New Frontiers In Index Investing

An examination of fundamental indexation

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Illustration by Jonathan Evans

Indexing is a powerful model for equity investing. It is inexpensive to implement and absolutely transparent. The strategy has immense capacity, is highly liquid and is naturally well diversified. More importantly, there is overwhelming evidence that index investing, in the long run, outperforms active investing.

The Capital Asset Pricing Model (CAPM)—inspired originally by the mean-variance portfolio analysis of Harry Markowitz, and derived as a pricing formula by William Sharpe—is indoctrinated by business schools everywhere. CAPM suggests that a cap-weighted market index, like the S&P 500 or Russell 1000, is an efficient equity investment. Investors cannot do better without extraordinary skill or information. This belief is largely unchallenged in the finance industry (except by the most brilliant portfolio managers and the most foolhardy speculators) and contributes significantly both to the popularity of index investing at the institutional level and the rising popularity of exchange-traded funds (ETFs) among retail investors.

A Crucial Flaw In Traditional Cap-Weighted Indexes

Despite all of their benefits, however, traditional indexes are flawed in a very fundamental way. Almost all major indexes are based on market-capitalization weightings. By definition, companies that are overvalued will have extra weight in the index at the expense of undervalued companies. A passive index investor is forced to allocate more of his portfolio in overvalued stocks and less of his portfolio in undervalued stocks—exactly the opposite of what common sense investing would suggest.

It can be quantitatively shown that a cap-weighted index will on average underperform a non-cap-weighted portfolio with similar risk, and the size of the underperformance is roughly equal to the noise in stock prices (Hsu 2005 and Treynor 2005). Qualitatively, the noisier stock prices are —that is, the more prices fluctuate independent of changes in company fundamentals—the greater is the cap-weighted index underperformance.

Empirically, we observe that cap-weighted indexes do underperform significantly relative to non-cap-weighted indexes of similar risk characteristics (Arnott, Hsu and Moore 2005, and Tamura and Shimizu 2005). This underperformance is robust across time, across time, macroeconomic cycles and countries.

Return Drag On Cap-Weighted Portfolios

We offer a simple example in this section to highlight the return drag associated with cap-weighting, and to illustrate how the noise in stock prices relates to the size of the cap index underperformance.

Suppose there are only two stocks in the market: A and B, each with one share outstanding.

Suppose the fair values (which investors do not observe) are $10 per share for each stock. Further, suppose that market prices are noisy, and that there is a 50/50 chance that a stock can be overvalued or undervalued by $2 per share. Note that the expected "mispricing" could occur in either of the two stocks, and we do not know which stock is overvalued or undervalued. In this economy, there is no simple way to take advantage of the mispricing (market inefficiency).

For simplicity, we also assume that the two stocks have the same equity market exposure, which leads to a 10 percent expected return on equity capital. Therefore, both companies are expected to increase their stock prices by $1 (10 percent increase on the $10 fair value). Note that the expected return on the overvalued stock is lower than the expected return on the undervalued stock, which is consistent with intuition. The investment objective is clearly to have more exposure to the undervalued stock and less exposure to the overvalued stock.

Observe that the cap-weighted market portfolio invests 60 percent in the overvalued stock and 40 percent in the undervalued stock. Had prices reflected the true values, however, the portfolio weight would have been 50 percent in each. After one period, assuming that the overvaluation

Figure 1

Annualized Return: Fundamental vs. MSCI Indexes			
Country	**Fundamental Index**	**MSCI Benchmark**	**Value Added**
World	12.36%	8.81%	3.55%
AUSTRALIA	14.53%	11.64%	2.89%
AUSTRIA	16.67%	11.07%	5.60%
BELGIUM	14.25%	12.76%	1.49%
CANADA	14.15%	10.39%	3.76%
DENMARK	15.94%	14.40%	1.54%
FINLAND	16.41%	14.83%	1.59%
FRANCE	14.39%	11.93%	2.45%
GERMANY	12.22%	9.90%	2.33%
GREECE	19.32%	16.08%	3.24%
HONG KONG	15.69%	13.74%	1.95%
IRELAND	17.18%	8.40%	8.78%
ITALY	13.14%	10.08%	3.06%
JAPAN	2.35%	-1.32%	3.67%
NETHERLANDS	13.49%	11.45%	2.04%
NEW ZEALAND	8.07%	7.43%	0.64%
NORWAY	15.51%	10.87%	4.64%
PORTUGAL	12.63%	10.34%	2.29%
SINGAPORE	8.93%	5.76%	3.17%
SPAIN	15.90%	12.40%	3.50%
SWEDEN	16.45%	14.25%	2.20%
SWITZERLAND	13.05%	12.53%	0.52%
U.K.	12.96%	10.21%	2.76%
U.S.	14.74%	12.36%	2.39%

Figure 2

Risk Characteristics: Fundamental vs. MSCI Indexes			
Country	Fundamental Index	MSCI Benchmark	
	Volatility	Volatility	Beta
World	13.42%	14.15%	0.90
AUSTRALIA	16.22%	17.19%	0.90
AUSTRIA	21.59%	22.88%	0.86
BELGIUM	17.32%	18.32%	0.90
CANADA	12.94%	15.44%	0.76
DENMARK	17.15%	18.76%	0.83
FINLAND	24.35%	34.02%	0.58
FRANCE	20.56%	20.57%	0.94
GERMANY	19.07%	22.36%	0.83
GREECE	38.99%	37.38%	1.02
HONG KONG	29.40%	28.76%	1.00
IRELAND	19.00%	19.96%	0.85
ITALY	24.33%	23.88%	0.99
JAPAN	19.74%	19.97%	0.95
NETHERLANDS	18.71%	18.33%	0.96
NEW ZEALAND	22.43%	20.16%	1.02
NORWAY	19.50%	21.24%	0.84
PORTUGAL	23.12%	22.73%	0.97
SINGAPORE	19.17%	21.42%	0.87
SPAIN	23.91%	25.14%	0.87
SWEDEN	17.78%	17.65%	0.98
SWITZERLAND	24.20%	23.78%	0.98
U.K	16.61%	16.30%	0.98
U.S.	14.31%	15.22%	0.88

and undervaluation persist—that is, the overvalued company appreciates from $12 to $13 and the undervalued company appreciates from $8 to $9—the cap-weighted portfolio return would be 10.0 percent. However, had the "fair-value weights" been applied, the "fair-value portfolio" would earn a return of 10.42 percent. The intuition for the cap-weighted portfolio's return drag is clear: The cap-weighted portfolio underperforms because it puts more weight in the overvalued stock, which will deliver less price appreciation in the future (and perhaps negative price appreciation if prices revert to fair values).

What is also interesting to note is that the return drag is related to the over- and undervaluation. Suppose, in the previous example, the mispricing was $3 (30 percent) instead of $2 (20 percent); the return drag on the cap portfolio relative to the fair-value-weighted portfolio would be 0.99 percent instead of 0.42 percent. At $4 and $5 mispricings, the return drags are 1.90 percent and 3.33 percent, respectively.

Furthermore, suppose the mispricing is transient, meaning that the over- and undervaluation dissipate over the course of the holding period; the predicted return drag on the cap-weighted portfolio becomes even more substantial. Returning to our original example, with $2 mispricing and reversion to fair value, the over-priced stock would revert from $12 back toward $10 while the underpriced stock would move from $8 toward $10, in addition to the $1 price appreciation associated with the equity market exposure. Therefore, the cap-weighted portfolio return would be 10.0 percent while the fair-value-weighted portfolio would return 14.6 percent. We note that the return drag on the cap-weighted portfolio is significantly increased when mispricing is temporary.

Improving Upon Cap-Weighting?

In the previous section, we illustrated that cap weighting leads to return drag relative to fair-value weighting, and the size of the return drag is proportional to the size of the mispricing in the equity market. The question, then, is whether we can construct fair-value-weighted portfolios. Unfortunately, the answer is no. We do not and cannot observe companies' fair values.

Fortunately, it is not necessary to construct fair-value-weighted portfolios in order to outperform cap-weighted portfolios. Hsu (2005) and Treynor (2005) show that portfolios need only be non-price-weighted to outperform standard cap-weighted indexes.

That said, a well-behaved portfolio should provide the greatest exposure to the largest companies, as this ensures broad market representation, high portfolio capacity and high liquidity. So how do we achieve the benefits of cap-weighting

Figure 3A

Fundamental Index 1000 Performance In Different Market Cycles

1962-2005	Bull Markets	Bear Markets	Expansions	Recessions
RA Fundamentals Index 1000	21.3%	-17.0%	13.2%	6.8%
S&P 500 Index	20.7%	-22.4%	11.4%	3.0%
3 Month T-Bill	5.4%	6.9%	5.3%	8.2%
RAFI 1000 Volatility	13.5%	16.1%	13.7%	19.9%
S&P 500 Volatility	13.5%	16.0%	13.9%	20.1%
RAFI 1000 Sharpe Ratio	1.2	-1.5	0.6	-0.1
S&P 500 Sharpe Ratio	1.1	-1.8	0.4	-0.3
RAFI Excess Return over S&P 500	0.7%	5.4%	1.8%	3.8%
RAFI Information Ratio	0.2	1.0	0.2	0.7

without using capitalization for weighting? To do this, we need to find alternative metrics for company size. According to the fundamental indexation methodology proposed by Arnott, Hsu and Moore (2005), measures of company size like cash flow, sales, gross dividend and book equity value work extremely well as size metrics for constructing portfolio weights. Using a composite measure called "fundamental value" derived from the aforementioned four financial variables to construct a 1,000-stock U.S. equity portfolio, Arnott, Hsu and Moore (2005) find excess annual performance of two percent relative to the S&P 500. Tamura and Shimizu (2005) find similar portfolio outperformance against the cap-weighted benchmarks in the EAFE countries using the fundamental index construction. We reproduce the two studies using 20 years of data (1984 through 2004) and summarize the results in Figure 4A. In addition, Hsu, Lee, Li and Moroz (2005) find that fundamental small-cap and mid-cap indexes outperform their respective cap-weighted small- and mid-cap indexes.

The U.S. and international evidence illustrate powerfully that using a composite of company fundamentals to create index weights leads to better indexes. The average value added by the 23 fundamental indexes is 2.8 percent over the respective MSCI cap-weighted indexes for the 20 years studied (Figure 1). A fundamental World Index outperforms by 3.5 percent the MSCI World Index over the same period (Figure 1). The fundamental indexes are also on average slightly less volatile, with an average beta just below one (see Figure 2).

We show the performance of the fundamental U.S. and World ex-U.S. indexes against the MSCI benchmarks in Figure 4. Additionally, we plot the rolling five-year excess return in Figures 5A-C. We note that the fundamental indexes only underperformed relative to the cap-weighted benchmarks during the height of the technology bubble.

Figure 3B

Fundamental Index 2000 Performance In Different Market Cycles

1979-2004	Bull Markets	Bear Markets	Expansions	Recessions	Value Cycle	Growth Cycle
RA Fundamentals Index Small	23.0%	-9.4%	16.6%	13.9%	18.5%	11.9%
Russell 2000 Index	21.7%	-17.5%	13.8%	9.9%	13.8%	12.4%
3 Month T-Bill	5.4%	6.9%	5.3%	8.2%	5.8%	5.5%
RAFI Small Volatility	16.5%	23.1%	17.0%	24.8%	18.8%	16.9%
Russell 2000 Volatility	17.9%	23.8%	18.4%	26.1%	20.0%	18.6%
RAFI Small Sharpe Ratio	1.1	-0.7	0.7	0.2	0.7	0.4
Russell 2000 Sharpe Ratio	1.0	-1.0	0.5	0.1	0.4	0.4
RAFI Small Excess Return over Russell 2000	1.3%	8.1%	2.8%	4.0%	4.7%	-0.5%
RAFI Small Information Ratio	0.3	1.5	0.6	1.2	0.9	-0.1

Why Does Fundamental Indexing Work So Well?

Empirically, fundamental indexes appear to be superiorly constructed relative to cap-weighted indexes. It is perhaps more accurate, however, to say that cap indexes are flawed by construction. If prices are noisy (too volatile given the changes in companies' fundamentals), cap weighting will introduce a return drag. Clearly, in this environment, fundamental weighting is the right index construction. On the other hand, if prices are perfectly efficient, then investors should be indifferent between holding any well diversified portfolios with similar risk characteristics. That is, if the market is efficient, fundamental indexes are as good as cap indexes. Therefore, we expect fundamental indexing to outperform cap indexing when prices are inefficient, and we expect fundamental indexing to
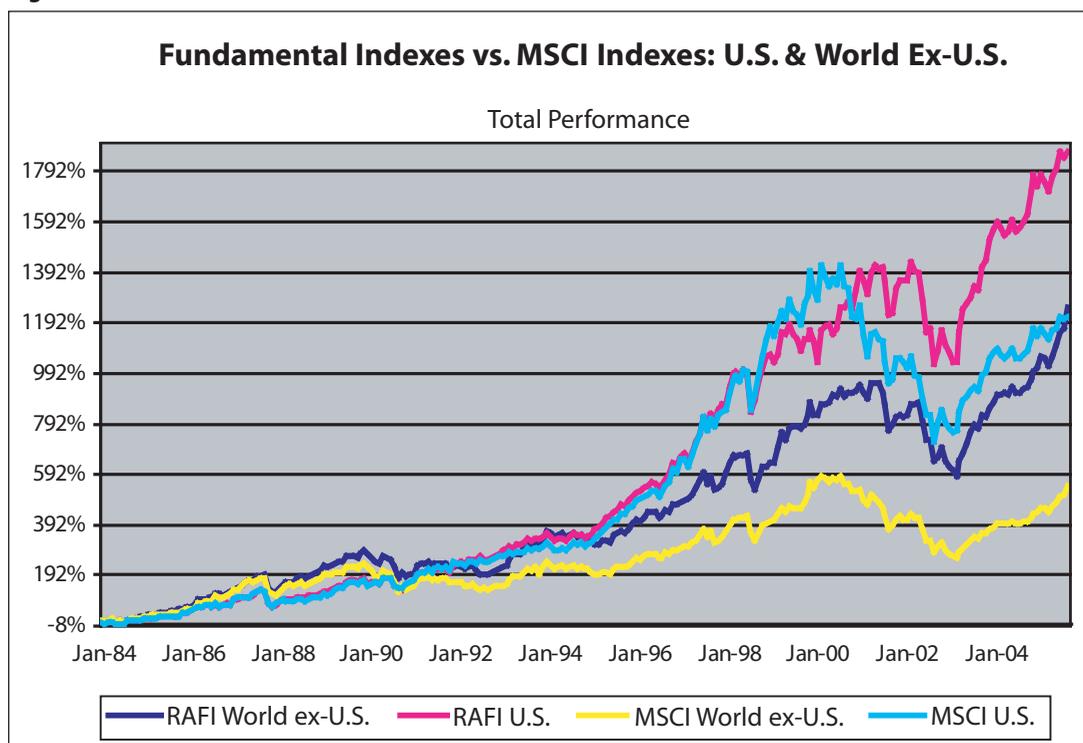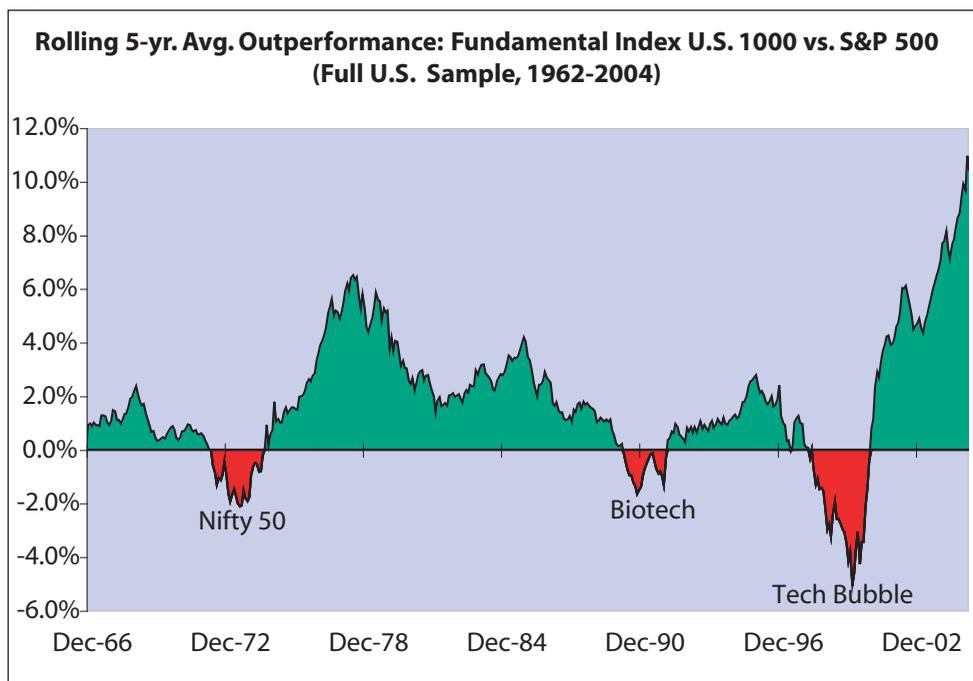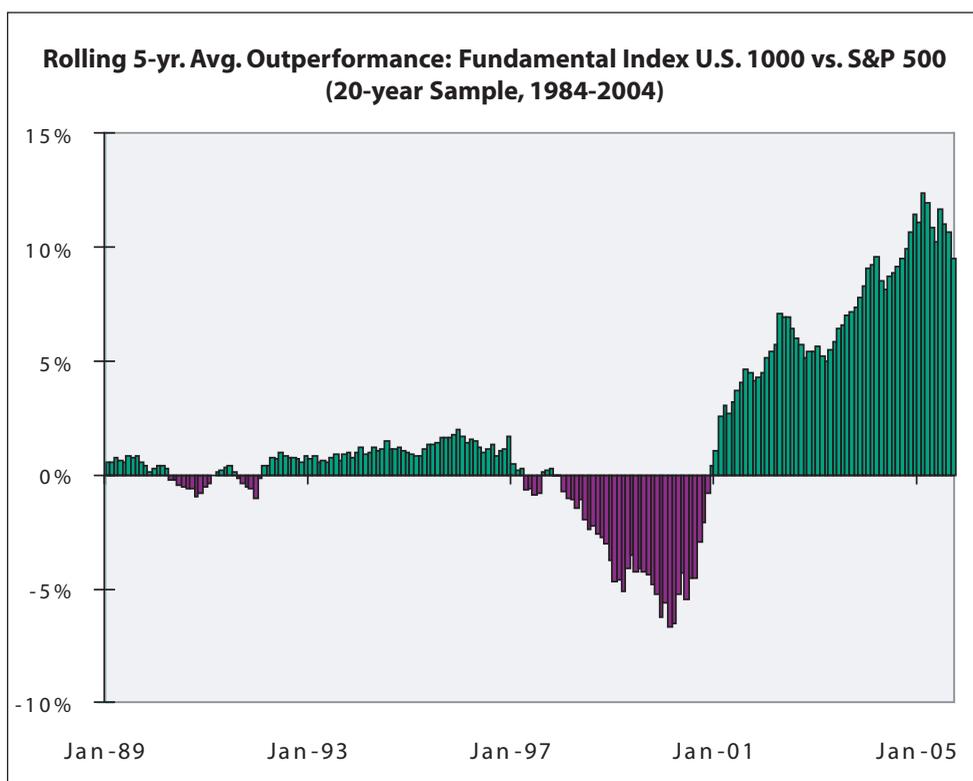
Figure 4

Fundamental Indexes vs. MSCI Indexes: U.S. & World Ex-U.S.

Total Performance

Legend: RAFI World ex-U.S. — RAFI U.S. — MSCI World ex-U.S. — MSCI U.S.

Figure 5A

Rolling 5-yr. Avg. Outperformance: Fundamental Index U.S. 1000 vs. S&P 500 (Full U.S. Sample, 1962-2004)

Figure 5B

Rolling 5-yr. Avg. Outperformance: Fundamental Index U.S. 1000 vs. S&P 500 (20-year Sample, 1984-2004)

tech sector ballooned to almost 25 percent of the entire portfolio at the height of the bubble (from an eight percent exposure in 1995). Compare that to the fundamental index's exposure of 10 percent in 2000 (from six percent in 1995). Cap indexes, like the Russell 1000 and S&P 500, were drawn into the tech bubble as the tech names rapidly appreciated in price and market cap. As P/Es increased into the stratosphere, more and more index money was forced into Internet and telecom companies, which in turn pushed the valuation level on those companies higher, fueling even higher P/Es. Fundamental indexes do not experience this problem. Under the fundamental indexing methodology, unless companies grow their cash flows, dividends, sales and book value faster than the rest of the economy, they do not receive additional allocations. In a fundamental index, stocks that were popular and trading at a premium in 1999, like Cisco, Worldcom, AOL and other tech names, would not receive overweights at the expense of the utilities, financials and energies, which produced larger and more robust cash flows.

Are Fundamental Indexes Just Value Indexes?

By construction, fundamental indexing underweights growth companies that are not growing their fundamentals. In this regard, fundamental indexes will tend to have lower P/Es and higher dividend yields than standard cap-weighted indexes. Fundamental indexing, however, is far from simple value investing. We show the performance of the U.S. Fundamental Index 1000 against the Russell 1000 Value Index in Figure 6. The U.S. Fundamental Index 1000 and 2000 outperform the Russell 1000 and 2000 Value reliably. Additionally, we show in Figures 3A-B that the U.S. Fundamental Index 1000 outperforms the S&P 500 and the U.S. Fundamental Index 2000 outperforms the Russell 2000 in both bull markets and expansionary economic environments; value indexes

keep pace with cap indexing when prices are efficient.

One intuitive way to understand why fundamental indexes outperform cap indexes is to examine the volatility of the cap index's sector exposure vs. the fundamental index's sector exposure. We show the sector exposures of the U.S. Fundamental Index 1000 vs. a cap-weighted peer benchmark in Figures 7 A-B.

Observe that the cap-weighted index's exposure to the

do not outperform in these environments.

Additionally, value indexes are limited in capacity and do not provide broad market participation and diversification.

One reason that the fundamental indexes outperform value indexes is because value indexes are based on capitalization, and discard (or underweight significantly) many growth companies that are growing their fundamentals equally rapidly. By contrast, fundamental indexes hold a significant portion in growth companies that are growing their fundamentals.

Turnover Cost?

Fundamental indexes do have higher turnover than cap-weighted indexes. By construction, cap indexes do not require rebalancing. Turnover comes largely from index reconstitution—when names are added or deleted from the index constituent list. Fundamental indexes are designed to rebalance annually. This imposes rebalancing turnover, in addition to reconstitution turnover.

Fundamental indexes, however, do have surprisingly favorable turnover. For the U.S. Fundamental Index 1000, the turnover is estimated at 10 percent to 12 percent per annum, depending on the sample period. Much of the increase in index turnover occurred in the late-1990s as the Fundamental Index 1000 rebalanced aggressively away from tech stocks. The S&P 500 and Russell 1000 report turnover of six percent to eight percent.

It is worth noting that much of the cap index turnover is spent on tiny names at the bottom of the list. These stocks are particularly expensive to purchase and sell. The turnover in the fundamental indexes is largely due to rebalancing the
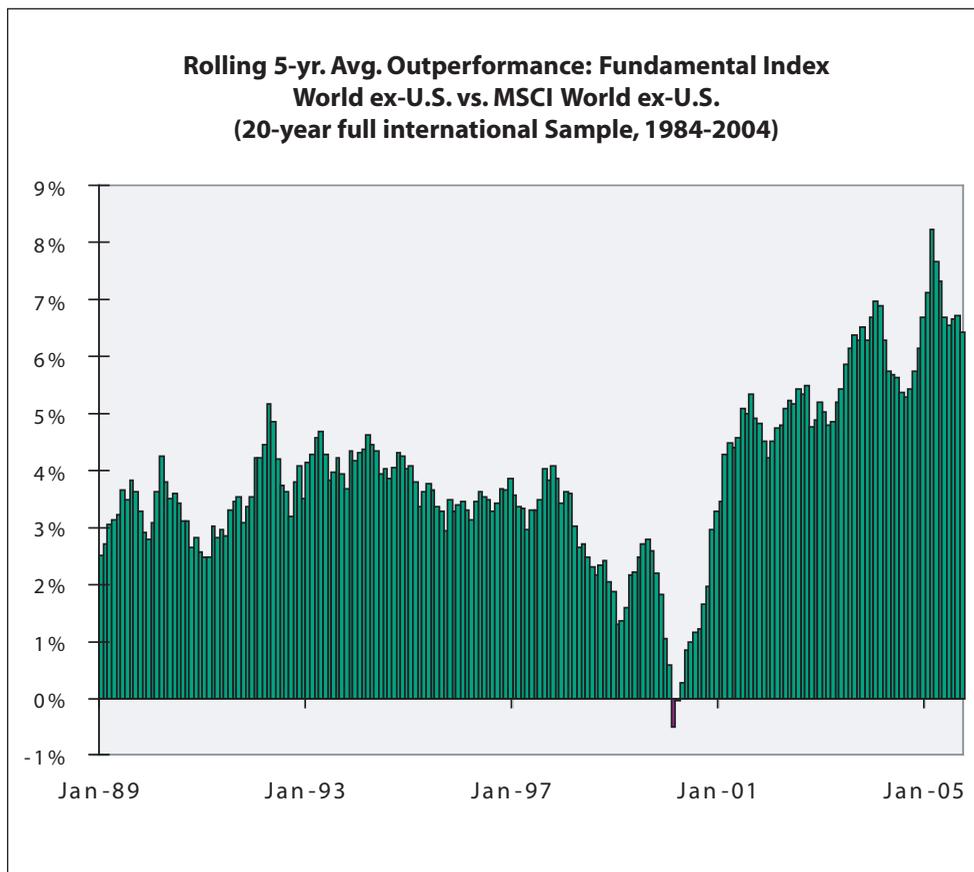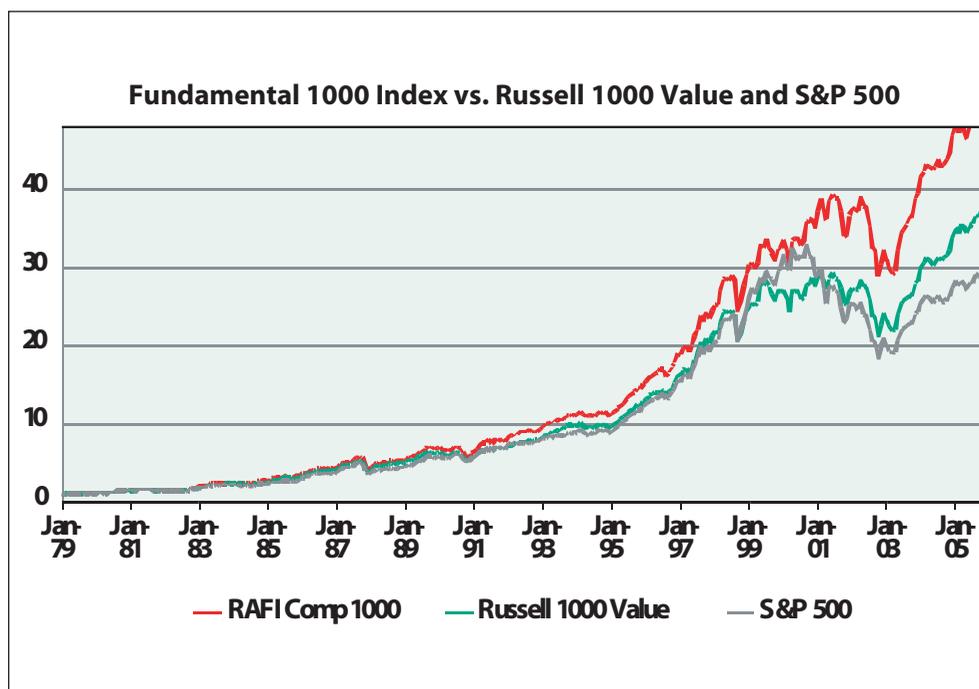
Figure 5C

Rolling 5-yr. Avg. Outperformance: Fundamental Index World ex-U.S. vs. MSCI World ex-U.S. (20-year full international Sample, 1984-2004)

Figure 6

Fundamental 1000 Index vs. Russell 1000 Value and S&P 500

— RAFI Comp 1000   — Russell 1000 Value   — S&P 500

Figure 7A

Sector Weightings, S&P 500 Index
(12-Month Centered Moving Average, 1962-2004)

Legend: Other, Non-Durable, Chemical, Telecom, Manu fact., Emergency, Retail, Durable, Electric Eq., Utility, Health, Finance

Figure 7B

Sector Weightings, Fundamental Index
(12-Month Centered Moving Average, 1962-2004)

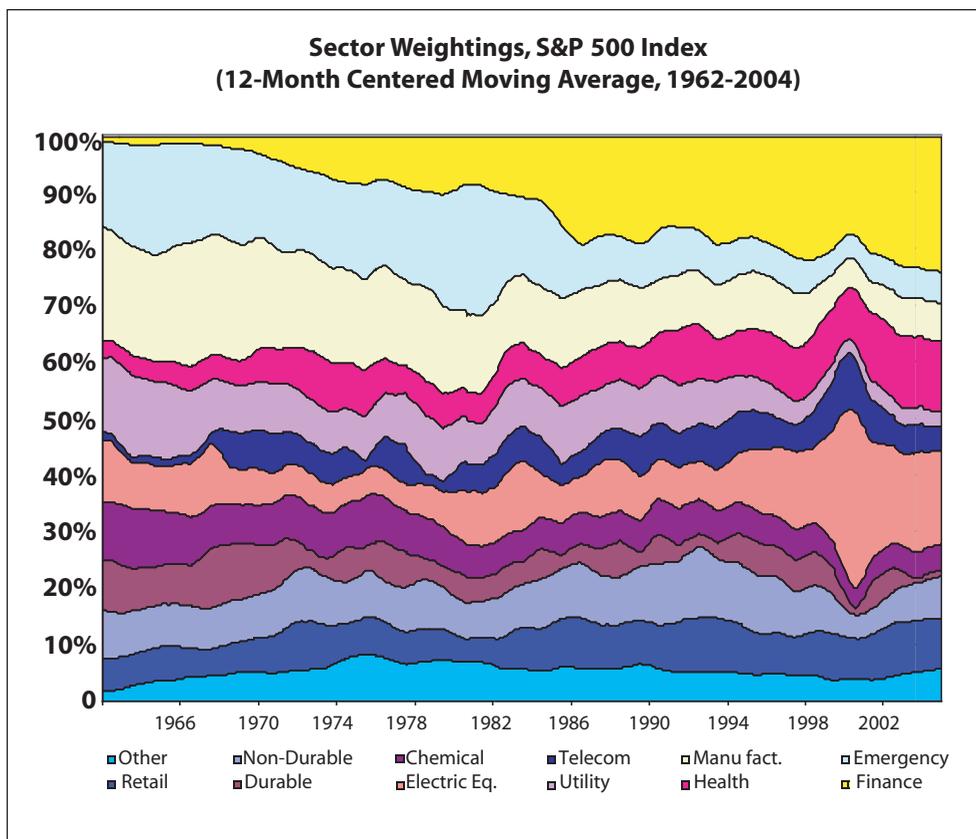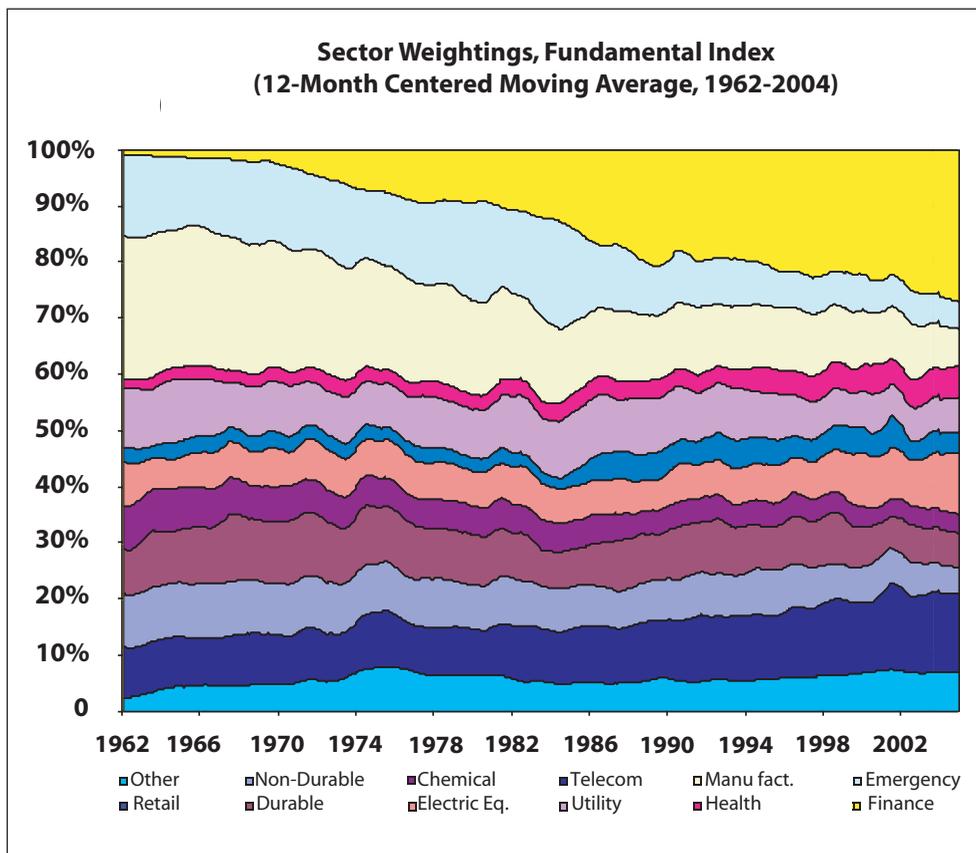Legend: Other, Non-Durable, Chemical, Telecom, Manu fact., Emergency, Retail, Durable, Electric Eq., Utility, Health, Finance

large names—i.e., selling Cisco to buy GE (in 1999). Therefore, the true turnover cost associated with maintaining a Fundamental index versus a cap-weighted index may be comparable, if not favoring the fundamental index. In any event, the turnover costs would not erode the fundamental index's alpha against its cap benchmark.

When Does Fundamental Indexing Not Work?

Revisiting Figures 5A-C, we find that fundamental indexes underperform in a bubble environment. The U.S. Fundamental Index 1000 underperformed during the Nifty 50 era, the biotech bubble and the tech bubble. This should not be surprising. During periods of rapid and irrational P/E expansions, fundamental indexes aggressively rebalance away from stocks with large market capitalizations relative to their fundamental measurements, and into stocks with large fundamental measurements relative to their capitalization. This rebalancing hurts performance in markets that exhibit extreme momentum.

Conclusion

Fundamental indexing eliminates the return drag inherent in cap-weighted indexes. The methodology preserves the capacity, liquidity, diversification and broad-market participation that are the chief benefits of traditional cap indexes. Empirically, we observe that fundamental indexes outperform their respective cap benchmarks significantly—two percent per annum in the U.S. and 3.5 percent globally. This outperformance is statistically significant and robust over different market environments, and also is present in the small and mid-size indexes.