

Ibbotson Style Indices:
A Comprehensive Set of Growth and Value Data

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Abstract

Basic diversification looks at the portfolio mix between stocks and bonds, domestic and international, and even large versus small allocations. These are all indeed important factors to consider when constructing a portfolio. Not until recently, however, have investors taken notice of the role that style (growth vs. value) plays in the risk and return characteristics of equities. Unfortunately, the current landscape of data sets that cover growth and value indices have scattered coverage and methodologies along with short histories. Ibbotson Associates, with the help of the Center for Research in Security Prices (CRSP[®]), has created a set of style indices going back to 1969 that are both comprehensive and mutually exclusive. This paper discusses the construction methodology of these indices, presents an analysis of the results, and provides samples of raw data.

Note from the Author

This paper is now in its 6th draft, and those of you who have read previous versions will notice a substantial difference in results. The Center for Research in Security Prices (CRSP) at the University of Chicago is the primary source of data and analytics for the Ibbotson style indices. Recently, CRSP has made major revisions to the underlying data in our growth/value study. These changes dramatically improve the quality of the results. All data presented in this 6th draft include the revisions that CRSP has made to the underlying data.

Index Construction

Ibbotson Associates developed methodology to construct a comprehensive set of style indices, and then contracted CRSP to fill in the back history of asset class returns. The first step in the project was to determine how to define and divide the universe of publicly traded equities into size and then style. The screening process starts each period by trimming the CRSP database of NYSE, AMEX, and NASDAQ National Market securities to eliminate American Depository Receipts, Unit Investment Trusts, Closed-End Funds, Real Estate Investment Trusts, American Trusts, and foreign-incorporated securities.

Four portfolios were formed based on size at the end of June of each year by sorting the NYSE universe by June-end market capitalization into large-cap, mid-cap, small-cap, and micro-cap size groupings. The breakpoints for these size portfolios were defined by selecting the top 20 percent (deciles 1-2) by number of companies for large-cap, the next 30 percent (deciles 3-5) for mid-cap, the next 30 percent (deciles 6-8) for small-cap, and the smallest 20 percent (deciles 9-10) for micro-cap.

The next step in assigning companies to their respective size-based portfolios is to make sure they have all the necessary data. To do that, we need to calculate the book-to-price ratios for each eligible company. For book-to-price ratios, we used the S&P Compustat[®] measure of

common equity for the last fiscal year ended by December 31 of the previous year and divided that by market capitalization at the end of December of the previous year. All companies that had valid book-to-price ratios were assigned to size portfolios based on their June-end market capitalization and the breakpoints described earlier.

With a comprehensive set of size portfolios constructed, the next step was to divide them into style classifications. We ranked the companies in each of the four size portfolios by book-to-price, and created a growth (low B/P) and value (high B/P) portfolio within each size grouping where the total market capitalization of the growth and value indices are equal within each portfolio. Of course, this leads to an unequal number of companies in each portfolio, but market coverage is approximately the same.

Once the large-, mid-, small-, and micro-cap growth and value portfolios were constructed, the last step was to create asset class returns. Portfolios were formed at June-end of each year, and value-weighted monthly returns were calculated from July to the following June. Lagged market values were used so that the returns for each month are weighted by the market values of the previous month-end. A security was included in the portfolio for a month if:

- It is eligible for the index at the end of the previous month
- It has a valid capitalization at the end of the previous month
- It has a valid return at the end of the current month. If a security delists during the month, a delisting return is used. If insufficient information exists to assign a value after delisting, a partial-month delisting return based on the last daily price is used.
- It was assigned to this portfolio during the last rebalancing period. (Note that companies starting after December of the previous year will not be included until June of the next year.)

For each asset class, the following data sets were created:

- Monthly total returns
- Monthly income returns
- Monthly price returns
- Monthly market values
- Monthly number of companies
- Annual book-to-price breakpoints
- Annual size breakpoints

Using the resulting data sets, we determined that 1969 was the most appropriate starting date for asset class analysis. The Ibbotson style indices were actually created going back further, but 1969 was the year in which all of the series, except micro-cap, covered at least 70 percent of the available market. While Ibbotson Associates has created a comprehensive set of style indices, we determined that the micro-cap series would not be presented in any of Ibbotson's publications, presentation materials, or software going forward. The quality of the micro-cap data may not be as good as that of the small-, mid-, and large-cap series. As can be seen in Appendix A, the percentage of market coverage for the micro-cap series gets quite low at times and dips significantly in the 1980s and 1990s. Complete market coverage analysis is included in Appendix A.

In addition to the size-based portfolios, an all-capitalization index called "IA All Value" was created using the lagged market capitalization-weighted returns of the large-, mid-, and small-cap value series. The same procedure was used to create an "IA All Growth" series from the three growth asset classes. Note that the micro-cap data was not used in the creation of the All Growth and All Value series due to the concerns over quality expressed above. The micro-cap data is still

very useful and has been presented throughout this paper for research purposes. In total, ten asset classes going back to 1969 were created using the new Ibbotson methodology. This is the first set of comprehensive and mutually exclusive U.S. style indices with a significant range of historical data. This contribution should greatly enhance the body of knowledge on growth and value investing.

Analysis

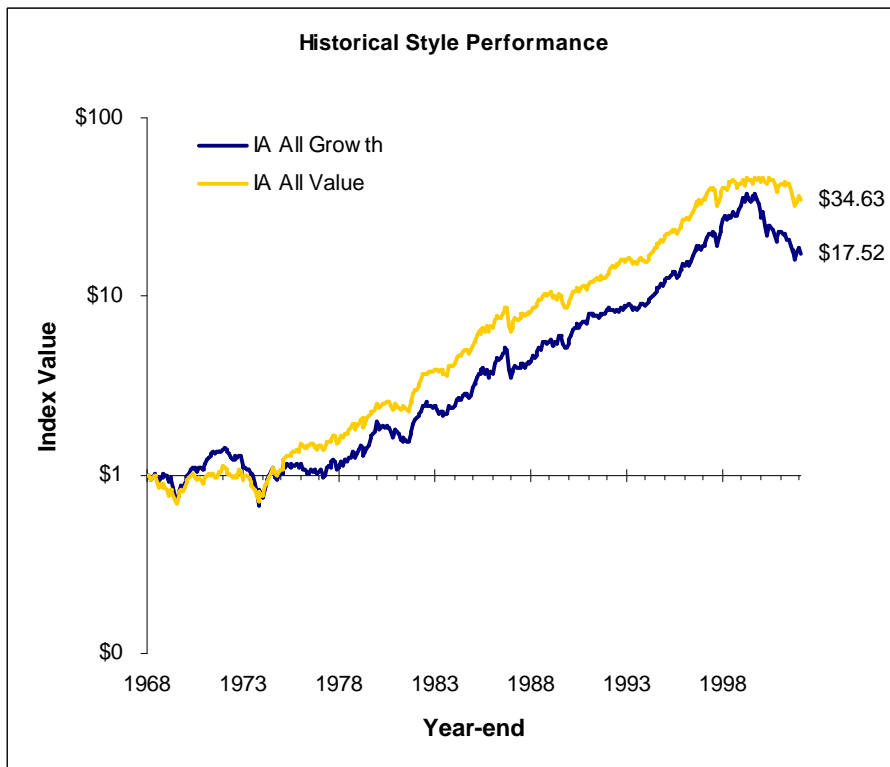
While this paper is not intended to provide a comprehensive analysis of the style indices created by Ibbotson Associates, we have delved into some of the results and uncovered a few interesting stories among the data. Appendix B and Appendix C display the size and style breakpoints for each of the portfolios, while Appendix D shows the number of companies included in each index. Appendix E compares the performance of the Ibbotson style indices with that of other major vendors like S&P/Barra, Russell, etc.

To start, let's look at the overall performance of value and growth stocks rolled up into aggregate style indices. Ibbotson's 2000 through 2003 *Stocks, Bonds, Bills, and Inflation*[®] *Yearbooks* present Fama and French style data going back to 1928. While the data presented there only includes large and small style indices, we can still conclude from the all growth and all value series that over the long term value stocks have well outperformed growth stocks. This pattern holds true with the Ibbotson data, as can be seen in Graph 1. An investment of \$1 in value stocks at year-end 1968 would have returned \$34.63 by the end of December 2002, a compound return of 11.0 percent. The same investment in growth stocks would have returned \$17.52 to the investor, a compound return of 8.8 percent. This outperformance of value stocks over growth stocks prevails throughout much of the analysis.

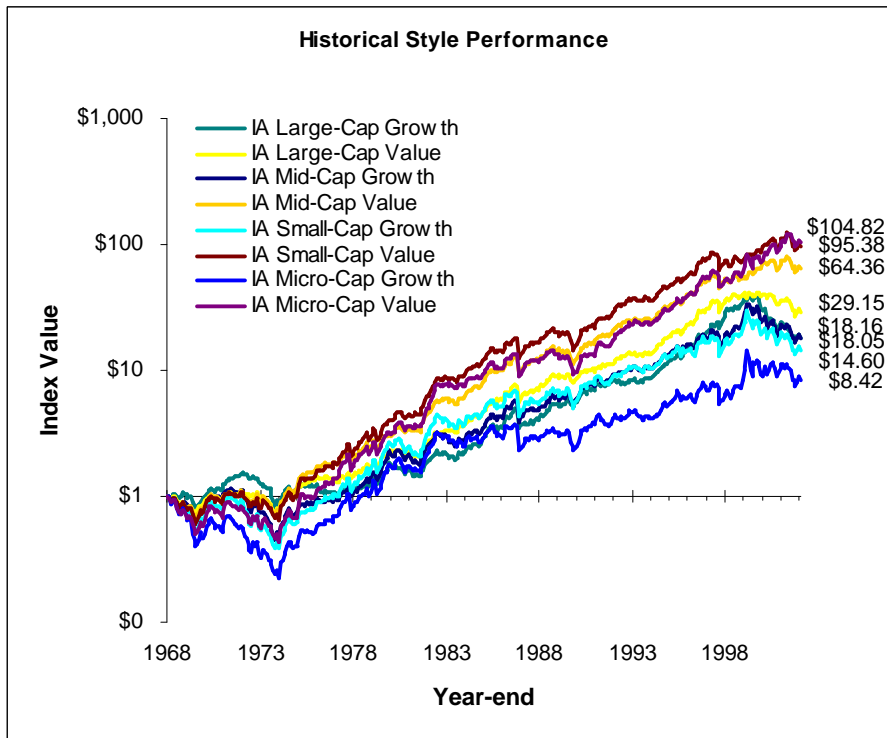
While it was somewhat expected that the value index would outperform the growth index over a long time frame, a closer look at value and growth between the four size portfolios yields

some interesting information. For example, the best four performers from 1969 through December 2002 were micro-cap value, small-cap value, mid-cap value, and large-cap value. Large-cap growth was the best-performing growth series, followed in order of performance by mid-cap growth, small-cap growth, and micro-cap growth. Over time, a consistent pattern of value outperforming growth emerges within each of the size groupings. One of the biggest surprises of the analysis, however, is the poor performance of micro-cap growth over time.

Graph 1: Historical Style Performance—All Growth and All Value 1/69–12/02



Graph 2: Historical Style Performance—Eight Style Indices 1/69–12/02



As seen in Graph 2, micro-cap growth is the worst-performing asset class. In fact, the four growth indices are the worst performers of the eight presented, with micro-cap and small-cap at the bottom. The poor performance of growth stocks, especially small company growth stocks, bears further analysis. One possible explanation for the poor performance of the Ibbotson smaller growth indices is simply a lack of data in the early years of the analysis. Appendix A shows that market coverage of the micro-cap indices wavers greatly through the 1980s and 1990s. This inconsistency is part of the reason Ibbotson does not feel as comfortable presenting data on the micro-cap indices. The reason the market coverage for smaller companies can get so low is partly due to the lack of book value data on many of those companies. This may be why many other data vendors have chosen not to present micro-cap style indices. This may also be why those vendors that do present small-cap style indices often have a very short history of data.

Focusing on the micro-cap growth index for a moment, one possible explanation for such poor performance may have to do with the upward movement of successful micro-cap

companies into higher capitalization benchmarks. To understand micro-cap style performance, it is necessary to first understand the difference between growth and value stocks. In general, growth stocks usually have relatively high growth rates of earnings, sales, or return on equity. They typically have high price-to-earnings and price-to-book ratios. The opposite is true for value companies, which usually have lower price-to-earnings and price-to-book ratios, along with higher dividend yields. Value stocks are often turnaround opportunities, companies with disappointing news, or companies with low growth prospects.

An investor putting money into a micro-cap growth company is paying relatively more per unit of earnings and book value based on the expectation that there is higher potential for greater gains down the road. Many successful technology companies are good examples of companies that started small, even in someone's garage, and then hit it big. Investors in micro-cap growth companies are very similar in psyche to venture capital firms. Venture capital companies invest money in very small companies with high growth potential. They know that many of these companies will fail, but the few that perform up to potential bring large gains. The same holds true for micro-cap companies, but not necessarily for the micro-cap index. While the performance of the many micro-cap companies that fail is included in the micro-cap growth index, those that hit their high potential tend to grow out of micro-cap and into a larger index. A company may have been micro-cap to begin with, but as the winners keep getting inflows of dollars from eager investors, their stock prices rise, leading to increased market capitalization. A micro-cap stock could move into small-, mid-, and eventually large-cap in very little time. For this reason, the companies that fail seem to stay very small and the companies that hit it big tend to grow out of the coverage of the micro-cap index. This may explain why the micro-cap growth index has such poor performance. It also explains why it is not necessarily an ominous sign for micro-cap investors. The typical micro-cap growth investor may not sell off a winner as soon as

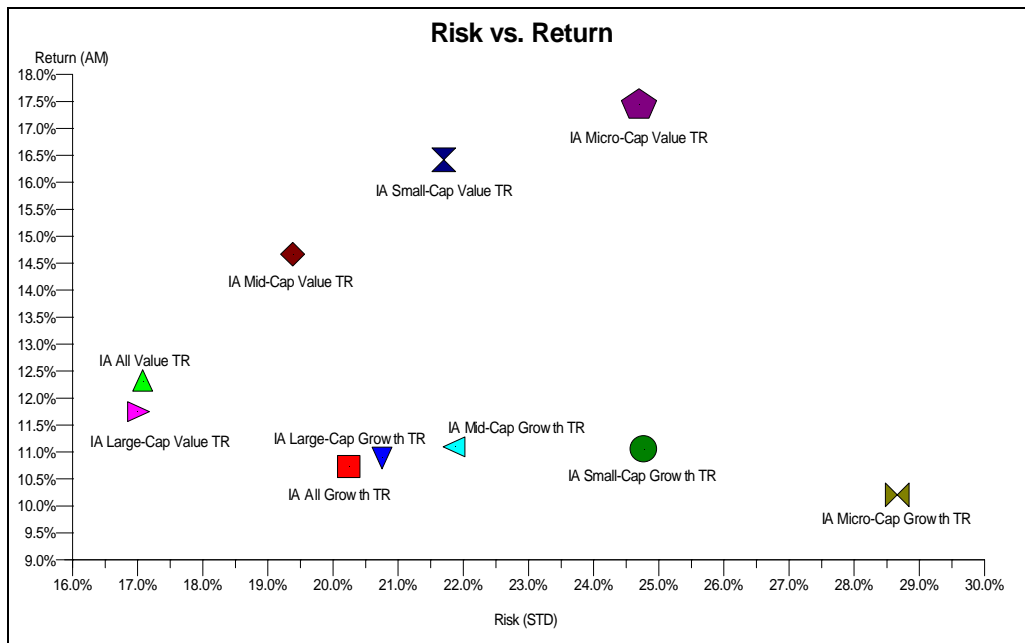
it hits, but rather will hold on to that company as it grows larger and reaps greater rewards. A test of the theory that the micro-cap growth index holds on to poor performers but loses its winners can be found in Appendix F. The same principals that affect the micro-cap index in this regard may impact the small-cap index to a lesser degree.

Further analysis of the complete set of style indices shows an interesting Sharpe Ratio pattern. It seems that not only do the value series outperform growth series on average, but their Sharpe Ratio is much higher. Sharpe Ratio is a measure of reward to variability. Basically, it measures the level of return per level of risk for an asset class. The specific measure is asset class return minus the risk-free rate (U.S. 30-day T Bills), divided by the standard deviation of the asset class. Every one of the Ibbotson value series has a higher Sharpe Ratio than its corresponding growth series. The traditional risk-return tradeoff does not seem to hold with regard to the split between growth and value. The value indices are offering more return and less risk. Table 1 and Graph 3 depict this phenomenon.

Table 1: Summary Statistics of Annual Returns 1969–2002

	Geometric Mean (%)	Arithmetic Mean (%)	Standard Deviation (%)	Sharpe Ratio
IA All Growth	8.79	10.72	20.25	0.21
IA All Value	10.99	12.31	17.08	0.34
IA Large-Cap Growth	8.90	10.91	20.75	0.21
IA Large-Cap Value	10.43	11.75	17.00	0.31
IA Mid-Cap Growth	8.88	11.09	21.88	0.21
IA Mid-Cap Value	13.03	14.66	19.37	0.42
IA Small-Cap Growth	8.20	11.04	24.77	0.18
IA Small-Cap Value	14.35	16.41	21.69	0.46
IA Micro-Cap Growth	6.47	10.20	28.66	0.13
IA Micro-Cap Value	14.66	17.44	24.69	0.44

Graph 3: Risk vs. Return Scatter Plot 1969–2002



Summary

Growth and value benchmarks from such data giants as S&P, Russell, Wilshire, and Barclays have laid the foundation of equity style analysis. There is broader coverage of large-cap style than there is of mid-, small-, or micro-cap, with many of the latter having a very short history of market returns. With investors becoming savvier, and portfolio managers craving better indices to benchmark against, there was an obvious need for a set of style indices with a consistent methodology that covers the entire market spectrum. Ibbotson Associates has created such a set of style indices, analysis and returns for which are included here. It is our hope that these indices will greatly enhance understanding of style investing.

For more information about Ibbotson style indices, see the contact information in Appendix G. The data and graphs presented here are for research purposes only and may not be redistributed without permission from Ibbotson Associates.

Appendix A: Market Coverage

June-end	Company Coverage				Market Value Coverage			
	Large-Cap	Mid-Cap	Small-Cap	Micro-Cap	Large-Cap	Mid-Cap	Small-Cap	Micro-Cap
1968	92%	77%	66%	58%	95%	78%	66%	61%
1969	92%	81%	71%	64%	95%	81%	71%	66%
1970	95%	85%	77%	71%	97%	86%	78%	73%
1971	94%	90%	82%	81%	97%	91%	83%	81%
1972	94%	90%	85%	80%	97%	92%	86%	79%
1973	97%	93%	86%	83%	98%	94%	87%	83%
1974	96%	95%	92%	86%	98%	96%	92%	87%
1975	98%	96%	94%	90%	99%	96%	94%	91%
1976	97%	96%	94%	91%	98%	97%	95%	92%
1977	97%	96%	93%	92%	98%	96%	93%	92%
1978	98%	96%	94%	92%	99%	96%	94%	93%
1979	98%	96%	93%	92%	98%	96%	93%	93%
1980	96%	96%	93%	92%	98%	96%	93%	92%
1981	98%	95%	94%	91%	98%	95%	94%	91%
1982	96%	91%	91%	92%	97%	92%	90%	92%
1983	98%	90%	78%	84%	99%	91%	79%	80%
1984	96%	94%	85%	78%	95%	95%	86%	78%
1985	98%	94%	80%	62%	99%	95%	83%	65%
1986	98%	94%	81%	78%	99%	95%	83%	76%
1987	98%	95%	80%	71%	99%	95%	82%	72%
1988	99%	95%	84%	76%	100%	96%	86%	76%
1989	98%	96%	90%	77%	99%	97%	91%	78%
1990	99%	94%	89%	76%	99%	96%	90%	78%
1991	98%	96%	90%	77%	99%	96%	92%	79%
1992	99%	95%	86%	73%	100%	95%	87%	74%
1993	99%	95%	89%	77%	99%	96%	90%	77%
1994	99%	96%	93%	87%	99%	96%	93%	86%
1995	100%	96%	93%	92%	100%	97%	93%	91%
1996	99%	95%	89%	88%	98%	96%	90%	87%
1997	99%	97%	95%	90%	99%	98%	95%	90%
1998	99%	97%	94%	89%	99%	97%	94%	89%
1999	98%	94%	92%	91%	99%	94%	92%	90%
2000	95%	90%	89%	90%	98%	90%	88%	89%
2001	99%	97%	97%	96%	99%	98%	97%	96%
2002	99%	98%	96%	97%	100%	99%	96%	96%
2003	99%	97%	96%	96%	100%	98%	96%	97%

1969 represents the starting point for Ibbotson's style indices analyzed throughout this paper.

Appendix B: Size Breakpoints (in thousands)

June-end	IA Large-Cap Min Mkt Cap	IA Large-Cap Max Mkt Cap	IA Mid-Cap Min Mkt Cap	IA Mid-Cap Max Mkt Cap	IA Small-Cap Min Mkt Cap	IA Small-Cap Max Mkt Cap	IA Micro-Cap Min Mkt Cap	IA Micro-Cap Max Mkt Cap
1969	\$563,223	\$35,471,952	\$164,255	\$558,165	\$64,575	\$163,723	\$2,459	\$64,565
1970	\$485,628	\$38,493,543	\$135,176	\$484,658	\$43,960	\$134,063	\$1,630	\$43,851
1971	\$548,435	\$40,749,280	\$151,796	\$547,799	\$48,364	\$151,632	\$1,168	\$48,040
1972	\$574,620	\$43,957,221	\$152,107	\$574,485	\$51,597	\$152,054	\$1,234	\$51,592
1973	\$487,704	\$50,127,787	\$120,838	\$485,495	\$36,408	\$120,804	\$742	\$36,391
1974	\$421,965	\$34,234,201	\$93,876	\$420,208	\$28,394	\$93,582	\$509	\$28,286
1975	\$393,348	\$30,634,016	\$83,595	\$393,162	\$24,318	\$82,936	\$480	\$24,306
1976	\$534,544	\$38,893,114	\$114,759	\$534,500	\$34,073	\$114,086	\$715	\$33,943
1977	\$554,866	\$41,069,928	\$128,922	\$554,625	\$37,050	\$128,605	\$567	\$37,006
1978	\$533,763	\$39,667,460	\$143,882	\$532,840	\$42,856	\$143,851	\$590	\$42,856
1979	\$629,857	\$46,003,055	\$172,137	\$629,749	\$49,186	\$172,017	\$885	\$48,878
1980	\$636,032	\$34,103,970	\$159,705	\$631,733	\$43,886	\$159,039	\$698	\$43,811
1981	\$965,571	\$39,333,383	\$253,220	\$964,986	\$67,638	\$253,156	\$898	\$67,568
1982	\$818,878	\$45,849,825	\$211,050	\$818,877	\$57,905	\$210,534	\$1,056	\$57,816
1983	\$1,077,629	\$61,294,811	\$306,816	\$1,077,150	\$85,644	\$306,787	\$1,448	\$85,605
1984	\$1,178,156	\$69,622,650	\$325,796	\$1,166,277	\$93,608	\$324,704	\$1,400	\$93,531
1985	\$1,316,368	\$77,811,122	\$356,943	\$1,313,731	\$94,952	\$356,010	\$1,411	\$94,800
1986	\$1,768,590	\$93,235,827	\$441,678	\$1,737,541	\$112,003	\$440,613	\$806	\$111,956
1987	\$2,068,495	\$90,964,190	\$480,052	\$2,064,693	\$115,962	\$479,950	\$853	\$115,898
1988	\$1,808,060	\$64,257,722	\$400,435	\$1,799,414	\$90,475	\$400,079	\$900	\$90,184
1989	\$2,049,592	\$64,615,859	\$466,686	\$2,014,077	\$100,276	\$466,061	\$464	\$100,274
1990	\$2,167,234	\$60,990,038	\$459,449	\$2,165,947	\$94,884	\$458,285	\$210	\$94,879
1991	\$2,194,965	\$72,832,500	\$458,118	\$2,192,375	\$86,620	\$457,549	\$563	\$86,544
1992	\$2,380,812	\$69,866,043	\$528,649	\$2,370,516	\$114,043	\$527,275	\$768	\$113,841
1993	\$2,809,950	\$82,127,250	\$601,285	\$2,806,554	\$135,531	\$601,188	\$516	\$135,234
1994	\$2,654,551	\$85,383,300	\$616,493	\$2,646,926	\$152,618	\$616,447	\$602	\$152,526
1995	\$2,652,574	\$92,321,640	\$625,664	\$2,635,884	\$152,958	\$625,165	\$223	\$152,900
1996	\$3,153,255	\$130,072,666	\$739,152	\$3,134,132	\$188,486	\$738,775	\$1,114	\$188,467
1997	\$3,283,689	\$163,407,284	\$727,624	\$3,281,785	\$197,137	\$727,500	\$556	\$197,134
1998	\$4,315,669	\$281,006,587	\$988,722	\$4,294,246	\$277,312	\$988,172	\$606	\$277,281
1999	\$3,888,022	\$452,330,026	\$729,765	\$3,884,050	\$176,075	\$729,128	\$971	\$175,615
2000	\$4,293,990	\$556,962,500	\$846,902	\$4,293,930	\$189,620	\$846,335	\$2,234	\$189,618
2001	\$4,696,566	\$415,792,414	\$992,946	\$4,660,679	\$206,941	\$988,425	\$235	\$206,914
2002	\$5,625,367	\$372,089,351	\$1,230,697	\$5,577,702	\$306,066	\$1,230,412	\$226	\$305,906
2003	\$4,033,730	\$259,579,610	\$958,164	\$3,990,973	\$245,643	\$958,049	\$236	\$244,791

Appendix C-1: Style Breakpoints (book-to-price)

June-end	<u>IA Large-Cap Growth</u>		<u>IA Large-Cap Value</u>		<u>IA Mid-Cap Growth</u>		<u>IA Mid-Cap Value</u>	
	Min B/P	Max B/P	Min B/P	Max B/P	Min B/P	Max B/P	Min B/P	Max B/P
1969	0.043	0.417	0.419	1.703	0.023	0.443	0.444	1.794
1970	0.048	0.502	0.503	2.201	0.049	0.582	0.585	2.517
1971	0.054	0.416	0.417	2.075	0.034	0.609	0.611	3.996
1972	0.038	0.330	0.335	1.776	0.036	0.554	0.557	3.051
1973	0.048	0.326	0.330	2.395	0.039	0.579	0.584	3.173
1974	0.069	0.391	0.394	3.355	0.064	0.965	0.970	3.832
1975	0.153	0.748	0.748	7.033	0.117	1.475	1.478	7.643
1976	0.143	0.654	0.662	4.088	0.120	1.037	1.038	9.106
1977	0.122	0.666	0.668	3.076	0.171	0.829	0.833	3.334
1978	0.160	0.841	0.850	3.842	0.078	0.936	0.937	3.705
1979	0.198	0.891	0.894	4.088	0.001	1.032	1.033	4.937
1980	0.111	0.763	0.769	3.055	-0.038	0.881	0.883	3.775
1981	0.066	0.650	0.651	3.990	-0.319	0.850	0.852	4.610
1982	0.089	0.838	0.840	4.075	-2.186	0.846	0.860	5.230
1983	-0.234	0.761	0.777	2.328	0.022	0.778	0.784	5.549
1984	0.085	0.712	0.713	1.941	-0.305	0.651	0.654	3.053
1985	0.107	0.739	0.745	1.919	-1.325	0.707	0.708	5.604
1986	0.074	0.564	0.568	1.908	-1.739	0.592	0.595	3.359
1987	0.013	0.497	0.506	1.616	-1.886	0.574	0.576	3.669
1988	-0.196	0.548	0.549	2.674	-3.291	0.646	0.646	4.507
1989	-0.131	0.548	0.549	1.931	-4.186	0.577	0.589	2.505
1990	-0.277	0.408	0.408	1.634	-2.464	0.534	0.535	2.930
1991	-0.045	0.442	0.443	2.868	-2.341	0.615	0.616	4.713
1992	-0.266	0.411	0.411	2.918	-1.586	0.511	0.514	3.951
1993	-0.266	0.367	0.368	1.603	-68.308	0.465	0.466	2.782
1994	-1.140	0.326	0.328	1.455	-0.556	0.417	0.418	2.694
1995	-1.032	0.348	0.351	1.520	-4.313	0.439	0.448	1.776
1996	-0.347	0.274	0.276	1.803	-1.289	0.383	0.384	2.519
1997	-0.705	0.272	0.273	1.358	-0.929	0.388	0.391	2.545
1998	-1.784	0.207	0.208	1.034	-0.828	0.316	0.316	2.716
1999	-0.485	0.155	0.155	2.324	-1.742	0.344	0.344	4.539
2000	-0.313	0.117	0.118	3.127	-1.937	0.315	0.315	3.656
2001	-0.225	0.179	0.179	2.468	-1.075	0.359	0.359	4.108
2002	-0.357	0.245	0.245	2.092	-0.264	0.402	0.402	2.464
2003	-1.042	0.303	0.306	2.010	-3.475	0.455	0.455	6.082

Appendix C-2: Style Breakpoints (book-to-price)

June-end	<u>IA Small-Cap Growth</u>		<u>IA Small-Cap Value</u>		<u>IA Micro-Cap Growth</u>		<u>IA Micro-Cap Value</u>	
	Min B/P	Max B/P	Min B/P	Max B/P	Min B/P	Max B/P	Min B/P	Max B/P
1969	0.020	0.386	0.387	2.075	-0.028	0.406	0.407	2.585
1970	0.044	0.595	0.599	4.889	-0.183	0.682	0.683	6.340
1971	0.086	0.731	0.732	7.736	-1.231	0.886	0.888	13.129
1972	0.078	0.665	0.672	6.422	-1.886	0.799	0.799	5.152
1973	0.058	0.720	0.722	6.563	-1.577	0.848	0.848	18.002
1974	0.114	1.223	1.229	11.997	-1.478	1.617	1.618	16.761
1975	0.016	1.913	1.917	15.502	-2.505	2.562	2.564	28.483
1976	-0.809	1.316	1.329	7.986	-9.247	1.772	1.784	33.167
1977	-0.108	1.060	1.060	5.550	-6.507	1.336	1.337	18.863
1978	-0.490	1.014	1.017	7.859	-13.627	1.259	1.259	13.830
1979	-1.321	1.022	1.029	7.523	-8.205	1.289	1.291	17.711
1980	-2.981	0.949	0.954	7.184	-8.030	1.164	1.166	16.169
1981	-0.393	0.830	0.839	5.471	-3.524	1.090	1.093	14.508
1982	-0.141	0.874	0.878	5.581	-8.170	1.085	1.087	12.342
1983	-2.675	0.775	0.778	5.210	-10.221	0.961	0.962	5.987
1984	-1.720	0.569	0.570	3.893	-7.486	0.614	0.615	11.251
1985	-1.021	0.679	0.680	6.562	-18.597	0.725	0.726	6.721
1986	-0.897	0.558	0.559	3.435	-32.607	0.630	0.630	6.099
1987	-16.698	0.560	0.561	5.133	-9.073	0.630	0.632	21.642
1988	-9.344	0.651	0.651	8.403	-10.592	0.799	0.800	81.305
1989	-22.059	0.594	0.598	7.784	-118.450	0.694	0.694	38.055
1990	-40.374	0.551	0.552	3.787	-158.089	0.716	0.719	40.578
1991	-85.105	0.723	0.724	13.483	-374.588	0.947	0.948	59.417
1992	-188.334	0.533	0.534	5.508	-340.029	0.639	0.643	34.180
1993	-59.932	0.465	0.466	12.768	-16.966	0.554	0.555	40.055
1994	-10.589	0.462	0.464	3.131	-75.715	0.547	0.547	8.631
1995	-3.585	0.492	0.492	3.797	-387.337	0.626	0.626	8.785
1996	-2.814	0.399	0.401	3.366	-73.500	0.564	0.564	12.723
1997	-5.711	0.395	0.395	5.091	-17.539	0.517	0.517	7.345
1998	-3.440	0.361	0.361	2.713	-16.679	0.456	0.456	31.534
1999	-5.278	0.425	0.425	3.711	-9.697	0.591	0.592	48.279
2000	-4.670	0.383	0.384	14.771	-8.569	0.650	0.650	16.901
2001	-4.526	0.437	0.437	23.134	-906.639	0.758	0.759	51.618
2002	-2.236	0.468	0.469	7.031	-109.741	0.597	0.597	52.832
2003	-17.973	0.561	0.561	9.556	-107.726	0.697	0.697	27.491

Appendix D: Number of Companies in Each Index

June-end	IA Large-Cap Growth # Co	IA Large-Cap Value # Co	IA Mid-Cap Growth # Co	IA Mid-Cap Value # Co	IA Small-Cap Growth # Co	IA Small-Cap Value # Co	IA Micro-Cap Growth # Co	IA Micro-Cap Value # Co
1969	105	125	169	162	180	178	319	322
1970	110	134	176	175	196	192	370	417
1971	92	159	192	189	216	219	400	519
1972	93	172	202	211	224	239	423	545
1973	93	190	215	224	227	244	451	596
1974	90	198	213	240	239	259	425	635
1975	106	183	212	239	248	275	421	627
1976	110	176	210	237	256	267	430	601
1977	123	170	214	234	248	262	423	593
1978	137	156	225	217	255	254	386	570
1979	136	155	226	213	245	255	384	529
1980	135	154	227	215	259	259	355	487
1981	138	151	224	213	254	262	332	482
1982	134	152	218	212	246	252	350	484
1983	151	141	244	228	253	258	358	475
1984	144	141	258	253	336	340	513	615
1985	139	150	274	265	393	382	604	745
1986	134	158	281	285	432	432	810	1006
1987	138	164	283	283	436	455	885	1115
1988	141	156	287	289	446	494	938	1178
1989	130	159	277	275	462	513	886	1157
1990	128	164	278	271	505	513	805	1071
1991	122	176	290	294	503	541	731	1092
1992	134	190	303	294	530	531	767	1130
1993	145	196	319	311	531	546	925	1266
1994	157	208	342	327	569	583	1206	1614
1995	154	229	379	362	622	629	1217	1696
1996	153	259	373	389	661	701	1235	1707
1997	170	262	412	411	630	688	1389	1889
1998	154	287	409	422	645	673	1356	1827
1999	144	311	413	412	624	676	1163	1683
2000	162	326	435	455	598	675	1027	1492
2001	140	265	355	376	584	665	1046	1674
2002	140	220	324	325	504	520	1066	1557
2003	139	225	293	323	461	517	905	1364

Appendix E: Vendor Comparison

	Last 5 Years (annual) Return	Last 10 Years (annual) Return	Last 20 Years (annual) Return	Last 30 Years (annual) Return
<u>Large-Cap Growth</u>				
IA Large-Cap Growth	-1.7	8.0	11.9	8.6
S&P/BARRA 500 Growth	-1.1	8.8	12.2	-
Wilshire Target Large Growth	0.8	9.6	13.1	-
Russell Top 200 Growth	-4.1	7.1	-	-
Fama-French Large Growth	-0.1	8.6	12.2	9.5
<u>Mid-Cap Growth</u>				
IA Mid-Cap Growth	-0.2	6.8	10.4	9.7
S&P/BARRA MidCap 400 Growth	7.1	11.3	-	-
Wilshire Target MidCap Growth	-3.0	6.8	10.0	-
Russell MidCap Growth	-1.8	6.7	-	-
<u>Small-Cap Growth</u>				
IA Small-Cap Growth	-2.6	4.7	8.0	9.7
S&P/BARRA SmallCap 600 Growth	0.6	-	-	-
Wilshire Target Small Growth	-0.9	7.3	9.2	-
Russell 2000 Growth	-6.6	2.6	5.8	-
Fama-French Small Growth	-3.5	4.7	6.7	8.1
<u>Large-Cap Value</u>				
IA Large-Cap Value	-1.2	9.7	12.8	11.5
S&P/BARRA 500 Value	-0.8	9.4	12.8	-
Wilshire Target Large Value	-1.4	8.6	13.0	-
Russell Top 200 Value	0.6	10.9	-	-
Fama-French Large Value	-3.9	6.6	12.1	12.6
<u>Mid-Cap Value</u>				
IA Mid-Cap Value	4.2	11.7	14.1	14.5
S&P/BARRA MidCap 400 Value	5.7	12.3	-	-
Wilshire Target MidCap Value	1.8	9.8	14.4	-
Russell MidCap Value	3.0	11.1	-	-
<u>Small-Cap Value</u>				
IA Small-Cap Value	4.2	12.3	14.6	16.2
S&P/BARRA SmallCap 600 Value	2.7	-	-	-
Wilshire Target Small Value	0.6	8.6	14.6	-
Russell 2000 Value	2.7	10.9	12.6	-
Fama-French Small Value	3.3	12.8	14.8	16.5

All data through year-end 2002

Appendix F: Migration Analysis

As stated earlier, one explanation for the poor performance of the smaller growth indices has to do with the upward movement of successful companies into higher capitalization benchmarks. To test this, we performed an independent analysis over the period June 2001 through June 2002 to see the migration pattern of micro-cap stocks. We used the S&P Compustat database as our data source, which has the same basic coverage of NYSE, AMEX, and NASDAQ stocks as the CRSP database over recent periods. We expected that some of the micro-cap growth companies that performed well would have migrated upward into a larger index when the portfolios are rebalanced again the following June-end. The results are summarized in Table F-1.

Table F-1: Results from micro-cap migration analysis 7/01–6/02

	Micro-Cap Growth	Micro-Cap Value
Companies with negative annualized return (7/01–6/02)	58.1%	51.0%
% of companies with negative returns that grew out of micro-cap by June 02	0.1%	0.1%
% of companies with positive returns that grew out of micro-cap by June 02	3.6%	1.8%
% market value of companies that grew out of micro-cap by June 02	19.2%	15.6%

The migration analysis seems to support the theory that successful micro-cap companies move upward into larger size classifications. From July 2001 through June 2002, only 0.1% of the micro-cap growth companies with negative annualized returns grew out of the micro-cap index (and into small-cap). This makes sense since investors will not generally funnel more money into those companies that do not perform well. On the other hand, 3.6% of the growth companies with positive returns moved up and out of the micro-cap classification in only one year. Examples of such companies are FTI Consulting, Kroll, and MB Financial (see Table F-2).

Companies like these had excellent years, and investors bid up their stock prices to a point where they moved out of the micro-cap index and into the small-cap index. The combined market capitalization of these 3.6 percent of micro-cap growth companies that grew into a large classification accounted for 19.2 percent of the total market capitalization of the micro-cap index as of June 2002. Similar numbers were reported for the micro-cap value series, except on a smaller scale.

Table F-2: Migration examples of micro-cap growth companies 7/01–6/02

Company Name	Annualized Total Return (7/01–6/02)	June 01 Mkt Val (\$mil)	June 02 Mkt Val (\$mil)
FTI Consulting, Inc.	141%	\$246	\$701
Kroll, Inc.	129%	\$212	\$496
MB Financial, Inc.	34%	\$184	\$604

While these figures present some evidence of micro-cap migration into larger classifications, keep in mind that this analysis was only measured over the short time frame of one year. It may take more than one year for a larger percentage of companies to establish a good track record of performance and have their prices bid up into larger asset classes. Also consider that the time frame this sample was taken from was in the middle of a severe market downturn. Had the market been performing well as it did in the late 1990s, it is likely that the migration from micro-cap would have been even more pronounced.

Just as micro-cap stock prices can be bid up into a higher size-based classification, the reverse can happen just as easily. Companies can fall from grace and may reside down in the micro-cap index for some time. For example, Enron corporation recently went through a very high profile bankruptcy due in large part to an accounting scandal (the same one that brought accounting firm Andersen to its knees). As seen in Table F-3, Enron fell from a large-cap company to a micro-cap company in less than a year. While this is a most dramatic case, it shows how larger companies can migrate down to the micro-cap classification.

Table F-3: Enron's fall from prosperity

Enron Corporation	June 01	June 02
Market Value (\$mil)	\$36,634	\$83
Stock Price	49.10	0.111

The examples of upward and downward migration presented here highlight one of the differences between measuring performance through an index and through an actively managed mutual fund. An actively managed micro-cap mutual fund may not invest in companies that have migrated down from larger classifications, but a passive index by design would have to include those companies. The point is not to compare passive and active fund management, but to understand some of the performance patterns that may be displayed by the style indices created here.

Appendix G: Contact Information

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