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“The economic performance of the past few decades has strongly influenced expectations about growth.”

Mind the (Expectations) Gap: Demographic Trends and GDP¹

A large body of research in psychology and economics shows that human beings tend to form their expectations by relying on past experiences—especially *recent* ones. Malmendier and Nagel (2011), for instance, talk about investors who live through long periods of poor stock market performance and how this experience affects their risk-taking propensities... *for life*. The most famous example comes from the “Depression Babies,” an entire generation that was scarred for life by the financial and macroeconomic shocks of the Great Depression. Of course the opposite effect also exists: periods of economic ebullience give rise to more intrepid investors, entrepreneurs, and so on.

Those times might feel like a distant past now, but until recently 3–4% growth in real GDP was considered “normal.” So it should come as no surprise that the economic performance of the past few decades has strongly influenced expectations about economic growth. However, when optimistic expectations get detached from reality we risk creating a significant expectations gap—a disconnect between what we take for granted given our recent experiences and what we *should* anticipate given simple arithmetic.

We explore the role of demography—one of the three Ds of the 3-D hurricane of debt,

deficits, and demographics—on economic growth in this issue of *Fundamentals*.² The following synopsis of our forthcoming paper on the topic (Arnott and Chaves, 2013) demonstrates that favorable trends in the size and composition of populations have helped to fuel the rapid economic growth experienced in the developed world over the past 60 years, and their reversal plays a crucial part in the current rapid deceleration in developed world growth.

Demographic Evolution

Tracing very long term trends will certainly help situate existing and emerging demographic states of affairs in their historical context. It may also indicate what used to be “normal,” if, indeed, there ever was such a condition. We examine four distinct phases that represent past, current, and future population profiles across different countries:³

Phase I. The first phase, covering most of human history, was ostensibly a high-mortality steady state, with births roughly matching deaths, short lifespans, and elevated support ratios (the number of non-workers, young and old, supported by the labor force). Life in the first phase can probably be described best by Hobbes’ famous quote as “solitary, poor, nasty, brutish, and short.”⁴



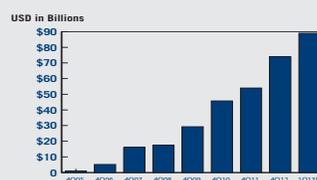
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Phase II. This phase, beginning around the time of the industrial revolution and climbing to a pinnacle in the decades after the Second World War, was characterized by a steady rise in life expectancy and a decline in birthrates. The working-age population soared and support ratios improved enormously.

Phase III. This phase, beginning in the present century, is almost an inverted image of the second phase: the fraction of seniors skyrockets and the fraction of workers tumbles. Until fertility rates get back to replacement levels (roughly 2.1 children per woman of child-bearing age), the population crests and begins to subside, with very high support ratios associated with senior citizens. However, this should not come as a surprise, because both phases II and III are impelled by the same forces: rising life expectancies and falling fertility rates.

Phase IV. This phase is the “future state,” which is by definition some-

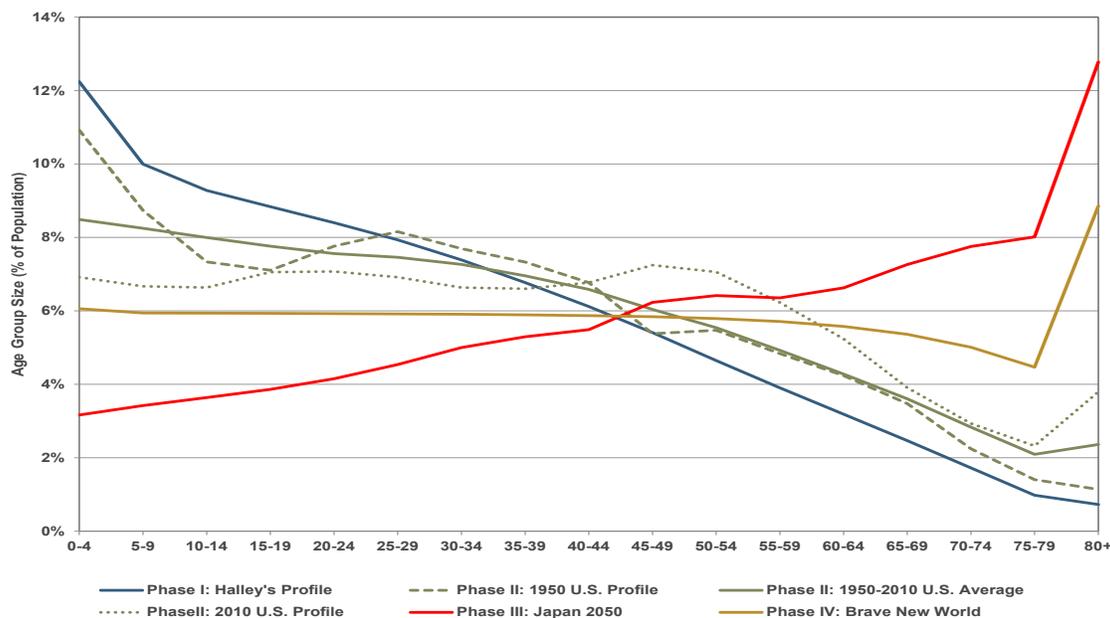
what speculative. For convenience, we model it as a new steady state with births equaling deaths, and with long lifespans, perhaps much longer than today’s. We include it for the purpose of comparison; since phases II and III are unquestionably temporary, it must differ from them.

The demographic profiles for each phase are illustrated in **Figure 1**. The solid blue line shows the profile of one of the first reasonably accurate demographic tables, produced by Edmond Halley for the city of Breslau (currently Wroclaw in Poland) in 1693.⁵ Not surprisingly, mortality rates were much higher than they are today. In particular, *infant* mortality was so high that there is an inflection in the curve right after age group 0–4: many newborns didn’t last a single year, let alone five. Median life expectancy was only 24 years at birth, but 34 for those fortunate or hardy enough to survive that first lethal year.⁶ From our perspective, Phase I is

a “steady state”; through the lens of our telescope, population structures were relatively stable for centuries. Obviously, for someone living through famine, wars, or decimating diseases, life was anything but stable.

The second phase is represented by the green lines, which depict two distinct points in U.S. history—1950 and 2010—and the average for the intervening period. It is possible to see the peak of the baby boomers in 1950 (dashed line) and the subsequent increase in the relative size of the working force in 2010 (dotted line). In these six decades, tumbling support ratios provided a strong tailwind to economic growth, as children fell relentlessly to historical lows as a share of the population, the working-age population soared, and support ratios for senior citizens remained low. Interestingly, the dotted line for 2010 becomes almost flat up to approximately age 50, reflecting the combined effects of lower mortality rates and the transition to a new steady state (Phase IV below).

Figure 1. Examples of Demographic Profiles in All Four Phases



Source: Research Affiliates, based on data from the United Nations and Bacaër (2011).

As an extreme example of the strong demographic imbalances which are developing in some countries, the red line presents the forecasted demographic profile for Japan in 2050. The slope of the curve is completely reversed, revealing a discouragingly small number of children and an astonishingly large number of senior citizens.

Finally, the gold line shows an example of a demographic profile of a hypothetical country with a life expectancy of 80 years (approximately the life expectancy for the developed economies of the world at the present time). This phase will be characterized by support ratios that are both higher than the demographic tailwind of recent decades and lower than what we expect in the coming Phase III decades.

Economic Growth

As interesting as studying historical and prospective demography might be, such an analysis would be incomplete if we did not consider the future prosperity of different countries in view of their past, current, and future demographic profiles. For this reason, we combine the rich trove of

past and forecasted future data from the United Nations with our previous work establishing a link between demographic profiles and economic growth. **Figure 2**, drawn from Arnott and Chaves (2012), shows the relationship between the size of each age group and growth in Real Per Capita GDP.

Our results show that children have a slightly negative effect on economic growth, but young adults start to positively contribute as they join the workforce. Skeptics might argue that wages and productivity peak later in life, typically in one's 40s and 50s. This is generally true, and helps to explain why the most prosperous nations often have a larger proportion of mature adults than the less prosperous nations. However, the definition of a peak, whether for productivity or anything else, is that we stop rising and start falling! When we reach peak productivity, by definition our productivity growth is zero.

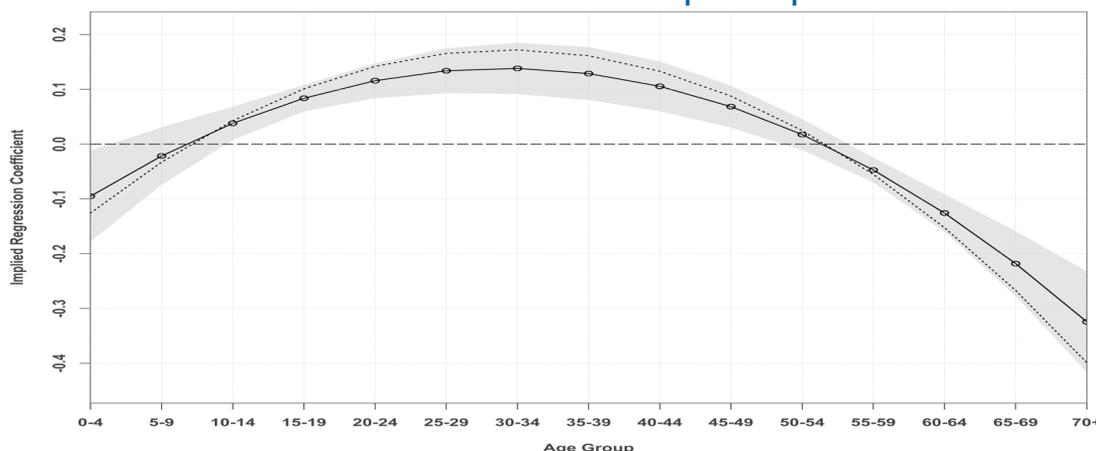
The average contribution to GDP growth becomes negative between 55 and 60. This does not mean that people begin to consume more GDP than they pro-

duce after age 55, only that—on average—workers above age 55 have passed their peak in productivity. Intuitively, the average 60-year-old is more productive than the average 40-year-old, but not so relative to the average 55-year-old. At ages 60 and above, the coefficients decline much more sharply: the mature worker exhibits falling productivity, and in retiring, a worker's productivity simply falls off a cliff.

The influence of demography on economic growth should not be underestimated. Our research shows that demography contributed to a tailwind in Phase II and will likely contribute to a headwind in Phase III. **Figure 3** presents the results for the countries of the G-8 and the BRICs. We forecast growth in Real Per Capita GDP (holding everything else constant) for every five-year interval between 1950 and 2050, based on the demographic linkages observed in the 1950-2010 data spanning 22 countries. These are not "normal" GDP growth rates, they are *abnormal* GDP growth rates, reflecting the impact of a demographic tailwind or headwind.

Japan displays the most manifest effects.

Figure 2. Relationship between Age Group Size and Real Growth in GDP per Capita



Source: Arnott and Chaves (2012).

The Japanese “economic miracle” of the 1960s to the 1980s got a terrific lift from demography. The birthrate plunged, so that support ratios associated with legions of children disappeared, and the support ratios associated with legions of senior citizens did not really outstrip the decline in the roster of children until the 1990s. Their demographic “dividend” may have peaked at approximately 3% per year, relative to the average demographic profile of the century from 1950 to 2050.

Now, the youngsters of the late 1940s and early 1950s are approaching retirement, and the baby bust from about 1980 onward is delivering a continually shrinking roster of new entrants to the labor force. With relatively few young workers to take the place of retiring boomers, Japan’s prospective demographic headwind may be greater than 2% per year. A transition from a 3% tailwind to a 2% headwind is shocking:

it suggests a 5 percentage point drop in normal real per capita GDP growth rates from the heady growth of the 1960s to the 1980s. Even if changes in policies and entitlements can halve these figures, it’s a formidable headwind.

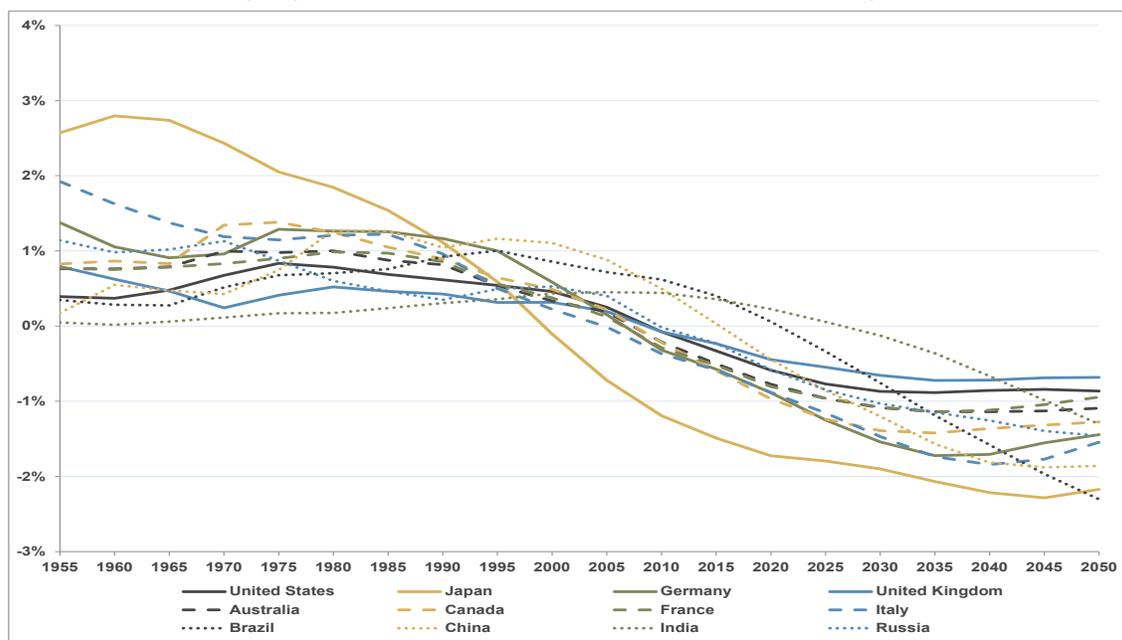
All 12 countries will confront varying speeds of demographic headwinds in the coming decades, first in the developed economies, then in the older emerging economies (China and Russia), and finally in the younger emerging economies (Brazil and India). These headwinds get stronger over time and appear to stabilize in the developed world and the older emerging economies only after about 2040. For the younger emerging economies, the demographic headwinds do not become acute for perhaps another 20–30 years.

All 12 countries enjoyed demographic tailwinds during the past 60 years, so these headwinds will feel more obstruc-

tive than they are. It is human nature to consider our personal experience to have been “normal,” so we evaluate subsequent events in comparison with this self-referential “norm.” If the people of Japan consider the former tailwind of 2–3% to be “normal,” then a future 2% headwind will feel like a ponderous 4–5% drag, relative to expectations. On average, the countries in this analysis enjoyed benign demographic profiles that boosted GDP growth by around 1% per year during much of the past six decades.

The first few decades of the sample were particularly beneficial to developed countries. China and Brazil seem to have experienced their peak demographic dividend recently. That said, a 2% erosion in high-single-digit growth is hardly a pessimistic forecast. Absent egregious policy missteps, these economies have ample room to catch up to the developed world, albeit at a gently

Figure 3. Forecasts of Economic Growth Based on Demographic Forces (Past, Current, and Prospective)



Source: Research Affiliates, based on data from the United Nations, Penn World Table, and Global Financial Data.

decelerating pace. The young emerging economies, like India (where the median age today is still only 25), will continue to enjoy a demography-fueled tailwind over the next decade or two.

Conclusion

Our main goal in presenting these results is to correct the common misconception that developed countries went through a “normal” period of high growth, as if we are all entitled to fast-growing prosperity. In reality, the developed world is entering a new phase in which the low fertility rates of past decades lead to slow growth (in many countries, no growth) in the young adult population; young adults are

the dominant engine for GDP growth. Mature adults, many of whom are at or near their peak productivity, are poised to retire, creating an impressive surge in the rolls of senior citizens. These newly-minted senior citizens, transitioning from near-peak productivity to retirement in a single step, will be drawing on the economy while no longer producing goods and services. The unequivocal good news of a steady rise in life expectancy means that these retirees will create a very substantial drag on GDP growth, as these seniors move from peak productivity to negligible productivity in just a few years. The danger is not in the slower growth.

Slow growth is not a bad thing. It’s still growth. The danger is in an expectations gap, in which we consider slower growth unacceptable. If we expect our policy elite to deliver implausible growth, in an environment in which a demographic tailwind has become a demographic headwind, they will deliver temporary outsized “growth” with debt-financed consumption (deficit spending). If we resist the necessary policy changes that can moderate these headwinds, we risk magnifying their impact.

Endnotes

1. The title is borrowed from Russel Kinnel’s wonderful Morningstar research, repurposed to our demography topic.
2. See past issues of *Fundamentals* for more on the 3-D Hurricane.
3. This choice of four phases might not come from traditional demographic theory, but it serves our purposes of illustrating the transitions most countries are recently experiencing.
4. Hobbes, Thomas. 1651. *Leviathan, or the Matter, Form, and Power of a Commonwealth, Ecclesiastical and Civil*. London: Andrew Crooke.
5. According to Bacaër (2011), before the 18th century it was common to publish bulletins with baptisms and burials that contained the cause of death—mainly to inform citizens about plague epidemics—but not the age of death. For this reason, most tables produced involved a significant amount of guesswork to estimate the age of death from the cause of death.
6. Halley himself won the actuarial lottery of the 17th century, reaching age 85. His own tables gave him a 1.4% chance of living so long.

References

- Arnott, Robert D., and Denis B. Chaves. 2012. “Demographic Changes, Financial Markets, and the Economy.” *Financial Analysts Journal*, vol. 68, no. 1 (January/February):23–46.
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- Bacaër, Nicolas. 2011. *A Short History of Mathematical Population Dynamics*. London: Springer Verlag.
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Performance Update

FTSE RAFI® Equity Index Series*

TOTAL RETURN AS OF 5/31/13	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED			
				3 YEAR	5 YEAR	10 YEAR	10 YEAR VOLATILITY
FTSE RAFI® All World 3000 ¹	TFRAW3	10.88%	32.04%	12.31%	3.16%	11.50%	18.54%
MSCI All Country World ²	GDUEACWF	9.54%	26.71%	12.90%	1.72%	8.66%	16.51%
FTSE RAFI® Developed ex US 1000 ³	FRXIXTR	8.12%	34.32%	9.65%	-0.69%	9.98%	20.19%
MSCI World ex US Large Cap ⁴	MLCUWXUG	7.36%	30.22%	10.83%	-1.19%	9.04%	18.15%
FTSE RAFI® Developed ex US Mid Small ⁵	TFRDXUSU	6.77%	25.90%	11.21%	4.18%	13.29%	18.88%
MSCI World ex US Small Cap ⁶	GCUDWXUS	9.91%	30.95%	13.49%	1.84%	11.76%	20.03%
FTSE RAFI® Emerging Markets ⁷	TFREMU	-6.13%	10.84%	3.37%	-0.53%	19.29%	24.47%
MSCI Emerging Markets ⁸	GDUEEGF	-3.29%	14.50%	5.74%	-0.90%	15.40%	23.93%
FTSE RAFI® 1000 ⁹	FRIOXTR	18.07%	34.26%	17.41%	8.38%	9.84%	17.09%
Russell 1000 ¹⁰	RU10INTR	15.48%	27.62%	16.92%	5.57%	7.96%	14.87%
S&P 500 ¹¹	SPTR	15.37%	27.28%	16.87%	5.43%	7.58%	14.57%
FTSE RAFI® US 1500 ¹²	FR15USTR	17.88%	34.78%	15.94%	10.61%	13.21%	21.80%
Russell 2000 ¹³	RU20INTR	16.45%	31.07%	15.72%	7.15%	9.78%	19.74%
FTSE RAFI® Europe ^{14**}	TFREUE	9.61%	33.18%	7.74%	1.32%	8.26%	17.51%
MSCI Europe ^{15**}	GDDLE15	9.73%	29.39%	10.76%	2.11%	7.70%	14.45%
FTSE RAFI® Australia ^{16**}	FRAUSTR	10.97%	33.35%	10.72%	4.59%	10.56%	13.52%
S&P/ASX 200 ^{17**}	ASA51	7.97%	26.50%	8.46%	1.84%	9.77%	13.53%
FTSE RAFI® Canada ^{18**}	FRCANTR	5.85%	17.81%	6.40%	3.65%	10.47%	13.49%
S&P/TSX 60 ^{19**}	TX60AR	3.01%	14.16%	4.57%	-0.93%	9.08%	13.95%
FTSE RAFI® Japan ^{20**}	FRJPNTR	37.65%	66.43%	10.87%	-1.41%	6.53%	19.95%
MSCI Japan ^{21**}	GDDLJN	33.86%	62.92%	11.22%	-2.61%	5.15%	19.30%
FTSE RAFI® UK ^{22**}	FRGBRTR	14.66%	33.20%	12.78%	6.37%	9.40%	15.46%
MSCI UK ^{23**}	GDDLUK	13.42%	28.29%	12.27%	5.70%	8.80%	13.36%

*To see the complete series, please go to: http://www.ftse.com/Indices/FTSE_RAFI_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 5/31/13	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED			
				3 YEAR	5 YEAR	10 YEAR	10 YEAR VOLATILITY
Russell Fundamental Global Index Large Company ²⁴	RUFGLTU	11.43%	31.43%	13.82%	4.11%	11.51%	16.86%
MSCI All Country World Large Cap ²⁵	MLCUAWOG	9.24%	26.24%	12.71%	1.50%	8.12%	16.19%
Russell Fundamental Developed ex US Index Large Company ²⁶	RUFDXLTU	8.88%	34.23%	10.21%	0.09%	10.61%	18.26%
MSCI World ex US Large Cap ²⁷	MLCUWXUG	7.19%	30.24%	10.63%	-1.40%	8.56%	18.02%
Russell Fundamental Developed ex US Index Small Company ²⁸	RUFDXSTU	9.45%	29.31%	12.81%	4.37%	13.54%	18.34%
MSCI World ex US Small Cap ⁶	GCUDWXUS	7.97%	27.37%	12.36%	1.62%	11.67%	20.25%
Russell Fundamental Emerging Markets ²⁹	RUFGETRU	-4.23%	14.88%	7.23%	2.20%	19.82%	24.20%
MSCI Emerging Markets ⁸	GDUEEGF	-3.29%	14.50%	5.74%	-0.90%	15.40%	23.93%
Russell Fundamental US Index Large Company ³⁰	RUFUSLTU	17.75%	32.42%	18.03%	8.41%	10.34%	15.47%
Russell 1000 ¹⁰	RU10INTR	15.48%	27.62%	16.92%	5.57%	7.96%	14.87%
S&P 500 ¹¹	SPTR	15.37%	27.28%	16.87%	5.43%	7.58%	14.57%
Russell Fundamental US Index Small Company ³¹	RUFUSSTU	17.27%	34.28%	16.92%	11.33%	13.78%	20.74%
Russell 2000 ¹³	RU20INTR	16.45%	31.07%	15.72%	7.15%	9.78%	19.74%
Russell Fundamental Europe ^{32**}	RUFEUTE	8.51%	30.57%	8.93%	2.72%	9.89%	15.92%
MSCI Europe ^{15**}	GDDLE15	9.08%	28.88%	10.34%	1.71%	7.70%	14.71%

*To see the complete series, please go to: http://www.russell.com/indices/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 5/31/13	BLOOMBERG TICKER	YTD	12 MONTH	ANNUALIZED			
				3 YEAR	5 YEAR	10 YEAR	10 YEAR VOLATILITY
RAFI® Bonds US Investment Grade Master ³³	—	-0.87%	3.77%	7.26%	8.10%	5.71%	5.99%
ML Corporate Master ³⁴	COAO	-0.57%	5.16%	7.52%	7.69%	5.45%	6.12%
RAFI® Bonds US High Yield Master ³⁵	—	2.91%	12.26%	11.84%	11.52%	10.13%	9.50%
ML Corporate Master II High Yield BB-B ³⁶	H0A4	3.51%	13.63%	11.60%	9.46%	8.56%	9.13%
RAFI® US Equity Long/Short ³⁷	—	8.75%	19.40%	2.13%	8.31%	5.78%	11.21%
1-Month T-Bill ³⁸	GB1M	0.02%	0.05%	0.07%	0.19%	1.55%	0.51%
FTSE RAFI® Global ex US Real Estate ³⁹	FRXR	3.67%	38.62%	14.77%	2.26%	—	—
FTSE EPRA/NAREIT Global ex US ⁴⁰	EGXU	2.67%	32.41%	14.90%	0.80%	—	—
FTSE RAFI® US 100 Real Estate ⁴¹	FRUR	10.42%	24.56%	17.13%	8.16%	—	—
FTSE EPRA/NAREIT United States ⁴²	UNUS	8.47%	17.62%	16.78%	5.00%	—	—
Citi RAFI Sovereign Developed Markets Bond Index Master ⁴³	CRFDMU	-2.97%	3.12%	5.87%	3.92%	5.63%	7.67%
Merrill Lynch Global Governments Bond Index II ⁴⁴	WOG1	-5.13%	-4.08%	3.68%	3.45%	4.63%	7.05%
Citi RAFI Sovereign Emerging Markets Local Currency Bond Index Master ⁴⁵	CRFELMU	-2.71%	11.51%	—	—	—	—
JPMorgan GBI-EM Global Diversified ⁴⁶	JGENVUUG	-3.15%	11.58%	—	—	—	—

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 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 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 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 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.

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