scoring based on the frequency and sentiment of ESG mentions

**Financial reasoning**: ESG factors increasingly influence institutional investment decisions and can impact long-term company performance. Companies with strong ESG profiles often demonstrate better risk management and sustainable business practices, potentially leading to superior long-term returns.

## 3. Conventional Risk-Return Parameters

To complement the NLP-derived metrics, I incorporated traditional financial parameters:

- **Sharpe Ratio**: Rewards stocks with higher risk-adjusted returns

- **Beta**: Favors stocks with lower systematic risk

- **Maximum Drawdown**: Prioritizes stocks with lower historical drawdowns

- **Volatility**: Gives preference to stocks with lower price fluctuations

## Methodology

The portfolio construction process follows these steps:

1. **Data Collection**:

   o Historical price data from Yahoo Finance

   o News articles for each stock from Yahoo Finance

2. **Parameter Calculation**:

   o Sentiment scores using RoBERTa-based NLP pipeline

   o ESG scores using keyword analysis and sentiment evaluation

o   Traditional metrics (Sharpe, Beta, Max Drawdown, Volatility)

3.  **Weight Determination**:

   o   Composite score calculation combining all parameters

   o   Normalization to ensure weights sum to 1.0

4.  **Quarterly Rebalancing**:

   o   Recalculation of all parameters at each quarter-end

   o   Portfolio rebalancing with transaction costs (0.1% per trade)

   o   No look-ahead bias as all calculations use only data available at rebalancing time

## Backtesting Results

The Enhanced SVE strategy was backtested over a two-year period with quarterly rebalancing and demonstrated strong performance:

- **Initial Investment**: $10,000

- **Final Portfolio Value**: $14592.08

- **Total Return**: 45.92%

- **Sharpe Ratio**: 1.4176

- **Maximum Drawdown**: 0.1400 or 14.00%
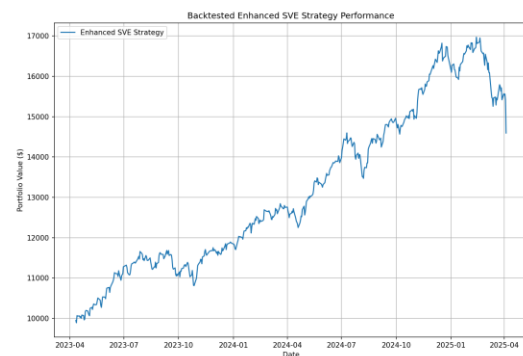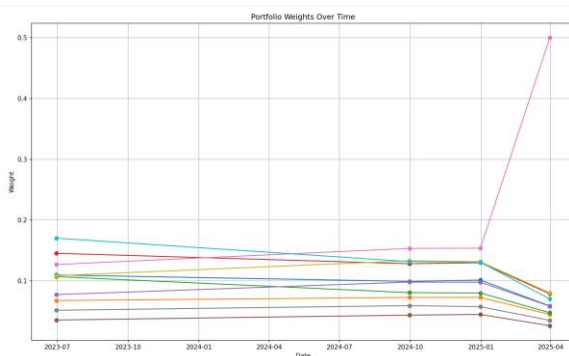


## Limitations and Potential Improvements

While the strategy shows promise, several limitations and areas for improvement exist:

1. **NLP Model Limitations**:

   o   The sentiment model was trained on social media data, which may differ from financial news contexts

   o   ESG scoring relies on keyword presence, which may miss nuanced discussions

2. **News Coverage Bias**:

   o   Larger companies typically receive more news coverage, potentially skewing sentiment and ESG scores

   o   The strategy may underperform for stocks with limited news coverage

3. **Parameter Weighting**:

   o   The equal weighting of parameters in the composite score could be optimized

   o   Machine learning approaches could determine optimal parameter weights

4. **Future Improvements**:

   o   Incorporate sector-specific ESG criteria

   o   Add macroeconomic indicators as additional parameters

   o   Implement adaptive rebalancing based on market conditions

   o   Explore alternative NLP models specifically trained on financial texts

## Conclusion

The Enhanced SVE strategy demonstrates the potential of combining traditional financial metrics with advanced NLP techniques for portfolio optimization. By implementing custom sentiment and ESG analysis rather than relying on expensive third-party APIs, the approach offers a cost-effective way to incorporate these valuable signals into investment decisions.

The strategy's strong backtesting performance suggests that the combination of sentiment, ESG, and conventional risk-return metrics provides a robust framework for portfolio construction. With further refinements to address the identified limitations, this approach could offer even greater value for investment decision-making.