Quant/Risk Report

Georgio Najm
and
Tevin Parathattal

September 8, 2025

AGENDA

1. Quantitative Risk Metrics
- Beta
- Alpha
- Value at Risk (VaR)

2. Portfolio Risks
- Concentration Risk
- Sector Risk
- Macroeconomic Risk

3. Future Plans

BETA (β)

What is Beta?

- **Beta (β) quantifies how much an asset's return moves relative to the overall market (systematic risk)**

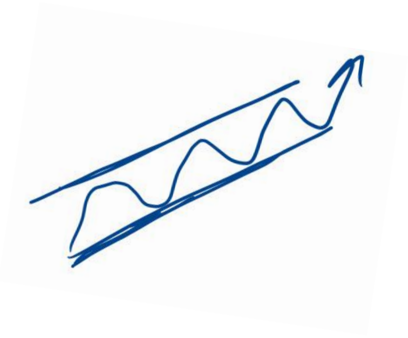
- Benchmark: S&P 500 = 1.0

- **β** > 1 ⟶ More volatile/riskier
- **β** < 1 ⟶ Less volatile/safer
- **β** = 1 ⟶ Moves with the market

Example: If **β** = 0.8 and the S&P 500 rises 1%, stock (or portfolio) rises 0.8%

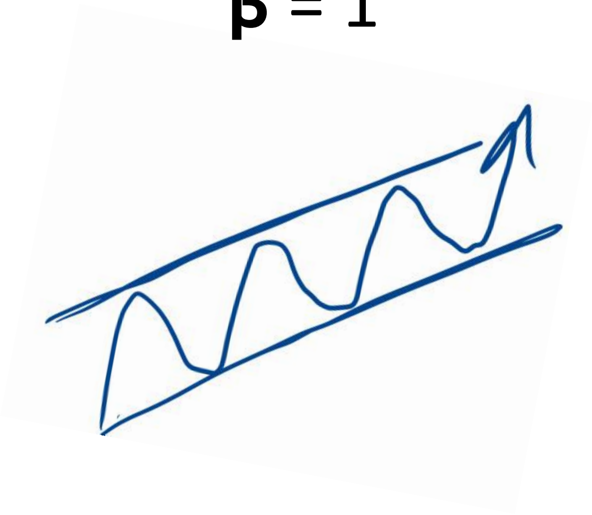
BETA VISUAL

β = 0.8



- Less Volatile (20%)
- More stable and performs well in bearish markets
- Sectors like: Utilities, Consumer Staples, Healthcare

β = 1



- Reflective of the Market

β = 1.3

- More Volatile (30%)
- Less stable and performs well in bullish markets
- Sectors like: Tech, Discretionary, and Energy

UNIVERSITY OF NORTH CAROLINA CHARLOTTE

BETA CALCULATION/RESULTS

$$?? = \frac{\text{Covariance } (R_e\ , R_m)}{\text{Variance } (R_m)}$$

Covariance = how changes in a stock's returns are related to changes in the market's returns.

Variance = how far the market's data points spread out from their average value.

$\mathbf{R_e}$ = the return on an individual stock

$\mathbf{R_m}$ = the return on the overall market

```
Using portfolio value: $744,525.00

=== CORE RISK SUMMARY (through 2025-09-05) ===
                      Metric          Value
                  Obs (days)     358.000000
       VaR 95% Hist (1d, $)   -8,007.146612
       VaR 99% Hist (1d, $)  -15,805.003806
      VaR 95% Param (1d, $)   -9,650.669550
      VaR 99% Param (1d, $)  -13,854.826637
       VaR 95% Hist (1w, $)  -17,904.524130
       VaR 99% Hist (1w, $)  -35,341.062895
      VaR 95% Param (1w, $)  -21,579.553143
      VaR 99% Param (1w, $)  -30,980.334176
                Beta vs SPY        0.687106
        Alpha (daily est.)         0.000248
      R^2 (market explain)         0.882770
        HHI (position-level)       0.090998
    Equity-only Beta vs SPY        0.813443
            Equity-only R^2        0.893363

Top Exposures (after exclusions & alignment):
        Weight (%)
Symbol
VEA      16.760000
AGG      16.170000
VOO      11.090000
META      8.960000
AAPL      5.570000
V         5.510000
WMT       5.440000
T         4.110000
QCOM      3.340000
XLV       3.060000

Sanity checks:
Weights sum (after alignment): 1.000000
Tickers downloaded: 27 (missing: [])
Benchmark used: SPY
```

β = 0.69

Less Volatile than market

UNC CHARLOTTE STUDENT MANAGED INVESTMENT FUND

JENSEN'S ALPHA (α)

What is Alpha?

- **Alpha is the excess return of an investment compared to the return predicted by CAPM**

Simplified Formula:

$\boldsymbol{\alpha}$ **=** Actual Rate of Return of Portfolio - Expected Rate of Return on Portfolio

- $\alpha > 0 \longrightarrow$ Outperformed benchmark
- $\alpha < 0 \longrightarrow$ Underperformed benchmark
- $\alpha = 0 \longrightarrow$ Matched benchmark

ALPHA CALCULATION/RESULTS

Jensen's Alpha = Rp – [Rf + β * (Rm – Rf)]

- Rp = Portfolio Return
- Rf = Risk-free Rate
- Rm = Benchmark / Market Return
- β = Portfolio Beta

```
Using portfolio value: $744,525.00

=== CORE RISK SUMMARY (through 2025-09-05) ===
                     Metric          Value
                 Obs (days)     358.000000
      VaR 95% Hist (1d, $)   -8,007.146612
      VaR 99% Hist (1d, $)  -15,805.003806
     VaR 95% Param (1d, $)   -9,650.669550
     VaR 99% Param (1d, $)  -13,854.826637
      VaR 95% Hist (1w, $)  -17,904.524130
      VaR 99% Hist (1w, $)  -35,341.062895
     VaR 95% Param (1w, $)  -21,579.553143
     VaR 99% Param (1w, $)  -30,980.334176
                Beta vs SPY       0.687106
         Alpha (daily est.)       0.000248
        R^2 (market explain)      0.882770
        HHI (position-level)      0.090998
     Equity-only Beta vs SPY      0.813443
            Equity-only R^2       0.893363

Top Exposures (after exclusions & alignment):
        Weight (%)
Symbol
VEA      16.760000
AGG      16.170000
VOO      11.090000
META      8.960000
AAPL      5.570000
V         5.510000
WMT       5.440000
T         4.110000
QCOM      3.340000
XLV       3.060000

Sanity checks:
Weights sum (after alignment): 1.000000
Tickers downloaded: 27 (missing: [])
Benchmark used: SPY
```

$\boldsymbol{\alpha}$ **= 0.0248%**

VALUE AT RISK (VaR)

What is VaR?

- **VaR estimates the maximum expected loss of an investment or portfolio over a given time horizon at a certain confidence level.**

3 Methods to Find VaR

- **Historical**: Uses past returns, picks the cutoff at the confidence level (e.g., 5th percentile for 95% VaR).
- **Variance - Covariance(Parametric)**: Assumes normal returns, calculates VaR with mean, volatility, and z-score.
- **Monte Carlo**: Simulates thousands of return scenarios using code

VaR = μ - (z * σ)

μ = Mean of Portfolio Returns

σ = Standard deviation of returns (volatility)

z = Z-score for chosen significance level (1.65 for 95%, 2.33 for 99%)

Example (Parametric Method):

Portfolio = $100,000

μ = 2%

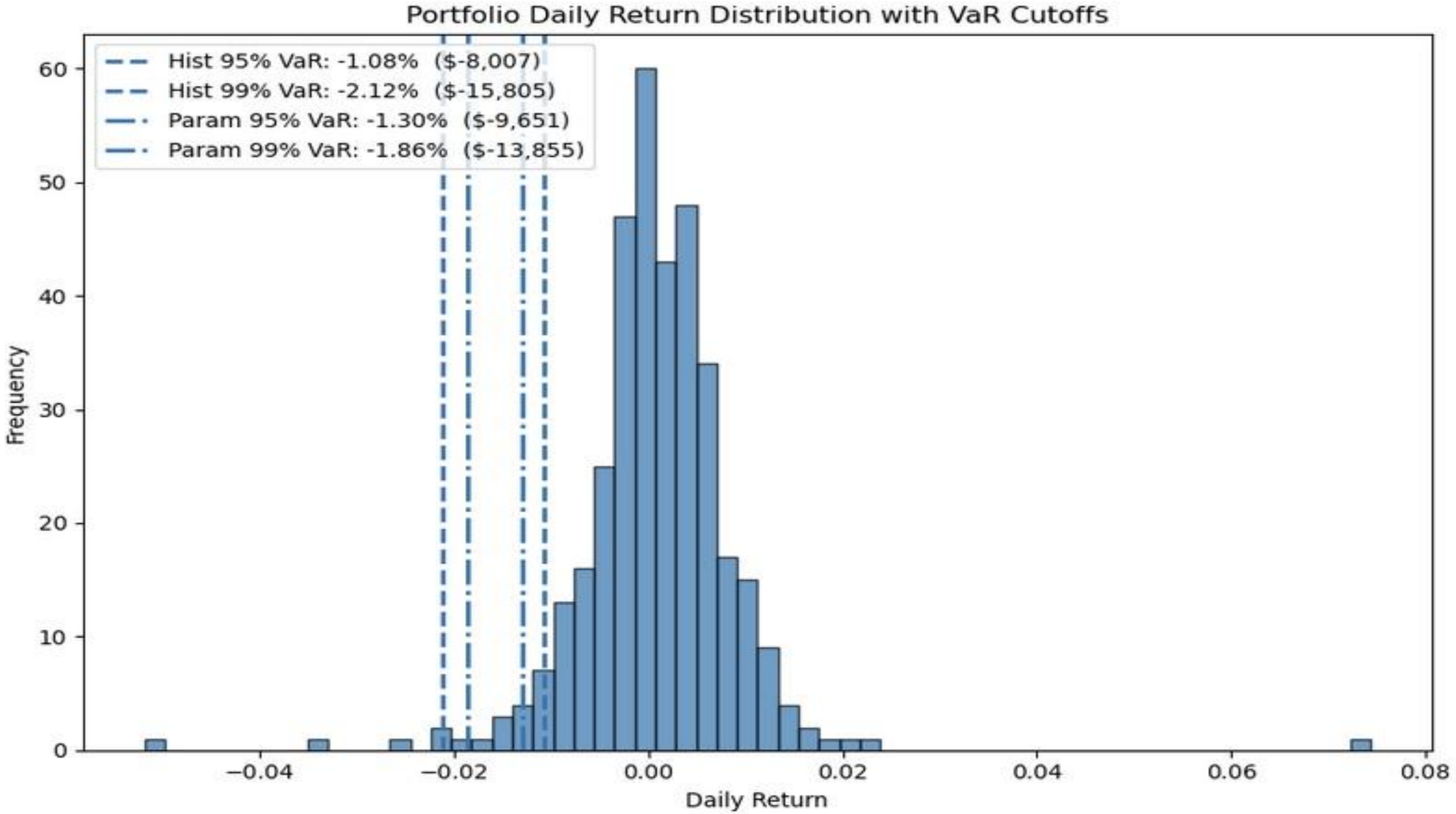
σ = 4%

z = 1.65 (95% Confidence)

VaR = 2% − (1.65 × 4%) = −4.6%

Max Loss = $4,600 in one month (95% Confidence)

VaR RESULTS



	VaR (1-day)	Return cutoff	Dollar cutoff
0	Hist 95%	−0.010755	−8,007.146612
1	Hist 99%	−0.021228	−15,805.003806
2	Param 95%	−0.012962	−9,650.669550
3	Param 99%	−0.018609	−13,854.826637

UNIVERSITY OF NORTH CAROLINA CHARLOTTE

VaR RESULTS

```
Using portfolio value: $744,525.00

=== CORE RISK SUMMARY (through 2025-09-05) ===
                  Metric           Value
              Obs (days)      358.000000
     VaR 95% Hist (1d, $)   -8,007.146612
     VaR 99% Hist (1d, $) -15,805.003806
    VaR 95% Param (1d, $)   -9,650.669550
    VaR 99% Param (1d, $) -13,854.826637
     VaR 95% Hist (1w, $) -17,904.524130
     VaR 99% Hist (1w, $) -35,341.062895
    VaR 95% Param (1w, $) -21,579.553143
    VaR 99% Param (1w, $) -30,980.334176
             Beta vs SPY        0.687106
      Alpha (daily est.)        0.000248
     R^2 (market explain)       0.882770
     HHI (position-level)       0.090998
Equity-only Beta vs SPY        0.813443
         Equity-only R^2        0.893363

Top Exposures (after exclusions & alignment):
        Weight (%)
Symbol
VEA      16.760000
AGG      16.170000
VOO      11.090000
META      8.960000
AAPL      5.570000
V         5.510000
WMT       5.440000
T         4.110000
QCOM      3.340000
XLV       3.060000
```

1 Day:

1-Day 95% Hist. VaR: −$8,007

1-Day 99% Hist. VaR: −$15,805

1-Day 95% Parametric VaR: −$9,651

1-Day 99% Parametric VaR: −$13,855

1 Week:

1-Week 95% Hist. VaR: −$17,904

1-Week 99% Hist. VaR: −$35,341

1-Week 95% Parametric VaR: −$21,580

1-Week 99% Parametric VaR: −$30,980

CONCENTRATION RISK

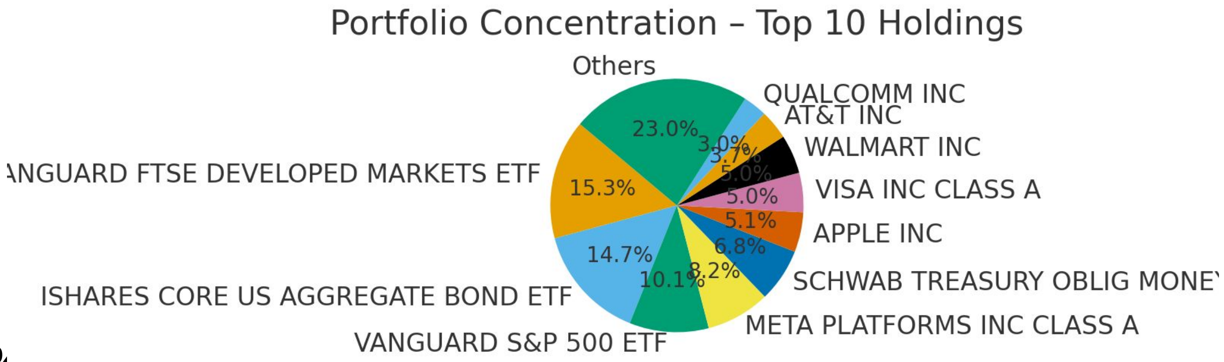
Total Positions: 29

Top 5 Holdings: 55.2% of portfolio

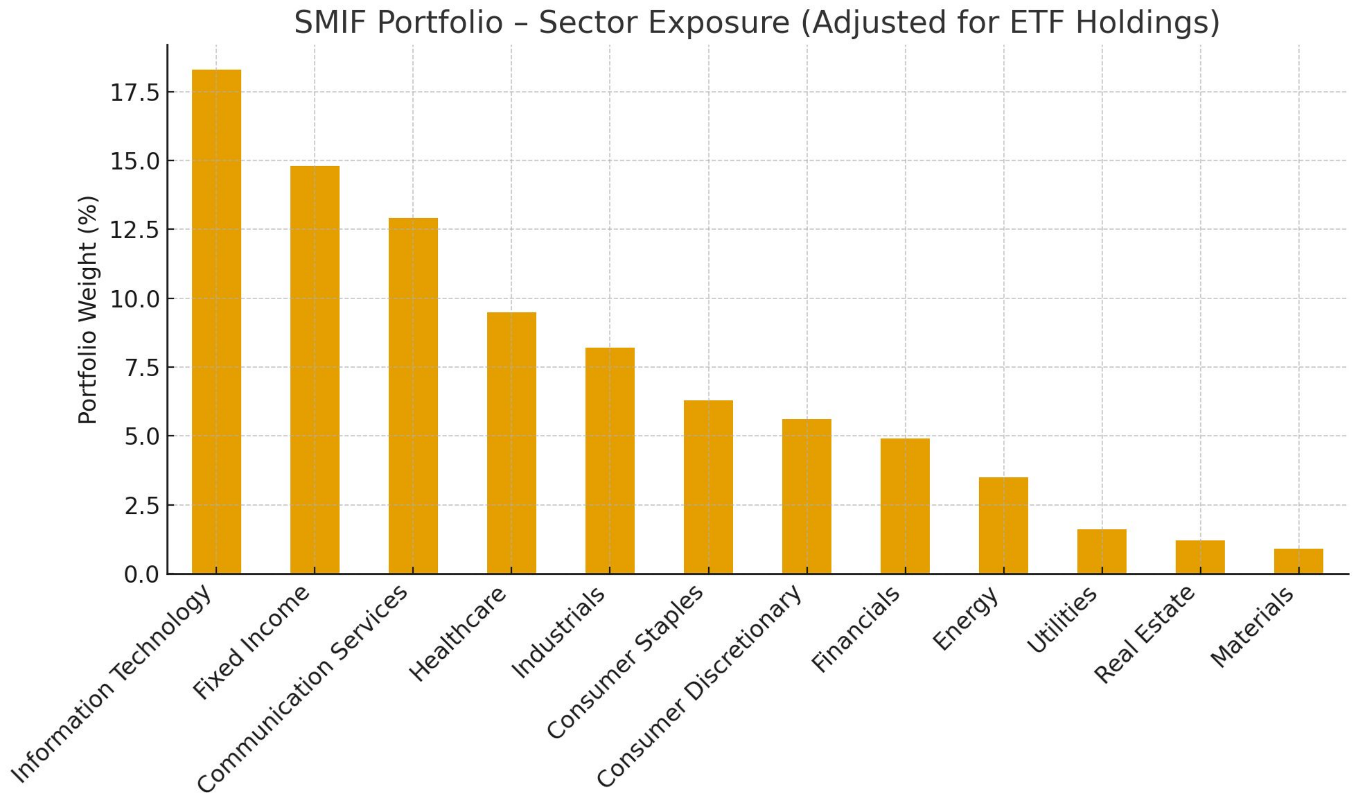
Top 10 Holdings: 77.0% of portfolio

Largest Positions

1. Vanguard FTSE Developed Markets ETF – 15.3%
2. iShares Core US Aggregate Bond ETF – 14.8%
3. Vanguard S&P 500 ETF – 10.1%
4. Meta Platforms Inc. (Class A) – 8.2%
5. Schwab Treasury Oblig Money Inv – 6.8%



SECTOR RISK

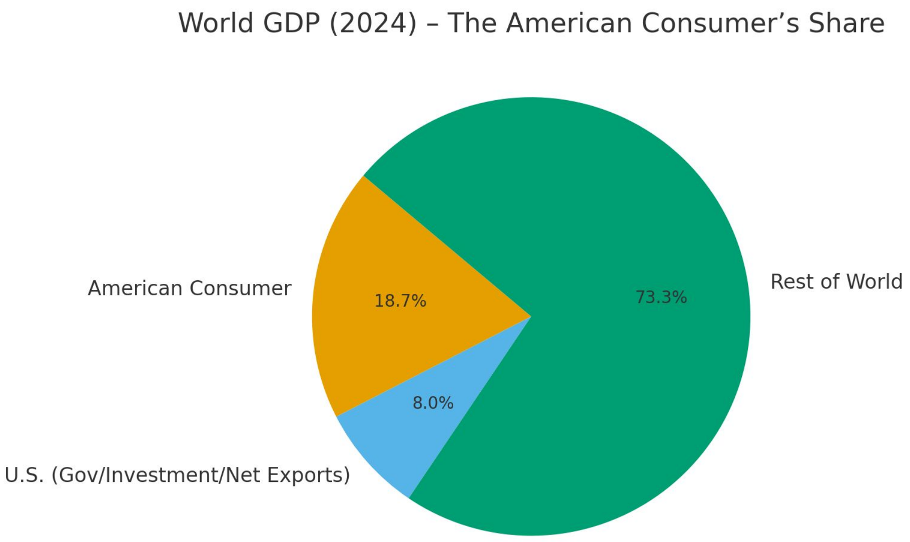


Sector Risk Highlights

- Overweight in Tech & Comms (~31%) ⟶ highly exposed to one theme
- Hidden overlap in ETFs ⟶ diversification weaker than it looks
- AGG bond weight (15%) ⟶ big interest rate sensitivity
- Defensive sectors tiny
- VEA tilt ⟶ clustered in Financials/Industrials abroad
- Healthcare underweight ⟶ less downside resilience

MACROECONOMIC RISK

- **70% of U.S. GDP = consumer spending** (BEA).
- The U.S. consumer alone = ~**15% of global GDP**.
- As manufacturing jobs were offshored (1970s–2000s), wage stagnation set in — credit (debt) filled the gap.
- Now, **white-collar jobs and even knowledge work** are moving abroad or being automated by AI.
- Risk: a shrinking middle-class → **weak demand, more debt reliance, less global stability.**



FUTURE PLANS

- **Sentiment Analysis** – integrate market/news sentiment into risk measures
- **Sharpe Ratio** – evaluate portfolio performance on a risk-adjusted basis
- **Automated Risk Report** – create a tool that generates reports directly from a CSV file

QUESTIONS?

SOURCES

- Yahoo Finance
- Bureau of Labor Statistics
- Bureau of Economic Analysis
- Investopedia
- Seeking Alpha