

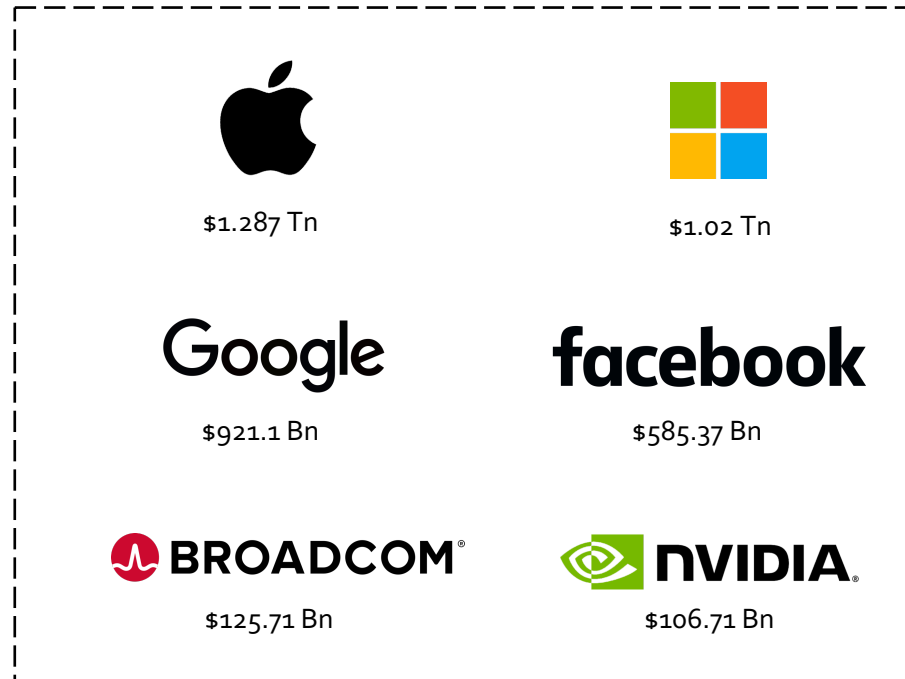
Portfolio Performance

Strategic Outlook through 2024
Released 2019

Portfolio Selection Criteria

- Actively traded on NYSE as common stock or American Depositary Receipts
- Large market cap
- Diverse industry selection
- Diverse country selection
- Well-established in home country to minimize risk exposure

US Market Selection



Technology



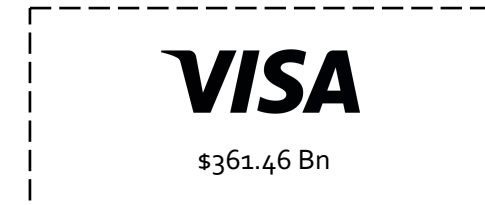
Auto Manufacturing



Online Retail



Financial Services



Digital Payment

Developed & Emerging Market Selection

Name	Industry	Country	Mkt Cap	Ticker
Linde PLC	Oil & Gas	Ireland	\$113.88 Bn	LIN
Shell PLC	Oil & Gas	UK	\$121.66 Bn	SHEL
Deutsche Bank AG	Financial Services	Germany	\$14.29 Bn	DB
Sanofi SA	Pharma	France	\$125.87 Bn	SNY
Unilever PLC	Consumer Goods	UK	\$149.27 Bn	UL

Developed Market

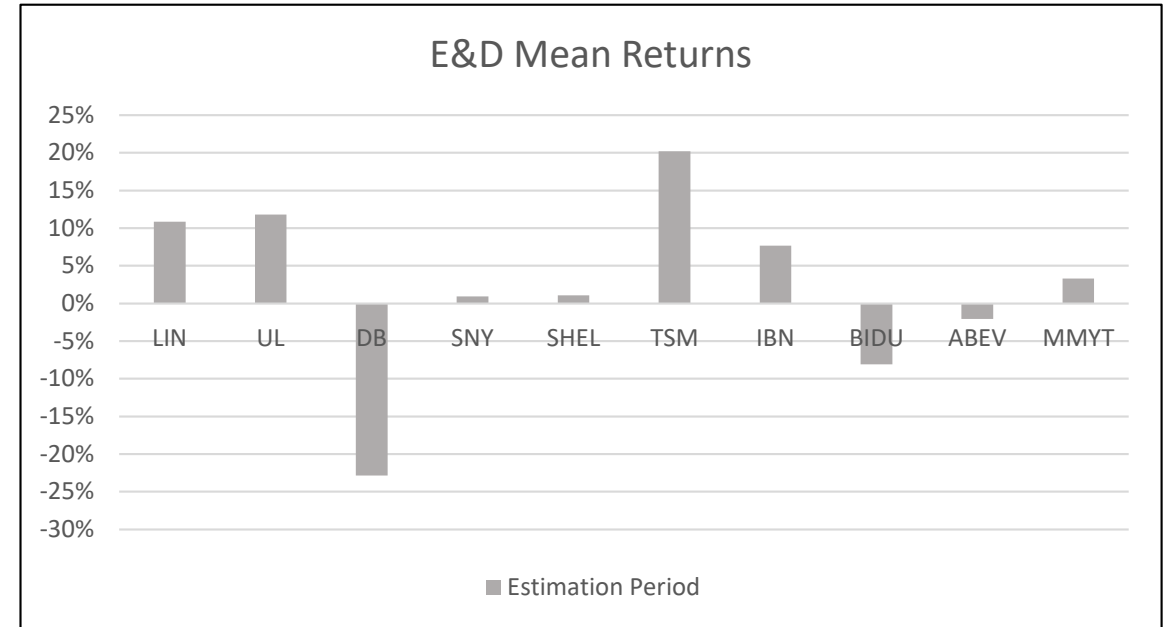
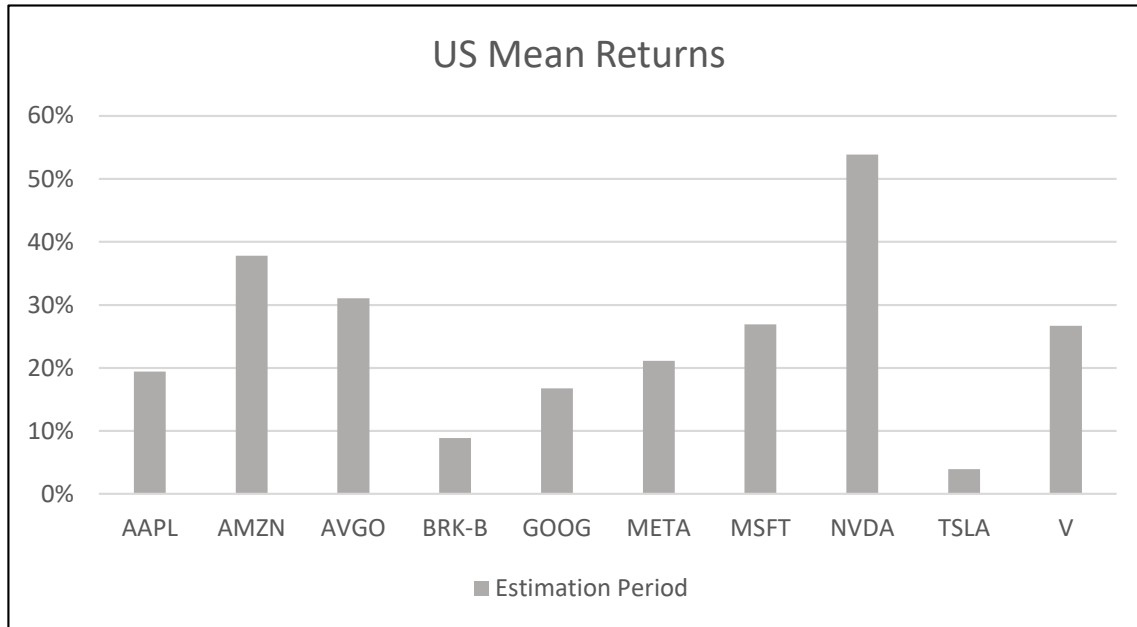
Name	Industry	Country	Mkt Cap	Ticker
TSMC Ltd	Semiconductor	Taiwan	\$286.57 Bn	TSM
ICICI Bank Ltd	Financial Services	India	\$48.72 Bn	IBN
Baidu Inc	Technology	China	\$43.71 Bn	BIDU
Ambev SA	Beverages	Brazil	\$72.97 Bn	ABEV
MakeMyTrip Ltd	Travel Services	India	\$2.36 Bn	MMYT

Emerging Market

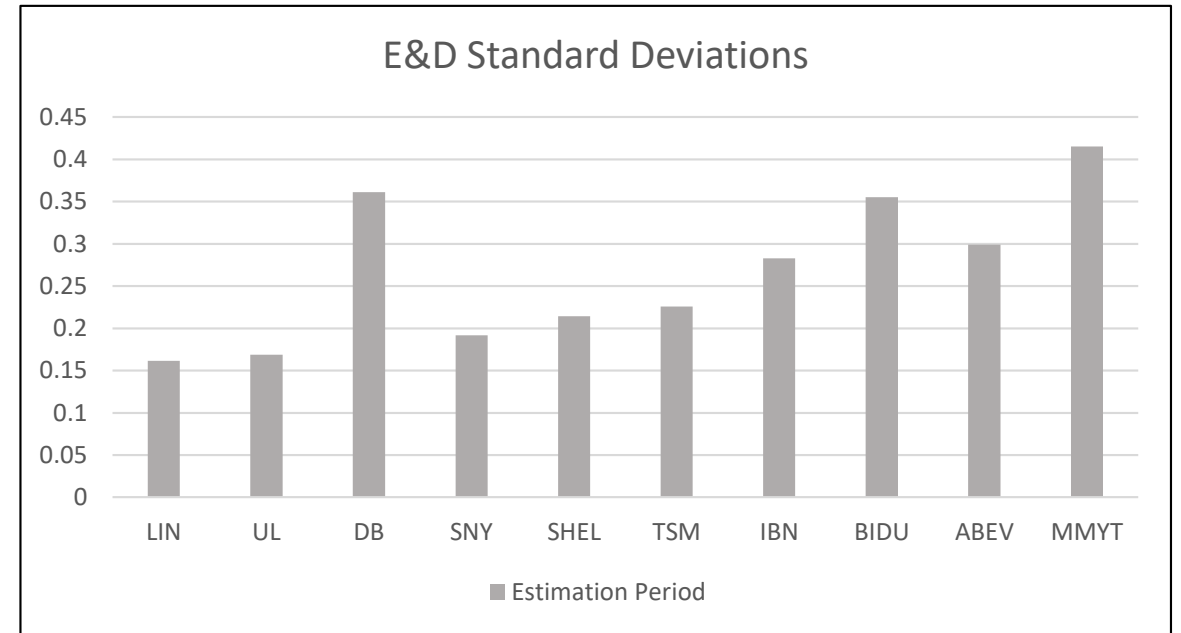
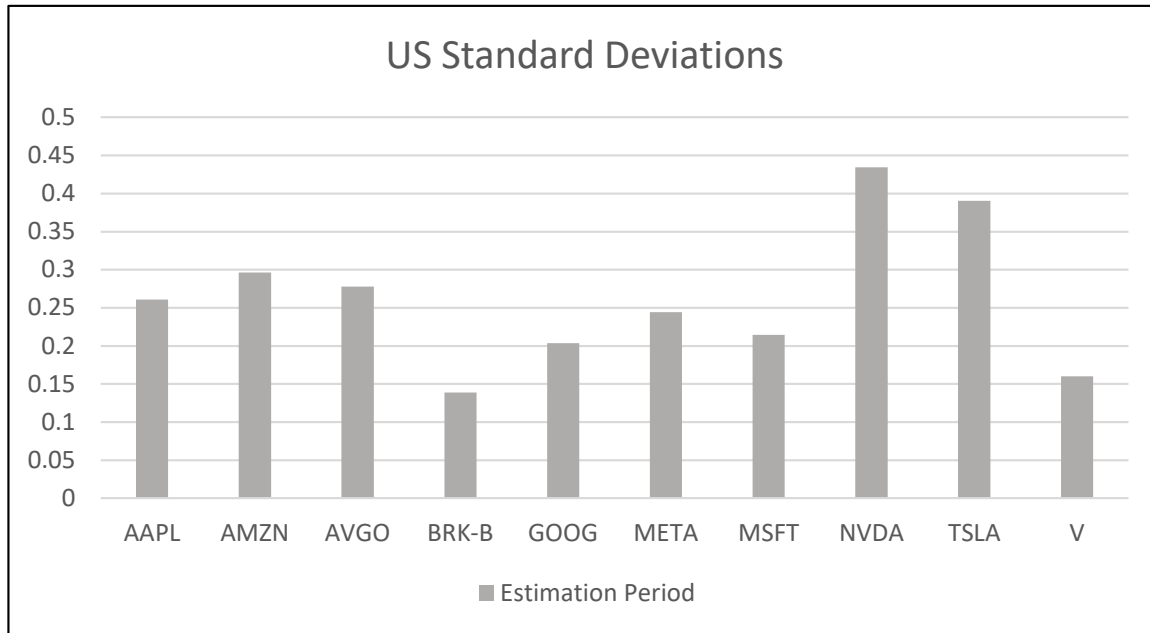
In-Sample Analysis

Estimation Period September 2014-2019

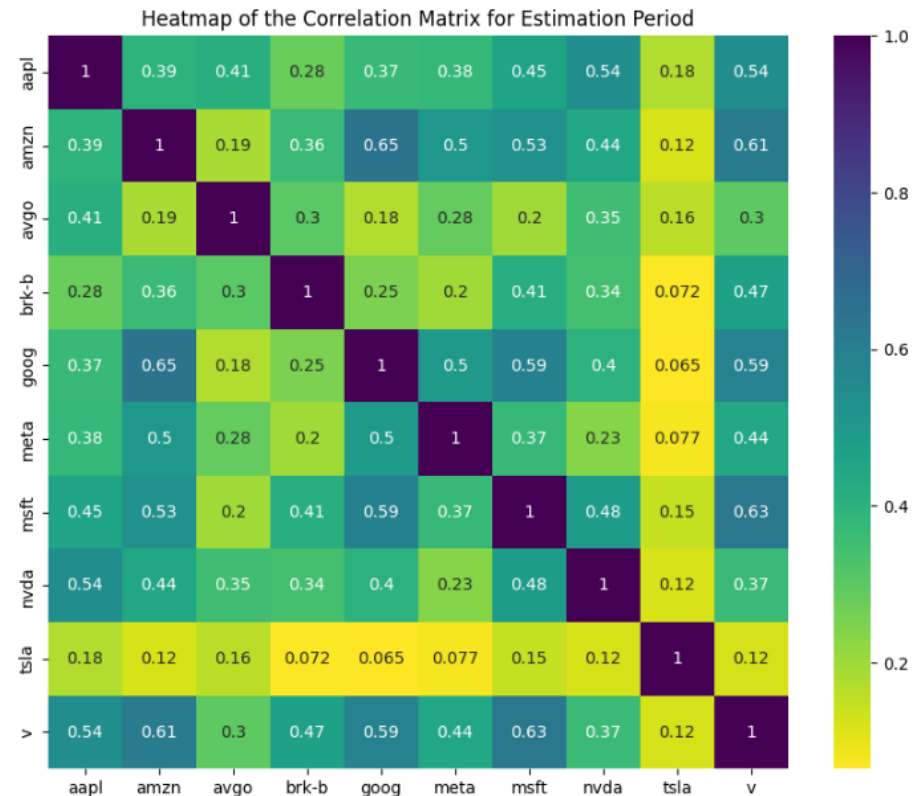
In-Sample Statistics



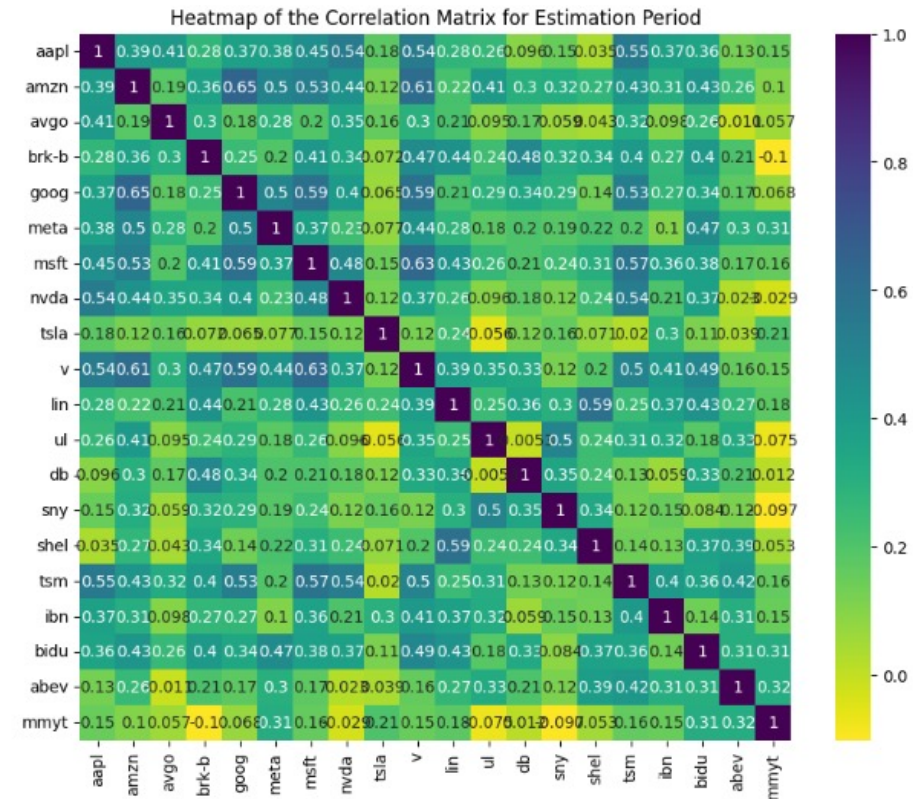
In-Sample Statistics



In-Sample Statistics



Average Correlation among the US stocks (excluding self): 0.390



Average Correlation among the global stocks (excluding self): 0.287

Equal Weighted Portfolio

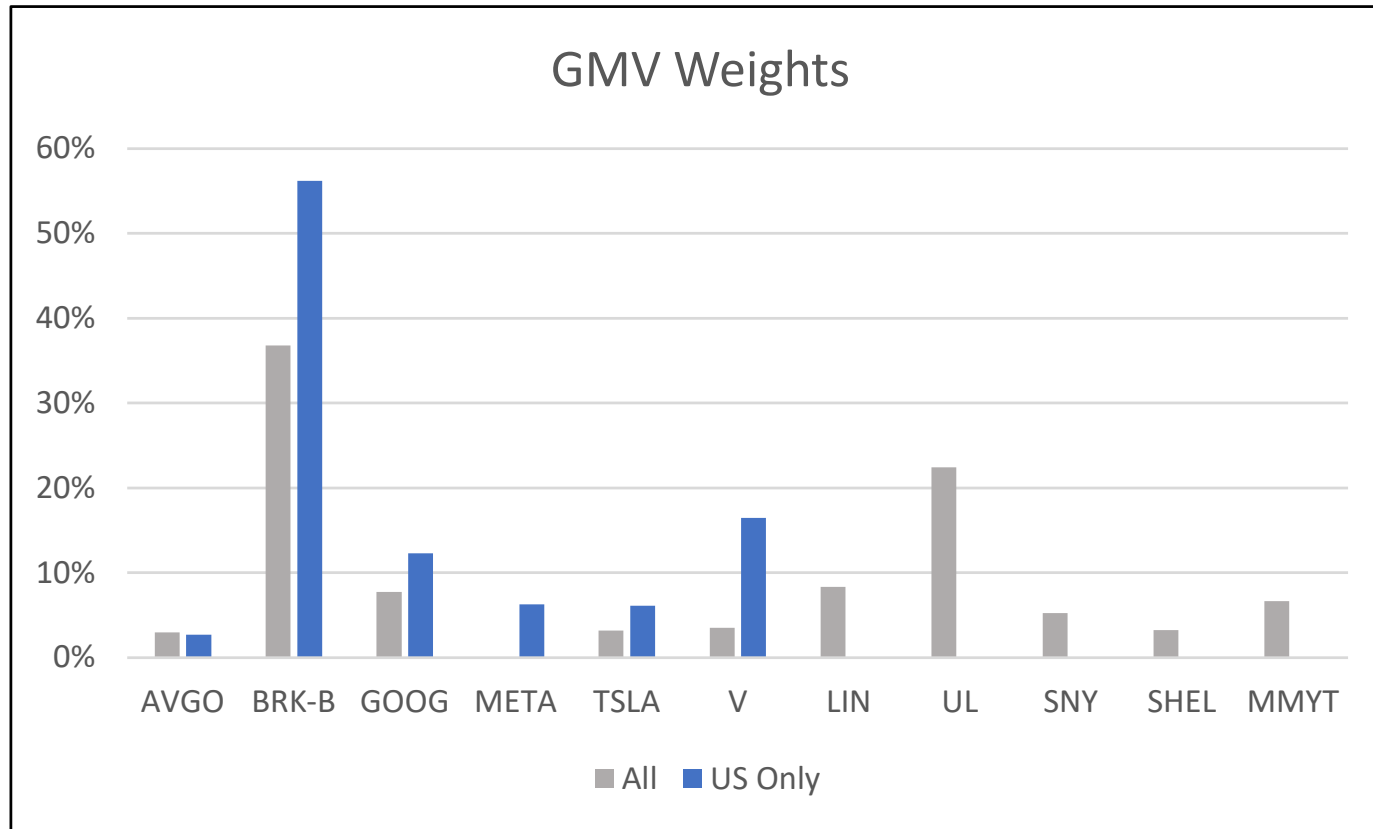
- For US Companies only we attribute a 10% weight to each stock
- For All Companies we attribute a 5% weight to each stock

Expected Return: 13.69%

Standard Deviation: 0.14

Sharpe Ratio: 0.97

Global Minimum Variance Portfolio

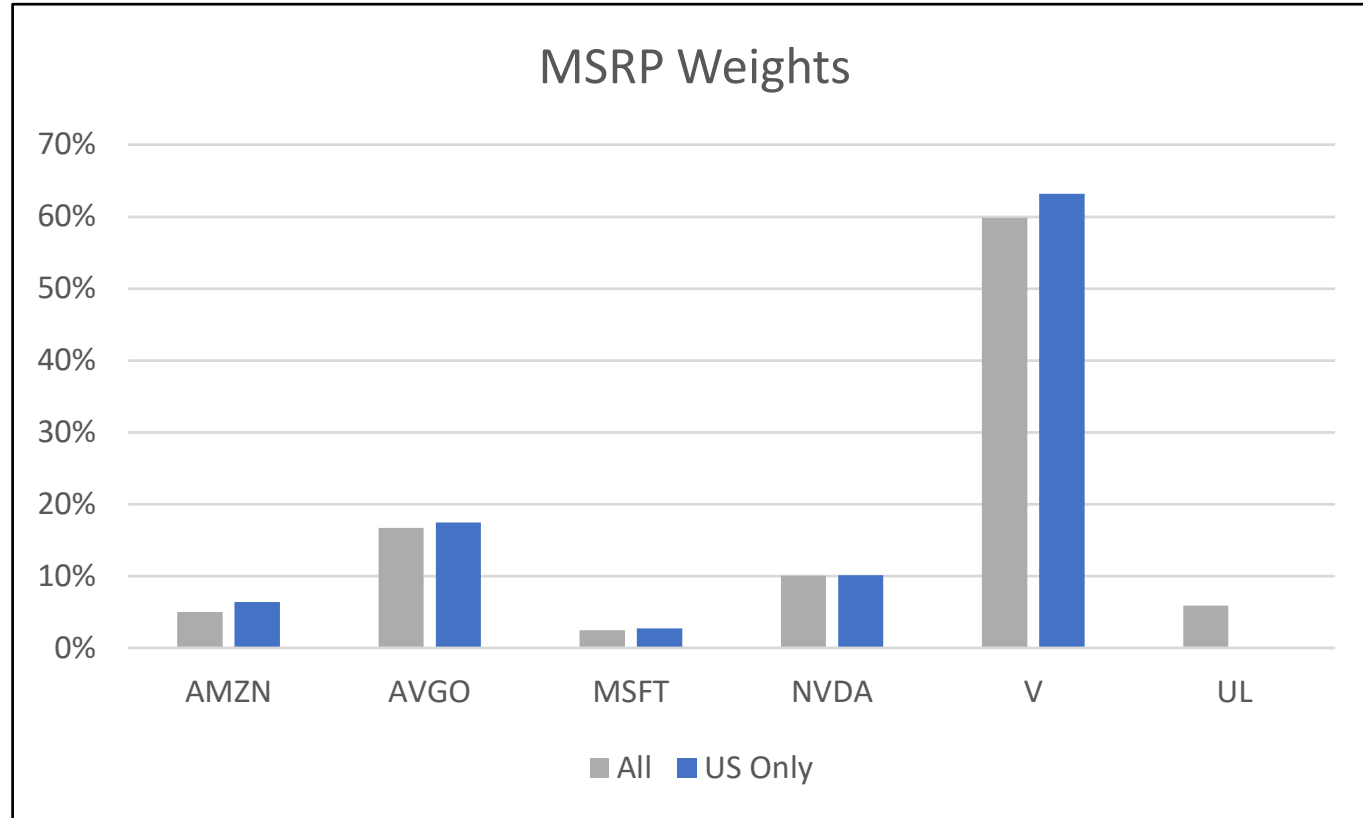


Expected Return: 10.41%

Standard Deviation: 0.10

Sharpe Ratio: 1.01

Maximum Sharpe Ratio Portfolio

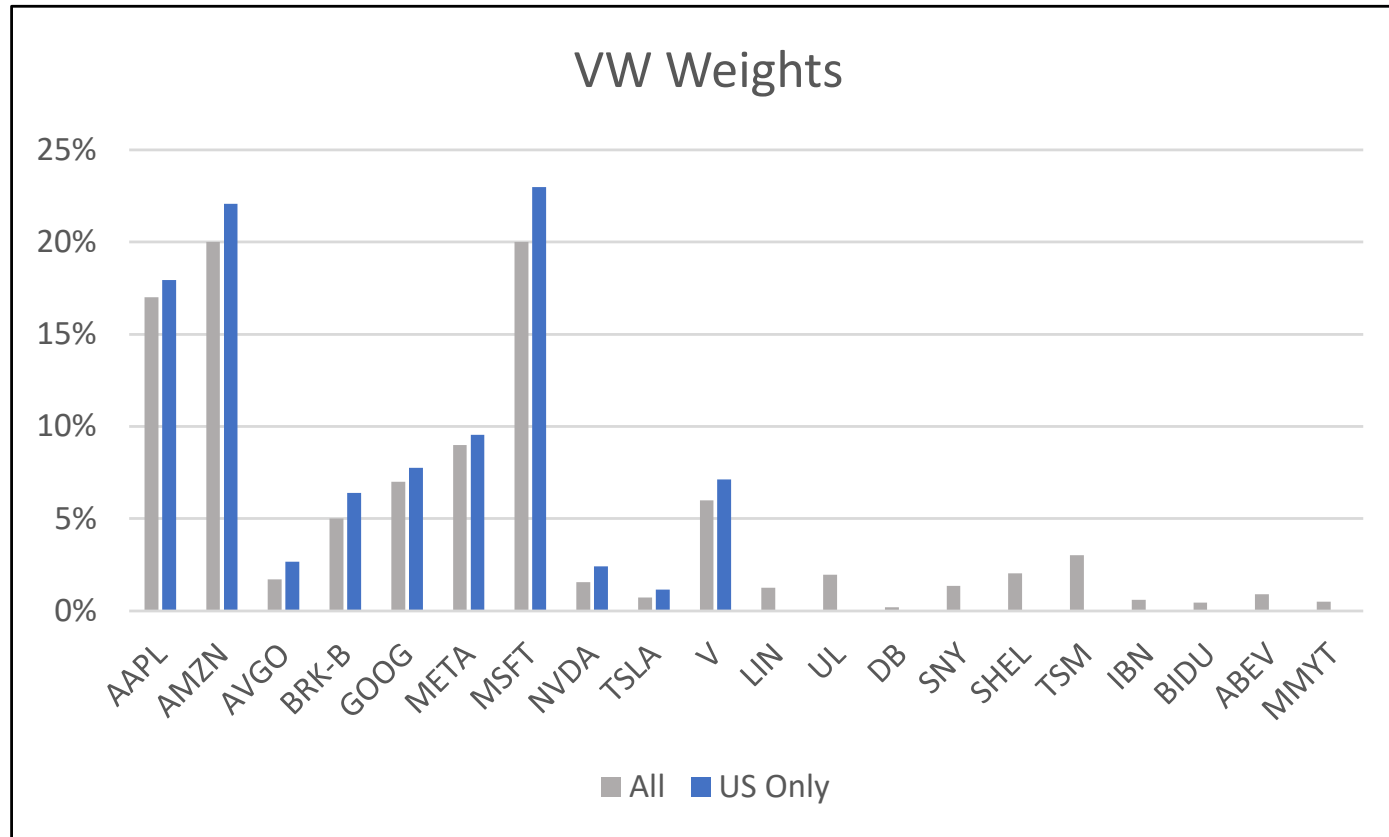


Expected Return: 29.85%

Standard Deviation: 0.17

Sharpe Ratio: 1.80

Value Weighted Portfolio

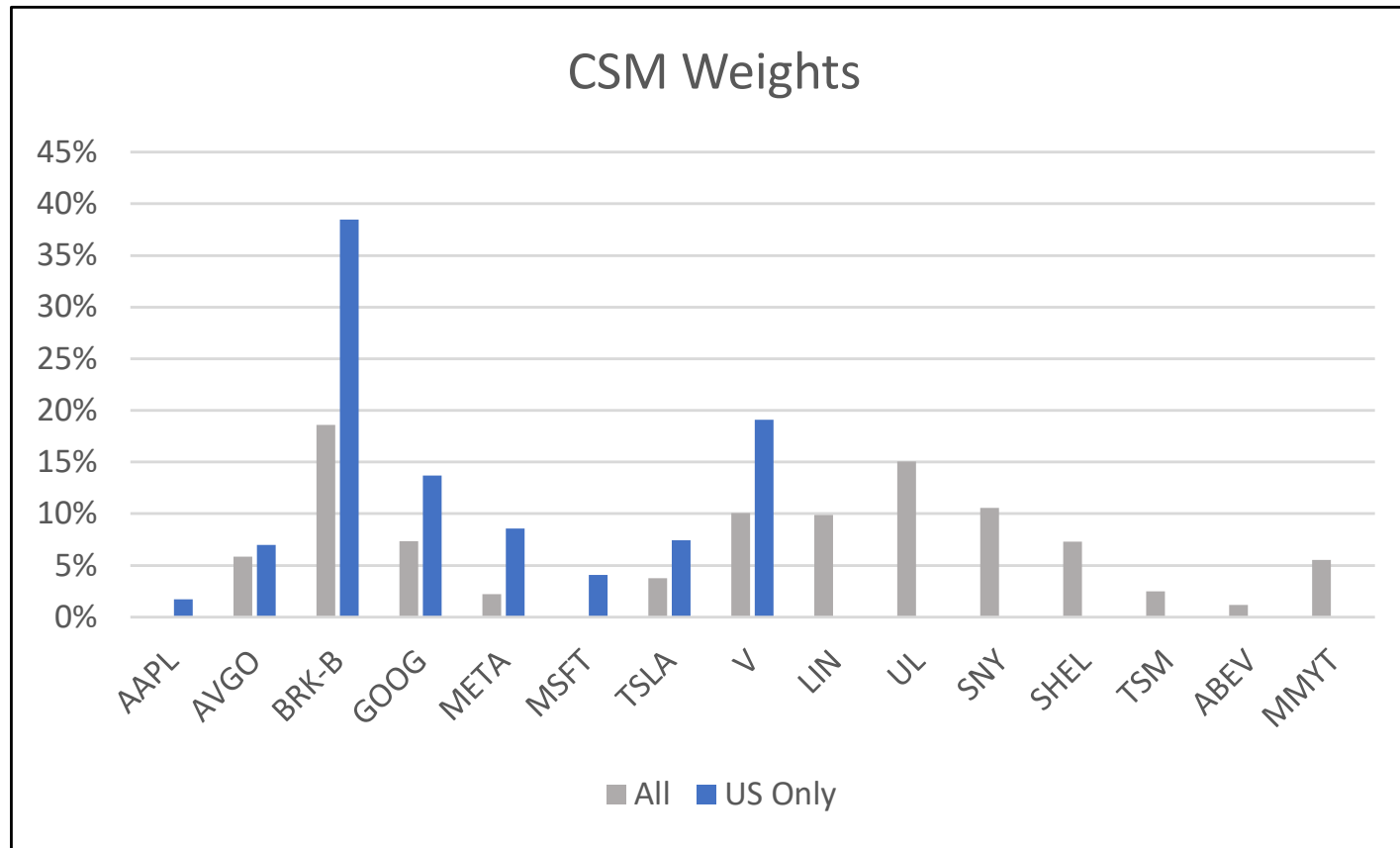


Expected Return: 15.01%

Standard Deviation: 0.1914

Sharpe Ratio: 0.78

Covariance Shrinkage Method Portfolio



Expected Return: 11.84%

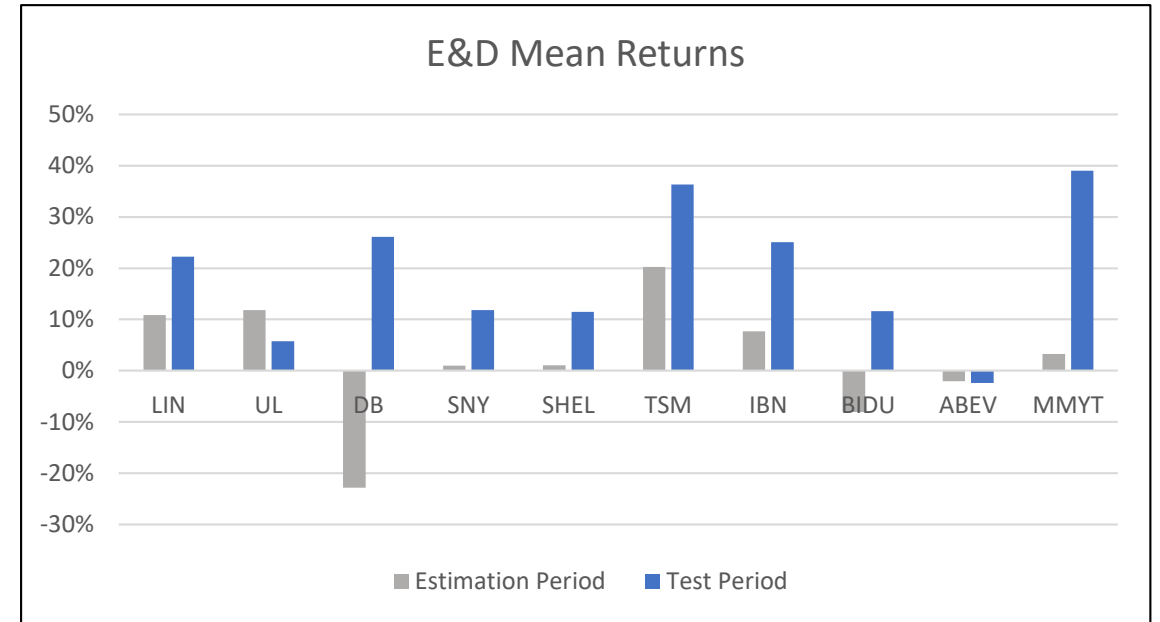
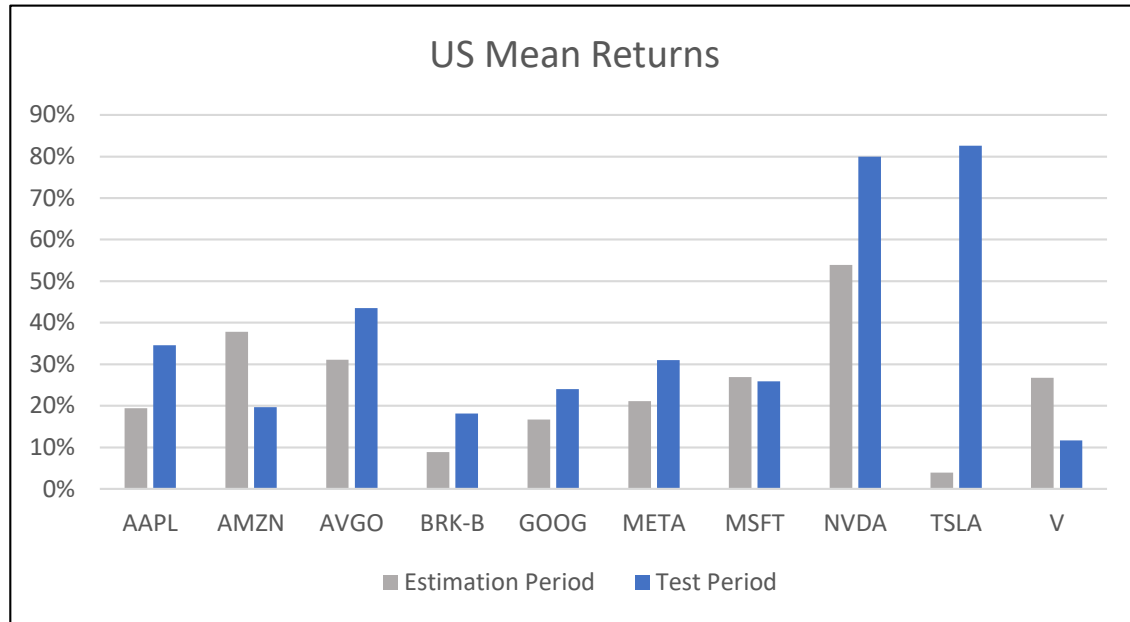
Standard Deviation: 0.3548

Sharpe Ratio: 0.33

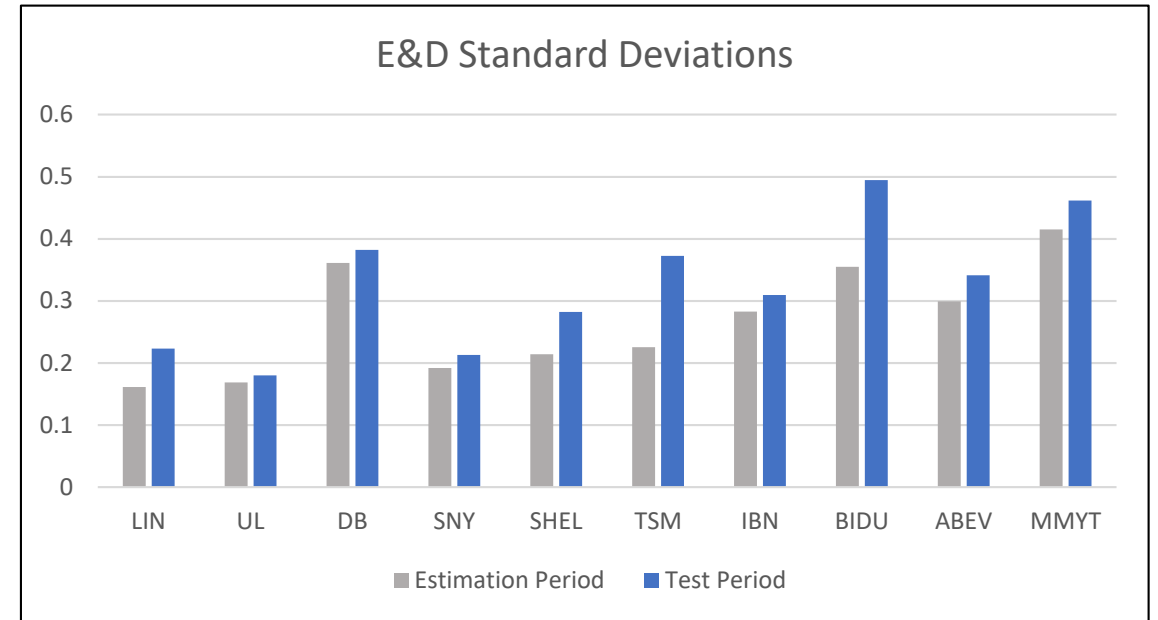
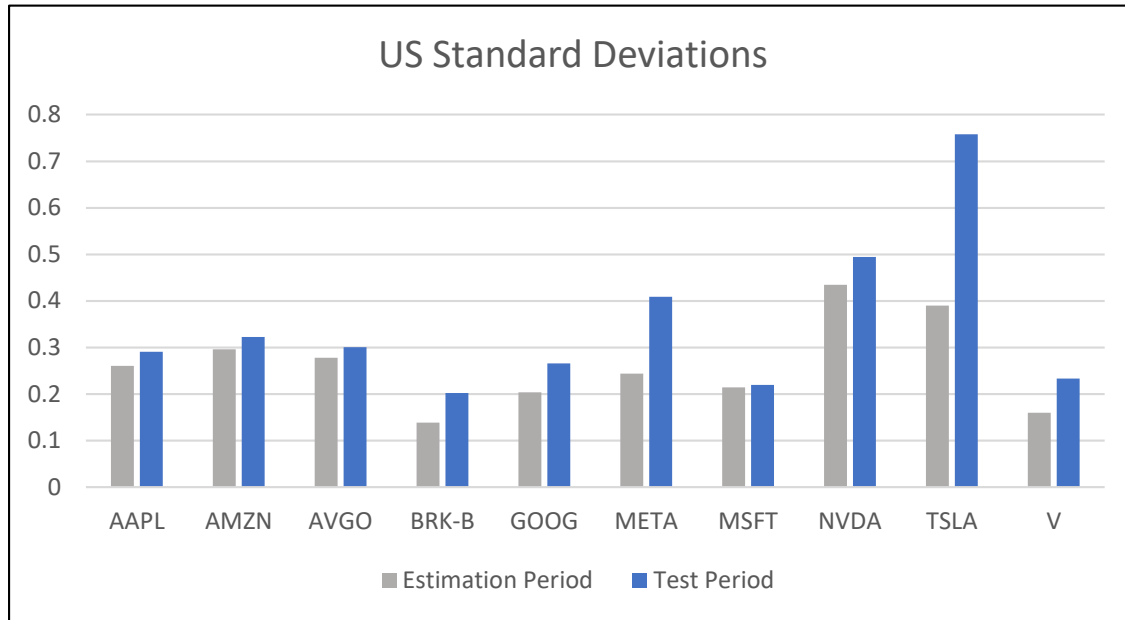
Out-Sample Analysis

Testing Period September 2019-2024

Out-Sample Statistics



Out-Sample Statistics



Explanations for differences between in-sample and out-of-sample periods

1. Increased Correlation

- Rising covariances during the pandemic caused previously uncorrelated sectors to move in the same direction.
- Berkshire Hathaway and Visa, typically less correlated, experienced simultaneous volatility as consumer spending dropped globally (covariance increased 47% from 0.47 to 0.69).

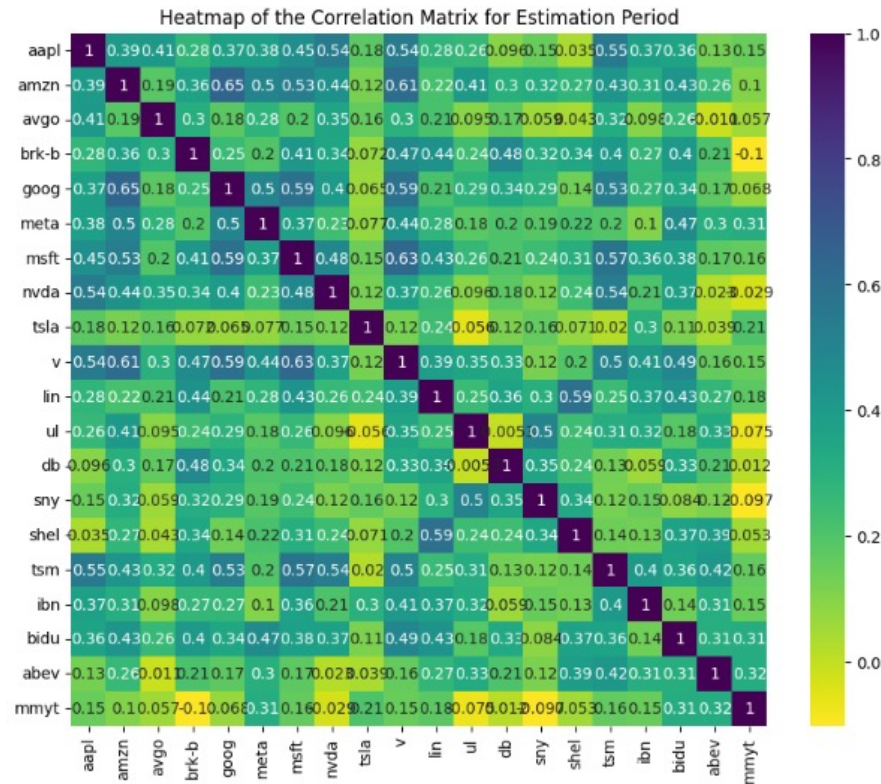
2. Non-Stationary Distributions

- Historical data (2014–2019) didn't capture the structural economic changes in the next period, such as a rapid pivot to tech and online services or the AI and electric car boom.

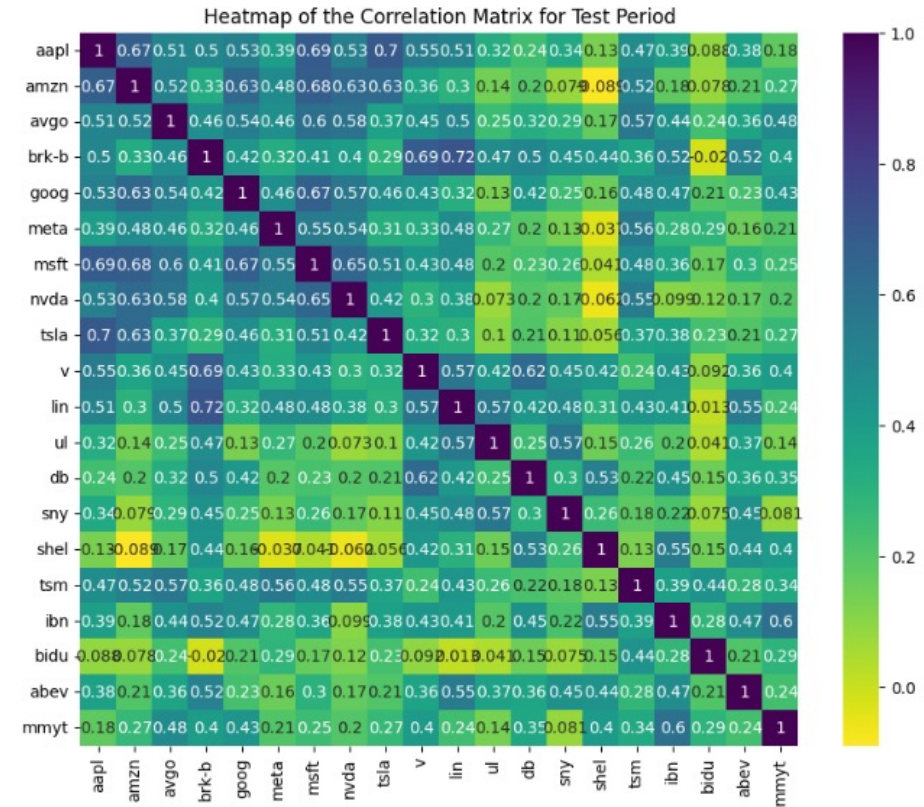
3. Sector-Specific Impacts

- Travel, energy, and financials heavily underperformed due to reduced mobility, oil demand shocks, and low interest rates, while tech and healthcare outperformed.

Out-Sample Statistics



Average Correlation among the US stocks (excluding self) - Testing Period:
0.527



Average Correlation among the global stocks (excluding self) - Testing Period:
0.352

Portfolio Strategy Evaluation

Testing Period September 2019-2024

EW and VW Performed Best

ALL RESULTS								
	Mean Return	Std Dev	Sharpe Ratio	CAPM Alpha	Treynor Measure	Information Ratio	Beta	Var
GMV	14.8%	<u>4.9%</u>	0.300	0.05	0.18	0.24	0.82	<u>0.0024</u>
MSRP	18.5%	6.2%	0.301	0.07	0.19	0.23	1.00	0.0038
EW	21.2%	6.0%	<u>0.353</u>	0.09	0.20	<u>0.42</u>	1.04	0.0036
VW	<u>22.6%</u>	6.6%	0.341	<u>0.10</u>	<u>0.21</u>	0.32	1.08	0.0044
CS	15.8%	5.0%	0.314	0.06	0.18	0.30	0.86	0.0025

US RESULTS								
	Mean Return	Std Dev	Sharpe Ratio	CAPM Alpha	Treynor Measure	Information Ratio	Beta	Var
GMV	17.8%	<u>5.8%</u>	0.306	0.07	0.18	0.26	0.97	<u>0.0034</u>
MSRP	19.2%	6.4%	0.300	0.07	0.19	0.23	1.03	0.0041
EW	<u>28.8%</u>	7.5%	<u>0.383</u>	<u>0.15</u>	<u>0.24</u>	<u>0.40</u>	1.21	0.0057
VW	20.8%	6.7%	0.312	0.09	0.20	0.25	1.05	0.0044
CS	19.9%	6.0%	0.330	0.08	0.19	0.34	1.03	0.0036

GMV Strategy Performance

Did it achieve the lowest out-of-sample portfolio variance?

Yes, in both US and global portfolios.

This aligns with its design goal of minimizing variance by emphasizing assets with low covariance.

ALL RESULTS	
Var	
GMV	<u>0.0024</u>
MSRP	0.0038
EW	0.0036
VW	0.0044
CS	0.0025

US RESULTS	
Var	
GMV	<u>0.0034</u>
MSRP	0.0041
EW	0.0057
VW	0.0044
CS	0.0036

GMV and CS Compared

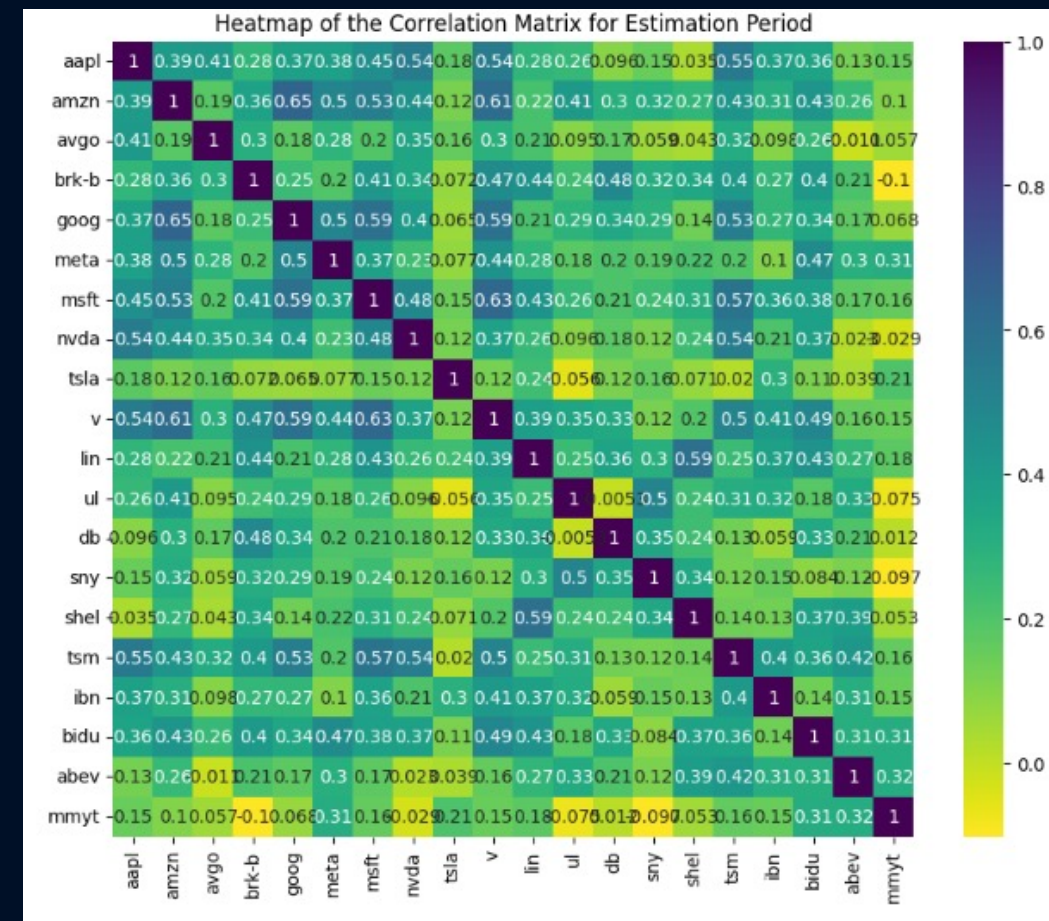
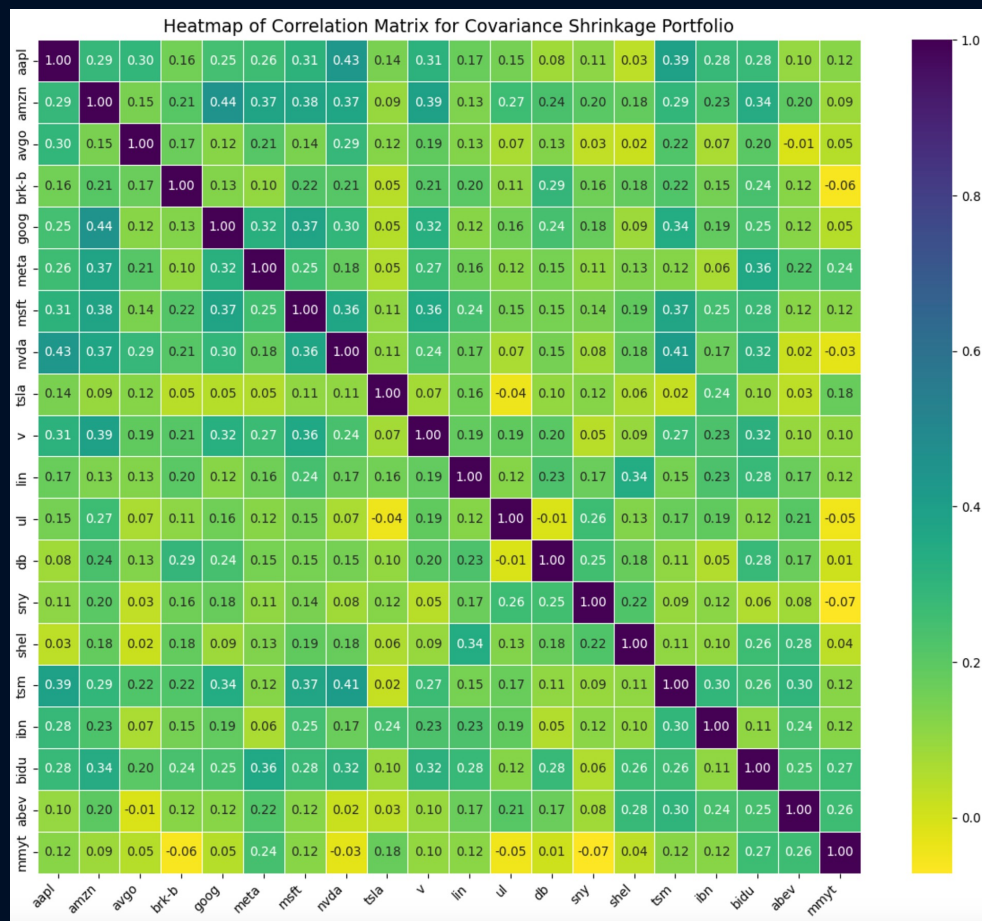
The Global Minimum Variance strategy aims to minimize the variance of the portfolio based on the estimation period covariance matrix.

The Covariance Shrinkage strategy is used when there is high estimation risk and the covariance matrix is noisy, shrinking the matrix to a more stable estimate.

ALL RESULTS	
	Var
GMV	<u>0.0024</u>
CS	0.0025

US RESULTS	
	Var
GMV	<u>0.0034</u>
CS	0.0036

Does Covariance Shrinkage Method shrink the covariance of the portfolio's assets?



MSRP Strategy Performance

Did it maintain the highest Sharpe ratio?

No, the Equal Weighted portfolio outperformed the MSRP in both cases

US Sharpe Ratio: EW = **0.38** MSRP = **0.30**

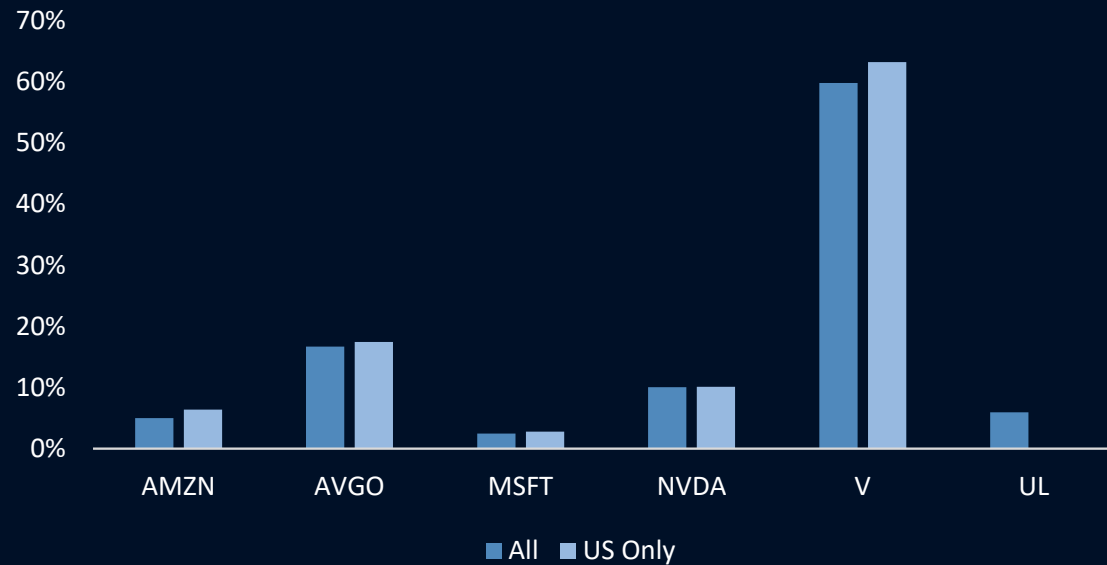
Global Sharpe ratio: EW = **0.35** MSRP = **0.30**

ALL RESULTS	
Sharpe Ratio	
GMV	0.300
MSRP	0.301
EW	<u>0.353</u>
VW	0.341
CS	0.314

US RESULTS	
Sharpe Ratio	
GMV	0.306
MSRP	0.300
EW	<u>0.383</u>
VW	0.312
CS	0.330

MSRP Strategy Performance

MSRP Weights



ALL RESULTS

Sharpe Ratio

GMV	0.300
MSRP	0.301
EW	<u>0.353</u>
VW	0.341
CS	0.314

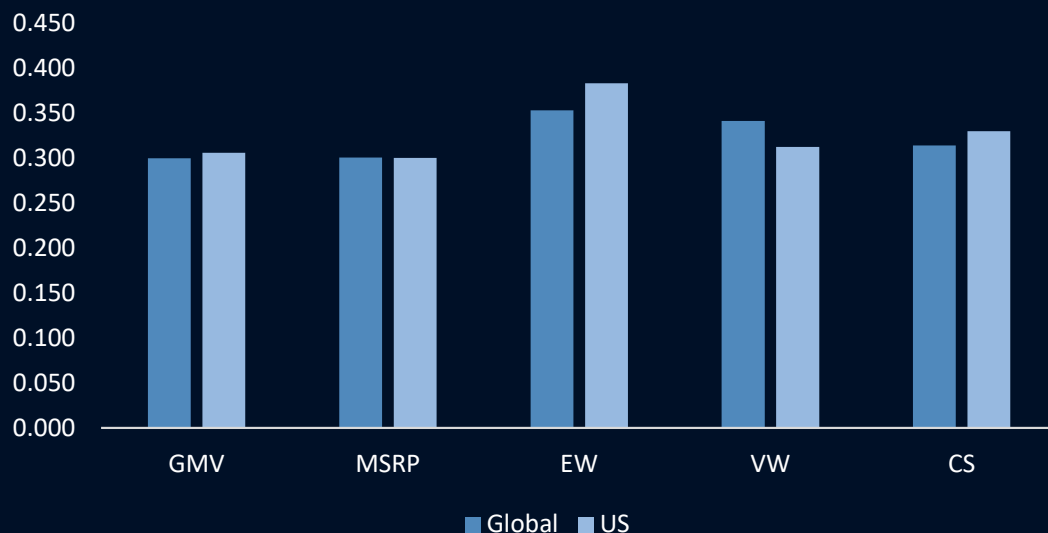
US RESULTS

Sharpe Ratio

GMV	0.306
MSRP	0.300
EW	<u>0.383</u>
VW	0.312
CS	0.330

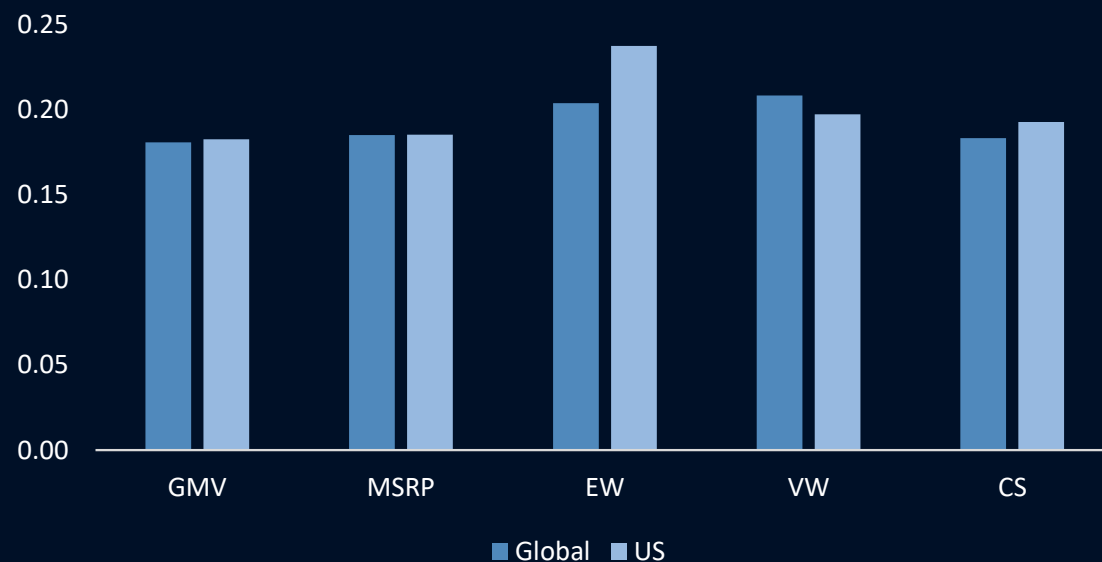
Impact of Global Diversification

Sharpe Ratios



Measuring added value per unit of total risk

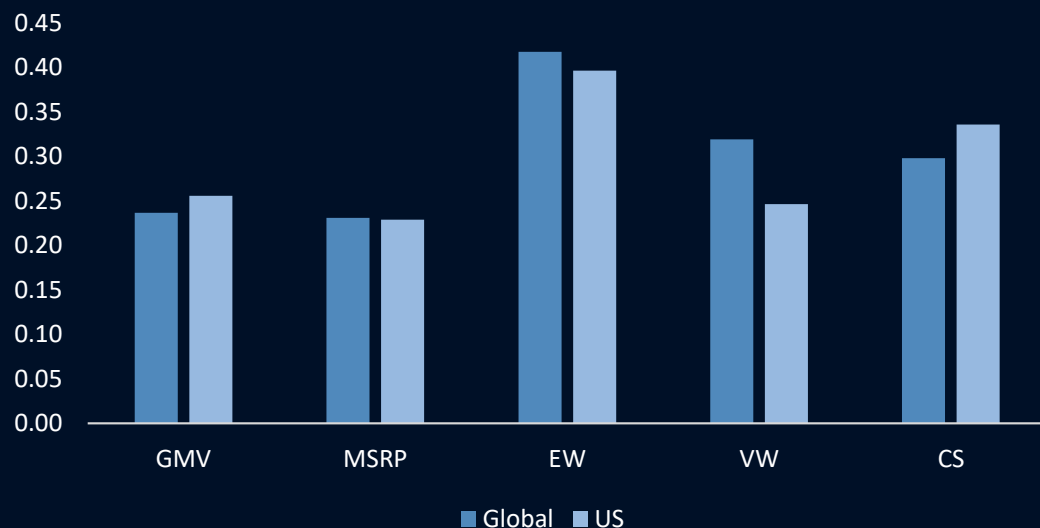
Treynor Measure



Measuring added value relative to portfolio market risk (beta)

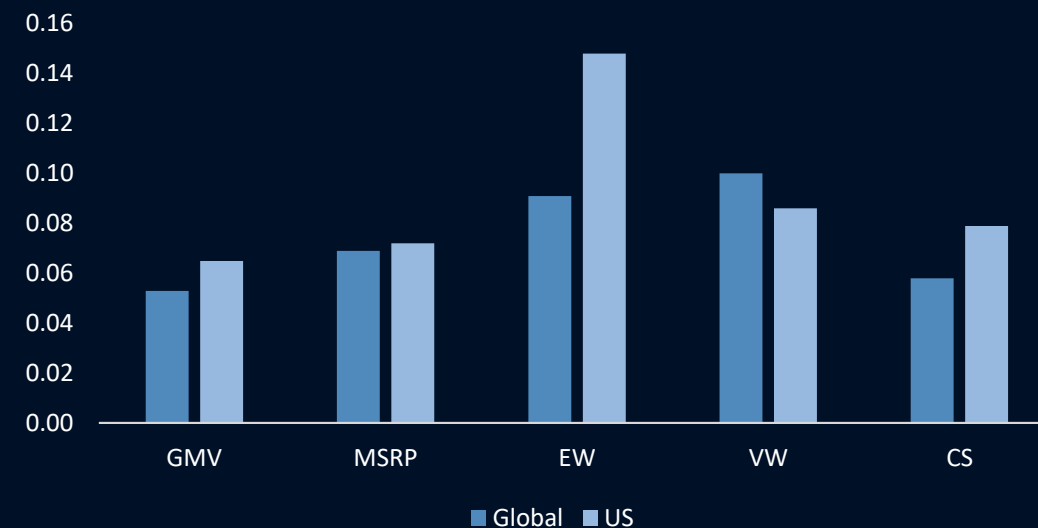
Impact of Global Diversification

Information Ratios



Measuring added value in active returns
normalized by tracking error

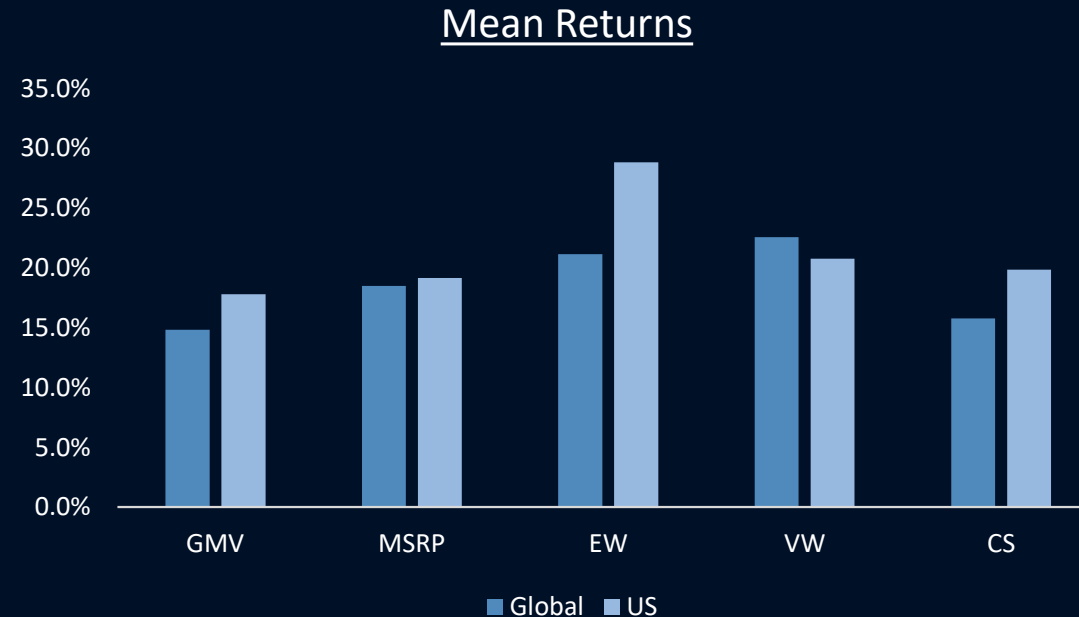
Alpha



Measuring added value compared to expectations
given the market risk taken

We believe US alpha is higher because it overperformed post-pandemic

Impact of Global Diversification



Although most risk-based performance metrics are very even for the US and global portfolios, total US returns outperform global returns in all portfolios except for the Value Weighted portfolio.

This possibly reflects the swift US recovery during the pandemic compared to other countries.

Investment Recommendations

Investing Entirely in a Single Portfolio

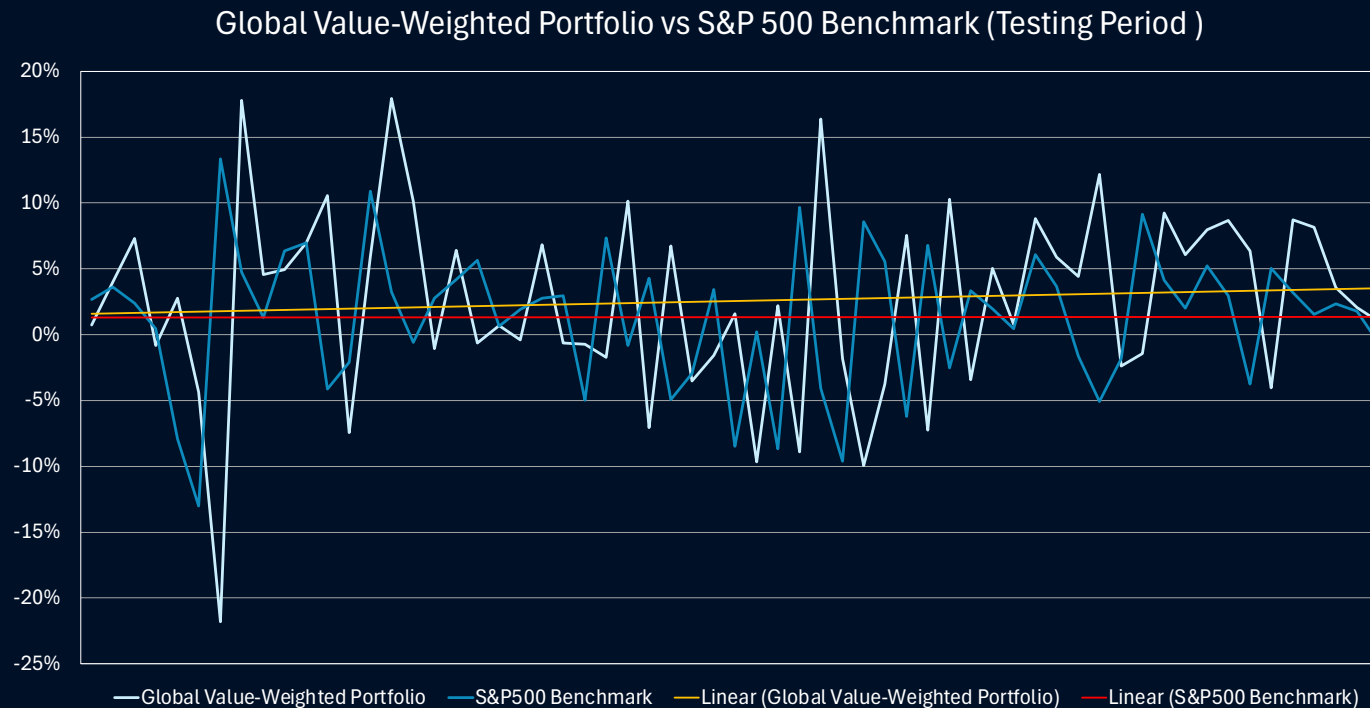
RECOMMENDATION: GLOBAL VALUE-WEIGHTED

1. Market-Leading Stock exposure: The allocation towards the market-dominating stocks enables VW portfolio to capitalize on post-COVID market recovery and the significant growth in tech sector.
2. Balanced Risk Metrics for **growth-oriented investors**: While its Sharpe ratio (0.341 global)* isn't the highest, VW balances acceptable risk with superior returns.
3. The Treynor Ratio (0.21 global) ** confirms that VW portfolio delivers good returns relative to market risk, even with a slightly higher beta (1.08). This portfolio prioritizes high absolute returns over risk efficiency.

* This suggests that VW's outperformance relies more on its high market exposure rather than efficient risk allocation.

** A **Treynor Ratio of 0.21** means that for every unit of market risk (beta = 1), the Value-Weighted Portfolio generates 0.21% of extra return above risk-free rate.

4. Offers the highest mean return (22.6%) and strong risk-adjusted returns in both US-only and global portfolios. This consistent outperformance highlights VW's ability to capitalize on market cap leaders like AAPL and MSFT.



*Lines represent the best-fit trend line

Adding a Portfolio to a Passive Fund

RECOMMENDATION: GLOBAL EQUAL WEIGHTED

1. Highest Information Ratio of 0.42
2. **Enhanced Risk-Adjusted Returns:** A portfolio with a **0.42 information ratio** demonstrates consistent excess returns relative to a benchmark, offering a passive fund the opportunity to outperform standard market indices.
3. **Active Return Potential:** By adding a portfolio with a **0.42 information ratio**, a passive fund can incorporate a systematic edge, leveraging skill-based returns while maintaining broad market exposure.

Adding a Portfolio to a Hedge Fund

RECOMMENDATION: DOMESTIC EQUA—WEIGHTED PORTFOLIO

Active funds can use CS for alpha generation*.

1. *Highest Treynor Measure 0.24*
2. Superior Market Risk Compensation: A Treynor measure of 0.24 indicates that the portfolio delivers 0.24% in excess return for every unit of market risk, making it a highly efficient use of risk exposure for a hedge fund seeking to maximize returns.
3. Strategic Advantage for Active Managed Funds: For an actively managed fund, the highest Treynor measure of 0.24 reflects the fund's ability to outperform the market relative to beta, offering a clear competitive edge in generating alpha from systematic market movements.

* $\text{Alpha} = \text{Portfolio Return} - [\text{Risk-Free Rate} + \beta(\text{Benchmark Return} - \text{Risk-Free Rate})]$.

Positive alpha (excess return) indicates outperformance of the portfolio relative to its benchmark



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