Whither Bonds, After the Demographic Dividend?

Robert D. Arnott
Chairman and CEO
Research Affiliates
Newport Beach, California

Deficits, levels of debt, and demographics are deeply interrelated. Demographics have a major impact on GDP growth as well as on investment returns. The long-term headwind that can be expected in the 21st century compared with the demographic dividend, or tailwind, of the 20th century has serious implications for bond investing. But there are still investment opportunities that can be found today.

There is an interconnectivity between economies and the capital markets both within and external to those economies. When thinking of bonds, however, it is easy to become insular and focus on only the domestic bond market. This discussion is a reminder that the relationships among markets are significant and they matter far more than most people think. These interrelated topics have come to be known as the "3-D Hurricane"—deficits, debt, and demographics.

The Pending 3-D Hurricane: Entitlements

Deficits lay a foundation for debt, which, in turn, sows seeds for future challenges. In **Figure 1**, the solid line shows the official US deficit as a percentage of GDP from the fourth quarter of 1953 to the first quarter of 2014. This percentage was reasonably benign until the early 1970s when it rose to 2% of GDP, which caused considerable angst. But it was not long until the normal range for debt was between 3% and 5% of GDP. Debt briefly rose to 10% of GDP during the financial crisis, but more recently, it is reported to be less than 3%. The problem is that these reported deficit levels are not the whole picture.

The dotted line in Figure 1 shows the change in US national debt expressed as a percentage of GDP over the same period. The dashed line in Figure 1 adds in the obligations of government sponsored entities (GSEs). The dash-dot-dash line is the official deficit, according to generally accepted accounting principles (GAAP), plus the year-over-year change in unfunded entitlements. Examples of this type of

This presentation comes from the Fixed-Income Management Conference held in Huntington Beach, California, on 16–17 October 2014 in partnership with CFA Society Orange County.

spending include funding for the Social Security and Medicare trust funds and funding for wars. The list is certain to grow as the US Congress discovers how easy it is to move expenditures off the balance sheet. Note that the deficit with entitlements exceeded 20% of GDP in 2009, which is off this chart. The addition of unfunded entitlements to the official deficit means that the United States is spending or committing to spend more than 20% of GDP per year. The true deficit for 2013 acknowledged by the Social Security Administration and by the Treasury Department is greater than $5 trillion. If the government was run like a corporation, that is the deficit it would report. This deficit figure uses a real discount rate of 3% for liabilities. As a nation, the United States cannot keep these promises and will most likely have to break them.

Around 2012, the US national debt reached 100% of GDP. The definition of GDP has been revised to include new ideas, which increases GDP and pushes the national debt line downward. But the level is still greater than 100% of GDP. If state and local debt as well as GSEs are added to national debt, the debt level increases to 180% of GDP, which is roughly the same percentage as in Greece. Add to that amount the unfunded Social Security, Medicare, and Medicaid liabilities and the debt level is at 650% of GDP.

So, if GDP is $17 trillion, that percentage translates into about $110 trillion of national debt based on GAAP. The government receives $3 trillion in taxes annually and owes $110 trillion. Compare this situation with a family that has $30,000 in income and debt of $1 million. The family is not going to be able to pay off that level of debt, so it will not be paid. In fact, this debt situation is going to make the politics of the past decade look benign, polite, and serene in contrast to the politics of the coming decade. It does not matter who is in the White House or who is running Congress, the United States cannot honor these promises and thus will not.

Figure 1. US Official Deficit, Change in Debt/GDP and Debt Plus GSEs, and Deficit Plus Entitlements, 4Q 1953 to 1Q 2014

Percentage of GDP (%)
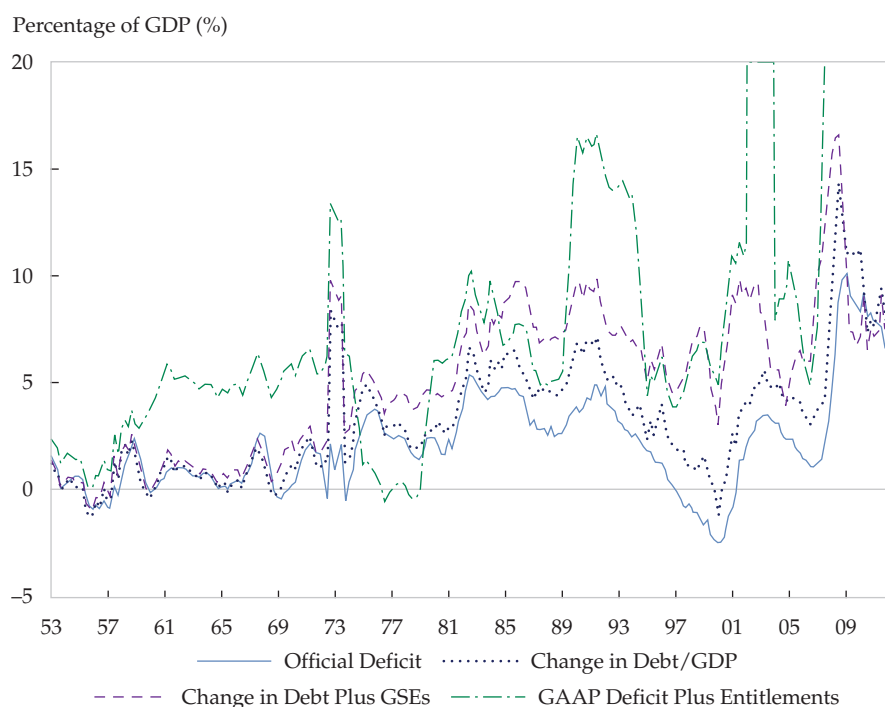
Sources: Based on data from the US Treasury Department and the Federal Reserve flow of funds.

Demographics are going to exacerbate these problems. The populations of the G–8 (i.e., United States, United Kingdom, Japan, Italy, Canada, France, Germany, and until 2014, Russia) are aging. In the 1950s, there was a bump in the population, with a little more than 10% of the population aged zero to four. Those are the baby boomers. Interestingly, in the 1950s, about 9% of the G–8 population was age 65 and older. In 60 years (1950–2010), the percentage increased to 16%, and over the next 20 years, the United Nations projects that age group to grow to 26%. That is a huge change in a relatively short amount of time. If you think of these headwinds as a storm, Japan is squarely in the middle of the storm. Europe is approaching the middle of the storm, and the United States is in the early stages of the storm.

Looking at the demographics of the BRIC (Brazil, Russia, India, China) economies, their bump in population occurred in 1970 and the median age in those economies at that time was 20 years old. Half of the population were teenagers or younger. Today, the median age in those economies is 30 years old, and people that age think differently than teenagers do. They focus on such questions as, How do I take care of my family? How do I build a career? How do I plan for the future? These people are squarely in the midpoint of the age cohort that drives productivity growth: ages 20–44. Productivity peaks when people are in their 40s or 50s, and it is important to recognize

that, statistically, once a person reaches his or her productivity peak, future growth in productivity is zero.

A common theme when you look at age cohorts in the most prosperous societies is that they have a lot of people in their 50s and older. A common theme in the most rapidly rising societies is that they have a lot of people in their 20s and 30s. In 1950, the G–8 countries had a median age of 30 and exhibited stupendous growth. Those countries still had a median age of 30 in 1970 and growth continued. The G–8 countries hit a median age of 40 in approximately 2010 and will reach a median age of 45 over the next two decades. These demographic changes will coincide with distinctly slower growth. Emerging economies will move from a median age of 30 to 40 over the next 30 years. Thus, in comparison, the emerging economies will compress into 30 years the demographic experiences that the G–8 countries experienced over 60 years. Those economies will have the opportunity to reach standards of living not dissimilar to what the G–8 countries experience today, assuming that their governments do not squander those opportunities.

Demographics matter considerably more than most people think they do. As I mentioned earlier, the highest GDP growth is associated with people aged 20–44. A greater presence of children hurts GDP growth by a small amount. But a greater presence of senior citizens hurts GDP growth by a significant amount because the seniors go from peak productivity to no productivity in a very short period of time.

Stocks perform better when there are many people in the 35–59 age group because that is when that cohort is soaring in growth. Furthermore, stocks perform worse when the 70+ age cohort is growing rapidly, which Japan is experiencing. Bonds experience peak performance with approximately a five-year age difference from stocks.

In 2012, Denis Chaves and I published some research in which we looked at the demographics of about two dozen countries going back to 1960.[1] We uncovered a very significant polynomial relationship between demographics and investment returns. We found that for stock returns, the implied regression coefficient for the 45–55 age group is approximately 1.0. This result means that a 1% change in that population translates into a 1% increase in annual stock market returns. The implied regression coefficient related to that same age group is approximately half as large for bonds as for stocks, but still a very significant impact.

Demography: Past, Present, and Prospects

I want to look at demographics from the perspective of history and then from the perspective of the future. I will start with Phase I, which is ancient history. I will

[1]Denis B. Chaves and Robert D. Arnott, "Demographic Changes, Financial Markets, and the Economy," *Financial Analysts Journal*, vol. 68, no. 1 (January/February 2012): 23–46.

then look at Phase II, which is a time of transition, and Phase III, which is the future.

Phase I. In his book *Leviathan*, published in 1651, Thomas Hobbes described the existence of man up to the 16th century as solitary, poor, nasty, brutish, and short. Edmund Halley, who discovered Halley's Comet, also started the life insurance industry. Halley went to Wroclaw, Poland, and created an actuarial table. He chose Wroclaw because for many decades, the city had experienced a stable population, relatively few wars or disruptions, and had kept meticulous records of births and deaths. He found that 12% of the population was one to four years old versus zero to four years old; at that time, families had the naming ceremony at age one because an estimated 20%–30% of infants died before their first birthday. Nearly 20% of children reaching age 1 did not survive to age 5, and 10% of those reaching age 5 did not survive to age 10. Life expectancy at birth was probably 12 years, at age 1 it was 24 years, and at age 5 the life expectancy increased to 32 years.

Phase II. In Phase II, the demographic dividend appeared. Benign demographics provided a tailwind for growth. **Figure 2** shows the US age demographic profile in 1950 and the profile described by Hobbes centuries before—brutish and short. The reasons why the profiles are so similar are because death rates had declined because of modern medicine, birth rates had not yet started to decline, and people were living longer. The spike in the zero to four age group is the baby boom.

**Figure 2. US Age Demographic Profile for 1950 and According to Hobbes**
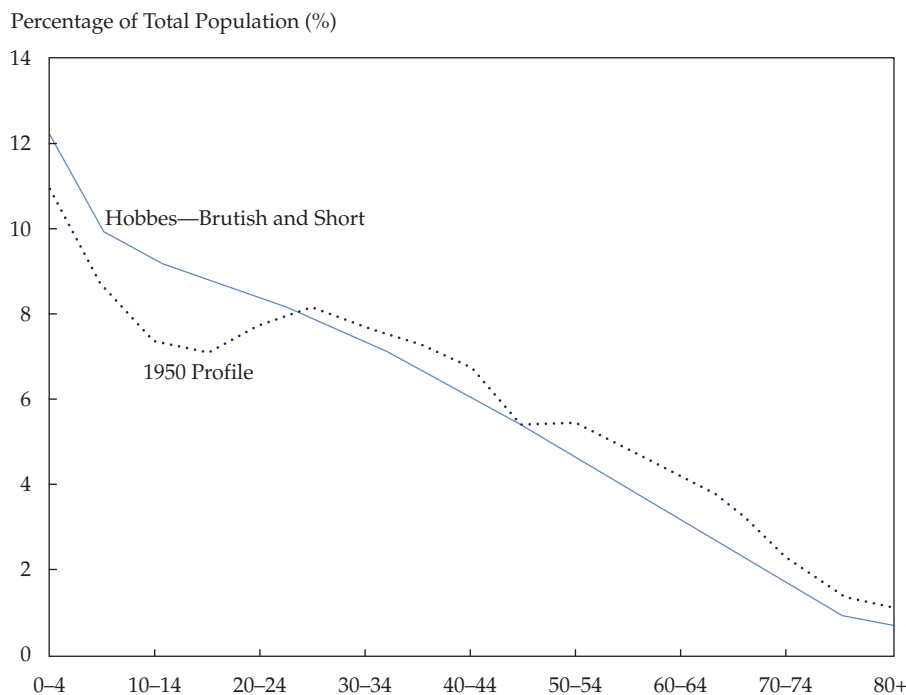
Percentage of Total Population (%)

Hobbes—Brutish and Short

1950 Profile

Sources: Based on data from the United Nations, the Penn World Table, and Global Financial Data.

Following 1950, life expectancy continued to soar. **Figure 3** shows the average life expectancy every five years from 1950 to 2010 of developed economies (proxied by the United States, Japan, Germany, and the United Kingdom) and emerging economies (proxied by the BRIC countries). For the United States, life expectancy was 46 years at the start of the 20th century, 69 years by 1950, and 78 years (which is the lowest life expectancy of the developed economies) by 2010. Japan, with the lowest life expectancy of the developed world in 1950, had the highest at 83 years by 2010. Looking at this group of countries as a whole, the average life expectancy was approximately 68 years in 1950 and 81 years by 2010. This improvement of 13 years was achieved over a 60-year span. So, life expectancy is increasing by about two months per year, and evidence indicates that the improvement will continue. In emerging economies, the improvements are rising even faster than in the developed economies. The outlier among the BRIC countries is Russia, where life expectancy for men hit a low 10 years ago at 59 years.

Life expectancy at age 65 is similarly increasing. In 1950, you could expect to live 10–15 years in retirement, whereas now the expectation is 20–25 years. Interestingly, US Census Bureau data suggest that the United States has already achieved the life expectancy goal at age 65 that the United Nations forecast for the year 2050. In other words, there may be a sharp rise in life expectancy among retirees. Death rates in two of the last six years have fallen, despite a rising population.

Defining the population of working-age people very simplistically as those aged 20–65, **Figure 4** shows the growth and projected growth in workers and retirees in the United States and Japan from 1950 to 2050. In 2012 and for the first time in US history, the population of retirees was rising more rapidly than the population of working-age people, which is a seminal change. The result is that the number of working-age people minus the retirees they have to support shifted negative in 2012 and is projected to not shift positive in the United States until the 2030s. In contrast, this difference shifted negative in Japan

Figure 3.   Average Life Expectancy in Five-Year Increments for Developed and Emerging Economies, 1950–2010
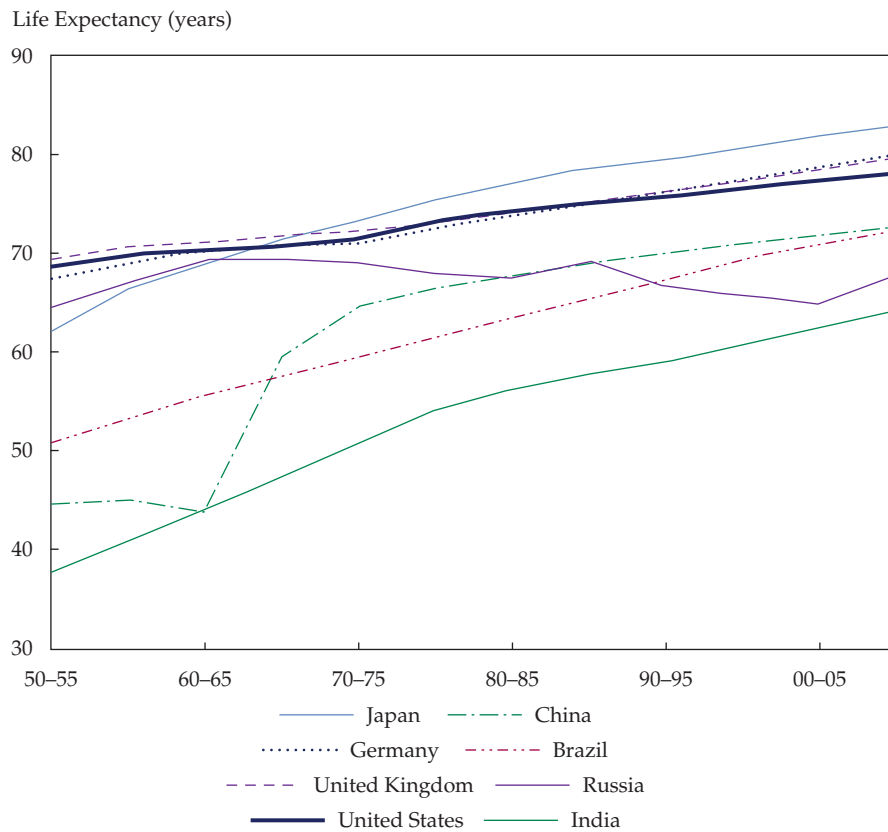
Notes: Developed economies are represented by the United States, Japan, Germany, and the United Kingdom. Emerging economies are represented by the BRIC countries.

Sources: Based on data from the United Nations, the Penn World Table, and Global Financial Data.

Figure 4. Growth and Projected Growth in Workers and Retirees in the United States and Japan, 1950–2050

A. United States

Increase in Age Group (thousands)

B. Japan

Increase in Age Group (thousands)
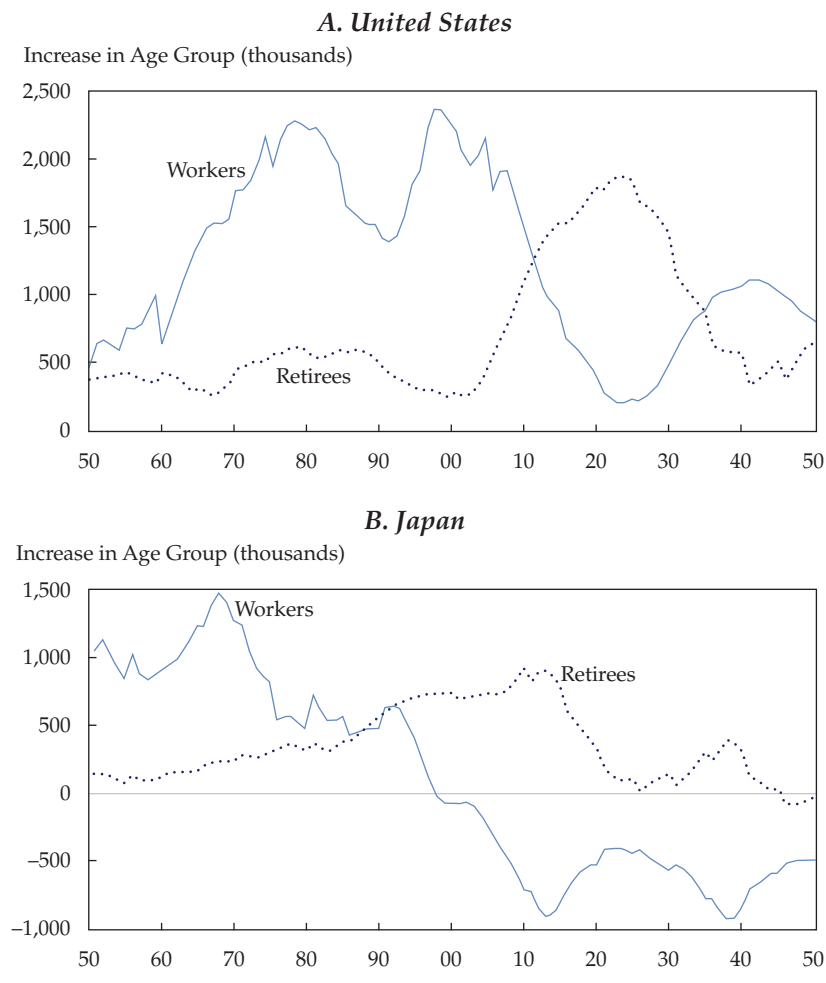
Source: Based on data from the United Nations.

in the 1990s, and at this point, there is no indication of it shifting positive.

The support ratio as calculated by the United Nations has also been changing dramatically. In 1950 in the United States, 55% of the population was working age (20–65) and 8%–9% of the population was 65 years old or older. Thus, the worker-to-retiree ratio was 7:1, which is a strong formula for rapid GDP growth. The support ratio fell to 5.8 by 1960 because people were living longer, but it was still an attractive ratio. The ratio has been fairly stable recently and is now 4.1, but it is poised to decrease by 40% to 2.7 by the year 2030.

Collectively, developed economies of the world are older than the United States. They reached the current US ratio (4.1) around 2000. China, with a current worker-to-retiree ratio of around 7:1, will be at around 4.1 in approximately 2020. India should reach that ratio in approximately 2055. China's and India's economic growth engines are functioning well right now and will continue to do so as long as the governments and corruption do not "dismantle" the engines.

As aging populations lead to more troublesome support ratios, two choices present themselves: accept the falling support ratios or work longer and retire later. To stabilize support ratios at a level of four workers for each retiree, or more accurately, four working-age people for each retiree because not all working-age people work, retirement age in the United States would have to increase rapidly from 65 years to 71 years. The idea of changing the retirement age should not be a shock. People today are living 15 years longer than their great grandparents, so why should they expect to retire at the same age that their great grandparents retired?

Phase III. As the population transitions to Phase III, more aging workers are exiting the labor force while fewer young people are entering the labor force. Birth rates have declined below replacement rates in one country after another. Those who are older may recall the 1968 book *The Population Bomb*, by Paul Erhlich, in which he stated that the world population would reach 6 billion by the year 2000 (which it did) and would reach 14 billion by the year

2050, absent any crises. Erhlich also predicted a world war and mass starvation around the year 2000, which would dramatically reduce the world's population to 2 billion. Although some of Erhlich's predictions did not transpire, the declining of birth rates and cresting of the world's population were already preordained at the time the book was published. Birth rates fell below replacement levels in Japan before 1960 and in 1971 for Russia, Germany, Canada, the United Kingdom, and the United States. Today, of the G–8 countries and the BRIC countries, only India has a birth rate that remains above the replacement rate, but just barely. India's 2012 birth rate of 2.8 is already estimated to have dropped to 2.4 and will equal the replacement rate when it drops to 2.1 children. The advent of the birth-control pill and access to cheap ultrasounds that has permitted gender selection have had a tremendous impact on growth rates as well as gender imbalance in some countries.

In Phase III, after the demographic dividend, the combination of low birth rates and increasing life expectancies combine to create serious headwinds for economic growth. Japan's demographic profile in 2050, which is more adverse than those of other countries, indicates that less than 3% of the population will be between the ages of 0 to 5 and there will be more people above the age of 65 than people below the age of 45. This sets the stage for what could be a very interesting span of history. Fertility rates must return to replacement levels at some stage, but absent the reversion in birth rates, the world population would eventually decline to zero after a few centuries.

Modeling the Link between GDP Growth and Demographics

To model the link between GDP growth and demographics, the first step was to determine what a country's demographic profile might suggest about abnormalities in GDP growth. **Figure 5** shows abnormal GDP growth relative to 1955–2050 averages for the United States, Japan, Germany, the United Kingdom, and the BRIC countries. For the United States, abnormal GDP growth peaked at approximately 1.0% around 1975, crossed over the zero line in approximately 2007, and will trough at approximately –1.0% between 2025 and 2030.

Figure 5. Abnormal GDP Growth in Developed and Emerging Economies, 1955–2050
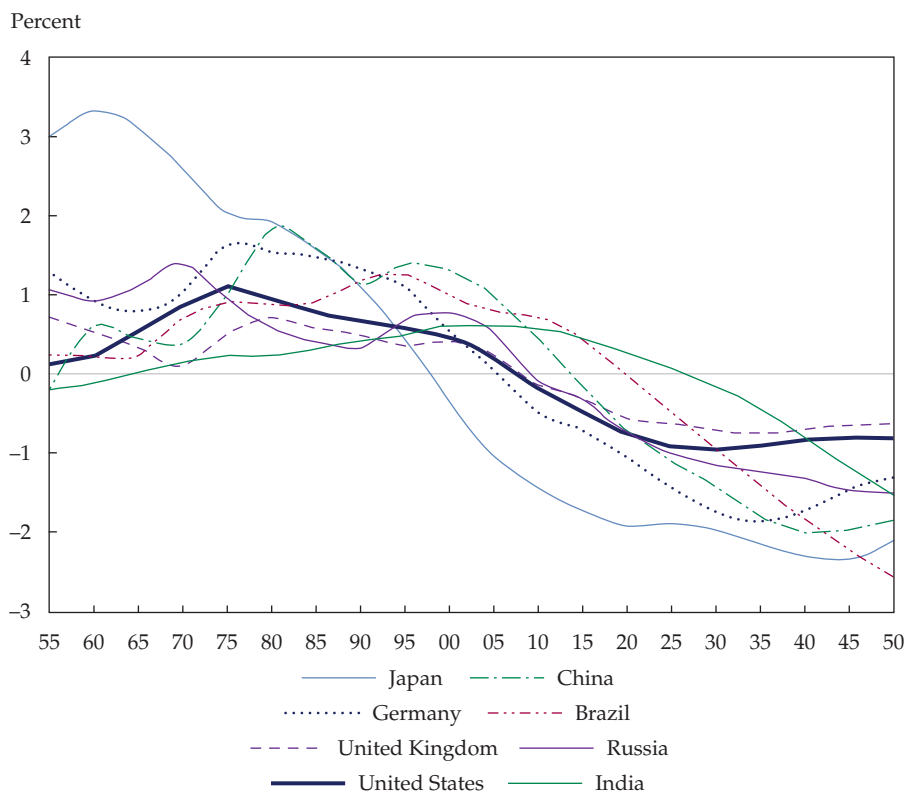
Notes: Developed economies are represented by the United States, Japan, Germany, and the United Kingdom. Emerging economies are represented by the BRIC countries.

Sources: Based on data from the United Nations, the Penn World Table, and Global Financial Data.

Figure 5 changes the idea of what "normal" GDP growth should be. In the past, 3.0% annual GDP growth was considered normal, but it was not. The 3.0% annual growth rate included a 1.0% demographic tailwind from the large group of workers in their peak productivity time. This figure indicates that countries should brace themselves for slow GDP growth in the coming couple of decades as the cohort of those over age 65 expands. This figure also indicates that the economic expansion from 2009 forward may represent the new definition of boom time, which does not have to be a dire prediction. For example, the Netherlands peaked in relative wealth about 400 years ago and has had slow growth with prosperity for the 400 years since then.

The natural consequence for economies with a lot of people in their 20s and 30s is that those economies are growing faster. But the natural pattern for economies with a more mature population is that they are more prosperous. So, if people demand that the political elite deliver 3% annual GDP growth when the new reality is 1%–2%, then they may be demanding the impossible. In response, governments will create an illusion of growth with massive deficit spending, but that merely borrows growth from the future. Think of Japan, which had high birth rates in the 1920s through the 1930s. World War II wiped out a generation, but the children came into the working-age cohort right around 1955, laying a solid foundation of hardworking, eager, and energetic people. Japan had a 3% annual economic tailwind in the 1960s and early 1970s. Japan's economic miracle was partly a demographic miracle and partly a cultural environment that facilitated what was occurring. Japan crossed over the zero line in the mid-1990s, and it is now looking at –2% annual growth relative to historic norms. But if the view of normal growth is considered to be approximately 2% and the shrinking population is factored in, Japan actually may have a slightly positive per capita GDP growth.

Turning to the effect of demographics on the performance of stocks and bonds, **Figure 6** shows in five-year increments the average annual performance boost or drag on stocks and bonds that is attributable to demographics in the G–8 and BRIC countries for 1950–2050. The assumption is that at any given valuation level, stocks should be biased higher than bonds. For example, assume a Shiller P/E of 15 back in the 1950s. The graph indicates that G–8 countries should have expected a 4% annual return over the norm in that environment. Stated differently, the natural Shiller P/E should have been higher during these times. In reality, the Shiller P/E was low and returns were extremely high. According to demography, the performance boost should have evaporated during the mid-1970s. It did so, and then it returned to predict significantly higher returns in the 1990s and 2000s.

Figure 6. Average Annual Abnormal Return of Stocks and Bonds in G–8 and BRIC Countries, 1950–2050 (Estimated)
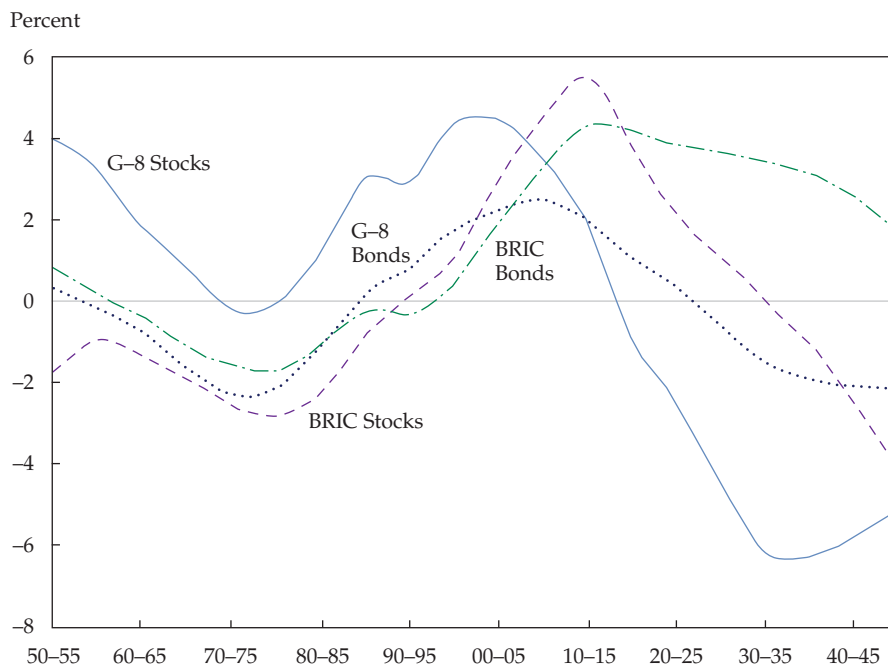
Sources: Based on data from the United Nations, the Penn World Table, and Global Financial Data.

Considering bond returns in the G–8 countries, as shown in Figure 6, demography indicates that today's returns should be 2% greater at any given level of real yield than what bonds have offered historically. Essentially, the natural real yield right now should be at its lowest level ever in the G–8 because of the large roster of mature workers in those countries who are scrambling to accumulate enough reserves to retire. The purpose of bonds has changed from being the asset class for earning a modest return to a diversification against stocks. Bonds act as an insurance policy against the possibility of stocks crashing. People are used to paying for insurance, and the premium in this case is the realization that a negative real return is acceptable for now.

But look forward 10 years or so in Figure 6 and a different picture emerges. The dynamics of real interest rates are that, in the long run, the natural real interest rate equals trend real GDP growth minus a savings factor. The savings factor is augmented at a time when a country has a large cohort of mature adults, so the savings factor goes up and the natural real interest rate goes down. During these years, monetary authorities are trying to smooth the business cycle with massive interventions, which seems to be a distraction from their core mission of maintaining the purchasing power of the currency and confidence in a fiat currency. Rather than smoothing the business cycle, monetary authorities are trying to develop macroprudential policies, and the effects are unknown. There is no evidence that central bankers can boost long-term GDP growth rates. But strong evidence does exist that they can boost inflation.

As a result, potential output has been overstated. There is less slack in the economy now than most people realize. Central banks that are trying to reinstate growth rates of the past, which no longer represent plausible growth rates for the future, are misguided and pursuing dangerous policies. The natural real rate of GDP growth is materially lower than it used to be. The normal situation in this environment is relatively high savings as the pool of young people shrinks.

Figure 7 shows expectations for real interest rates in developed economies and emerging markets for 2014–2023. The current real interest rate in the United States is –1.5% at the short end of maturities. The natural real interest rate is more like –0.5%, absent continued interventions. The natural real interest rate can be expected to migrate toward –0.3% in the coming decade. Real interest rates will most likely remain negative, absent default risk. In Japan, real interest rates will probably stay negative unless inflation goes negative. It is a similar story for the United Kingdom. But the picture is significantly different for emerging markets.

Figure 7. Real Expected Interest Rate, 2014–2023

A. Developed Economies

B. Emerging Markets
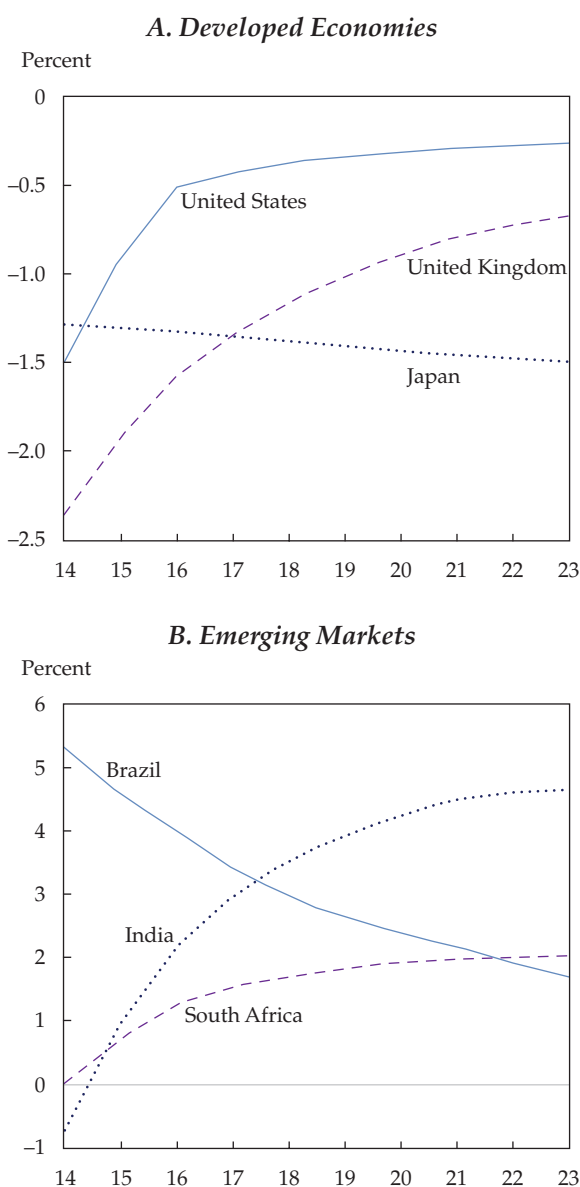
Sources: Based on data from Bloomberg, the United Nations Population Division, Global Financial Data, the IMF, and the Penn World Table.

Implications for Markets

The debt burden must be addressed. The choices are pay the debt, abrogate the liabilities, or reflate. In the United States, the official debt level is 100% of GDP, but it increases to 650% when entitlements are included. It will either abrogate on large chunks of the entitlements or reflate, thus reducing the real value of those obligations. Demographics slow real GDP growth. When measured according to the Consumer Price Index (CPI), the United States has shown real GDP growth averaging 2.7% annually over the past 50 years. The working range for real GDP growth

today is between 1% and 2%, and the working range approaches 1% 10–15 years from now.

Most investors rely on two investment pillars: stocks and bonds. Neither of these asset classes is priced to offer adequate returns in the relatively near future. Those two pillars crumble if the choice for addressing the level of debt is debasing the currency, and it does seem that central bankers are intent on doing at least some of that. Investors need to establish a third pillar for investment strategy, such as diversifying into emerging and alternative markets, seeking markets with higher yield and/or growth, and focusing on markets that can hedge inflation risk.

This article qualifies for 0.5 CE credit.

Question and Answer Session

Robert D. Arnott

Question: Over the time you have been studying this topic, do you find that it is starting to receive more focus or is it still seen as a problem that is 20–30 years down the road?

Arnott: Demography tends to move very slowly. It is like a river with a powerful current. If you wade in around the edges of the river, you do not really notice how powerful the current is, but it is strong. I talked about the effects of demographics on equity returns and the annual compounded tailwind or headwind that can result. But the headwind or tailwind may not be noticeable in any given year, and if people cannot see it, they will not pay attention to it. Investment advisers tend to focus on their next quarterly statement to clients. But if they can expand their thinking to a five-year horizon, which is the minimum time horizon where demographics really start to have an impact, they have a huge opportunity to make a difference.

Question: In the next five years, do you see an inflation problem, and are you more concerned about inflation or continued disinflation or deflation?

Arnott: I am not at all concerned about deflation. Any determined central banker can defeat deflation. All that is needed is a printing press. Japan has proven that. Japan is mired in what could only be described as a near depression, and it still has 1.5% inflation. So, if a central bank prints enough money, it can create inflation in an economy that is near a depression.

In the private sector, deleveraging is deflationary and an aging demographic is also deflationary. Consumption among the affluent class crests when they reach their early 50s and then starts to drift lower. Then it starts to drift lower at a faster pace. I would propose that the US central bank is systematically, deliberately, and aggressively understating inflation.

For the average US consumer, the consumption basket is dominated by four categories: rent or housing, food, fuel, and health care. The Bureau of Labor Statistics (BLS) calculates inflation for each of these sub-buckets. According to its statistics, none of the four categories shows lower inflation than the CPI over the past year or past three years or past five years. But all four of these categories have experienced higher inflation than the CPI by 1%–3% per year. So, it is unclear what the BLS is measuring when it shows inflation to be so benign. I would argue that inflation is actually running about 2%–3% higher than what is publicly acknowledged.