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KEY POINTS

1. Expected return is the return of an average stock plus the return due to the investor's skill.
2. Traditional indexing does not come up to the expected return of uninformed investors.
3. Active managers evaluated against cap-weighted indices have to surmount the benchmark's return drag before they can add value.

Measuring the "Skill" of Index Portfolios

The gently satirical variety show "A Prairie Home Companion," long running on public radio in the United States, has made the fictional town of Lake Wobegon famous. The residents of Lake Wobegon believe that in their town "all the women are strong, all the men are good looking, and all the children are above average." But the townsfolk are outlandishly optimistic. Clearly, we recognize that *everyone* can't be above average; indeed, we would generally suspect naiveté when met with such unrealistic positivity. Nonetheless, when it comes to investing, most of us live in Lake Wobegon; we believe we can select winning stocks and top quartile managers. Most of us think we are above average.¹ Indeed, the irony is that it is the select few who aspire to achieve middling results—the 20% of investors who index—who achieve consistent net-of-fees outperformance against Lake Wobegon investors.

When conducting manager searches, we hope to find skilled managers who know which stocks are misvalued and can translate this information into meaningful outperformance. Inevitably, however, when choosing money managers about half of us will be below average. Those who accept that it is hard to find managers who consistently outperform opt for index investing. A passive index does not have the informational advantage that an active manager might possess, but at least the inves-

tors will earn a market return without the high cost of active management.

In this issue, we are uninterested in rehashing the old topic of the benefit of index investing. Instead we question one of the key tenets of index investing.

Is it, in fact, true that traditional index investors have earned returns that can be reasonably earned by uninformed investors? Is it true that by investing in the cap-weighted index we receive the average return associated with an uninformed selection of stocks? Surprisingly, we find that traditional indexing—and active managers who hug the benchmark (closet indexers)—deliver below-average returns.² They systematically deliver returns that are inferior to the expected returns of uninformed investors.

Expected Returns

Uninformed investors cannot distinguish between good stocks and bad ones, and their portfolio returns will deviate from the return of an average stock in a random manner. In comparison, informed investors invest more in stocks that are likely to perform well, and avoid those that are likely to perform worse. There is an intuitive mathematical identity which captures this idea and decomposes any portfolio's expected return into the sum of two components:

$$R_p = E[r_{AVG}] + n \times \text{cov}[r_i, w_i] \quad (1)$$



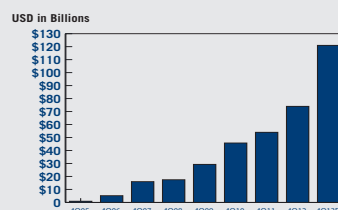
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where

- R_p = expected return of investor's portfolio;
- $E[r_{AVG}]$ = expected return of uninformed investor (return of an average stock);
- $n \times cov[r_i, w_i]$ = covariance between the weights assigned to each stock and the subsequent returns.³

Covariance measures how much two variables move together: If the strategy assigns more weight to better-performing stocks, covariance is positive; if the strategy assigns more weight to worse-performing stocks, it is negative; and if the stock assignment is random, this term is zero. The covariance of stock weights and returns reflects how informed the investor is. In other words, it captures the investor's skill.

The relationship above is widely used in the financial literature to estimate the skill of managers.⁴ The expected return of a portfolio is the sum of the return for an average stock and the return due to the investor's skill. The first component is quite intuitive. The return of an average stock is the expected return of the uninformed investor who selects stocks haphazardly. An informed investor would invest more in stocks expected to have higher returns and less in stocks expected to have lower returns. The better the investor is able to predict stocks' relative returns, and the more conviction with which these views are expressed in the portfolio, the higher the portfolio return.

The "Skill" of an Index Portfolio

Recognizing that they are unlikely to select skilled money managers, many market participants choose index-based alternatives which presumably deliver the return

“Most of us think we are above average.”

that would be similar to a portfolio of stocks chosen by an uninformed investor; that is, the return of the average stock. Choosing an index spares investors from paying high fees to unskilled managers.

The return decomposition that we introduced in the previous section can help us determine whether index investing offers expected returns equivalent to the returns that uninformed investors can, in principle, achieve. We can simulate index weights and check the level of skill represented by the covariance between the index constituents' weights and subsequent returns. If the index does indeed deliver a return matching that of an uninformed manager, then the covariance term showing skill will be zero. We will examine the following five options, four smart beta indices and one traditional cap-weighted index:

- An equal-weighted strategy;
- The average of 100 portfolios of 30 randomly selected stocks;
- A minimum variance strategy;
- A fundamentally weighted strategy, where the weights are proportional to company size as represented by financial accounting measures; and
- A cap-weighted index.

Some of these options have been around for many years and have large amounts of assets under management; others are younger and only now gaining widespread acceptance. The first four indices fall into the category of smart betas, strategy indices which do not base weights on price-related measures such as capitalization.⁵ Ironically the category of smart beta also includes the portfolios of randomly selected stocks.

Table 1 shows the return decomposition for the five strategies.

Most of the strategies examined here do not exhibit skill at a level that is statistically different from zero. This is what one would expect of rules-based strategies which trade only on publicly available information.

“Traditional index returns are inferior to the expected returns of uninformed investors.”

The one exception is the cap-weighted index. It has a statistically significant negative covariance term. In the U.S. market, over the period 1962 through 2012, the negative return translates into approximately 200 bps of drag per year.

Table 1. Indices' Imputed Levels of Skill, 1964–2012

Index	Investor's Skill (Covariance of Weights and Expected Returns)	Statistical Significance of Investor's Skill (t-statistic)	
Equal-Weighted	0.0000	0.00	No skill
Average of 100 Portfolios of 30 Random Stocks	-0.0002	-0.03	No skill
Minimum Variance	-0.0057	-0.43	No skill
Fundamentally Weighted	-0.0021	-0.24	No skill
Cap-Weighted	-0.0199	-2.52	Negative skill

Source: Research Affiliates

Cap-weighted indices are the most commonly used option for passive investing, yet the expected return of a cap-weighted index is lower than that of an approach in which stocks are randomly selected and weighted. That's the news from Lake Wobegon. But what accounts for this outcome?

Benchmark Choice and Performance Timeframe

Listeners perceive that the residents of Lake Wobegon are, in many respects, limited, quirky, and decidedly below average. But the residents see themselves, and *all* their children, as better than mediocre. People are prone to avoid facing reality by spinning compelling but nonetheless fanciful narratives.⁶ When it comes to investment management, some investors believe, "We are well aware of the inferiority of the cap-weighted index approach. That is exactly why we use active management!" Are they right? Does opting for active management automatically free us from the curse of capitalization weighting?

In theory, when we hire active managers, we want them to buy stocks which are more likely to perform well and avoid stocks whose prospective performance is poor. In principle we expect the active portfolio to deviate substantially from the benchmark. In other words, to deviate with conviction.

In practice, however, we fire active managers if they underperform the cap-weighted benchmark over a three-year period. Our trigger-happy behavior creates incentives for managers to avoid trades with long payoff periods and the

corresponding risk of short-term underperformance. For rational managers with sizeable assets under management, hugging the benchmark in pursuit of a lower tracking error than the competing managers is one effective strategy to avoid outsized underperformance and the associated termination.

In summary, regardless of what we say, what we *do* incentivizes managers to hew to the cap-weighted benchmark and not to enter profitable trades that induce higher tracking error and/or are risky in the short term. This means that the average active manager will have a portfolio very similar to the cap-weighted index, and, accordingly, he or she will experience the same return drag. The better active managers will add value relative to the cap-weighted benchmark, but their starting point means that they have to overcome the return drag before they can begin to exhibit outperformance that can match the results of naïve weighting schemes like equal or even random weighting. In contrast, any portfolio which employs mechanical rebalancing rules to create target weights that are unrelated to prices will give investors a head start against active managers.

“People are prone to avoid reality by spinning fanciful narratives.”

Suppose you want to hire an active manager but avoid the return drag associated with the cap-weighted benchmark. What should you do? The answer might be simpler than you think. Start with incentives. Tell your active managers

you don't take tracking error into account. Better yet, tell your active managers you do take tracking error into account and expect it to be large. Managers whose tracking error is small aren't active; they don't have their own opinions, or don't hold them strongly. Similarly, lengthening the evaluation period—and sticking to it—will enable managers to take advantage of value bets with long-term payoffs.

Conclusion

The skill of the informed fund manager is investing in stocks that are likely to perform better than average and avoiding those that are likely to perform worse. Investors and consultants devote considerable resources to deciding whether or not a manager is skillful. Ironically, though, when it comes to passive investing, they completely abandon the framework of performance evaluation; they simply accept on faith that the standard cap-weighted benchmark is the optimal "uninformed" portfolio. But what if they were to examine the "management" skill of index portfolios in the same way they examine the results of active managers?

Our analysis shows that cap-weighted indices amazingly have negative skill as measured by the standard analytics used to judge active managers. Cap-weighting systematically allocates larger weights to overpriced stocks and smaller weights to underpriced stocks. Active managers benchmarked to cap-weighted indices have to overcome this return drag before they can start adding value. The same analysis applied to smart beta indices reveals that they are not plagued by the same problem. Smart beta investing, an alternative to negatively skilled passive management, can also complement unencumbered active managers.

Endnotes

1. That experts tend to overestimate their ability to make predictions and estimates is well established. Kahneman (2011), in particular, discusses the commonplace trait of “overconfident optimism” among experts (see especially pages 261–265). Dunning and Kruger (1999) present experimental evidence that inexpert individuals are doubly encumbered: they overestimate their ability and lack the metacognitive ability to realize it. Further research on the Dunning–Kruger effect (Ehrlinger *et al.*, 2008) indicates that, in viewing their performance too favorably, the inexpert do not underestimate others’ abilities; rather, they fail to recognize their own errors.
2. By definition, broad cap-weighted indices match the return of the market portfolio; that is, the aggregate return of all the stocks held at market weights. In other words, traditional indices deliver the *market-weighted* average return. They do not, however, deliver the return of the *average* asset.
3. Equation (1) can be derived trivially by noting the definition of covariance: $\text{cov}[a,b] = E[ab] - E[a]E[b]$.

$$R_p = n \times E[r_i w_i] = n \times E[r_i] \times E[w_i] + n \times \text{cov}[r_i w_i] =$$

$$R_p = E[r_i] + n \times \text{cov}[r_i w_i].$$

At time t_0 we estimate $R_p = \sum_{i=1}^n [r_i w_i]$, the *ex ante* return of a portfolio. *Ex ante* the weights w_i and returns r_i are unknown and represent IID random variables. It may be counterintuitive to think of portfolio weights as random variables. A useful analogy may be to try to compare the performance of different portfolios ten years from now. At the present moment both future weights and future returns represent random variables. All we know is the statistical distribution of weights and returns in different portfolios. In the beginning of the investment period, at time t_1 , the weights of the portfolio come to be specified. The returns are realized in the end of the investment period, at time t_2 . The expectation and covariance are both cross sectional operators here. For the last step in the equation we used the fact that *ex ante* $E[w_i] = 1/n$.

4. See, for instance, Grinblatt and Titman (1993).
5. The designation “smart beta” was coined by Towers Watson consultants. The term is not meant to be derogatory to providers of traditional indices whose returns are driven by market beta. The originators’ intent was to suggest that investors would benefit from strategies that tap multiple sources of return.
6. Tuckett and Taffler (2012) report that storytelling is one of the most important ways fund managers deal with the anxiety of making investment decisions under conditions of uncertainty. In particular, managers tell stories to explain their successes and failures in ways that tend to preserve or enhance their self-esteem. The authors do not say that fund managers confabulate, but they suggest that the plausibility and coherence of their narratives may be valued more than their accuracy.

References

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Performance Update

FTSE RAFI® Equity Index Series*

TOTAL RETURN AS OF 1/31/14	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED			
				3 YEAR	5 YEAR	10 YEAR	10 YEAR VOLATILITY
FTSE RAFI® All World 3000 ¹	TFRAW3	-3.79%	15.70%	7.85%	19.09%	9.38%	18.57%
MSCI All Country World ²	GDUEACWF	-3.98%	13.28%	8.27%	16.66%	7.10%	16.59%
FTSE RAFI® Developed ex US 1000 ³	FRXIXTR	-3.43%	14.99%	4.92%	15.77%	7.94%	20.25%
MSCI World ex US ⁴	GDDUWXUS	-4.02%	11.19%	5.64%	14.33%	6.98%	18.21%
FTSE RAFI® Developed ex US Mid Small ⁵	TFRDXUSU	-1.69%	15.41%	6.51%	19.75%	10.75%	18.81%
MSCI World ex US Small Cap ⁶	GCUDWXUS	-1.71%	18.13%	7.07%	19.89%	8.98%	20.14%
FTSE RAFI® Emerging Markets ⁷	TFREMU	-7.72%	-15.51%	-6.32%	13.79%	12.85%	24.40%
MSCI Emerging Markets ⁸	GDUEEGF	-6.47%	-9.85%	-3.03%	15.13%	10.40%	23.96%
FTSE RAFI® 1000 ⁹	FRIOXTR	-3.73%	23.01%	14.39%	23.90%	8.73%	17.16%
Russell 1000 ¹⁰	RU10INTR	-3.19%	22.23%	14.14%	19.84%	7.23%	14.97%
S&P 500 ¹¹	SPTR	-3.46%	21.52%	13.93%	19.19%	6.83%	14.67%
FTSE RAFI® US 1500 ¹²	FR15USTR	-3.99%	28.59%	15.00%	28.27%	11.02%	21.74%
Russell 2000 ¹³	RU20INTR	-2.77%	27.03%	14.69%	22.26%	8.31%	19.70%
FTSE RAFI® Europe ^{14**}	TFREUE	-0.86%	19.61%	6.66%	15.56%	7.16%	17.50%
MSCI Europe ^{15**}	GDDLE15	-1.76%	15.14%	8.33%	14.69%	6.47%	14.43%
FTSE RAFI® Australia ^{16**}	FRAUSTR	-3.09%	13.50%	10.19%	14.87%	10.02%	13.55%
S&P/ASX 200 ^{17**}	ASA51	-3.03%	11.06%	7.77%	12.90%	9.40%	13.63%
FTSE RAFI® Canada ^{18**}	FRCANTR	-0.09%	13.16%	5.36%	15.65%	8.98%	13.44%
S&P/TSX 60 ^{19**}	TX60AR	0.53%	11.40%	3.31%	11.65%	7.79%	13.88%
FTSE RAFI® Japan ^{20**}	FRJPNTR	-6.34%	34.04%	11.54%	11.91%	4.48%	19.88%
MSCI Japan ^{21**}	GDDLJN	-6.71%	31.98%	12.28%	11.27%	3.38%	19.33%
FTSE RAFI® UK ^{22**}	FRGBRTR	-2.75%	10.32%	8.61%	15.34%	8.52%	15.58%
MSCI UK ^{23**}	GDDLUK	-3.55%	7.30%	7.46%	13.63%	7.78%	13.64%

*To see the complete series, please go to: http://www.ftse.com/Indices/FTSE_RAFL_Index_Series/index.jsp.

**The above indices have been restated to reflect the use of local currencies for all single country strategies and EUR for Europe regional strategies rather than USD.

Russell Fundamental Index Series*

TOTAL RETURN AS OF 1/31/14	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED			
				3 YEAR	5 YEAR	10 YEAR	10 YEAR VOLATILITY
Russell Fundamental Global Index Large Company ²⁴	RUFGLTU	-3.97%	16.36%	9.23%	18.56%	9.49%	16.89%
MSCI All Country World Large Cap ²⁵	MLCUAWOG	-4.19%	12.78%	8.22%	16.13%	6.71%	16.29%
Russell Fundamental Developed ex US Index Large Company ²⁶	RUFDXLTU	-3.26%	16.36%	6.00%	14.94%	8.49%	18.34%
MSCI World ex US Large Cap ²⁷	MLCUWXUG	-4.36%	10.45%	5.57%	13.95%	6.65%	18.10%
Russell Fundamental Developed ex US Index Small Company ²⁸	RUFDXSTU	-1.79%	19.24%	8.89%	19.56%	10.86%	18.17%
MSCI World ex US Small Cap ⁶	GCUDWXUS	-1.71%	18.13%	7.07%	19.89%	8.98%	20.14%
Russell Fundamental Emerging Markets ²⁹	RUFGETRU	-6.80%	-8.58%	-2.48%	16.94%	14.00%	23.97%
MSCI Emerging Markets ⁸	GDUEEGF	-6.47%	-9.85%	-3.03%	15.13%	10.40%	23.96%
Russell Fundamental US Index Large Company ³⁰	RUFUSLTU	-4.05%	21.88%	14.75%	21.94%	9.08%	15.54%
Russell 1000 ¹⁰	RU10INTR	-3.19%	22.23%	14.14%	19.84%	7.23%	14.97%
S&P 500 ¹¹	SPTR	-3.46%	21.52%	13.93%	19.19%	6.83%	14.67%
Russell Fundamental US Index Small Company ³¹	RUFUSSTU	-3.26%	26.40%	15.18%	27.95%	12.09%	20.74%
Russell 2000 ¹³	RU20INTR	-2.77%	27.03%	14.69%	22.26%	8.31%	19.70%
Russell Fundamental Europe ^{32**}	RUFEUETE	-1.13%	17.76%	7.27%	16.02%	8.40%	15.83%
MSCI Europe ^{15**}	GDDLE15	-1.76%	15.14%	8.33%	14.69%	6.47%	14.43%

*To see the complete series, please go to: http://www.russell.com/indexes/data/Fundamental/About_Russell_Fundamental_indexes.asp.

**The above indices have been restated to reflect the use of local currencies for all single country strategies and EUR for Europe regional strategies rather than USD.

Performance Update

Fixed Income/Alternatives

TOTAL RETURN AS OF 1/31/14	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED			
				3 YEAR	5 YEAR	10 YEAR	10 YEAR VOLATILITY
RAFI® Bonds US Investment Grade Master ³³	—	2.04%	0.84%	5.83%	8.53%	5.70%	5.82%
ML Corporate Master ³⁴	COAO	1.78%	1.03%	5.89%	9.24%	5.38%	5.95%
RAFI® Bonds US High Yield Master ³⁵	—	0.67%	4.38%	8.53%	17.03%	9.08%	9.44%
ML Corporate Master II High Yield BB-B ³⁶	H0A4	0.71%	5.95%	8.31%	15.16%	7.74%	9.14%
RAFI® US Equity Long/Short ³⁷	—	-1.69%	8.04%	2.31%	11.16%	4.60%	11.20%
1-Month T-Bill ³⁸	GB1M	0.00%	0.03%	0.05%	0.07%	1.49%	0.52%
FTSE RAFI® Global ex US Real Estate ³⁹	FRXR	-5.50%	-1.36%	4.61%	19.57%	—	—
FTSE EPRA/NAREIT Global ex US ⁴⁰	EGXU	-4.09%	-5.22%	4.50%	16.45%	—	—
FTSE RAFI® US 100 Real Estate ⁴¹	FRUR	2.85%	3.28%	9.65%	27.44%	—	—
FTSE EPRA/NAREIT United States ⁴²	UNUS	4.18%	2.93%	9.57%	22.10%	—	—
Citi RAFI Sovereign Developed Markets Bond Index Master ⁴³	CRFDMU	0.29%	-0.96%	3.66%	5.44%	5.28%	—
Merrill Lynch Global Governments Bond Index II ⁴⁴	WOG1	1.62%	-1.34%	1.87%	3.56%	4.33%	—
Citi RAFI Sovereign Emerging Markets Local Currency Bond Index Master ⁴⁵	CRFELMU	-4.55%	-15.00%	—	—	—	—
JPMorgan GBI-EM Global Diversified ⁴⁶	JGENVUUG	-4.63%	-13.81%	—	—	—	—

Definition of Indices:

- (1) The FTSE RAFI® All World 3000 Index is a measure of the largest 3,000 companies, selected and weighted using fundamental factors; (sales, cash flow, dividends, book value), across both developed and emerging markets.
- (2) The MSCI All Country World Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed and emerging markets.
- (3) The FTSE RAFI® Developed ex US 1000 Index is a measure of the largest 1,000 non U.S. listed, developed market companies, selected and weighted using fundamental factors; (sales, cash flow, dividends, book value).
- (4) The MSCI World ex US Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets, excluding the United States.
- (5) The FTSE RAFI® Developed ex US Mid Small Index tracks the performance of small and mid-cap companies domiciled in developed international markets (excluding the United States), selected and weighted based on the following four fundamental measures of firm size: sales, cash flow, dividends and book value.
- (6) The MSCI World ex US Small Cap Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of small cap developed markets, excluding the United States.
- (7) The FTSE RAFI® Emerging Markets Index comprises the largest 350 Emerging Market companies selected and weighted using fundamental factors (sales, cash flow, dividends, book value).
- (8) The MSCI Emerging Markets Index is an unmanaged, free-float-adjusted cap-weighted index designed to measure equity market performance of emerging markets.
- (9) The FTSE RAFI® 1000 Index is a measure of the largest 1,000 U.S. listed companies, selected and weighted using fundamental factors; (sales, cash flow, dividends, book value).
- (10) The Russell 1000 Index is a market-capitalization-weighted benchmark index made up of the 1,000 highest-ranking U.S. stocks in the Russell 3000.
- (11) The S&P 500 Index is an unmanaged market index that focuses on the large-cap segment of the U.S. equity market.
- (12) The FTSE RAFI® US 1500 Index is a measure of the 1,001st to 2,500th largest U.S. listed companies, selected and weighted using fundamental factors; (sales, cash flow, dividends, book value).
- (13) The Russell 2000 is a market-capitalization weighted benchmark index made up of the 2,000 smallest U.S. companies in the Russell 3000.
- (14) The FTSE RAFI® Europe Index is comprised of all European companies listed in the FTSE RAFI® Developed ex U.S. 1000 Index, which in turn is comprised of the largest 1,000 non U.S. listed developed market companies, selected and weighted using fundamental factors; (sales, cash flow, dividends, book value).
- (15) The MSCI Europe Index is a free-float adjusted market capitalization weighted index that is designed to measure the equity market performance of the developed markets in Europe.
- (16) The FTSE RAFI® Australia Index is comprised of all Australian companies listed in the FTSE RAFI® Developed ex U.S. 1000 Index, which in turn is comprised of the largest 1,000 non U.S. listed developed market companies, selected and weighted using fundamental factors; (sales, cash flow, dividends, book value).
- (17) The S&P/ASX 200 Index, representing approximately 78% of the Australian equity market, is a free-float-adjusted, cap-weighted index.
- (18) The FTSE RAFI® Canada Index is comprised of all Canadian companies listed in the FTSE RAFI® Developed ex U.S. 1000 Index, which in turn is comprised of the largest 1,000 non U.S. listed developed market companies, selected and weighted using fundamental factors; (sales, cash flow, dividends, book value).
- (19) The S&P/Toronto Stock Exchange (TSX) 60 is a cap-weighted index consisting of 60 of the largest and most liquid (heavily traded) stocks listed on the TSX, usually domestic or multinational industry leaders.
- (20) The FTSE RAFI® Japan Index is comprised of all Japanese companies listed in the FTSE RAFI® Developed ex U.S. 1000 Index, which in turn is comprised of the largest 1,000 non U.S. listed developed market companies, selected and weighted using fundamental factors; (sales, cash flow, dividends, book value).
- (21) The MSCI Japan Index is an unmanaged, free-float-adjusted cap-weighted index that aims to capture 85% of the publicly available total market capitalization of the Japanese equity market.
- (22) The FTSE RAFI® UK Index is comprised of all UK companies listed in the FTSE RAFI® Developed ex U.S. 1000 Index, which in turn is comprised of the largest 1,000 non U.S. listed developed market companies, selected and weighted using fundamental factors; (sales, cash flow, dividends, book value).
- (23) The MSCI UK Index is an unmanaged, free-float-adjusted cap-weighted index that aims to capture 85% of the publicly available total market capitalization of the British equity market.
- (24) The Russell Fundamental Global Index Large Company is a measure of the largest companies, selected and weighted using fundamental factors; (adjusted sales, retained cash flow, dividends + buybacks), across both developed and emerging markets.
- (25) The MSCI All Country World Large Cap Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed and emerging markets.
- (26) The Russell Fundamental Developed ex US Large Company is a subset of the Russell Fundamental Developed ex US Index, and is a measure of the largest non-U.S. listed developed country companies, selected and weighted using fundamental factors; (adjusted sales, retained cash flow, dividends + buybacks).
- (27) The MSCI World ex US Large Cap Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of large cap-developed markets, excluding the United States.
- (28) The Russell Fundamental Developed ex US Index Small Company is a subset of the Russell Fundamental Developed ex US Index, and is a measure of small non-U.S. listed developed country companies, selected and weighted using fundamental factors; (adjusted sales, retained cash flow, dividends + buybacks).
- (29) The Russell Fundamental Emerging Markets Index is a measure of Emerging Market companies, selected and weighted using fundamental factors; (adjusted sales, retained cash flow, dividends + buybacks).
- (30) The Russell Fundamental U.S. Index Large Company is a subset of the Russell Fundamental US Index, and is a measure of the largest U.S. listed companies, selected and weighted using fundamental measures; (adjusted sales, retained cash flow, dividends + buybacks).
- (31) The Russell Fundamental US Index Small Company is a subset of the Russell Fundamental US Index, and is a measure of U.S. listed small companies, selected and weighted using fundamental measures; (adjusted sales, retained cash flow, dividends + buybacks).
- (32) The Russell Fundamental Europe Index is a measure of European companies, selected and weighted using fundamental factors; (adjusted sales, retained cash flow, dividends + buybacks).
- (33) The RAFI® Bonds US Investment Grade Master Index is a U.S. investment-grade corporate bond index comprised of non-zero fixed coupon debt with maturities ranging from 1 to 30 years issued by publicly traded companies. The issuers held in the index are weighted by a combination of four measures of their fundamental size—sales, cash flow, dividends, and book value of assets.
- (34) The Merrill Lynch U.S. Corporate Master Index is representative of the entire U.S. corporate bond market. The index includes dollar-denominated investment-grade corporate public debt issued in the U.S. bond market.
- (35) The RAFI® Bonds US High Yield Master is a U.S. high-yield corporate bond index comprised of non-zero fixed coupon debt with maturities ranging from 1 to 30 years issued by publicly traded companies. The issuers held in the index are weighted by a combination of four measures of their fundamental size—sales, cash flow, dividends, and book value of assets.
- (36) The Merrill Lynch Corporate Master II High Yield BB-B Index is representative of the U.S. high yield bond market. The index includes domestic high-yield bonds, including deferred interest bonds and payment-in-kind securities. Issues included in the index have maturities of one year or more and have a credit rating lower than BBB-/Baa3, but are not in default.
- (37) The RAFI® US Equity Long/Short Index utilizes the Research Affiliates Fundamental Index® (RAFI®) methodology to identify opportunities that are implemented through long and short securities positions for a selection of U.S. domiciled publicly traded companies listed on major exchanges. Returns for the index are collateralized and represent the return of the strategy plus the return of a cash collateral yield.
- (38) The 1-Month T-bill return is calculated using the Bloomberg Generic 1-month T-bill. The index is interpolated based off of the currently active U.S. 1 Month T-bill and the cash management bill closest to maturing 30 days from today.
- (39) The FTSE RAFI® Global ex US Real Estate Index comprises 150 companies with the largest RAFI fundamental values selected from the constituents of the FTSE Global All Cap ex U.S. Index that are classified by the Industry Classification Benchmark (ICB) as Real Estate.
- (40) The FTSE EPRA/NAREIT Global ex US Index is a free float-adjusted index, and is designed to represent general trends in eligible listed real estate stocks worldwide, excluding the United States. Relevant real estate activities are defined as the ownership, trading and development of income-producing real estate.
- (41) The FTSE RAFI® US 100 Real Estate Index comprises of the 100 U.S. companies with the largest RAFI fundamental values selected from the constituents of the FTSE USA All Cap Index that are classified by the Industry Classification Benchmark (ICB) as Real Estate.
- (42) The FTSE EPRA/NAREIT United States Index is a free float-adjusted index, is a subset of the EPRA/NAREIT Global Index and the EPRA/NAREIT North America Index and contains publicly quoted real estate companies that meet the EPRA Ground Rules. EPRA/NAREIT Index series is seen as the representative benchmark for the real estate sector.
- (43) The Citi RAFI Sovereign Developed Markets Bond Index Series seeks to reflect exposure to the government securities of a universe of 22 developed markets. By weighting components by their fundamentals, the indices aim to represent each country's economic footprint and proxies for its ability to service debt. Performance may be positive or negative. Past performance is not an indication of future results. Backdated from 09/30/2001 through 12/30/2011. Live data from 01/02/2012 through present.
- (44) The Merrill Lynch Global Government Bond Index I tracks the performance of investment grade sovereign debt publicly issued and denominated in the issuer's own domestic market and currency.
- (45) The Citi RAFI Sovereign Emerging Markets Local Currency Bond Index Series seeks to reflect exposure to the government securities of a universe of 15 emerging markets. By weighting components by their fundamentals, the indices aim to represent each country's economic footprint and proxies for its ability to service debt. Performance may be positive or negative. Past performance is not an indication of future results. Backdated from 09/30/2011 through 12/30/2011. Live data from 01/02/2012 through present.
- (46) The JPMorgan GBI-EM Diversified Index seeks exposure to the local currency sovereign debt of over 15 countries in the emerging markets.

Source: All index returns are calculated using total return data from Bloomberg and FactSet. Returns for all single country strategies and Europe regional strategies are in local currency. All other returns are in USD.

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