

Factor Indexes in Perspective

Insights from 40 Years of Data

Part II: Supplementary Materials

Mehdi Alighanbari

Raman Aylur Subramanian

Padmakar Kulkarni

September 2014

Contents

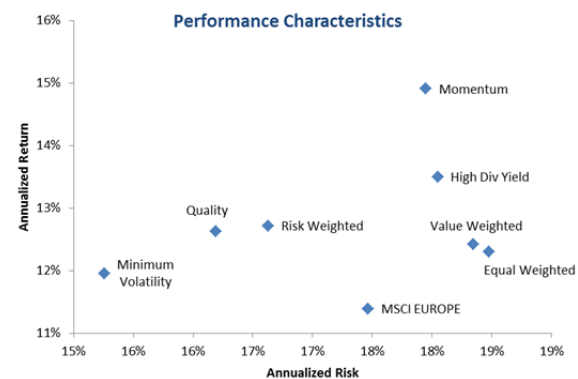
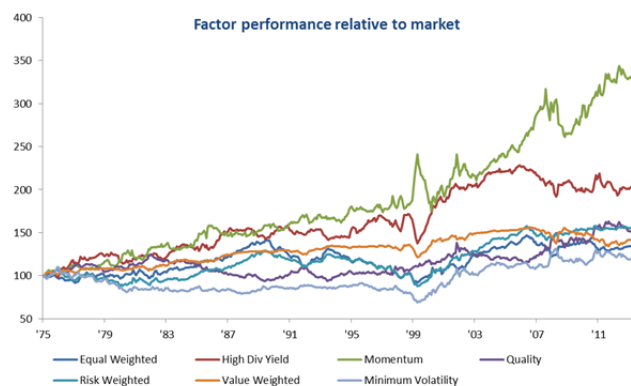
Contents.....	2
Appendix A: Factor Analysis for Selected MSCI Regions.....	3
MSCI Europe	3
MSCI USA	5
MSCI Emerging Markets	7
MSCI Japan.....	9
Appendix B: Methodology	11
Extensions to the Historical Data of the MSCI Factor Indexes:.....	11
Simulation of Low Volatility Index data prior to 1988	12
Appendix C: Definitions of Metrics in the Report.....	13
Client Service Information is Available 24 Hours a Day.....	19
Notice and Disclaimer	19
About MSCI.....	19

Appendix A: Factor Analysis for Selected MSCI Regions

This appendix presents a standard IndexMetrics analysis for factor indexes in selected regional MSCI indexes (MSCI Europe, USA, Emerging Markets and Japan). The same analyses can be repeated for any MSCI region or country index. For consistency, we have used gross total returns in USD, but similar analyses can be done for different currencies.

MSCI Europe

All factor indexes based on MSCI Europe have outperformed their parent index over the 40-year period from November 1975 to March 2014. Quality, Risk Weighted and Minimum Volatility indexes have achieved higher performance with lower risk.



Performance Metrics	MSCI EUROPE	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Total Return* (%)	11.6	12.5	13.8	15.1	12.8	12.9	12.6	12.2
Total Risk* (%)	17.5	18.5	18.0	17.9	16.2	16.6	18.3	15.3
Return/Risk	0.66	0.68	0.76	0.84	0.79	0.78	0.69	0.80
Active Return* (%)	0.0	0.9	2.1	3.5	1.2	1.3	1.0	0.6
Tracking error* (%)	0.0	5.1	5.4	7.0	5.0	4.6	2.9	5.7
Information Ratio	NA	0.18	0.39	0.50	0.25	0.29	0.35	0.10
Historical Beta	1.00	1.02	0.99	0.95	0.89	0.92	1.04	0.83
Turnover** (%)	2.7	28.6	36.6	80.8	30.9	23.8	16.9	22.0
Price to Book***	1.6	1.2	1.4	2.0	2.7	1.3	1.2	1.7
Price to Earnings***	12.6	13.4	9.6	14.5	12.3	13.0	10.9	12.5
Div. Yield*** (%)	3.8	3.7	5.8	3.0	3.4	3.8	4.3	3.9

* Annualized in USD from 28-Nov-1975 to 31-Mar-2014

** Average annual one-way index turnover from 28-Nov-1975 to 31-Mar-2014

*** Average value from 28-Nov-1975 to 31-Mar-2014

Risk Profile	MSCI EUROPE	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Total Risk* (%)	17.5	18.5	18.0	17.9	16.2	16.6	18.3	15.3
Ann. Downside Deviation (%)	11.5	12.1	11.5	11.4	10.3	10.8	12.0	9.8
Sortino ratio	1.01	1.03	1.20	1.32	1.24	1.19	1.06	1.25
95 percentile Var (%)	-8.5	-8.3	-7.9	-7.9	-7.9	-8.0	-8.5	-7.5
99 percentile Var (%)	-13.1	-14.6	-13.9	-15.1	-11.7	-12.9	-13.8	-10.7
Expected Shortfall @ 95%	-11.6	-12.8	-11.9	-11.4	-10.4	-11.5	-12.3	-9.9
Expected Shortfall @ 99%	-16.5	-18.1	-16.9	-17.8	-15.5	-16.2	-17.2	-14.3
Max Drawdown (%)	59.0	63.6	64.3	56.0	49.2	59.1	63.6	49.9
Max Drawdown period (in months)	16	16	16	16	16	16	16	16
Skewness	-0.59	-0.64	-0.48	-0.59	-0.56	-0.69	-0.55	-0.57
Kurtosis	4.47	5.31	4.89	4.60	4.51	5.23	4.82	4.47
Relative Risk Metrics								
Tracking error* (%)		5.1	5.4	7.0	5.0	4.6	2.9	5.7
Max Drawdown of Active Returns (%)		36.3	20.3	27.0	25.2	33.8	12.3	41.0
Number of years of underperformance		17	14	10	15	16	14	24
Max consecutive years of underperformance		5	2	2	5	5	3	5

* Annualized in USD from 28-Nov-1975 to 31-Mar-2014

Performance *	MSCI EUROPE	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
YTD	2.2%	3.9%	3.5%	1.7%	2.7%	3.2%	3.0%	4.0%
1 Yr	25.2%	30.5%	31.3%	19.9%	17.7%	25.7%	31.7%	21.1%
3 Yr **	9.0%	7.9%	10.0%	13.6%	12.3%	9.6%	7.5%	10.9%
5 Yr **	18.2%	20.1%	19.5%	20.6%	18.9%	19.8%	18.4%	17.0%
10 Yr **	8.0%	8.8%	8.0%	12.5%	10.2%	9.9%	7.5%	9.7%

* Gross Total Returns in USD for period ending 31-Mar-2014

** Annualized

Valuations	MSCI EUROPE	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Price to Book	1.6	1.2	1.4	2.0	2.7	1.3	1.2	1.7
Price to Cash Earnings	6.3	5.6	5.0	7.3	7.8	5.7	5.0	6.2
Price to Earnings	12.6	13.4	9.6	14.5	12.3	13.0	10.9	12.5
Div. Yield (%)	3.8	3.7	5.8	3.0	3.4	3.8	4.3	3.9

Average values from 28-Nov-1975 to 31-Mar-2014

Concentration and Capacity	MSCI EUROPE	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Concentration Metrics *								
Avg No of Stocks	516	516	116	137	124	516	516	134
Effective No of Stocks	122	501	37	48	43	369	117	81
Market Cap coverage (%)		100.0	25.1	32.5	33.9	100.0	100.0	55.4
Top 10 Sec wt (%)	20.6	2.1	44.1	36.9	39.9	6.9	20.7	22.3
Capacity of the Strategy (@ USD 1 bn) **								
Stock Ownership (% of Float Market Cap)								
Average		0.03%	0.01%	0.01%	0.01%	0.03%	0.01%	0.02%
95 percentile		0.09%	0.09%	0.05%	0.04%	0.09%	0.02%	0.12%
Tail Average @ 95%		0.10%	0.09%	0.06%	0.05%	0.13%	0.04%	0.19%
Maximum		0.15%	0.09%	0.09%	0.05%	0.23%	0.17%	0.23%
Stock Ownership (% of Full Market Cap)								
Average		0.02%	0.01%	0.01%	0.01%	0.02%	0.01%	0.01%
95 percentile		0.05%	0.08%	0.05%	0.04%	0.06%	0.02%	0.08%
Tail Average @ 95%		0.06%	0.09%	0.05%	0.04%	0.08%	0.03%	0.11%
Maximum		0.10%	0.09%	0.07%	0.05%	0.19%	0.17%	0.21%
Degree of Index Tilt *								
Active Share (%) **	0.0	45.4	81.3	66.0	66.8		24.0	60.2
Avg Weight Multiplier	1	5	5	4	3	5	1	4
Max Weight Multiplier	1	100	5	7	5	97	11	14
Max Strategy Weight (%)	3.4	0.2	7.0	5.0	5.0	0.9	4.1	3.2

* Average values from 28-Nov-1975 to 31-Mar-2014

** As of 03-Mar-2014 rebalancing

Liquidity and Tradability	MSCI EUROPE	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Tradability of the Strategy (@ USD 1 bn / 10% of daily trading vol.)								
Weighted Average ATVR (%)		96.5	69.1	64.8	53.0	77.2	91.0	59.0
Days to Trade - Periodic Rebalancing *								
Weighted Average		0.3	1.9	1.5	0.8	0.5	0.3	2.2
95 percentile		0.4	0.6	1.7	0.4	0.9	0.2	1.2
Tail Average @ 95%		0.6	1.8	2.5	0.9	1.5	0.4	3.4
Maximum		1.6	5.8	6.8	2.8	4.0	2.4	11.5
Days to complete 95% trading		0.8	3.7	2.9	1.6	1.8	0.4	6.3
Days to Trade - Relative to Parent Index **								
Weighted Average		0.8	2.8	1.2	1.5	1.2	0.5	3.6
95 percentile		2.5	4.9	2.2	2.4	3.3	0.5	9.8
Tail Average @ 95%		4.0	5.3	2.3	2.7	5.9	1.1	13.7
Maximum		7.5	6.4	2.5	3.2	10.3	6.9	20.4
Days to complete 95% trading		2.5	1.7	5.8	1.7	5.0	1.9	1.7
Days to Trade - Relative to Cash **								
Weighted Average		1.0	3.3	1.7	2.1	1.6	0.7	3.3
95 percentile		3.1	3.8	2.1	2.4	4.1	0.9	5.4
Tail Average @ 95%		4.7	4.9	2.7	3.0		1.5	9.3
Maximum		8.3	7.4	3.4	4.1	11.1	7.4	21.5
Days to complete 95% trading		3.0	5.6	2.9	3.5	5.7	1.5	11.1
Replication Costs								
Turnover*** (%)	2.7	28.6	36.6	80.8	30.9	23.8	16.9	22.0
Performance Drag in bps (at 25 bps)	1.4	14.3	18.3	40.4	15.4	11.9	8.5	11.0
Performance Drag in bps (at 50 bps)	2.7	28.6	36.6	80.8	30.9	23.8	16.9	22.0
Performance Drag in bps (at 75 bps)	4.1	43.0	54.8	121.2	46.3	35.7	25.4	32.9

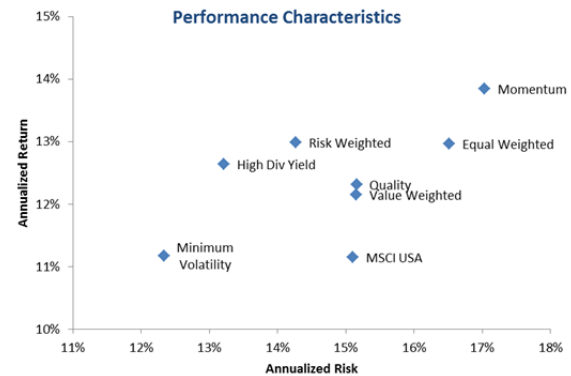
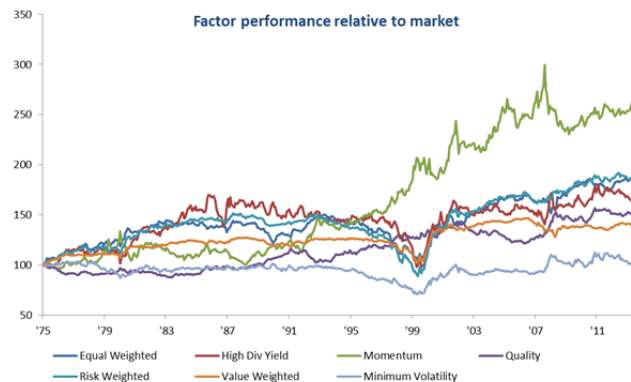
* Average of last four rebalancings ending Dec-2013

** As of 03-Mar-2014 rebalancing

*** Average annual one-way index turnover from 28-Nov-1975 to 31-Mar-2014

MSCI USA

For MSCI USA, almost all factor indexes outperformed their parent index from November 1975 to March 2014. The exception is the Minimum Volatility index, which performed similar to the parent index. On a risk-adjusted basis, Minimum Volatility outperformed its parent index with return/risk of 0.92 versus 0.75 for MSCI USA.



Performance Metrics	MSCI USA	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Total Return* (%)	11.3	13.1	13.0	14.0	12.5	13.2	12.4	11.4
Total Risk* (%)	15.1	16.5	13.2	17.0	15.2	14.3	15.2	12.3
Return/Risk	0.75	0.80	0.98	0.82	0.82	0.93	0.82	0.92
Active Return* (%)	0.0	1.8	1.5	2.7	1.2	1.8	1.0	0.0
Tracking error* (%)	0.0	4.9	8.2	7.4	3.7	5.3	3.4	5.2
Information Ratio	NA	0.37	0.18	0.36	0.32	0.35	0.30	0.01
Historical Beta	1.00	1.05	0.73	1.02	0.97	0.89	0.98	0.77
Turnover** (%)	2.8	23.0	31.9	84.8	25.7	19.6	15.9	21.1
Price to Book***	2.0	1.6	1.7	2.5	3.1	1.7	1.6	2.1
Price to Earnings***	14.1	14.2	11.0	15.3	14.2	13.2	13.1	13.7
Div. Yield*** (%)	3.0	2.8	5.0	2.4	2.6	3.4	3.5	3.6

* Annualized in USD from 28-Nov-1975 to 31-Mar-2014

** Average annual one-way index turnover from 28-Nov-1975 to 31-Mar-2014

*** Average value from 28-Nov-1975 to 31-Mar-2014

Risk Profile	MSCI USA	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Total Risk* (%)	15.1	16.5	13.2	17.0	15.2	14.3	15.2	12.3
Ann. Downside Deviation (%)	9.6	10.5	8.1	10.7	9.2	8.9	9.6	7.6
Sortino ratio	1.18	1.25	1.61	1.30	1.35	1.48	1.28	1.50
95 percentile Var (%)	-6.5	-6.5	-4.8	-6.8	-6.3	-5.3	-6.1	-4.7
99 percentile Var (%)	-10.1	-11.8	-10.9	-13.3	-10.1	-10.0	-12.1	-9.0
Expected Shortfall @ 95%	-9.5	-10.4	-8.3	-10.5	-9.0	-9.0	-9.8	-7.6
Expected Shortfall @ 99%	-14.8	-16.7	-12.6	-16.4	-13.8	-14.4	-15.4	-12.1
Max Drawdown (%)	50.6	53.3	50.1	51.7	40.5	48.7	55.9	41.0
Max Drawdown period (in months)	16	21	21	16	16	21	21	16
Skewness	-0.56	-0.63	-0.51	-0.50	-0.34	-0.69	-0.60	-0.55
Kurtosis	4.98	5.73	4.69	4.83	4.55	6.08	5.21	5.53
Relative Risk Metrics								
Tracking error* (%)		4.9	8.2	7.4	3.7	5.3	3.4	5.2
Max Drawdown of Active Returns (%)		31.3	47.6	24.7	15.7	43.5	21.1	37.9
Number of years of underperformance		17	16	15	17	14	18	21
Max consecutive years of underperformance		6	3	3	4	6	4	6

* Annualized in USD from 28-Nov-1975 to 31-Mar-2014

Performance *	MSCI USA	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
YTD	1.8%	3.0%	2.4%	0.7%	0.0%	3.2%	2.1%	2.1%
1 Yr	22.0%	24.0%	17.1%	21.1%	21.3%	19.6%	22.9%	12.8%
3 Yr **	14.7%	15.1%	16.0%	15.7%	16.6%	16.0%	15.2%	15.4%
5 Yr **	21.3%	25.4%	22.8%	21.4%	20.9%	23.5%	23.3%	20.0%
10 Yr **	7.6%	9.6%	8.6%	9.1%	9.1%	9.5%	7.6%	8.7%

* Gross Total Returns in USD for period ending 31-Mar-2014

** Annualized

Valuations	MSCI USA	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Price to Book	2.0	1.6	1.7	2.5	3.1	1.7	1.6	2.1
Price to Cash Earnings	8.3	7.6	6.5	9.5	9.9	7.4	6.8	7.9
Price to Earnings	14.1	14.2	11.0	15.3	14.2	13.2	13.1	13.7
Div. Yield (%)	3.0	2.8	5.0	2.4	2.6	3.4	3.5	3.6

Average values from 28-Nov-1975 to 31-Mar-2014

Concentration and Capacity	MSCI USA	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Concentration Metrics *								
Avg No of Stocks	400	399	81	95	125	400	401	119
Effective No of Stocks	97	395	32	42	44	291	100	66
Market Cap coverage (%)		99.9	25.1	29.9	47.6	100.0	100.0	63.8
Top 10 Sec wt (%)	25.0	3.1	46.5	40.3	39.6	8.1	24.4	27.5
Capacity of the Strategy (@ USD 1 bn) **								
Stock Ownership (% of Float Market Cap)								
Average		0.01%	0.00%	0.01%	0.00%	0.01%	0.01%	0.01%
95 percentile		0.04%	0.02%	0.03%	0.02%	0.04%	0.01%	0.05%
Tail Average @ 95%		0.04%	0.02%	0.04%	0.03%	0.05%	0.02%	0.09%
Maximum		0.11%	0.02%	0.05%	0.03%	0.09%	0.02%	0.12%
Stock Ownership (% of Full Market Cap)								
Average		0.01%	0.00%	0.01%	0.00%	0.01%	0.01%	0.01%
95 percentile		0.03%	0.02%	0.03%	0.02%	0.04%	0.01%	0.05%
Tail Average @ 95%		0.04%	0.02%	0.04%	0.03%	0.05%	0.02%	0.08%
Maximum		0.05%	0.02%	0.05%	0.03%	0.09%	0.02%	0.12%
Degree of Index Tilt *								
Active Share (%) **	0.0	44.6	65.6	77.9	69.4	44.1	21.5	65.8
Avg Weight Multiplier	1	3	9	4	2	3	1	4
Max Weight Multiplier	1	67	19	8	4	49	17	14
Max Strategy Weight (%)	4.9	0.4	6.5	5.0	5.0	1.1	5.0	7.3

* Average values from 28-Nov-1975 to 31-Mar-2014

** As of 03-Mar-2014 rebalancing

Liquidity and Tradability	MSCI USA	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Tradability of the Strategy (@ USD 1 bn / 10% of daily trading vol.)								
Weighted Average ATVR (%)		52.2	33.3	52.3	40.6	42.5	39.1	33.7
Days to Trade - Periodic Rebalancing *								
Weighted Average		0.2	0.9	1.7	1.3	0.3	0.2	1.6
95 percentile		0.3	0.2	1.9	0.5	0.4	0.2	0.6
Tail Average @ 95%		0.5	0.7	2.4	1.3	0.8	0.3	1.8
Maximum		1.4	2.0	4.2	2.6	3.3	0.7	5.3
Days to complete 95% trading		0.8	1.5	3.1	2.4	1.0	0.5	3.9
Days to Trade - Relative to Parent Index **								
Weighted Average		0.5	1.1	1.5	1.2	0.9	0.3	3.2
95 percentile		1.5	1.6	2.5	1.8	2.1	0.4	7.2
Tail Average @ 95%		1.9	1.7	2.8	2.2	3.6	0.6	11.8
Maximum		2.7	1.9	3.1	2.8	8.0	1.3	16.8
Days to complete 95% trading		1.4	3.7	2.7	2.1	0.3	3.6	2.0
Days to Trade - Relative to Cash **								
Weighted Average		0.7	1.6	1.9	1.6	1.2	0.6	3.1
95 percentile		1.9	1.7	2.2	1.8	2.6	0.8	3.8
Tail Average @ 95%		2.3	2.1	2.8	2.3	4.1	1.1	6.9
Maximum		3.2	2.9	3.7	3.8	8.9	2.0	17.7
Days to complete 95% trading		1.8	2.5	3.2	2.4	3.8	1.2	8.7
Replication Costs								
Turnover***(%)	2.8	23.0	31.9	84.8	25.7	19.6	15.9	21.1
Performance Drag in bps (at 25 bps)	1.4	11.5	15.9	42.4	12.8	9.8	8.0	10.5
Performance Drag in bps (at 50 bps)	2.8	23.0	31.9	84.8	25.7	19.6	15.9	21.1
Performance Drag in bps (at 75 bps)	4.2	34.5	47.8	127.3	38.5	29.4	23.9	31.6

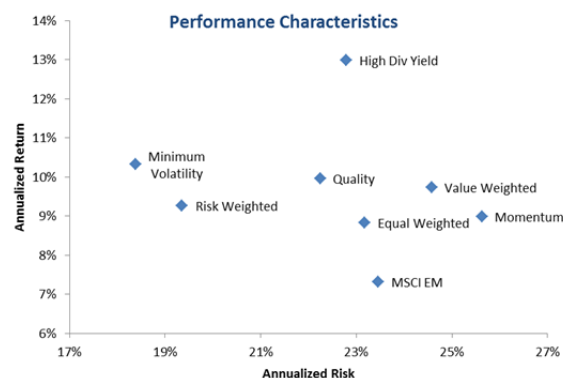
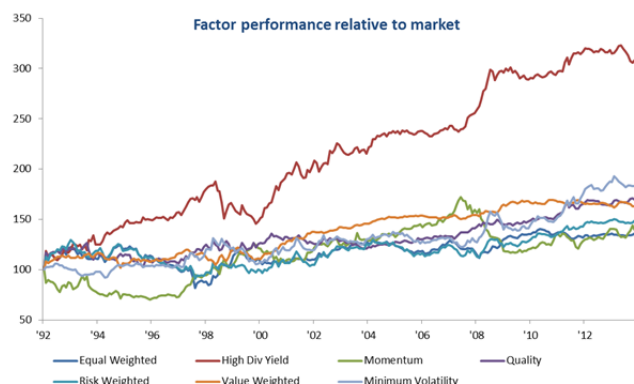
* Average of last four rebalancings ending Dec-2013

** As of 03-Mar-2014 rebalancing

*** Average annual one-way index turnover from 28-Nov-1975 to 31-Mar-2014

MSCI Emerging Markets

For Emerging Markets, all the factors outperformed the parent index, and most showed lower volatility as well. The High Dividend Yield index was the clear winner for the May 1992 to March 2014 period with strong and smooth outperformance of 5.7% annually relative to its parent index, MSCI Emerging Markets Index. Data for MSCI EM Factor Indexes starts from 29-May-1992.



Performance Metrics	MSCI EM	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Total Return* (%)	7.9	9.2	13.6	9.2	10.3	9.6	10.1	10.6
Total Risk* (%)	23.5	23.2	22.9	25.6	22.3	19.4	24.6	18.4
Return/Risk	0.34	0.40	0.60	0.36	0.46	0.49	0.41	0.57
Active Return* (%)	0.0	1.5	5.7	1.7	2.7	2.0	2.4	3.0
Tracking error* (%)	0.0	7.7	8.2	9.4	7.1	8.0	4.8	7.3
Information Ratio	NA	0.20	0.70	0.18	0.37	0.24	0.50	0.41
Historical Beta	1.00	0.93	0.91	1.02	0.91	0.78	1.03	0.76
Turnover** (%)	6.3	46.5	43.2	98.1	36.6	34.6	32.1	27.5
Price to Book***	1.8	1.2	1.6	2.4	3.2	1.4	1.2	1.8
Price to Earnings***	14.9	36.4	10.8	17.0	13.3	19.2	13.0	15.4
Div. Yield*** (%)	2.4	2.8	4.4	1.9	2.7	3.0	2.9	3.1

* Annualized in USD from 29-May-1992 to 31-Mar-2014

** Average annual one-way index turnover from 29-May-1992 to 31-Mar-2014

*** Average value from 29-May-1992 to 31-Mar-2014

Risk Profile	MSCI EM	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Total Risk* (%)	23.5	23.2	22.9	25.6	22.3	19.4	24.6	18.4
Ann. Downside Deviation (%)	16.3	15.6	15.2	17.9	15.2	13.2	16.5	12.4
Sortino ratio	0.49	0.59	0.90	0.51	0.68	0.73	0.61	0.85
95 percentile Var (%)	-10.2	-10.1	-9.7	-11.3	-10.5	-9.0	-10.4	-8.4
99 percentile Var (%)	-17.4	-17.4	-16.5	-21.5	-17.8	-14.9	-17.9	-14.0
Expected Shortfall @ 95%	-15.6	-15.2	-14.4	-17.3	-14.6	-12.9	-16.1	-12.1
Expected Shortfall @ 99%	-24.7	-22.6	-23.6	-25.6	-23.3	-20.1	-25.3	-19.7
Max Drawdown (%)	61.4	62.3	52.7	70.6	57.9	57.4	60.1	50.8
Max Drawdown period (in months)	16	46	16	16	16	46	13	16
Skewness	-0.67	-0.45	-0.68	-0.71	-0.67	-0.69	-0.55	-0.75
Kurtosis	5.01	4.68	5.02	4.29	4.87	4.97	5.04	5.29
Relative Risk Metrics								
Tracking error* (%)		7.7	8.2	9.4	7.1	8.0	4.8	7.3
Max Drawdown of Active Returns (%)		35.5	22.7	31.1	19.4	33.3	13.0	22.0
Number of years of underperformance		9	4	8	5	10	7	9
Max consecutive years of underperformance		3	2	2	2	3	3	3

* Annualized in USD from 29-May-1992 to 31-Mar-2014

Performance *	MSCI EM	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
YTD	-0.4%	1.2%	-2.1%	2.5%	1.0%	0.7%	-2.1%	-0.7%
1 Yr	-1.1%	-0.3%	-3.6%	1.2%	2.4%	-0.9%	-2.2%	-2.3%
3 Yr **	-2.5%	-2.3%	-1.1%	0.1%	1.5%	1.1%	-3.8%	4.7%
5 Yr **	14.8%	17.1%	15.7%	16.6%	18.1%	18.6%	15.3%	19.3%
10 Yr **	10.5%	11.4%	14.3%	11.3%	14.3%	12.8%	11.7%	14.7%

* Gross Total Returns in USD for period ending 31-Mar-2014

** Annualized

Valuations	MSCI EM	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Price to Book	1.8	1.2	1.6	2.4	3.2	1.4	1.2	1.8
Price to Cash Earnings	8.7	10.8	7.0	10.9	9.8	9.3	6.7	9.3
Price to Earnings	14.9	36.4	10.8	17.0	13.3	19.2	13.0	15.4
Div. Yield (%)	2.4	2.8	4.4	1.9	2.7	3.0	2.9	3.1

Average values from 29-May-1992 to 31-Mar-2014

Concentration and Capacity	MSCI EM	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Concentration Metrics *								
Avg No of Stocks	787	789	262	213	197	786	767	262
Effective No of Stocks	144	775	60	63	55	517	127	135
Market Cap coverage (%)		100.0	31.5	34.3	33.9	99.9	97.7	61.5
Top 10 Sec wt (%)	19.5	1.4	32.7	32.8	34.4	6.2	21.1	14.6
Capacity of the Strategy (@ USD 1 bn) **								
Stock Ownership (% of Float Market Cap)								
Average		0.07%	0.02%	0.03%	0.02%	0.06%	0.03%	0.04%
95 percentile		0.18%	0.10%	0.12%	0.10%	0.17%	0.06%	0.30%
Tail Average @ 95%		0.23%	0.10%	0.14%	0.11%	0.25%	0.08%	0.42%
Maximum		0.45%	0.11%	0.18%	0.12%	0.42%	0.16%	0.53%
Stock Ownership (% of Full Market Cap)								
Average		0.04%	0.01%	0.01%	0.01%	0.03%	0.01%	0.02%
95 percentile		0.09%	0.08%	0.07%	0.06%	0.09%	0.04%	0.13%
Tail Average @ 95%		0.12%	0.09%	0.09%	0.08%	0.12%	0.06%	0.24%
Maximum		0.22%	0.10%	0.16%	0.12%	0.29%	0.10%	0.47%
Degree of Index Tilt *								
Active Share (%) **	0.0	44.6	73.2	71.2	65.9	44.3	25.0	70.3
Avg Weight Multiplier	1	4	3	3	3	6	2	4
Max Weight Multiplier	1	183	3	6	5	116	25	19
Max Strategy Weight (%)	4.2	0.1	5.9	5.2	5.0	1.0	4.9	1.6

* Average values from 29-May-1992 to 31-Mar-2014

** As of 02 Dec 2013 rebalancing

Liquidity and Tradability	MSCI EM	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Tradability of the Strategy (@ USD 1 bn / 10% of daily trading vol.)								
Weighted Average ATVR (%)		125.2	94.9	93.6	81.0	102.1	110.4	79.9
Days to Trade - Periodic Rebalancing *								
Weighted Average		0.5	2.4	2.8	1.3	1.3	0.2	5.2
95 percentile		0.9	1.4	3.9	0.8	1.8	0.4	1.6
Tail Average @ 95%		1.5	3.2	6.2	2.0	3.7	0.7	5.9
Maximum		4.8	10.1	12.3	7.1	19.0	2.3	21.3
Days to complete 95% trading		1.7	4.9	7.3	2.9	4.0	0.7	14.5
Days to Trade - Relative to Parent Index **								
Weighted Average		1.7	2.4	2.7	2.4	2.6	0.7	8.5
95 percentile		6.0	6.0	6.0	5.1	7.0	1.3	21.1
Tail Average @ 95%		9.2	8.1	7.9	6.6	13.7	1.7	32.2
Maximum		27.7	11.4	10.3	10.5	55.9	2.7	61.5
Days to complete 95% trading		23.8	4.1	6.0	1.8	1.8	5.8	5.1
Days to Trade - Relative to Cash **								
Weighted Average		2.4	3.3	3.7	3.3	3.5	1.1	8.8
95 percentile		7.8	4.6	4.4	3.8	8.9	2.2	11.4
Tail Average @ 95%		11.5	6.8	7.4	6.0	16.5	3.0	21.6
Maximum		31.8	15.4	13.6	13.7	59.9	5.5	67.5
Days to complete 95% trading		7.8	6.7	8.2	6.4	11.4	3.0	24.8
Replication Costs								
Turnover*** (%)	6.3	46.5	43.2	98.1	36.6	34.6	32.1	27.5
Performance Drag in bps (at 25 bps)	3.1	23.3	21.6	49.0	18.3	17.3	16.0	13.7
Performance Drag in bps (at 50 bps)	6.3	46.5	43.2	98.1	36.6	34.6	32.1	27.5
Performance Drag in bps (at 75 bps)	9.4	69.8	64.8	147.1	55.0	51.9	48.1	41.2

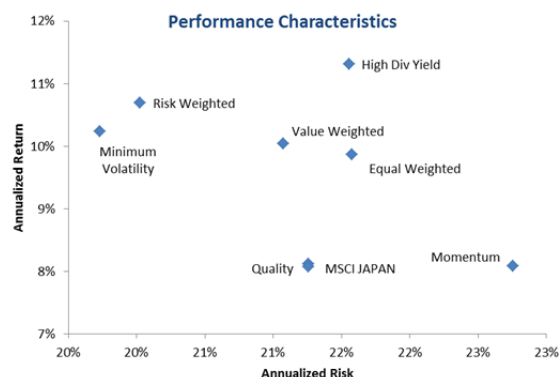
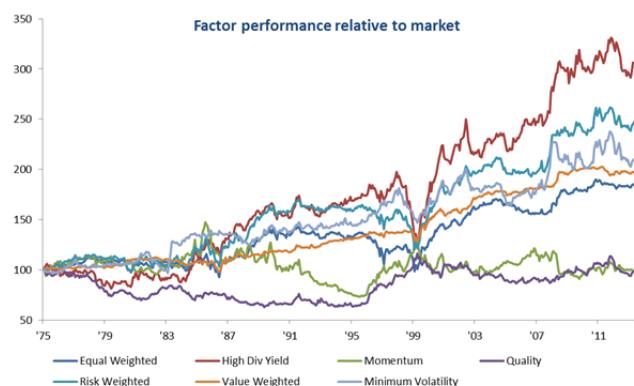
* Average of last four rebalancings ending Dec-2013

** As of 02-Dec-2012 rebalancing

*** Average annual one-way index turnover from 29-May-1992 to 31-Mar-2014

MSCI Japan

For Japan, Quality and Momentum indexes do not show any premium for the 40-year period of November 1975 to March 2014. Their performance relative to the parent index is flat. Similar to Emerging Markets, the High Dividend Yield index was the winning factor index for Japan.



Performance Metrics	MSCI JAPAN	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Total Return* (%)	8.2	9.9	11.4	8.1	8.1	10.8	10.1	10.3
Total Risk* (%)	21.3	21.6	21.6	22.8	21.3	20.0	21.1	19.7
Return/Risk	0.38	0.46	0.53	0.36	0.38	0.54	0.48	0.52
Active Return* (%)	0.0	1.8	3.2	0.0	0.0	2.6	1.9	2.1
Tracking error* (%)	0.0	6.9	9.7	9.8	7.1	7.3	3.7	6.7
Information Ratio	NA	0.26	0.33	0.00	-0.01	0.35	0.52	0.32
Historical Beta	1.00	0.96	0.91	0.97	0.94	0.88	0.98	0.88
Turnover** (%)	2.5	23.2	53.0	87.0	48.1	22.2	16.1	23.2
Price to Book***	1.9	1.7	1.5	2.2	2.5	1.6	1.6	1.9
Price to Earnings***	29.9	39.7	19.4	31.7	20.2	32.3	29.5	27.1
Div. Yield*** (%)	1.3	1.3	2.1	1.1	1.2	1.4	1.4	1.4

* Annualized in USD from 28-Nov-1975 to 31-Mar-2014

** Average annual one-way index turnover from 28-Nov-1975 to 31-Mar-2014

*** Average value from 28-Nov-1975 to 31-Mar-2014

Risk Profile	MSCI JAPAN	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Total Risk* (%)	21.3	21.6	21.6	22.8	21.3	20.0	21.1	19.7
Ann. Downside Deviation (%)	12.9	12.9	12.1	14.1	13.0	11.7	12.5	11.2
Sortino ratio	0.63	0.77	0.94	0.58	0.63	0.92	0.81	0.92
95 percentile Var (%)	-8.8	-9.0	-8.0	-9.2	-8.8	-8.0	-8.9	-7.4
99 percentile Var (%)	-13.2	-15.0	-14.2	-14.7	-13.2	-12.5	-12.4	-12.8
Expected Shortfall @ 95%	-11.6	-11.8	-10.9	-12.9	-11.7	-10.9	-11.3	-10.5
Expected Shortfall @ 99%	-16.1	-16.7	-16.7	-18.5	-16.0	-15.4	-15.1	-14.7
Max Drawdown (%)	61.1	57.7	46.9	66.3	61.3	52.4	50.4	44.9
Max Drawdown period (in months)	170	105	32	169	37	105	34	36
Skewness	0.27	0.34	0.55	0.26	0.29	0.36	0.27	0.60
Kurtosis	3.84	4.34	4.59	4.67	4.25	4.44	3.61	5.22
Relative Risk Metrics								
Tracking error* (%)		6.9	9.7	9.8	7.1	7.3	3.7	6.7
Max Drawdown of Active Returns (%)		31.4	38.5	52.5	40.1	32.0	14.8	20.1
Number of years of underperformance		15	13	21	20	17	9	16
Max consecutive years of underperformance		3	3	6	3	6	2	2

* Annualized in USD from 28-Nov-1975 to 31-Mar-2014

Performance *	MSCI JAPAN	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
YTD	-5.5%	-3.6%	-0.7%	-7.1%	-0.9%	-2.0%	-5.0%	-1.8%
1 Yr	7.8%	8.5%	4.0%	1.6%	5.7%	5.1%	8.4%	0.2%
3 Yr **	5.6%	6.2%	6.0%	5.3%	5.9%	6.6%	4.7%	6.9%
5 Yr **	10.5%	12.2%	11.2%	8.5%	11.6%	11.3%	11.3%	9.3%
10 Yr **	2.3%	3.6%	6.1%	1.9%	3.1%	4.6%	3.6%	4.1%

* Gross Total Returns in USD for period ending 31-Mar-2014

** Annualized

Valuations	MSCI JAPAN	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Price to Book	1.9	1.7	1.5	2.2	2.5	1.6	1.6	1.9
Price to Cash Earnings	8.8	10.2	7.4	10.5	11.3	9.5	7.6	8.4
Price to Earnings	29.9	39.7	19.4	31.7	20.2	32.3	29.5	27.1
Div. Yield (%)	1.3	1.3	2.1	1.1	1.2	1.4	1.4	1.4

Average values from 28-Nov-1975 to 31-Mar-2014

Concentration and Capacity	MSCI JAPAN	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Concentration Metrics *								
Avg No of Stocks	275	275	57	58	44	275	275	103
Effective No of Stocks	85	275	27	33	29	199	78	73
Market Cap coverage (%)		100.0	17.3	25.6	20.5	100.0	100.0	67.1
Top 10 Sec wt (%)	25.5	3.9	51.1	45.5	48.1	11.8	26.9	24.2
Capacity of the Strategy (@ USD 1 bn) **								
Stock Ownership (% of Float Market Cap)								
Average		0.09%	0.03%	0.03%	0.06%	0.09%	0.04%	0.05%
95 percentile		0.22%	0.22%	0.15%	0.41%	0.23%	0.08%	0.24%
Tail Average @ 95%		0.28%	0.23%	0.19%	0.47%	0.34%	0.10%	0.37%
Maximum		0.45%	0.23%	0.35%	0.56%	0.83%	0.17%	0.69%
Stock Ownership (% of Full Market Cap)								
Average		0.06%	0.03%	0.03%	0.04%	0.06%	0.03%	0.04%
95 percentile		0.14%	0.20%	0.13%	0.28%	0.16%	0.06%	0.17%
Tail Average @ 95%		0.15%	0.21%	0.16%	0.33%	0.22%	0.09%	0.23%
Maximum		0.17%	0.23%	0.22%	0.41%	0.41%	0.17%	0.35%
Degree of Index Tilt *								
Active Share (%) **	0.0	42.3	81.8	65.2	89.1	46.3	21.9	51.1
Avg Weight Multiplier	1	3	9	5	6	3	1	2
Max Weight Multiplier	1	16	14	9	9	20	5	10
Max Strategy Weight (%)	4.8	0.4	8.0	5.0	5.0	1.6	5.3	3.1

* Average values from 28-Nov-1975 to 31-Mar-2014

** As of 03-Mar-2014 rebalancing

Liquidity and Tradability	MSCI JAPAN	Equal Weighted	High Div Yield	Momentum	Quality	Risk Weighted	Value Weighted	Minimum Volatility
Tradability of the Strategy (@ USD 1 bn / 10% of daily trading vol.)								
Weighted Average ATVR (%)		185.5	141.2	180.3	190.5	147.5	169.2	137.7
Days to Trade - Periodic Rebalancing *								
Weighted Average		0.3	3.1	4.1	4.4	0.7	0.2	1.9
95 percentile		0.5	1.1	6.3	1.7	1.3	0.4	1.7
Tail Average @ 95%		0.8	3.4	9.3	5.2	2.0	0.6	4.0
Maximum		2.4	6.9	15.9	11.3	5.1	1.3	8.3
Days to complete 95% trading		0.9	5.1	9.5	8.7	2.0	0.5	6.2
Days to Trade - Relative to Parent Index **								
Weighted Average		1.2	3.6	1.0	6.2	2.3	0.6	3.1
95 percentile		4.3	6.1	2.4	12.1	6.1	1.1	7.4
Tail Average @ 95%		5.8	6.5	2.6	16.7	9.7	1.6	11.9
Maximum		9.1	6.6	2.7	18.9	31.2	2.9	25.8
Days to complete 95% trading		1.6	1.7	4.6	1.7	1.7	1.7	1.7
Days to Trade - Relative to Cash **								
Weighted Average		1.8	4.3	1.5	6.9	3.1	1.1	3.5
95 percentile		5.8	5.0	2.5	8.0	7.8	2.4	6.2
Tail Average @ 95%		7.7	6.2	3.2	11.6	11.3	3.1	10.2
Maximum		11.3	7.9	4.2	20.7	32.6	5.0	27.3
Days to complete 95% trading		5.1	6.4	3.1	12.1	9.0	2.4	8.4
Replication Costs								
Turnover***(%)	2.5	23.2	53.0	87.0	48.1	22.2	16.1	23.2
Performance Drag in bps (at 25 bps)	1.2	11.6	26.5	43.5	24.1	11.1	8.0	11.6
Performance Drag in bps (at 50 bps)	2.5	23.2	53.0	87.0	48.1	22.2	16.1	23.2
Performance Drag in bps (at 75 bps)	3.7	34.9	79.6	130.5	72.2	33.4	24.1	34.8

* Average of last four rebalancings ending Dec-2013

** As of 03-Mar-2014 rebalancing

*** Average annual one-way index turnover from 28-Nov-1975 to 31-Mar-2014

Appendix B: Methodology

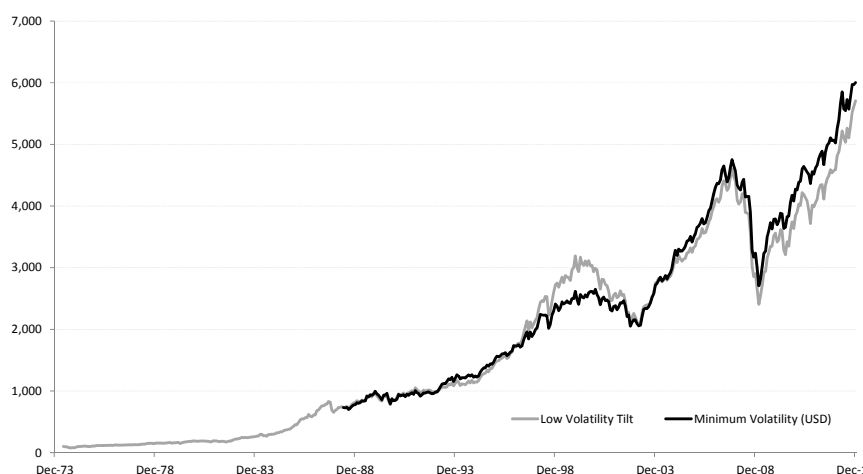
Extensions to the Historical Data of the MSCI Factor Indexes:

	MSCI Factor Index	MSCI Region / Country	History Index Level Start Date
1	MSCI Risk Weighted Index	World, EAFE, Europe, Pacific ex Japan, Kokusai (World ex Japan), Japan	31-May-1973
		USA, North America	29-Nov-1974
		Emerging Markets, ACWI, AC Asia ex Japan	31-May-1991
2	MSCI Equal Weighted Index	World, EAFE, Europe, Pacific ex Japan, Kokusai (World ex Japan), Japan	31-May-1973
		USA, North America	29-Nov-1974
		Emerging Markets, ACWI, AC Asia ex Japan	31-May-1991
3	MSCI Value Weighted Index	World, EAFE, Europe, Pacific ex Japan, Kokusai (World ex Japan), Japan	31-May-1973
		USA, North America	29-Nov-1974
		Emerging Markets, ACWI, AC Asia ex Japan	31-May-1991
4	MSCI Minimum Volatility Index	World, EAFE, Europe, Pacific ex Japan, Kokusai (World ex Japan), Japan, USA, North America	31-May-1988
		Emerging Markets, ACWI, AC Asia ex Japan	31-May-1993
5	MSCI Quality Index	World, EAFE, Europe, Kokusai (World ex Japan), Japan, USA	28-Nov-1975
		Emerging Markets, ACWI, AC Asia ex Japan	29-May-1992
6	MSCI Momentum Index	World, EAFE, Europe, Pacific ex Japan, Kokusai (World ex Japan), Japan	31-May-1973
		USA, North America	29-Nov-1974
		Emerging Markets, ACWI, AC Asia ex Japan	31-May-1991
7	MSCI High Dividend Yield Index	World, EAFE, Europe, Kokusai (World ex Japan), Japan, USA	28-Nov-1975
		Emerging Markets, ACWI, AC Asia ex Japan	29-May-1992

Simulation of Low Volatility Index data prior to 1988

For the MSCI Minimum Volatility (USD) Index, MSCI has official data available publicly from the end of May 1988, which is when data begins for the Barra risk model used to optimize the index. For the purposes of our study, we have simulated a proxy for the MSCI Minimum Volatility Indexes for the World region prior to 31 May 1988. The simulated proxy selects the top 300 stocks by lowest three-year weekly variance from the MSCI World Index, constructs a "score" which is the inverse of this variance, and then weights stocks in proportion to this score \times market capitalization. The exhibit below compares the performance of our simulated Low Volatility Tilt Index with the official MSCI Minimum Volatility (USD) Index on the MSCI World universe. The historical tracking error between the two is 4.40%.¹

Historical Performance of MSCI World Minimum Volatility (USD) Index and simulated World Low Volatility Tilt



¹ A similar approach was implemented for other regions.

Appendix C: Definitions of Metrics in the Report

Total Return

Total Return (r) is a measure of gain or loss on the index. Annualized total return is calculated as:

$$r = \left(\frac{P_{\text{end}}}{P_{\text{start}}} \right)^{\left(\frac{365}{T} \right)} - 1$$

where P_{end} = price at end date, P_{start} = price at start date, and T = number of calendar days between the end date and start date.

Total Risk

Total Risk (σ , also called Volatility) is a measure of index return dispersion. Annualized volatility is computed as the standard deviation ($stdev$) of monthly index Total Returns:

$$\sigma = stdev(r_1, r_2, \dots, r_t) \times \sqrt{12}$$

where (r_1, r_2, \dots, r_t) is the set of observed monthly Index Total Returns.

Return/Risk

Return/Risk is the index return per unit of index risk and computed as the ratio of Total Return to Total Risk:

$$\text{Return_to_Risk} = \frac{r}{\sigma}$$

Sharpe Ratio

The Sharpe Ratio is computed as the average index Excess Return per unit of index risk where Excess Return is the average monthly difference between the Index Total Return and the risk-free rate, annualized over the period:

$$\text{Excess_Return}_i = \left(\frac{P_{i+1}}{P_i} - 1 \right) - r_{\text{risk-free}}$$

$$\text{Mean_Excess_Return} = \frac{1}{T} \sum_{i=1}^T \text{Excess_Return}_i \times 12$$

$$\text{Sharpe_Ratio} = \frac{\text{Mean_Excess_Return}}{\sigma_{\text{Excess_Return}}}$$

and $r_{\text{risk-free}}$ is the 1-month LIBOR rate at the start of the period in the Factor index's currency of calculation.

Active Return

Active return is the Total Return of a factor index relative to its parent:

$$ra = r_{\text{Factor_Index}} - r_{\text{Parent}}$$

Tracking Error:

Tracking Error (*TE*, also called Active Risk) measures the dispersion of Active Returns between a factor index and its parent.

TE is calculated as the annualized standard deviation of Active Returns:

$$TE = \text{stdev}(ra_1, ra_2, \dots, ra_t) \times$$

Where $(ra_1, ra_2, \dots, ra_t)$ are monthly active returns (i.e., factor index return minus parent Index return)

Information Ratio

Information Ratio (*IR*) measures Return/Risk in Active space. It is calculated as the ratio of Active Return to Tracking Error (Active Risk):

$$IR = \text{Active Return} / \text{Tracking Error}$$

Correlation

Correlation (ρ) is a measure of the degree of co-movement between a factor index its parent:

$$\rho = \frac{\text{Covariance}(\text{Factor Index, Parent})}{\sigma_{\text{Factor_Index}} \times \sigma_{\text{Parent}}}$$

Historical Beta

Beta (β) is a measure of the level of co-movement between a factor index and its parent:

$$\beta = \rho * \frac{\sigma_{\text{Factor_Index}}}{\sigma_{\text{Parent}}}$$

Turnover

Turnover measures the percentage change in the composition of an index at each index rebalancing. Two-way turnover aggregates both buy/weight increases and sell/weight decreases. One-way turnover is one half of two-way turnover:

$$\text{One-way_turnover} = \frac{1}{2} \sum_{i=1}^N |w_{\text{proforma},i} - w_{\text{current},i}|$$

$w_{\text{proforma},i}$ = weight of security *i* in the proforma Index

$w_{\text{current},i}$ = weight of security *i* in the current Index

Downside Deviation

Downside Deviation is computed as the annualized standard deviation of negative monthly Total Returns. It is a measure of the risk of losses. Annualized Downside Deviation is calculated as:

$$\sigma_{\text{Downside}} = \text{stdev}(r_1, r_2, \dots, r_t) \times \sqrt{12}, \forall r_i < 0,$$

For all monthly Total Returns which are less than zero.

Sortino Ratio

In a similar fashion to the Sharpe Ratio, the Sortino Ratio is computed as the average Excess Return (above a specified Minimum Acceptable Return, MAR) per unit of Total Downside Risk:

$$\text{Excess_Return}_i = \left(\frac{P_{i+1}}{P_i} - 1 \right) - \text{MAR}$$

$$\text{Mean_Excess_Return} = \frac{1}{t} \sum_{i=1}^t \text{Excess_Return}_i \times 12$$

$$\text{Sortino_Ratio} = \frac{\text{Mean_Excess_Return}}{\sigma_{\text{Downside}}}$$

and MAR is 0.

Value at Risk (VaR)

For a given time horizon and confidence interval, Value at Risk (VaR) measures the *highest* index left tail return with that confidence and over that time horizon. Historical VaR computes this left tail return measure using historical observations.

Thus, if the historical VaR of an Index is 1% at a one month, 95% confidence level, historically the Index has fallen 1% or more over a given month on more than 5% of occasions.

Expected Shortfall

For a given time horizon and confidence interval, Expected Shortfall (also called Conditional Value at Risk or CVaR) measures the *expected* index left tail return with that confidence and over that time horizon. Historical CVaR computes this left tail return measure using historical observations.

Thus, if the historical CVaR of an Index is 2.5% at a one month, 95% confidence level, then historically the Index has averaged losses of 2.5% in the 5% of its lowest return months.

Maximum Drawdown

Maximum drawdown (MD) is the maximum percentage drop in Total Return over the period of analysis.

Maximum Drawdown period

Maximum Drawdown period is the number of months over which the Maximum Drawdown occurred.

Skewness

Skewness is the third central moment of the Index's gross monthly Total Return distribution and measures the degree of asymmetry of this Return distribution: A negative number means that the left tail of returns (relative to the Mean) is longer than the right tail of returns.

Kurtosis

Kurtosis is the fourth central moment of the Index's Total Return distribution and measures the peakedness of the return distribution: A positive number means that the tails of the distribution are fatter than the tails of a normal distribution.

Effective Number of Stocks

Effective number of stocks (EN) is a measure of Index concentration and ranges between 1 (for a single stock) and the number of stocks in the Index (for an equal-weighted index). Generally, the lower the EN , the more concentrated an Index:

$$EN = \frac{1}{\sum_{i=1}^N w_i^2}$$

Where the w_i are the weights of the N stocks in the Index.

Market Cap Coverage

Market Cap Coverage measures the total Free Float Market Capitalization, in the parent index, of stocks which are constituents of the factor index:

$$\text{Market_Cap_Coverage} = \frac{\sum_{i \in \text{factor_index}} \text{FF_Market_Cap}_i}{\text{Parent_FF_Market_Cap}}$$

Where the FF_Market_Cap_i are summed over all the parent index constituents which are members of the factor index, and $\text{Parent_FF_Market_Cap}$ is the total Free-Float Market Capitalization of the parent index.

Top 10 Security Weight

Top 10 Security Weight is a measure of portfolio concentration and calculated as the cumulative weight of the 10 highest weight securities in the index:

$$\text{Top_10_Security_Weight} = \sum_{i=1}^{10} w_i$$

where w_i = security weight in the index, ordered from highest weight (w_1) to lowest.

Capacity/Stock ownership

Capacity measures the proportion of the Free-Float/Full Market Capitalization of a stock held in a fund perfectly replicating an index, relative to the Free-Float/Full Market Capitalization of the stock in the index, assuming a certain Fund size (AUM):

$$\text{Capacity}_i = \frac{w_i \times \text{AUM}}{\text{Market_Cap}_i}$$

Active Share

Active Share measures the degree of Active tilt of the factor index. Mathematically, it is the one-way turnover that will be incurred in shifting from the parent to the factor index:

$$\text{Active_Share} = \frac{1}{2} \sum_{i=1}^N |w_{\text{Factor_Index}_i} - w_{\text{Parent_Index}_i}|$$

Where the i run over the N stocks in the Parent index and $w_{\text{Factor_Index}_i}$ is the weight of stock i in the Factor index and $w_{\text{Parent_Index}_i}$ is the weight of the same stock in the parent Index.

Weight Multiplier

Weight Multiplier (WM) is the ratio of the weight of a security in the factor index to its weight in the parent:

$$WM_i = \frac{w_{\text{Factor_Index}_i}}{w_{\text{Parent_Index}_i}}$$

Where $w_{\text{Factor_Index}_i}$ is the weight of stock i in the factor index and $w_{\text{Parent_Index}_i}$ is the weight of the same stock in the parent Index.

Weighted Average ATVR

ATVR (Annual Traded Value Ratio) provides a measure of trading volume in a security as a proportion of market capitalization (for more details, please refer to the [MSCI Global Investable Market Indices Methodology](#)). The weighted average ATVR then measures this liquidity at the Index level:

$$\text{Weighted_Average_ATVR} = \sum_i w_{\text{Factor_Index}_i} \times \text{ATVR}_i$$

Where $w_{\text{Factor_Index}_i}$ is the weight of stock i in the Factor index and ATVR_i is its ATVR.

Days to Trade

Days to Trade is the number of days required to trade a change in a stock position given its average trading volume:

$$\text{Days_to_Trade}_i = \frac{w_{\text{Factor_Index}_i} \times \text{AUM}}{\text{ATV}_i \times \text{Limit}}$$

Where $w_{\text{Factor_Index}_i}$ is the weight of stock i in the Factor index and ATV_i is its Average Traded Value, AUM is the size of the position (e.g. US\$ 10bn) and Limit is a cap on the percentage of Average Traded Value (here 20%) that can be traded in a given day.

Performance drag

Performance Drag is computed as the total transaction cost incurred as a result of tracking the index assuming linear, proportional, transaction costs:

$$\text{Performance_Drag} = 2 \times \text{One-way_Turnover} \times \text{Assumed_Transaction_Cost}$$

Where Assumed_Transaction_Cost is expressed as a constant (assumed linear in trade size) proportion of the size of the trade.

Separate Factor Index vs. Multi-Factor Index Turnover

In the 'Combination Effects' section of the IndexMetrics output we highlight the potential cost-effectiveness in terms of turnover reduction of combining multiple Factor Indices into a single Multi-Factor index. For this calculation, the Turnover of separate mandates is calculated as:

$$\sum_i \omega_{current,i} \times turnover_i + \frac{\sum_i |\omega_{current,i} - \omega_{proforma,i}|}{2}$$

Where the sum is taken over component strategy weights.

Client Service Information is Available 24 Hours a Day

clientservice@msci.com

Americas

Americas	1.888.588.4567 (toll free)
Atlanta	+ 1.404.551.3212
Boston	+ 1.617.532.0920
Chicago	+ 1.312.675.0545
Monterrey	+ 52.81.1253.4020
New York	+ 1.212.804.3901
San Francisco	+ 1.415.836.8800
Sao Paulo	+ 55.11.3706.1360
Toronto	+ 1.416.628.1007

Europe, Middle East & Africa

Cape Town	+ 27.21.673.0100
Frankfurt	+ 49.69.133.859.00
Geneva	+ 41.22.817.9777
London	+ 44.20.7618.2222
Milan	+ 39.02.5849.0415
Paris	0800.91.59.17 (toll free)

Asia Pacific

China North	10800.852.1032 (toll free)
China South	10800.152.1032 (toll free)
Hong Kong	+ 852.2844.9333
Seoul	00798.8521.3392 (toll free)
Singapore	800.852.3749 (toll free)
Sydney	+ 61.2.9033.9333
Taipei	008.0112.7513 (toll free)
Tokyo	+ 81.3.5290.1555

Notice and Disclaimer

- This document and all of the information contained in it, including without limitation all text, data, graphs, charts (collectively, the "Information") is the property of MSCI Inc. or its subsidiaries (collectively, "MSCI"), or MSCI's licensors, direct or indirect suppliers or any third party involved in making or compiling any Information (collectively, with MSCI, the "Information Providers") and is provided for informational purposes only. The Information may not be modified, reverse-engineered, reproduced or disseminated in whole or in part without prior written permission from MSCI.
- The Information may not be used to create derivative works or to verify or correct other data or information. For example (but without limitation), the Information may not be used to create indexes, databases, risk models, analytics, software, or in connection with the issuing, offering, sponsoring, managing or marketing of any securities, portfolios, financial products or other investment vehicles utilizing or based on, linked to, tracking or otherwise derived from the Information or any other MSCI data, information, products or services.
- The user of the Information assumes the entire risk of any use it may make or permit to be made of the Information. NONE OF THE INFORMATION PROVIDERS MAKES ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION (OR THE RESULTS TO BE OBTAINED BY THE USE THEREOF), AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EACH INFORMATION PROVIDER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF ORIGINALITY, ACCURACY, TIMELINESS, NON-INFRINGEMENT, COMPLETENESS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY OF THE INFORMATION.
- Without limiting any of the foregoing and to the maximum extent permitted by applicable law, in no event shall any Information Provider have any liability regarding any of the Information for any direct, indirect, special, punitive, consequential (including lost profits) or any other damages even if notified of the possibility of such damages. The foregoing shall not exclude or limit any liability that may not by applicable law be excluded or limited, including without limitation (as applicable), any liability for death or personal injury to the extent that such injury results from the negligence or willful default of itself, its servants, agents or sub-contractors.
- Information containing any historical information, data or analysis should not be taken as an indication or guarantee of any future performance, analysis, forecast or prediction. Past performance does not guarantee future results.
- The Information should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. All Information is impersonal and not tailored to the needs of any person, entity or group of persons.
- None of the Information constitutes an offer to sell (or a solicitation of an offer to buy), any security, financial product or other investment vehicle or any trading strategy.
- It is not possible to invest directly in an index. Exposure to an asset class or trading strategy or other category represented by an index is only available through third party investable instruments (if any) based on that index. MSCI does not issue, sponsor, endorse, market, offer, review or otherwise express any opinion regarding any fund, ETF, derivative or other security, investment, financial product or trading strategy that is based on, linked to or seeks to provide an investment return related to the performance of any MSCI index (collectively, "Index Linked Investments"). MSCI makes no assurance that any Index Linked Investments will accurately track index performance or provide positive investment returns. MSCI Inc. is not an investment adviser or fiduciary and MSCI makes no representation regarding the advisability of investing in any Index Linked Investments.
- Index returns do not represent the results of actual trading of investible assets/securities. MSCI maintains and calculates indexes, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the index or Index Linked Investments. The imposition of these fees and charges would cause the performance of an Index Linked Investment to be different than the MSCI index performance.
- The Information may contain back tested data. Back-tested performance is not actual performance, but is hypothetical. There are frequently material differences between back tested performance results and actual results subsequently achieved by any investment strategy.
- Constituents of MSCI equity indexes are listed companies, which are included in or excluded from the indexes according to the application of the relevant index methodologies. Accordingly, constituents in MSCI equity indexes may include MSCI Inc., clients of MSCI or suppliers to MSCI. Inclusion of a security within an MSCI index is not a recommendation by MSCI to buy, sell, or hold such security, nor is it considered to be investment advice.
- Data and information produced by various affiliates of MSCI Inc., including MSCI ESG Research Inc. and Barra LLC, may be used in calculating certain MSCI equity indexes. More information can be found in the relevant standard equity index methodologies on www.msci.com.
- MSCI receives compensation in connection with licensing its indexes to third parties. MSCI Inc.'s revenue includes fees based on assets in investment products linked to MSCI equity indexes. Information can be found in MSCI's company filings on the Investor Relations section of www.msci.com.
- MSCI ESG Research Inc. is a Registered Investment Adviser under the Investment Advisers Act of 1940 and a subsidiary of MSCI Inc. Except with respect to any applicable products or services from MSCI ESG Research, neither MSCI nor any of its products or services recommends, endorses, approves or otherwise expresses any opinion regarding any issuer, securities, financial products or instruments or trading strategies and neither MSCI nor any of its products or services is intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such. Issuers mentioned or included in any MSCI ESG Research materials may include MSCI Inc., clients of MSCI or suppliers to MSCI, and may also purchase research or other products or services from MSCI ESG Research. MSCI ESG Research materials, including materials utilized in any MSCI ESG Indexes or other products, have not been submitted to, nor received approval from, the United States Securities and Exchange Commission or any other regulatory body.
- Any use of or access to products, services or information of MSCI requires a license from MSCI. MSCI, Barra, RiskMetrics, IPD, FEA, InvestorForce, and other MSCI brands and product names are the trademarks, service marks, or registered trademarks of MSCI or its subsidiaries in the United States and other jurisdictions. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and Standard & Poor's. "Global Industry Classification Standard (GICS)" is a service mark of MSCI and Standard & Poor's.

About MSCI

MSCI Inc. is a leading provider of investment decision support tools to investors globally, including asset managers, banks, hedge funds and pension funds. MSCI products and services include indexes, portfolio risk and performance analytics, and ESG data and research.

The company's flagship product offerings are: the MSCI indexes with over USD 9 trillion estimated to be benchmarked to them on a worldwide basis¹; Barra multi-asset class factor models, portfolio risk and performance analytics; RiskMetrics multi-asset class market and credit risk analytics; IPD real estate information, indexes and analytics; MSCI ESG (environmental, social and governance) Research screening, analysis and ratings; and FEA valuation models and risk management software for the energy and commodities markets. MSCI is headquartered in New York, with research and commercial offices around the world.

¹As of March 31, 2014, as reported on June 25, 2014, by eVestment, Lipper and Bloomberg