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“The financial health of worker and retiree alike has met a headwind.”

KEY POINTS

1. The obvious remedies (e.g., higher taxes, higher savings rates) for the problems related to a rapidly falling worker-to-retiree support ratio are unlikely to be embraced by U.S. constituencies, leaving governments' and corporations' abrogation of their pension promises to retirees as the most likely future scenario.
2. Using the more complex lifetime savings models as a guide, we adopt a simple and straightforward model to analyze the impending retiree support problem.
3. Demographic shifts are playing a major role in the current high valuations of developed market assets, putting near-term and current retirees in the precarious position of facing very low long-term yields on their investment portfolios.
4. Dissatisfaction by both retirees and workers with their respective financial positions will fuel more intense social distress over the next decades as pension reform inaction comes home to roost.

From Brutish to a Brouhaha: Shifting Winds and the Demographic Payback

Concerns over the U.S. retirement system are well known. We need not look far to see what our nation's future will be if we continue to “kick the retirement system can” down the road, particularly in light of our nation's 3-D hurricane of debt, deficits, and demographics (Arnott 2009 and Hsu 2011). Japan has been crushed by its growing mass of retirees, the nation's “lost decade” now a quarter-century in length. Europe, also in the midst of demographic change, has been dangerously burdened in recent years with a rolling series of crises, strikes, and dramatic displays of political chicken. The United States, just like Japan and Europe before us, will soon be swept away on the prevailing winds of demographic change and the deepening socioeconomic problems that follow on. We must take heed.

In this article, we explore simple analogs to necessarily complex models used to better track the “when” of the growing economic challenges of an aging population. In particular, we look at 1) net savings rate and adjusted workforce experience and 2) global adjusted workforce experience as a means of assessing the economic pressures of a rapidly falling worker-to-retiree support ratio. Lastly, we analyze the required retirement age to maintain stable net retirement savings.

Battening Down the Hatches

If we are observant, one thing is obvious—the demographic problem of an aging population will not resolve itself by continued pursuit of traditional Keynesian demand stimulus. We must look further. Remedies for the pending pension and medical care challenge are limited:

1. Higher taxes or evisceration of non-retirement spending
2. Higher savings and investment rates
3. Abrogation of the pension/medical promise
 - a. Reduced payouts or larger co-pays
 - b. Steady rise in the retirement age
 - c. Means testing

Voters do not appear to support higher taxes as a means of redistributing income from workers to retirees as the worker-to-retiree support ratio falls. Workers do not support delayed retirement or changes in benefits. Policy makers, fixated on stimulating demand, are unlikely to draft programs that incentivize higher savings and investment rates (i.e., deepening of capital as a means to replace the lost income of retiring workers). Unfortunately, continued inaction will inevitably lead to abrogation by both governments and corporations of their respective pension/medical promises—perhaps the most drastic and disruptive of the possible solutions.

From Brutish to Balmy

Developed countries, generating around 80% of global gross domestic product (GDP) but home to only 20% of world population, have undergone a stark demographic transition over the last 150 years. Their citizens have migrated from lives characterized as “solitary, poor, nasty, brutish, and short” (Hobbes [1651], 2013) to lives in which retirement is a benefit all can enjoy for a generous number of years. The challenge now is how to honor the promises made to retiring workers as the number of workers drops in relation to retirees. Emerging nations will confront a similar challenge in the next two decades.

The life span of a U.S. citizen has increased substantially over the last century. In 1900, infant mortality stood at 15%. For those children who survived the first year of life, the average life span was just under 59 years. At age 25 an

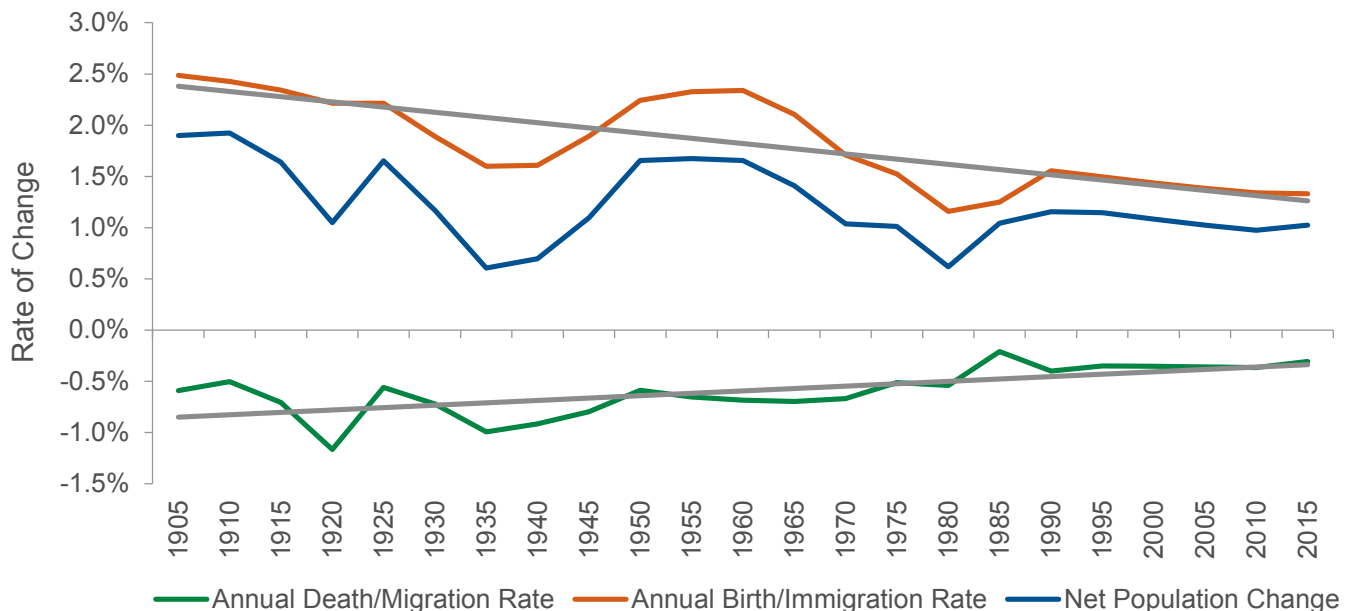
adult had a 55% chance of reaching 65 years, and those who achieved that milestone had typically only another decade of life. Over the next 50 years, life expectancy rose three months for every year that passed. If the reduction in infant mortality is also considered, the gain was an extra 4.5 months a year. Today the probability a U.S. citizen will reach age 65 is 92%, and once achieving that, will enjoy, on average, another 18 years of life.

Figure 1 compares the annual death/migration and birth/immigration rates of the U.S. population from 1905 to 2015. The birth/immigration rate, at 2.5% a year in 1900, has steadily declined to less than 1.5% today. The rate of death/migration has likewise trended lower, but at a much slower pace. Interestingly, the declining trend in births—a function of more children surviving into adulthood because of medical and health-related innovations, such as penicillin and clean water, as well as the higher cost associated with raising children—has

been significantly more impactful than the declining trend in deaths.

These sweeping demographic changes do not bode well for the U.S. Social Security and Medicare systems, whose efficacy and viability have been thoroughly analyzed, and rightly so. Retirement savings accounts, whether individually owned or government controlled, constitute one of the largest pools of investment assets. In 2011, it was estimated that this global asset pool stood at 72% of the GDP of the Organisation for Economic Co-operation and Development (OECD) countries. Although many of the factors that drive flows into and out of retirement savings—such as government policy, employment rates, and investor sentiment—are inherently uncertain, the flows driven by long-term demographic trends are more predictable. To understand how agents in an economy can be expected to smooth their income in anticipation of retirement, we need to look at lifetime savings models.

Figure 1. U.S. Population Changes, 1905-2015



Source: Research Affiliates, LLC, based on U.S. Census Bureau data.

Lifetime Savings Models

Basic models of individual behavior have been in place since Fisher (1930) penned his thoughts on intertemporal choice, also referred to as income smoothing. Since then, many others have contributed their thoughts and research in this area, including Modigliani (1970, 1976, 1998); Merton (1971); Bodie, Merton, and Samuelson (1992); Bodie and Crane (1997); and Bodie, Treussard, and Willen (2007).¹

Others have added to the literature by constructing models for the economy as a whole, such as the successive improvements to the Fisher model by Allais (1947), Samuelson (1958), and Diamond (1965). The result is known as the overlapping generations (OLG) model. The OLG model encompasses a multigenerational approach and addresses intergenerational equity. Recent work by Fehr, Jokisch, and Kotlikoff (FJK) (2007) builds on years of model parameterization and research.

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Their article “Will China Eat Our Lunch or Take Us to Dinner?” incorporates the global economic effects of labor and capital supplied by China. The FJK model is complex, as 24 pages of output tables attest. The plethora of numbers comes to one conclusion: it is not *if*, but when and how, the United States will pay for the unavoidable demographic transition to a more-aged society.

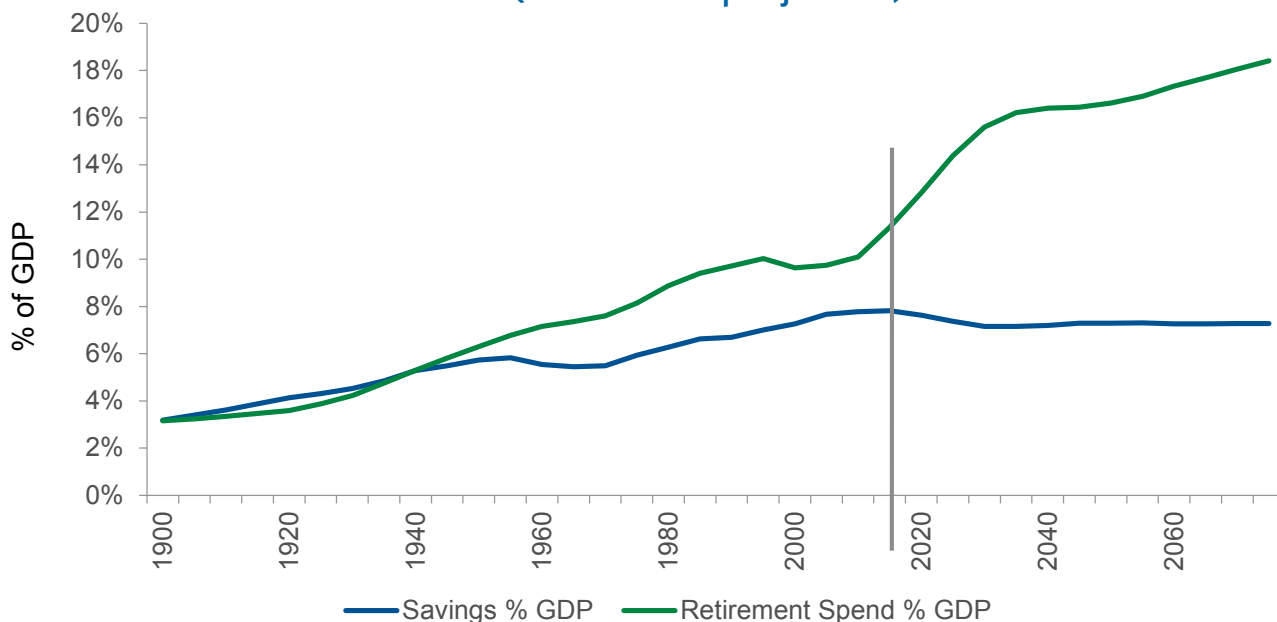
For an economy to adequately support a growing percentage of retirees, structural adaptations such as capital deepening, higher taxes, delayed benefits, or some combination of the three must occur. This acknowledgement is not new, yet the solution eludes us—or at least the willingness to proceed with a solution eludes us. Rather than let the complexity

of the OLG approach stymie us, let’s take a simpler look at the issue.

A Simple Model ...

Using the more complex models as a guide, we undertake a straightforward back-of-the-envelope analysis to explore when the United States must begin to “pay the piper.” We start by comparing, as **Figure 2** shows, the amount of savings by workers and the amount of expenditures by retirees as percentages of GDP from 1900 to 2075 using the U.S. demographic profile in each five-year increment since 1900. Savings as a percentage of GDP rose through the period from 1900 to 2015, spurred by an increasing level of contributions because of lower worker mortality. The large Baby Boom generation was the final hurrah that pushed savings levels above what longevity gains alone would have achieved. Assuming a fixed retirement age of 65 and a continued low population growth rate, the total amount of savings would be expected to decline before it would level out.

Figure 2. U.S. Modeled Savings and Retirement Spending, 1900–2075 (actual and projected)



Source: Research Affiliates, LLC, based on U.S. Census Bureau data.

Early in the 20th century, retirement spending (or dis-savings) began to grow at a faster pace than savings. This continued until the 1990s, at which point the rate of retirement spending began to dip. The slackening pace reflected the retirement of the “Silent Generation,” the population cohort raised during the Great Depression.

A reversal of this trend is underway. In the coming years as the Baby Boomers retire, we should see a large increase in retirement spending from currently depressed levels. The net savings rate, the difference between the savings and retirement spending rates, has trended for a few decades between -2% and -4% of GDP. Going forward, however, spending and savings rates are expected to significantly diverge, plunging the net savings rate into seriously negative territory, perhaps 10% or more of GDP.

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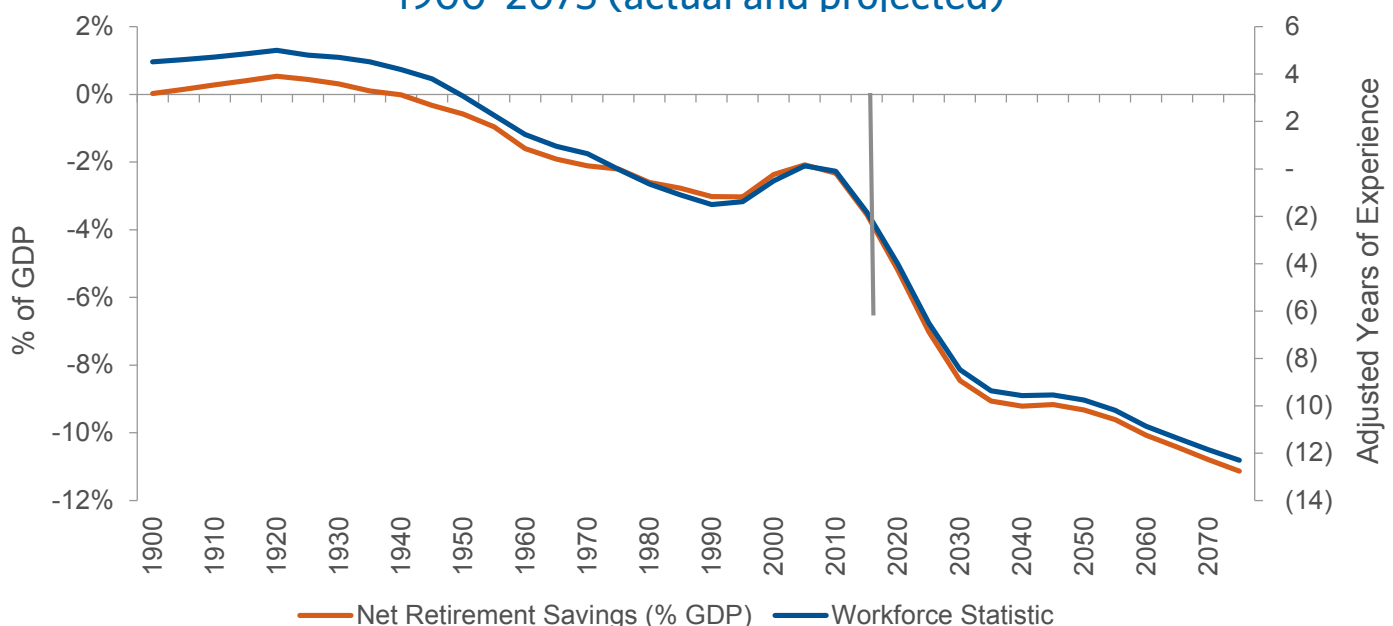
The Baby Boom generation, for more than the last quarter-century, has been making an extra retirement contribution through investment and/or taxes. That positive trend in savings, while somewhat offsetting the economic cost to workers of the now well-established demographic trend of longer life and lower fertility, will reverse in the years ahead. The negative trend in savings and positive trend in retirement spending will resume as the Baby Boomers leave the workforce and begin to call on their entitlements. After decades of analysis, discussion, recommendation, and procrastination, the painful transition to a retiree-heavy society is now upon us.

... and Simpler Yet

We can derive an even simpler measure (based directly on the nation’s demographic profile) of when the United States must pay the piper. Although this approach does not address solutions or complex relationships within an economy, it can serve as a valuable intuitive check to our understanding of the problem we are facing. An experienced (i.e., older) workforce tends to save more of aggregate earnings compared with a less experienced workforce. As greater numbers of workers retire, the “effective experience” level of the total workforce is reduced. A retiree can be expected to spend far more than an average worker saves in a single year.

Figure 3 illustrates the similarity of the implied net retirement savings rate and the adjusted workforce experience statistic over the period 1900-2075. This simple comparison supports the

Figure 3. Net Retirement Savings and Adjusted Workforce Experience, 1900-2075 (actual and projected)



Source: Research Affiliates, LLC, based on U.S. Census Bureau data.

forecast of a dramatic decline in net retirement savings as a percentage of GDP commensurate with a drop in the workforce experience level. *Note that all of these findings assume no change in retirement age.*

Global Considerations

A global adjusted workforce experience level weighted by GDP allows us to compare the statistic's trajectory among the developed nations. **Figure 4** shows this measure for the United States, Japan, Germany, and China.

The actual and expected trend of the global adjusted workforce experience statistic is quite similar to that of the United States. The forecast for Germany (proxying for Europe) and Japan—both regions already buffeted by demographic headwinds—is to drop much more steeply than for the United States or the global economy as a

whole. The trend for China (proxying the emerging economies) is likewise lower, but less steep, because these nations' demographic changes will not take hold for another 20 to 25 years.

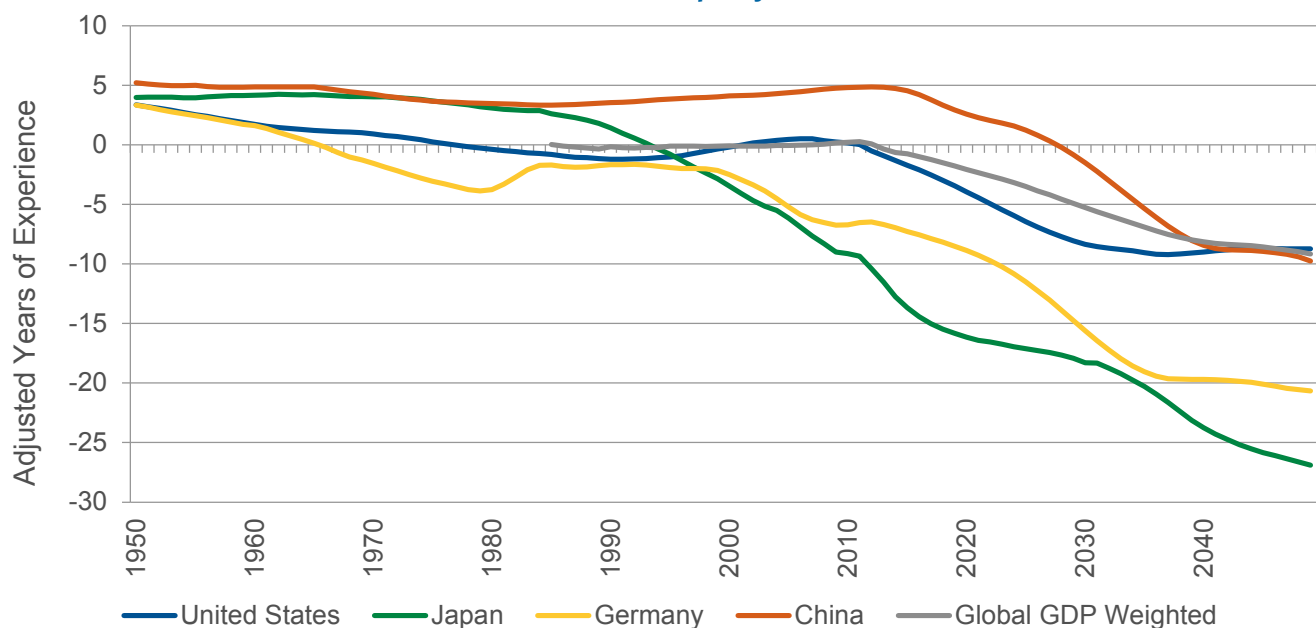
The emerging economies have a demographic profile startlingly similar to that of the developed world in 1950, and by 2040, they will look startlingly like the developed world in 2015. Improvements in human longevity due to the international transfer of health-care innovations have been swift, improving life expectancy more than improvements in economic conditions. In the coming quarter-century, we will discover if the emerging economies are able to enjoy the economic growth that the developed world has known since 1950 or if they will grow old before they become rich. The answer will vary from country to country, depending on whether political leaders permit the natural ambitions of their citizens to bear fruit.

The Benefit of Later Retirement

As previously stated, a number of possible reforms could be availed upon to lessen the trauma of the impending demographic transition to an older, retiree-heavy population. For example, if the average retirement age for U.S. workers were increased, the resulting higher savings and lower spending rates could cap net retirement spending at current levels.

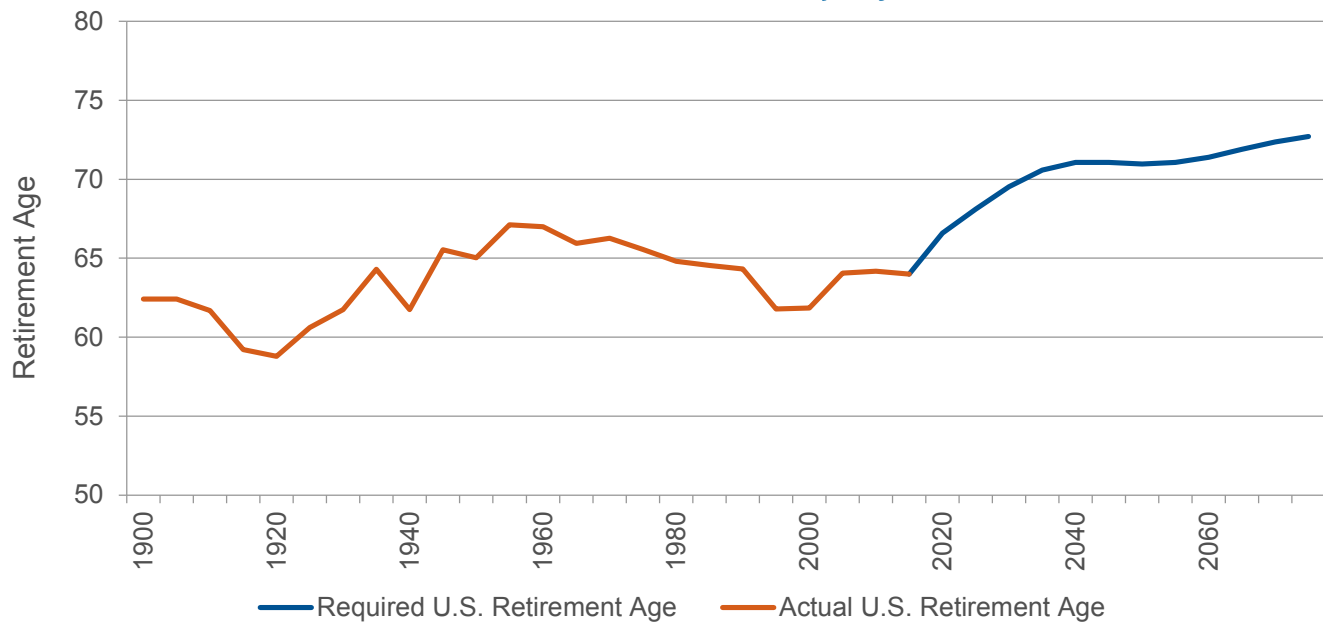
Figure 5 applies a rising retirement age to our simple analysis. If the adjusted years of experience are capped at 2015 levels, the required retirement age would need to gradually increase from 65, the current "normal retirement age,"² to above 70 over the next 20 years. In so doing, we could substantially ease the burden on workers of supporting a retiree-heavy population and forestall the economically

Figure 4. Global Adjusted Workforce Experience, 1950–2050 (actual and projected)



Source: Research Affiliates, LLC, based on data from OECD.

Figure 5. Required Retirement Age to Maintain Stable Net Retirement Savings, 1900–2075 (actual and projected)



Source: Research Affiliates, LLC, based on data from Sobek (2006), Bureau of Labor Statistics, and U.S. Census Bureau.

detrimental impact of a deteriorating net savings rate. We think this transition is necessary, and therefore, inevitable.

From Balmy to a Brouhaha

For the United States, and even more so for Europe and Japan, the jig is up. The demographic tailwind we have enjoyed is now reversing to become a full-blown head-on gale. Our demographic woes must be addressed with some combination of much higher rates of savings and investment (capital deepening); higher taxes to provide for income redistribution from workers to retirees as the support ratios of workers to retirees grow larger; and a substantial rise in the retirement age. Without sufficient or timely reform, the United States, and other developed nations, can anticipate increasing public and private debt defaults driven by overtaxed pension systems. Pressure on all fronts—

workers and retirees in particular, but also investors—will mount quickly.

We believe the current high valuations of developed market assets, both debt and equity, are largely rooted in demography; as Baby Boomers panic over their retirement resources, they willingly buy assets at ever-lower real yields—even negative real yields—hence, at ever-higher prices. Will subsequent generations happily buy assets at similarly high prices, hence, at lousy forward-looking returns, as retirees seek to transform their assets into liquid cash to spend during their golden years? This leaves all investors—especially near-term and current retirees—in an overly sensitive position. That position relies heavily on a preposterous hope for high returns on capital assets, from a starting point of very low yields.

Retirees are bound to be dissatisfied with the financial position many will find themselves in. Workers, likewise, will be dissatisfied with the position they find themselves in as they are asked to supplement, at ever-higher percentages of their earned income, the income promises made by the government to retirees. Both sides of the equation appear to be headed for a big brouhaha. Granted, the short, brutish life of the average worker of 150 years ago has been replaced with a much longer, healthier life span today, but the financial health of worker and retiree alike has met a headwind. Perhaps the only bright spot on the horizon is a reversal in the Boomer-driven demand for assets as these accumulated assets are liquidated, putting pressure on asset prices and returning yields to more normal, more rewarding levels.

Endnotes

1. Please note that the works cited are far from exhaustive for the respective authors as well as for the literature itself.
2. Under the current structure of the U.S. Social Security system, the age to receive full benefits (also known as "full retirement age" or "normal retirement age") is 65 for workers born in 1937 or earlier. For workers born in 1938 through 1942, the age increases by two-month increments for each birth year (i.e., for birth year 1938, normal retirement age is 65 and two months). For birth years from 1943 through 1954, normal retirement age is 66. For workers born in 1955 through 1959, the age increases by two-month increments for each birth year (i.e., for birth year 1955, normal retirement age is 66 and two months). For workers born in 1960 and later, normal retirement age is 67.

References

Allais, Maurice. 1947. *Economie et Intérêt*. Paris: Imprimerie Nationale.

Arnott, Robert. 2009. "The '3-D' Hurricane Force Headwind." Research Affiliates *Fundamentals*, November. Available at https://www.researchaffiliates.com/Our%20Ideas/Insights/Fundamentals/Pages/F_2009_Nov_3D_Hurricane.aspx.

Bodie, Zvi, and Dwight Crane. 1997. "Personal Investing: Advice, Theory, and Evidence." *Financial Analysts Journal*, vol. 53, no. 6 (November/December):13-23.

Bodie, Zvi, Robert Merton, and William Samuelson. 1992. "Labor Supply Flexibility and Portfolio Choice in a Lifecycle Model." *Journal of Economic Dynamics & Control*, vol. 16, nos. 3/4 (July-October):427-449.

Bodie, Zvi, Jonathan Treussard, and Paul Willen. 2007. "The Theory of Life-Cycle Saving and Investing." Federal Reserve Bank of Boston Public Policy Discussion Paper No. 07-3 (May). Available at SSRN, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1002388.

Diamond, Peter. 1965. "National Debt in a Neoclassical Growth Model." *American Economic Review*, vol. 55, no. 5 (December):1126-1150.

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Fehr, Hans, Sabine Jokisch, and Laurence Kotlikoff. 2007. "Will China Eat Our Lunch or Take Us to Dinner? Simulating the Transition Paths of the United States, the European Union, Japan, and China." *Fiscal Policy and Management in East Asia*, NBER-EASE, vol. 16 (October):133-193.

Fisher, Irving. 1930. *The Theory of Interest*. New York: The Macmillan Company.

Hobbes, Thomas. (1651) 2013. *Leviathan*. Printed for Andrew Crooke, at the Green Dragon in St. Paul's Churchyard. Reprint: The Project Gutenberg EBook, produced by Edward White and David Widger.

Hsu, Jason. 2011. "The 3-D Hurricane and the New Normal." Research Affiliates white paper, June. Available at https://www.researchaffiliates.com/Production%20content%20library/201106_3D_Hurricane_and_New_Normal.pdf.

Merton, Robert. 1971. "Optimum Consumption and Portfolio Rules in a Continuous-Time Model." *Journal of Economic Theory*, vol. 3, no. 4 (December):373-413.

Modigliani, Franco. 1970. "The Life-Cycle Hypothesis and Intercountry Differences in the Saving Ratio" in W.A. Eltis, M.F.G. Scott, and J.N. Wolfe, eds., *Induction, Growth, and Trade: Essays in Honour of Sir Roy Harrod*. Oxford: Oxford University Press:197-225.

———. 1976. "Life-Cycle, Individual Thrift, and the Wealth of Nations." *American Economic Review*, vol. 76, no. 3 (June):297-313.

———. 1998. "The Role of Intergenerational Transfers and Life Cycle Saving in the Accumulation of Wealth." *Journal of Economic Perspectives*, vol. 2, no. 2 (Spring):15-40.

Samuelson, Paul. 1958. "An Exact Consumption-Loan Model of Interest With or Without the Social Contrivance of Money." *Journal of Political Economy*, vol. 66, no. 6 (December):467-482.

Sobek, Matthew. 2006. Tables on Labor Force, in *Historical Statistics of the United States, Earliest Times to the Present: Millennial Edition*, vol. 2, edited by Susan Carter, Scott Gartner, Michael Haines, Alan Olmstead, Richard Sutch, and Gavin Wright. Cambridge University Press: New York, NY.