Nomura Securities Co Ltd, Tokyo
Global Quantitative Research

Global fundamental indices

Do they outperform market-cap weighted indices on a global basis?

Date
28 October 2005

This report is a translation of an article appearing in the Japanese-language Security Analysts Journal October 2005 Vol. 43 No. 10.

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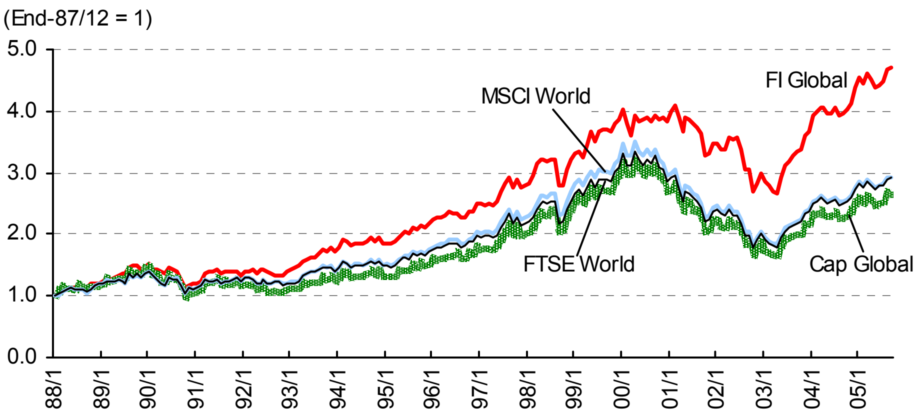
Summary

In this report, we present the new concept of fundamental indexing developed by Robert D. Arnott et al (2005). Fundamental indexing assigns index weightings to stocks based on the use of fundamentals that are not tied to share prices, rather than using the commonly accepted method of assigning index weightings based on market capitalization. Mr Arnott claims that historical analysis of US stocks shows that fundamental indices have outperformed market-cap weighted indices consistently over time. In this report, we examine the performance of fundamental indices on a global basis using indices we formulated based on the methods of Mr. Arnott and his colleagues. Our analysis shows that fundamental indices have outperformed market-cap weighted indices in all the countries included in our study.

Cumulative performances of global indices



Note: Cumulative performance of each index is based on a value of one from the starting date of end-December 1987.
Source: Nomura

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Introduction

In an article published in 2005 (note 1), Robert Arnott, Jason Hsu, and Philip Moore (hereafter referred to as Arnott) proposed a new indexing method that differs from the commonly accepted method of assigning index weightings based on market capitalization. Rather than using market capitalization, the trio proposed using fundamental measures of company size to weigh stock indices. The fundamentals the trio uses are gross dividends, cash flow, equity book value (shareholders' equity), and gross sales. The use of cap-weighted indices as benchmarks in equity investment management has become in effect conventional practice, and many passive funds are managed based on cap-weighted indices. One of the key conclusions of the capital asset pricing model (CAPM), a pillar of modern finance theory, is that the "market portfolio" is mean-variance optimal. The foundation for Arnott's fundamental indexing approach is based on two key claims related to the CAPM market portfolio. First, CAPM assumes the market portfolio includes all investable assets (this would extend from marketable securities such as common stock to commodities and human capital, for example) and standard cap-weighted indices do not measure up on this score. Second, numerous empirical studies (note 2) have rejected the mean-variance efficiency of cap-weighted indices, which is equivalent to rejecting them as close proxies for the CAPM market portfolio. If cap-weighted indices are not sufficiently mean-variance efficient, it should be possible to construct indices that provide superior mean-variance performance compared with those of cap-weighted indices. Fundamental indexing arose as a response to this issue.

According to Arnott, one of the shortcomings of cap-weighted indices is that, compared with the "true" equity market portfolio, these indices will consistently be overweight currently overpriced stocks and underweight undervalued ones, with this bias giving rise to systemic error. Put differently, if you subscribe to the notion that share prices converge towards a "true" equity value over the longer term, this suggests that some stocks are overvalued (perhaps around half of them) and some stocks are undervalued (the other half), and that the process of share prices converging towards their "true" equity value over time creates negative "alpha" for all stocks. Arnott claims that finding a way to neutralize this error is important. If an index is constructed using equal weighting without any price weighting, this error does not arise, but an equal-weighted index does not give any consideration to company size, which means it would not be viable as a passive investment method for large sums of institutional pension money. In view of this, the fundamental indexing approach proposed by Arnott uses more objective economic measures such as sales and equity book value as proxies of company size, rather than market capitalization, which stems from investor valuation. While the metrics used by Arnott's fundamental indexing approach have some correlation to market capitalization, these metrics are not directly tied to share prices. As a result, fundamental indexing has less systemic error than the 100% structural weighting error of cap-weighted indices.

Arnott showed using historical US share price data that fundamental indices consistently outperformed cap-weighted indices over time. In this report, we test and verify if this pattern of outperformance holds on a global basis. We constructed global fundamental indices using constituent stocks of the FTSE Developed Index and tested the performance of these indices. If our study also shows that fundamental indexing outperformed cap-weighted indices, this would support Arnott's assertion (note 3). For this reason, we constructed our global fundamental indices to adhere as closely as possible to the definitions used by Arnott (note 4).

Our paper is structured in the following way. First, we explain how we constructed our global fundamental indices. Second, we use multiple measures to compare the performance of the indices we constructed. Third, we compare historical returns of foreign equity portfolios managed by Japanese asset managers with the estimated returns if those assets had been passively managed using global fundamental indexing. Fourth, we consider differences in returns, and we look particularly closely at comparisons against existing cap-weighted value indices.

Note 1: US-based Research Affiliates has applied for a patent for the construction and management of indices based on objective non-capitalization measures of company size (Publ. No. US-2005-0171884-A1 and WO 2005/076812).

Note 2: Among the academic papers that have rejected the efficiency of various cap-weighted market indexes are Ross (1978), Gibbons (1982), and Gibbons, Ross, and Shanken (1989).

Note 3: We do not think that observed outperformance by fundamental indexing on a global basis is sufficient to show the superiority of fundamental indexing.

Note 4: We determined precise parameters such as the number of stocks and N/A data after meeting several times with Robert Arnott and Jason Hsu.

■ Construction of global fundamental indices

In the place of market cap, the fundamental indexing method proposed by Arnott uses other metrics as proxies for company size to assign index weightings to stocks. These metrics are as follows:

- Equity book value
- Cash flow (trailing five-year average)
- Gross dividends (trailing five-year average)
- Gross sales (trailing five-year average)

For equity book value, we use the most recent single-year data. For cash flow, gross dividends, and gross sales, however, we use trailing five-year averages because the use of single-year data for these three metrics results in substantial volatility in many cases, which in turn sharply increases the turnover that accompanies rebalancing.

Using the same methodology and metrics as Arnott, we have constructed two global fundamental indices: one is a global fundamental index similar to MSCI World Index and the other is a global ex-Japan fundamental index. We have also constructed a fundamental index for each country in the FTSE Developed Index series.

The corporate fundamental data necessary to build these indices are from the Worldscope database; this data has all been converted into US dollar terms. The study period extends for 212 months from January 1988 through August 2005; the longest period possible to analyze using data from Worldscope. For the cash flow metric, we use operating cash flow. When operating cash flow data is not available, we use net profits + depreciation expense as a proxy.

FTSE Group, the global index provider, and Research Affiliates (founded by Robert Arnott) announced in July 2005 that they would introduce and maintain data on fundamental indices (note 5). For this reason, we use the constituent stocks of the FTSE Developed Index since 1994, which is when FTSE started publicly disclosing this information, as the sample population in our analysis. For our sample population prior to 1994, we use all stocks belonging to the FTSE Developed Index (23 countries listed in Exhibit 1) for which corporate fundamental data is available from Worldscope. Likewise, for stock price information, we use FTSE data for years dating back to 1994, and for years prior to this, we use Worldscope data; both data sets were converted into US dollar terms. Because there are insufficient constituent stocks in the FTSE Developed Index series for some individual countries for which we calculated fundamental indices, we use all stocks for which corporate fundamental data is available from Worldscope for both years prior to and following 1994. In the case of countries for which there are not enough constituent stocks over the selected study period even when all stocks for which corporate fundamental data is available from Worldscope are used in our sample population, we shorten the study period. The number of constituent stocks for each country’s index in our study and the length of the study period is shown in Exhibit 1 (note 6).

Using the same methodology as Arnott, we rebalance our indices and reset portfolio weightings once a year on 1 January based on the data available on the last trading day of the prior year. We use fundamental data with a four-month lag, taking into account when this data is available. This means for our 1 January rebalancing we are able to use fundamental data for fiscal periods that ended as late as end-August of the prior year.

Note 5: The FTSE RAFI US 1000 and FTSE RAFI Global ex-US 1000 indices will be introduced in autumn 2005, according to a 19 July 2005 press release by FTSE and Research Affiliates.

Note 6: We decided on the number of constituent stocks for each country’s fundamental index based on our meetings with Robert Arnott et al.

1. Number of constituent stocks in each country's fundamental index

	Fundamental Index Regional Index		FTSE Developed		
	No. of companies	Analysis period	No. of companies	FTSE market cap	Weight
				$mn	%
US	1,000	88/1–	735	12,454,579	53.48
Japan	400	88/1–	477	2,119,369	9.10
UK	250	88/1–	146	2,530,421	10.87
France	100	88/1–	62	1,023,251	4.39
Germany	100	88/1–	53	733,571	3.15
Canada	100	88/1–	73	723,544	3.11
Italy	80	88/1–	47	448,909	1.93
Australia	80	88/1–	116	553,497	2.38
Hong Kong	80	88/1–	109	298,004	1.28
Switzerland	50	88/1–	33	673,763	2.89
Spain	50	89/1–	29	413,575	1.78
Netherlands	50	89/1–	21	349,166	1.50
Sweden	50	88/1–	32	250,072	1.07
Belgium, Luxembourg	30	88/1–	18	121,079	0.52
Finland	30	90/1–	12	119,433	0.51
Singapore	30	92/1–	51	89,375	0.38
Denmark	30	88/1–	13	87,540	0.38
Norway	30	89/1–	8	73,088	0.31
Ireland	30	90/1–	8	72,221	0.31
Greece	30	93/1–	12	57,736	0.25
Austria	30	89/1–	8	39,619	0.17
Portugal	30	92/1–	8	34,312	0.15
New Zealand	30	95/1–	18	22,078	0.09

Note: We use the constituent stocks in the FTSE Developed Index, market caps, weightings as of end-August 2005 based on data from FTSE.
Source: Nomura

A detailed look at how we constructed our fundamental indices

When rebalancing, we first calculate the metric weights of each stock for each of the four fundamental metrics mentioned above. We then took the four fundamental metric weights for each stock and calculated the average of these metric weights, which we call the composite fundamental metric. We then rank all the stocks by their composite fundamental metrics and select the 1,000 largest stocks by their composite fundamental metrics for the stock rosters for our global fundamental indices (for individual country indices, we separately rank a predetermined number of stocks for each country). For index weights, we used a weighted average based on the composite fundamental metrics.

However, we apply special treatment for companies that did not distribute dividends, following the methodology used by Arnott. As Arnott states, many companies choose not to pay dividends for tax and other reasons rather than because they have small or weak cash flows. For companies not paying a dividend, we therefore forego the gross dividend metric and instead use the average of the three other company-size metrics to calculate the composite fundamental metric of such stocks.

For benchmarking purposes, we considered MSCI World and FTSE Developed to be comparable indices for the global fundamental index we constructed using the aforementioned methodology. That said, there are no cap-weighted indices that are exact parallels of the global fundamental index in terms of the number of constituent stocks, the timing of rebalancing, and other attributes. So as to isolate the disparity in performance stemming from different weighting methods (for the metrics used) and minimize the impact of other differences such as the number of constituent stocks and the timing of rebalancing on performance, we constructed as a reference a cap-weighted index that, aside from weighting methods, is constructed using the same methods and rules as our fundamental indices. This reference index contains the 1,000 largest stocks in the world by market cap on a cap-weighted basis and allows for direct comparisons of performance between it and our fundamental indices that are not complicated by differences in the number of constituent stocks, the timing of rebalancing, and other factors. For the same reason, we also constructed reference cap-weighted indices with an equal number of stocks as those in each in our fundamental indices for individual countries.

■ Relative performance of fundamental indices

Exhibit 3 shows the cumulative performance since January 1988 of the global fundamental index (FI Global) (comprises 1,000 stocks from 23 countries including Japan), the reference cap-weighted index (Cap Global), MSCI World index, and FTSE World index (note 7). Exhibit 4 shows the fundamental index ex Japan (FI ex Japan) (comprises 1,000 stocks from 22 countries excluding Japan) and benchmarks with similar configurations. Exhibit 2 lists key performance attributes such as average returns (geometric, annualized) and volatility. The share price returns shown in these exhibits do not include dividends, and are not adjusted for transaction and other costs.

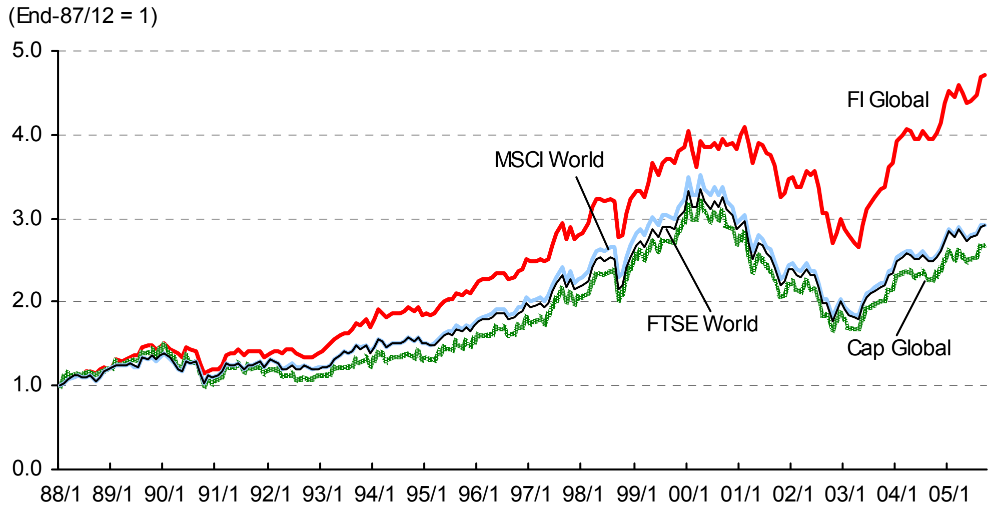
Exhibit 3 verifies that the returns of the global fundamental index were sharply higher than those of the other indices over the study period. The average return (geometric, annualized) of FI Global over the roughly 18 years from 1988 was 8.78%, exceeding by 3.23ppt the 5.55% return of the reference Cap Global index over the same span. FI Global's average annual return was also more than 2ppt greater than those of the other benchmark indices. These results are consistent with the research results from the study performed on US data by Arnott in 2005. The 13.14% (calculated on an annualized basis) volatility of FI Global was about 1ppt below the levels of the other indices (all were above 14%). FI ex Japan exhibited similar performance characteristics as those of FI Global. The average return (geometric, annualized) of FI ex Japan was 10.26%, which was more than 2% greater than the average returns of the other indices.

2. Performance characteristics of key indices

		Ending value of $1	Geometric return %	Volatility %	Sharpe ratio
Global Index	FI Global	4.72	8.78	13.14	0.33
	Cap Global	2.67	5.55	14.19	0.08
	MSCI World	2.93	6.08	14.26	0.12
	FTSE Developed	2.92	6.06	14.40	0.11
Global Index ex Japan	FI ex Japan	6.12	10.26	13.44	0.43
	Cap ex Japan	4.43	8.42	13.60	0.29
	MSCI Kokusai	4.33	8.30	13.67	0.28
	FTSE World ex Japan	4.33	8.29	13.68	0.28

Note: Geometric returns and volatility are shown on an annualized basis.
Source: Nomura

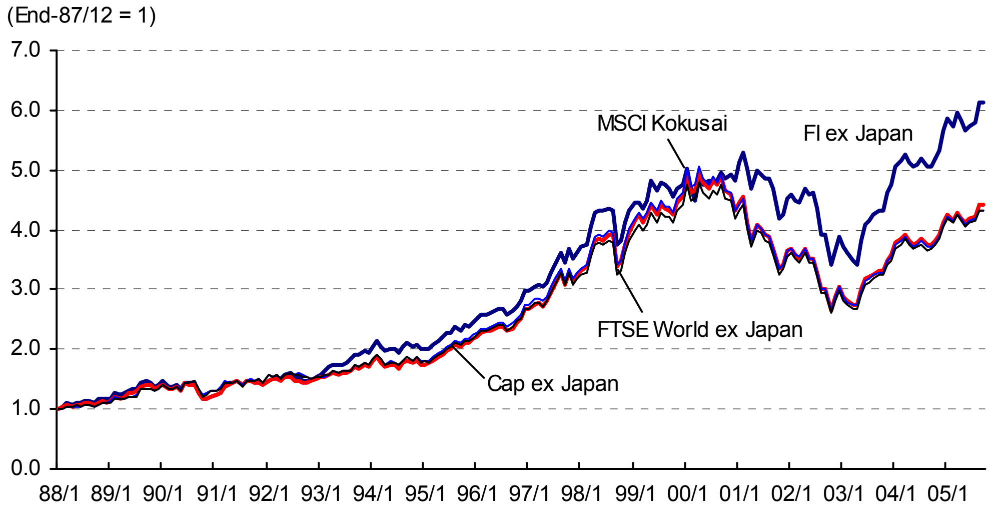
3. Cumulative performances of global indices



Note: Cumulative performance of each index is based on a value of one from the starting date of end-December 1987.
Source: Nomura

Note 7: FTSE Developed is a better benchmark than FTSE World considering the stock universe used in this analysis, but since we could not obtain index data for the entire length of the study period, we used FTSE World as a proxy. The difference between the two indices is that FTSE World includes stocks from "Advanced Emerging" countries (six countries as of end-August 2005) but FTSE Developed does not. The weight of these six countries in FTSE World was around 4.5% as of end-August 2005.

4. Cumulative performances of global indices (ex Japan)



Note: Cumulative performance of each index is based on a value of one from the starting date of end-December 1987.
Source: Nomura

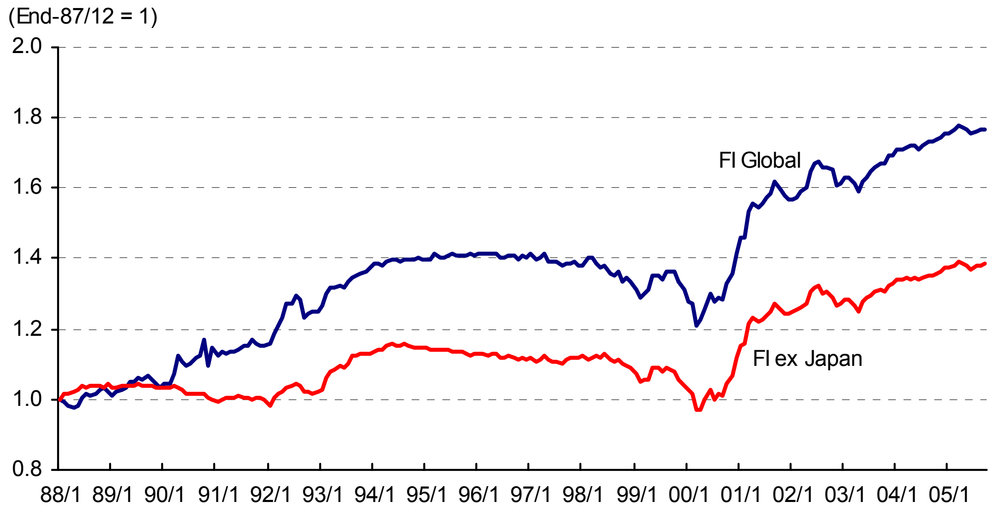
We look next at the relative performances of the fundamental indices versus the benchmark indices. Exhibit 5 shows the statistical significance of the excess return versus the benchmark indices and of the CAPM alpha for both FI Global and FI ex Japan. The t-statistics show that CAPM alpha versus the benchmark indices is significant in nearly all cases for both FI Global and FI ex Japan. The information ratio (IR) based on the reference cap-weighted indices is 0.66 for the Cap Global and 0.49 for Cap ex Japan, which is in synch with the results of Arnott's US study, which showed an information ratio of 0.50. We think these figures confirm the strong relative performances of FI Global and FI ex Japan.

5. Relative performance of fundamental indices versus benchmarks

Index	Benchmark	Excess return vs benchmark			TE	IR	CAPM Beta	CAPM Alpha		
			t-stat						t-stat	
FI Global	Cap Global	3.23	2.76	**	4.92	0.66	0.87	3.37	3.11	**
	MSCI World	2.70	1.90		5.97	0.45	0.84	2.97	2.26	*
	FTSE World	2.72	1.90		6.02	0.45	0.83	3.00	2.29	*
FI ex Japan	Cap ex Japan	1.84	2.05	*	3.76	0.49	0.95	2.03	2.30	*
	MSCI Kokusai	1.96	1.65		4.99	0.39	0.92	2.28	1.96	
	FTSE World ex Japan	1.97	1.71		4.82	0.41	0.92	2.27	2.02	*

Note: Excess returns, tracking error (TE), CAPM alpha are all shown on an annualized basis in percentage terms. The t-statistics for excess returns are based on a null hypothesis of zero. ** indicates statistical significance at the 1% level and * indicates statistical significance at the 5% level (we tested at both levels).
Source: Nomura

6. Relative performance of fundamental indices versus benchmarks



Note: Our definition of relative performance is the cumulative performance of the fundamental indices net of the cumulative performance of the reference cap-weighted indices. Our calculations are based on a value of one as of end-December 1987.
Source: Nomura

Exhibit 7 compares the turnover of the global fundamental indices versus the reference cap-weighted benchmarks. Since 1994, the annual turnover of the global fundamental indices averaged around 14% (one-way trades), which is nearly twice the 7% average for the reference cap-weighted indices. The disparity in annual turnover is somewhat larger than that found in Arnott's US application of fundamental indexing (10.55% for the fundamental composite index versus 6.30% for the reference cap-weighted index), but is in general agreement with Arnott's results. We think the turnover of the global fundamental indices is sufficiently low to be within the acceptable range for indexing.

7. Turnover of the global fundamental indices (%)

	Global Index		Global Index ex Japan	
CY:	FI	Cap	FI	Cap
88–89	12.82	18.35	12.96	20.11
89–90	12.71	14.41	12.75	14.57
90–91	14.06	16.19	13.63	15.91
91–92	12.02	15.68	12.41	16.59
92–93	12.06	15.82	11.40	15.52
93–94	12.90	15.03	14.10	15.92
94–95	10.36	4.33	10.01	4.30
95–96	12.64	9.34	12.11	9.91
96–97	11.30	5.91	10.47	5.64
97–98	13.99	8.27	11.60	7.26
98–99	14.57	8.84	15.05	8.25
99–00	20.67	8.68	19.19	8.86
00–01	18.20	11.64	18.86	11.72
01–02	14.65	5.93	14.48	5.06
02–03	13.83	4.42	13.80	3.85
03–04	14.32	5.94	14.21	6.62
04–05	8.91	5.78	9.19	5.92
Avg	13.53	10.27	13.31	10.35
Avg (94–)	13.95	7.19	13.54	7.04

Note: (1) The FI column shows the turnover (%) for the FI Global and the Cap column shows the turnover for Cap Global; (2) the turnover figures show one-way trades; (3) the replacement of all stocks in the index would represent 100% turnover; (4) the figures only reflect turnover from annual rebalancing; (5) we calculated turnover based on indices constructed from the entire stock universe of Worldscope from 1988-89 through 1993-94, and based on indices constructed from the stock universe of FTSE Developed from 1994-95.
Source: Nomura

Country fundamental index performance

The performance of the country fundamental indices for the 23 countries that make up FTSE Developed and the country cap-weighted indices that we constructed as reference benchmarks are shown in Exhibits 8 and 9.

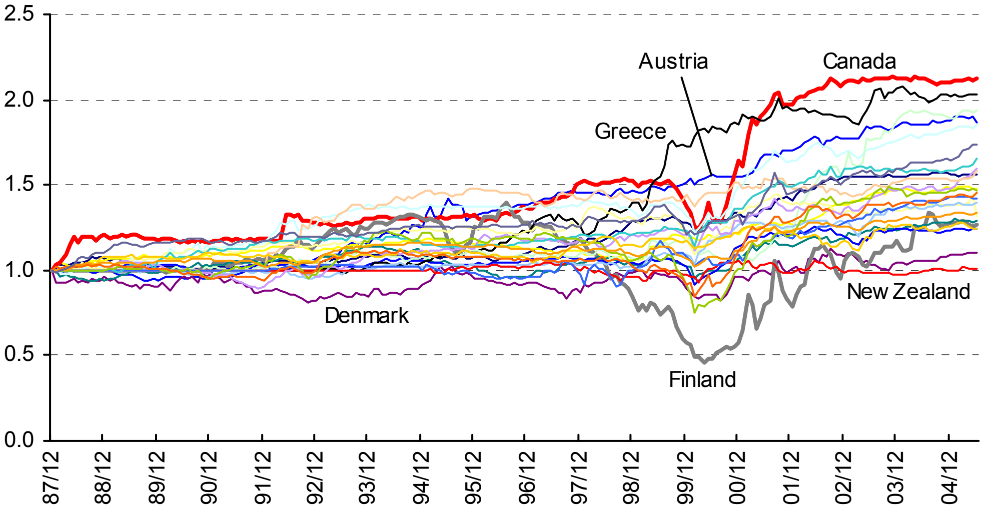
While it is important to note that the study periods differ for some countries, the largest excess returns (shown on an annualized basis) are Greece's 5.65% and Canada's 4.32%. The smallest excess return, at merely 0.13%, was earned in New Zealand, but the excess return was still positive in this case. Of particular interest to us is that for all 23 countries the CAPM alpha and the excess returns versus the returns of the reference cap-weighted indices were positive. The excess returns were statistically significant at the 5% level for 13 of the 23 countries. The fundamental index beta for nearly all countries was less than one, and CAPM alphas were significant at the 5% level for all countries for which excess returns were also significant at that that level. This data shows that fundamental indices outperformed cap-weighted indices in all the developed countries we examined without exception and thus supports Arnott's assertion that fundamental indices offer superior mean-variance performance.

8. Performance of country fundamental indices

	Excess returns vs benchmark			TE	IR	CAPM beta	CAPM alpha		
		t-stat						t-stat	
Australia	2.52	3.42	**	3.09	0.82	0.96	2.62	3.63	**
Austria	3.77	3.26	**	4.70	0.80	0.95	3.96	3.51	**
Belgium	2.25	3.27	**	2.88	0.78	0.97	2.33	3.41	**
Canada	4.32	2.49	*	7.24	0.60	0.76	4.54	3.17	**
Denmark	0.58	0.32		7.59	0.08	0.89	1.55	0.89	
Finland	1.54	0.35		17.38	0.09	0.65	3.55	1.08	
France	1.46	1.42		4.30	0.34	0.98	1.57	1.53	
Germany	1.23	1.34		3.82	0.32	0.97	1.33	1.47	
Greece	5.65	3.44	**	5.81	0.97	1.04	5.41	3.35	**
Hong Kong	3.51	2.80	**	5.24	0.67	0.86	3.61	3.12	**
Ireland	4.25	2.80	**	5.98	0.71	0.98	4.34	2.85	**
Italy	1.58	1.33		4.95	0.32	0.97	1.68	1.43	
Netherlands	2.01	2.13	*	3.81	0.53	1.05	1.87	2.04	*
New Zealand	0.13	0.09		4.57	0.03	1.02	0.13	0.09	
Norway	2.82	2.18	*	5.25	0.54	0.98	2.92	2.26	*
Portugal	3.42	2.25	*	5.58	0.61	0.94	3.59	2.42	*
Singapore	2.63	1.44		6.72	0.39	1.02	2.63	1.43	
Spain	3.04	2.92	**	4.23	0.72	0.92	3.45	3.62	**
Sweden	2.34	1.20		7.95	0.29	0.93	2.73	1.42	
Switzerland	1.24	1.30		4.00	0.31	1.06	0.93	1.00	
UK	1.65	2.09	*	3.30	0.50	0.99	1.67	2.11	*
US	2.13	1.55		5.75	0.37	0.87	2.64	2.02	*
Japan	3.15	2.99	**	4.41	0.71	0.98	2.99	2.84	**

Note: For each country, we compared the fundamental index performance with the reference cap-weighted index performance. Excess returns, tracking error (TE), CAPM alpha are all shown on an annualized basis in percentage terms. The t-statistics for excess returns are based on a null hypothesis of zero. ** indicates statistical significance at the 1% level and * indicates statistical significance at the 5% level (we tested at both levels).
Source: Nomura

9. Relative performance of country fundamental indices



Note: The fundamental index performance of each country is relative to the reference cap-weighted index of each country. We assumed a value of one for the starting date in our calculation of each country's relative fundamental index performance.
Source: Nomura

■ Changes in country weights and stock rosters

We divided the 23 countries that make up our global fundamental index into nine countries/regions. Exhibits 10, 11, and 12 show the weights assigned to each country/region in the global fundamental index and the reference cap-weighted index. The weights shown in Exhibit 10 are those immediately after rebalancing at the end of each year.

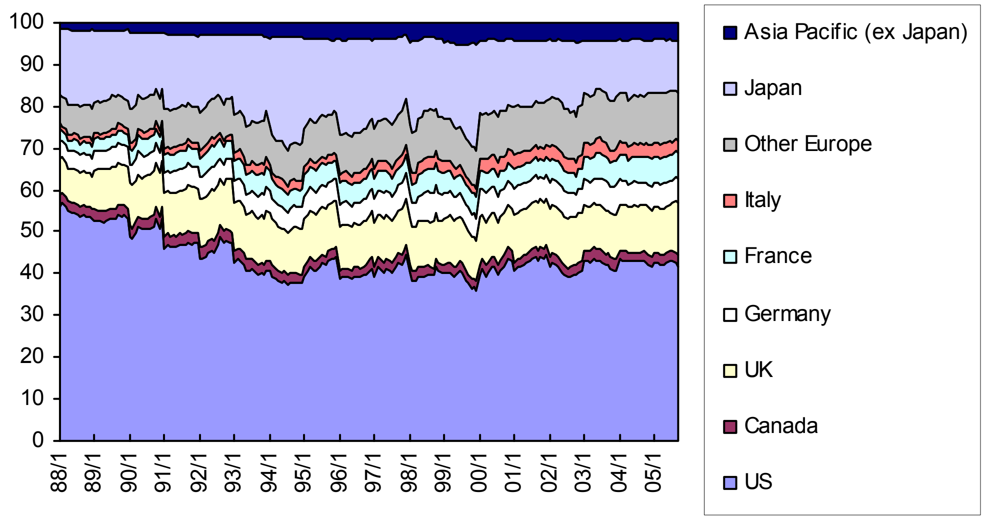
One of the most interesting features of the global fundamental index is the weight assigned to Japan. During Japan's economic bubble in the late-1980s, Japan's weight in the reference cap-weighted index rose to around 50%, but it stayed at around 20% in the global fundamental index. Japan's weight in the cap-weighted index has fallen by around 40ppts from the bubble peak and stood at about 10% in 2005. By comparison, Japan's weight in the global fundamental index stood at about 13% in 2005, down by 10ppts from a peak of about 23% in 1996. Compared with the size of the change in Japan's weight in the cap-weighted index, the change in the weight in the fundamental index is modest. This data supports Arnott's assertion that fundamental indices are less exposed to a key shortcoming of cap-weighted indices, namely the overweighting of overvalued stocks and underweighting of undervalued stocks.

10. Weight according to country/region after annual rebalancing

	US		Canada		UK		Germany		France		Italy		Other Europe		Japan		Asia Pacific	
	FI	Cap	FI	Cap	FI	Cap	FI	Cap	FI	Cap	FI	Cap	FI	Cap	FI	Cap	FI	Cap
88/1	56.15	33.31	2.72	3.12	8.64	8.15	4.29	3.54	2.73	1.55	1.31	1.65	6.92	4.37	15.59	42.67	1.65	1.63
89/1	52.67	28.84	2.61	1.77	9.28	7.19	4.67	2.60	2.88	1.22	1.38	1.36	7.52	4.36	17.12	51.02	1.88	1.63
90/1	48.92	28.40	2.68	1.70	9.90	6.99	4.67	2.64	3.54	1.85	1.51	1.35	8.02	4.66	18.55	50.89	2.21	1.51
91/1	45.90	35.41	2.84	2.20	10.51	8.44	5.04	4.10	4.04	3.39	1.54	1.73	9.34	6.17	18.20	36.95	2.59	1.62
92/1	43.75	34.63	2.87	2.04	11.48	9.58	5.12	4.03	4.49	2.78	1.64	1.35	8.91	5.79	18.97	37.75	2.79	2.05
93/1	42.62	43.92	2.76	1.88	11.56	10.36	5.10	4.06	4.93	3.35	1.86	1.24	9.02	6.65	19.29	25.83	2.86	2.71
94/1	40.53	40.37	2.50	1.56	11.50	10.82	5.23	3.92	4.72	3.62	1.70	0.82	8.90	6.84	21.28	26.32	3.65	5.71
95/1	39.25	37.51	2.35	1.43	11.30	9.99	5.36	3.86	5.18	3.39	1.88	1.23	9.36	7.13	21.38	30.93	3.94	4.53
96/1	38.61	44.13	2.07	1.28	10.70	9.36	5.12	3.54	5.02	3.03	2.12	1.26	9.36	7.77	23.20	25.59	3.81	4.04
97/1	39.45	47.51	2.24	1.86	10.54	10.72	5.69	3.99	4.55	3.31	2.46	1.36	9.60	8.58	21.49	18.07	3.98	4.60
98/1	40.09	54.22	2.24	1.98	10.77	10.93	5.88	4.13	4.46	3.53	2.31	1.70	9.78	9.41	19.90	11.11	4.57	2.98
99/1	40.04	54.59	2.14	1.50	11.15	10.13	6.13	4.48	4.75	4.10	2.63	2.28	10.29	10.65	18.25	9.69	4.62	2.58
00/1	39.94	50.21	2.23	1.88	11.27	9.37	6.72	4.48	4.31	4.57	3.17	2.07	10.89	9.50	17.13	14.82	4.34	3.09
01/1	40.48	53.07	2.20	2.10	11.48	9.89	6.37	3.69	4.62	4.90	3.30	2.40	11.48	10.17	15.78	10.59	4.30	3.18
02/1	41.52	56.16	2.34	2.05	11.76	9.86	6.14	3.60	5.18	4.65	3.22	2.11	11.79	9.58	14.02	8.77	4.04	3.24
03/1	43.04	53.48	2.29	2.27	11.03	10.15	6.14	2.94	5.60	4.88	3.31	2.51	11.68	10.01	12.73	10.01	4.18	3.76
04/1	43.32	52.80	2.18	2.51	11.15	9.62	5.97	3.66	5.97	5.11	3.04	2.27	11.67	10.20	12.68	10.11	4.02	3.71
05/1	42.77	51.18	2.23	2.84	11.04	9.51	5.85	3.70	6.01	5.09	3.38	2.57	12.08	11.21	12.71	10.08	3.94	3.81

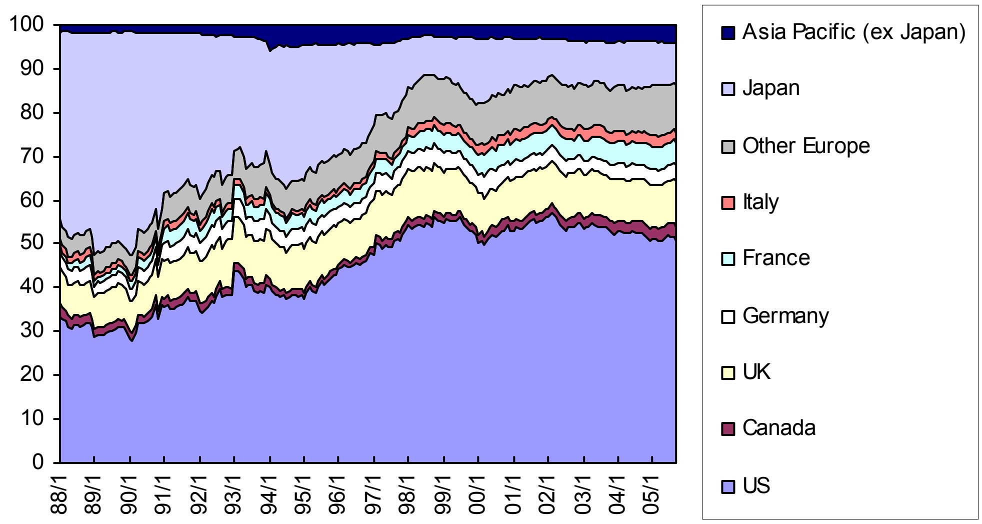
Note: (1) The FI column denotes the country/region weight in the fundamental index and the Cap column denotes the country/region weight in the reference cap-weighted index. Weights are shown are in percentage terms and represent weights immediately after annual rebalancing.
Source: Nomura

11: Weights of countries/regions in global fundamental index



Source: Nomura

12. Weights of countries/regions in reference global cap-weighted index



Source: Nomura

Exhibits 13 and 14 list the 30 stocks with the largest weights in the global fundamental index and the reference global cap-weighted index, respectively, as of the 1 January 2005 rebalancing. US-based Microsoft has the third-largest weight at 1.28% in the cap-weighted index, but is ranked 33rd in the fundamental index with only a 0.44% weight and thus does not appear in Exhibit 13. Among Japanese stocks, NTT ranks ninth in the global fundamental index but its lower weighting in the cap -weighted index does not even place it in the top 30.

13. Top 30 stocks by weight in global fundamental index

No.	Company	Country	Weight %
1	Exxon Mobil Corporation	US	1.34
2	General Electric	US	1.23
3	BP	UK	1.14
4	Citigroup	US	0.95
5	Vodafone Group	UK	0.94
6	HSBC Hldgs	UK	0.76
7	DaimlerChrysler	Germany	0.74
8	Verizon Communications	US	0.74
9	NTT	Japan	0.73
10	Ford Motor	US	0.72
11	Wal-Mart Stores	US	0.71
12	Royal Dutch Petroleum	Netherlands	0.70
13	Toyota Motor	Japan	0.70
14	Altria Group	US	0.69
15	Bank of America	US	0.67
16	SBC Communications	US	0.67
17	ING Group CVA	Netherlands	0.61
18	Total	France	0.61
19	General Motors Corp	US	0.61
20	Pfizer	US	0.56
21	AXA	France	0.55
22	JPMorgan Chase & Co	US	0.53
23	ChevronTexaco	US	0.53
24	American Intl Group	US	0.52
25	ENI	Italy	0.51
26	Berkshire Hathaway -CL A	US	0.49
27	GlaxoSmithKline	UK	0.47
28	Shell Transport & Trading Co	UK	0.46
29	UBS AG	Switzerland	0.46
30	Merck & Co	US	0.45

Note: Weights are as of 1 January 2005 immediately after rebalancing.
Source: Nomura

14. Top 30 stocks by weight in reference global cap-weighted index

No.	Company	Country	Weight %
1	General Electric	US	1.70
2	Exxon Mobil Corporation	US	1.49
3	Microsoft Corp	US	1.28
4	Citigroup	US	1.10
5	Wal-Mart Stores	US	0.99
6	BP	UK	0.93
7	Pfizer	US	0.90
8	Bank of America	US	0.85
9	Johnson & Johnson	US	0.84
10	HSBC Hldgs	UK	0.83
11	Vodafone Group	UK	0.79
12	American Intl Group	US	0.76
13	International Business Machines	US	0.73
14	Intel Corp	US	0.67
15	Toyota Motor	Japan	0.65
16	Novartis (REGD)	Switzerland	0.63
17	Procter & Gamble	US	0.62
18	JPMorgan Chase & Co	US	0.62
19	GlaxoSmithKline	UK	0.61
20	Total	France	0.61
21	Cisco Systems	US	0.57
22	Altria Group	US	0.55
23	Royal Dutch Petroleum	Netherlands	0.54
24	Berkshire Hathaway-CLA	US	0.50
25	ChevronTexaco	US	0.50
26	Verizon Communications	US	0.49
27	Sanofi-Aventis	France	0.49
28	Royal Bank of Scotland Group	UK	0.47
29	Wells Fargo & Company	US	0.47
30	Dell	US	0.46

Note: Weights are as of 1 January 2005 immediately after rebalancing.
Source: Nomura

■ Performance comparison versus foreign equity funds

In this section, we compare the performance of the global fundamental indices with those of foreign equity funds. The purpose of this exercise is to determine the relative performance of a passive fund that tracked fundamental indices, if such a fund were constructed.

We use Mercer Manager Performance Analytics data supplied by Mercer Investment Consulting to analyze the performance of foreign equity funds. This Japanese pension fund data is collected from trust banks, life insurers, and investment advisory companies that manage pension assets in joint accounts, composite accounts, and private-placement investment trusts. The performance figures include forecast dividend returns (income returns). For our analysis, we selected 120 actively managed funds that are benchmarked against the MSCI Kokusai (note 8). The steps we followed in our analysis are outlined below in the order in which analysis was conducted:

(1) We compared the returns of the global fundamental index (ex Japan) with the returns of actively managed funds that are benchmarked against MSCI Kokusai.

(2) We examined periods for which at least 24 consecutive months of data are available. The study periods are as follows: (i) January 1993–December 1995, (ii) January 1996–December 1998, (iii) January 1999–December 2001, and (iv) January 2002–June 2005 (note 9).

(3) We used stock price returns (calculated in yen terms) for the global fundamental index (ex Japan) (note 10). However, we subtracted estimated market impact (annual turnover of 15% x 100bps = 0.15%) from global fundamental index returns (note 11).

(4) We calculated excess returns for each actively managed fund by subtracting their actual returns from the forecast dividend-inclusive returns of the MSCI Kokusai (yen terms) for each study period. We calculated excess returns for the global fundamental index (ex Japan) by subtracting its returns from the stock price returns (does not include dividends) of the MSCI Kokusai (yen terms) (note 12).

(5) The performance distribution of the actively managed funds is shown in four segments: max, upper 25%, upper 50%, upper 75%, and 100%. We also calculated the percentile ranking of the global fundamental index (ex Japan).

Exhibit 15 contrasts the performance characteristics of the global fundamental index and actively managed funds. Excluding the period of January 1996 through December 1998 (which includes the start of the IT bubble), the global fundamental index (ex Japan) is among the best performers. Over the entire study period, the percentile rank of the average excess return of the fundamental index is 17.71% and that of the information ratio is 23.11%. From this, we can conclude that a global fundamental index fund, at least in the past, would have been an exceptionally attractive investment product for many investors.

Note 8: Our study period extends from January 1990 through June 2005, but the startup date and the end date for each fund differs. We limited our analysis to funds for which monthly returns are available. Our analysis was also limited to funds with average annual tracking error of between 1–10%.

Note 9: We did not examine years prior to 1992 because of an insufficient number of funds available for analysis.

Note 10: We did not calculate returns that included forecast dividends for the global fundamental index (ex Japan) since we did not have sufficient data on ex-dividend days.

Note 11: We estimated impact costs at 100bps after speaking to fund managers.

Note 12: We used different treatments of dividends in calculating the returns of the actively managed funds and those of the global fundamental index (ex Japan). The exclusion of dividend income returns in calculating returns for the global fundamental index (ex Japan) works as a handicap for this index in return comparisons. This is because gross dividends of constituent companies in the fundamental index tend to be relatively high since we use gross dividends as a metric in calculating weights for fundamental indices.

15. Comparison of excess returns: actively managed funds vs. global fundamental index fund

Excess return vs. benchmark (annualized, %)

Analysis period	Funds actually invested (benchmark: MSCI Kokusai)						Fundamental index	
	No. of funds	Max	Top 25%	Top 50%	Top 75%	Min	Avg (%)	Percentile
Jan 93–Dec 95	22	2.71	1.34	0.51	-2.41	-6.50	2.46	9.09
Jan 96–Dec 98	49	4.11	-0.15	-1.58	-2.99	-8.44	-1.58	48.98
Jan 99–Dec 01	74	9.38	1.72	-0.78	-2.23	-6.27	5.12	5.41
Jan 02–Dec 05	68	6.88	0.45	-0.96	-2.07	-3.83	3.19	7.35
Average	53	5.77	0.84	-0.70	-2.43	-6.26	2.30	17.71

IR (annualized)

Analysis period	Funds actually invested (benchmark: MSCI Kokusai)						Fundamental index	
	No. of funds	Max	Top 25%	Top 50%	Top 75%	Min	Avg (%)	Percentile
Jan 93–Dec 95	22	0.76	0.33	0.05	-0.38	-1.09	0.76	4.55
Jan 96–Dec 98	49	0.93	-0.04	-0.40	-0.72	-1.33	-0.70	71.43
Jan 99–Dec 01	74	2.81	0.36	-0.14	-0.66	-1.63	0.69	13.51
Jan 02–Dec 05	68	1.25	0.16	-0.38	-1.04	-1.97	1.11	2.94
Average	53	1.44	0.20	-0.22	-0.70	-1.51	0.47	23.11

Note: Fundamental index fund return is the index return net of the market impact (annual turnover of 15% x 100bps = 0.15%).
Source: Nomura

■ Comparison versus cap-weighted value indices

We remain uncertain as to the sources of the fundamental indices' excess returns over cap-weighted indices. The structure of fundamental indices is based on book value of shareholders' equity, gross dividends, and other items widely regarded as value factors. Because differences in stock weights versus those of cap-weighted indices can be attributed to size factors, Burton Malkiel and others have asserted that value and size effects could account for the excess returns of fundamental indices (note 13). While we do not rule out this possibility, we acknowledge the difficulties of debating the issue. If some given value effect were a source of outperformance, then it would follow that an index weighted according to this value metric ought to outperform. If the underlying tenet of fundamental indexing—i.e., shareholders' equity, sales, and other fundamental measures of corporate value are better measures of the true value of a company than market cap—holds true, then the already identified value effect probably should explain the excess returns of fundamental indexing. If so, there would be little merit to debating whether the source of excess returns stemmed from value effects or fundamental indexing effects. Consequently, our interest lies in whether performance differences exist between fundamental indices and cap-weighted value indices and, if so, which has greater merit for investors. We use empirical tests to examine this issue.

Using data for global indices, we compared the performance of fundamental indices and cap-weighted value indices. For our comparison, we used two existing value indices: MSCI World Value and FTSE World Value. Exhibit 16 outlines the construction method for these indices.

16. Construction method for two key value indices

	MSCI World Value	FTSE World Value
Composition method	The value contribution and the growth contribution are calculated with three kinds of value indices and five kinds of growth indices. The value ratio and the growth ratio are determined based on each contribution.	The value ranking and the growth ranking are calculated with four kinds of value indices and five kinds of growth indices. The value ratio and the growth ratio are determined based on each contribution.
Ratio	1.00 : 0.00	1.00 : 0.00
	0.65 : 0.35	0.75 : 0.25
	0.50 : 0.50	0.50 : 0.50
	0.35 : 0.65	0.25 : 0.75
	0.00 : 1.00	0.00 : 1.00
Indices	**Value**	**Value**
	- B/P	- B/P
	- E/P	- S/P (sales yield = sales / market cap)
	- D/P	- D/P
		- CF/P
	Growth	**Growth**
	- Estimated long-term EPS growth rate	- EPS growth rate for past 3 years
	- Estimated short-term EPS growth rate	- Sales growth rate for past 3 years
	- Internal growth rate	- Estimated EPS growth rate for next 2 years
	- Historical long-term EPS growth trend	- Estimated sales growth rate for next 2 years
	- Historical long-term SPS growth trend	- ROE x internal reserve ratio

Source: Nomura, based on MSCI, FTSE public releases

Note 13: Burton Malkiel, professor of economics at Princeton University, suggested that value and size effects could explain the excess returns of fundamental indexing at the 2005 Research Affiliates Advisory Panel.

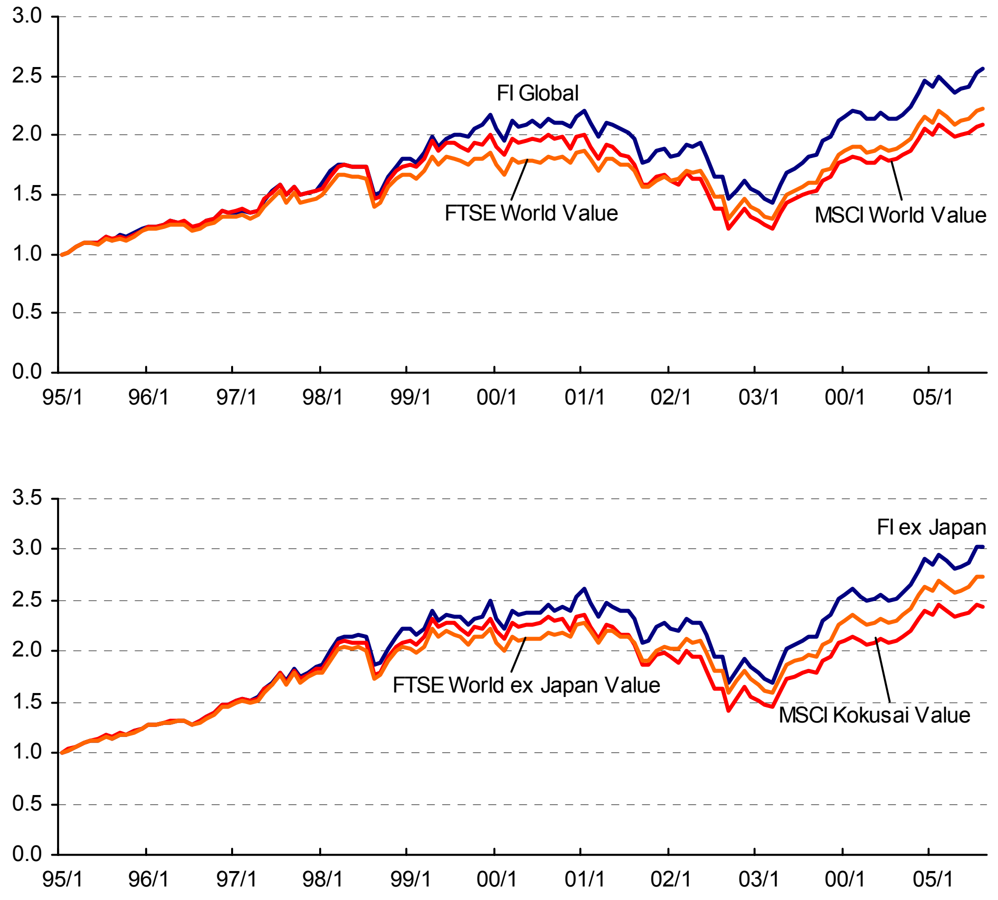
Exhibit 17 presents performance data for the cap-weighted value indices. This data shows that fundamental indices have outperformed existing cap-weighted value indices. Over our study period, the FI Global recorded an average annual CAPM alpha of 2.33% versus the MSCI World Value Index. Even for those that see fundamental indices as merely a type of value indexing, these results show that fundamental indices exhibit attractive returns versus those of existing value indices (note 14).

17. Performance comparison: fundamental versus existing value indices

Index	Period	Benchmark	Excess return vs. benchmark	Excess return t-test	TE	IR	CAPM beta	CAPM alpha	CAPM alpha t-test
FI Global	Full-term	MSCI World Value	2.02	1.66	5.11	0.39	0.86	2.33	2.06 *
	Since 1995	MSCI World Value	1.92	2.13 *	2.93	0.66	0.94	2.10	2.42 *
		FTSE World Value	1.30	1.68	2.52	0.52	1.02	1.24	1.60
FI ex Japan	Full-term	MSCI Kokusai Value	1.98	2.19 *	3.80	0.52	0.94	2.21	2.50 *
	Since 1995	MSCI Kokusai Value	2.03	2.49 *	2.66	0.77	0.95	2.27	2.87 **
		FTSE World ex Japan Value	1.01	1.44	2.27	0.44	1.04	0.80	1.17

Note: Excess returns, tracking error (TE), CAPM alpha are all shown on an annualized basis in percentage terms. The t-statistics for excess returns are based on a null hypothesis of zero. ** indicates statistical significance at the 1% level and * indicates statistical significance at the 5% level (we tested at both levels).
Source: Nomura

18. Performance of fundamental and existing value indices



Source: Nomura

Note 14: Arnott points out that existing value indices are ultimately indices that are weighted according to market cap and thus have the disadvantages of standard cap-weighted indices.

Performance is not the only advantage that fundamental indices have over cap-weighted value indices—they also have lower turnover rates. Exhibit 19 shows the average annual turnover rates of value indices versus that of our FI Global. The 13.5% annual turnover of the FI Global is much lower than the 28.1% turnover of the FTSE World Value. We think this difference stems from the different construction methods of the indices. Most standard cap-weighted value indices rank stocks according to some value metric and adopt the upper 50% in their stock rosters (note 15). This method causes substantial turnover in stocks near the cutoff line for inclusion or exclusion from value indices when they are rebalanced. By contrast, weight revisions to fundamental indices when they are rebalanced tend to be modest because the weights are directly determined by value metrics themselves.

19. Comparison of average annual turnover rates (% of one-way trades)

FI Global	MSCI World Value	FTSE World Value
13.53	19.05	28.10

Note: We used averages for every twelve months from 1998–2005 for FI Global. For MSCI World Value, we calculated average annual turnover rates based on half-yearly rebalancing for November 2003–May 2005 (our calculations based on MSCI data). As FTSE World Value has not disclosed turnover rates, we estimated average annual turnover based on stock data on the days before and after rebalancing for December 2004–June 2005.
Source: Nomura

Note 15: The value indices we used for comparison purposes in this report use methods they have devised to limit turnover rates. For example, instead of splitting stocks in half as 100% value and 100% gross, they allow for the use intermediary values such as 65% value and 35% gross, or combine multiple metrics to determine which stocks to include or exclude.

■ Conclusion

We applied the fundamental indexing methodology developed by Arnott et al to construct global fundamental indices and tested the performance of those indices using an array of measures. Our tests show that the performance of fundamental indices has surpassed that of market-cap weighted indices in all the countries that we examined. We are uncertain as to why fundamental indices outperform cap-weighted indices, but our tests have shown that this pattern, which was first observed for US stocks, holds true globally. We think this provides robust support for the case that fundamental indices outperform cap-weighted indices. We found in our comparisons of foreign equity investment funds that fundamental indices offer stability combined with strong investment performance (upper 23 percentile by average information ratio score). These results indicate to us that fundamental indices would be an attractive investment product for many investors. As a final test, we compared the performance of fundamental indices and cap-weighted value indices, which many think have similar performance characteristics. Our analysis showed that (1) the alpha of fundamental indices is larger than that of existing cap-weighted value indices and (2) turnover is lower. We consider these to be desirable characteristics for indexing.

In recent years an increasingly large portion of pension money has been allocated to passive funds benchmarked to indices (note 16). Management fees for passive investment are lower than those for active investment and large sums of money can be invested and managed in this manner. While these advantages are important drivers of this trend, the main argument behind the shift to passive investment is the premise that the market portfolio is the most efficient in a mean-variance framework. Yet, as numerous academic papers have shown, existing market-cap weighted equity indices are not necessarily optimally efficient by mean-variance measures. Moreover, we think investors can no longer afford to ignore the negatives that arise from the concentration of investment in passive funds linked to certain indices. In our view, passive investment management, which is premised on investment efficiency, has become increasingly divorced from this principle in practice for three reasons: (1) the large concentration of assets invested in passive funds benchmarked against certain popular indices, (2) the overriding emphasis that many institutional investors place on minimizing tracking error, and (3) trading geared to anticipating the movement of passive investment money. We wonder if too much passive investment money is concentrated in a handful of indices that may not be close proxies of the mean-variance optimal portfolio. We do not claim fundamental indices exhibit optimal efficiency in the mean-variance framework, but we do think new concepts in indexing and the diversification of indices designed to serve as benchmarks for passive investment are clearly a positive for the asset management community.

Note 16: The passive investment ratio for Japanese stocks as of end-March 2005 stood at 76.87% and the ratio for foreign equities was 79.86%, according to the FY04 asset management industry report and reference materials issued by the Government Pension Investment Fund.

We would like to acknowledge the support and advice received during our research for this report from Robert Arnott and Jason Hsu. We are also grateful to Jack Traynor and Burton Malkiel for their useful comments.

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