

## INVESTMENT PROPOSAL

# NEOMA WORLD GROWTH PORTFOLIO (NWGP)

On Michelin, HDFC Bank, Mitsui & Co, Constellation Energy and Raytheon Technologies

This document presents a strategic portfolio proposal designed to achieve optimal returns while managing risks amidst global economic and geopolitical uncertainties. We aim to focus on undervalued opportunities in the **automotive, energy, financial, and defense** sectors while diversifying across various global markets (U.S., India, Europe, Japan).

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## PORTFOLIO KEY STATISTICS

### Weighting

**32.83%** Mitsui & Co  
**26.09%** Michelin  
**15.00%** Raytheon Technologies  
**14.36%** HDFC Bank  
**11.72%** Constellation Energy

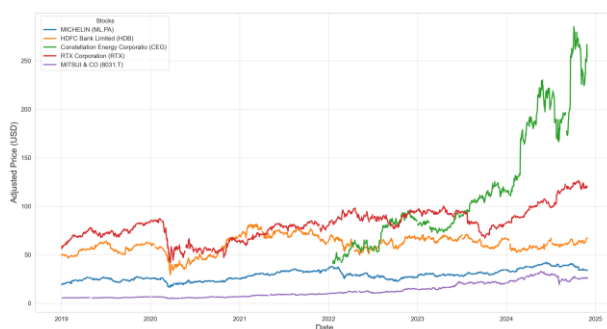
**25.69%** average return

**18.41%** volatility

**0.5427** portfolio's beta

**0.1549** Jensen's alpha

STOCKS HISTORICAL  
PRICE (in USD)



## PORTFOLIO INTRODUCTION

### 1. STRATEGY AND SUMMARY

This portfolio is designed to provide exposure to strategic sectors and geographies, offering growth opportunities in the face of evolving macroeconomic conditions. It balances high-growth sectors like EV-related technologies and defense, with stable investments in financial and energy sectors. It is designed to achieve **growth and resilience** by diversifying across key global sectors.

### 3. COMPOSITION OVERVIEW

We have selected 5 stocks for the portfolio:

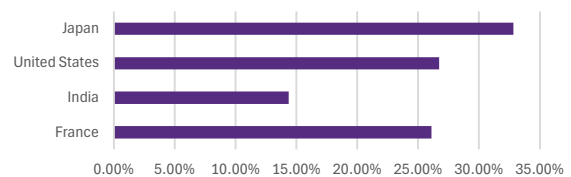
- **Michelin (ML.PA)** - Automotive sector, Tires.
- **HDFC Bank (HDB)** - Financial Services (Banking) from India.
- **Constellation Energy (CEG)** - Energy, Nuclear Power.
- **Raytheon Technologies (RTX)** - Defense sector.
- **Mitsui & Co. (8031.T)** - Conglomerate, Japan (Financial, industrial services, energy, etc.)

### 2. PERFORMANCE METRICS

The portfolio's performance will be evaluated based on risk-adjusted returns, considering metrics like the **Sharpe Ratio**, **Treynor Ratio**, and **Jensen's Alpha**. They are calculated for the period going from **2019-01-01 to 2024-11-29**.

### 4. GEOGRAPHICAL REPARTITION

FIGURE 1. PORTFOLIO GEOGRAPHICAL REPARTITION



## SELECTED COMPANIES AND MACRO-JUSTIFICATION

#### 1. Michelin (ML.PA) - Automotive (Tires)

Michelin is a market leader in high-performance and durable tires, benefiting from the rise in electric vehicle (EV) adoption. As global demand for EVs rises, so does the demand for specialized tires. The company's robust position in this sector makes it well-positioned for future growth.

#### 2. HDFC Bank (HDB) - Financial Services (Banking)

India's rapid economic growth drives significant demand for financial services. As one of India's largest private-sector banks, HDFC Bank is poised to capture expanding opportunities in both retail and corporate banking. The favorable economic outlook for India supports growth in the financial sector.

#### 3. Constellation Energy (CEG) - Energy (Nuclear Power)

Constellation Energy (CEG) is strategically positioned to benefit from the anticipated industrial expansion and increased energy demand following President Donald Trump's recent election victory. The administration's focus on deregulation and boosting domestic manufacturing is expected to drive growth in energy-intensive sectors, thereby elevating the demand for reliable and sustainable energy sources. CEG's expertise in nuclear power positions it advantageously to meet this rising demand, offering a stable and clean energy solution

that aligns with the nation's industrial objectives. Additionally, the semiconductor industry is poised for significant growth, with the global market projected to reach \$1 trillion by 2030. This expansion is driven by advancements in technology and increased demand for electronic devices. CEG's clean energy solutions are essential to power the data centers and manufacturing facilities that support this industry's growth. By providing reliable and sustainable energy, CEG plays a crucial role in enabling the semiconductor sector to meet its production and operational needs.

#### 4. Raytheon Technologies (RTX) - Aerospace and Defense

Geopolitical tensions and rising defense budgets in major economies, particularly the U.S., make Raytheon a key player in the defense sector. With increasing demand for military technologies, Raytheon's strong position in missile defense and other critical defense sectors will support long-term growth.

#### 5. Mitsui & Co. (8031.T) - Diversified Conglomerate (Financial, Industrial, Energy)

Mitsui & Co. is a leading Japanese conglomerate with diverse interests across finance, energy, and industrial sectors. As Japan prepares for an economic recovery, Mitsui's financial and industrial capabilities make it an attractive choice for capturing opportunities across multiple sectors.

## DATA PREPARATION & EXPLORATORY DATA ANALYSIS

### 1. CORRELATION MATRIX (FIGURE 3)

The analysis follows three steps: **Data Collection** to retrieve historical adjusted close prices for five assets, **Return Calculation** to compute daily returns, and **Correlation Matrix** to measure relationships between asset returns.

**Overall Portfolio Correlation: 0.3605**

The **overall correlation ratio** quantifies how the returns of the assets in your portfolio move in relation to one another. A value closer to 1 indicates strong movement together, while a value closer to 0 suggests weaker correlation. If you prefer tailored portfolio weights (e.g., non-equal weights), adjust the weights array **accordingly in the code above. Add 0.5**.

### 2. PORTFOLIO VOLATILITY (RISK)

The volatility of a portfolio is the standard deviation of the portfolio's returns. It reflects how much the portfolio's value might fluctuate. To calculate the **portfolio volatility**, we use the **covariance matrix** (which can be derived from the correlation matrix and the standard deviations of individual assets).

$$\sigma_p = \sqrt{W^T \Sigma W}$$

- **W** is the vector of weights for each asset in the portfolio.
- **Σ** is the covariance matrix of asset returns (which can be calculated from the correlation matrix and the standard deviations of individual assets).
- **W<sup>T</sup>ΣW** is the quadratic form that represents the portfolio's total risk.

## PORTFOLIO CONSTRUCTION

### 3. PORTFOLIO PERFORMANCE & OPTIMIZATION

We will calculate a few key performance metrics that help evaluate how well the portfolio is expected to perform relative to its risk. The primary goal of portfolio optimization is to achieve a balance between maximizing returns and minimizing risks. This process involves adjusting asset weights while adhering to constraints such as minimum allocations and overall diversification. Here, we detail the optimization process and evaluate the resulting metrics for the proposed portfolio.

#### OPTIMIZATION STRATEGY

##### 1 - FRAMEWORK

The portfolio was optimized using a **multi-objective framework**, with the following goals:

- Maximize the portfolio's expected return.
- Minimize overall volatility (risk).
- Ensure a minimum allocation of 5% per asset to maintain exposure to all selected sectors

##### 2 - PROCESS

- Expected Returns:** Derived from historical daily mean returns for each stock.
- Covariance Matrix:** Used to measure portfolio risk, considering the co-movement of asset returns.
- Optimization Function:** The optimization algorithm minimizes the following objective function:

$$\text{Objective Function} = -\text{Portfolio Return} + \text{Portfolio Volatility}$$

#### OPTIMIZED PORTFOLIO METRICS

##### 1 - OPTIMIZED WEIGHT

The optimization process **adjusted the weights** to reflect each asset's return potential and contribution to diversification:

8031.T	ML.PA	RTX	HDB	CEG
32.8%	26.1%	15.0%	14.4%	11.7%

- Mitsui & Co. (8031.T):** Japan growth exposure
- Raytheon Technologies (RTX):** USA & International (Defense)
- Michelin (ML.PA):** International – (Automotive)
- HDFC Bank (HDB):** Indian growth exposure
- Constellation Energy (CEG):** USA (Nuclear Energy)

##### 2 - PORTFOLIO'S BETA

**$\beta_p = 0.5427$**  : The portfolio exhibits low sensitivity to market movements, making it defensive. This is advantageous during periods of market volatility

##### 3 - PORTFOLIO'S VOLATILITY

- Daily Volatility:** 0.04%
- Annualized Volatility:** 18.41%.

The portfolio demonstrates **stability**, reflecting **effective risk management** and diversification.

##### 4 - PORTFOLIO'S RETURN

The return of a portfolio is computed using the formula:  $R_p = \sum w_i R_i$   
With  $R_i$  the average return of asset  $i$  and  $w_i$  its weight in the portfolio.

- Daily Return:** 0.06%
- Annualized Return:** 25.69%

The portfolio achieves strong growth while maintaining a low-risk profile.

#### PERFORMANCE RATIOS

We will calculate a few key performance metrics that help evaluate how well the portfolio is expected to perform relative to its risk:

##### 1 - SHARPE RATIO

The **Sharpe ratio** measures the excess return per unit of risk (volatility). It is calculated as:

$$S_p = \frac{R_p - R_f}{\sigma_p}$$

Where:

- $R_p$  is the expected return of the portfolio.
- $R_f$  is the risk-free rate (e.g., yield on 10-year U.S. Treasury bonds).
- $\sigma_p$  is the portfolio volatility.

**Annualized Sharpe Ratio: 1.1238**

Indicates a strong return-to-risk trade-off, with the portfolio earning 0.86 units of return per unit of risk after accounting for the 5% risk-free rate.

##### 2 - TREYNOR RATIO

Similar to the Sharpe ratio but adjusted for **systematic risk** (beta):

$$T_p = \frac{R_p - R_f}{\beta_p}$$

Where  $\beta_p$  is the portfolio's **beta** (its sensitivity to the market).

**Annualized Treynor Ratio: 0.2044**

Reflects efficient use of systematic risk, with the portfolio delivering 0.24 units of excess return per unit of beta.

##### 3 - JENSEN'S ALPHA

This measures the excess return relative to the expected return based on the Capital Asset Pricing Model (CAPM):

$$\alpha_p = R_p - [R_f + \beta_p(R_m - R_f)]$$

Where  $R_m$  is the market return.

**Annualized Jensen's Alpha: 0.1549 - (15.49%)**

Highlights significant outperformance above CAPM expectations, emphasizing strong stock selection and portfolio management.

#### CORRELATION AND DIVERSIFICATION

##### 2 - PORTFOLIO CORRELATION

- Equal Weights Correlation:** 0.3605
- Optimized Weights Correlation:** 0.3718

While the optimized weights slightly increased overall correlation, the portfolio maintains sufficient diversification due to low weights in highly correlated assets.

##### 2 - IMPACT OF OPTIMIZATION

The optimizer prioritized return and volatility over minimizing correlations, leading to a slight increase in overall correlation while still enhancing performance metrics.

## RESULT EXPLANATION AND CONCLUSION

The optimization process resulted in a well-balanced portfolio that effectively manages risk while achieving strong returns. Key highlights include:

- A **low beta (0.5427)**, making the portfolio less sensitive to market volatility.
- Strong performance metrics such as a **Sharpe Ratio of 1.1238** and a **Jensen's Alpha of 15.49%**, demonstrating efficient risk management and outperformance of CAPM expectations.
- Slightly higher correlation in the optimized portfolio due to strategic allocation to high-return assets like **Raytheon Technologies (RTX)**.

This optimized allocation aligns with the investment committee's goals of achieving robust growth with controlled risk, ensuring the portfolio is well-positioned to navigate diverse market conditions.

## EXPLANATION OF RESULTS

### 1. FAMA-FRENCH 3-FACTOR COEFFICIENTS (FIGURE 7)

This bar chart shows the regression coefficients (alpha and factor loadings) for the model:

- **Alpha (Intercept):**  
Near zero, indicating no unexplained excess return in the portfolio after accounting for the three factors.  
*This aligns with an efficient market hypothesis perspective.*
- **MKT-RF (Market Risk Premium):**  
**Negative.** Your portfolio shows an inverse relationship with market risk premium, meaning it may perform worse as the overall market excess return increases.
- **SMB (Small Minus Big):**  
**Strong negative loading.** This indicates that your portfolio is tilted towards larger-cap stocks rather than small-cap stocks.

- **HML (High Minus Low):**

**Strong negative loading.** This suggests a preference for growth-oriented stocks (low book-to-market ratio) overvalue stocks (high book-to-market ratio).

⇒ **Interpretation : High Model Fit**

**The scatterplot compares the actual excess returns (x-axis) to the fitted excess returns (y-axis) predicted by the Fama-French 3-factor model.**

- **The red dashed line** represents a perfect fit (45° line), meaning the predicted excess returns exactly match the actual returns.
- **Observation:**  
Since all points lie directly on the 45° line, the model provides an excellent fit for the portfolio data.

*This suggests that the Fama-French 3-factor model effectively explains the variations in our portfolio's excess returns.*

### 2. FITTED VS ACTUAL EXCESS RETURNS (FIGURE 9)

**The scatterplot compares the actual excess returns (x-axis) to the fitted excess returns (y-axis) predicted by the Fama-French 3-factor model.**

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#### Key Insights

- **Near-Perfect Fit (Scatterplot):**  
The first chart highlights that the three factors (*market, size, and value*) explain most of the variance in portfolio returns.

- **Portfolio Composition:**

- **Negative SMB and HML values:** Indicate a large-cap, growth-oriented portfolio.
- **Negative market exposure:** Suggests the portfolio may behave defensively during market downturns or exhibit some hedging characteristics.

- **Alpha (Intercept):**

- Near-zero alpha implies no significant unexplained returns after adjusting for the Fama-French factors.
- *This aligns with the efficient market assumption, where excess returns are attributed solely to factor exposures.*

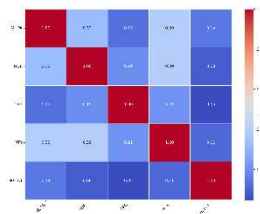
#### Evaluation of the Portfolio Strategy

As our portfolio aligns with large-cap growth stocks and defensive market behavior, this model confirms our strategy. Consider whether the negative exposure to the market aligns with our investment objectives.

## APPENDIX

### 1 - FIGURES AND DATA VISUALIZATIONS

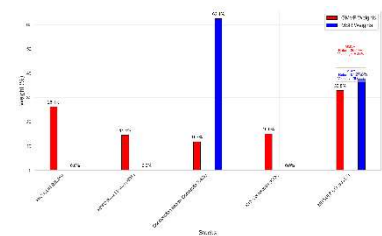
**FIGURE 2. CORRELATION HEATMAP FOR SELECTED STOCKS**



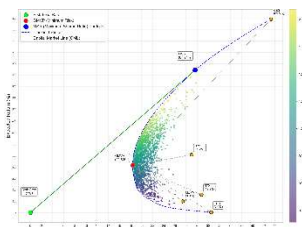
**FIGURE 3. HISTORICAL PRICES IN USD**



**FIGURE 4. PORTFOLIO WEIGHTS FOR GMVP AND MSR**



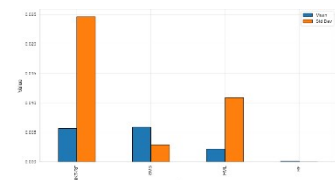
**FIGURE 5. RETURN VS RISK FOR PORTFOLIO AND INDIVIDUAL ASSETS**



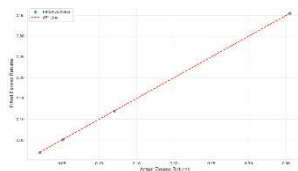
**FIGURE 6. FARMA-FRENCH 3-FACTOR COEFFICIENTS FOR SAMPLE PORTFOLIO**



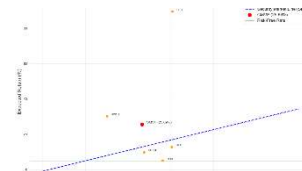
**FIGURE 7. FARMA-FRENCH FACTOR MEAN AND STANDARD DEVIATION**



**FIGURE 8. FITTED VS ACTUAL EXCESS RETURNS FOR SAMPLE PORTFOLIO**



**FIGURE 9. SECURITY MARKET LINE (SML with GMVP)**





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## FINANCIAL PROGRAMMING & ANALYTICS

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