The Power of Many

How portfolio breadth shapes momentum outcomes

This paper explores how portfolio breadth influences the performance, consistency, and risk profile of momentum strategies. Through empirical analysis across multiple equity universes, we investigate how expanding or contracting the number of holdings affects realized returns, risk-adjusted outcomes, and the stability of momentum as an investment approach.

Key Findings

- **Broader momentum portfolios generally deliver stronger and more consistent performance.** Risk-adjusted returns improve as the number of holdings increases.

- **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 approaches the full top-quintile momentum cohort.

Background

Momentum investing has long been recognized as one of the most persistent and empirically validated return premia across global equity markets. Its appeal lies in a simple yet powerful observation: stocks that have demonstrated strong relative performance tend to continue outperforming, while laggards often persist in underperformance. This tendency for price trends to endure has been documented across regions, market cap segments, and time horizons, making momentum a foundational component in many systematic investment frameworks.

Despite its well-established strengths, including its historical robustness, intuitive economic rationale, and diversification benefits when combined with other factors, momentum investing still invites important practical questions about implementation. Among these, a central and universal portfolio construction question arises: how many securities should a momentum portfolio hold?

This paper explores how portfolio breadth influences the performance, consistency, and risk profile of momentum strategies. Through empirical analysis across multiple equity universes, we investigate how expanding or contracting the number of holdings affects realized returns, risk-adjusted outcomes, and the stability of momentum as an investment approach.

Literature Review

The intuition behind diversification is centuries old, reflected in the well known proverb: "don't put all your eggs in one basket." Miguel de Cervantes captured this wisdom in Don Quixote (1615), reminding readers that prudent risk management requires thoughtful allocation.

Harry Markowitz later formalized this key insight in Modern Portfolio Theory (1959), mathematically demonstrating how diversification reduces portfolio variance. Though he did not prescribe a specific number of holdings, Markowitz highlighted the diminishing marginal benefits as more securities are added.

Elton and Gruber (1977) extended this foundational work by showing that the most significant reduction in total risk occurs in the early stages of portfolio expansion. Their research suggested that a portfolio of 20–30 stocks captures the large majority of attainable diversification benefits within the US equity market.

While diversification theory is well established, its intersection with momentum investing—a strategy that often holds narrower subsets of the market—warrants a closer examination.

A Study on Momentum and Portfolio Breadth

We tested how the number of holdings influences the performance of momentum portfolios by constructing long-only, market-cap-weighted strategies based on stocks ranked by prior 12-month returns, excluding the most recent month (12–1m formation period) and rebalanced monthly.

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

Starting with the top quintile of momentum stocks within each universe, we generated twelve random subsets representing varying levels of portfolio breadth. These varied from a single holding to 90% of the full top quintile momentum group. Each level of portfolio breadth was simulated 30 independent times with random sampling. This design allowed us to capture the central tendency and dispersion of possible outcomes, while testing whether holding only a portion of the high momentum group could replicate or even improve upon the characteristics of the full top quintile portfolio. For a full description of universes and methodology, please see Appendix A.

Findings:

1. **Broader portfolios improved risk-adjusted performance.**

The following tables display the median outcomes of each universe at varying levels of portfolio breath. Across all ten universes, the results consistently indicate that broader portfolios deliver improved risk-adjusted performance. Narrow, highly concentrated portfolios exhibit greater variability and lower median performance.

US Large Cap (Russell 1000 proxy), Median Performance & Risk Metrics
July 1986 – September 2025

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%	7.95%	-3.14%	34.77%	38.09%	0.13	-0.09	1.14	0.99
10	1%	11.50%	0.41%	16.23%	22.73%	0.37	0.03	1.10	1.04
20	2%	12.27%	1.18%	13.96%	20.97%	0.44	0.08	1.10	1.01
40	4%	12.62%	1.54%	12.00%	19.96%	0.49	0.13	1.10	1.04
60	6%	12.43%	1.34%	11.14%	19.28%	0.49	0.12	1.09	1.03
80	8%	12.64%	1.55%	10.68%	18.94%	0.51	0.14	1.10	1.03
100	10%	12.66%	1.58%	10.17%	18.64%	0.51	0.15	1.09	1.03
120	12%	12.81%	1.73%	9.93%	18.48%	0.53	0.17	1.09	1.02
140	14%	12.82%	1.74%	9.75%	18.51%	0.53	0.18	1.10	1.03
160	16%	12.69%	1.61%	9.61%	18.36%	0.52	0.16	1.09	1.03
180	18%	12.78%	1.69%	9.45%	18.29%	0.53	0.18	1.09	1.03
200	20%	12.82%	1.73%	9.37%	18.24%	0.54	0.18	1.09	1.03

US Mid Cap (Russell MidCap proxy), Median Performance & Risk Metrics
July 1986 – September 2025

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%	5.73%	-5.70%	36.40%	40.28%	0.07	-0.15	1.12	1.01
10	1%	12.39%	0.96%	15.36%	23.15%	0.41	0.06	1.10	1.04
16	2%	12.63%	1.20%	13.47%	21.91%	0.44	0.09	1.09	1.05
32	4%	12.99%	1.56%	11.55%	20.84%	0.47	0.13	1.10	1.04
48	6%	13.09%	1.66%	11.04%	20.53%	0.49	0.15	1.10	1.04
64	8%	13.00%	1.57%	10.55%	20.26%	0.49	0.15	1.09	1.03
80	10%	13.11%	1.67%	10.34%	20.12%	0.50	0.16	1.10	1.03
96	12%	13.11%	1.68%	10.23%	20.08%	0.50	0.17	1.09	1.03
112	14%	13.22%	1.79%	10.01%	19.97%	0.51	0.18	1.09	1.03
128	16%	13.23%	1.80%	9.94%	19.97%	0.51	0.18	1.09	1.04
144	18%	13.17%	1.74%	9.89%	19.91%	0.51	0.17	1.09	1.03
160	20%	13.22%	1.78%	9.84%	19.89%	0.51	0.18	1.09	1.03

US Small Cap (Russell 2000 proxy), Median Performance & Risk Metrics
July 1986 – September 2025

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%	1.06%	-9.67%	48.76%	52.19%	-0.04	-0.20	1.10	1.05
10	1%	11.04%	0.30%	19.13%	27.23%	0.28	0.02	1.10	1.09
40	2%	13.24%	2.50%	12.23%	23.89%	0.43	0.20	1.14	1.06
80	4%	13.26%	2.52%	10.29%	22.72%	0.45	0.24	1.13	1.07
120	6%	13.29%	2.56%	9.76%	22.46%	0.45	0.26	1.13	1.06
160	8%	13.00%	2.26%	9.23%	22.25%	0.45	0.24	1.13	1.07
200	10%	13.10%	2.36%	9.07%	22.23%	0.46	0.27	1.13	1.07
240	12%	13.20%	2.46%	8.81%	22.14%	0.46	0.28	1.13	1.07
280	14%	13.13%	2.40%	8.78%	22.10%	0.46	0.27	1.13	1.07
320	16%	13.22%	2.48%	8.64%	22.06%	0.46	0.29	1.13	1.07
360	18%	13.20%	2.46%	8.55%	21.98%	0.46	0.29	1.13	1.07
400	20%	13.20%	2.46%	8.50%	21.97%	0.46	0.29	1.13	1.07

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US Micro Cap (Russell Microcap proxy), Median Performance & Risk Metrics
July 1986 – September 2025

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%	-1.28%	-13.06%	55.92%	59.04%	-0.08	-0.24	1.08	1.01
10	1%	14.37%	2.59%	23.54%	31.50%	0.36	0.12	1.15	1.01
40	2%	14.61%	2.84%	14.41%	25.65%	0.44	0.19	1.15	1.04
80	4%	14.70%	2.92%	11.67%	24.42%	0.49	0.26	1.14	1.04
120	6%	15.06%	3.29%	10.62%	23.89%	0.50	0.31	1.14	1.05
160	8%	14.97%	3.19%	10.15%	23.84%	0.50	0.31	1.15	1.06
200	10%	14.81%	3.03%	9.88%	23.89%	0.50	0.31	1.15	1.07
240	12%	14.77%	2.99%	9.50%	23.58%	0.50	0.31	1.14	1.07
280	14%	14.74%	2.96%	9.29%	23.67%	0.49	0.32	1.14	1.08
320	16%	14.73%	2.95%	9.13%	23.59%	0.50	0.33	1.15	1.07
360	18%	14.74%	2.96%	8.91%	23.51%	0.50	0.33	1.15	1.07
400	20%	14.73%	2.95%	8.80%	23.44%	0.50	0.34	1.15	1.07

MSCI ACWI ex-US, Median Performance & Risk Metrics
October 2005 – September 2025

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%	1.32%	-5.87%	33.80%	37.40%	-0.01	-0.18	0.90	0.87
10	0%	7.68%	0.49%	15.55%	22.63%	0.27	0.03	0.99	0.90
40	2%	7.98%	0.79%	11.46%	19.79%	0.33	0.07	0.97	0.91
80	4%	7.90%	0.71%	10.25%	18.90%	0.34	0.07	0.97	0.91
120	6%	7.87%	0.67%	9.89%	18.82%	0.33	0.07	0.97	0.92
161	8%	7.92%	0.73%	9.53%	18.74%	0.33	0.07	0.97	0.91
201	10%	7.88%	0.69%	9.52%	18.53%	0.34	0.07	0.96	0.91
241	12%	7.81%	0.62%	9.29%	18.48%	0.33	0.07	0.96	0.91
282	14%	7.72%	0.53%	9.22%	18.47%	0.33	0.06	0.96	0.91
322	16%	7.85%	0.66%	9.20%	18.45%	0.34	0.07	0.97	0.91
362	18%	7.76%	0.57%	9.15%	18.47%	0.33	0.06	0.97	0.91
410	20%	7.77%	0.58%	9.10%	18.43%	0.33	0.06	0.96	0.91

MSCI ACWI ex-US Small Cap, Median Performance & Risk Metrics
October 2005 – September 2025

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%	1.95%	-5.52%	41.92%	45.71%	0.01	-0.12	1.04	1.02
10	0%	11.73%	4.27%	16.31%	24.00%	0.42	0.24	1.10	0.89
84	2%	11.52%	4.06%	8.47%	19.67%	0.50	0.48	1.09	0.92
169	4%	11.69%	4.22%	7.56%	19.29%	0.52	0.54	1.09	0.91
253	6%	11.55%	4.08%	7.22%	19.08%	0.52	0.56	1.09	0.93
338	8%	11.83%	4.36%	6.98%	19.00%	0.54	0.62	1.09	0.92
423	10%	11.54%	4.08%	6.92%	19.01%	0.52	0.59	1.09	0.92
507	12%	11.68%	4.22%	6.83%	18.96%	0.53	0.61	1.09	0.92
592	14%	11.62%	4.15%	6.79%	18.91%	0.53	0.61	1.09	0.92
676	16%	11.63%	4.16%	6.73%	18.91%	0.53	0.62	1.09	0.92
761	18%	11.64%	4.17%	6.71%	18.90%	0.53	0.62	1.09	0.92
850	20%	11.64%	4.17%	6.69%	18.90%	0.53	0.62	1.09	0.92

MSCI ACWI, Median Performance & Risk Metrics
October 2005 – September 2025

| 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%	1.38%	-7.54%	33.50%	36.78%	-0.01	-0.22	0.93	0.91
10	0%	8.09%	-0.83%	15.29%	21.41%	0.29	-0.05	0.94	0.90
52	2%	8.44%	-0.47%	10.87%	18.66%	0.36	-0.05	0.97	0.97
105	4%	8.58%	-0.33%	9.85%	18.08%	0.38	-0.03	0.96	0.95
157	6%	8.84%	-0.08%	9.12%	17.64%	0.41	-0.01	0.98	0.95
210	8%	8.96%	0.04%	8.97%	17.68%	0.41	0.00	0.98	0.96
262	10%	8.67%	-0.25%	8.77%	17.51%	0.40	-0.03	0.97	0.96
315	12%	8.80%	-0.12%	8.72%	17.45%	0.41	-0.01	0.97	0.96
367	14%	8.77%	-0.14%	8.58%	17.46%	0.41	-0.02	0.98	0.96
420	16%	8.78%	-0.13%	8.55%	17.40%	0.41	-0.02	0.98	0.96
472	18%	8.67%	-0.24%	8.48%	17.38%	0.41	-0.03	0.97	0.96
530	20%	8.74%	-0.18%	8.46%	17.38%	0.41	-0.02	0.97	0.96

MSCI ACWI Small Cap, Median Performance & Risk Metrics
October 2005 – September 2025

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%	-7.28%	41.30%	45.67%	-0.02	-0.17	1.06	1.00
10	0%	9.65%	1.56%	16.70%	23.60%	0.34	0.10	1.08	0.92
121	2%	10.43%	2.35%	8.07%	19.03%	0.46	0.28	1.05	0.97
242	4%	10.64%	2.55%	7.32%	18.65%	0.49	0.35	1.05	0.95
363	6%	10.94%	2.85%	6.99%	18.57%	0.50	0.40	1.06	0.95
484	8%	11.11%	3.02%	6.92%	18.49%	0.51	0.43	1.06	0.95
606	10%	10.92%	2.83%	6.83%	18.51%	0.50	0.42	1.06	0.95
727	12%	10.83%	2.75%	6.82%	18.51%	0.50	0.40	1.06	0.95
848	14%	10.96%	2.87%	6.74%	18.46%	0.51	0.43	1.06	0.95
969	16%	10.95%	2.86%	6.70%	18.45%	0.51	0.43	1.06	0.95
1090	18%	11.02%	2.93%	6.68%	18.43%	0.51	0.44	1.06	0.95
1220	20%	11.00%	2.91%	6.69%	18.45%	0.51	0.43	1.06	0.95

MSCI Emerging Markets, Median Performance & Risk Metrics
October 2005 – September 2025

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%	2.22%	-4.93%	37.24%	41.80%	0.01	-0.12	1.00	0.91
10	1%	8.09%	0.94%	17.69%	26.02%	0.25	0.05	1.02	0.94
19	2%	7.91%	0.76%	14.51%	24.16%	0.26	0.05	1.03	0.96
40	4%	9.41%	2.26%	12.70%	22.93%	0.34	0.18	1.01	0.93
59	6%	8.33%	1.18%	11.95%	22.57%	0.30	0.10	1.02	0.94
80	8%	8.39%	1.24%	11.16%	22.41%	0.31	0.11	1.02	0.96
100	10%	8.34%	1.19%	10.92%	22.25%	0.30	0.11	1.02	0.96
120	12%	8.39%	1.24%	10.77%	22.26%	0.30	0.11	1.02	0.96
139	14%	8.54%	1.39%	10.65%	22.15%	0.32	0.13	1.03	0.96
159	16%	8.31%	1.16%	10.49%	22.06%	0.30	0.11	1.02	0.96
179	18%	8.28%	1.13%	10.34%	22.02%	0.30	0.11	1.02	0.96
200	20%	8.31%	1.16%	10.26%	21.95%	0.31	0.11	1.02	0.96

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MSCI Emerging Markets Small Cap, Median Performance & Risk Metrics

October 2005 – September 2025

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%	2.52%	-5.79%	46.06%	50.57%	0.02	-0.13	1.12	1.01
10	1%	11.86%	3.56%	18.23%	28.19%	0.37	0.19	1.11	0.95
35	2%	12.91%	4.60%	11.90%	24.37%	0.46	0.39	1.11	0.96
70	4%	13.33%	5.02%	9.88%	23.61%	0.50	0.51	1.12	0.93
104	6%	12.79%	4.48%	8.88%	23.04%	0.49	0.50	1.09	0.94
139	8%	12.55%	4.24%	8.35%	22.99%	0.47	0.50	1.10	0.96
175	10%	12.90%	4.60%	8.02%	22.75%	0.49	0.57	1.11	0.94
209	12%	12.99%	4.68%	7.83%	22.80%	0.50	0.60	1.10	0.95
244	14%	12.78%	4.48%	7.64%	22.57%	0.49	0.60	1.10	0.95
279	16%	12.86%	4.55%	7.50%	22.61%	0.50	0.61	1.10	0.95
314	18%	12.94%	4.63%	7.41%	22.58%	0.50	0.63	1.10	0.95
350	20%	12.89%	4.58%	7.32%	22.57%	0.50	0.63	1.10	0.95

2. Diversification benefits emerge quickly as portfolios expand.

As measured by tracking error, the largest improvements in risk reduction occur early when expanding portfolio breadth and its benefits decline substantially with each incremental expansion.

US Large Cap (Russell 1000 proxy)
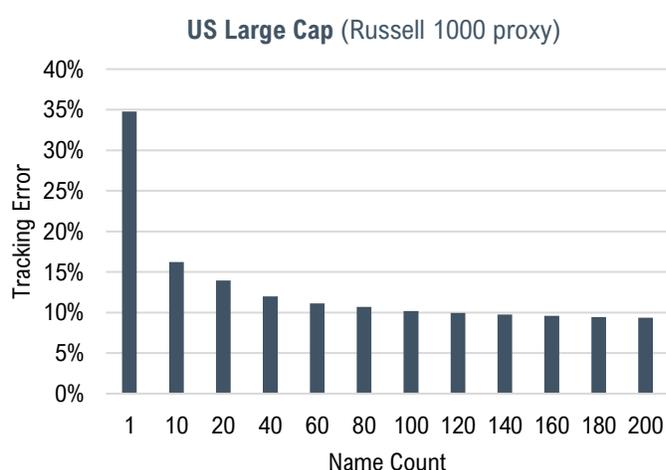
Name Count	% of Universe	Tracking Error
1	0%	34.77%
10	1%	16.23%
20	2%	13.96%
40	4%	12.00%
60	6%	11.14%
80	8%	10.68%
100	10%	10.17%
120	12%	9.93%
140	14%	9.75%
160	16%	9.61%
180	18%	9.45%
200	20%	9.37%

US Mid Cap (Russell Mid Cap proxy)
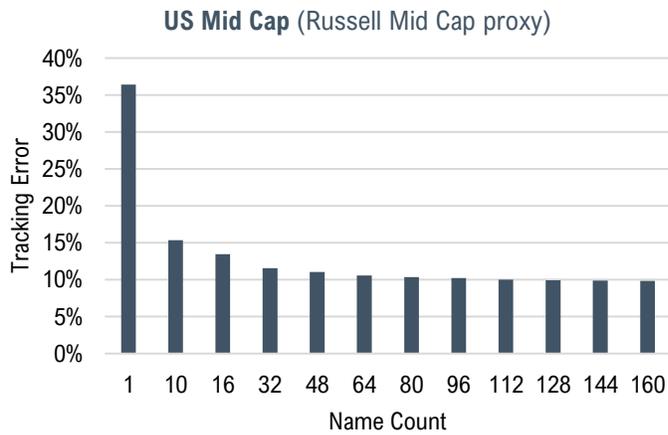
Name Count	% of Universe	Tracking Error
1	0%	36.40%
10	1%	15.36%
16	2%	13.47%
32	4%	11.55%
48	6%	11.04%
64	8%	10.55%
80	10%	10.34%
96	12%	10.23%
112	14%	10.01%
128	16%	9.94%
144	18%	9.89%
160	20%	9.84%

US Small Cap (Russell 2000 proxy)
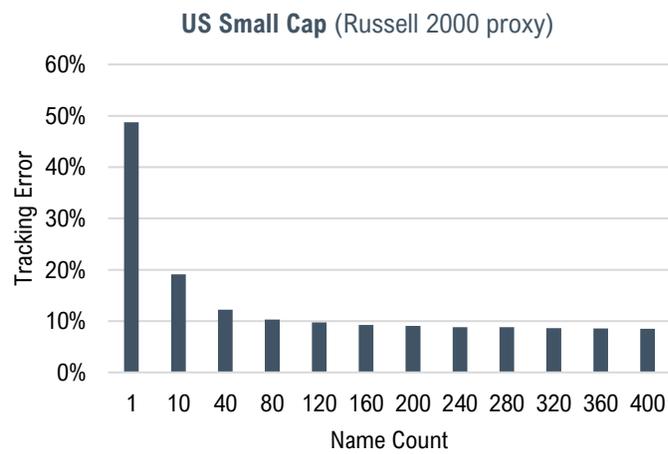
Name Count	% of Universe	Tracking Error
1	0%	48.76%
10	1%	19.13%
40	2%	12.23%
80	4%	10.29%
120	6%	9.76%
160	8%	9.23%
200	10%	9.07%
240	12%	8.81%
280	14%	8.78%
320	16%	8.64%
360	18%	8.55%
400	20%	8.50%

US Micro Cap (Russell Microcap proxy)
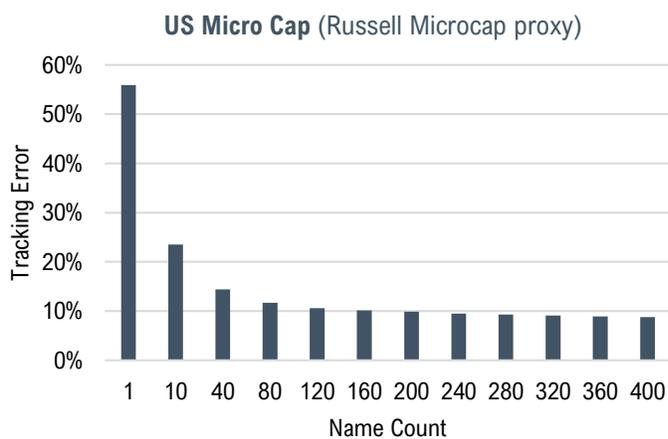
Name Count	% of Universe	Tracking Error
1	0%	55.92%
10	1%	23.54%
40	2%	14.41%
80	4%	11.67%
120	6%	10.62%
160	8%	10.15%
200	10%	9.88%
240	12%	9.50%
280	14%	9.29%
320	16%	9.13%
360	18%	8.91%
400	20%	8.80%

MSCI ACWI ex-US
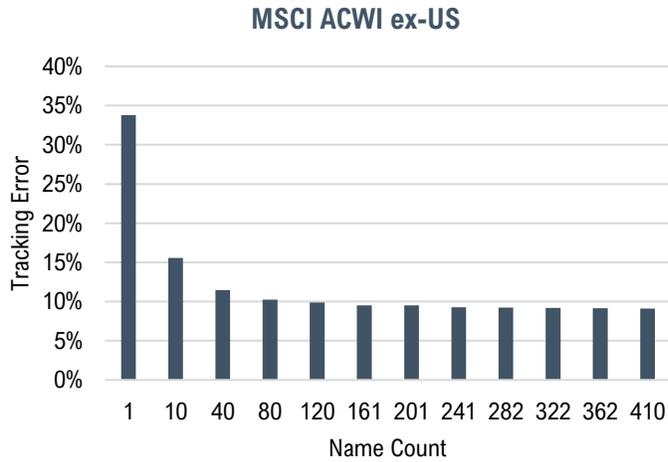
Name Count	% of Universe	Tracking Error
1	0%	33.80%
10	0%	15.55%
40	2%	11.46%
80	4%	10.25%
120	6%	9.89%
161	8%	9.53%
201	10%	9.52%
241	12%	9.29%
282	14%	9.22%
322	16%	9.20%
362	18%	9.15%
410	20%	9.10%

MSCI ACWI ex-US Small Cap
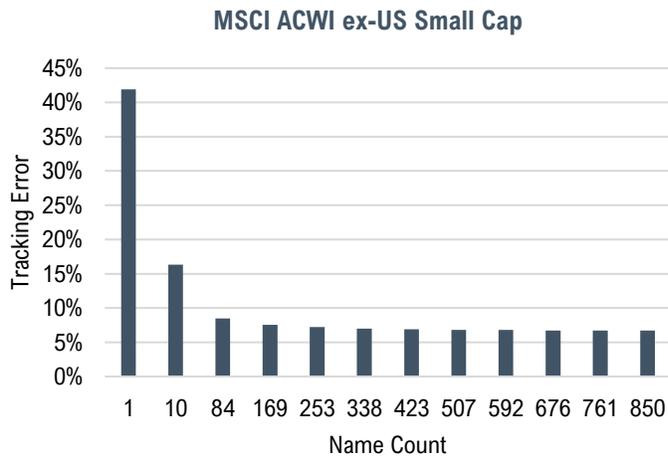
Name Count	% of Universe	Tracking Error
1	0%	41.92%
10	0%	16.31%
84	2%	8.47%
169	4%	7.56%
253	6%	7.22%
338	8%	6.98%
423	10%	6.92%
507	12%	6.83%
592	14%	6.79%
676	16%	6.73%
761	18%	6.71%
850	20%	6.69%
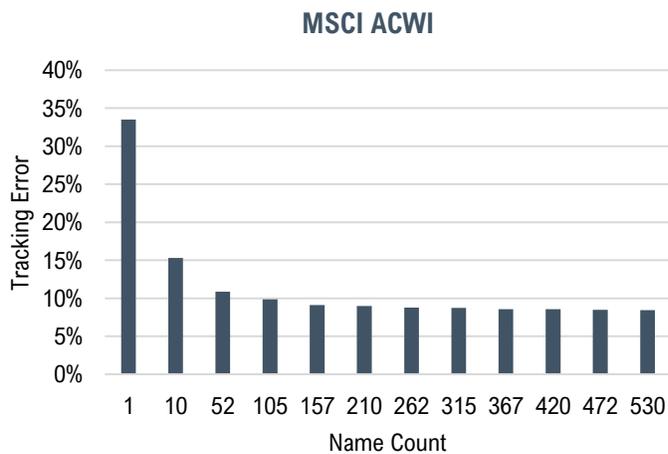
MSCI ACWI

Name Count	% of Universe	Tracking Error
1	0%	33.50%
10	0%	15.29%
52	2%	10.87%
105	4%	9.85%
157	6%	9.12%
210	8%	8.97%
262	10%	8.77%
315	12%	8.72%
367	14%	8.58%
420	16%	8.55%
472	18%	8.48%
530	20%	8.46%

MSCI ACWI Small Cap
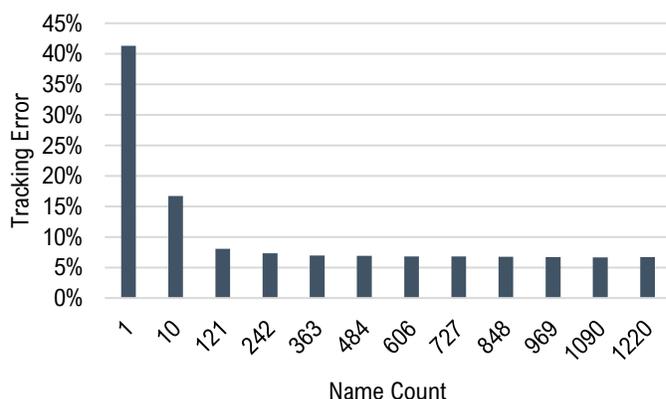
Name Count	% of Universe	Tracking Error
1	0%	41.30%
10	0%	16.70%
121	2%	8.07%
242	4%	7.32%
363	6%	6.99%
484	8%	6.92%
606	10%	6.83%
727	12%	6.82%
848	14%	6.74%
969	16%	6.70%
1090	18%	6.68%
1220	20%	6.69%

MSCI Emerging Markets
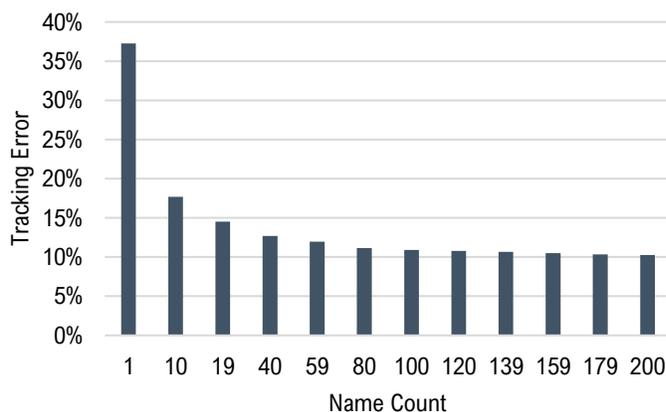
Name Count	% of Universe	Tracking Error
1	0%	37.24%
10	1%	17.69%
19	2%	14.51%
40	4%	12.70%
59	6%	11.95%
80	8%	11.16%
100	10%	10.92%
120	12%	10.77%
139	14%	10.65%
159	16%	10.49%
179	18%	10.34%
200	20%	10.26%

MSCI EM Small
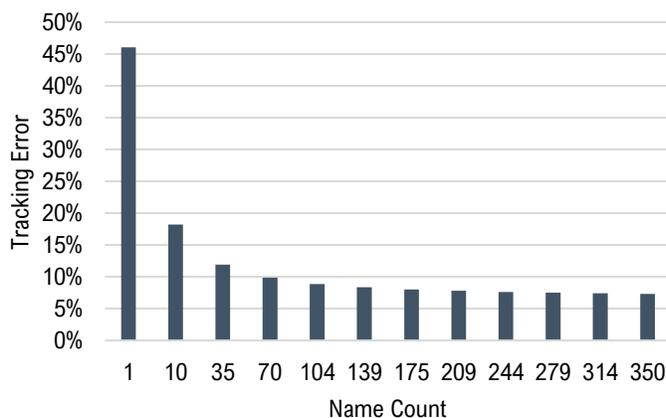
Name Count	% of Universe	Tracking Error
1	0%	46.06%
10	1%	18.23%
35	2%	11.90%
70	4%	9.88%
104	6%	8.88%
139	8%	8.35%
175	10%	8.02%
209	12%	7.83%
244	14%	7.64%
279	16%	7.50%
314	18%	7.41%
350	20%	7.32%

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3. Outcome consistency increases with portfolio breadth.

Risk adjusted performance as well as the dispersion of outcomes – measured using the coefficient of variation of sharpe ratios – tightened considerably as portfolio name count expanded. 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 ranked by 12-1m momentum. The accompanying horizontal bar charts 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 (see Appendix B).

US Large Cap (Russell 1000 proxy)

US Mid Cap (Russell Mid Cap proxy)

RMid Proxy, Market Cap. Weighted

RMid Proxy, Market Cap. Weighted: Sharpe Ratio Stability (Std vs CV)

US Small Cap (Russell 2000 proxy)

R2000 Proxy, Market Cap. Weighted

R2000 Proxy, Market Cap. Weighted: Sharpe Ratio Stability (Std vs CV)

US Micro Cap (Russell Microcap proxy)

RMicro Proxy, Market Cap. Weighted

RMicro Proxy, Market Cap. Weighted: Sharpe Ratio Stability (Std vs CV)

MSCI ACWI ex-US

ACWIXUS, Market Cap. Weighted

ACWIXUS, Market Cap. Weighted: Sharpe Ratio Stability (Std vs CV)

ACWI ex-US Small Cap

ACWIXUS Small, Market Cap. Weighted

ACWIXUS Small, Market Cap. Weighted: Sharpe Ratio Stability (Std vs CV)

MSCI ACWI

ACWI, Market Cap. Weighted

ACWI, Market Cap. Weighted: Sharpe Ratio Stability (Std vs CV)

MSCI ACWI Small Cap

ACWI Small, Market Cap. Weighted

ACWI Small, Market Cap. Weighted: Sharpe Ratio Stability (Std vs CV)

MSCI Emerging Markets

MSCI EM Small Cap

EM Small, Market Cap. Weighted

EM Small, Market Cap. Weighted: Sharpe Ratio Stability (Std vs CV)
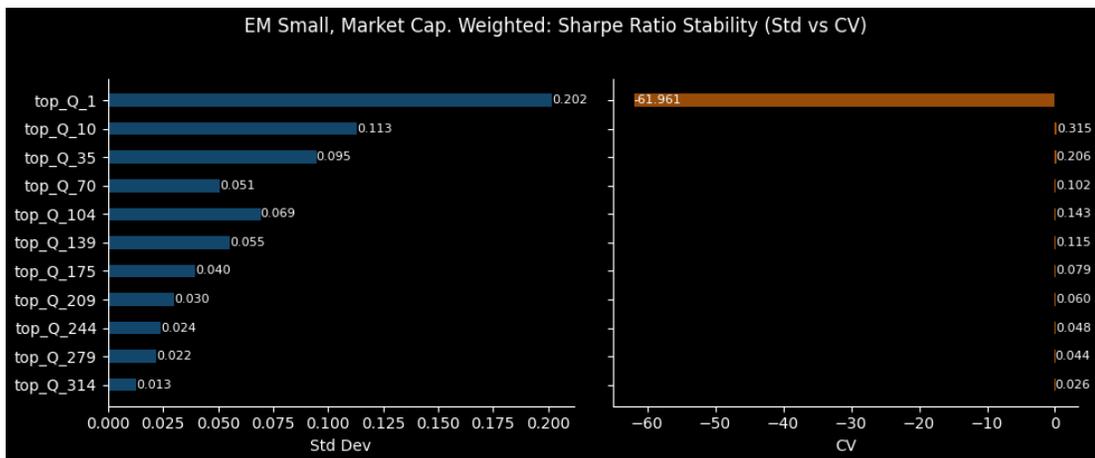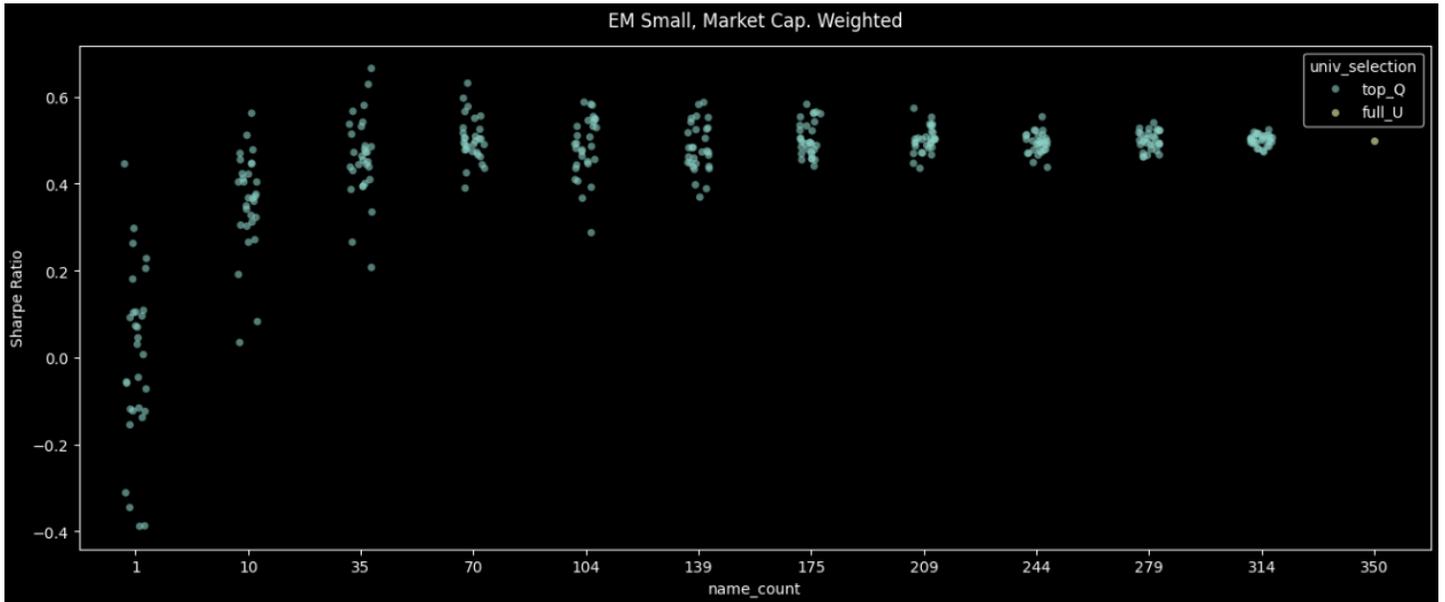
Discussion

Our findings extend the insights of Markowitz (1959) and Elton & Gruber (1977) into the domain of momentum investing. While diversification remains central to risk management, momentum frameworks often emphasize stronger signals found in more concentrated subsets.

Yet concentration brings volatility. The evidence here suggests that **breadth enhances both realized performance and reliability**, particularly when momentum signals experience short-term noise or reversals.

Importantly, while Elton & Gruber focused on capturing market variance, our study centers on maximizing **risk-adjusted returns** for momentum strategies—a distinct, though related, objective.

Conclusion

Our findings reaffirm that diversification plays a central role in improving the stability and consistency of momentum portfolios. Broader portfolios generally deliver stronger risk-adjusted outcomes, with the largest gains occurring as portfolios expand from very concentrated structures to moderately diversified ones. Beyond that point, the benefits continue but at a diminishing pace.

At the same time, diversification is only one element of effective momentum design. Within IMC's Informed Momentum framework, we incorporate both price momentum and measures of fundamental improvement. This intersection often elevates the quality of the opportunity set, allowing a portfolio to retain conviction without relying solely on price-based signals. As a result, a slightly more focused portfolio can remain disciplined without sacrificing robustness.

The balance between breadth and signal strength is therefore an important consideration. While broader portfolios improve consistency, thoughtful refinement of the underlying momentum signal can support maintaining a degree of concentration when the evidence warrants it. Our work continues to explore this balance, with the goal of enhancing the persistence and practicality of momentum-driven portfolio construction.

As Cervantes wrote in Don Quixote, "The road is always better than the inn." Likewise, the optimal portfolio is not a destination but a pursuit. One that invites continual research and refinement to better understand how portfolio design choices shape the performance and persistence of momentum strategies.

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 July 1986 through September 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 October 2005 through September 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.

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

Appendix C

Median Active Share calculated for portfolios holding the full top-quintile momentum group (20% of Universe) as well as for the portfolios formed from random samples comprising 50% of that group (10% of Universe):

Universe	10% of Universe	20% of Universe
US Large Cap (Russell 1000 proxy)	90.6%	80.4%
US Mid Cap (Russell Midcap proxy)	88.9%	77.8%
US Small Cap (Russell 2000 proxy)	88.2%	76.5%
US Micro Cap (Russell Microcap proxy)	87.0%	73.9%
MSCI ACWI ex USA	89.4%	78.4%
MSCI ACWI ex USA Small Cap	87.2%	74.5%
MSCI ACWI	89.0%	77.3%
MSCI ACWI Small Cap	87.2%	74.3%
MSCI EM	89.7%	78.6%
MSCI EM Small Cap	86.4%	72.5%

Formal definition

$$\text{Active Share} = \frac{1}{2} \sum_i \left| w_i^{\text{portfolio}} - w_i^{\text{benchmark}} \right|$$

where:

- w_i = weight of security i
- The sum is taken over **all securities in either portfolio**

The division by 2 avoids double-counting overweights and underweights.

Appendix D

Below are the median risk statistics for the US subsamples aligned to the time period of the MSCI datasets (October 2005 – September 2025).

US Large Cap (Russell 1000 proxy), Median Performance & Risk Metrics
October 2005 – September 2025

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%	7.75%	-3.45%	30.33%	33.84%	0.18	-0.11	1.10	0.97
10	1%	9.55%	-1.66%	14.74%	21.31%	0.36	-0.11	1.01	1.02
20	2%	9.76%	-1.44%	12.59%	19.55%	0.42	-0.11	0.99	1.00
40	4%	10.67%	-0.53%	10.74%	18.75%	0.49	-0.05	1.03	1.05
60	6%	10.85%	-0.36%	9.82%	18.01%	0.51	-0.03	1.01	1.02
80	8%	11.10%	-0.10%	9.25%	17.70%	0.52	-0.01	1.01	1.02
100	10%	10.86%	-0.35%	8.73%	17.33%	0.53	-0.04	1.00	1.01
120	12%	10.96%	-0.24%	8.47%	17.24%	0.54	-0.03	1.01	1.00
140	14%	11.04%	-0.17%	8.30%	17.13%	0.55	-0.02	1.01	1.01
160	16%	10.72%	-0.48%	8.05%	16.96%	0.54	-0.06	1.00	1.01
180	18%	10.86%	-0.34%	7.91%	16.94%	0.55	-0.04	1.00	1.01
200	20%	10.92%	-0.29%	7.81%	16.88%	0.55	-0.04	1.01	1.01

US Mid Cap (Russell Mid Cap proxy), Median Performance & Risk Metrics
October 2005 – September 2025

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%	3.07%	-7.11%	31.54%	35.65%	0.04	-0.23	0.97	1.02
10	1%	9.60%	-0.57%	13.36%	21.11%	0.38	-0.04	0.99	0.98
16	2%	10.43%	0.26%	11.81%	20.10%	0.45	0.02	1.01	0.99
32	4%	10.66%	0.49%	9.88%	19.37%	0.47	0.05	1.00	0.99
48	6%	10.56%	0.39%	9.12%	19.09%	0.48	0.04	1.01	0.99
64	8%	10.00%	-0.17%	8.65%	18.66%	0.45	-0.02	0.99	0.98
80	10%	10.18%	0.01%	8.41%	18.53%	0.46	0.00	1.00	0.98
96	12%	10.17%	-0.01%	8.38%	18.45%	0.46	0.00	1.00	0.99
112	14%	10.17%	0.00%	8.17%	18.38%	0.47	0.00	1.00	0.98
128	16%	10.17%	0.00%	8.08%	18.36%	0.47	0.00	1.00	0.99
144	18%	10.16%	-0.02%	8.01%	18.34%	0.47	0.00	0.99	0.98
160	20%	10.22%	0.04%	7.94%	18.30%	0.47	0.01	1.00	0.98

US Small Cap (Russell 2000 proxy), Median Performance & Risk Metrics
October 2005 – September 2025

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%	-0.27%	-9.91%	48.87%	52.84%	-0.04	-0.22	1.03	1.00
10	1%	8.33%	-1.31%	17.92%	26.08%	0.26	-0.07	0.97	0.95
40	2%	10.47%	0.83%	10.90%	22.16%	0.40	0.08	1.01	0.97
80	4%	10.66%	1.02%	9.00%	21.06%	0.43	0.11	1.00	0.97
120	6%	10.55%	0.91%	8.19%	20.99%	0.43	0.11	1.02	0.97
160	8%	10.56%	0.92%	7.83%	20.73%	0.43	0.12	1.01	0.97
200	10%	10.51%	0.87%	7.52%	20.64%	0.43	0.12	1.01	0.97
240	12%	10.56%	0.92%	7.35%	20.69%	0.43	0.13	1.02	0.98
280	14%	10.45%	0.81%	7.24%	20.55%	0.43	0.11	1.01	0.97
320	16%	10.39%	0.75%	7.13%	20.55%	0.43	0.10	1.01	0.97
360	18%	10.49%	0.85%	7.07%	20.51%	0.43	0.12	1.01	0.97
400	20%	10.47%	0.83%	7.02%	20.49%	0.43	0.12	1.01	0.97

US Micro Cap (Russell Microcap proxy), Median Performance & Risk Metrics
October 2005 – September 2025

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%	-6.69%	-14.97%	57.47%	59.74%	-0.13	-0.24	0.86	0.80
10	1%	7.90%	-0.38%	23.90%	31.26%	0.21	-0.02	1.03	0.97
40	2%	9.09%	0.81%	13.28%	24.24%	0.31	0.06	1.06	1.00
80	4%	9.10%	0.81%	11.11%	23.40%	0.32	0.08	1.03	1.00
120	6%	9.09%	0.81%	9.51%	22.54%	0.33	0.09	1.03	1.00
160	8%	8.69%	0.41%	9.37%	22.73%	0.32	0.05	1.05	1.02
200	10%	8.35%	0.07%	9.24%	22.78%	0.29	0.01	1.04	1.03
240	12%	8.45%	0.17%	8.57%	22.47%	0.31	0.02	1.04	1.02
280	14%	8.06%	-0.22%	8.25%	22.68%	0.28	-0.03	1.04	1.06
320	16%	8.10%	-0.18%	7.98%	22.50%	0.29	-0.02	1.04	1.05
360	18%	8.16%	-0.12%	7.67%	22.46%	0.29	-0.02	1.04	1.05
400	20%	8.16%	-0.12%	7.41%	22.28%	0.29	-0.02	1.04	1.04

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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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.

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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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Important Disclosures: