Executive Report

To: Chief Financial Officer (CFO), Investment Corporation of Dubai (ICD)
From: Zeba Farzana
Date: 2nd September 2025
Subject: Strategic Asset Allocation for the ICD's US-Focused Satellite Portfolio

Introduction

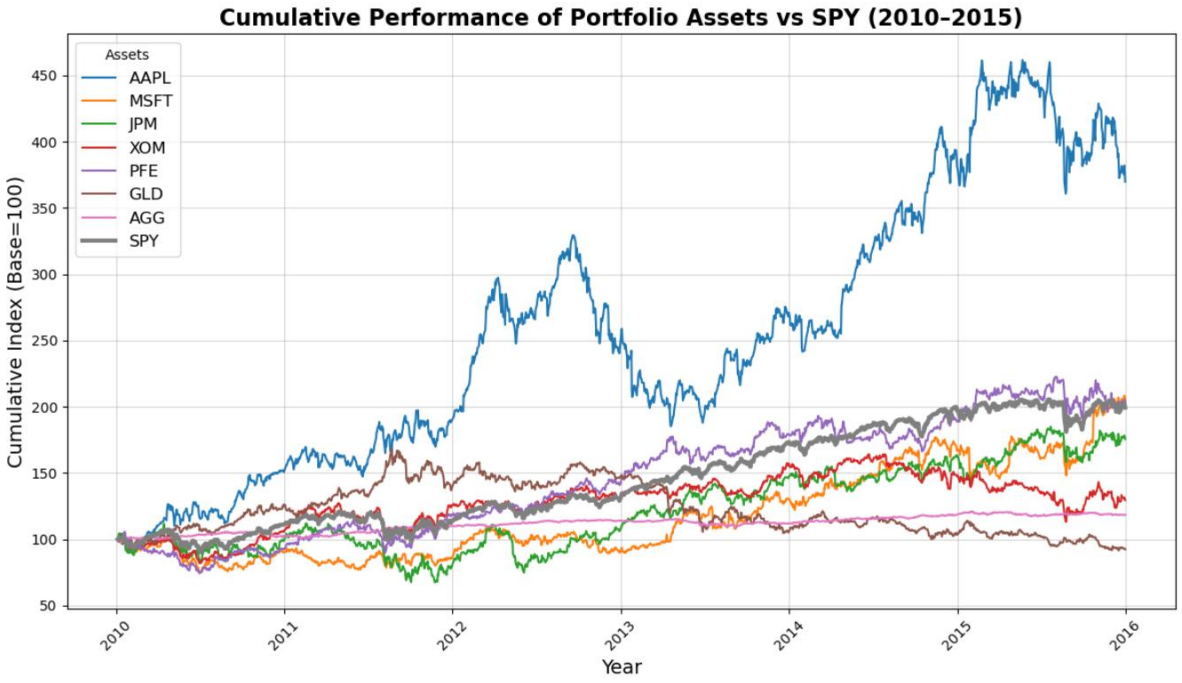
This memo presents a comprehensive, data-driven analysis of seven US market assets and provides a recommendation for the optimal portfolio allocation for the ICD's US-Focused Satellite Portfolio. Using historical data from 2010–2015 and applying quantitative techniques like Monte Carlo simulation and risk-return analysis, I have identified the optimal allocation of assets that maximize risk-adjusted returns while also maintaining diversification.

1. Treatment of Missing Values

A ***forward-fill*** method has been used to handle missing values. Since these are stock closing prices, the immediate previous day's value can be a reasonable estimate for the current day's value.

One point to note is that there can still be cases when an event completely changes the course of a stock price movement. Such cases are not considered in this study.

2. Performance Benchmarking



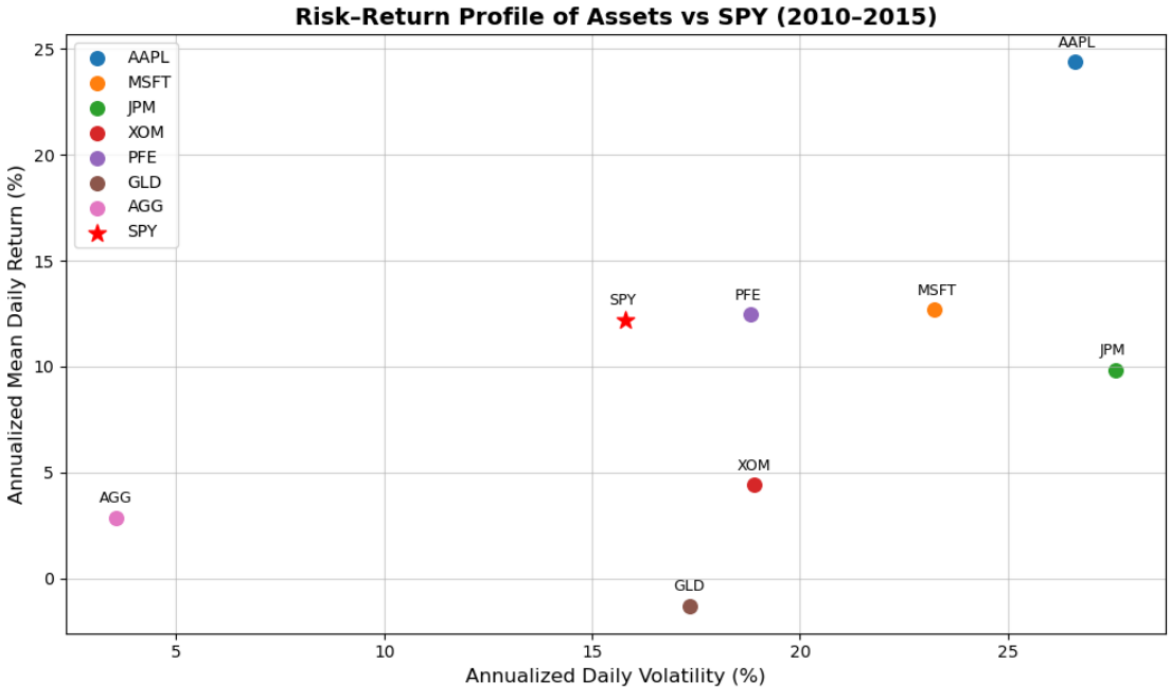
- **Outperformers:**
    - **AAPL** consistently outperformed the SPY benchmark across the period.
- **Underperformers:**
    - **MSFT** and **JPM** consistently underperformed SPY.
    - **XOM** tracked the benchmark until 2013, then underperformed.
- **Benchmark-like behavior:**
    - **PFE** mirrored SPY's movements closely.
- **Volatility-driven deviations:**
    - **GLD** outperformed SPY until 2013 but then declined sharply, reflecting changing investor sentiment toward gold. Gold is usually considered a safe-haven asset, so investors rush to it during periods of market uncertainty, high inflation, or economic risk. Its strong performance until 2013 suggests there may have been lingering market volatility or concerns from the aftermath of the 2008–2009 financial crisis. The sharp decline post-2013 indicates a shift toward risk-on sentiment, with investors preferring equities (SPY) over gold, likely due to economic recovery, improving stock markets, or declining inflation fears.
    - **AGG** displayed stable underperformance, indicating steady fixed-income returns in a period of low-to-moderate interest rate changes. Bonds provide stability but generally have lower returns compared to equities. AGG's consistent but underwhelming performance suggests that interest rates were relatively low and steady, providing predictable but modest returns. Investors likely earned steady income but missed the strong equity gains, reflecting a market environment favoring growth assets over fixed-income securities.

Overall Market Insight:

- **Early period (2010–2013)**: Market uncertainty or cautious sentiment, as reflected in strong gold performance.
- **Later period (2013–2015)**: Transition to a more confident, growth-oriented market, with equities (SPY) outperforming safe-haven assets like GLD and stable bond returns.
- Bonds (AGG) acted as a stabilizer but lagged in returns, confirming a low-interest-rate, growth-focused environment.

The underperformance of GLD post-2013 and AGG's stability suggest a **market environment transitioning from crisis-driven safe-haven demand to moderate growth**, where equities provided higher returns relative to bonds and commodities.

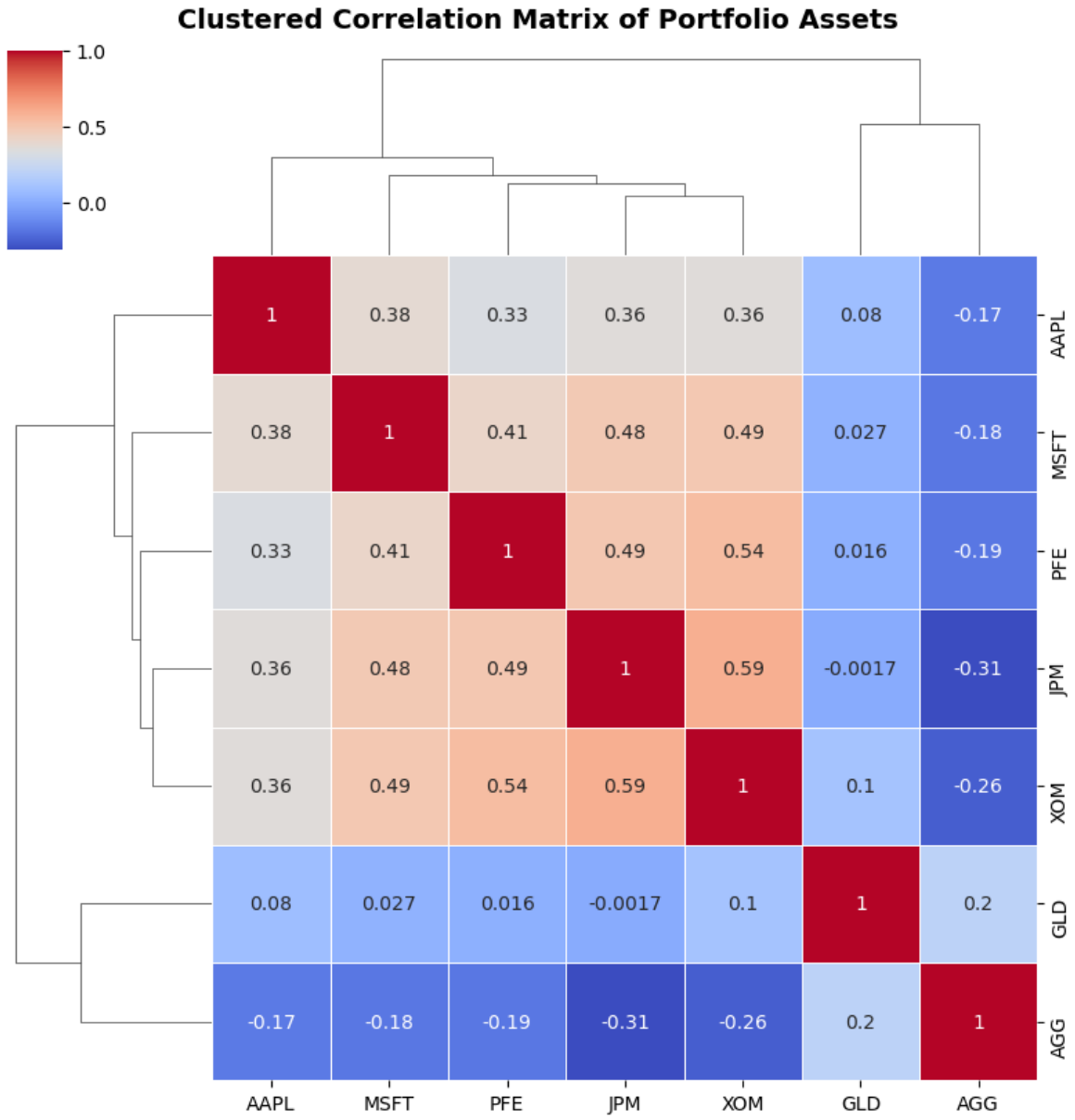
3. Risk-Return Profiling



- **None of the assets** are more efficient than the benchmark as none of them gives a higher return for the same level of risk of the benchmark or a lower level of risk for the same level of return
- **AAPL** provides higher returns but also has higher volatility compared to the benchmark.
- **AGG** is less risky but it gives lower return than the benchmark, so it is not very efficient
- **GLD** is only slightly more risky than the benchmark but it's return is also very less, so it is also not efficient

The risk-return profiles of **AGG** and **GLD** differ significantly from equities. **AGG** offers low volatility and stable but modest returns, reflecting its role as a fixed-income hedge. **GLD**, as a commodity, carries moderate risk but delivers limited returns relative to equities. In contrast, equities such as AAPL and PFE provide higher returns with greater volatility, making them the primary drivers of portfolio growth, while AGG and GLD primarily serve to reduce overall portfolio risk and provide diversification.

4. Correlation Structure and Diversification Potential



- **Equities (AAPL, MSFT, JPM, XOM, PFE):**
  - All show moderate positive correlations with each other.
  - Correlation coefficients range from 0.32 to 0.59, indicating they tend to move together but not perfectly.
  - **Highest correlations:**
    - **XOM & JPM: 0.595** → likely reflecting sector exposure and macroeconomic sensitivity.
    - **XOM & PFE: 0.542**, **JPM & PFE: 0.494** → suggests equities in financial, energy, and healthcare sectors still share some market risk.

- **GLD (Gold):**
  - Low correlations with all equities: 0.016–0.104, except slight positive correlation with XOM (0.104).
  - Essentially uncorrelated with US equities, confirming its role as a hedge.
- **AGG (Aggregate Bond ETF):**
  - Weak to negative correlations with all equities: -0.17 to -0.31.
  - Slight positive correlation with GLD (0.199), reflecting bond–gold co-movement in low-interest environments.

Cluster Identification

There are two primary clusters:

1. **Equity Cluster:**
   - **AAPL, MSFT, JPM, XOM, PFE**
   - Moderately correlated, forming a high-correlation cluster, meaning these assets will tend to move in the same direction during market events.
   - Diversification within this cluster is limited because they share systematic risk.
2. **Non-Equity Assets:**
   - **GLD (Gold)** → low correlation with equities, providing a hedge against equity downturns.
   - **AGG (Bonds)** → negative correlations with equities, also providing a stabilizing effect.

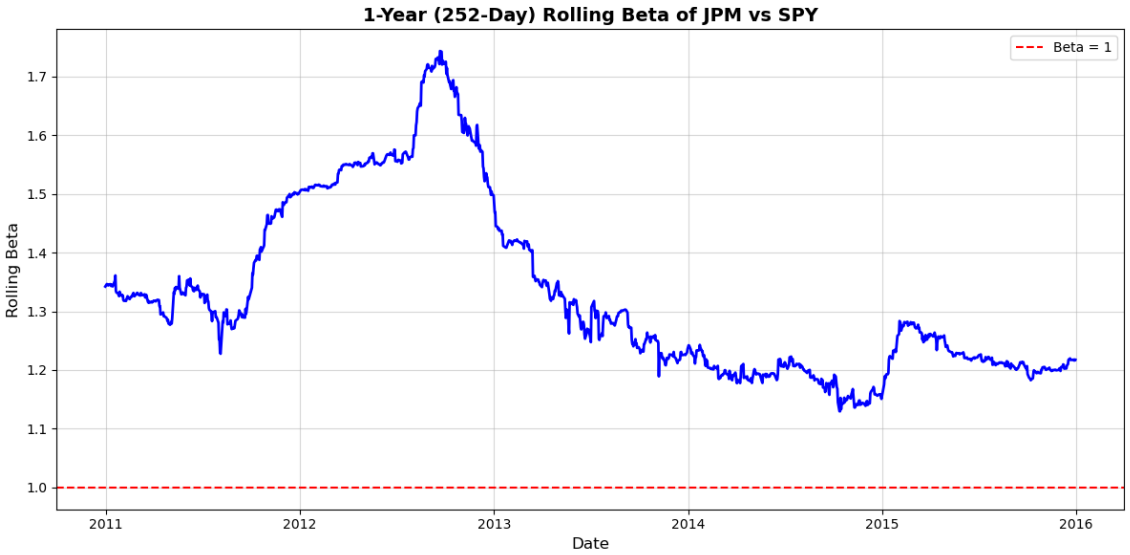
Diversification Benefits

- **Including GLD in a US-equity-heavy portfolio is beneficial due to:**
  - Low correlation with equities (close to zero).
  - Benefits: Reduces portfolio volatility, offers protection during equity market stress, especially during high inflation or geopolitical uncertainty.
- **Including AGG in a US-equity-heavy portfolio is beneficial due to:**
  - Negative correlation with equities (-0.17 to -0.31).
  - Benefits: Reduces portfolio risk and smooths returns; bonds provide predictable income streams and downside protection although has overall low return.
- **Combined effect of GLD and AGG:**
  - Both assets serve as diversifiers but in slightly different ways:

- GLD → uncorrelated safe investment.
- AGG → negatively correlated fixed-income stabilizer.

- Including both in an equity-dominated portfolio would likely lower overall volatility while retaining upside potential, improving the risk-adjusted performance.

5. Dynamic Market Risk



- The rolling beta of JPM is always greater than 1, which means JPM is consistently more volatile than the SPY benchmark.
- However, the beta fluctuates over time, indicating that JPM exhibits a **time-varying beta**, not a stable one.
- This shows that JPM's sensitivity to market movements changes depending on market conditions and economic events.

The year on year fluctuation is as below:

Period	Beta Behavior
End of 2011 – Mid 2012	Rolling beta **increases** steadily
Late 2012	Rolling beta **peaks**
2013 – End 2014	Rolling beta **declines** gradually
Start of 2015	Beta **rises slightly**, then declines again

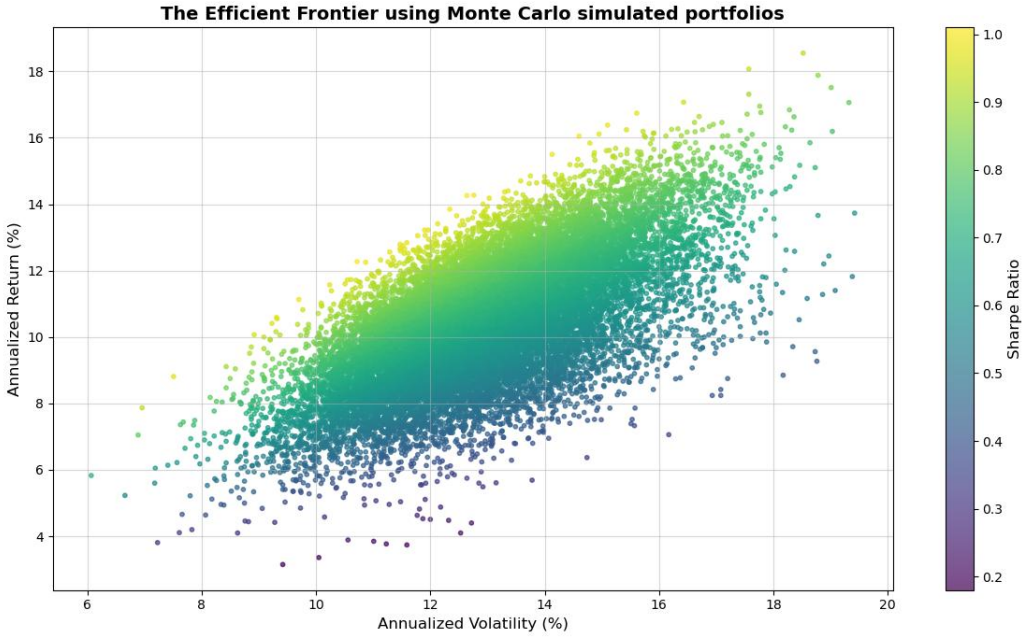
Some of the possible economic or market events can be:

1. **End of 2011 – Mid 2012 (Increasing Beta)**
    - Eurozone Debt Crisis: Heightened global market volatility, risk aversion.

- US Fiscal Uncertainty: Budget debates and fear of "fiscal cliff" increased equity market risk.
- JPM, being a large financial institution, was more sensitive to market swings, hence rising beta.

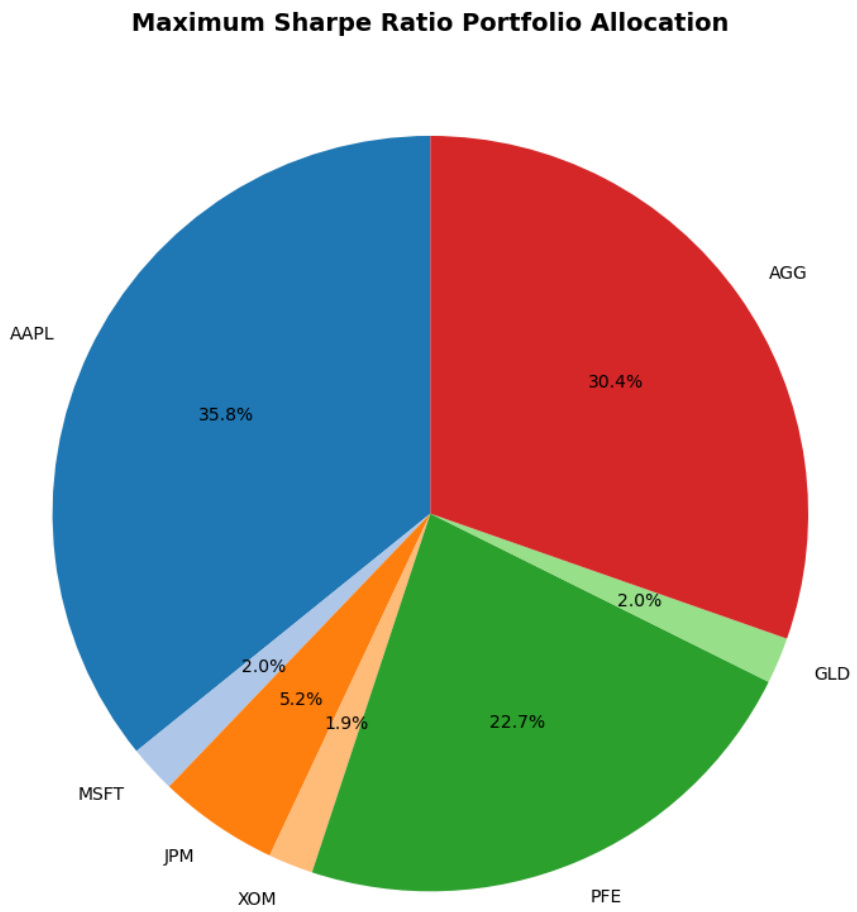
2. **Late 2012 (Beta Peaks)**
   - Post-crisis recovery phase in US and global markets.
   - JPM might have taken higher exposure to market-sensitive assets or trading gains, temporarily increasing sensitivity to the benchmark.
3. **2013 – End 2014 (Declining Beta)**
   - US economic recovery strengthens, equity markets stabilize.
   - Volcker Rule and other regulatory reforms may have reduced risk-taking by banks, lowering JPM's beta.
   - Market volatility overall declined → lower systematic risk for financials.
4. **Start of 2015 (Temporary Increase)**
   - Global market uncertainty: China's stock market turbulence and oil price drop.
   - JPM's beta rises slightly due to exposure to global market swings.
5. **Later 2015 (Declining Beta)**
   - Markets stabilize after early 2015 shocks.
   - JPM's sensitivity to SPY decreases as volatility normalizes.

6. Optimal Allocation and Final Recommendation:



Based on **Monte Carlo simulation and maximum Sharpe ratio optimization**, the recommended asset weights for the US-Focused Satellite Portfolio are:

Asset	Weight (%)
AAPL	35.82
MSFT	2.03
JPM	5.16
XOM	1.92
PFE	22.72
GLD	1.98
AGG	30.3



Rationale for choosing this allocation:

- **AAPL and PFE:** Capture secular growth in technology and healthcare.

- **AGG:** Provides fixed-income stability to mitigate volatility.
- Small allocations to cyclical and commodity assets (XOM, GLD, MSFT, JPM): Maintain diversification and exposure to select market opportunities without over-concentration.
- Portfolio achieves highest risk-adjusted returns while remaining aligned with US market fundamentals and ICD's mandate.

We recommend adopting this data-driven portfolio allocation for the ICD US-Focused Satellite Portfolio. It:

- Maximizes risk-adjusted returns (Sharpe ratio).
- Ensures diversification with bonds (AGG) and commodities (GLD).
- Leverages US market growth sectors such as consumer spending, technological innovation, and structured healthcare demand.
- Provides resilience to macroeconomic shocks, informed by historical beta and correlation analysis.
- Complements ICD's broader global allocations by concentrating on liquid, transparent US markets with strong risk-adjusted potential.

Action: Approve implementation of the proposed allocation as the US-Focused Satellite Portfolio for ICD. Supporting charts (cumulative performance, risk-return scatter, rolling beta, pie chart of optimal weights) are attached for reference.