

# **Innovations in Retirement Financing**

Edited by Olivia S. Mitchell, Zvi Bodie, P. Brett  
Hammond, and Stephen Zeldes

Pension Research Council  
The Wharton School of the University of Pennsylvania

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## **Preface**

What can be done to help employees, their employers, and the public sector, perform more efficiently to enhance old-age security? We distill answers to this question in this volume from a wide range of economists, housing and benefits specialists, lawyers, and financial advisers. The consensus is that a strong retirement income system requires attention not only to assets conventionally “dedicated” to retirement purposes, such as pensions, but also to the broader components of wealth such as housing, longevity, health, and intellectual capital. Experts from financial institutions, government, and academia offer important lessons for stakeholders to better structure the environment for retirement asset accumulation and decumulation. This book should be required reading for all those seeking to improve retirement provision and retirement decision making for generations to come.

Sponsorship for the work leading to this volume was generously provided by the Wharton Financial Institutions Center and two other institutions at the University of Pennsylvania, the Boettner Center for Financial Gerontology and the Penn Aging Research Center. We also acknowledge research support from the Pension and Welfare Benefits Administration at the United States Department of Labor. The Pension Research Council continues to benefit from the invaluable input from our Senior Partners and Institutional Members, and the support of Victoria Jo. On behalf of the Pension Research Council at The Wharton School, I thank all of them along with the many contributors and editors who helped make this volume feasible.



# **Part I**

## **Sources of Financial Retirement Risk**



## Chapter 1

# **Analyzing and Managing Retirement Risks**

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Zvi Bodie, P. Brett Hammond, and  
Olivia S. Mitchell

This book offers new perspectives on financial innovations to improve risk management in retirement. This is important because in many parts of the world, advances in medicine and rising living standards have succeeded in producing longer life expectancies than anyone who is old today could reasonably have anticipated. Looking ahead, it is quite likely that many more of us will live beyond what was once considered the “normal” retirement age, surviving to celebrate our hundredth birthdays and beyond. Maintaining a decent standard of living during such a long period without relying on earned income presents a formidable challenge. Planning ahead for our retirement years requires confronting and managing a host of risks that threaten to undermine our prospect of retirement wellbeing.

These risks manifest themselves in two areas: those due to unexpectedly *low income* and those due to unanticipated *health shocks*. When asked to assess their prospects for old age, people everywhere are quick to think of financial insecurity and medical incapacity before almost all other considerations. New institutions and new financial products are required to help people at all ages better prepare for this increasingly long and uncertain period of life.

Poor income and health may mean different things to different people and groups, but in any case their manifestation in old age is the culmination of risk processes to which people are exposed over their lifetimes. The risk-management literature outlines two key types of risks, namely *individual* risk and *systematic* risk. Individual (or as sometimes called, idiosyncratic) risk includes individual-specific experiences that differentiate people from their larger group, cohort, or society. Individual risk tends to be the result of lifestyle choices that are to some extent under people’s control, or at least are affected by behavior. For instance, it could arise from the shock of pre-

mature death, the sudden onset of chronic illness or disability, the result of poor investment choices, the outcome of consumption and saving choices, and/or unemployment. Factors influencing individual risk to which people are exposed are thought to include education including knowledge of personal finance, family social and economic circumstances, and other personality and preference factors.

By contrast, systematic risk stems from processes outside the reach of individual action, generally affected only at the political or institutional levels, if at all. This second class of risk focuses on shocks to life expectancies of groups or cohorts, unexpected developments in the overall economy, changes in aggregate economic and market dynamics (influencing overall asset markets), and/or unanticipated changes in government programs (e.g. taxes, social security benefits, inflation, etc.). Many older people are at least aware of the possibility of adverse movements in inflation or asset prices and the possibility of cutbacks in old-age benefits promised by governments, employers, and other institutions. Layered atop these concerns are important macrodemographic forces including sweeping financial sector reform and massive population aging, all of which will be likely to reshape global retirement income provision.

### **Sources of Old-Age Economic Insecurity**

A schematic list of the main sources of economic insecurity in retirement is provided in Table 1. Developments in both areas—individual and systematic risks—are prompting policymakers and workers as well as retirees to seek new ways to assess the risks of retirement. At the same time, they are spurring innovations in financial instruments that might help people and institutions manage and protect against the financial ravages of old age.

People confront diverse risks when they are young, as they seek to save for retirement, and also when old, when they try to figure out how to draw down their assets during the retirement period. The conventional life-cycle economic recommends that workers build up assets during their work lives, and gradually draw them down during the retirement phase. In practice, however, this pattern is often difficult to implement. Some people find it unpleasant if not impossible to defer consumption, perhaps because they implicitly must face the fact of their own aging when doing so. Another explanation for undersaving when young and overconsuming when old is that people may expect that, in the future, the government will do what is necessary to cover old-age income and medical care needs. Unfortunately, social security systems in most developed nations face insolvency and will not easily be able to pay tomorrow's elderly benefits equal to those of today's retirees (Mitchell, Myers, and Young 1999). Furthermore, private undersaving is a major problem: U.S. data indicate that older workers' wealth accumulations are substantially below retirement saving targets, and many

TABLE 1. Understanding Old-Age Economic Insecurity

*Old-age insecurity attributable to*

- Low income
- Poor health

*Sources of old-age retirement risk*

- Idiosyncratic risk. Old-age income and healthcare concerns influenced by:
  - Labor market history*: earning and benefit coverage patterns, employment and un-employment outcomes, retirement behavior.
  - Saving and consumption patterns, asset allocation strategies*: ignorance regarding retirement goals and financial illiteracy; lack of access to assets of various types; risk preferences and discount rates.
  - Individual morbidity/mortality*: genetic makeup, personal health habits and hobbies, worklife exposure, healthcare in youth and old age.
- Systematic risk. Old-age income and healthcare concerns influenced by:
  - Cohort changes*: unanticipated rise in life expectancies; unexpected increases in medical care and long-term care costs.
  - Portfolio developments*: unexpected changes in values of housing, pension, other assets.
  - Macroeconomic performance*: economic booms or busts; increases in global volatility.
  - Institutional innovations*: unanticipated changes in tax and/or transfer policy (e.g., social security program insolvency); unexpected legal or regulatory changes (e.g., imposition of asset tests for receipt of government transfers).

retirees will be unable to maintain consumption levels in old age (Moore and Mitchell, 2000). Despite these observations, only half of all working Americans say they have thought about saving for retirement, with the avoiders motivated by fear of finding out how insecure they might be and by concern that they might have to make sacrifices (Selnow 2000). These problems are global, with baby boomers in Europe and increasingly in Asia reporting that they have serious concerns about a comfortable retirement.

Another possible explanation for why people are poorly prepared for retirement is the sheer difficulty of obtaining and processing information about the underlying risks that they face. For example, human life expectancy has increased well above projections just a hundred years ago, and dramatic improvements are potentially plausible in the developed world in the future. Nevertheless, reasonable experts have erred in the past about mortality improvements and looking ahead, the magnitudes of future changes are again in dispute.<sup>1</sup> Consequently, it is understandable that the public remains uncertain regarding what to assume about future life expectancy trends. To take another example, most workers and even their retired counterparts are unaware of the need for long-term (nursing home) care in retirement, and as a result they fail to make adequate provision for their own coverage. In the U.S., for instance, one-quarter of the elderly eventually

# Inflation-Adjusted NYSE Index: 1968-1984

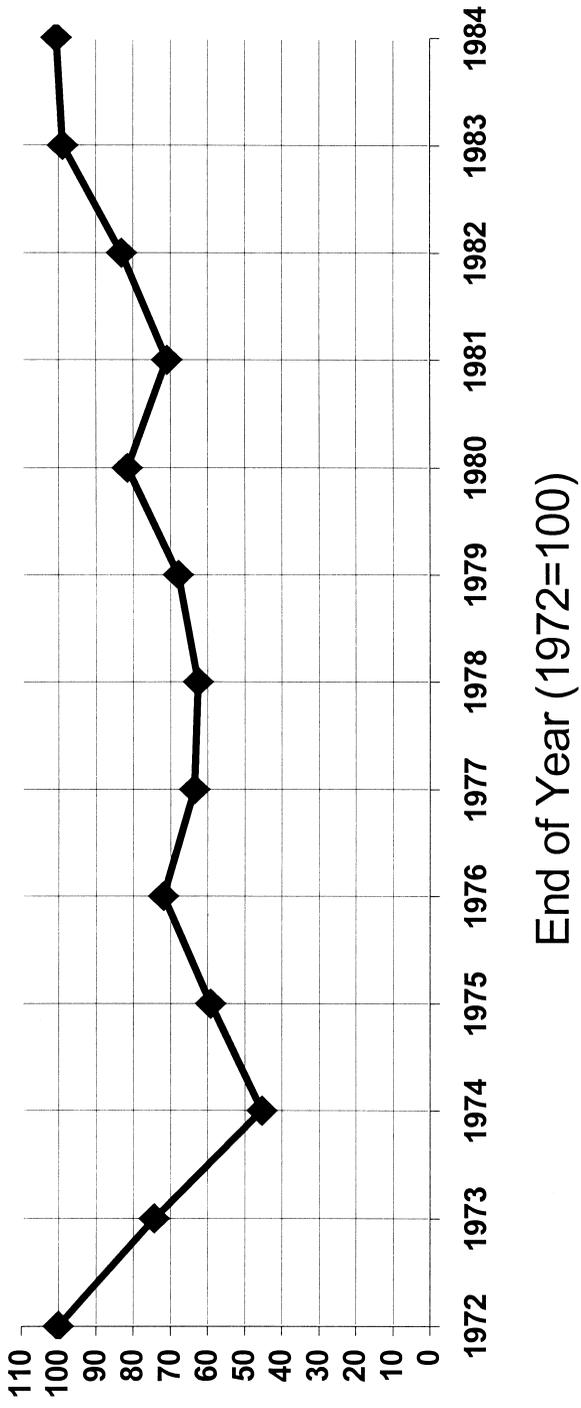


Figure 1. The U.S. stock market has not always tracked inflation well. Source: Bodie and Crane (1999).

require long-term care, yet many believe, wrongly, that nursing home coverage is provided by the government free of charge (Warshawsky et al., this volume). In fact, in the U.S. only the indigent can rely on long-term nursing home coverage, requiring the elderly to exhaust almost all of their own assets before becoming eligible. Lacking correct information on such provisions, people may make serious mistakes by not saving for their own needs and not making provision for long-term care coverage.

Other important risks facing workers and retirees are also poorly understood by the average citizen, and often by the experts. As yet little is known about the variability of and correlations in returns to human capital, financial capital, and benefits promised by pension and other old-age programs. But as we show in this volume, there are rather close links between earnings and pension benefits that can be paid by public and private pension systems. These linkages merit much more exploration to determine their impacts on old-age economic security. For example, the study by Levine et al. (this volume) indicates that differences in people's retirement incomes can be directly tied to their lifetime pay levels, and linked more strongly than to differences in the length of time employed or to other sociodemographic factors. A related analysis by Davis and Willen (this volume) also highlights correlations between earnings and asset returns, and also evaluates how aging changes how these correlations should influence investors' portfolio mixes.

One of the largest sources of idiosyncratic risk is inadequate knowledge about financial market processes. That is, ordinary people (and their advisers) often appear poorly informed regarding volatility in asset returns and inflation rates. For example, the U.S. has for some time experienced a relatively low rate of inflation and rising stock prices, both of which have contributed to a widespread belief that equities serve as a good hedge for inflation. But the evidence is not supportive of this surmise: during the 1970s, inflation rates reached double digits and stock prices fell by more than half in just two years (1974–75). This is illustrated in Figure 1, which shows that the inflation-adjusted NYSE stock index fluctuated substantially over the period 1/1968 to 12/1984. Similarly, Brown et al. (2000) report that stocks are not a good inflation hedge, at least in the short to medium term. As a result, retirees seeking to protect against the corrosive effect of inflation over a 25-year retirement period would probably benefit from investing a portion of their financial assets in inflation-protected assets (Brown et al., this volume).

## **Approaches to Old-Age Risk Management**

In the personal finance literature the risks and rewards of retirement financial decision making are often cast in a *risk management* context. Traditionally, the term has referred mainly to the purchase of insurance and is

distinguished from *investment management*.<sup>2</sup> From an analytical viewpoint, however, risk and investment management should be thought of in an integrated manner. This is because the purchase of insurance is an integral part of the decision making process in which risk and reward are traded off, when the unit of analysis is an individual or a family. For example, one could decrease one's exposure to the risk of income loss by buying disability insurance; alternatively one could insure against a decline in stock prices by buying put options.

In taking this broader perspective on risk management in the retirement context, we find it useful to distinguish three methods of managing risk: *hedging*, *insuring*, and *diversifying*. Table 2 illustrates the key focus of these three approaches.<sup>3</sup>

*Hedging* against risk means eliminating the risk of a loss by sacrificing the potential for gain. For example, as a worker grows older, it is often argued that he should reduce the fraction of his wealth held in stocks by boosting the fraction in risk-free bonds or annuities.<sup>4</sup> In so doing, he is perceived to hedge against stock market risk. Hedging can take other forms, of course, including the use of derivatives such as futures and swap contracts. Thus if someone held a portfolio of stocks and sought to hedge it without selling the stocks, he could do so by selling short a futures contract on a stock index.

*Insuring* against risk means paying a known sum of money (the insurance premium) to eliminate the risk of losing a much larger sum. In this case, the insured party protects against loss but retains the potential for gain. To continue our example, if the investor bought put options on stocks instead of selling them, he would be insuring against stock market risk. If stock prices went up by more than enough to offset the cost of the puts, he would come out ahead.

*Diversification*, the third risk management tool, means investing in many different risky assets instead of putting all of one's money in a single asset. Diversification is useful when it reduces one's total exposure to risk without lowering one's expected rate of return. In practice, however, the power of diversification to reduce risk is limited by positive correlations across one's portfolio of risky assets. Thus a stockbroker whose human capital returns depend solely on equity markets will be undiversified if his financial assets consist only of stocks.

In contrast to this integrated view of retirement risk management, many in the investment industry have taken a much narrower view of retirement preparedness. Their strategy has been mainly to advocate diversification in one's financial personal portfolio to the virtual exclusion of hedging and insuring. This is to some extent driven by the relatively strong average performance of publicly traded U.S. equities in the past two decades. Nevertheless there appears to be little public awareness of how risky stocks are, even in the long run. This leads to the observation that in some cases, hedging and insuring may be at least as effective as diversification. For instance, this

TABLE 2. Approaches to Old-Age Risk Management

*Conventional risk management tools*

- *Hedging.* Seeks to eliminate a risk of loss by sacrificing possibility of gain. Example: reduce expected risk by giving up return, buy bonds
- *Insuring.* Seeks to exchange a known premium for protection against possibility of larger loss. Example: buy life annuity or long-term care insurance; invest in inflation-indexed bond
- *Diversifying.* Seeks to minimize total risk exposure while maximizing expected return. Example: invest pension fund in globally diversified asset portfolio

*Institutions for managing old-age risk*

- Individual and family. Examples: self insure via saving and continued work; family care and offsetting work effort
- Employers and/or unions. Examples: group employment-based life, disability, health, pension and related benefits
- Community organizations. Examples: welfare and charity support
- Governments. Examples: old-age and healthcare programs; tax/ transfer policies
- International agencies. Examples: bail-outs for bankrupt pension systems; low-cost loans for pension reform programs.

could be true in the case of longevity risk, the risk of wage and real interest rate shocks, inflation, and the shocks to the stock market as a whole.

In addition to hedging, insurance, and diversification, education and investment in financial literacy is a separate element that can improve the chances for success of any approach to risk management. Knowing which approach to take in what circumstances and, even more importantly, knowing when to ask for additional information, analysis, and other forms of assistance, is often key to retirement security. To illustrate these points, we turn next to a discussion of recent developments in individual financial planning for retirement.

## **Developments in Retirement Planning Models**

Institutional change and the process of financial disintermediation may have brought a “new era of individual responsibility for retirement security” (Leibowitz et al., this volume). For example, the advent of participant-directed defined contribution pension plans has given workers the ability to decide how much to save for retirement (if any), how much stock to hold in the retirement portfolio (if any), when (or if) one should alter asset allocations, and how much of the money to annuitize at retirement (if any). One advantage of this type of retirement plan is that it makes pension saving more popular than previously, but a cost is that it forces important financial decisions on the relatively financially unsophisticated (see Mitchell and Schieber, 1998).

In this environment, it appears that workers and retirees require additional help if they are to confront retirement risks and seek ways to manage them effectively. Good retirement planning models can be useful in this regard, though, as we show in this volume, designing them to make sense to average people is a challenge. It is worth pointing out that retirement planning models differ from behavioral economic models in that the former are *prescriptive*, while the latter are *descriptive*. That is, planning models embed objectives that the planner then tries to attain: for instance, one might want to smooth consumption before and after retirement, protect a widow's consumption after the death of a spouse, avoid running out of money in old age, or have a fund to leave to the children (among other possible targets). By contrast, an economic model of behavior instead tries to explain observed behavior and predict how outcomes might change if initial conditions were changed (Bernheim et al., this volume).

In the prescriptive context, a retirement planning model will typically offer the worker or retiree advice on how much to save, where to place one's investments, and how much to consume, depending on the targets specified and the instruments available. Of course, such models can yield very different prescriptions about saving and investment, depending on how they are structured and the assumptions they use as inputs. The approach proposed by Leibowitz et al. (this volume) formulates a user-friendly tool called the Asset/Salary Ratio. In this framework, a model user first specifies his target replacement ratio, or the ratio of postretirement to preretirement income. This income flow target can then be converted to a present discounted value and compared to actual assets in hand. From this calculation, asset shortfalls can be converted into increased saving objectives. This approach serves as a useful check on one's overall position, and it can offer the opportunity for sensitivity analysis as investment portfolios are changed.

More complex approaches are also available. For example, the approach taken by Bernheim et al. (this volume) builds in a great deal of detail about state and federal tax rules crucial for determining net-of-tax income streams. This model, however, does not currently incorporate uncertainty when modeling asset portfolio returns. By contrast, modeling uncertainty is a primary objective of the Financial Engines structure described by Scott (this volume). Of course, model structure matters: for instance, using one approach a worker might conclude he is "well protected" under a particular saving and investment path, but with another approach the same individual might be told that his retirement plan is a failure (Bernheim et al., this volume; Warshawsky and Ameriks 2000; Moore and Mitchell 2000). Perhaps it is no wonder that workers face retirement planning with trepidation.

Looking ahead, there remain several key challenges in the retirement planning field. One is that it is essential to help workers and retirees understand how to incorporate uncertainty into thinking about retirement needs

and retirement assets. Another is that modelers need to better understand users' risk tolerance toward uncertainty and their willingness to change behaviors, given model prescriptions. But doing a better job in this arena will require new research to ascertain correlations across risky assets including human wealth, housing equity, and pension wealth from both public and private sources, and measuring risk tolerances.

Other research is also needed, gathering data on how people process information and how they act on it. A confounding influence is that as retirement planning models grow more elaborate, they also tend to become far too complex for ordinary people to use, particularly if they are not financially sophisticated. Learning more about human limitations will be key to making these models more useful. As Steven Utkus (2000) noted, experts should focus more on learning about how system participants think "about the educational barriers and limits, and . . . capturing the systemic effects of emotional behavior. There has to be some way of incorporating this understanding in our models of how participants might use retirement products." The first step may be to improve education that enables people to choose appropriate tools and techniques for assessing and ameliorating the financial risks of retirement.

### **Developments in Products to Increase Retirement Wellbeing**

Several financial products appear to offer innovative opportunities for people to diversify, hedge, and insure their old-age economic security. Here we review some of the attributes of these products, including a form of hybrid pension plan as a means to structure pension wealth; the reverse annuity mortgage as a means to access illiquid housing wealth; and the role of international asset diversification as a means to protect investors against certain kinds of risk in old-age income streams.

Turning first to the pension case, pundits and policymakers have both praised and excoriated the variety of employer-provided pension known as the "cash balance" plan. This is sometimes called a hybrid pension, since it has elements of both a defined benefit and a defined contribution plan. It is not a particularly novel approach, in fact, since it was first developed in 1985 for employers seeking to move away from conventional defined benefit pensions.

More recently, the cash balance model attracted public scrutiny when the IBM Corporation announced it was transitioning away from its traditional defined benefit toward a cash balance format. The old IBM plan rewarded early retirement with a relatively backloaded benefit formula, whereas the new plan incorporates smoother benefit accruals across years of service with the firm, with no special reward for working up to the age of eligibility for early retirement. The trend toward eliminating early retirement subsidies is

found to be widespread in survey results for 77 pension conversions examined by Clark and Schieber (this volume). The companies adopting these cash balance plans offered larger and more portable benefits to younger and more mobile employees, and virtually eliminated the spikes in accruals that had previously been offered to high levels of seniority. In this sense, the new plans are more age-neutral than those they replaced, and as such they will tend to encourage workers to extend their employment careers. Of course, working longer is one way to help finance a longer anticipated retirement period, so these pensions may well be consistent with greater retirement security.

Turning from pensions to housing, we note that most older Americans have home equity, and their homes represent a key source of personal wealth. That is, Moore and Mitchell (2000) report that housing wealth amounted to about \$150,000 for the median household on the verge of retirement, and half the population had little financial assets of any kind. This finding gives rise to two questions. First, do older Americans actually use their housing wealth to finance retirement consumption? Second, if they do not, are there financial products that could facilitate the conversion of this wealth stock into an income flow, and if so, how costly would it be?

The first question is explored empirically by Venti and Wise (this volume), who rely on longitudinal datasets to examine how housing wealth appears to change with age. One way that older persons might extract income from their housing wealth would be to “trade down” to less expensive dwellings. But Venti and Wise find little evidence that people who remain homeowners through time draw down their housing wealth smoothly as they age. This is a difficult hypothesis to test, of course, since homes may depreciate due to poor upkeep and/or neighborhood decline, but respondents might not report *de facto* drops in housing values. In any event, there are sharp changes in housing wealth when life events intervene, such as the death of a spouse or entering a nursing home. In other words housing wealth appears to be used by the elderly as a type of self-insurance rather than as a liquid asset. This wealth discontinuity result may be due to high transaction costs imposed on home sellers plus moving costs that may be quite substantial, particularly for the elderly.

In view of the difficulty people seem to have converting their housing wealth to income, economists have suggested the need for a product known as a “reverse annuity mortgage” (RAM). This instrument permits the homeowner to sell a portion of his net home equity to a financial institution, which in turn pays that individual a fixed monthly income flow in the form of a life annuity. The annuity is supposed to be structured so that the homeowners receives a cash flow equal in present value to the fraction of his equity secured, but he never must sell the house to access the equity value of the asset. At the homeowner’s death, the financial institution sells the home and recovers remaining equity. RAMs are currently available in the U.S.

market, but as described by Caplin (this volume), only some 50,000 of these products have been sold to date. It appears that the product's theoretical appeal is offset in practice by several problems, including limits on the total amount of homeowner equity that is accessible, upfront costs totaling 14 percent of capital, the risk of foreclosure, and continuing uncertainty about the tax status of the product. These realities mean that this sort of financial innovation will have to be reconfigured to be simpler and more transparent, less costly, and better regulated, if it is to meet retirees' needs in the next several decades.

Next we turn to the role of international diversification in retirement portfolios, a topic of growing interest to investors in Europe, Asia, and Latin America. In his analysis, P. S. Srinivas (this volume) shows that many countries explicitly limit retirement portfolio investments in nondomestic assets, with the restrictions motivated by diverse policy considerations. What is critical, of course, is that these investment caps and restrictions impose an implicit tax on investors by restricting them to a less favorable risk-return tradeoff than they might have had from a globally diversified portfolio. Whether they might have preferred to invest globally is not observed in many cases, because of currency controls prohibiting registering of this demand. In the specific cases examined here, restrictions imposed by government regulatory constraints on key Latin American pension fund portfolios are shown to have exposed plan participants to lower returns with inferior risk exposure, as compared to the next best alternative. This analysis therefore highlights the fact that political factors often influence retirement wellbeing by undermining what markets can do to help protect against retirement risk. Once again, institutional rigidities and barriers erected by governments at times preclude implementing the risk management strategies which appear most sensible from an economic and finance perspective.

### **Developments in Annuities and Bundled Insurance Products**

From an individual's perspective, a fundamental reason for investing in bonds and fixed annuities is to transfer resources safely over time. Three features of bonds and annuities are essential in achieving this objective: they must be free of default risk; they must match the maturity and time pattern of the spending target; and they must match the unit of account of the spending target. Hence if someone plans an expenditure 20 years from now, the only way to hedge it precisely is with a default-free, 20-year, pure discount bond or its functional equivalent. Investing in a bond of any other maturity would expose the person to interest-rate risk. Shorter maturity bonds would expose the investor to "reinvestment" risk when the bonds have to be "rolled over," and longer maturity bonds would expose her to "price" risk because the bonds would have to be liquidated before maturity.

Unfortunately in the real world, nominal bonds and annuities have not always done a good job in carrying out their fundamental economic function of transferring resources safely over time. In some cases, the issuers (including some governments) have defaulted on their promise to pay, or have confiscated the payment through taxation. In other cases, bondholders have lost value because the currency used as unit of account suffers from inflation. The problem of inflation risk may be dealt with by denominating bonds in units of constant purchasing power: that is, by tying payments to an index of the cost of living. In many countries, however, private sector borrowers have been reluctant historically to issue bonds indexed to the cost of living. In consequence, financial economists have urged governments to issue inflation-indexed bonds to provide households with the much needed long-run hedge for retirement saving.

For many years no major industrialized country government proved willing to do so, but things began to change in the 1980s. In 1981, the British government began issuing inflation-indexed gilts (i.e., bonds) with the stated goal of providing a means for pension funds to hedge retirement benefits that were indexed to the cost of living. The government of Canada followed the UK lead in 1994, and the U.S. Treasury followed suit in 1997. Today, U.S. Treasury-issued inflation-indexed bonds can be stripped by qualified financial institutions to provide a complete array of pure discount bonds with maturities up to 30 years. As a result, it is now possible for investors to hedge real spending targets completely as far as 30 years into the future using these bonds.

A further development occurred in 1998 when the U.S. Treasury also began issuing inflation-indexed savings bonds, known as Series I (I-bonds). Although the interest rate on I-bonds is lower than on the Treasury's marketable inflation-protected bonds (TIPS), I-bonds have features that make them especially attractive to individual investors.<sup>5</sup> Among these are the fact that I-bonds are accrual-type bonds, so the holder receives all the interest and principal at redemption. Income tax is paid on I-bonds only at redemption; by contrast, on TIPS, income tax must be paid each year and the tax is levied on both coupons received and the increase in the nominal value of principal due to inflation. (Both types of bonds are exempt from state and local income tax.) Furthermore, the U.S. Treasury guarantees a fixed schedule of inflation-adjusted redemption values on I-bonds, so the holder always receives principal plus accrued interest no matter when they are cashed in. By contrast, Treasury guarantees TIPS inflation-adjusted value only at the maturity date; selling them before maturity requires engaging a broker-dealer in the secondary market. Consequently, if real interest rates have risen since the TIPS were issued, the holder will sell at a loss. Finally, the purchaser pays no fees when buying or redeeming I-bonds at the local bank at any time, whereas if TIPS are purchased after issue (or sold before maturity), the broker-dealer must play a role and bid-ask spreads can be large.

If these products are as beneficial as they seem to be, one might well ask why the market seems so thin for them. One explanation is that they are not particularly well known in much of the developed world. In the U.S., for instance, the Treasury has not marketed I-bonds or TIPS particularly aggressively, and inflation-linked annuities have been slow to get started. Inflation-linked annuities are better known in the U.K., Israel, and Australia, among other countries. Another explanation may be that financial advisors have yet to recommend them to their clients, probably in large part due to low commissions and some illiquidity (at least for TIPS). A different argument has been that anticipated inflation and inflation rate volatility have been low for some time, so the real returns on these products seem relatively unattractive (Brown et al., this volume). Also investors may be attracted by higher expected returns on stocks, believing that stocks are not risky in the long run; if so, stocks might appear to offer a higher risk-adjusted expected return than I-bonds.<sup>6</sup>

These questions become of key importance with the rapid growth of individually managed retirement accounts, resulting both from changes in the corporate pension world and from the growth in individual retirement accounts. Currently the individual annuity market is small in the U.S., but as Brown et al. (this volume) point out, the fraction of the retiree population having self-directed accounts will burgeon in the next two decades. In many analysts' view, this asset growth will spur demand for annuities of many types. Supportive of this conclusion is the finding that administrative expense loadings on life annuities have fallen substantially. For instance in both the U.S. and the UK, many years ago as much as 25–30 percent of the asset value was devoted to administrative costs in a single-premium immediate nominal annuity, but this figure is down to 5 percent today. The costs associated with adverse selection also appear to be lower than previously. Finally, the advent of TIPS and I-bonds means that insurers now have the potential to offer inflation-indexed annuities which would do a great deal to protect old-age retirement consumption. The U.S. market for such products is still nascent; it is better developed in the U.K., Australia, and other nations.

A different approach to annuities is taken by Blake et al. (this volume). Here the risk of special concern is cross-cohort mortality risk, which is different from the within-cohort mortality normally the purview of life insurers. However, it is natural to ask if there is any way to protect an entire cohort against sudden mortality changes for the group as a whole, and if so how this risk might be spread and financed. Private insurers may be able to pool cross-cohort mortality if they can invest in assets that permit hedging, but Blake and his coauthors surmise that enforcing cross-generational contracts of this sort might require support from a government. Of course this in turn requires measuring and pricing appropriately for this insurance.

One reason that older people might not annuitize much of their wealth is

that they feel they need to hold on to assets in case they have to finance nursing home care. The problem is that annuities, once bought, tend to be illiquid, so that buyers cannot readily access the needed funds to pay for nursing home bills. In point of fact, longer life expectancies have coincided with increased health care costs near the end of people's lives, and the specter of needing two to three years of long-term care (LTC) figures prominently in many discussions of retirement planning. Warshawsky et al. (this volume) discuss how an integrated instrument could help resolve this problem by combining a life annuity with long-term care insurance. They argue that combining the coverage mitigates the adverse selection that would occur in the demand for each of the two products on a stand-alone basis.

### **Global and Local Institutions: Changing Delivery Systems**

As products and services for addressing the financial risks of retirement are changing, so too are the varieties of institutions available to provide support to the elderly. Today, many diverse retirement-income systems coexist around the world, each relying in varying proportions on one or more of the following institutional forms:

- Support from family or community;
- Pension plans sponsored by employers and/or labor unions;
- Social insurance programs run by governments;
- Personal savings in the form of real and financial assets — equity in one's home or business, savings accounts, insurance contracts, mutual funds, etc.

Many experts agree, however, that the mix of these institutional forms will change significantly in the next few years. This is particularly true for industrialized countries such as the United States, the UK, Australia, Western Europe, and Japan, where people are both living longer and having many fewer children. In these nations, people will find they can rely less on family and government support than in the past, instead turning to financial markets and related institutions by saving and investing for their own retirement. Even in emerging markets, new demographic and economic realities have prompted the beginning of widespread retirement system reforms, as seen in the pension reform movements of Latin America and Eastern Europe, and more recently, in Asia.<sup>7</sup>

In response to global population aging and financial deregulation trends, governments and financial firms are seeking to create new institutions and services that might afford better protection against the financial consequences of old-age illness, disability, and longevity, and to insulate people against both inflation and asset price fluctuations. New opportunities will become available for older persons to continue employment, perhaps on a

part-time basis, and to convert their assets, particularly housing wealth, into spendable income. For better or for worse, these financial marketplace developments are paired with widespread financial disintermediation, meaning that people are being given more individual choice over their own asset accumulation and decumulation processes. As these new financial instruments transfer more responsibility and choice to workers and retirees, it will be a challenge to frame risk-reward tradeoffs and cast financial decision making in a format that ordinary people can understand and implement.

## **Conclusions**

Several common themes emerge in our overview of retirement needs and innovative financial products to help people meet their old-age security goals. First, that there is a profound need for better data on and understanding of retirement risks. Additional research must explore the entire range of retirement assets, both private and public, and include both financial and human wealth. Second, retirement planning models must incorporate these findings regarding retirement risks (including cross-asset correlations). Retirement planning modelers must also develop better tools to help users make more informed retirement planning decisions. Third, retirement planning analysts should use all the tools of risk management—hedging, insurance, and diversification—to guide those making retirement plans. Fourth, users, modelers, and policymakers all require broader perspectives on the retirement accumulation and decumulation process, and more financial education.

Despite these reasons for caution, we also have identified several innovative financial products that offer interesting new opportunities for people to diversify, hedge, and insure their old-age security. Some of these products are currently marketed around the world, while others have yet to be brought to market; they include inflation-linked annuities, survivor bonds, and reverse annuity mortgages. Some of the innovations arise from bundling existing insurance products: for example, long-term care insurance with life annuities, or possibly reverse mortgage annuities linked to market-risk insurance. New products are also needed to protect retirement income, but sometimes their development has been slowed by market failures and institutional rigidities as well as information barriers. There remains a profoundly important role for additional economic and financial research to better inform all stakeholders on the costs and benefits of developing innovative products for retirement security.

## **Notes**

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1. See the 1994–96 Technical Panel Report to the Social Security Advisory Council (SSAC) on alternative mortality projections.
2. See for example Hughes and LeClair (1996).
3. Bodie and Merton (2000) elaborate on this discussion.
4. For examples of financial planners offering advice to this effect see Canner et al. (1997).
5. Features of these bonds are detailed at [www.savingsbonds.gov/sav/sbifaq.htm](http://www.savingsbonds.gov/sav/sbifaq.htm).
6. Principal-protected investment contracts linked to stock market indexes have been available to individual investors since the 1970s, and recently they have become popular in Europe. In the U.S., however, they have not yet taken off. Although they lack standardization, these contracts guarantee that at the maturity date the investor will receive at least some part of his original principal back. In addition, if the underlying market index has risen over the life of the contract, the investor receives some “participation rate” times the proportional increase in the index. For more on these securities see McDowell (2000); an in-depth treatment appears in Bodie and Crane (1999).
7. See Bodie and Mitchell (1996), for instance.

## References

- Bernheim, B. Douglas, Lorenzo Forni, Jagadeesh Gokhale, and Laurence J. Kotlikoff. This volume. “An Economic Approach to Setting Retirement Saving Goals.”
- Blake, David, William Burrows, and J. Michael Orszag. This volume. “Survivor Bonds and Compulsory Annuitization: Reducing the Cost of Pension Provision.”
- Bodie, Zvi and Dwight B. Crane. 1999. “The Design and Production of New Retirement Savings Products.” *Journal of Portfolio Management* 25, 2 (January/February): 77–82.
- Bodie, Zvi and Robert C. Merton. 2000. *Finance*. Upper Saddle River, N.J.: Prentice-Hall.
- Bodie, Zvi, Olivia S. Mitchell, and John A. Turner, eds. 1996. *Securing Employer-Provided Pensions: An International Perspective*. Pension Research Council. Philadelphia: University of Pennsylvania Press.
- Brown, Jeffrey R., Olivia S. Mitchell, and James M. Poterba. This volume. “Mortality Risk, Inflation Risk, and Annuity Products.”
- Canner, Niko, N. Gregory Mankiw, and David N. Weil. 1997. “An Asset Allocation Puzzle.” *American Economic Review* 87, 1 (March): 181–91.
- Caplin, Andrew. This volume. “Turning Assets into Cash: Problems and Prospects in the Reverse Mortgage Market.”
- Clark, Robert L. and Sylvester J. Schieber. This volume. “Taking the Subsidy Out of Early Retirement: Converting to Hybrid Pensions.”
- Davis, Steven J. and Paul Willen. This volume. “Income Shocks, Asset Returns, and Portfolio Choice.”
- Hughes, Charles and Robert T. LeClair. 1996. “Financial Planning as an Employee Benefit.” In *The Handbook of Employee Benefits: Design, Funding, and Administration*, ed. Jerry S. Rosenbloom. 4th ed. Chicago: Irwin. 455–70.
- Levine, Philip B., Olivia S. Mitchell, and John W. R. Phillips. This volume. “Worklife Determinants of Retirement Income: Differences Across Men and Women.”
- Leibowitz, Martin L., J. Benson Durham, P. Brett Hammond, and Michael Heller. This volume. “Retirement Planning and the Asset/Salary Ratio.”
- McDowell, Dagen. 2000. “Alternative Downside Protection on Your Investment.” [www.thestreet.com/funds/deardagen/924234.html](http://www.thestreet.com/funds/deardagen/924234.html)

- Mitchell, Olivia S., Robert J. Myers, and Howard Young, eds. 1999. *Prospects for Social Security Reform*. Pension Research Council. Philadelphia: University of Pennsylvania Press.
- Mitchell, Olivia S. and Sylvester J. Schieber, eds. 1998. *Living with Defined Contribution Pensions*. Pension Research Council. Philadelphia: University of Pennsylvania Press.
- Moore, James F. and Olivia S. Mitchell. 2000. "Projected Retirement Wealth and Saving Adequacy." In *Forecasting Retirement Needs and Retirement Wealth*, ed. Olivia S. Mitchell, P. Brett Hammond, and Anna M. Rappaport. Pension Research Council. Philadelphia: University of Pennsylvania Press. 68–94.
- Selnow, Gary. 2000. Discussion at the Pension Research Council Conference on Financial Innovations for Retirement Income, Wharton School.
- Scott, Jason. This volume. "Outcomes-Based Investing with Efficient Monte Carlo Simulation."
- Social Security Advisory Council (SSAC) Technical Panel. 1994–96. *Final Report and Appendices*. ([www.ssa.gov](http://www.ssa.gov))
- Srinivas, P. S. and Juan Yermo. This volume. "Risk Management Through International Diversification: The Case of Latin American Pension Funds."
- Utkus, Steven. 2000. Discussion at the Pension Research Council Conference on Financial Innovations for Retirement Income, Wharton School.
- Venti, Steven F. and David A. Wise. This volume. "Aging and Housing Equity."
- Warshawsky, Mark J. and John Ameriks. 2000. "How Prepared Are Americans for Retirement?" In *Forecasting Retirement Needs and Retirement Income*, ed. Olivia S. Mitchell, P. Brett Hammond, and Anna M. Rappaport. Pension Research Council. Philadelphia: University of Pennsylvania Press. 33–67.
- Warshawsky, Mark J., Brenda C. Spillman, and Christopher M. Murtaugh. This volume. "Integrating Life Annuities and Long-Term Care Insurance: Theory, Evidence, Practice, and Policy."