Rob Arnott

> **The basic premise of a "Glidepath" approach is that a systematic increase in the allocation to bonds over time leads to less risk in our planned spending power in retirement. But does it?**

The Glidepath Illusion

Young adults should buy stocks; mature adults should favor bonds. Or so we're taught. It makes intuitive sense. Young people have modest savings and lots of time to recover losses from any bear markets. People approaching retirement have more to lose and less time to recover from bear markets. Typically, they want greater certainty as to how much they can safely spend in retirement and less risk that a decline in the value of their investments will demolish their retirement plans.

This type of logic has spawned a huge retirement planning industry, with a wide array of target-date strategies whose Glidepath mechanisms systematically ramp down portfolio risk as an investor approaches retirement. These products are, for many people, the default option in their 401(k) and other defined contribution pension portfolios. Shockingly, the basic premise upon which these billions are invested is flawed.

Does a Glidepath Lead to Retirement Bliss?

Glidepaths feature equity-centric allocations for younger investors transitioning to bond-centric allocations for retired participants. The basic premise of a Glidepath approach is that a systematic increase in the allocation to bonds over time leads to less risk in our planned spending power in retirement. But does it?

To test the Glidepath premise, we simulate how the approach would have worked in the past. Of course, we do *not* think it wise to plan for the future by extrapolating the past, but it can be illustrative, particularly on the risk side. We use the 141 years of stock and bond market returns from 1871 to 2011, so our first breadwinner starts working in 1871 and retires at the end of 1911 and our last starts in 1971 and retires at the end of 2011. This gives us 101 worker bees with 101 different investment experiences.[1]

Consider an investor, Prudent Polly, who plans to save for retirement by investing in a standard Glidepath portfolio. Prudent Polly starts working, fresh out of college, at age 22 and plans to retire at age 63, after working for 41 years. Polly saves $1,000 a year *in real terms* for each of the 41 years, ramping up contributions with inflation. The first panel of **Table 1** shows the ending retirement assets for each option. With classic Glidepath investing, Polly finishes with an average portfolio of $124,460, better than three times the $41,000 that she actually set aside. Because these numbers are adjusted for inflation, Polly has tripled the real purchasing power of her investments. But, there's a range of

RAFI® Managed Assets*

USD in Billions
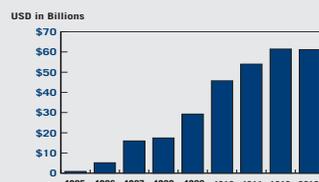
*Includes RAFI® assets managed or sub-advised by Research Affiliates® or RAFI licensees.

outcomes, as evidenced by the $37,670 standard deviation in the results. The standard deviation doesn't begin to cover the potential range: Polly could have finished with as little as $49,940—scant reward for foregoing $41,000 of spending over her working life—or as much as $211,330. The same savings program gives us a range which offers us 2.4 *times* more wealth at the 90th percentile than at the 10th percentile.

Because actuaries tell us that Polly should live 20 additional years from age 63, it's much more important to know how large a lifetime inflation-indexed annuity she can buy than to know the size of her nest egg. The second panel of Table 1 shows the average Ending Retirement Real Annuity—an important measure of Polly's success. On average, by saving $1,000 per year, indexed to inflation, history suggests that she should expect to have a retirement portfolio that will pay her $7,730 per year for life, also indexed to inflation. Sounds anemic… but then again she was only saving $1,000 per year. Unfortunately, again, there's a big range. Over the past 141 years, she and her counterparts from past generations could have retired on anywhere from $2,390 to $13,130 per year.

If the Glidepath doesn't lead to greater retirement assets, perhaps it at least provides Polly with more "visibility" into her likely retirement income, a few years before she retires, because the allocation is becoming far less aggressive (another argument advanced in favor of a Glidepath solution). If this transparency were true, people could plan their retirements with greater confidence. Looking at the last panel of Table 1, we can see that Polly's annuity at age 63 is 154% larger

Table 1. A Comparison of Retirement Strategies, 1871–2011

	Prudent Polly Glidepath 80→20	Balanced Burt Static Mix 50/50	Contrary Connie Inverse Glidepath 20→80
Panel A. Ending Retirement Assets			
Average	$124,460	$137,870	$152,060
Standard deviation	$37,670	$41,250	$57,010
Min	$49,940	$51,800	$53,040
10 percentile	$73,550	$78,820	$79,300
50 percentile	$119,760	$142,620	$148,240
90 percentile	$177,400	$184,090	$227,670
Max	$211,330	$209,110	$286,920
90% / 10% ratio	2.41	2.34	2.87
Panel B. Ending Retirement Real Annuity			
Average	$7,730	$8,550	$9,440
Standard deviation	$2,520	$2,780	$3,780
Min	$2,390	$2,540	$2,660
10 percentile	$4,590	$4,590	$4,560
50 percentile	$7,420	$8,280	$8,680
90 percentile	$11,180	$11,760	$15,070
Max	$13,130	$14,470	$18,040
90% / 10% ratio	2.44	2.56	3.30
Panel C. Final 10-Year Change in Income (Ratio)			
Average	154%	193%	236%
Standard deviation	82%	140%	218%
Min	-54%	-53%	-52%
10 percentile	9%	15%	16%
50 percentile	128%	142%	156%
90 percentile	280%	349%	447%
Max	1302%	1759%	2316%
90% / 10% ratio	3.50	3.91	4.73

Source: Research Affiliates, based on data from Schwert, Shiller, Ibbotson, and Bianco.

than it would have been at 53. This is partly because the portfolio nearly doubles in size in that last decade and because she can buy a richer annuity with 20 years' life expectancy than with 30 years. Unfortunately for Polly, the higher expected annuity is associated with considerable variability around that outcome. Her annuity at age 63 could be 54% less or 1302% greater at 53; the 10th percentile shows almost no change from age 53. This is basically the situation for those who turned 63 in 2011; they could have retired with roughly the same lifetime inflation indexed annuity at age 53 as they would now be able to buy at age 63. Sad, but true.[2]

What's the Alternative?

So, the Glidepath strategy gives us a pretty uncertain retirement nest egg after 40 years of careful savings, with a pretty uncertain spending stream. Even as retirement looms near, it doesn't give us much confidence about our retirement prospects or lifestyle. So what? Markets are uncertain. At least we can have more confidence and a safer outcome by ramping down our risk late in life than by any other plan, right? Not true.

Consider another investor, Balanced Burt, who is uncomfortable choosing between equities and bonds and thus decides to maintain a steady course at 50/50, for life. Looking at Table 1, we see that Burt winds up with an average outcome that is 10% better than Polly's, with an average portfolio of $137,870 (versus $124,460) and an average annuity of $8,550 (versus $7,730). In addition, his worst case is better than hers, as is his 10th percentile outcome, and median outcome; only the single best outcome doesn't improve in

portfolio value, but even that outcome improves in the annuity that he can buy. It is no surprise that Burt's final 10-year change in retirement income becomes less stable than Polly's; he is finishing his career with more money in the riskier market. The ratio between 10th and 90th percentile outcome jumps from a 3.5 ratio for Polly to a 3.9 ratio for Burt. This improvement happens entirely from the best outcomes getting better; the worst outcomes do not get worse!

Now consider another investor, Contrary Connie, who is skeptical of the standard retirement strategies—either a balanced

> **❝** *We can quantify [risk]; we can predict the breadth of the range; we cannot predict where, within the range, our own experience may lie.* **❞**

portfolio or a Glidepath approach. Connie rationalizes that if a static 50/50 strategy is better than a Glidepath strategy, an Inverse-Glidepath strategy might be more appropriate for meeting her goals than either of the "standard" options. It should come as no surprise that this counterintuitive strategy beats a static 50/50 portfolio by essentially the same margin that static 50/50 beats Glidepath. Contrary Connie beats Prudent Polly by ramping up her risk late in life when the portfolio is already large. Connie finishes with an average portfolio of $152,060, versus Polly's $124,460. Connie's worst, median, and best outcomes all trump Polly's. Connie has to accept more uncer-

tainty late in life as to how much she can spend in retirement—but it's upside uncertainty!

Critics may argue—correctly—that past is not prologue. This outcome is presumably due to higher real returns for stocks and bonds later in the 141-year period (for example, during the immense bull market from 1982 through 1999), leading to a slight tendency for investors to benefit from ramping up risk later rather than earlier in life. To address this criticism, we put the 141-year history into a lottery, with each year's returns randomly drawn. It delivers the same relative ranking for the merits of Glidepath versus static 50/50 versus Inverse-Glidepath. The inverse finishes on top again![3]

Note, if we systematically replace equities with bonds every year so that we are a 50/50 investor at the midpoint of our career, our returns will fall into the same return distribution, over time, whichever path we pursue. Our average allocation will be 50/50 in all three cases! Markets certainly don't care about our Glidepath, so we're as likely to have our best stock market returns late in our career as early. If the best stock market returns come early, it's self-evident that we'll finish richer with a Glidepath strategy. And, if the best stock market returns come late in our career, we'll do well to ramp our risk up as our career evolves. But, in our 20s, how can we know whether stock returns will be better early or late in our careers?

Past is *Not* Prologue

We've written extensively about the "3-D Hurricane" that's bearing down on us, about the importance of ratcheting down

return expectations in a world of lower yields, and about the perils of extrapolating the past in order to shape future expectations. Much of this work has proven to be very relevant to investors in recent years. Can we transform this historically rooted test of various formulaic approaches to retirement planning into something that might be relevant today? We *probably* can.

Rather than hoping for a repeat of the past, with substantial returns earned on a foundation of far higher yields than today's yields, we should probably shape expectations based on the current outlook. **Table 2** seeks to transform the "What if past is prologue?" scenarios of Table 1 to answer a different question: "What if risk in the future resembles risk in the past, but returns in the future are lower to the extent that yields are currently lower than the past norms?" It's a subtle question, but it's awfully useful to anyone thinking about setting aside reserves for some future retirement.

Accordingly, we make the following adjustments to the data, before we drop it into our lottery tumbler:

- Cut the average annual historical notional bond return by 2.0% to

1.9%. Long bonds have had an average duration of 15 years. Multiplying the 15 years by the 180 bps yield difference—the gap between the past average and the current real yield—gives us 27% of price appreciation, embedded in the 141 years of history, about 20 bps per annum. This means that bond returns over the last 141 years enjoyed *both* 180 bps of higher real yield *and* 20 bps of capital gain from falling yields.

- Cut the average annual stock return by 2.9% to 5.4%. Stocks have seen dividend yields tumble from an average of 4.5% to 2.1%. This cor-

Table 2. A Comparison of Retirement Strategies, Adjusted for Today's Lower Yields, 1871–2011

	Prudent Polly Glidepath 80→20	Balanced Burt Static Mix 50/50	Contrary Connie Inverse Glidepath 20→80
Panel A. Ending Retirement Assets			
Average	$69,320	$75,560	$81,990
Standard deviation	$21,220	$22,230	$29,450
Min	$27,660	$28,930	$29,850
10 percentile	$40,760	$42,120	$43,150
50 percentile	$64,600	$77,850	$80,060
90 percentile	$99,670	$101,440	$121,020
Max	$113,920	$115,490	$149,070
90% / 10% ratio	2.45	2.41	2.80
Panel B. Ending Retirement Real Annuity			
Average	$3,610	$3,940	$4,270
Standard deviation	$1,220	$1,300	$1,680
Min	$1,010	$1,050	$1,070
10 percentile	$2,130	$2,140	$2,090
50 percentile	$3,390	$4,010	$3,890
90 percentile	$5,230	$5,300	$6,630
Max	$6,300	$7,180	$8,840
90% / 10% ratio	2.46	2.48	3.16
Panel C. Final 10-Year Change in Income (Ratio)			
Average	144%	176%	213%
Standard deviation	95%	154%	229%
Min	-60%	-61%	-61%
10 percentile	0%	3%	-4%
50 percentile	108%	118%	124%
90 percentile	280%	330%	409%
Max	1426%	1892%	2451%
90% / 10% ratio	3.81	4.17	5.31

Source: Research Affiliates, based on data from Schwert, Shiller, Ibbotson, and Bianco.

responds to a 114% rise in valuation levels. Even though this rise largely occurred over the past 30 years, let's spread it out over the full 141 years, which gives us 0.5% per year. This means that stock returns over the past 141 years enjoyed *both* 240 bps of higher dividend yield *and* 50 bps of capital gain from rising valuation multiples.

- Cut the real bond yield, which forms the basis for pricing our real annuities, by 180 bps to 90 bps. We hope this doesn't hold true, because it means that the retirement annuities will be more expensive and our annuities skinnier as a result. But it is the naïve "random walk" assumption from current real TIPS yields.

Some might consider these results bleak. We consider them realistic. We can see in Table 2 that today's newly minted college graduate, choosing to invest on Prudent Polly's Glidepath, saving $1,000 per year for 41 years, seems likely to deliver a retirement annuity of $2,130 to $5,230. On Contrary Connie's Inverse-Glidepath, our college grad can plausibly expect a retirement annuity between $2,090 to $6,630, with some slight hope for better results and some small risk of worse.

For those weighing a choice of retiring today versus funding their nest egg for 10 additional years, there's little difference from the evidence: If we work for a decade longer, we can expect to retire on twice the annuity that we could buy today, give or take a wide range. And there's less than a 10% likelihood that markets will be so bad in the next 10 years that we're likely to retire poorer than we could today.

Conclusion

The late economic historian and consultant Peter Bernstein was fascinated by the distinct difference between *risk* and *uncertainty*. *Risk* is, to borrow from former U.S. Secretary of Defense Donald Rumsfeld's decision tree, the "known unknowns." *Uncertainty* is the "unknown unknowns," the black swans, the fundamental changes that can't be anticipated. The dispersion in outcomes in Tables 1 or 2, the spread between best and worst outcomes, exemplifies risk. We can quantify it; we can predict the breadth of the range; we cannot predict where, within the range, our own experience may lie.

For most investors, the difference between Table 1 and Table 2 exemplifies *uncertainty*. The implications of a structural change in our starting yield are just too jolting to bear thoughtful consideration. Today's world of negative real yields is, for most of us, a black swan, an "unknown unknown." We want to draw our lottery samples from the past, rather than to think about the implications of a starkly different world. But a world of lower yields—and negative real yields on "riskless" assets—is neither risk nor uncertainty. It simply *is* our current reality. We can choose to accept this new reality, and accept that Table 2 more accurately spans our current reasonable return expectations in a low-yielding world, or we can choose to pretend that the investing world hasn't changed in this profound way. For investors who prefer to pretend that the old norms have not changed, this "new normal" will feel like a black swan, and they will suffer accordingly.

Our message remains largely unchanged. Investors who are prepared to save aggressively, spend cautiously, and work a few years longer (because we're *living* longer), will be fine. Those who do not follow this course are likely to suffer perhaps grievous disappointment. Glidepath—with less risk taken late in our working lives—is inferior to its counterintuitive inverse. But it is entirely secondary whether we choose a Glidepath strategy, an Inverse-Glidepath, or a simple 50/50 rebalanced blend. No strategy can make up for inadequate savings or premature retirement.

As always, please don't shoot the messenger.

Endnotes

1. During this period, stocks averaged an annual 8.3% return and bonds 3.9%.
2. This example is based solely on investment returns, paired with a program of regular contributions, over the 41 years.
3. Results available on request.

Performance Update

FTSE RAFI® Equity Index Series*

TOTAL RETURN AS OF 8/31/12	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED			10 YEAR VOLATILITY
				3 YEAR	5 YEAR	10 YEAR	
FTSE RAFI® All World 3000[1]	TFRAW3	7.04%	3.72%	5.32%	-0.49%	10.15%	19.29%
MSCI All Country World[2]	GDUEACWF	9.88%	6.82%	8.28%	-1.12%	7.56%	17.44%
FTSE RAFI® Developed ex US 1000[3]	FRX1XTR	4.38%	-3.24%	-0.34%	-4.11%	8.32%	20.81%
MSCI World ex US Large Cap[4]	MLCUWXUG	7.12%	-0.15%	3.35%	-3.87%	7.62%	18.89%
FTSE RAFI® Developed ex US Mid Small[5]	TFRDXUSU	4.60%	-5.89%	5.16%	0.14%	12.86%	19.15%
MSCI World ex US Small Cap[6]	GCUDWXUS	7.31%	-4.27%	6.34%	-2.71%	10.56%	20.68%
FTSE RAFI® Emerging Markets[7]	TFREMU	4.12%	-6.70%	5.88%	1.68%	21.21%	25.13%
MSCI Emerging Markets[8]	GDUEEGF	5.92%	-5.48%	6.96%	-0.07%	15.35%	24.53%
FTSE RAFI® 1000[9]	FR10XTR	11.13%	15.58%	12.05%	2.32%	8.20%	18.02%
Russell 1000[10]	RU10INTR	13.37%	17.33%	13.82%	1.47%	6.86%	15.87%
S&P 500[11]	SPTR	13.51%	18.00%	13.62%	1.28%	6.51%	15.63%
FTSE RAFI® US 1500[12]	FR15USTR	10.76%	12.62%	14.30%	4.52%	11.99%	22.40%
Russell 2000[13]	RU20INTR	10.60%	13.40%	13.89%	1.90%	9.00%	20.49%
FTSE RAFI® Europe[14]	TFREUE	5.46%	-2.53%	-2.20%	-5.98%	8.04%	23.73%
MSCI Europe[15]	GDDLE15	8.78%	2.15%	3.22%	-4.72%	7.51%	21.03%
FTSE RAFI® Australia[16]	FRAUSTR	13.44%	6.55%	11.11%	3.67%	15.24%	23.49%
S&P/ASX 200[17]	ASA51	10.93%	1.79%	10.42%	1.93%	14.94%	23.92%
FTSE RAFI® Canada[18]	FRCANTR	6.71%	-1.20%	9.33%	2.88%	15.33%	21.56%
S&P/TSX 60[19]	TX60AR	5.59%	-4.18%	8.13%	1.15%	13.91%	21.76%
FTSE RAFI® Japan[20]	FRJPNTR	-4.85%	-9.71%	-3.44%	-5.60%	4.60%	17.28%
MSCI Japan[21]	GDDLJN	0.03%	-5.34%	-1.74%	-6.37%	3.15%	16.89%
FTSE RAFI® UK[22]	FRGBRTR	8.11%	8.97%	4.86%	-3.87%	7.37%	20.50%
MSCI UK[23]	GDDLUK	8.12%	7.61%	8.04%	-2.99%	7.11%	18.60%

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

Russell Fundamental Index Series*

TOTAL RETURN AS OF 8/31/12	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED			10 YEAR VOLATILITY
				3 YEAR	5 YEAR	10 YEAR	
Russell Fundamental Global Index Large Company[24]	RUFGLTU	8.12%	6.89%	8.13%	0.58%	10.56%	17.92%
MSCI All Country World Large Cap[25]	MLCUAWOG	10.06%	7.57%	7.98%	-1.10%	6.99%	17.14%
Russell Fundamental Developed ex US Index Large Company[26]	RUFDXLTU	4.71%	-1.81%	1.85%	-2.99%	9.86%	19.26%
MSCI World ex US Large Cap[27]	MLCUWXUG	7.17%	0.44%	3.06%	-3.86%	7.13%	18.79%
Russell Fundamental Developed ex US Index Small Company[28]	RUFDXSTU	6.54%	-1.72%	5.53%	-0.36%	12.57%	18.70%
MSCI World ex US Small Cap[6]	GCUDWXUS	7.31%	-4.27%	6.34%	-2.71%	10.56%	20.68%
Russell Fundamental Emerging Markets[29]	RUFGETRU	6.49%	-4.13%	8.73%	3.11%	20.89%	24.93%
MSCI Emerging Markets[8]	GDUEEGF	5.92%	-5.48%	6.96%	-0.07%	15.35%	24.53%
Russell Fundamental US Index Large Company[30]	RUFUSLTU	11.82%	17.69%	14.04%	3.03%	8.80%	16.54%
Russell 1000[10]	RU10INTR	13.37%	17.33%	13.82%	1.47%	6.86%	15.87%
S&P 500[11]	SPTR	13.51%	18.00%	13.62%	1.28%	6.51%	15.63%
Russell Fundamental US Index Small Company[31]	RUFUSSTU	10.82%	12.50%	16.31%	5.70%	12.50%	21.26%
Russell 2000[13]	RU20INTR	10.60%	13.40%	13.89%	1.90%	9.00%	20.49%
Russell Fundamental Europe[32]	RUFEUTE	6.88%	-0.99%	2.25%	-3.91%	11.05%	22.72%
MSCI Europe[15]	GDDLE15	8.78%	2.15%	3.22%	-4.72%	7.51%	21.03%

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

Performance Update

Fixed Income/Alternatives

TOTAL RETURN AS OF 8/31/12	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED			
				3 YEAR	5 YEAR	10 YEAR	10 YEAR VOLATILITY
RAFI® Bonds Investment Grade Master[33]	—	7.68%	10.54%	9.57%	8.79%	6.87%	6.06%
ML Corporate Master[34]	C0A0	8.25%	10.02%	9.58%	7.83%	6.64%	6.22%
RAFI® Bonds High Yield Master[35]	—	10.87%	14.41%	14.64%	11.59%	11.45%	10.32%
ML Corporate Master II High Yield BB-B[36]	H0A4	9.85%	12.80%	13.26%	8.50%	9.38%	9.41%
RAFI® US Equity Long/Short[37]	—	-3.61%	-2.90%	-0.53%	1.11%	4.39%	11.74%
1-Month T-Bill[38]	GB1M	0.03%	0.03%	0.07%	0.58%	1.65%	0.50%
FTSE RAFI® Global ex US Real Estate[39]	FRXR	17.90%	0.48%	5.44%	—	—	—
FTSE EPRA/NAREIT Global ex US[40]	EGXU	21.95%	6.84%	8.53%	—	—	—
FTSE RAFI® US 100 Real Estate[41]	FRUR	18.90%	19.43%	23.88%	—	—	—
FTSE EPRA/NAREIT United States[42]	UNUS	17.13%	19.96%	23.52%	—	—	—
Citi RAFI Sovereign Developed Markets Bond Index Master[43]	CRFDMU	3.23%	-0.15%	4.96%	6.36%	7.61%	7.85%
Merrill Lynch Global Governments Bond Index II[44]	W0G1	2.39%	0.65%	5.03%	6.85%	6.76%	7.13%
Citi RAFI Sovereign Emerging Markets Local Currency Bond Index Master[45]	CRFELMU	10.01%	—	—	—	—	—
JPMorgan GBI-EM Global Diversified[46]	JGENVUUG	9.26%	—	—	—	—	—

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 1000 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 Large Cap 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. equities 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 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 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 State. 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/NARIET Global Index and the EPRA/NAREIT North America Index and contains publicly quoted real estate companies that meet the EPRA Ground Rules. EPRA/NARIET 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 23 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.

(44) The Merrill Lynch Global Government Bond Index II 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 14 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.

(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.