

## The Power of Many: Breadth Across Style Factors

### A Study on Portfolio Breadth in Value, Growth and Quality Portfolios



This paper is an extension of our recent research paper that analyzed how portfolio breadth influences the performance, consistency, and risk profile of momentum strategies (see [The Power of Many - How Portfolio Breadth Shapes Momentum Outcomes](#)). In this latest study, we test how the number of holdings affects outcomes of three additional style factor strategies: Value, Growth, and Quality.

#### Key Findings

- Consistent with our findings on Momentum portfolios, broader portfolios generally deliver stronger risk-adjusted returns for Growth and Quality. Value, however, exhibits a less consistently monotonic relationship between breadth and performance.
- Diversification benefits accrue rapidly but plateau quickly. The largest improvements in risk reduction occur when moving from extremely concentrated portfolios to moderately diversified ones.
- Outcome variability tightens substantially as portfolios expand. The dispersion of realized results narrow meaningfully as the number of holdings rises.

## A Study on Value, Growth and Quality and Portfolio Breadth

We recently published research that analyzed how portfolio breadth influences the performance, consistency, and risk profile of momentum strategies (see [The Power of Many - How Portfolio Breadth Shapes Momentum Outcomes](#)). As an extension of that work, we test how the number of holdings affects the performance of three additional style factor portfolios: Value, Growth, and Quality.

Value is defined as the top quintile of Book-to-Price (B/P), calculated as common equity divided by market value (market price multiplied by common shares outstanding). Growth is defined as the inverse of Value and represented by the bottom quintile of B/P. Quality is defined as the top quintile of Return on Equity (ROE), calculated as trailing 12-month net income divided by total shareholders' equity, with equity averaged across aligned historical reporting periods.

Portfolios were constructed as long-only, market-capitalization-weighted strategies and reconstituted annually at June month-end. Portfolio weights were rebalanced monthly based on market capitalization. For a full description of universes and methodology, please see Appendix A.

### Universes Analyzed:

- US Large Cap (Russell 1000 proxy)
- US Mid Cap (Russell Mid Cap proxy)
- US Small Cap (Russell 2000 proxy)
- US Micro Cap (Russell Microcap proxy)
- MSCI ACWI ex USA
- MSCI ACWI ex USA Small Cap
- MSCI ACWI
- MSCI ACWI Small Cap
- MSCI Emerging Markets
- MSCI Emerging Markets Small Cap

Like the momentum breadth study, for each factor and within each universe we generated twelve random subsets representing varying levels of portfolio breadth. These ranged from a single holding to 90% of the full factor quintile. Each level of portfolio breadth was simulated across 30 independent random samples. This design allowed us to capture both the central tendency and dispersion of possible outcomes, while testing whether holding only a subset of the factor cohort could replicate or potentially improve upon the characteristics of the full quintile portfolio.



## Findings:

### 1. **Broader portfolios improved risk-adjusted performance for Growth and Quality, but not consistently for Value.**

The following tables display the median outcomes of each universe at varying levels of portfolio breadth. For Growth and Quality, results across the majority of universes indicate that broader portfolios generally deliver stronger risk-adjusted performance. Narrow, highly concentrated portfolios exhibit greater variability and lower median outcomes.

For Value, however, the relationship is less consistently monotonic. Across most universes, there is often a point at which risk-adjusted returns peak and then begin to diminish as portfolios broaden further. This suggests that the diversification benefits of additional breadth may eventually be offset by dilution of the Value signal, or by the inclusion of “value traps”—stocks that are inexpensive for persistent or structural reasons rather than temporary mispricing.

**US Large Cap (Russell 1000 proxy), Median Performance & Risk Metrics**  
June 1988 – December 2025

**R1000 Proxy - Median Risk Metrics**

Name Count	% of Universe	VALUE							
		Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	8.27%	-3.07%	30.18%	33.59%	0.17	-0.11	1.05	0.95
10	1%	10.25%	-1.10%	14.63%	20.73%	0.36	-0.08	1.00	1.00
20	2%	10.50%	-0.85%	12.67%	19.53%	0.38	-0.06	1.01	1.00
40	4%	10.84%	-0.50%	10.90%	18.57%	0.43	-0.05	1.01	1.00
60	6%	10.57%	-0.78%	10.43%	18.27%	0.43	-0.07	1.01	1.00
80	8%	10.66%	-0.69%	10.07%	18.11%	0.43	-0.07	1.01	1.01
100	10%	10.30%	-1.04%	9.69%	17.75%	0.42	-0.11	1.00	1.02
120	12%	10.88%	-0.47%	9.45%	17.65%	0.45	-0.05	1.00	1.00
140	14%	10.40%	-0.95%	9.40%	17.63%	0.42	-0.10	1.00	1.01
160	16%	10.51%	-0.84%	9.31%	17.63%	0.43	-0.09	1.00	1.02
180	18%	10.52%	-0.83%	9.17%	17.55%	0.44	-0.09	1.00	1.02
200	20%	10.52%	-0.82%	9.10%	17.50%	0.44	-0.09	1.00	1.02

Name Count	% of Universe	GROWTH							
		Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	3.99%	-7.36%	36.93%	40.25%	0.03	-0.20	1.08	1.16
10	1%	10.49%	-0.85%	15.22%	22.17%	0.34	-0.05	1.04	1.02
20	2%	11.06%	-0.29%	12.15%	19.68%	0.41	-0.02	1.03	1.03
40	4%	11.46%	0.12%	9.59%	18.25%	0.47	0.01	1.03	1.01
60	6%	11.58%	0.24%	8.49%	17.71%	0.50	0.03	1.04	1.01
80	8%	12.10%	0.75%	7.69%	17.19%	0.55	0.10	1.05	1.00
100	10%	12.49%	1.14%	7.28%	17.10%	0.56	0.15	1.05	1.01
120	12%	12.24%	0.89%	6.88%	16.87%	0.55	0.13	1.04	1.00
140	14%	12.39%	1.04%	6.74%	16.93%	0.56	0.16	1.05	1.01
160	16%	12.06%	0.71%	6.39%	16.70%	0.55	0.11	1.04	1.01
180	18%	12.35%	1.00%	6.29%	16.71%	0.57	0.16	1.05	1.01
200	20%	12.35%	1.00%	6.11%	16.63%	0.57	0.16	1.05	1.01

Name Count	% of Universe	QUALITY							
		Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	9.91%	-1.44%	30.30%	33.83%	0.20	-0.05	1.11	0.98
10	1%	12.10%	0.75%	13.12%	19.23%	0.49	0.06	0.99	0.86
20	2%	12.14%	0.79%	11.12%	18.08%	0.50	0.07	1.02	0.92
40	4%	12.74%	1.39%	8.77%	16.90%	0.58	0.17	1.02	0.92
60	6%	12.68%	1.33%	7.20%	16.13%	0.60	0.19	1.01	0.92
80	8%	13.06%	1.71%	6.39%	15.61%	0.65	0.26	1.01	0.92
100	10%	13.12%	1.77%	5.91%	15.50%	0.66	0.30	1.01	0.91
120	12%	12.67%	1.33%	5.39%	15.34%	0.64	0.25	1.02	0.92
140	14%	12.90%	1.55%	5.15%	15.30%	0.65	0.30	1.01	0.93
160	16%	12.89%	1.54%	4.76%	15.16%	0.66	0.33	1.02	0.93
180	18%	12.92%	1.57%	4.57%	15.07%	0.67	0.34	1.01	0.92
200	20%	13.00%	1.65%	4.36%	15.01%	0.67	0.38	1.01	0.92

**US Mid Cap (Russell MidCap proxy), Median Performance & Risk Metrics**  
June 1988 – December 2025

RMid Proxy - Median Risk Metrics		VALUE							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	9.23%	-2.41%	31.16%	34.66%	0.18	-0.08	1.06	0.86
10	1%	11.14%	-0.50%	12.99%	20.40%	0.40	-0.04	0.99	0.97
16	2%	11.67%	0.03%	11.63%	19.59%	0.45	0.00	0.99	0.96
32	4%	12.07%	0.43%	9.59%	18.40%	0.49	0.05	1.00	0.95
48	6%	11.89%	0.25%	9.05%	17.92%	0.49	0.03	0.98	0.94
64	8%	11.57%	-0.08%	8.70%	17.83%	0.49	-0.01	0.98	0.95
80	10%	11.57%	-0.07%	8.49%	17.78%	0.50	-0.01	0.98	0.95
96	12%	11.87%	0.23%	8.33%	17.70%	0.51	0.03	0.99	0.95
112	14%	11.89%	0.24%	8.19%	17.64%	0.51	0.03	0.99	0.95
128	16%	11.87%	0.23%	8.11%	17.61%	0.51	0.03	0.99	0.94
144	18%	11.80%	0.16%	8.06%	17.59%	0.51	0.02	0.99	0.95
160	20%	11.87%	0.23%	8.00%	17.55%	0.51	0.03	0.99	0.95

		GROWTH							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	4.48%	-7.17%	41.32%	45.23%	0.03	-0.17	1.06	1.16
10	1%	11.38%	-0.26%	16.09%	24.03%	0.35	-0.02	1.11	1.13
16	2%	11.34%	-0.30%	13.44%	22.53%	0.37	-0.02	1.09	1.12
32	4%	11.72%	0.08%	11.83%	21.34%	0.40	0.01	1.10	1.12
48	6%	11.92%	0.28%	10.54%	20.76%	0.44	0.03	1.10	1.11
64	8%	11.45%	-0.20%	10.01%	20.54%	0.42	-0.02	1.10	1.12
80	10%	11.79%	0.15%	9.97%	20.53%	0.43	0.02	1.10	1.12
96	12%	12.00%	0.35%	9.67%	20.25%	0.45	0.04	1.10	1.12
112	14%	11.98%	0.33%	9.71%	20.42%	0.45	0.04	1.11	1.13
128	16%	11.95%	0.31%	9.51%	20.23%	0.45	0.03	1.11	1.12
144	18%	12.00%	0.36%	9.30%	20.14%	0.45	0.04	1.10	1.12
160	20%	11.96%	0.32%	9.28%	20.14%	0.45	0.03	1.10	1.12

		QUALITY							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	5.28%	-6.36%	32.34%	36.58%	0.06	-0.20	1.07	1.13
10	1%	12.60%	0.96%	11.60%	20.90%	0.47	0.08	1.09	1.03
16	2%	12.54%	0.89%	9.97%	19.34%	0.49	0.09	1.06	1.01
32	4%	12.53%	0.89%	6.94%	18.03%	0.54	0.13	1.05	1.01
48	6%	12.42%	0.78%	6.00%	17.66%	0.54	0.14	1.06	1.03
64	8%	13.13%	1.49%	5.28%	17.47%	0.58	0.27	1.06	1.01
80	10%	12.76%	1.12%	4.75%	17.33%	0.57	0.24	1.05	1.01
96	12%	12.97%	1.32%	4.49%	17.26%	0.58	0.30	1.06	1.01
112	14%	13.08%	1.43%	4.21%	17.19%	0.59	0.34	1.06	1.01
128	16%	13.00%	1.36%	4.04%	17.17%	0.58	0.33	1.06	1.01
144	18%	13.03%	1.39%	3.87%	17.07%	0.59	0.36	1.06	1.01
160	20%	13.06%	1.42%	3.74%	17.08%	0.60	0.38	1.06	1.01

**US Small Cap (Russell 2000 proxy), Median Performance & Risk Metrics**  
June 1988 – December 2025

R2000 Proxy - Median Risk Metrics		VALUE							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	7.16%	-4.09%	41.77%	45.71%	0.09	-0.10	1.03	0.85
10	1%	11.55%	0.29%	16.83%	25.29%	0.34	0.02	1.02	0.92
40	2%	12.88%	1.62%	11.28%	21.78%	0.46	0.15	1.03	0.92
80	4%	13.08%	1.82%	9.84%	21.34%	0.48	0.20	1.03	0.94
120	6%	13.08%	1.82%	9.12%	21.00%	0.49	0.19	1.03	0.94
160	8%	12.96%	1.70%	8.68%	20.81%	0.48	0.21	1.03	0.94
200	10%	13.38%	2.12%	8.15%	20.57%	0.51	0.27	1.03	0.93
240	12%	13.19%	1.93%	8.01%	20.51%	0.50	0.23	1.02	0.93
280	14%	13.37%	2.12%	7.91%	20.53%	0.51	0.27	1.03	0.93
320	16%	13.35%	2.09%	7.89%	20.48%	0.51	0.27	1.03	0.93
360	18%	13.33%	2.07%	7.87%	20.47%	0.51	0.26	1.03	0.93
400	20%	13.32%	2.07%	7.83%	20.42%	0.51	0.26	1.03	0.93

R2000 Proxy - Median Risk Metrics		GROWTH							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	-4.31%	-15.56%	57.01%	60.34%	-0.09	-0.26	1.16	1.21
10	1%	8.86%	-2.39%	20.81%	30.05%	0.20	-0.11	1.14	1.23
40	2%	9.19%	-2.06%	13.49%	25.59%	0.25	-0.16	1.14	1.26
80	4%	9.28%	-1.97%	11.60%	24.36%	0.26	-0.18	1.14	1.26
120	6%	9.44%	-1.82%	10.27%	23.88%	0.28	-0.18	1.13	1.25
160	8%	9.70%	-1.55%	9.82%	23.63%	0.29	-0.16	1.14	1.25
200	10%	9.68%	-1.57%	9.52%	23.54%	0.29	-0.17	1.14	1.25
240	12%	9.54%	-1.72%	9.31%	23.36%	0.28	-0.19	1.13	1.25
280	14%	9.49%	-1.76%	9.21%	23.38%	0.28	-0.19	1.14	1.25
320	16%	9.51%	-1.74%	9.03%	23.25%	0.28	-0.19	1.14	1.25
360	18%	9.58%	-1.68%	8.97%	23.28%	0.29	-0.19	1.14	1.25
400	20%	9.56%	-1.70%	8.87%	23.23%	0.29	-0.19	1.14	1.25

R2000 Proxy - Median Risk Metrics		QUALITY							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	5.33%	-5.93%	41.64%	45.61%	0.06	-0.15	1.05	0.97
10	1%	11.48%	0.23%	14.88%	23.43%	0.37	0.01	1.01	0.91
40	2%	11.77%	0.51%	8.79%	19.83%	0.44	0.06	0.97	0.93
80	4%	11.93%	0.67%	6.88%	18.98%	0.48	0.10	0.97	0.91
120	6%	12.12%	0.87%	5.88%	18.75%	0.49	0.15	0.98	0.93
160	8%	12.10%	0.84%	5.50%	18.64%	0.50	0.16	0.98	0.93
200	10%	12.19%	0.94%	5.19%	18.47%	0.50	0.18	0.98	0.92
240	12%	12.21%	0.96%	4.99%	18.44%	0.51	0.19	0.98	0.92
280	14%	12.28%	1.02%	4.81%	18.40%	0.51	0.21	0.98	0.92
320	16%	12.20%	0.94%	4.67%	18.40%	0.51	0.20	0.98	0.92
360	18%	12.18%	0.92%	4.59%	18.34%	0.51	0.20	0.98	0.92
400	20%	12.21%	0.95%	4.52%	18.34%	0.51	0.21	0.98	0.92

**US Micro Cap (Russell Microcap proxy), Median Performance & Risk Metrics**  
June 1988 – September 2025

RMicro Proxy - Median Risk Metrics		VALUE							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	3.17%	-9.27%	55.67%	58.09%	0.00	-0.14	0.99	0.72
10	1%	14.11%	1.66%	22.40%	29.26%	0.38	0.07	1.05	0.88
40	2%	16.31%	3.86%	14.67%	23.84%	0.55	0.25	1.05	0.85
80	4%	15.82%	3.38%	12.10%	22.42%	0.58	0.29	1.05	0.88
120	6%	16.41%	3.96%	11.00%	21.91%	0.62	0.35	1.05	0.88
160	8%	16.21%	3.76%	10.46%	21.70%	0.62	0.37	1.05	0.90
200	10%	16.11%	3.66%	10.28%	21.48%	0.62	0.36	1.05	0.89
240	12%	16.19%	3.75%	9.90%	21.38%	0.62	0.38	1.05	0.89
280	14%	16.52%	4.07%	9.73%	21.27%	0.64	0.41	1.05	0.88
320	16%	16.35%	3.90%	9.66%	21.23%	0.63	0.40	1.05	0.89
360	18%	16.41%	3.96%	9.45%	21.10%	0.64	0.42	1.05	0.88
400	20%	16.37%	3.92%	9.45%	21.13%	0.64	0.42	1.05	0.89

		GROWTH							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	-10.96%	-23.41%	79.82%	83.96%	-0.18	-0.31	1.21	1.20
10	1%	9.02%	-3.43%	27.58%	36.14%	0.17	-0.13	1.16	1.26
40	2%	10.12%	-2.32%	17.77%	28.82%	0.24	-0.11	1.15	1.26
80	4%	11.40%	-1.05%	14.33%	26.97%	0.31	-0.08	1.18	1.27
120	6%	10.84%	-1.61%	12.72%	26.27%	0.30	-0.12	1.16	1.28
160	8%	10.94%	-1.51%	11.73%	25.87%	0.31	-0.12	1.17	1.29
200	10%	11.47%	-0.98%	11.35%	25.76%	0.33	-0.08	1.18	1.28
240	12%	11.79%	-0.66%	10.87%	25.63%	0.34	-0.06	1.19	1.28
280	14%	11.37%	-1.08%	10.43%	25.42%	0.34	-0.10	1.18	1.29
320	16%	11.47%	-0.98%	10.09%	25.35%	0.34	-0.10	1.18	1.29
360	18%	11.55%	-0.89%	9.86%	25.22%	0.34	-0.09	1.18	1.28
400	20%	11.58%	-0.86%	9.70%	25.17%	0.35	-0.09	1.18	1.29

		QUALITY							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	3.63%	-8.82%	49.60%	52.09%	0.02	-0.19	0.95	0.76
10	1%	12.13%	-0.31%	17.60%	24.27%	0.39	-0.02	0.95	0.84
40	2%	13.59%	1.14%	11.56%	20.27%	0.53	0.10	0.95	0.86
80	4%	13.54%	1.09%	8.85%	19.27%	0.55	0.12	0.96	0.87
120	6%	13.90%	1.45%	8.15%	18.77%	0.59	0.19	0.95	0.85
160	8%	14.22%	1.77%	7.40%	18.42%	0.61	0.24	0.96	0.85
200	10%	14.30%	1.85%	7.17%	18.36%	0.62	0.25	0.96	0.85
240	12%	14.13%	1.68%	6.89%	18.29%	0.62	0.24	0.96	0.85
280	14%	14.28%	1.84%	6.57%	18.19%	0.63	0.27	0.95	0.85
320	16%	14.32%	1.87%	6.42%	18.11%	0.63	0.29	0.96	0.85
360	18%	14.30%	1.85%	6.33%	18.08%	0.63	0.29	0.96	0.85
400	20%	14.35%	1.90%	6.23%	18.03%	0.63	0.30	0.96	0.85

**MSCI ACWI ex-US, Median Performance & Risk Metrics**  
June 2006 – December 2025

MSCI ACWIXUS - Median Risk Metrics		VALUE							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	2.37%	-3.47%	31.88%	36.34%	0.03	-0.14	1.08	0.98
10	0%	7.53%	1.98%	16.08%	24.96%	0.24	0.13	1.21	1.05
40	2%	6.66%	1.10%	11.20%	22.30%	0.23	0.10	1.18	1.09
80	4%	6.75%	1.19%	9.65%	21.29%	0.24	0.12	1.16	1.09
120	6%	7.36%	1.81%	9.09%	21.35%	0.28	0.20	1.18	1.11
161	8%	7.51%	1.95%	8.75%	21.08%	0.28	0.22	1.17	1.10
201	10%	7.42%	1.87%	8.64%	21.16%	0.28	0.22	1.17	1.10
241	12%	7.27%	1.71%	8.46%	20.98%	0.27	0.20	1.17	1.11
282	14%	7.26%	1.71%	8.44%	20.98%	0.27	0.20	1.17	1.12
322	16%	7.46%	1.91%	8.29%	20.89%	0.28	0.23	1.17	1.11
362	18%	7.37%	1.81%	8.30%	20.91%	0.28	0.22	1.17	1.11
410	20%	7.09%	1.54%	8.26%	21.32%	0.26	0.19	1.18	1.12

		GROWTH							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	-1.72%	-6.08%	33.04%	36.69%	-0.10	-0.17	0.94	0.95
10	0%	5.79%	0.23%	15.39%	22.47%	0.19	0.02	0.97	0.90
40	2%	6.34%	0.79%	9.56%	18.51%	0.26	0.08	0.95	0.87
80	4%	5.70%	0.14%	7.91%	17.61%	0.24	0.02	0.93	0.88
120	6%	6.15%	0.59%	7.35%	17.29%	0.27	0.08	0.93	0.88
161	8%	6.16%	0.61%	6.94%	17.24%	0.27	0.09	0.94	0.88
201	10%	6.11%	0.55%	6.56%	17.00%	0.27	0.08	0.94	0.89
241	12%	6.34%	0.78%	6.44%	16.91%	0.29	0.12	0.93	0.88
282	14%	6.37%	0.81%	6.26%	16.90%	0.29	0.14	0.94	0.88
322	16%	6.30%	0.75%	6.00%	16.80%	0.29	0.12	0.94	0.88
362	18%	6.36%	0.80%	6.06%	16.86%	0.29	0.13	0.94	0.88
410	20%	5.97%	0.41%	5.88%	16.65%	0.27	0.07	0.93	0.89

		QUALITY							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	1.40%	-4.14%	30.89%	34.60%	0.00	-0.13	0.93	0.85
10	0%	5.72%	0.16%	14.44%	22.00%	0.20	0.01	0.97	0.88
40	2%	6.19%	0.63%	8.78%	18.78%	0.26	0.07	0.99	0.93
80	4%	6.76%	1.20%	7.02%	17.97%	0.29	0.17	0.99	0.92
120	6%	6.60%	1.04%	6.18%	17.75%	0.29	0.16	0.99	0.91
161	8%	6.41%	0.86%	5.63%	17.30%	0.29	0.15	0.97	0.92
201	10%	6.35%	0.80%	5.36%	17.25%	0.28	0.16	0.97	0.93
241	12%	6.33%	0.78%	5.05%	17.12%	0.28	0.15	0.98	0.93
282	14%	6.26%	0.70%	4.88%	16.99%	0.28	0.14	0.97	0.93
322	16%	6.35%	0.79%	4.73%	16.96%	0.28	0.17	0.98	0.93
362	18%	6.34%	0.79%	4.62%	17.00%	0.29	0.17	0.97	0.92
410	20%	6.64%	1.09%	4.33%	17.24%	0.30	0.25	1.00	0.94

## MSCI ACWI ex-US Small Cap, Median Performance & Risk Metrics

June 2006 – December 2025

MSCI ACWIXUS Small - Median Risk Metrics		VALUE							
Name	Count	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
	% of Universe								
1	0%	2.01%	-6.18%	37.55%	41.48%	0.01	-0.16	0.97	0.90
10	0%	6.60%	-0.13%	16.73%	26.18%	0.18	-0.01	1.05	1.05
84	2%	8.81%	2.08%	8.68%	20.98%	0.35	0.25	1.10	1.00
169	4%	9.39%	2.66%	7.71%	20.77%	0.38	0.35	1.10	1.00
253	6%	8.87%	2.14%	7.13%	20.41%	0.36	0.30	1.09	1.01
338	8%	9.07%	2.34%	7.12%	20.42%	0.37	0.33	1.09	1.00
423	10%	9.06%	2.33%	7.01%	20.39%	0.37	0.34	1.10	1.01
507	12%	9.09%	2.36%	6.99%	20.45%	0.37	0.34	1.10	1.01
592	14%	9.20%	2.47%	6.88%	20.32%	0.38	0.36	1.10	1.00
676	16%	9.06%	2.33%	6.82%	20.29%	0.37	0.34	1.10	1.00
761	18%	9.13%	2.40%	6.80%	20.34%	0.38	0.35	1.10	1.00
850	20%	9.21%	2.48%	7.48%	21.60%	0.36	0.33	1.14	1.04

		GROWTH							
Name	Count	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
	% of Universe								
1	0%	-6.50%	-14.12%	41.85%	45.79%	-0.15	-0.34	0.95	1.16
10	0%	4.19%	-2.54%	16.89%	25.28%	0.11	-0.15	0.96	1.04
84	2%	6.61%	-0.12%	7.31%	20.09%	0.25	-0.02	1.01	1.03
169	4%	6.56%	-0.17%	6.10%	19.72%	0.25	-0.03	1.02	1.02
253	6%	6.29%	-0.44%	5.60%	19.60%	0.24	-0.08	1.01	1.04
338	8%	6.26%	-0.48%	5.30%	19.48%	0.24	-0.09	1.01	1.03
423	10%	6.26%	-0.47%	5.22%	19.53%	0.24	-0.09	1.01	1.03
507	12%	6.40%	-0.33%	5.03%	19.39%	0.25	-0.07	1.02	1.03
592	14%	6.41%	-0.33%	4.95%	19.38%	0.25	-0.07	1.01	1.03
676	16%	6.35%	-0.38%	4.93%	19.38%	0.25	-0.08	1.01	1.03
761	18%	6.35%	-0.38%	4.88%	19.39%	0.25	-0.08	1.01	1.03
850	20%	6.83%	0.10%	4.62%	19.12%	0.28	0.02	1.02	1.01

		QUALITY							
Name	Count	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
	% of Universe								
1	0%	0.45%	-8.70%	37.30%	42.74%	-0.03	-0.25	1.08	1.06
10	0%	6.77%	0.04%	15.77%	25.00%	0.21	0.00	1.06	1.03
84	2%	8.03%	1.30%	6.49%	20.23%	0.32	0.21	1.07	1.01
169	4%	8.32%	1.59%	5.35%	19.97%	0.34	0.30	1.07	1.02
253	6%	8.37%	1.64%	4.71%	19.82%	0.35	0.35	1.07	1.01
338	8%	8.27%	1.54%	4.44%	19.75%	0.34	0.35	1.08	1.02
423	10%	8.41%	1.68%	4.26%	19.66%	0.35	0.39	1.08	1.01
507	12%	8.55%	1.82%	4.17%	19.70%	0.36	0.44	1.08	1.01
592	14%	8.53%	1.80%	4.08%	19.70%	0.35	0.44	1.08	1.01
676	16%	8.31%	1.58%	4.00%	19.66%	0.35	0.39	1.07	1.01
761	18%	8.38%	1.65%	3.95%	19.68%	0.35	0.42	1.08	1.01
850	20%	9.23%	2.50%	3.75%	19.90%	0.39	0.67	1.11	1.01

**MSCI ACWI, Median Performance & Risk Metrics**  
June 2006 – December 2025

MSCI ACWI - Median Risk Metrics		VALUE							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	2.81%	-5.17%	32.65%	36.42%	0.04	-0.15	1.11	1.13
10	0%	5.99%	-1.98%	14.86%	23.18%	0.22	-0.13	1.11	1.15
52	2%	6.67%	-1.30%	10.57%	20.54%	0.25	-0.12	1.08	1.15
105	4%	7.00%	-0.97%	9.20%	19.80%	0.28	-0.11	1.09	1.14
157	6%	6.71%	-1.26%	8.71%	19.53%	0.27	-0.15	1.07	1.15
210	8%	6.79%	-1.18%	8.52%	19.49%	0.27	-0.14	1.08	1.16
262	10%	6.67%	-1.31%	8.35%	19.30%	0.27	-0.16	1.08	1.15
315	12%	6.79%	-1.18%	8.45%	19.58%	0.27	-0.14	1.09	1.16
367	14%	6.75%	-1.23%	8.29%	19.39%	0.27	-0.15	1.08	1.16
420	16%	6.72%	-1.25%	8.29%	19.47%	0.27	-0.15	1.08	1.16
472	18%	6.74%	-1.23%	8.24%	19.36%	0.27	-0.15	1.08	1.15
530	20%	6.78%	-1.19%	8.20%	19.36%	0.27	-0.15	1.08	1.16
		GROWTH							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	2.24%	-5.73%	30.99%	34.84%	0.02	-0.17	0.96	0.98
10	0%	9.17%	1.20%	13.51%	20.49%	0.37	0.09	1.03	0.90
52	2%	10.44%	2.46%	8.23%	17.51%	0.51	0.30	1.02	0.87
105	4%	10.83%	2.85%	6.85%	16.91%	0.55	0.41	1.03	0.87
157	6%	10.95%	2.97%	6.12%	16.61%	0.57	0.46	1.02	0.88
210	8%	10.70%	2.73%	5.92%	16.53%	0.55	0.46	1.02	0.89
262	10%	10.96%	2.98%	5.64%	16.39%	0.58	0.53	1.03	0.87
315	12%	10.91%	2.94%	5.44%	16.25%	0.58	0.53	1.02	0.86
367	14%	10.89%	2.91%	5.39%	16.30%	0.58	0.55	1.03	0.87
420	16%	10.73%	2.76%	5.33%	16.24%	0.57	0.52	1.02	0.88
472	18%	11.10%	3.12%	5.24%	16.23%	0.59	0.59	1.03	0.87
530	20%	10.97%	3.00%	5.15%	16.20%	0.58	0.58	1.03	0.87
		QUALITY							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	2.84%	-5.14%	32.85%	37.65%	0.03	-0.16	0.99	0.94
10	0%	8.91%	0.93%	13.44%	21.32%	0.34	0.06	1.01	0.96
52	2%	9.74%	1.77%	7.82%	17.43%	0.49	0.22	1.02	0.91
105	4%	10.03%	2.05%	6.25%	16.56%	0.51	0.34	1.02	0.90
157	6%	9.87%	1.90%	5.47%	16.43%	0.51	0.35	1.01	0.92
210	8%	10.25%	2.28%	4.98%	16.32%	0.53	0.45	1.03	0.92
262	10%	10.08%	2.11%	4.76%	16.12%	0.53	0.45	1.03	0.92
315	12%	9.99%	2.02%	4.40%	15.95%	0.53	0.47	1.02	0.92
367	14%	10.06%	2.09%	4.33%	16.05%	0.53	0.50	1.02	0.92
420	16%	10.15%	2.18%	4.15%	15.90%	0.54	0.52	1.02	0.91
472	18%	10.24%	2.26%	4.09%	15.93%	0.55	0.56	1.03	0.92
530	20%	10.13%	2.16%	3.97%	15.92%	0.54	0.54	1.02	0.92

**MSCI ACWI Small Cap, Median Performance & Risk Metrics**  
June 2006 – December 2025

MSCI ACWI Small - Median Risk Metrics		VALUE							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	-1.33%	-9.13%	42.58%	46.22%	-0.05	-0.20	1.00	1.03
10	0%	7.27%	-0.52%	15.56%	23.68%	0.25	-0.04	1.01	0.98
121	2%	8.94%	1.15%	8.06%	19.59%	0.36	0.13	1.02	0.95
242	4%	8.31%	0.51%	7.28%	19.14%	0.35	0.07	1.00	0.97
363	6%	8.44%	0.65%	7.30%	19.27%	0.36	0.08	1.02	0.98
484	8%	8.45%	0.66%	6.89%	19.06%	0.36	0.10	1.01	0.98
606	10%	8.43%	0.63%	6.83%	19.17%	0.37	0.10	1.02	0.98
727	12%	8.55%	0.75%	6.81%	19.29%	0.37	0.11	1.02	0.98
848	14%	8.53%	0.74%	6.79%	19.32%	0.37	0.11	1.02	0.98
969	16%	8.58%	0.78%	6.70%	19.25%	0.37	0.12	1.02	0.98
1090	18%	8.61%	0.82%	6.61%	19.19%	0.37	0.12	1.02	0.98
1220	20%	8.60%	0.81%	6.57%	19.15%	0.37	0.12	1.02	0.98

		GROWTH							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	-3.91%	-14.36%	44.14%	46.77%	-0.13	-0.33	0.86	0.97
10	0%	7.22%	-0.56%	18.72%	26.49%	0.20	-0.02	1.06	1.01
121	2%	8.24%	0.46%	6.88%	20.06%	0.34	0.07	1.06	1.04
242	4%	8.14%	0.36%	6.08%	19.83%	0.33	0.06	1.06	1.07
363	6%	7.92%	0.14%	5.63%	19.60%	0.33	0.03	1.05	1.05
484	8%	8.13%	0.35%	5.55%	19.59%	0.34	0.06	1.06	1.06
606	10%	8.00%	0.22%	5.42%	19.56%	0.33	0.04	1.06	1.05
727	12%	8.05%	0.27%	5.39%	19.56%	0.33	0.05	1.06	1.06
848	14%	8.10%	0.32%	5.30%	19.54%	0.34	0.06	1.06	1.06
969	16%	8.05%	0.27%	5.26%	19.51%	0.34	0.05	1.06	1.06
1090	18%	8.04%	0.26%	5.23%	19.50%	0.34	0.05	1.06	1.06
1220	20%	8.70%	0.92%	4.96%	18.55%	0.39	0.19	1.04	1.02

		QUALITY							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	-1.87%	-9.66%	37.38%	41.11%	-0.07	-0.23	1.03	1.03
10	0%	7.46%	-0.33%	14.10%	23.43%	0.26	-0.02	1.04	1.02
121	2%	8.93%	1.14%	5.11%	19.49%	0.38	0.22	1.05	1.00
242	4%	8.99%	1.19%	4.23%	19.36%	0.39	0.29	1.06	1.00
363	6%	8.69%	0.89%	3.88%	19.18%	0.37	0.24	1.05	1.01
484	8%	9.01%	1.22%	3.73%	19.26%	0.39	0.33	1.06	1.01
606	10%	8.89%	1.09%	3.58%	19.17%	0.38	0.30	1.05	1.01
727	12%	9.14%	1.34%	3.52%	19.12%	0.40	0.39	1.06	1.01
848	14%	9.01%	1.22%	3.38%	19.10%	0.39	0.36	1.05	1.01
969	16%	8.94%	1.15%	3.35%	19.09%	0.39	0.34	1.05	1.01
1090	18%	9.02%	1.23%	3.31%	19.08%	0.39	0.37	1.05	1.01
1220	20%	9.00%	1.20%	3.28%	19.08%	0.39	0.37	1.05	1.01

**MSCI Emerging Markets, Median Performance & Risk Metrics**  
June 2006 – December 2025

MSCI EM - Median Risk Metrics		VALUE								
Name	Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1		0%	1.23%	-5.49%	35.75%	40.70%	-0.01	-0.14	1.06	0.98
10		1%	8.24%	2.19%	17.40%	26.96%	0.25	0.12	1.08	1.05
19		2%	8.28%	2.22%	14.77%	25.13%	0.27	0.14	1.08	0.97
40		4%	8.96%	2.90%	12.47%	24.05%	0.31	0.24	1.11	0.98
59		6%	8.32%	2.26%	11.93%	24.02%	0.29	0.19	1.11	1.02
80		8%	8.26%	2.20%	11.16%	23.39%	0.29	0.20	1.10	0.99
100		10%	8.16%	2.11%	10.78%	23.22%	0.29	0.19	1.10	1.00
120		12%	8.27%	2.21%	10.51%	23.06%	0.29	0.21	1.10	1.00
139		14%	8.57%	2.52%	10.37%	23.05%	0.31	0.24	1.10	1.00
159		16%	8.51%	2.45%	10.19%	22.80%	0.31	0.24	1.09	0.99
179		18%	8.45%	2.40%	10.12%	22.89%	0.30	0.24	1.10	1.00
200		20%	7.27%	1.21%	9.42%	23.28%	0.25	0.13	1.09	1.04

		GROWTH								
Name	Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1		0%	-4.53%	-9.95%	36.76%	40.45%	-0.15	-0.28	0.77	0.89
10		1%	3.36%	-2.69%	17.20%	24.86%	0.07	-0.16	0.91	0.92
19		2%	5.30%	-0.76%	14.16%	23.12%	0.16	-0.05	0.93	0.93
40		4%	4.86%	-1.20%	11.62%	21.99%	0.15	-0.10	0.92	0.92
59		6%	5.46%	-0.60%	10.65%	21.10%	0.19	-0.06	0.92	0.91
80		8%	5.21%	-0.84%	9.98%	21.06%	0.18	-0.08	0.93	0.93
100		10%	5.64%	-0.42%	9.40%	20.46%	0.21	-0.05	0.93	0.91
120		12%	5.51%	-0.55%	9.02%	20.49%	0.20	-0.06	0.93	0.91
139		14%	5.45%	-0.61%	8.86%	20.21%	0.20	-0.07	0.92	0.91
159		16%	5.68%	-0.38%	8.40%	20.02%	0.21	-0.05	0.92	0.91
179		18%	5.55%	-0.50%	8.34%	20.01%	0.20	-0.06	0.92	0.91
200		20%	5.63%	-0.43%	7.65%	19.71%	0.21	-0.06	0.92	0.91

		QUALITY								
Name	Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1		0%	0.81%	-3.97%	33.03%	38.36%	-0.01	-0.11	0.88	0.78
10		1%	6.31%	0.25%	16.21%	24.78%	0.18	0.01	0.96	0.90
19		2%	6.35%	0.29%	13.48%	23.91%	0.22	0.02	1.02	0.95
40		4%	5.57%	-0.49%	10.46%	22.14%	0.19	-0.05	0.98	0.95
59		6%	5.87%	-0.19%	9.50%	21.60%	0.21	-0.02	0.98	0.96
80		8%	6.35%	0.29%	8.31%	21.08%	0.23	0.04	0.99	0.95
100		10%	5.97%	-0.09%	7.65%	20.98%	0.21	-0.01	0.98	0.96
120		12%	6.20%	0.14%	7.36%	20.85%	0.22	0.02	0.99	0.96
139		14%	6.09%	0.03%	6.93%	20.55%	0.22	0.00	0.98	0.96
159		16%	6.28%	0.23%	6.60%	20.72%	0.23	0.03	0.98	0.97
179		18%	6.40%	0.35%	6.37%	20.45%	0.24	0.05	0.98	0.96
200		20%	6.19%	0.14%	5.72%	20.36%	0.23	0.02	0.98	0.96

**MSCI Emerging Markets Small Cap, Median Performance & Risk Metrics**  
June 2006 – December 2025

MSCI EM Small - Median Risk Metrics		VALUE							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	2.11%	-3.66%	42.17%	47.18%	0.01	-0.10	1.11	0.93
10	1%	8.91%	0.97%	17.84%	29.22%	0.27	0.05	1.11	1.01
35	2%	11.43%	3.50%	11.15%	25.68%	0.38	0.31	1.13	1.01
70	4%	11.73%	3.80%	9.19%	24.87%	0.41	0.43	1.13	1.00
104	6%	11.08%	3.15%	8.24%	24.41%	0.39	0.37	1.11	1.02
139	8%	11.98%	4.04%	7.79%	24.44%	0.43	0.52	1.14	1.00
175	10%	11.65%	3.71%	7.49%	24.22%	0.42	0.52	1.13	1.00
209	12%	11.75%	3.81%	7.31%	24.21%	0.42	0.51	1.13	1.00
244	14%	11.88%	3.94%	7.24%	24.24%	0.43	0.55	1.13	1.01
279	16%	11.86%	3.93%	7.09%	24.16%	0.43	0.56	1.13	1.00
314	18%	11.83%	3.90%	7.00%	24.16%	0.43	0.56	1.13	1.00
350	20%	11.83%	3.89%	7.68%	25.42%	0.41	0.51	1.17	1.04

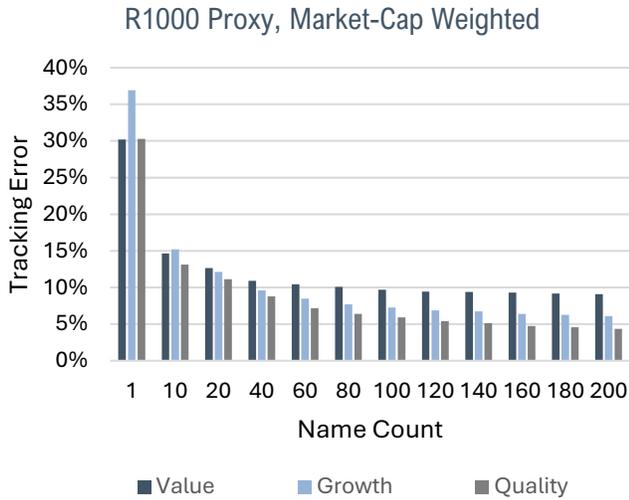
		GROWTH							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	-5.26%	-11.92%	44.20%	46.82%	-0.16	-0.29	0.83	0.95
10	1%	4.16%	-3.77%	19.14%	28.20%	0.09	-0.18	0.97	1.08
35	2%	5.01%	-2.93%	11.75%	24.16%	0.15	-0.24	0.98	1.05
70	4%	6.23%	-1.71%	9.09%	22.90%	0.21	-0.19	1.00	1.05
104	6%	6.01%	-1.93%	8.18%	22.42%	0.20	-0.22	0.99	1.06
139	8%	5.70%	-2.24%	7.69%	22.29%	0.19	-0.29	0.98	1.06
175	10%	5.97%	-1.97%	7.18%	22.17%	0.20	-0.28	0.99	1.06
209	12%	5.77%	-2.16%	6.88%	21.99%	0.19	-0.31	0.98	1.05
244	14%	5.82%	-2.12%	6.71%	22.07%	0.20	-0.31	0.98	1.06
279	16%	5.73%	-2.21%	6.58%	21.91%	0.19	-0.33	0.98	1.06
314	18%	5.68%	-2.26%	6.46%	21.94%	0.19	-0.34	0.98	1.06
350	20%	6.72%	-1.22%	5.89%	21.47%	0.24	-0.21	0.99	1.04

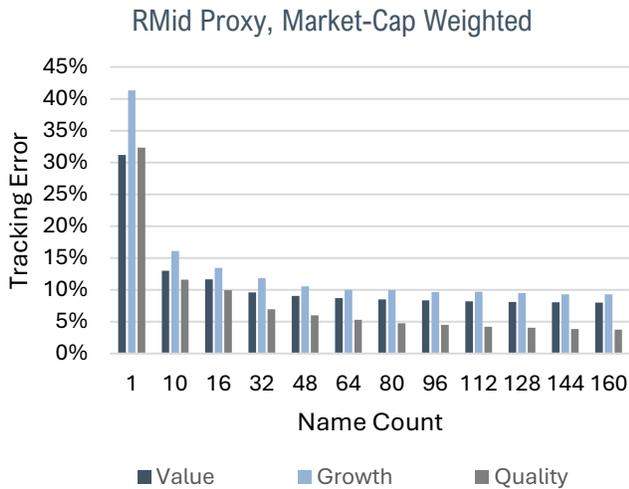
		QUALITY							
Name Count	% of Universe	Annualized Return	Annualized Excess Return	Tracking Error	Standard Deviation	Sharpe Ratio	Information Ratio	Up Market Capture	Down Market Capture
1	0%	0.00%	-7.40%	38.93%	42.73%	-0.04	-0.19	0.92	0.86
10	1%	7.89%	-0.05%	17.54%	27.48%	0.23	0.00	0.99	0.96
35	2%	8.83%	0.89%	10.26%	22.99%	0.32	0.08	1.00	0.93
70	4%	8.51%	0.57%	7.75%	21.93%	0.32	0.07	0.98	0.95
104	6%	9.11%	1.18%	6.64%	21.41%	0.35	0.18	0.99	0.92
139	8%	9.04%	1.10%	6.08%	21.29%	0.36	0.18	0.99	0.94
175	10%	8.70%	0.77%	5.65%	21.13%	0.34	0.13	0.98	0.94
209	12%	9.01%	1.07%	5.48%	21.04%	0.36	0.20	0.99	0.93
244	14%	8.63%	0.69%	5.23%	21.04%	0.34	0.13	0.98	0.95
279	16%	8.89%	0.95%	5.01%	20.93%	0.36	0.19	0.98	0.94
314	18%	9.03%	1.10%	4.89%	20.84%	0.36	0.22	0.98	0.94
350	20%	9.79%	1.86%	4.21%	21.34%	0.39	0.44	1.01	0.94

## 2. Diversification benefits emerge quickly as portfolios expand.

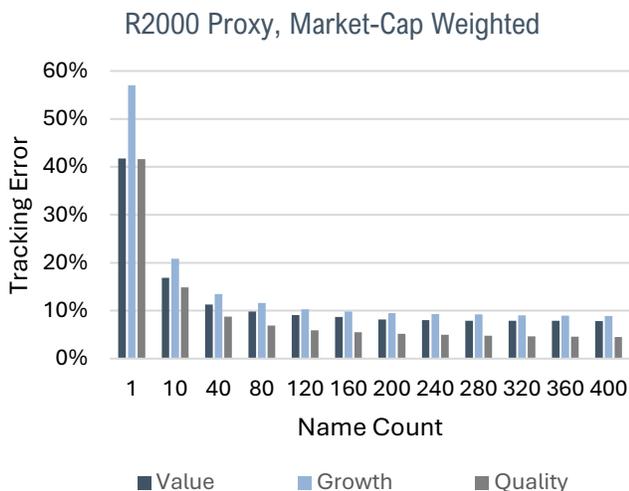
As measured by tracking error, the largest reductions in risk occur early as portfolio breadth expands, with diminishing benefits from each additional increment in name count. This pattern mirrors the results observed in the momentum study.



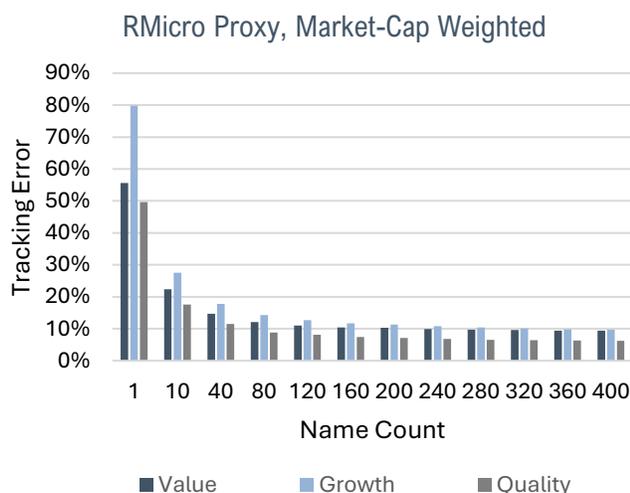
Name Count	% of Universe	Value	Growth	Quality
1	0%	30.18%	36.93%	30.30%
10	1%	14.63%	15.22%	13.12%
20	2%	12.67%	12.15%	11.12%
40	4%	10.90%	9.59%	8.77%
60	6%	10.43%	8.49%	7.20%
80	8%	10.07%	7.69%	6.39%
100	10%	9.69%	7.28%	5.91%
120	12%	9.45%	6.88%	5.39%
140	14%	9.40%	6.74%	5.15%
160	16%	9.31%	6.39%	4.76%
180	18%	9.17%	6.29%	4.57%
200	20%	9.10%	6.11%	4.36%



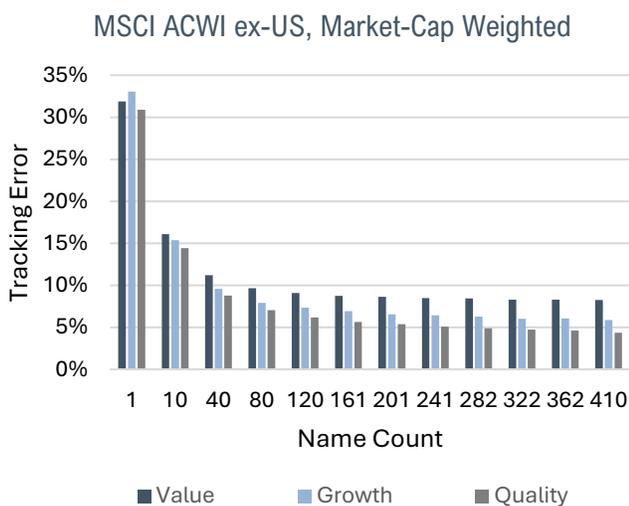
Name Count	% of Universe	Value	Growth	Quality
1	0%	31.16%	41.32%	32.34%
10	1%	12.99%	16.09%	11.60%
16	2%	11.63%	13.44%	9.97%
32	4%	9.59%	11.83%	6.94%
48	6%	9.05%	10.54%	6.00%
64	8%	8.70%	10.01%	5.28%
80	10%	8.49%	9.97%	4.75%
96	12%	8.33%	9.67%	4.49%
112	14%	8.19%	9.71%	4.21%
128	16%	8.11%	9.51%	4.04%
144	18%	8.06%	9.30%	3.87%
160	20%	8.00%	9.28%	3.74%



Name Count	% of Universe	Value	Growth	Quality
1	0%	41.77%	57.01%	41.64%
10	1%	16.83%	20.81%	14.88%
40	2%	11.28%	13.49%	8.79%
80	4%	9.84%	11.60%	6.88%
120	6%	9.12%	10.27%	5.88%
160	8%	8.68%	9.82%	5.50%
200	10%	8.15%	9.52%	5.19%
240	12%	8.01%	9.31%	4.99%
280	14%	7.91%	9.21%	4.81%
320	16%	7.89%	9.03%	4.67%
360	18%	7.87%	8.97%	4.59%
400	20%	7.83%	8.87%	4.52%

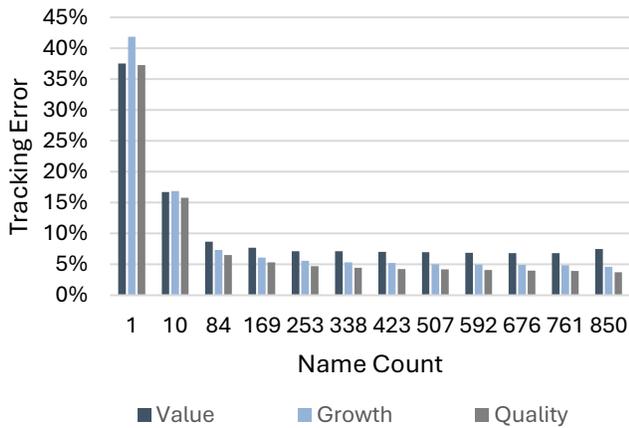


Name Count	% of Universe	Value	Growth	Quality
1	0%	55.67%	79.82%	49.60%
10	1%	22.40%	27.58%	17.60%
40	2%	14.67%	17.77%	11.56%
80	4%	12.10%	14.33%	8.85%
120	6%	11.00%	12.72%	8.15%
160	8%	10.46%	11.73%	7.40%
200	10%	10.28%	11.35%	7.17%
240	12%	9.90%	10.87%	6.89%
280	14%	9.73%	10.43%	6.57%
320	16%	9.66%	10.09%	6.42%
360	18%	9.45%	9.86%	6.33%
400	20%	9.45%	9.70%	6.23%



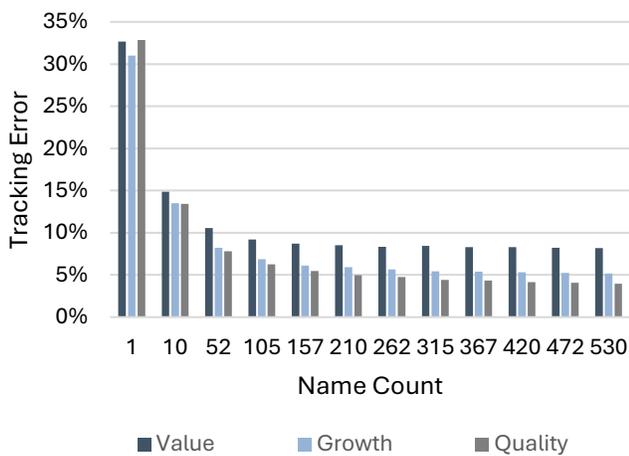
Name Count	% of Universe	Value	Growth	Quality
1	0%	31.88%	33.04%	30.89%
10	0%	16.08%	15.39%	14.44%
40	2%	11.20%	9.56%	8.78%
80	4%	9.65%	7.91%	7.02%
120	6%	9.09%	7.35%	6.18%
161	8%	8.75%	6.94%	5.63%
201	10%	8.64%	6.56%	5.36%
241	12%	8.46%	6.44%	5.05%
282	14%	8.44%	6.26%	4.88%
322	16%	8.29%	6.00%	4.73%
362	18%	8.30%	6.06%	4.62%
410	20%	8.26%	5.88%	4.33%

MSCI ACWI ex-US Small, Market-Cap Wtd.



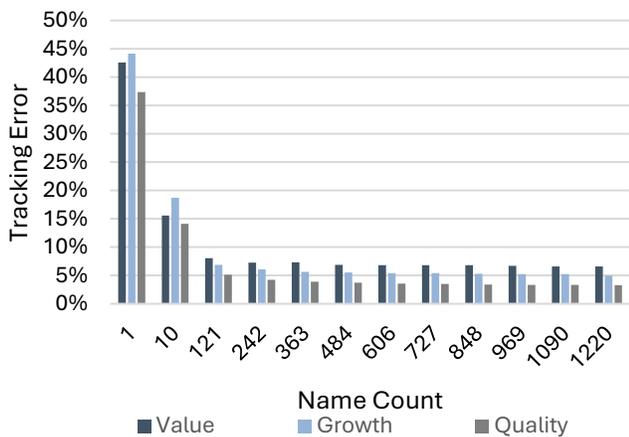
Name Count	% of Universe	Value	Growth	Quality
1	0%	37.55%	41.85%	37.30%
10	0%	16.73%	16.89%	15.77%
84	2%	8.68%	7.31%	6.49%
169	4%	7.71%	6.10%	5.35%
253	6%	7.13%	5.60%	4.71%
338	8%	7.12%	5.30%	4.44%
423	10%	7.01%	5.22%	4.26%
507	12%	6.99%	5.03%	4.17%
592	14%	6.88%	4.95%	4.08%
676	16%	6.82%	4.93%	4.00%
761	18%	6.80%	4.88%	3.95%
850	20%	7.48%	4.62%	3.75%

MSCI ACWI, Market-Cap Weighted

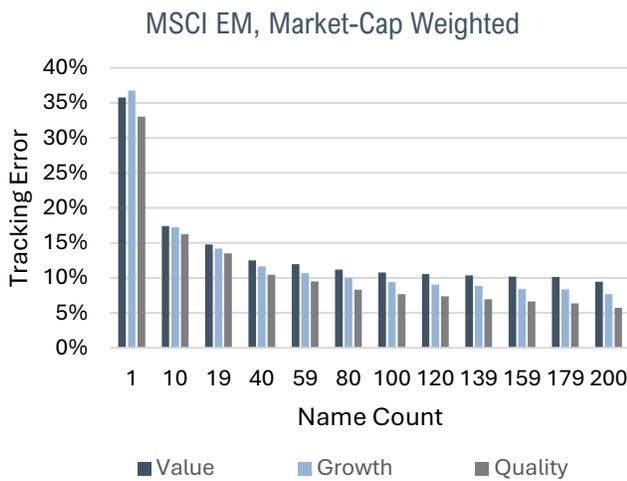


Name Count	% of Universe	Value	Growth	Quality
1	0%	32.65%	30.99%	32.85%
10	0%	14.86%	13.51%	13.44%
52	2%	10.57%	8.23%	7.82%
105	4%	9.20%	6.85%	6.25%
157	6%	8.71%	6.12%	5.47%
210	8%	8.52%	5.92%	4.98%
262	10%	8.35%	5.64%	4.76%
315	12%	8.45%	5.44%	4.40%
367	14%	8.29%	5.39%	4.33%
420	16%	8.29%	5.33%	4.15%
472	18%	8.24%	5.24%	4.09%
530	20%	8.20%	5.15%	3.97%

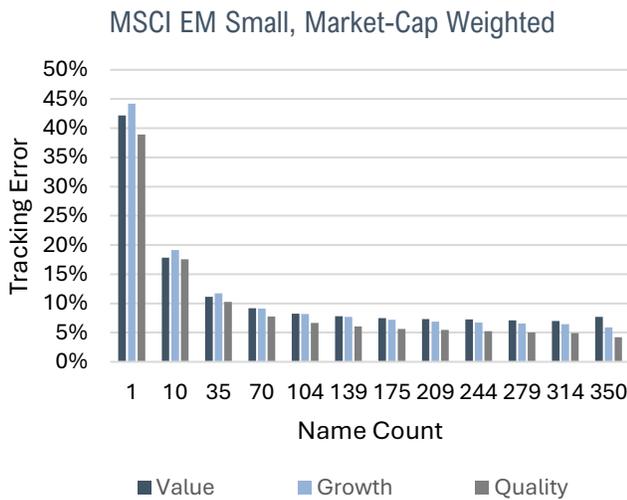
MSCI ACWI Small, Market-Cap Weighted



Name Count	% of Universe	Value	Growth	Quality
1	0%	42.58%	44.14%	37.38%
10	0%	15.56%	18.72%	14.10%
121	2%	8.06%	6.88%	5.11%
242	4%	7.28%	6.08%	4.23%
363	6%	7.30%	5.63%	3.88%
484	8%	6.89%	5.55%	3.73%
606	10%	6.83%	5.42%	3.58%
727	12%	6.81%	5.39%	3.52%
848	14%	6.79%	5.30%	3.38%
969	16%	6.70%	5.26%	3.35%
1090	18%	6.61%	5.23%	3.31%
1220	20%	6.57%	4.96%	3.28%



Name Count	% of Universe	Value	Growth	Quality
1	0%	35.75%	36.76%	33.03%
10	1%	17.40%	17.20%	16.21%
19	2%	14.77%	14.16%	13.48%
40	4%	12.47%	11.62%	10.46%
59	6%	11.93%	10.65%	9.50%
80	8%	11.16%	9.98%	8.31%
100	10%	10.78%	9.40%	7.65%
120	12%	10.51%	9.02%	7.36%
139	14%	10.37%	8.86%	6.93%
159	16%	10.19%	8.40%	6.60%
179	18%	10.12%	8.34%	6.37%
200	20%	9.42%	7.65%	5.72%

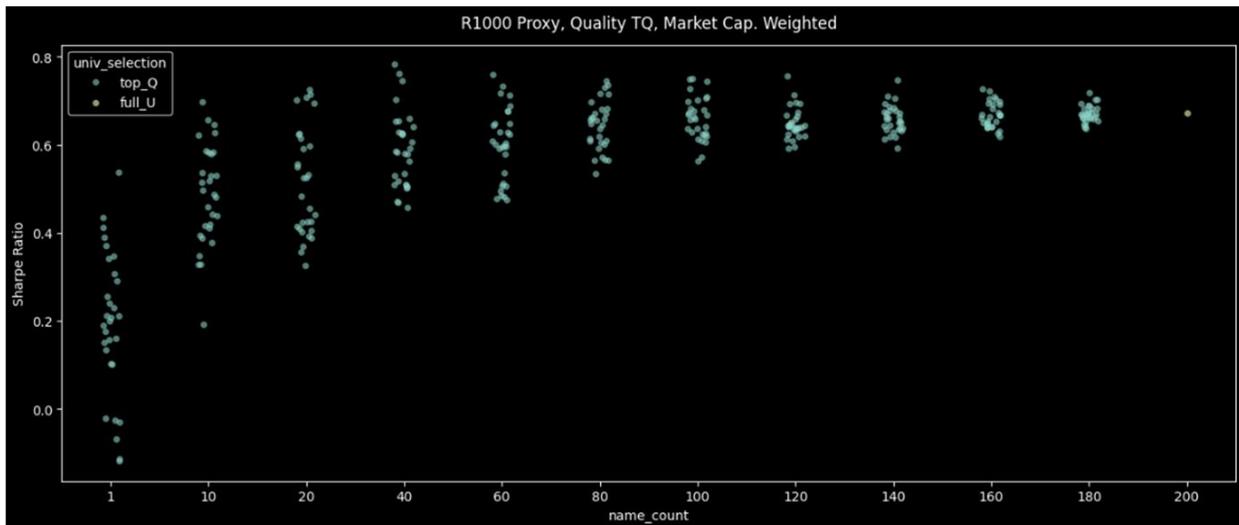
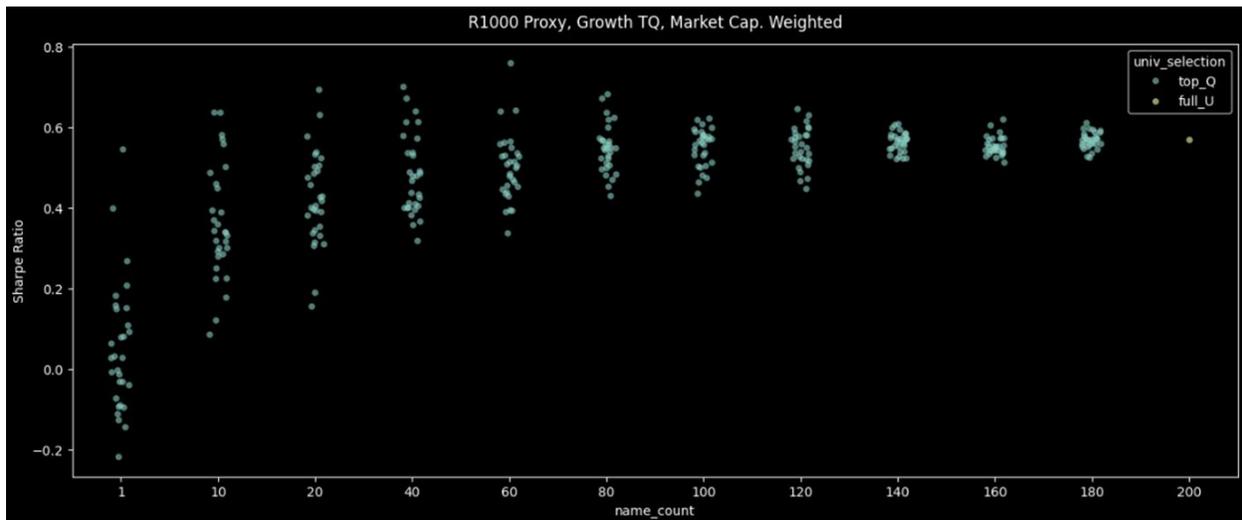
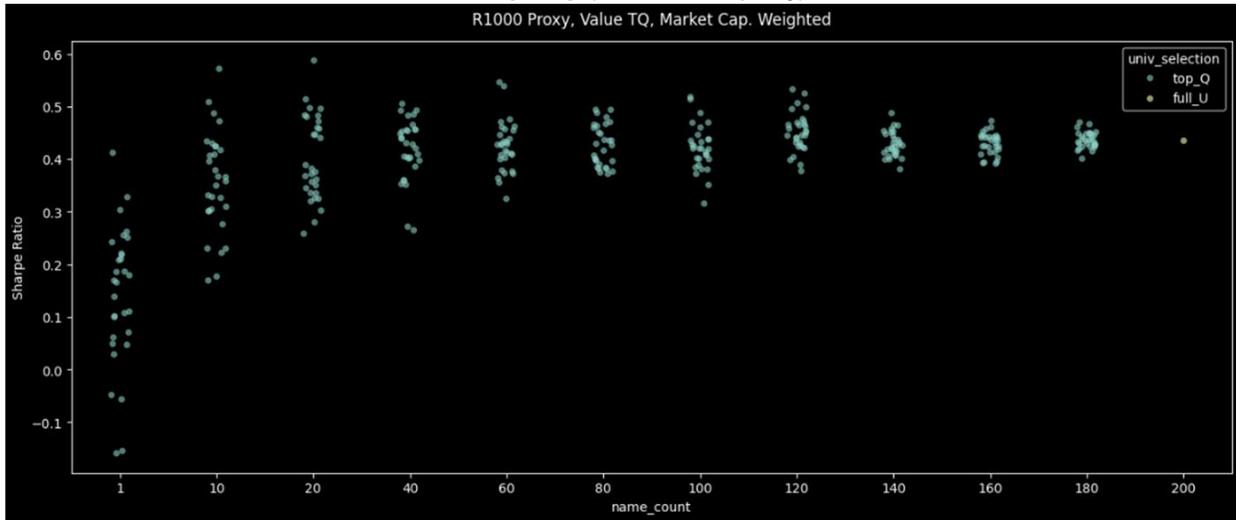


Name Count	% of Universe	Value	Growth	Quality
1	0%	42.17%	44.20%	38.93%
10	1%	17.84%	19.14%	17.54%
35	2%	11.15%	11.75%	10.26%
70	4%	9.19%	9.09%	7.75%
104	6%	8.24%	8.18%	6.64%
139	8%	7.79%	7.69%	6.08%
175	10%	7.49%	7.18%	5.65%
209	12%	7.31%	6.88%	5.48%
244	14%	7.24%	6.71%	5.23%
279	16%	7.09%	6.58%	5.01%
314	18%	7.00%	6.46%	4.89%
350	20%	7.68%	5.89%	4.21%

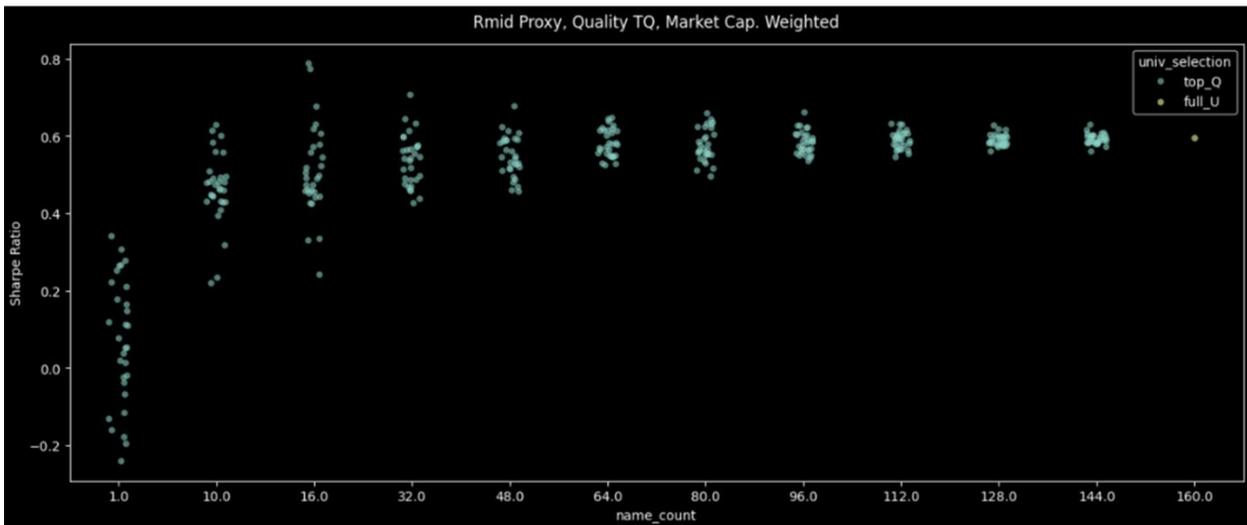
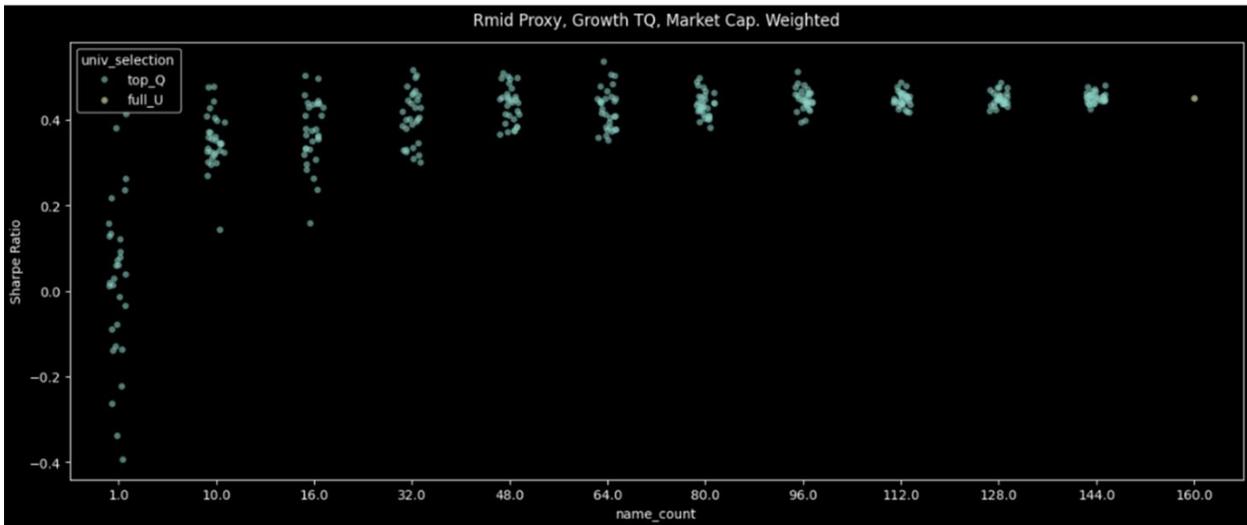
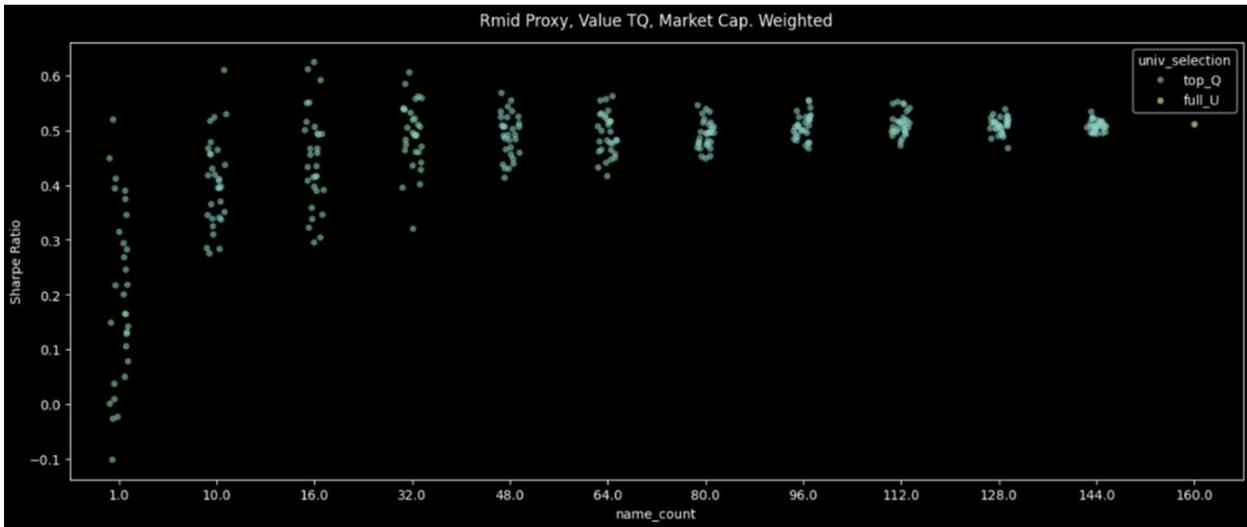
### 3. Outcome consistency increases with portfolio breadth.

Risk Consistent with the prior study, the dispersion of outcomes tightens meaningfully as portfolio name count increases. Each blue dot in the figures below represents one of the 30 random simulations for a given number of holdings, while the orange dot corresponds to the top-quintile (20%) portfolio for the given style factor. Dispersion is measured using the coefficient of variation. See Appendix B for additional plots and details.

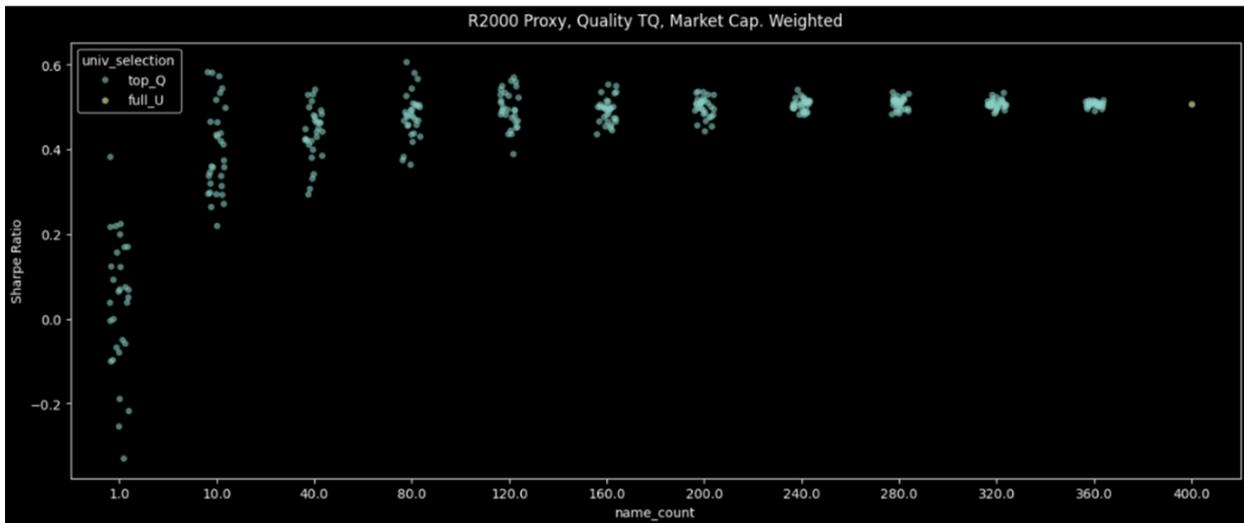
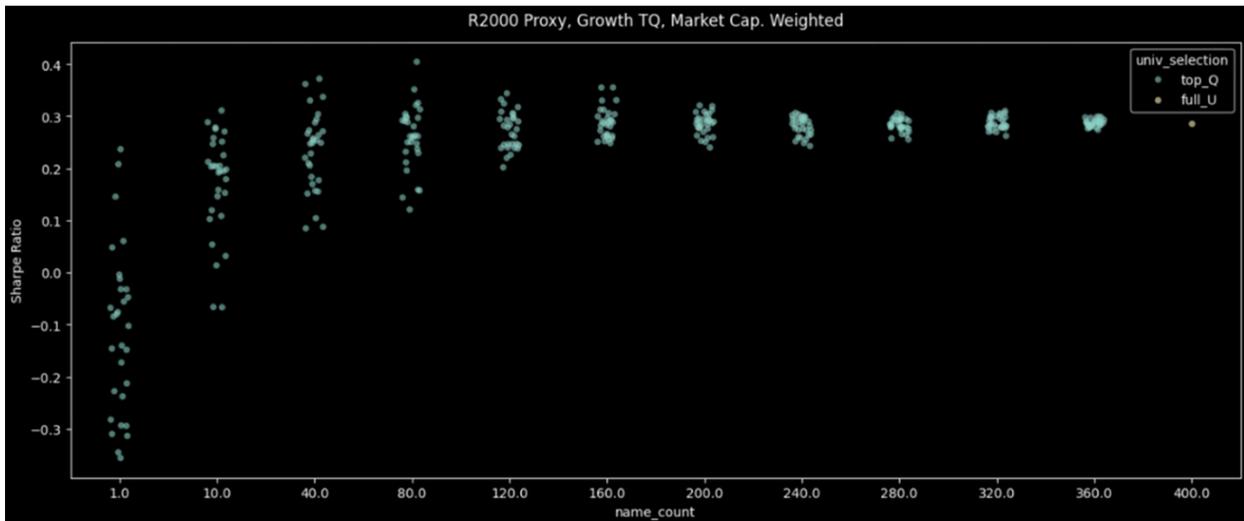
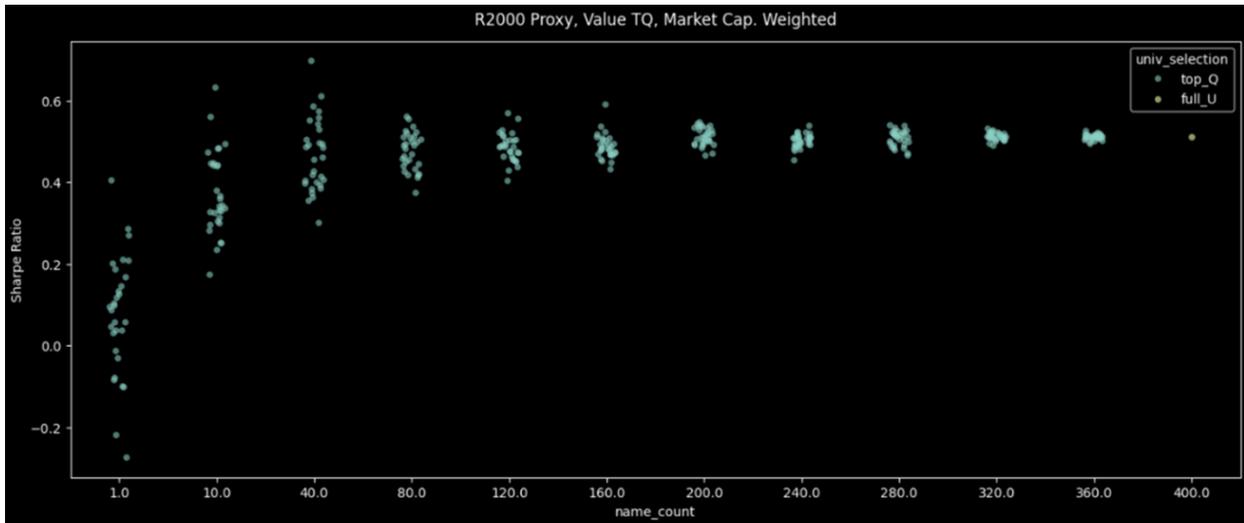
# US Large Cap (Russell 1000 proxy)



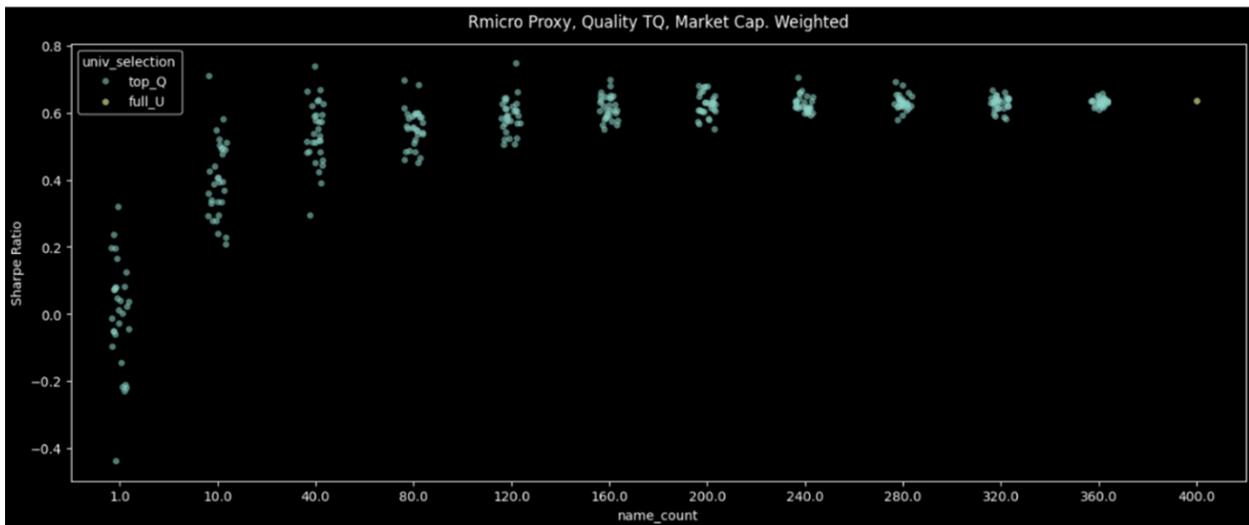
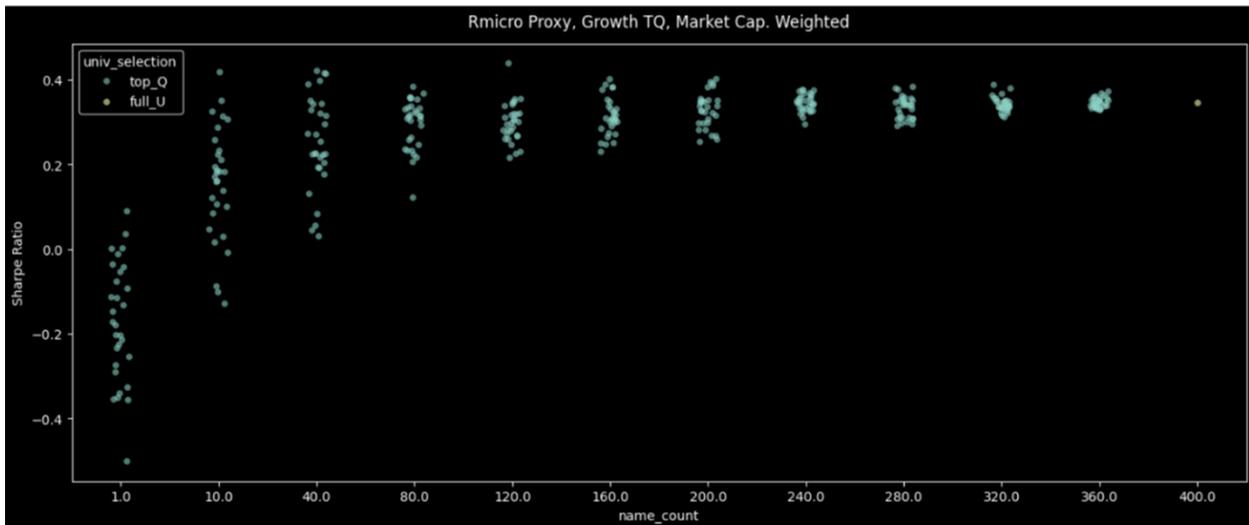
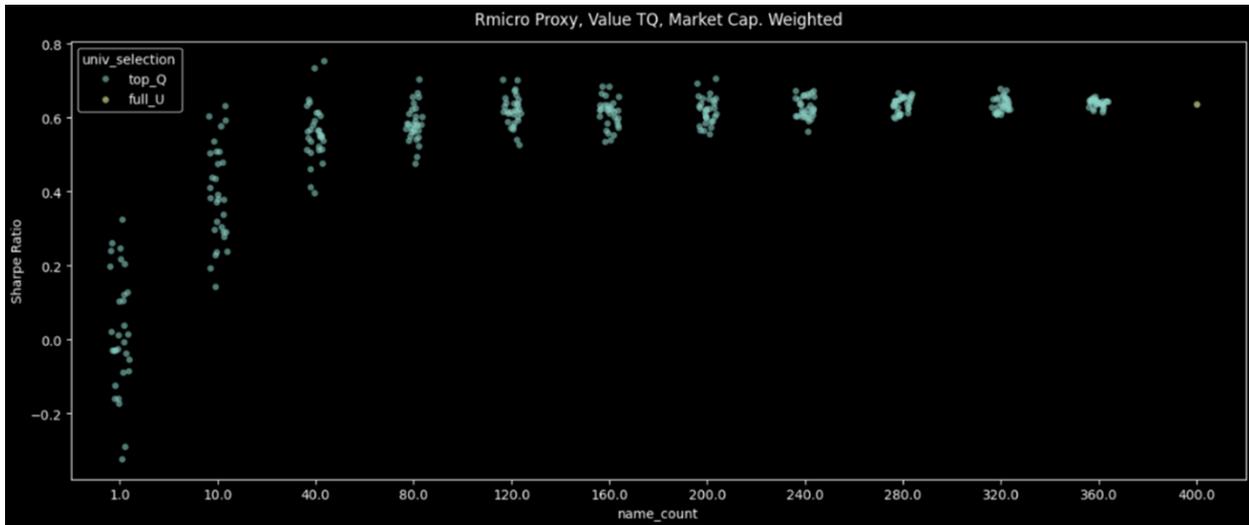
# US Mid Cap (Russell Mid Cap proxy)



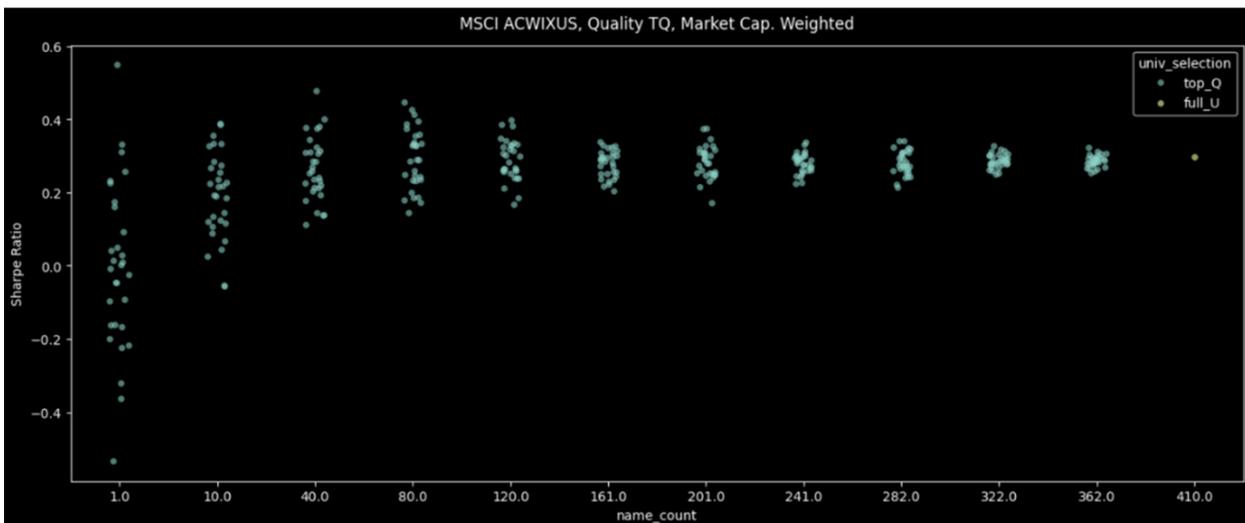
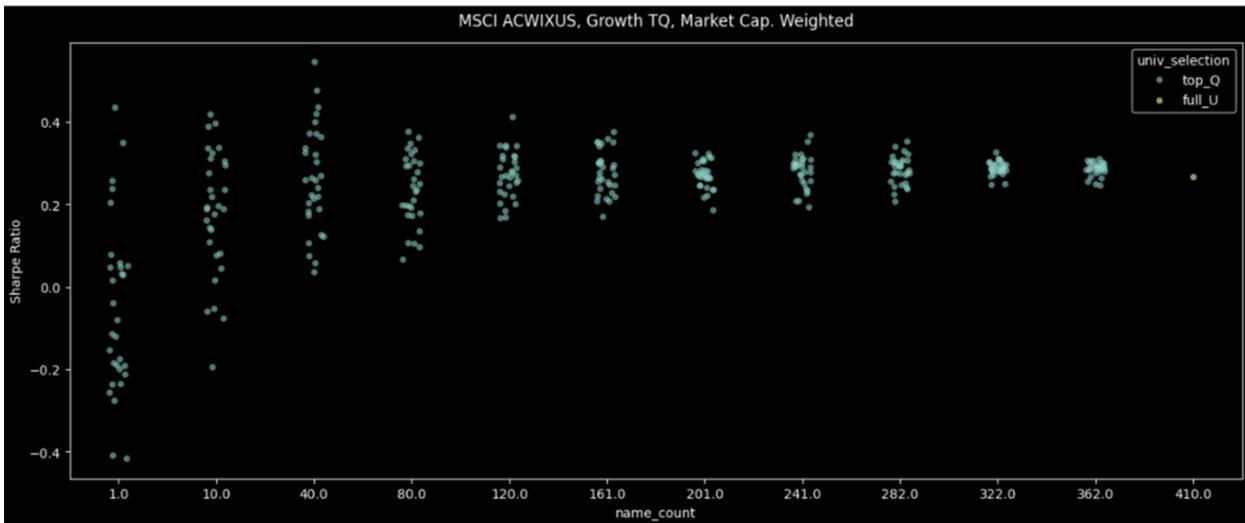
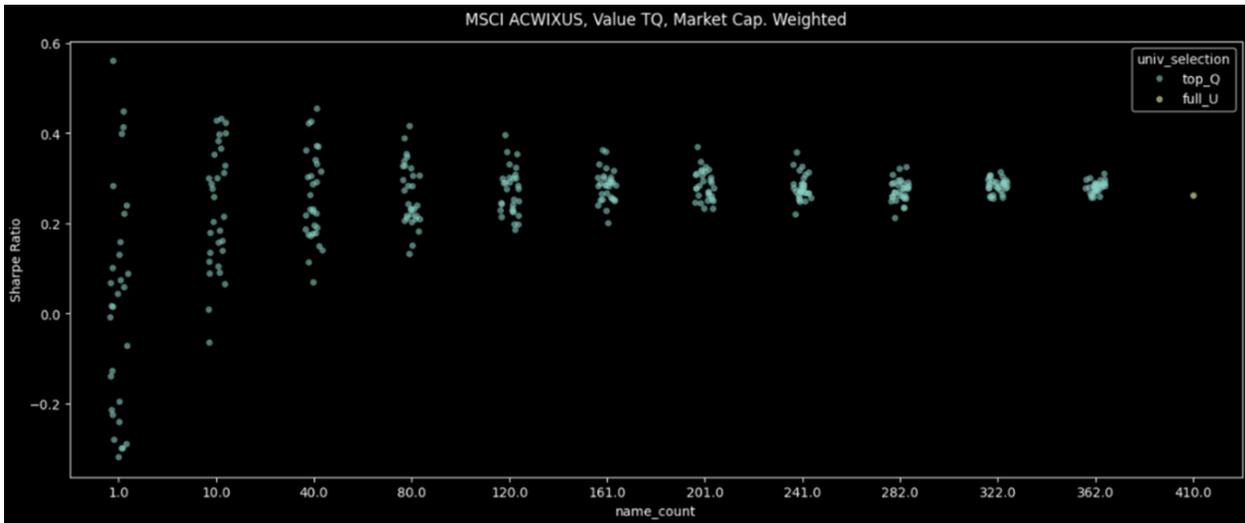
## US Small Cap (Russell 2000 proxy)



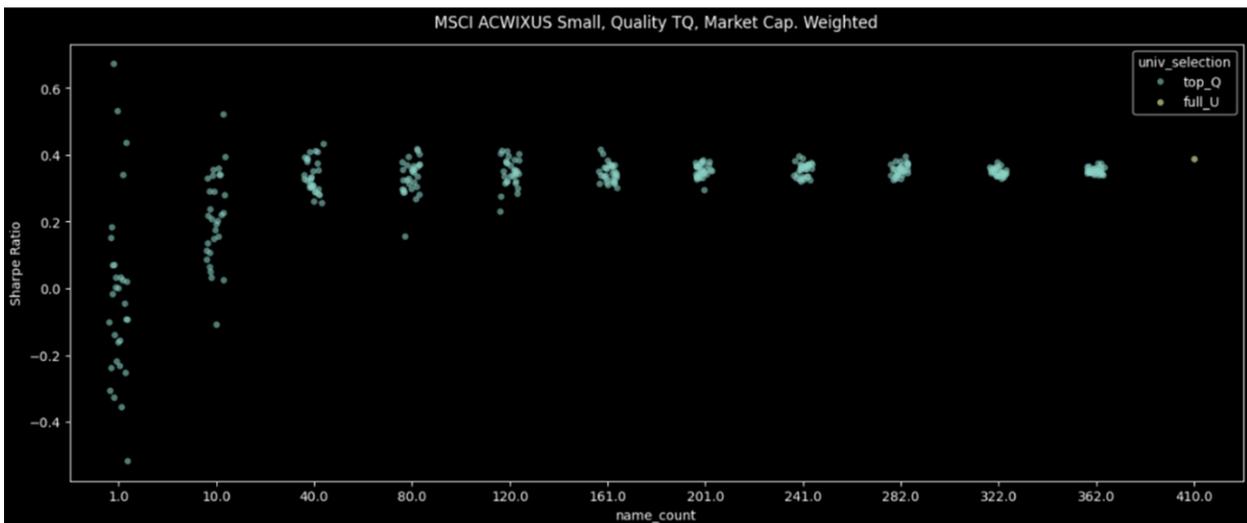
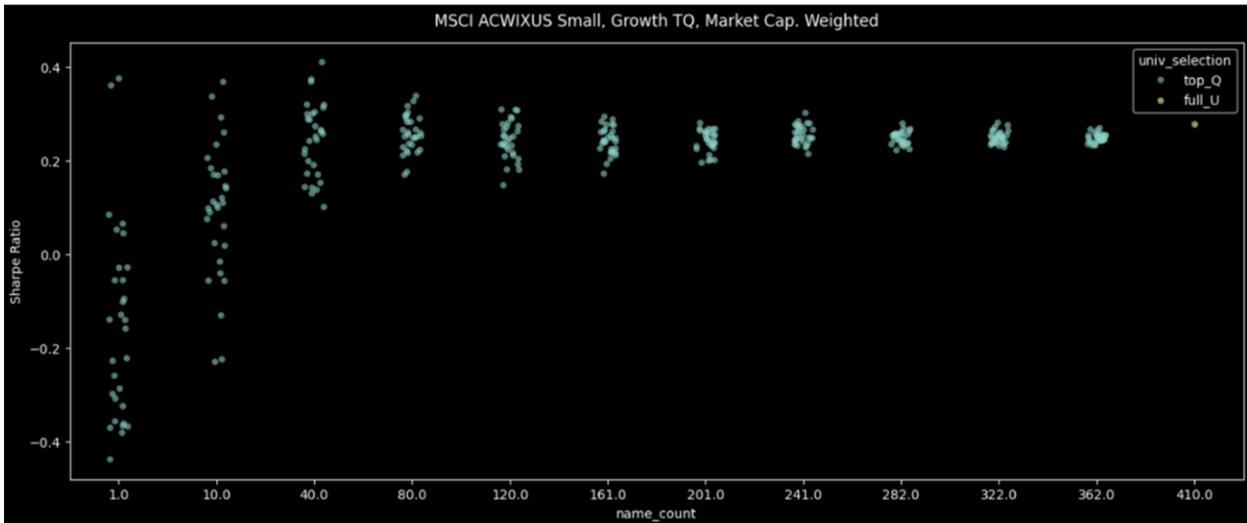
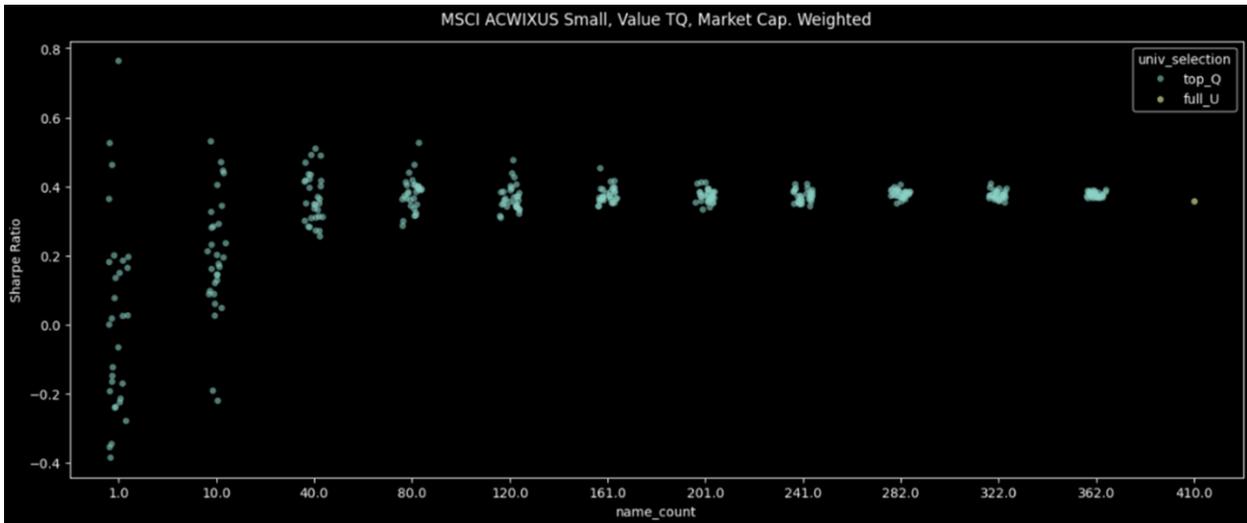
## US Micro Cap (Russell Microcap proxy)



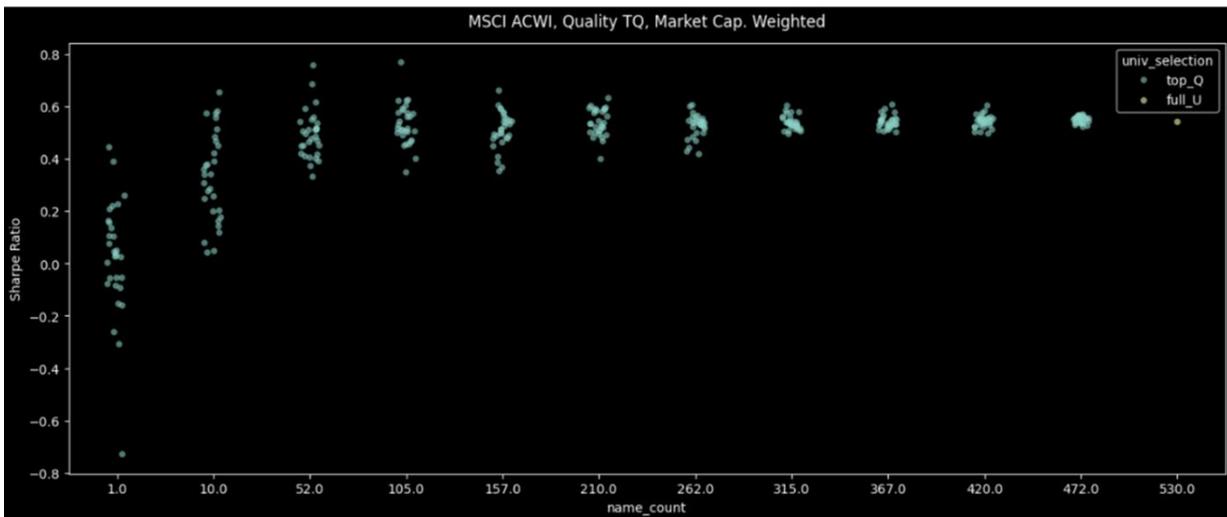
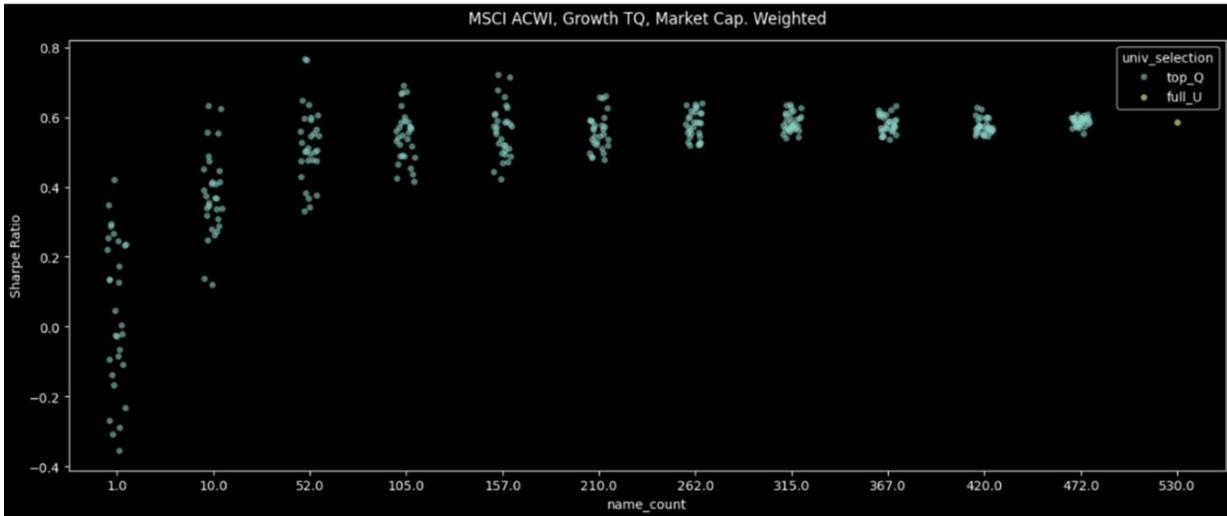
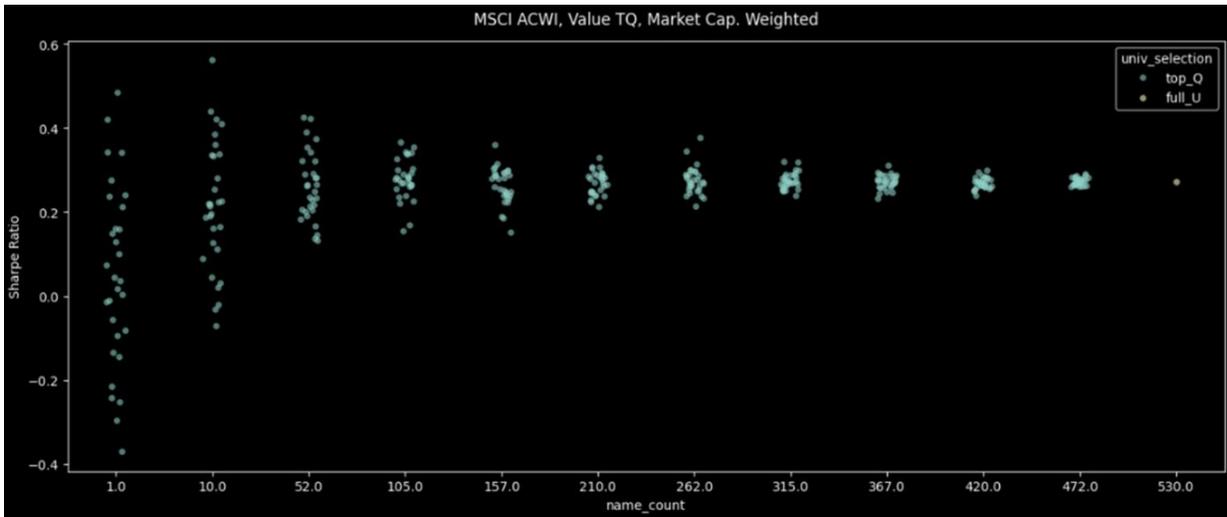
# MSCI ACWI ex-US



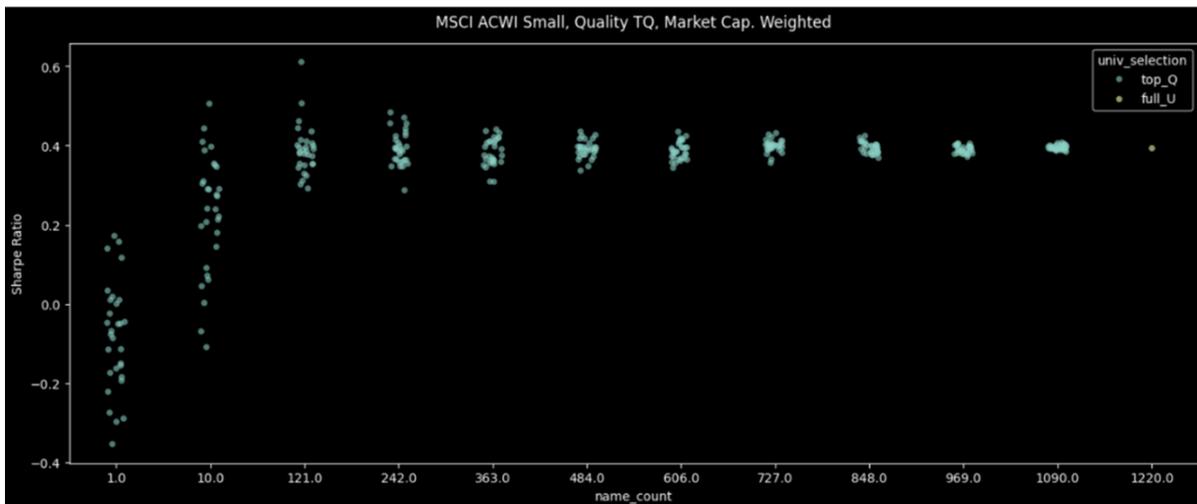
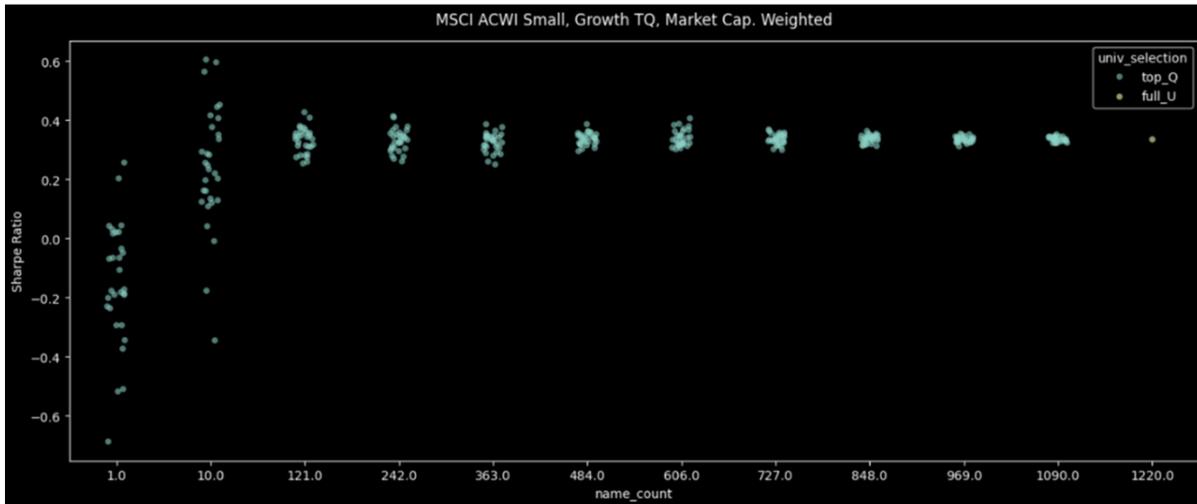
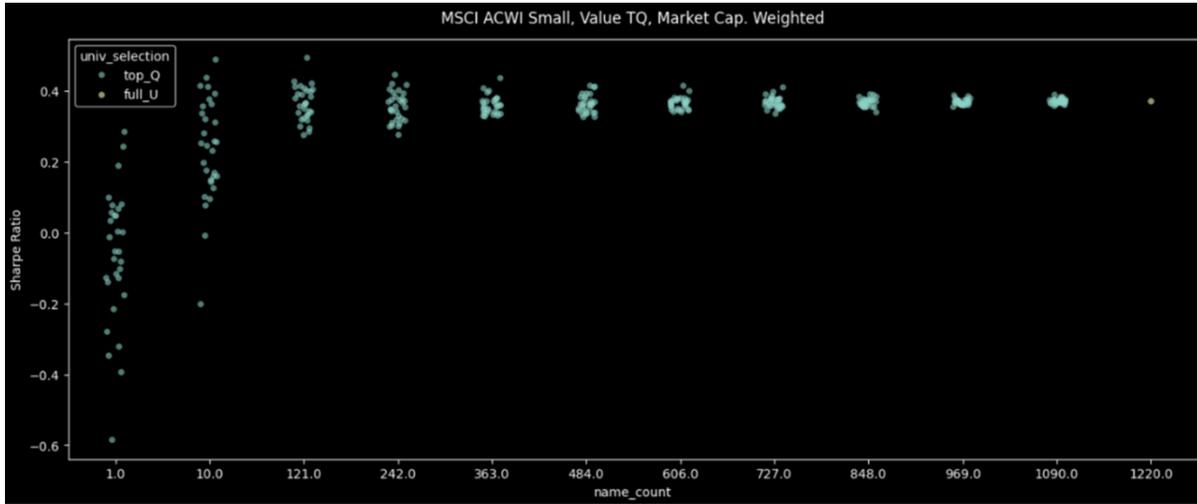
# ACWI ex-US Small Cap



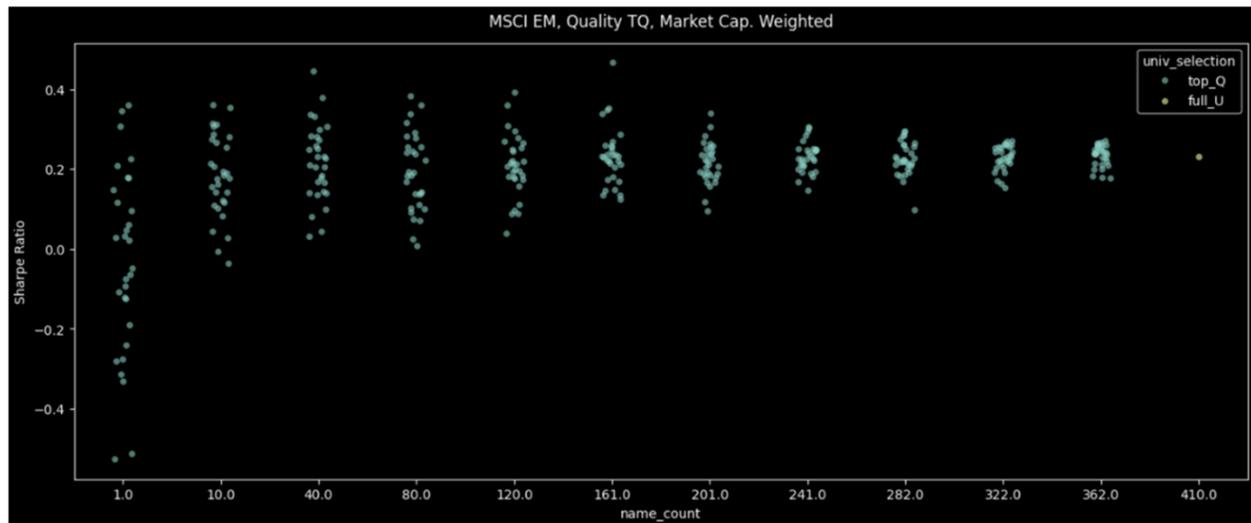
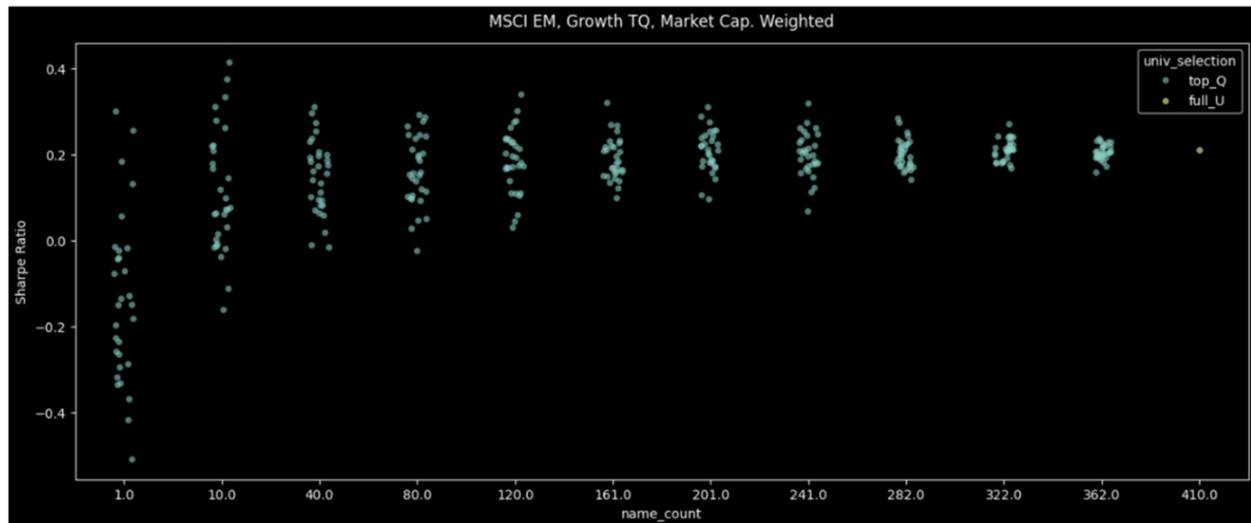
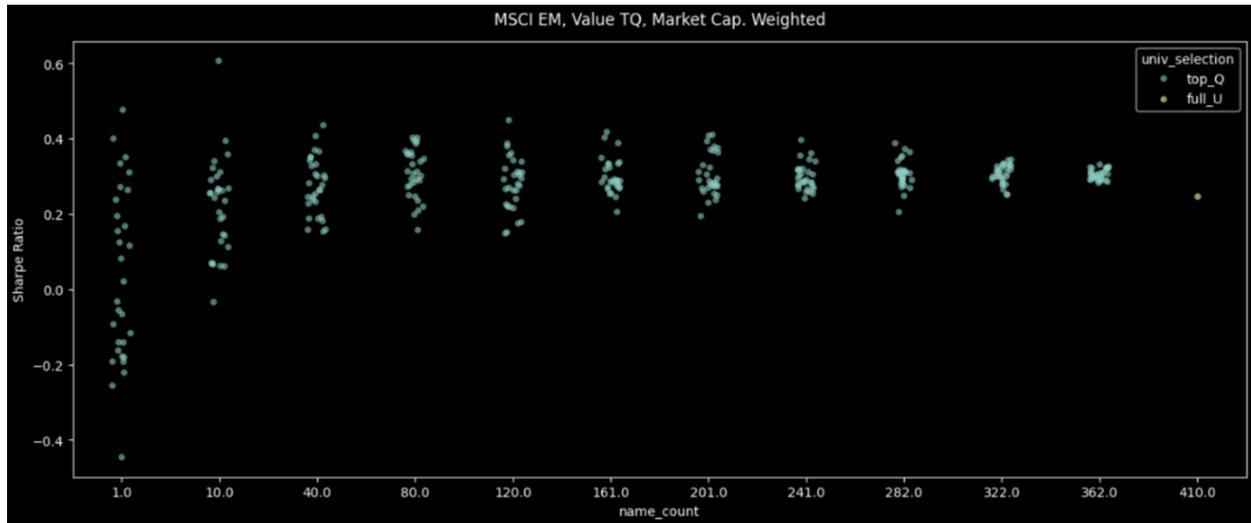
# MSCI ACWI



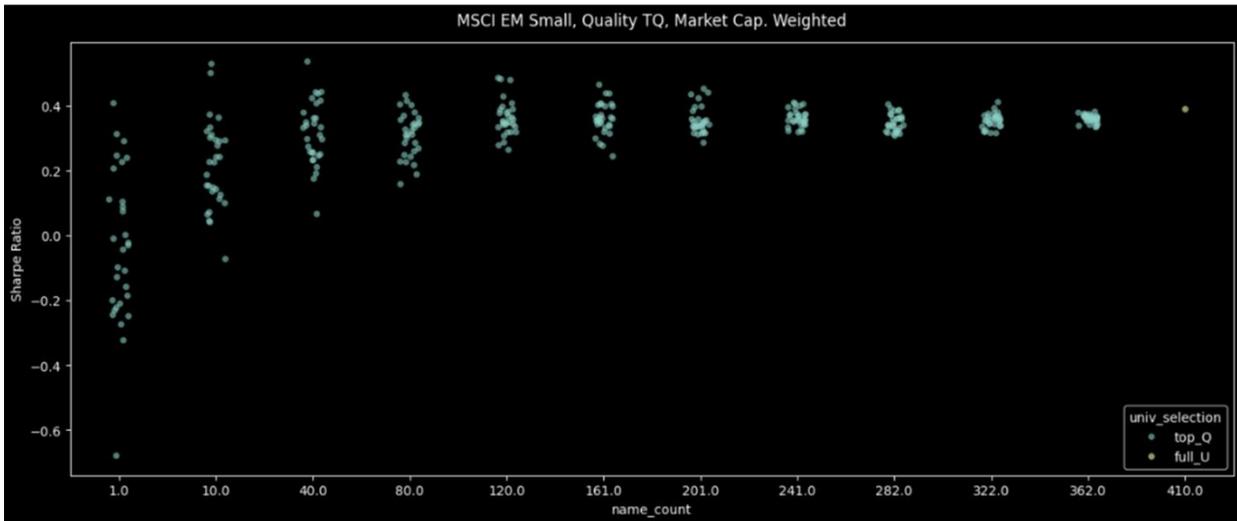
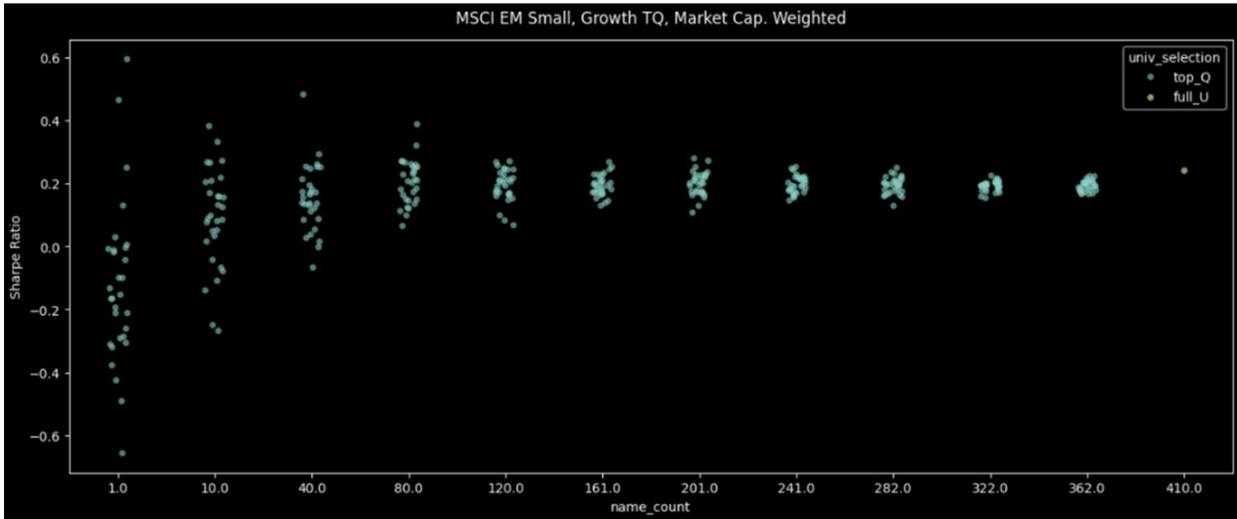
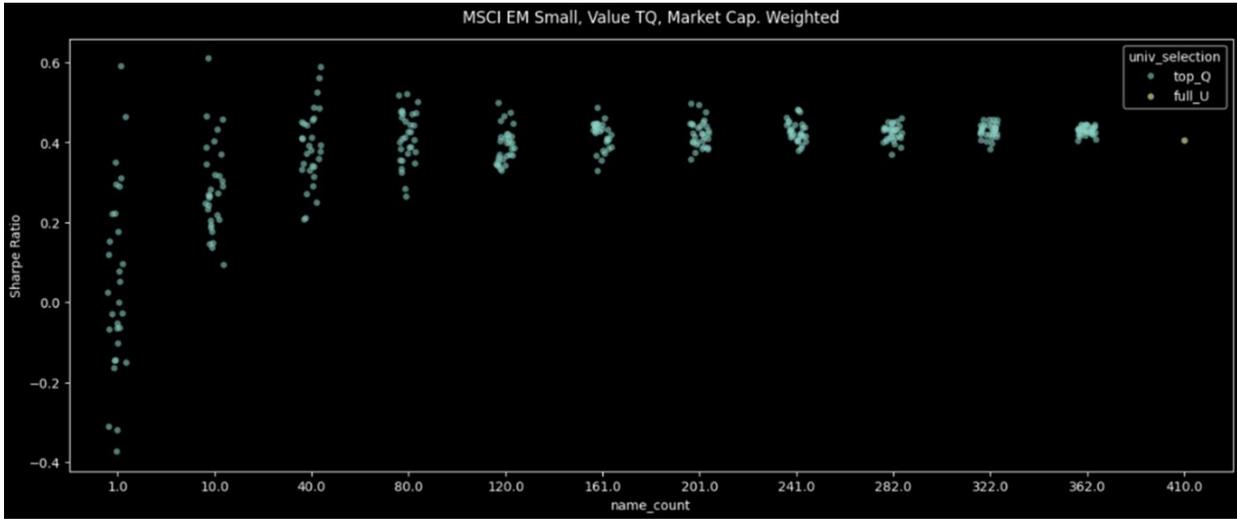
# MSCI ACWI Small Cap



## MSCI Emerging Markets



# MSCI EM Small Cap



## Conclusion

Extending our analysis beyond momentum to the Value, Growth, and Quality style factors reveals meaningful differences in how portfolio breadth influences factor outcomes. For Growth and Quality, broader portfolios tend to deliver stronger risk-adjusted performance across most universes, consistent with the patterns observed in the momentum breadth study.

Value, however, exhibits a less consistent monotonic relationship between breadth and performance. In many universes, risk-adjusted results peak at moderate levels of diversification and may decline as portfolios broaden further. This suggests that the diversification benefits of additional breadth can eventually be offset by dilution of the Value signal and the inclusion of “value traps.”

Despite these differences in return profiles, a consistent theme emerges across all three factors: diversification benefits emerge quickly. Measured by tracking error, the largest reductions in risk occur early as portfolio breadth expands, with diminishing incremental improvements as portfolios become broader. Increasing breadth also materially improves outcome stability. As portfolio name count rises, dispersion narrows meaningfully, indicating greater reliability of realized results. Narrow, concentrated implementations exhibit substantially wider variability across random samples, while broader portfolios deliver more consistent outcomes.

Ultimately, portfolio construction is not one-size-fits-all. While broader implementations generally enhance robustness and repeatability, the optimal breadth depends on the factor’s underlying economic drivers and the extent to which diversification strengthens the intended signal.

## Appendix A

For the US, we constructed proxy universes to approximate the Russell 1000, Russell Midcap, Russell 2000, and Russell Microcap indices, using monthly data from June 1988 through December 2025. These proxies consisted of publicly traded US companies with prices above \$2, excluding ADRs and secondary listings. The Russell 1000 proxy (large-cap) comprised the top 1,000 companies by market capitalization, while the Russell Midcap proxy (mid-cap) comprised the 800 smallest companies by market capitalization within the Russell 1000 proxy. The Russell 2000 proxy (small-cap) included companies ranked 1,001–3,000, and the Russell Microcap proxy (micro-cap) included companies ranked 2,001–4,000. For non-US markets, we used the MSCI ACWI, MSCI ACWI Small Cap, MSCI ACWI ex USA, MSCI ACWI ex USA Small Cap, MSCI EM, and MSCI EM Small Cap indices, with monthly data from June 2006 through December 2025. All universes were market-capitalization-weighted to maintain consistency with index methodology.

## Appendix B

Coefficient of Variation (CV)

The Coefficient of Variation is a standardized measure of dispersion that expresses the degree of variability relative to the mean of a dataset. A lower CV indicates greater consistency and less relative variation. For example, a CV of 0.10 (10%) means that the standard deviation equals 10% of the mean, signifying relatively stable outcomes.

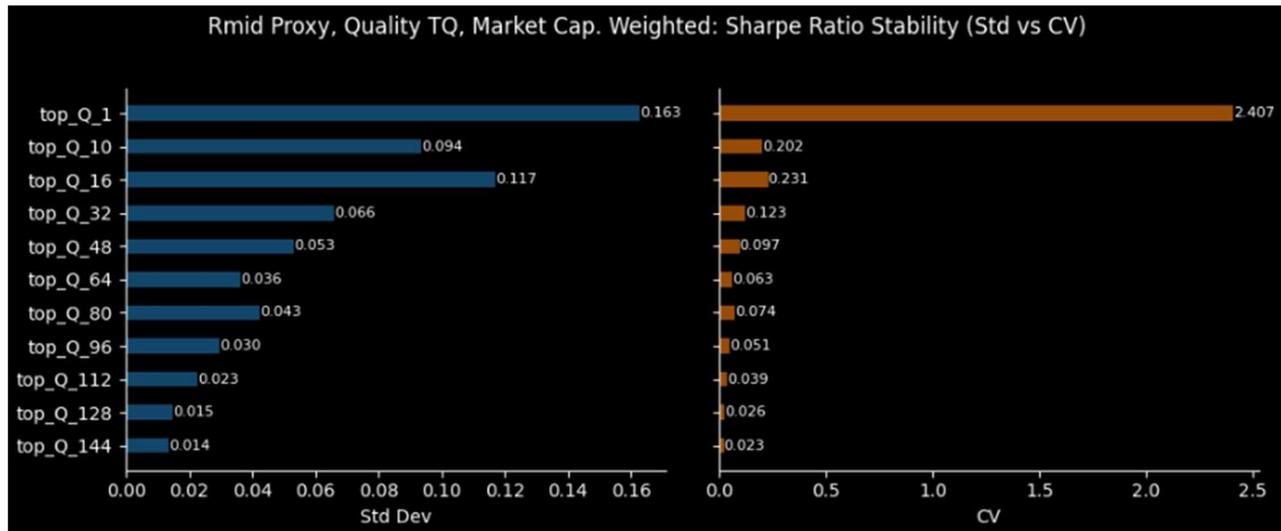
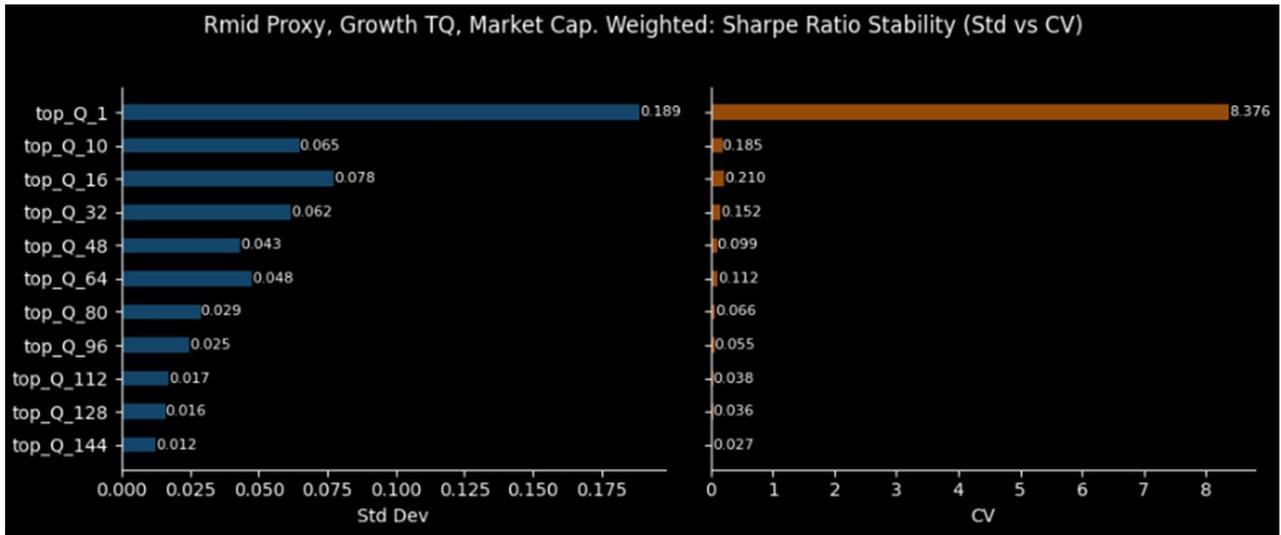
$$CV = \frac{\text{Standard Deviation}}{\text{Mean}}$$

The horizontal bar charts below display the sample standard deviation and CV for the randomly sampled portfolios. We define the stabilization threshold as the point at which the Coefficient of Variation (CV) of the Sharpe ratio falls below 0.10.

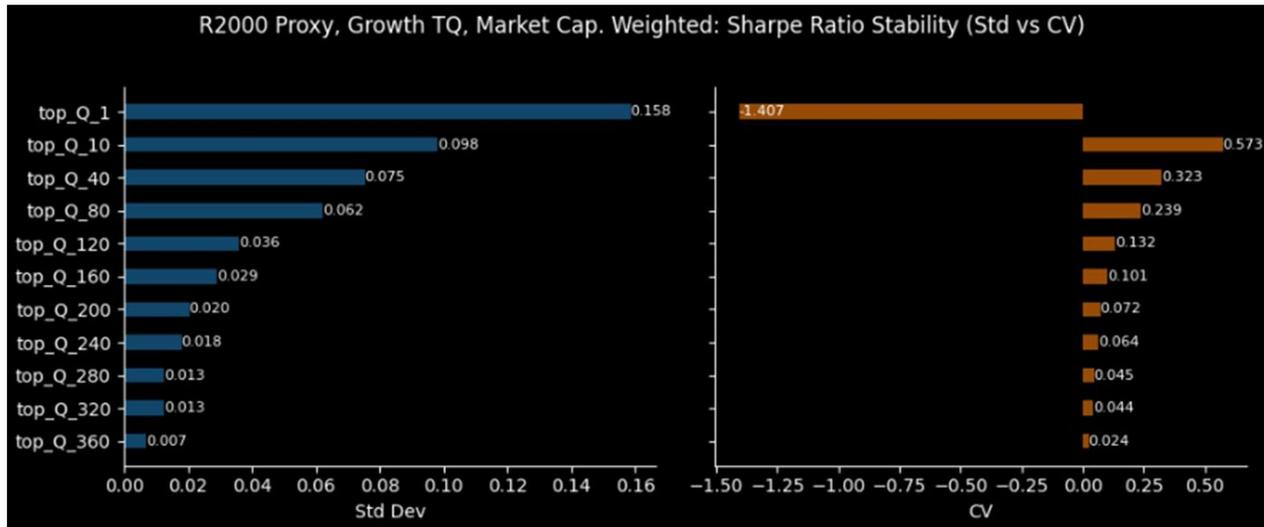
## US Large Cap (Russell 1000 proxy)



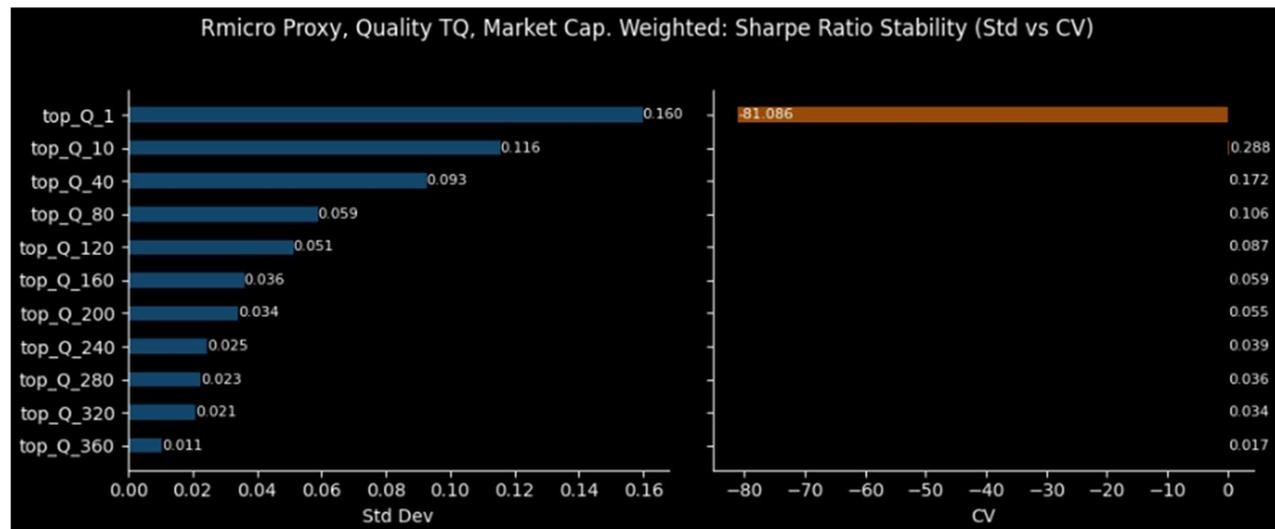
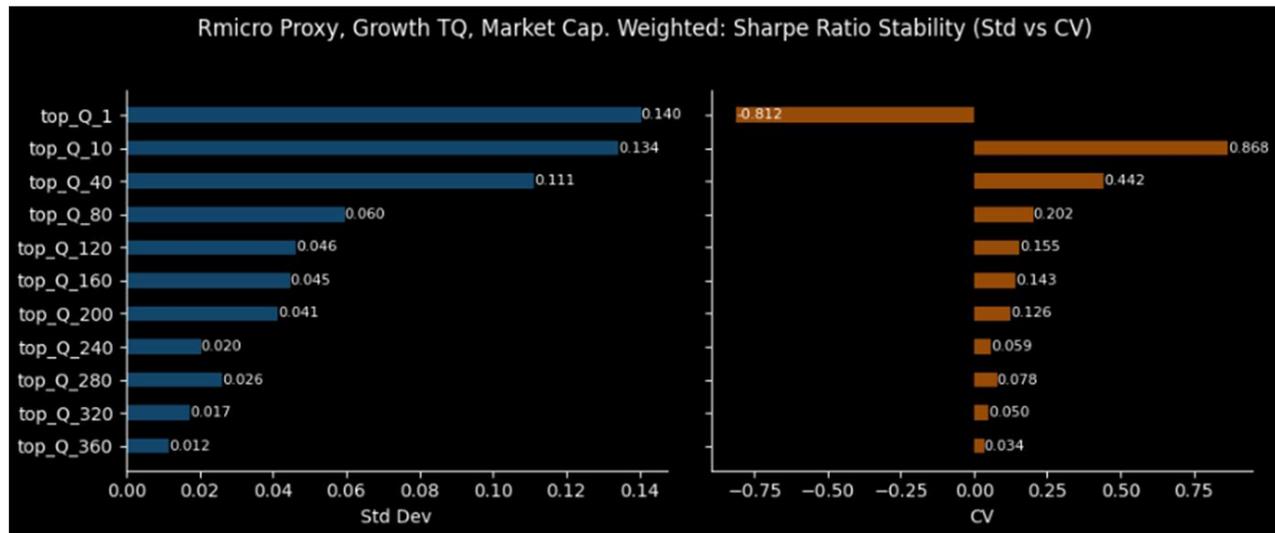
US Mid Cap (Russell Mid Cap proxy)



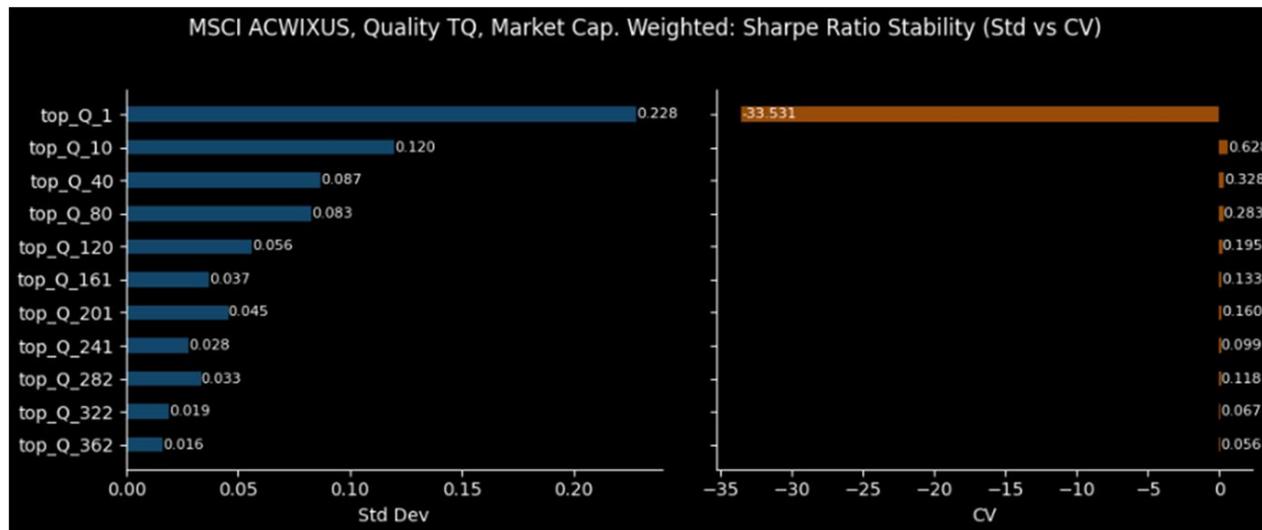
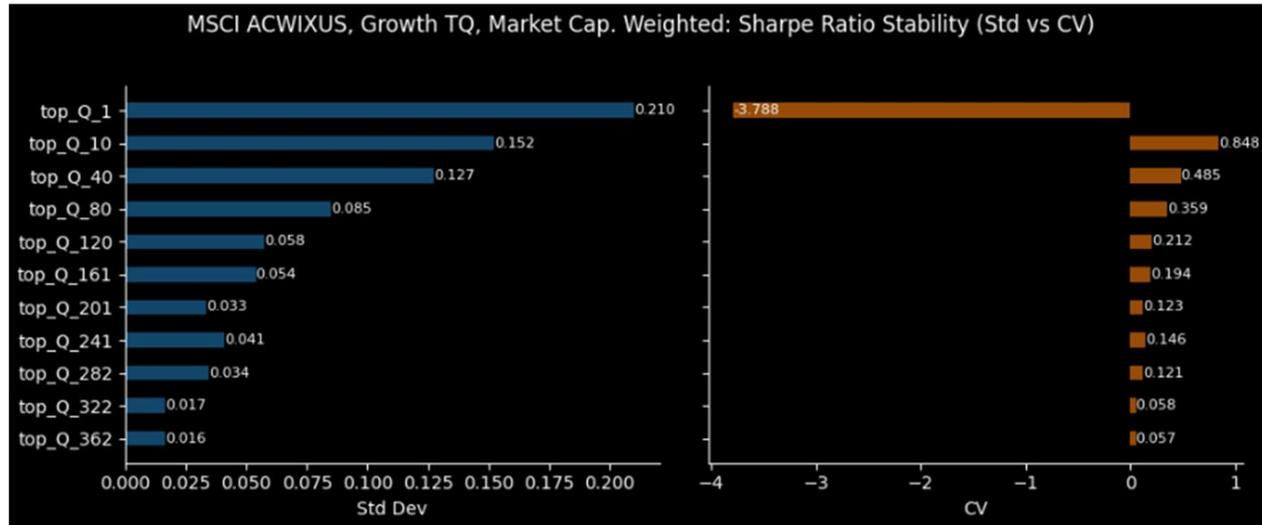
US Small Cap (Russell 2000 proxy)



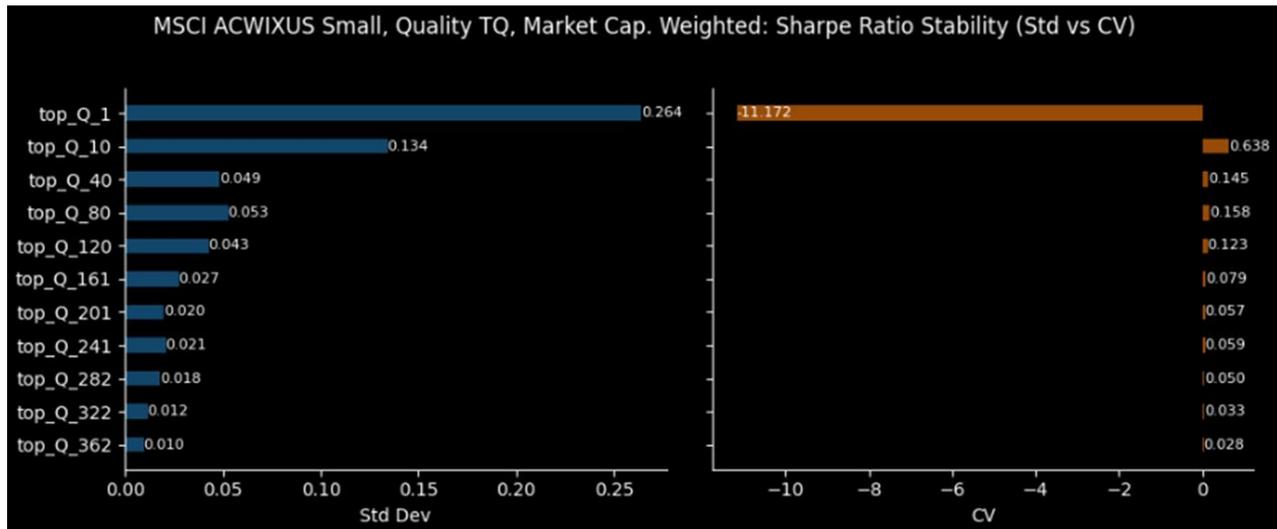
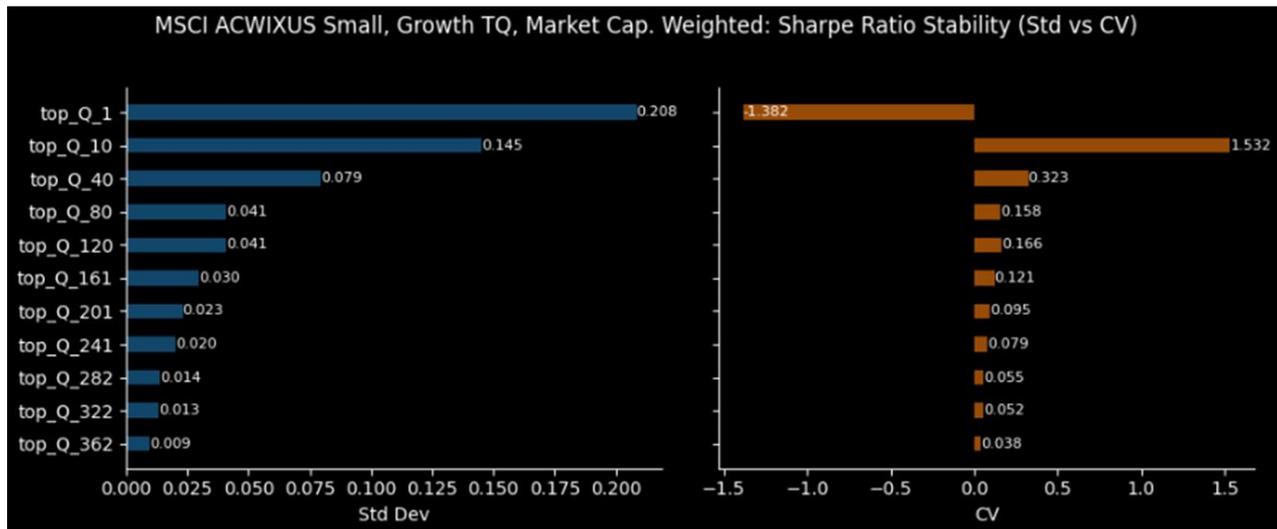
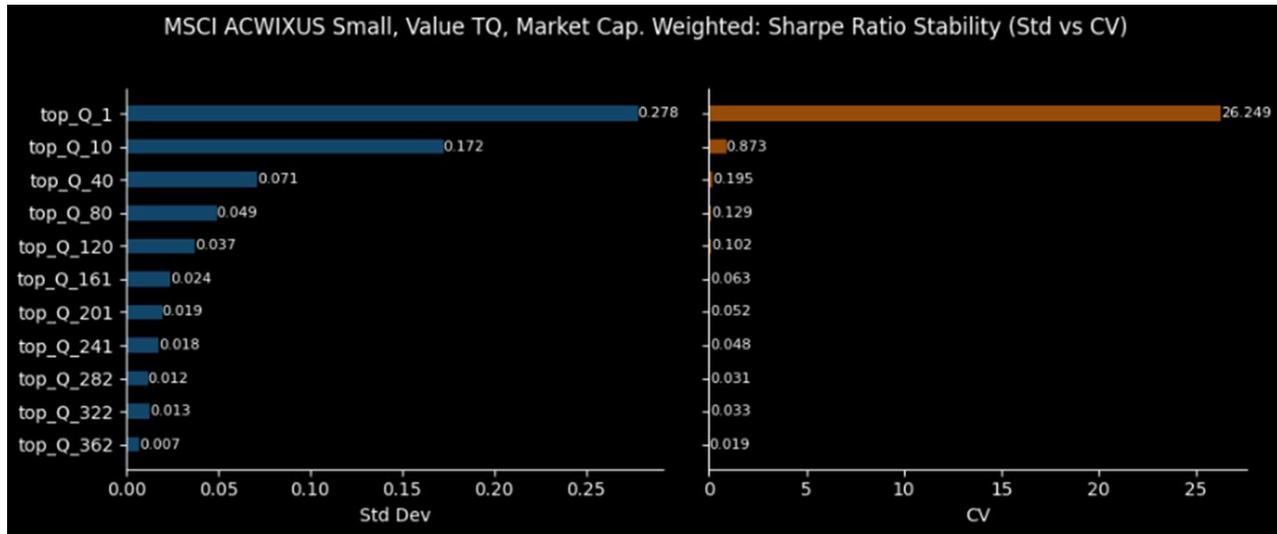
US Micro Cap (Russell Microcap proxy)



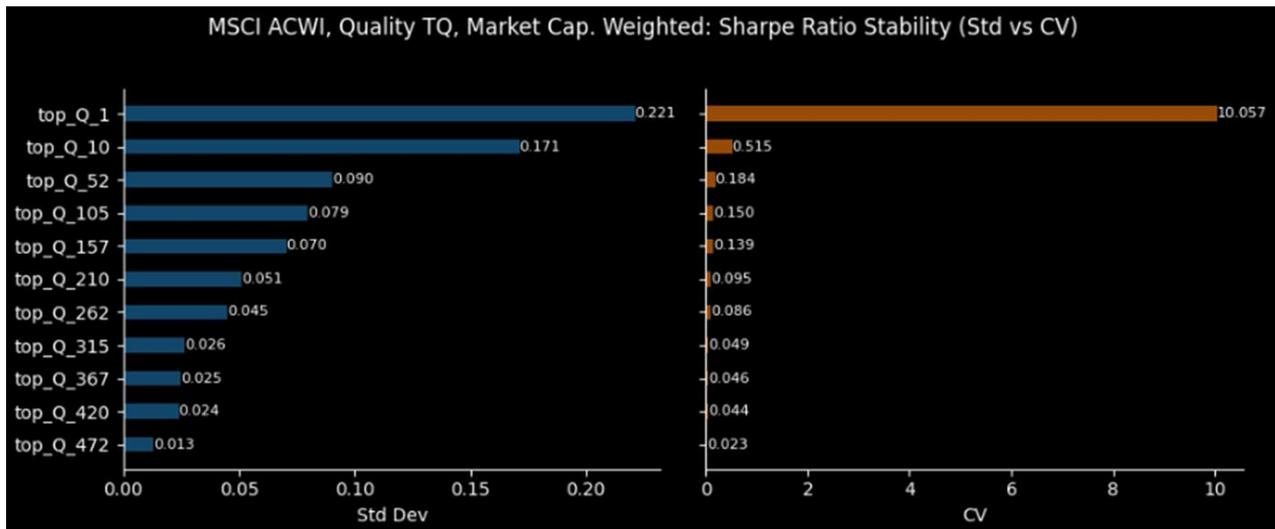
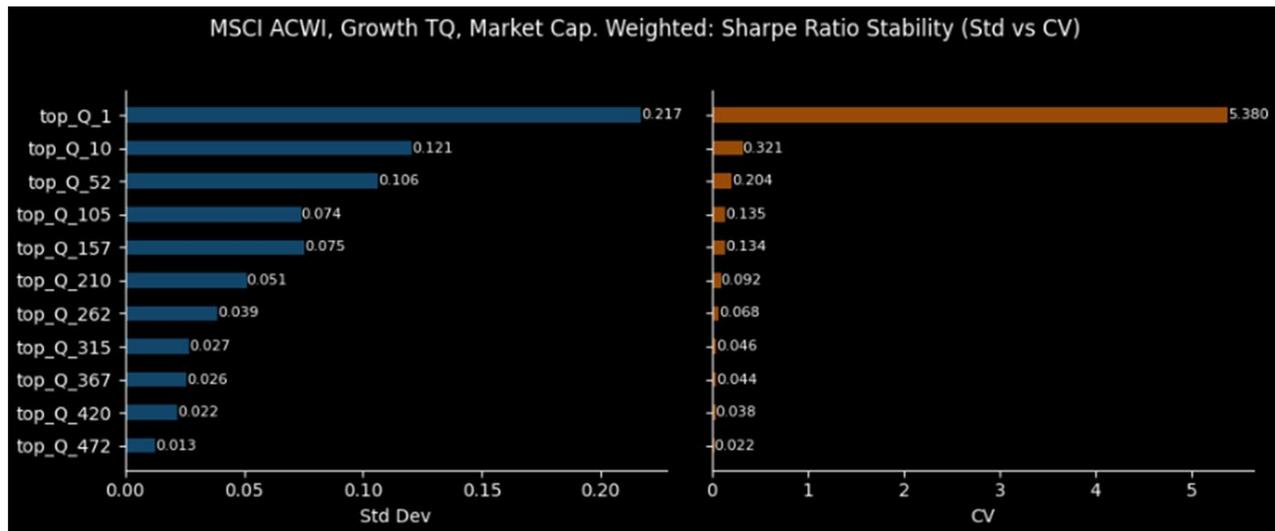
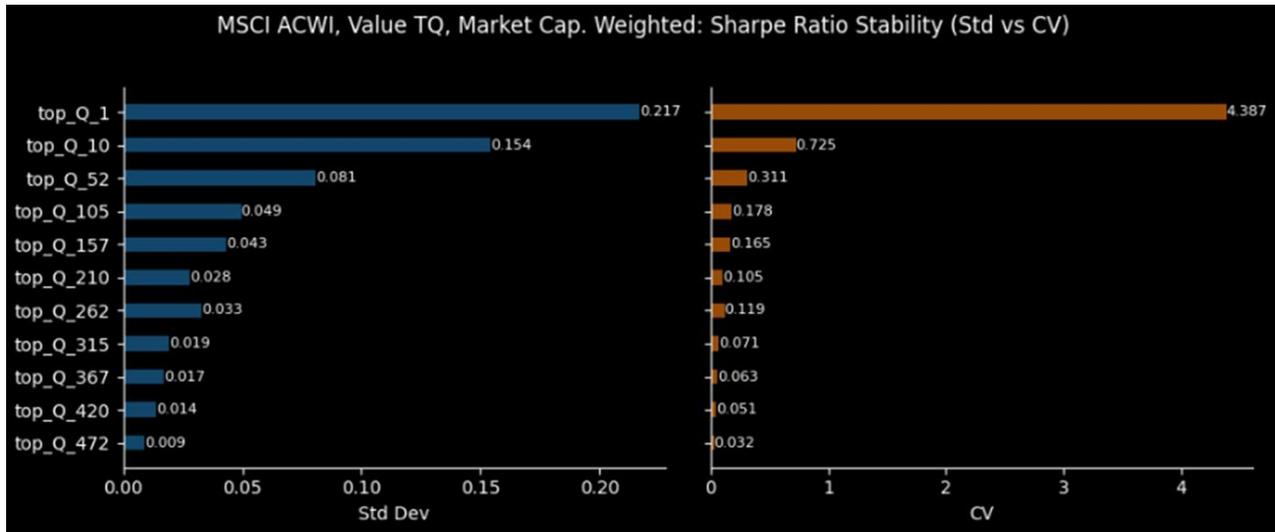
## MSCI ACWI ex-US



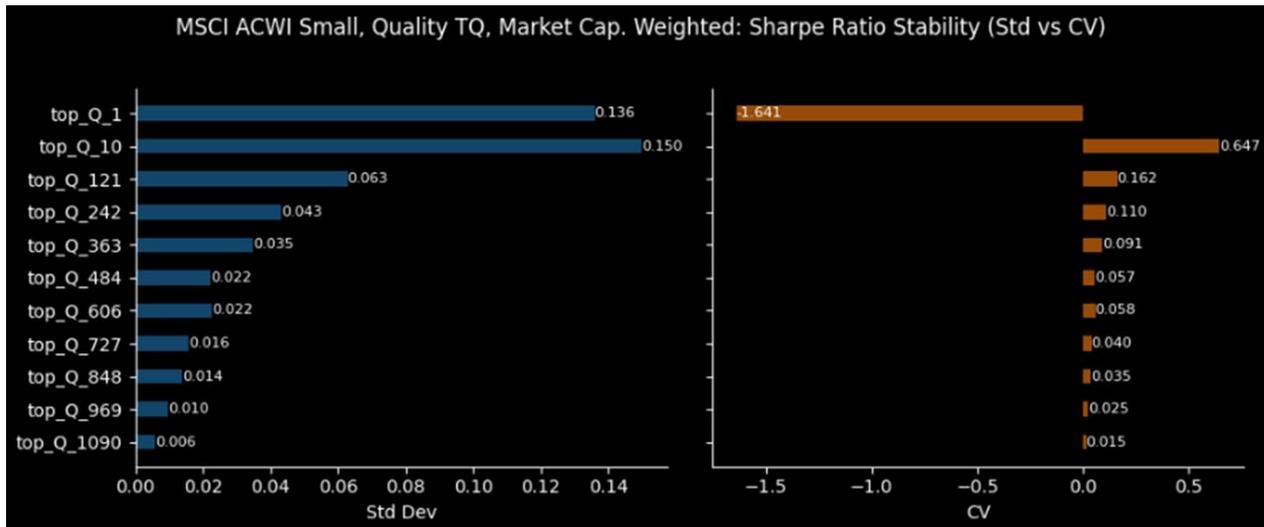
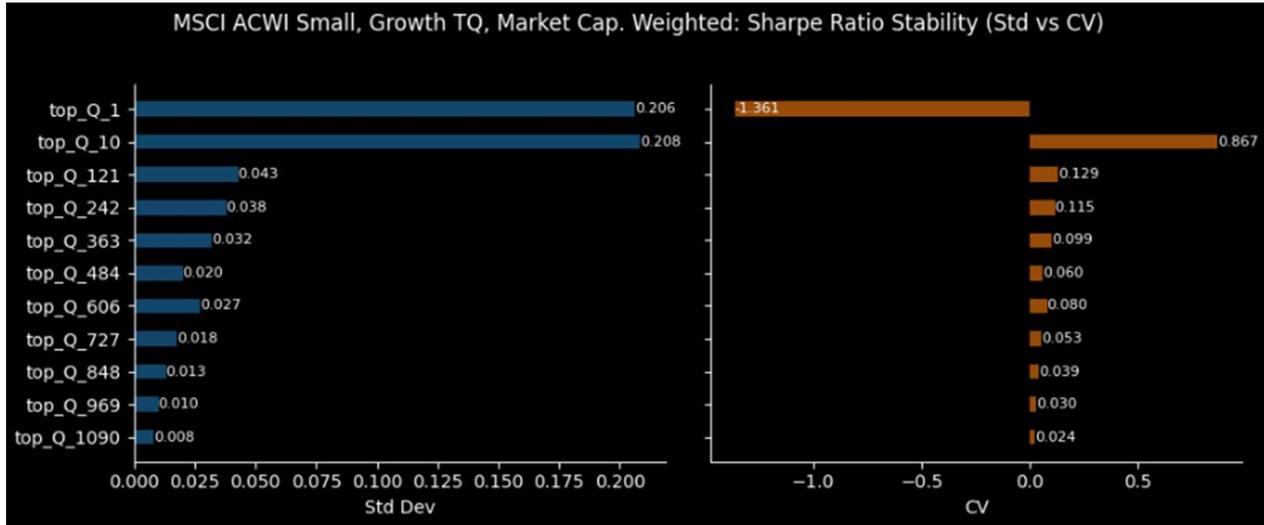
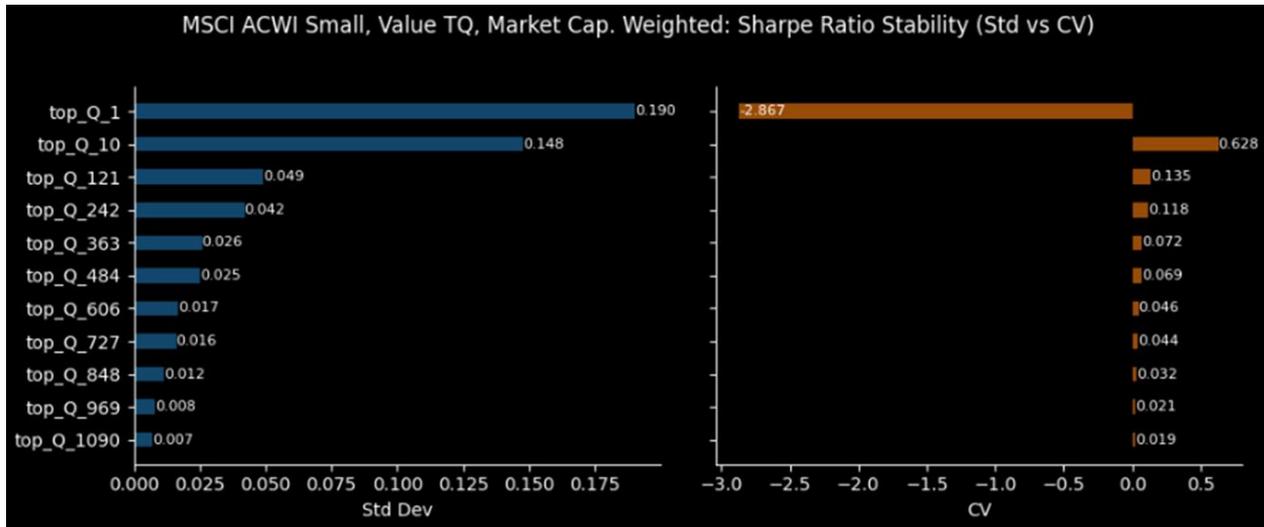
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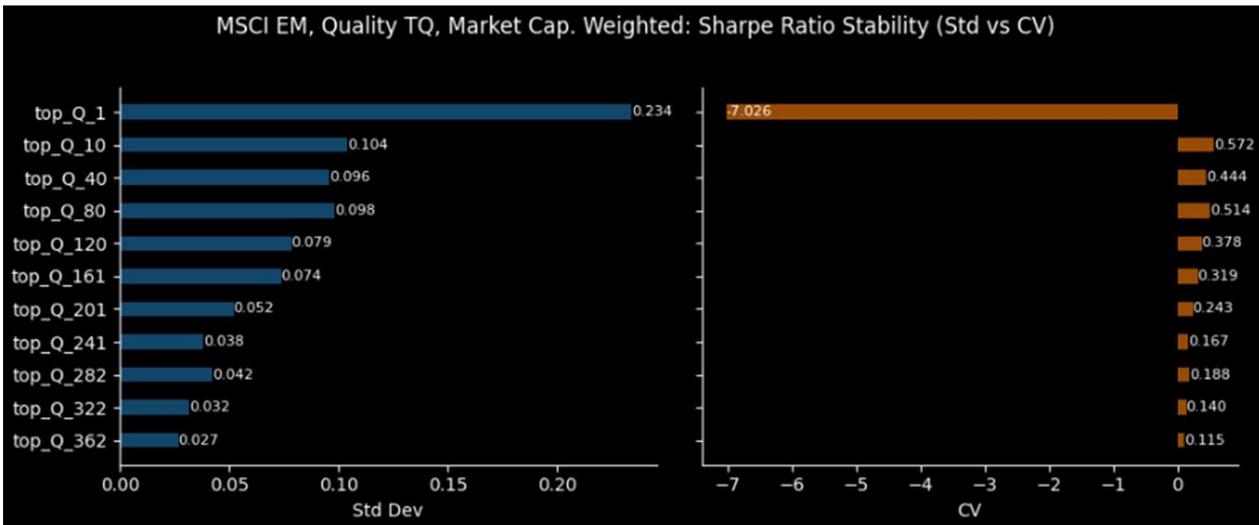
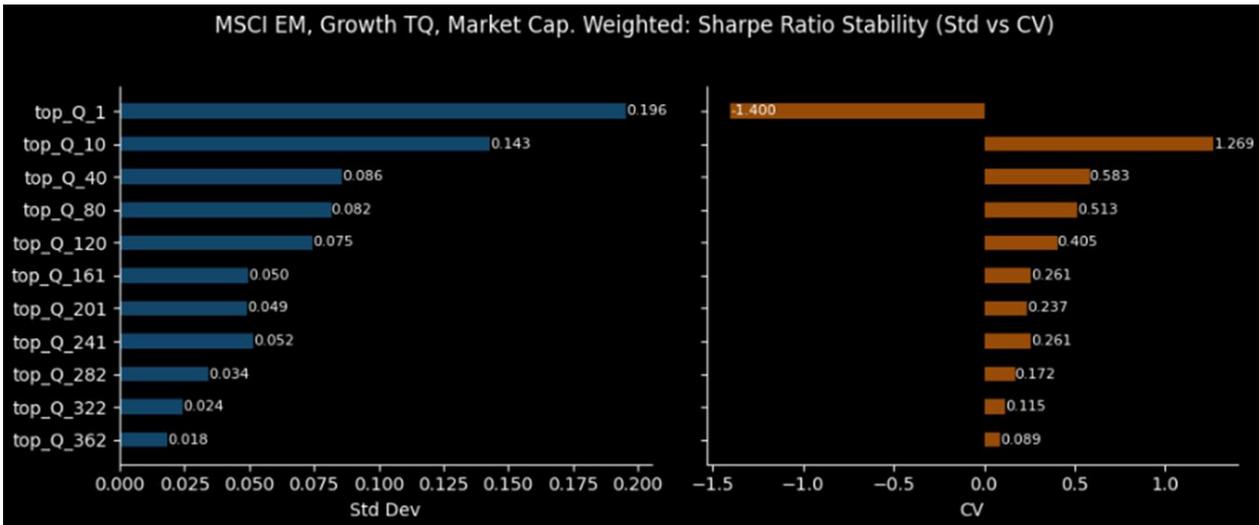
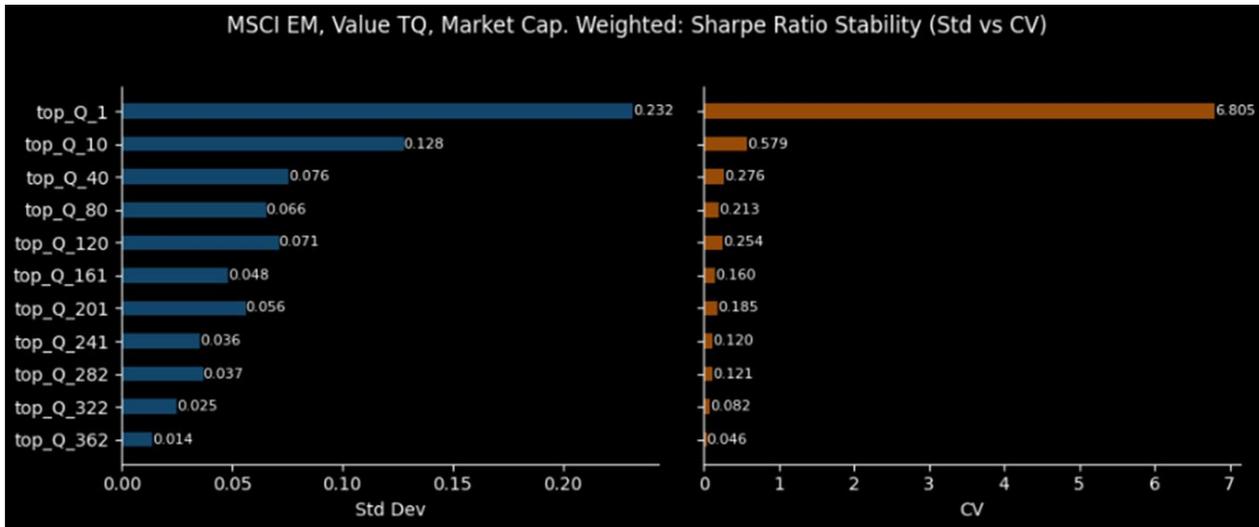
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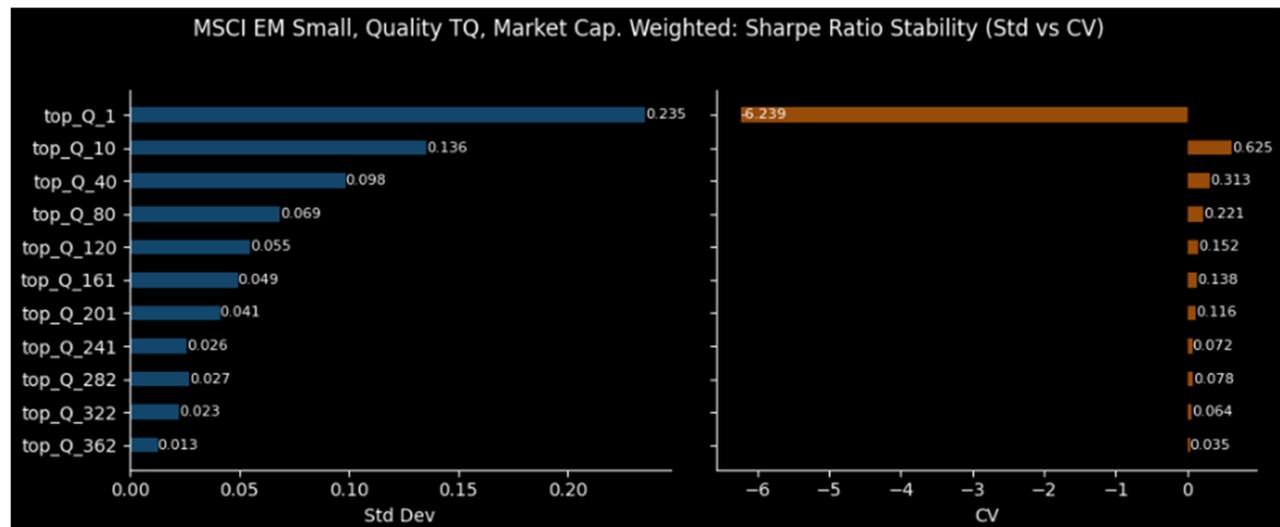
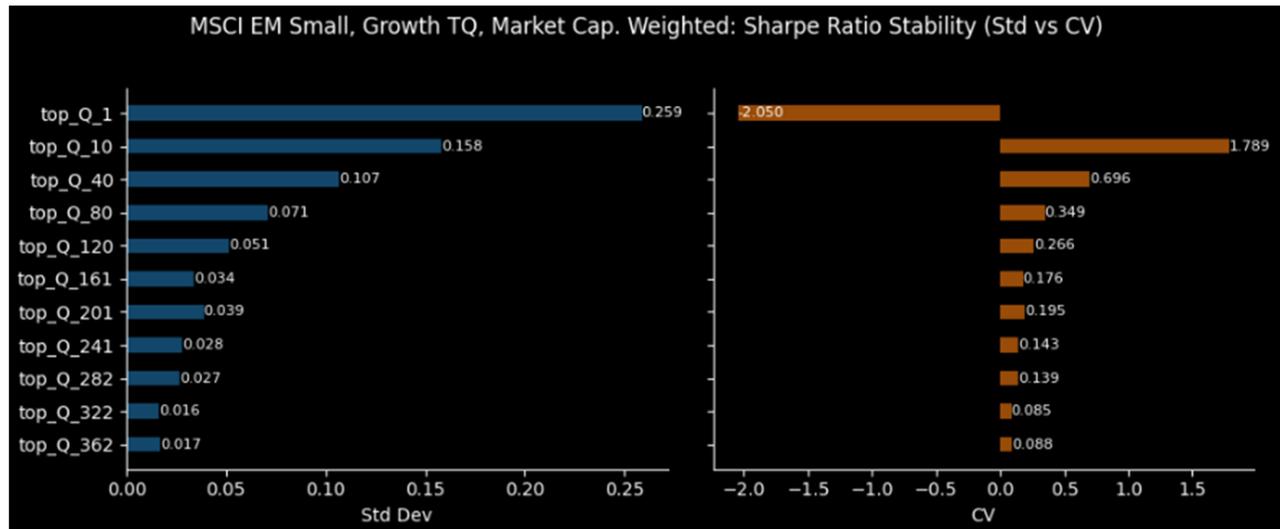
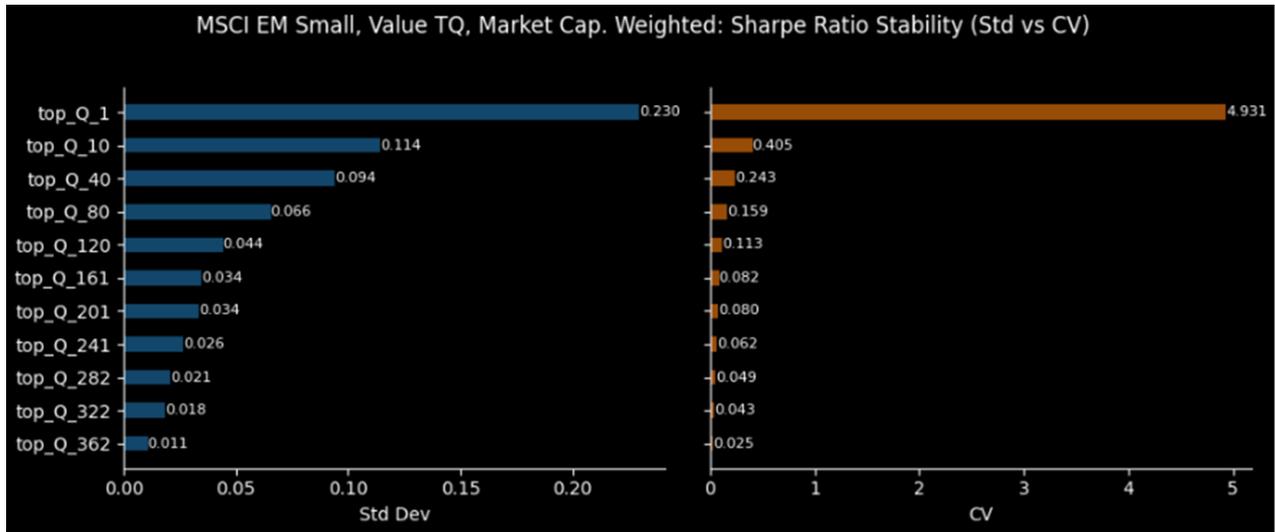
## MSCI ACWI Small Cap



## MSCI Emerging Markets



### MSCI EM Small Cap



## About IMC

IMC is solely focused on helping clients build better portfolios through our Informed Momentum investment approach. This approach has been applied consistently across all strategies since the inception of the firm in 2007. The daily application of our systematic process is designed to deliver consistent and predictable results. Since our entire company works for a single objective, it only makes sense to align the name of our brand with exactly what we do every day.

We are the **Informed Momentum Company**.

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## Contributors

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Luke is a research analyst conducting research across all IMC's investment strategies from a generalist perspective. Prior to joining the company in 2024, Luke was an analyst with ClariVest Asset Management performing quantitative and qualitative analysis to evaluate buy/sell decisions and manage portfolio risk for the firm's emerging market seed strategy. Luke's experience also includes working as an analyst with Wasatch Global Investors and Goldman Sachs. Luke holds a Master of Science in Computer Science/Applied Data Science from the University of Southern California and a Bachelor of Arts as a Mathematics and Music double-major from St. Olaf College. Luke has 10 years of investment experience and is a CFA charterholder.

### TRAVIS PRENTICE

Travis is the chief investment officer, responsible for oversight of all of IMC's strategies, as well as a portfolio manager for IMC's US and Global strategies. Travis co-founded The Informed Momentum Company, formerly EAM Investors, in 2007. Prior to that, Travis was a partner, managing director and portfolio manager with Nicholas-Applegate Capital Management where he had lead portfolio management responsibilities for their Micro and Ultra Micro Cap investment strategies and a senior role in the firm's US Micro/Emerging Growth team. He has 28 years of institutional investment experience specializing in momentum-based strategies. He holds an MBA from San Diego State University and a BA in Economics and a BA in Psychology from the University of Arizona.

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**This research paper is provided solely for general informational purposes and is intended exclusively for institutional investors.** It does not constitute personalized investment advice, nor is it a recommendation to buy, sell, or hold any security. The factor-based investment strategies discussed may not be suitable for all investors, and each investor should assess these strategies based on their specific financial situation, objectives, and risk tolerance before making investment decisions. This paper is designed to share analytical insights into momentum investing and is not a direct solicitation of investment. Data and methodologies from third-party sources, including academic studies (e.g., Da et al., 2014; Fan et al., 2022) and index providers (e.g. MSCI), are obtained from sources believed to be reliable but are not guaranteed for accuracy, completeness, or reliability. Limitations, such as sample selection or market-specific conditions, may affect the applicability of findings. Supporting documentation for claims or statistical analyses is available upon request.

Performance results are based on hypothetical and backtested analyses using MSCI indices or Russell index proxy universes. The results do not reflect actual trading and exclude real-world factors such as transaction costs, management fees, taxes, liquidity constraints, and market impact, which could materially reduce returns. Hypothetical performance is subject to limitations, including the risk of overfitting to historical data, and does not guarantee future results. Unless otherwise stated, performance results are presented gross of advisory fees, transaction costs, and other expenses, which would reduce returns if included. Investors should consult with their advisors to understand the impact of such costs on performance.

Past performance is not indicative of future results, and no assurance is provided that these strategies will achieve similar outcomes.