

The United States Longevity Insurance Market

Xi Mo and Anthony Webb

Center for Retirement Research at Boston College

7 January 2009

Abstract

This paper documents the substantial decline in traditional sources of longevity insurance, and shows that published statistics on the individual annuity market greatly overstate its size and growth. We consider whether the decline in annuitization rates is cause for concern. We then document in more detail the structure, size, and pricing of the individual annuity market, and discuss product innovations. We conclude by discussing policy options for increasing rates of voluntary annuitization.

Xi Mo is a graduate student and Anthony Webb a research economist at the Center for Retirement Research at Boston College. We would like to thank Matt Drinkwater for providing data and explanations.

This paper describes the current state of and recent developments in the United States market for longevity insurance – for insurance against the risk of outliving one’s wealth. Although the United States annuity market is well-developed by international standards, households rarely voluntarily annuitize any of their wealth. The overwhelming proportion of the longevity insurance enjoyed by American households is provided by Social Security and defined benefit pensions. Social Security pays benefits in the form of a lifetime inflation-protected annuity while defined benefit pensions until recently typically paid benefits in the form of a nominal annuity. These sources of longevity insurance are declining in importance. However, only a very small proportion of households voluntarily annuitizes, and a majority appears to show a strong preference for converting annuity income into lump sums.

In Section One, we review theoretical calculations of the value of annuitization. We argue that once account is taken of pre-annuitized wealth, longevity risk pooling within marriage, and the risk posed by uninsured medical costs, the value of annuitization is less than indicated by early papers. Nonetheless, at prevailing levels of actuarial unfairness, one might expect a greater level of demand than currently exists. We consider why households appear to be so reluctant to annuitize. In Section Two, we document the declining role of Social Security and defined benefit pensions in providing longevity insurance. Section Three describes the United States annuity market in more detail, and Section Four considers product innovations. We conclude in Section Five by considering policy options to increase annuitization rates.

1. Theoretical Calculations of the Value of Annuities

In the absence of annuities, households must trade-off the risk of outliving their wealth against their desire to maximize lifetime consumption. An actuarially fair annuity enables a risk-averse household facing an uncertain lifespan to increase lifetime consumption because, by reallocating wealth from those who die to those who live unusually long, it is able to offer a rate of return in excess of that obtainable

on equivalent unannuitized investments. But annuities are not actuarially fair. They also involve a loss of liquidity. This lack of liquidity may be a particular disadvantage in the United States where most households face substantial uncertainty as to the level of their out-of-pocket health-care costs.

A series of papers have attempted to calculate the actuarial unfairness of annuities, to investigate whether the longevity insurance they provide is sufficient to outweigh that actuarial unfairness, and to determine optimal annuitization strategies. The latter calculations require computationally intensive numerical optimization techniques and it is only in the last two or three years that models have begun to incorporate the level of realism required to support financial planning recommendations.

The first paper to calculate the value of annuities, taking account of the value of the longevity insurance they provided, was Mitchell, Poterba, Warshawsky, and Brown (1999). Assuming CRRA utility with plausible coefficients of risk aversion, they calculated that the value of the longevity insurance to single individuals with no pre-annuitized wealth greatly exceeded plausible estimates of the actuarial unfairness of annuities. The value of this longevity insurance was lower, but still substantially greater than the estimates of actuarial unfairness, when an assumed 50 percent of wealth was held in pre-annuitized form, for example through Social Security and defined benefit pensions.

Brown and Poterba (2000) extended the analysis to married couples. They calculated “annuity equivalent wealth,” the factor by which financial assets must be multiplied so that the household is indifferent between purchasing an actuarially fair annuity and undertaking an optimal decumulation of its financial assets. They found that longevity risk pooling within marriage substantially reduced the value of annuitization.

Dushi and Webb (2004) analyzed data from the Health and Retirement Study data, a panel of Americans born between 1931 and 1941, and found that the average household held much more than half its wealth in pre-annuitized form. Again assuming CRRA utility, the value of annuitizing the small proportion of wealth held in unannuitized form was now barely sufficient to offset the actuarial unfairness of annuities.¹ Those that did annuitize would generally be better off delaying until their late 70s or early 80s.

All the above models assume that the household does not face any uncertainty regarding the marginal utility of consumption, that the marginal utility of consumption remains constant during retirement, and that the household does not have a bequest motive. Although it is unclear to what extent most households have a bequest motive, it is unlikely that the marginal utility of consumption remains constant during retirement. Households may prefer greater consumption at younger ages when they are better able to enjoy leisure pursuits, and marginal utility may spike in the event of uninsured medical expenses. Models are only now being developed (Turra and Mitchell, 2004 Pang and Warshawsky, 2008 and Yogo, 2008) that incorporate the risk of incurring uninsured medical expenses. But these sophisticated models do not as yet incorporate the house, an asset that plausibly functions as self-insurance against the cost of long-term care, one of the largest sources of uninsured medical costs.

The value of annuitization can be compared with the cost, the extent to which the money's worth of an annuity, the income stream, discounted by an interest rate and annual survival probabilities, falls short of the premium paid. Calculating the money's worth of an annuity is not straightforward. One alternative would be to use population mortality tables. But many high mortality households have little annuitizable wealth. On the other hand, households that actually purchase annuities

¹ The assumption regarding the way in which consumption enters the utility function can substantially affect the results. For example, the value of annuitization would be much higher if one were to assume that pre-annuitized wealth met basic living expenses that did not enter the utility function.

have much lower than average mortality. The money's worth also depends on the interest rate used to discount the income stream. One alternative might be to use the Treasury Strip interest rate, on the grounds that annuity payments are protected by state level guarantees. But one might choose the term structure of high-grade corporate bonds if that is the household's alternative investment. One must then decide whether to take the average of the prices charged by all insurance companies, or to assume that the household shops around, and what assumptions to make about the level of management charges on alternative investments. Calculations reported in Gong and Webb (2008), discussed in more detail in Section Three, show that even using population mortality tables and the AA corporate bond interest rate, annuities commonly have money's worths in excess of 90 percent.

Notwithstanding these very favorable money's worths, rates of voluntary annuitization are extremely low. There were \$6.5 billion immediate annuity sales, excluding structured settlements in 2006. This compares with the approximately \$81 billion expected present value of initial Social Security benefit claims in 2006.³

This has led to a considerable discussion of both rational and behavioral explanations for non-annuitization. Brown and Warshawsky (2001) contains summary of the principal candidates. But the behavioral reasons appear to go beyond mere inertia. Brown, Casey, and Mitchell (2007) found that a majority of individuals in the Health and Retirement Study, a nationally representative panel of Americans approaching retirement, would be willing to exchange their Social Security annuity for a lump sum that was less than its actuarial value. One explanation for their finding might be that households are simply not capable of making the necessary actuarial calculations. But it is also possible that households are framing the decision not as an opportunity to retain valuable longevity insurance, but as the taking of a risky gamble that the household will lose if it dies

³ Authors' calculations, assuming population mortality for the 1941 birth cohort, a three percent interest rate, and the number of new benefit claims reported in the Annual Statistical Supplement to the Social Security Bulletin, 2007.

young. A controlled experiment conducted by Agnew, Anderson, Gerlach, and Szykman (2008) supports this view. Individuals who received a presentation that emphasized the benefits of annuities were significantly more likely to annuitize than those who received a presentation emphasizing the benefits of unannuitized investments. But the above authors found that the financially literate were actually less likely to annuitize. Perhaps a little knowledge, or thinking you know more than you actually know, is a dangerous thing.

2. The Declining Role of Social Security and Defined Benefit Pensions

Americans have traditionally obtained most of their longevity insurance from Social Security and defined benefit pensions. Both of these sources of retirement income are declining in relation to pre-retirement income.

Social Security is a largely pay-as-you-go social insurance program funded by a payroll tax. Retired worker benefits can be claimed at any age from 62 to 70, and are paid in the form of an inflation-indexed annuity. The benefits of individuals claiming before their full retirement age are actuarially reduced, and those of individuals claiming after their full retirement age are actuarially increased. The full retirement age is 65 for individuals born before 1938, but has been increased to 67 for individuals born after 1959. This increase is equivalent to a 13.3 percent cut in benefits for individuals who claim benefits at age 65.

Increased female labor force participation has further decreased Social Security replacement rates. Married women are entitled to claim the greater of their own retired worker benefit, and a spousal benefit which, if claimed at the wife's full retirement age, equals one half of the husband's benefit payable at his full retirement age.⁴ If the wife is still better off claiming spousal rather than retired worker benefit, an increase in female earnings reduces the replacement rate by

⁴ Married men can also claim spousal benefit if their earnings are sufficiently large in relation to those of their wife.

increasing the denominator (the household's earnings), but not the numerator (Social Security benefits).

Figure One shows past and projected Social Security replacement rates for households claiming benefits at age 65 between 1979 and 2024, assuming first that the ratio of the wife's to the husband's earnings stayed at the 1979 level, and second that it eventually converges to the 2005 cross section of wife-to-husband's ratios by age.

In the long run, Social Security replacement rates may fall still further.⁵ Prior to 1984, Social Security benefits were untaxed. From 1984 until 1993, 50 percent of benefits were potentially taxable for single individuals and married couples earning more than \$25,000 and \$32,000 respectively. Beginning with 1994, the maximum taxable proportion was increased to 85 percent. Importantly, the tax thresholds were not indexed, so that increases in nominal incomes result in an increasing proportion of retirees facing taxation of benefits.

Historically, the second principal source of longevity insurance in the United States has been defined benefit pensions, which have traditionally provided benefits in the form of a nominal annuity. Although defined benefit pension plans still predominate in the public sector, over the past 20 years they have largely been displaced in the private sector by 401(k) and other defined contribution plans. Figure Two shows the percentage of private sector workers with pension coverage who have a defined benefit, defined contribution, or both types of plan.

⁵ The Social Security Trustees project that in the absence of tax increases or benefit cuts the Social Security Trust Fund will be exhausted by 2042, at which point benefits, including benefits in payment, would be cut by approximately 30 percent.

At the same time, there has been a dramatic increase in the proportion of defined benefit pension plans that offer a lump sum option – up from 15 percent in 1995 to 49 percent in 2007.⁶

Brown and Warshawsky (2001) contains forecasts to 2009 and 2019 of defined benefit pension plan coverage and annual benefit payments from a base year of 1999, based on the Pension Benefit Guaranty Corporation Pension Insurance Modeling System. The forecast is that the number of active plan participants will remain stable at 11 million over the 20-year period, while annual benefits will increase in inflation adjusted terms from \$94 billion in 1999 to \$160 billion in 2019. We are currently in the process of updating the above calculations to reflect the accelerate rate of defined benefit pension plan freezes and terminations. If a large proportion of participants exercise the newly acquired right to take benefits in the form of a lump sum, then real benefits could actually fall in real terms, even without an accelerate decline in defined benefit pension plan coverage.

The extent to which the displacement of defined benefit by defined contribution pension plans reduces annuitization rates depends on the extent to which individuals voluntarily annuitize their defined contribution plan balances. This is because, in contrast to other countries (for example, the United Kingdom which prior to April 2006 required participants in defined contribution plans to annuitize their plan balances by age 75 at the latest), there is no legal requirement for participants to annuitize at any age. After attaining age 59 ½, individuals may withdraw their balances without penalty. Starting in the year that they attain age 70 ½, they are required to take a “required minimum withdrawal” of an amount equal to their plan balance divided by their remaining life expectancy, as specified in unisex life tables published by the Internal Revenue Service.

⁶ National Compensation Survey: Employee Benefits in Private Industry in the United States, 2000 – Chapter 3, table 113 <http://www.bls.gov/ncs/ebs/sp/ebbl0015.pdf>
National Compensation Survey: Employee Benefits in Private Industry in the United States, March 2005 – Chapter 2, table 51 <http://www.bls.gov/ncs/ebs/sp/ebbl0022.pdf>

Reno et al (2005) report that only 20 percent of plans offer an annuitization option, and that only two percent of participants exercise it.⁸ But Brown (1999) found that 48 percent of Health and Retirement Study households stated that expected to annuitize at least part of their defined contribution account balances. The first cohort with substantial defined contribution account balances has yet to reach the ages when mortality credits become substantial, and it is possible, but in our opinion unlikely, that the remaining households will eventually act in accordance with their stated intentions.

3. The Individual Annuity Market

The United States is one of the few countries with a significant private annuity market.¹⁰ But it is still small relative to GDP, with annual immediate annuity sales averaging less than 0.1 percent of GDP for the period 1996 – 2006.¹² Expressed as a percentage of GDP, the market is also smaller than that in the United Kingdom.

We refer readers interested in the history of annuities in the United States to Poterba (1997). Published statistics on the current size and recent growth of the individual annuity market give a highly misleading picture of the extent to which households are voluntarily purchasing longevity insurance. This is because the overwhelming majority of annuity purchases are of so-called deferred, as opposed to immediate annuities.

Deferred annuities are investment products that give the policyholder the option to annuitize, but also permit prior withdrawal of the investment.¹⁴ It seems likely that only a small percentage of deferred annuity holders will eventually exercise the

⁸ The remaining 80 percent can still access the annuity market by rolling over their 401(k) balance into an Individual Retirement Account (IRA) offering an annuity option.

¹⁰ Other countries are Canada, Chile, the Netherlands, Switzerland, and the United Kingdom. (George A. Mackenzie. 2006)

¹² GDP data source: National Income and Product Accounts Table, Bureau of Economic Analysis <http://www.bea.gov>

¹⁴ For a review, see Brown and Poterba (2005). Many deferred annuities appear to have high investment management, insurance, and surrender charges.

annuitization option. Brown and Warshawsky (2004) report that only about one percent of holders are currently receiving annuity payments. Reno et al. (2005, page 78) report that in 2004 about \$10 billion of deferred annuities are converted into immediate annuities. Until the annuitization option is exercised, deferred annuities lack the essential feature of immediate annuities that enables them to give an enhanced income return over similar unannuitized investments, namely the reallocation of wealth from those who die young to those who live unusually long.

Although voluntary purchases of immediate annuities have increased in recent years, the increase has been insignificant in relation to the decline in the amount of longevity insurance provided by Social Security and in particular defined benefit pensions.

Table One reports sales of various annuity types, in billions of dollars, for the period 1996 to 2007. Sales of variable deferred annuities predominate. Total immediate annuity sales increased from \$3.0 billion in 1996, to \$6.8 billion in 2007. In 2007, variable immediate annuity sales represented less than five percent of total immediate annuity sales. The proportion peaked at just over 20 percent in 2000, the year the United Stock market hit an all-time high. In correspondence, industry representatives have attributed the decline in variable immediate annuity sales to competition from deferred annuity products with income and withdrawal guarantees, and de-emphasizing in marketing campaigns.

The taxation of annuities depends on whether they are purchased with taxed (non-qualified) or tax-deferred (qualified) wealth (such as IRA or 401(k) balances). If they are purchased with tax-deferred wealth, both the income and the capital components of the annuity income are subject to tax. But if they are purchased with taxed wealth, the portion of the annuity payments that represent the return of that

capital is excluded from tax.¹⁵ Table Two analyzes immediate annuities between qualified and non-qualified sales. There appears to be no clear pattern in the data.

Annuity Money's Worths in the United States

We refer the reader to the discussion in the final paragraph of page three of issues relating to the calculation of annuity money's worths. James and Song(2002) calculated money's worth ratio for US and seven other high and middle-income countries and found out that the money's worth ratios for the average annuitant exceeds 95% in almost every country when discounting at the risk free treasury rate. Among annuitants, the money's worth for US, UK and Canada, which operate in the freest markets, are found out to be less than those of Switzerland (120%) and Israel (109%), which operate in quasi-mandatory heavily regulated systems. Gong and Webb (2008) found that money's worths exceeded 100 percent of the premium paid to households with annuitant mortality when the income flow was discounted using either the Treasury STRIP or the term structure of the AA corporate bond interest rate.¹⁶ They were around 100 percent to households with population average mortality when the Treasury STRIP interest rate was used, and came close to 100 percent when the AA corporate bond interest rate was used. The money's worths were higher than those calculated by Mitchell, Poterba, Warshawsky, and Brown (1999), using 1995 data. This may reflect Gong and Webb (2008) use of institutional prices, but may also reflect a trend towards higher money's worths documented by James and Song (2002).

¹⁵ For further information, see <http://www.irs.gov/publications/p939/ar02.html#d0e819>

¹⁶ They used institutional rates supplied by Hueler Associates that are slightly more favorable than retail rates. Population mortality was obtained from Social Security cohort life tables, and annuitant mortality was projected using Projection Scale AA.

4. Annuity Product Innovation

In recent years, there have been a number of potentially welfare-enhancing annuity product innovations. Their impact on the annuity market has been modest, and the overwhelming majority of sales are of traditional nominal annuities.

Variable Immediate Annuities

Traditional fixed annuities have bond-like investment characteristics in that they provide a guaranteed fixed income. In contrast, variable immediate annuities provide a lifetime income the amount of which depends on the performance of an underlying fund. If the return on the underlying fund exceeds a certain target rate, typically around four percent, the annuity income increases. If the return falls short, the annuity income declines.

Variable immediate annuities overcome an argument in favor of deferred annuitization (Milevsky, 1998, Milevsky and Young, 2002), namely that at younger ages households are better-off sacrificing mortality credits in order to obtain the benefit of the equity premium. With variable immediate annuities, households can enjoy both.

There would seem to be a strong case that retired households should invest at least part of their wealth in variable immediate annuities. According to both economic theory and the recommendations of financial planners, households should invest mainly in stocks when young, and rebalance in favor of bonds as they age.¹⁷ Most life-cycle funds have an equity allocation of around 50 percent at the age of retirement. If households are going to annuitize at retirement, it would seem unlikely that they should purchase only fixed annuities - that would imply that the

¹⁷ Financial planners often argue that younger households should hold a greater proportion of their financial assets in stocks because stocks are relatively less risky over long horizons, a questionable claim. A more convincing justification (Jagannathan and Kocherlakota, 1996) is that a large proportion of the wealth of younger households is held in relatively low-risk human capital.

optimal 50:50 equity bond allocation the day before retirement suddenly changed to 100:zero the day after.

Notwithstanding their attractions, the market for variable immediate annuities remains extremely small. In 2007, they comprised less than five percent of the total immediate annuity market. Figure Three shows sales over the period 1996 to 2007. After peaking in 2000 and 2001, the years when the stock market was at record highs, sales are back almost to levels of ten years ago.

Medically underwritten annuities

There is a strong relationship between longevity and socio-economic status (see, for example, Attanasio and Hoynes, 2000). In theory, this ought to provide an incentive for insurance companies to try to select “better,” i.e. high mortality risks, much as providers of life insurance try to screen out high mortality lives. In practice, and with the exception of medically underwritten annuities providing larger payouts to individuals able to demonstrate that they have shorter than average life expectancy due to health-related conditions, the only underwriting is on the basis of gender. In 2004, medically underwritten annuities comprised only four percent of the total market.¹⁸ These products have the potential to improve welfare if purchasers of medically underwritten annuities would otherwise have chosen to not to annuitize.

In contrast, the State of Montana has required insurance companies to use unisex pricing since 1985. The State of Massachusetts has recently enacted a similar law that prohibits, as of Jan 1, 2009, the use of sex-distinct mortality tables for individual or group annuities or pure endowment contracts.¹⁹

¹⁸ Drinkwater, Matthew (2006). Substandard Annuities. *LIMRA International, Inc.* Page 7.

¹⁹ Currin , Cailie (August 20, 2008). Gender Equity in MA Annuities . Retrieved November 13, 2008, from lifeinsurancelawblog Web site:

<http://www.lifeinsurancelawblog.com/2008/09/articles/statebystate-developments/massachusetts/commissioner-burnes-on-unisex-annuities-at-lhca/>

Zip code underwriting

There are substantial geographic variations in average longevity. Zipcode or postcode pricing allows insurers to manage longevity risk and reduce adverse selection by exploiting this relationship. Postcode pricing was introduced in the United Kingdom market in 2007 and several major insurance companies have announced plans to issue of postcode annuities.²⁰ Those living in less affluent neighborhoods will be offered up to a 5 per cent increase in annuity rates.²¹ As yet, no company uses zipcode pricing in the United States.

Inflation Protected Annuities

An individual purchasing a nominal annuity faces the risk of his income being eroded by the effects of inflation. We calculate that at a 2.5 percent inflation rate, a couple aged 65 faces a 30.5 percent risk of surviving long enough to see their real income halved.²² Households can, of course, purchase increasing nominal annuities, but these do not protect against unexpected inflation. The overwhelming majority of purchasers choose a level nominal annuity, possibly because these offer the highest initial income.

Treasury inflation protected securities (TIPS) have existed in the US since 1997, but the market for inflation-protected annuities has been slow to develop. TIAA-CREF has for some time offered a variable immediate annuity invested in TIPS, but it is not a true inflation-indexed annuity because changes in real interest rates could affect the value of the securities, and therefore the payouts from the annuity. Irish life was

²⁰ Hill, Jennifer (2008, June 13). <http://www.reuters.com>. Retrieved November 22, 2008, from Reuters Web site:

<http://www.reuters.com/article/rbssInsuranceMultiline/idUSL1383215920080613>.

Milner, Leah (2008, Aug 11). <http://www.moneymarketing.co.uk/>. Retrieved November 23, 2008, Web site: <http://www.moneymarketing.co.uk/cgi-bin/item.cgi?id=171014&d=340&h=341&f=342>

²¹ Milner, Leah (2008, Aug 11). <http://www.moneymarketing.co.uk/>. Retrieved November 23, 2008, Web site: <http://www.moneymarketing.co.uk/cgi-bin/item.cgi?id=171014&d=340&h=341&f=342>

²² We assume population average mortality for the 1943 birth cohort.

the first company to offer a true inflation-indexed annuity.²⁴ Although additional companies have entered the market, the size of the inflation protected immediate annuity market remains very small. In year 2006, it is estimated that the sales of inflation-indexed immediate annuities is less than \$200 million²⁵ a year, representing less than 3% of total immediate annuities sold.

Gong and Webb (2008) calculate that inflation-indexed annuities have similar money's worths to those of nominal annuities.²⁶ They ought therefore to be attractive to households seeking to hedge inflation risk. The lack of demand may reflect a preference for higher real income early in retirement, or a lack of awareness of the likely effect of inflation on the real income provided by a level nominal annuity.

The Advanced Life Deferred Annuity

Annuities are most effective when used to finance consumption at advanced old age. Consider a household aged 60 that wants to enjoy \$1 of consumption at age 100. Assume that the probability of survival to 100 is one percent, the real interest is three percent, and that the insurance company applies a 100 percent mark-up on actuarially fair rates. One option for the household would be to deposit \$0.31 in a bank account. With accumulated interest, that amount would provide the required \$1.00 at age 100. But the household would do much better by purchasing an annuity paying out \$1 at age 100, conditional on survival to that age. An insurance company applying a 100 percent mark-up would sell that annuity for only \$0.0062.

²⁴ Brown, Jeffrey R., Olivia S. Mitchell and James M. Poterba. 2002. "Mortality Risk, Inflation Risk, and Annuity Products," in O. Mitchell, Z. Bodie, B. Hammond, and S. Zeldes, *Innovations in Retirement Financing*, University of Pennsylvania Press: Philadelphia, PA, pp.175 - 197.

²⁵ Woolley, Scott (2006). *Retire Relaxed*. Retrieved December 17, 2008, from Forbes Web site: <http://www.forbes.com/forbes/2006/1211/158.html>.

²⁶ The above authors compared the money's worths of nominal annuities, discounted at the Treasury STRIP interest rate, with those of inflation-protected annuities, discounted at the term structure of Treasury Inflation Protected Securities yields.

The Advanced Life Deferred Annuity (ALDA) puts the above idea to work and was first brought to the attention of the academic community by Milevsky (2005). Milevsky envisaged an inflation-protected annuity that would be purchased at retirement or even earlier. But in contrast to a traditional annuity, income payments would only start at some advanced age, (say) 85, providing insurance against the risk of living exceptionally long. The deferral period reduces the cost of the longevity insurance provided by the ALDA in just the same way that a large deductible can reduce the cost of homeowner's insurance.

Although a few insurance companies have very recently begun to offer ALDA type products with benefits fixed in nominal terms, no company has thus far launched the type of inflation-protected product proposed by Milevsky.

Gong and Webb (2008) compared retirement wealth decumulation strategies based around the inflation-protected ALDA with the alternatives of the purchase of an inflation-protected annuity immediately on retirement, postponing the purchase of an annuity until some advanced age, and undertaking an optimal decumulation of unannuitized wealth. They showed that strategies based around the ALDA have three important advantages. First, they enable households to preserve liquidity at least until the ALDA payments commence, because their purchase cost is a fraction of the cost of immediate annuities, thus overcoming a potentially important psychological barrier to annuitization. They calculated that a household planning to smooth consumption through its retirement would need to allocate only 15 percent of its age 60 wealth to an ALDA with payments commencing at age 85, holding the remainder of its wealth in unannuitized form to finance consumption from age 60 to 85. Second, although a risk-averse household facing an uncertain lifespan would prefer the full longevity insurance provided by an actuarially fair annuity to the partial longevity insurance provided by an actuarially fair ALDA, at plausible projected levels of actuarial unfairness, the household would prefer the ALDA to full annuitization. The intuition is simply that the household is purchasing much less actuarial unfairness, but getting almost as much longevity insurance. An ALDA also

dominates an optimal decumulation of unannuitized wealth. Third, ALDAs have the potential to improve and simplify the process of retirement wealth decumulation. Gong and Webb (2008) showed that simple rules-of-thumb that perform almost as well as the optimal can be applied to the management of wealth decumulation over a period ending on the date that the ALDA income commences. In contrast, widely advocated rules for managing the decumulation of unannuitized wealth over an entire lifetime are highly suboptimal.

Although we are not aware of any published data, we understand that ALDA sales have, as yet, achieved only modest sales.

The life care annuity

Annuities involve a loss of liquidity. This is not a serious drawback if the household's financial needs are known in advance. But households in the United States are exposed to substantial uninsured medical and long-term care costs. A desire for liquidity might therefore deter annuitization. Warshawsky, Murtaugh, and Spillman (2001) proposed an annuity that would address this issue by providing increased benefits in the event of the annuitant being admitted to long-term care. They argued that a combination product might be less affected by adverse selection than products sold separately. Annuity/long-term-care products have now been in the market for about eight years, but have achieved only modest sales.²⁷ A LIMRA survey of nearly ninety long-term-care insurance professionals nonetheless indicated optimism that the market is headed for moderate to strong growth over the next few years.²⁸

²⁷ Fran, Matso Lysiak. March 1, 2007. "Combo deal: hybrid long-term-care/annuity products are life insurers' newest weapon in their battle for retirement assets." Retrieved January 8, 2009, from the Free Library. <http://www.thefreelibrary.com/Combo+deal%3a+hybrid+long-term-care%2fannuity+products+are+life+insurers'...-a0160641464>.

²⁸ Fran, Matso Lysiak. March 1, 2007. "Combo deal: hybrid long-term-care/annuity products are life insurers' newest weapon in their battle for retirement assets." Retrieved January 8, 2009, from the Free Library. <http://www.thefreelibrary.com/Combo+deal%3a+hybrid+long-term-care%2fannuity+products+are+life+insurers'...-a0160641464>.

Aggregate mortality risk sharing

An annuity provider faces three kinds of mortality risk. The first is that it obtains a bad draw of mortality outcomes from a given risk pool. The insurer can largely eliminate this risk by increasing the size of the risk pool. The second is that it experiences a greater than expected level of adverse selection, for example, if other insurers develop means of selecting the “better,” i.e. high mortality risk. The third is that the average mortality of the whole population declines more rapidly than expected. Friedberg and Webb (2007) used the Lee Carter (1992) model to quantify the magnitude of this risk. Using the Capital Asset Pricing Model, they showed that the capital markets would, in theory, be willing to accept this risk at relatively low cost.

Both Dowd (2003), discussing aggregate mortality risk, and Smetters (2004), analyzing similarly non-diversifiable terrorism risk, note that daily gains and losses in financial markets dwarf potential losses from the risks in question. Financial markets may be better positioned than smaller and constrained insurance markets to absorb these nondiversifiable risks. Smetters also notes legal and regulatory barriers (like the double taxation of investment income earned by insurance companies) that limit the capacity of the insurance market to bear risk,

Longevity bonds are one possible mechanism for transferring aggregate mortality risk to the capital markets. In contrast to a regular bond, where the issuer makes periodic payments of interest and capital, the issuer of a longevity bond would make payments proportional to the number of survivors in a reference population, for example, United States males born in a particular year. An annuity provider could completely hedge his interest rate risk, and also hedge a large part of his mortality

risk. In November 2004, The European Investment Bank announced the issue of a 540 million pound longevity bond, with payments based on based on United Kingdom male lives aged 65 in 2003. The issue was subsequently withdrawn. The European Investment Bank intended purchasing reinsurance from Partner Re, and insurers could likely obtain better terms by dealing directly with reinsurers. An alternative design to transfer the risk to financial markets is possible, for example by making bondholders residual claimants after survivor benefits are met. No attempts have yet been made to issue dollar denominated bonds based on United States mortality tables.

An alternative approach is for the insurance company to share aggregate mortality risk with annuitants. From the perspective of the insurance company, aggregate mortality risk is far greater than the risk of having a bad draw from the annuitant pool. But the opposite is true from the perspective of the annuitant. The risk of outliving his wealth far exceeds the risk of a small single digit percentage reduction in his annuity income in the event of average mortality rates decreasing more rapidly than expected.

The Teachers Insurance and Annuity Association (TIAA) offers participating annuities through its companion organization College Retirement Equities Fund (CREF) where the annuity payments are linked to the mortality experiences of its participants and the historical experience is used as a guide in the annual adjustment to the mortality participation factor. (Piggott, Valdez, and Detzel, 2005). Brown and Orszag (2006) argue that, with well-informed consumers, the participating annuity would offer annuitants a higher expected payout to compensate the annuitants for bearing aggregate mortality risk.

Another alternative longevity risk management device is mortality derivatives that transfer longevity risk via capital markets to financial investors. Two types of longevity risk transfer have emerged, a customized hedge and a standardized index hedge. In a customized hedge, also known as a cash flow hedge, the insurer pays a

series of fixed payments to investors and receives the actual payments due to retirees. In a standardized index hedge, also known as a value hedge, the hedge is standardized to reflect a national longevity index. The insurer makes fixed payments based on fixed mortality rates and receives floating payments that are based on the realized mortality rates of the index. We intend to report on the growth of this new longevity insurance market in subsequent versions of this paper.

Reverse mortgages

The value of a home can be decomposed into the present value of the flow of housing services for the anticipated period of ownership, ending on death or earlier sale, and the reversionary interest, the present value of the eventual sale proceeds. Reverse mortgages, the most widely used of which is the Home Equity Conversion Mortgage, enable households aged 62 and older to consume the reversionary interest while continuing to live in their home. In contrast to a regular mortgage, the interest payments on a reverse mortgage are rolled up and repaid on death or the earlier sale of the property, with the amount repayable capped at the sale proceeds. The loan can be taken as a lump sum, a line of credit, a series of periodic payments, or a lifetime income. Reverse mortgages are therefore a means by which households can consume the reversionary interest in their home in the form of an annuity.

Since the HECM program was launched in 1990, take-up has grown rapidly, although only a small minority of households borrows on reverse mortgages.²⁹ But only a small minority of borrowers takes the lifetime income option, most choosing a line of credit. It is unclear whether this reflects annuity aversion, or whether the drawdown pattern reflects specific expenditure needs.

²⁹ There were 112,154 [<http://www.reversemortgage.org/>] HECM mortgage originations for the year ending 30 September 2008.

5. Encouraging or mandating annuitization

Brown and Warshawsky (2001) contains a comprehensive review of options for either mandating or encouraging annuitization. By forcing high mortality households to annuitize, mandatory annuitization might reduce the prices of annuities for everyone. But Dushi and Webb (2005) argue that the gains may be much less than might appear at first glance because the highest mortality households have very little annuitizable wealth. The experience of the United Kingdom suggests that mandatory annuitization would be also be highly unpopular. It would also adversely affect those households that would rationally prefer not to annuitize, even at the more favorable rates made possible by compulsion. Gong and Webb (2008) calculate that approximately 16 percent of Health and Retirement Study households would be made worse off in expected utility terms by mandatory annuitization of uniform and actuarially fair terms.

There seems to be more possibility of encouraging annuitization by either making it the default option in 401(k) plans, or by requiring 401(k) plans to offer an annuitization option. Brown and Warshawsky (2001) draw parallels with the success of 401(k) auto-enrolment. But there are also important differences. Most households probably recognize that saving for retirement is a worthwhile objective, so that auto-enrolment merely has to overcome procrastination and impatience. But it is far from clear that most households also see annuities as an appropriate tool for managing wealth decumulation in retirement.

In addition, there is broad agreement that, at worst, defaulting households into contributing to their employer's 401(k) plan does little harm. A household that finds it is saving more than it desires can easily remedy the situation. But the annuitization decision is not so easily reversed, nor is there yet a consensus on what might represent an appropriate default. Should households be defaulted into annuitizing all of their retirement wealth, or just sufficient to produce an income that covers basic living expenses? The latter is more sensible, but would be difficult to administer without knowledge of the balances in all of the household's accounts.

At what age should households be defaulted into annuities? Should the default be a level nominal, inflation protected, or variable annuity? Should spousal consent be required before a married individual takes a single life annuity, similar to the consent required of defined benefit plan participants? Under current law, insurance companies selling annuities to individuals annuitizing 401(k) balances quote gender specific rates. But under current law, insurance companies would be required to provide unisex rates to individuals defaulted into annuities. Annuity rates vary considerably from provider to provider. How should we ensure that the annuity provider into which the individual is defaulted is not only financially sound, but also provides a competitive product?

References

- Agnew, Julie R., Lisa R. Anderson, Jeffrey R. Gerlach, and Lisa R. Szykman. 2008. "Who Chooses Annuities? An Experimental Investigation of the Role of Gender, Framing, and Defaults." *American Economic Review*, 98(2): 418–22.
- Attanasio, Orazio and Hilary Hoynes. 2000. "Differential Mortality and Wealth Accumulation." *Journal of Human Resources*, Vol 35, No.1:1-29.
- Brown, Jeffrey R. 2001. "Private Pensions, Mortality Risk, and the Decision to Annuitize." *Journal of Public Economics*, 82(1): 29-62.
- Brown, Jeffrey R. 2007. "Rational and Behavior Perspectives on the Role of Annuities in Retirement Planning." National Bureau of Economic Research Working Paper No. 13537.
- Brown, Jeffrey R., Marcus D. Casey, and Olivia S. Mitchell. 2007. "Who Value the Social Security Annuity? New Evidence on the Annuity Puzzle." National Bureau of Economic Research Working Paper No. W13800.
- Brown, Jeffrey R., Olivia S. Mitchell, and James M. Poterba. 2001. "The Role of Real Annuities and Indexed Bonds in an Individual Accounts Retirement Program," in J. Campbell and M. Feldstein, Risk Aspects of Investment-Based Social Security Reform, University of Chicago Press: Chicago, IL, pp. 321-360.
- Brown, Jeffrey R., Olivia S. Mitchell and James M. Poterba. 2002. "Mortality Risk, Inflation Risk, and Annuity Products," in O. Mitchell, Z. Bodie, B. Hammond, and S. Zeldes, Innovations in Retirement Financing, University of Pennsylvania Press: Philadelphia, PA, pp.175 - 197.

Brown, Jeffrey R. and James M. Poterba. 2000. "Joint Life Annuities and the Demand for Annuities by Married Couples," *Journal of Risk and Insurance*, 67(4): pp. 527 - 553.

Brown, Jeffrey R. and James M. Poterba. 2006. "Household Demand for Variable Annuities," *Tax Policy and the Economy*.

Brown, Jeffrey R. and Mark J. Warshawsky. 2004. "Longevity Insured Retirement Distributions from Pension Plans: Market and Regulatory Issues," In W. Gale, J. Shoven, and M. Warshawsky, eds., Public Policies and Private Pensions, Brookings Institution.

Brown, Jeffrey R. and Peter Orszag. 2006. "The Political Economy of Government-issued Longevity Bonds." *Journal of Risk & Insurance*. Vol. 73, No. 4, pp. 611-631, December 2006.

Currin , Cailie . August 20, 2008. "Gender Equity in MA Annuities." Retrieved November 13, 2008, from lifeinsurancelawblog Web site: www.lifeinsurancelawblog.com.

Drinkwater, Matthew. 2006. "Substandard Annuities." *LIMRA International, Inc.* Page 7.

Dowd, Kevin. 2003. "Survivor bonds: a comment on Blake and Burrows." *Journal of Risk and Insurance*. Vol. 70, No.2, pp.339-48, June 2003.

Dushi, Irena and Anthony Webb. 2004. "Household Annuity Decisions: Simulations and Empirical Analyses." *Journal of Pension Economics and Finance* 3.2 (2004): 109-143.

Forrest, Steve. 2008. "Pensions and Longevity: Risk and Opportunities in UK and Europe." Global Financial Leadership Forum.

Friedberg, Leora and Anthony Webb. 2007. "Life Is Cheap: Using Mortality Bonds to Hedge Aggregate Mortality Risk" *The B.E. Journal of Economic Analysis & Policy*: Vol. 7.1, Article 31. 2007.

Gong, Guan and Anthony Webb. 2007. "Evaluating the Advanced Life Deferred Annuity – An Annuity People Might Actually Buy." Center for Retirement Research at Boston College Working Paper.

Hill, Jennifer. June 13, 2008. "UK insurer Aviva joins postcode annuity fray." Retrieved November 22, 2008, from Reuters Web site: www.reuters.com.

Internal Revenue Service. www.irs.gov

Jagannathan, Ravi and Narayana Kocherlakota. 1996. "Why Should Older People Invest Less in Stocks Than Younger People?" Federal Reserve Bank of Minneapolis Quarterly Review Vol. 20 No. 3 Summer Pages 11-23.

James, Estelle and Xue Song. 2002. "Annuities Markets Around the World: Money's Worth and Risk Intermediation." American Economic Association Meetings and CERP Working Paper 16/01.

Lee, Ronald and Lawrence R. Carter. 1992. "Modeling and Forecasting U.S. Mortality." *Journal of the American Statistical Association*, 87(419):659 – 671.

Lysiak, Fran Matso. March 1, 2007. "Combo deal: hybrid long-term-care/annuity products are life insurers' newest weapon in their battle for retirement assets." Retrieved January 8, 2009, from the Free Library. www.thefreelibrary.com.

Mackenzie, George A. 2006. Annuity Markets and Pension Reform. Cambridge University Press: New York, NY, pp.24.

Milevsky, Moshe A. 1998. "Optimal Asset Allocation Towards the End of the Life Cycle: To Annuitize or not to Annuitize?" *Journal of Risk and Insurance*, 65(3): 401-426.

Milevsky, Moshe A., and Virginia R. Young. 2003. "Annuitization and Asset Allocation." Working Paper, Schulich School of Business, York University, Toronto.

Milevsky, Moshe. 2005. "Real Longevity Insurance With a Deductible: Introduction to Advanced-Life Delayed Annuities (ALDA)." *North American Actuarial Journal*, Vol. 9 No. 4, pp.109-122.

Milner, Leah. Aug 11, 2008. "Prudential postcode annuity move marks tipping point, says Hargreaves Lansdown." Retrieved November 23, 2008, Web site: www.moneymarketing.co.uk

Mitchell, Olivia S., James Poterba, Mark J. Warshawsky and Jeffrey R. Brown. 1999. "New Evidence on the Money's Worth of Individual Annuities," *American Economic Review*, Vol. 89 No. 5, pp.1299-1318.

National Compensation Survey: Employee Benefits in Private Industry in the United States, 2000 – Chapter 3, table 113. Web site: www.bls.gov.

National Compensation Survey: Employee Benefits in Private Industry in the United States, March 2005 – Chapter 2, table 51. Web site: www.bls.gov.

National Bureau of Economic Research, Fast Facts, Feb 2007. "The Decline in Eligible Traditional Pension Plan Participants." FFE#41. <http://ebri.matrixgroup.net>

National Income and Product Accounts Table, Bureau of Economic Analysis.
www.bea.gov

National Reverse Mortgage Lenders Association, October 14, 2008. "Press Release: Reverse Mortgages Show Growth in 2008." www.nrmlaonline.org

Pang, Gaobo and Mark Warshawsky. 2008. "Optimizing the Equity –Bond-Annuity Portfolio in Retirement: The impact of Uncertain Health Expenses." Pension Research Council Working Paper No. 2008-05.

Piggott, John, Emiliano Valdez and Bettina Detzel. 2005. "The Simple Analytics of Pooled Annuity Fund." *Journal of Risk and Insurance* 72(3): 497 – 520.

Poterba, James M. 1997. "The History of Annuities in the United States." National Bureau of Economic Research Working Paper No. 6001.

Reno, Virginia P., Michael J. Greatz, Kenneth S. Apfel, Joni Lavery, and Catherine Hill, eds. 2005. "Uncharted Waters: Paying Benefits from Individual Accounts in Federal Retirement Policy" Study panel final report, January. Washington D.C., National Academy of Social Insurance.

Smetters, Kent A. 2004. "Insuring Against Terrorism: The Policy Challenge." Brookings-Wharton Papers on Financial Services - 2004, pp. 139-187.

Social Security Administration. "Annual Statistical Supplement to the Social Security Bulletin, 2007." www.ssa.gov.

Turra, Cassio M. and Olivia S. Mitchell. 2004. "The impact of Health Status and Out-of-Pocket Medical Expenditures on Annuity Valuation." Michigan Retirement Research Center Research Paper No. WP 2004-086.

Yogo, Motohiro. 2008. "Portfolio Choice in Retirement: Health Risk and the Demand for Annuities, Housing, and Risky Assets." AFA 2009 San Francisco Meetings Paper.

Warshawsky, Mark J., Christopher M. Murtaugh and Brenda C. Spillman. 2001. "In Sickness and in Health: An Annuity Approach to Financing Long-Term Care and Retirement Income." *The Journal of Risk and Insurance*, 2001, Vol.68, No.2, 225-254.

Woolley, Scott .2006. "Retire Relaxed." Retrieved December 17, 2008, from Forbes Web site: www.forbes.com.

Table One: Annuity Sales by Product Types for the Period 1996 – 2007(Dollars in Billions).

Variable Annuities	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
- Variable Immediate Annuities	0.2	0.2	0.3	0.5	0.8	0.7	0.6	0.5	0.3	0.3	0.4	0.3
- Variable Deferred Annuities	74.1	88.0	99.5	122.5	136.6	112.6	114.4	128.9	132.6	136.6	160.0	183.8
Total Variable Annuities	74.3	88.2	99.8	123.0	137.3	113.3	115.0	129.4	132.9	136.9	160.4	184.1
Fixed Annuities												
- Fixed Immediate Annuities	2.8	2.8	2.1	2.4	3.0	3.6	4.8	4.8	5.3	5.3	6.1	6.5
- Fixed Deferred Annuities	32.8	32.7	26.6	35.3	44.7	64.7	92.6	78.6	76.6	68.3	66.3	60.3
- Structured Settlements	2.4	2.7	3.3	4.0	5.0	6.0	5.9	6.0	6.0	5.9	5.9	6.2
Total Fixed Annuities	38.0	38.2	32.0	41.7	52.7	74.3	103.3	89.4	87.9	79.5	78.3	73.0
Total Immediate Annuities	3.0	3.0	2.4	2.9	3.8	4.3	5.4	5.3	5.6	5.6	6.5	6.8

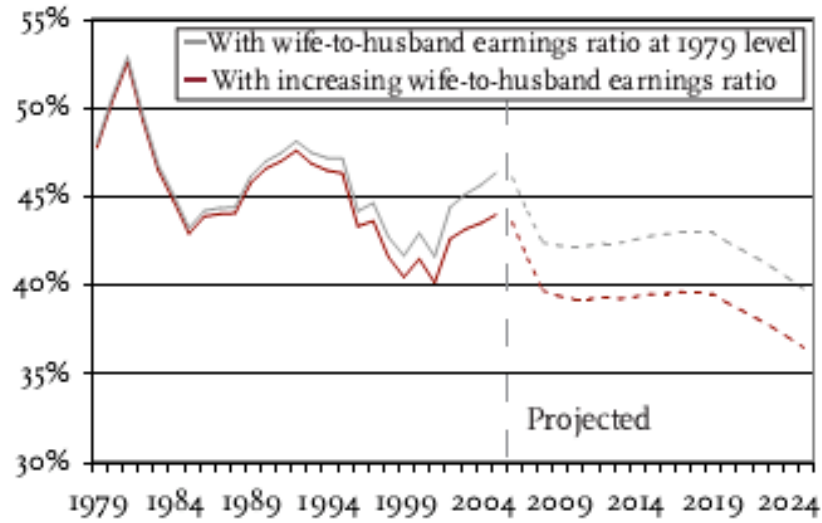
Data Source: LIMRA 2006 Annuity full report & Q2 08 Annuity report

Table Two: Immediate Annuity Qualified and Nonqualified Sales for the period 2001 – 2006.

Variable Immediate (Dollars in Million)	2001		2002		2003		2004		2005		2006	
	Amount	% of total	Amount	% of total	Amount	% of total	Amount	% of total	Amount	% of total	Amount	% of total
Qualified	481	67.94%	378	62.27%	237	45.75%	146	52.14%	87	29.49%	145	39.73%
Nonqualified	227	32.06%	229	37.73%	281	54.25%	134	47.86%	208	70.51%	220	60.27%
Total Variable Immediate	708		607		518		280		295		365	
Fixed Immediate (Dollars in Billion)												
Qualified	1.8	50.00%	1.5	31.25%	1.2	25.00%	1.2	22.64%	1.4	26.42%	1.9	31.15%
Nonqualified	1.8	50.00%	3.3	68.75%	3.6	75.00%	4.1	77.36%	3.9	73.58%	4.2	68.85%
Total Fixed Immediate	3.6		4.8		4.8		5.3		5.3		6.1	

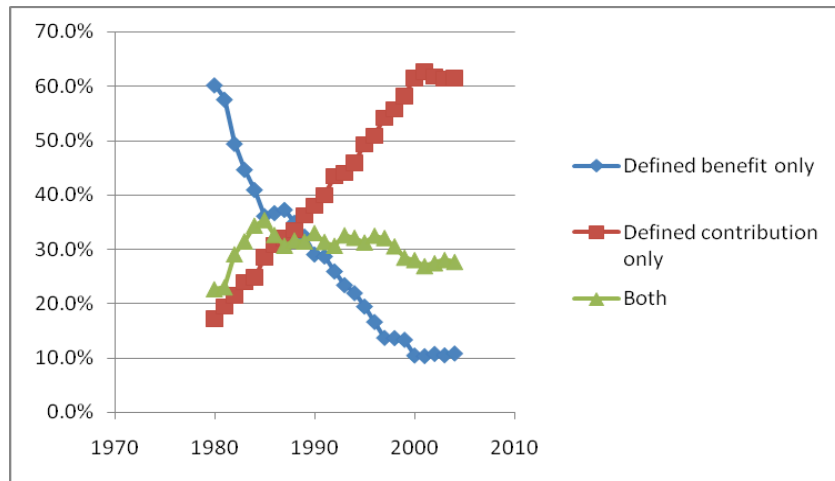
Data Source: LIMRA 2006 Annuity full report & Q2 08 Annuity report

Figure One: Historical and Projected Social Security Replacement Rates for the Average Household Claiming at Age 65, 1979 – 2025.³⁰



Munnell, Alicia H. (2007). WORKING WIVES REDUCE SOCIAL SECURITY REPLACEMENT RATE. *Center for Retirement Research at Boston College. Oct 2007*
 Data Source: Author’s calculation from the 1962-2006 CPS.

Figure Two: Private Sector Workers with Pension Coverage, By Pension Type, 1980, 1992, and 2004.

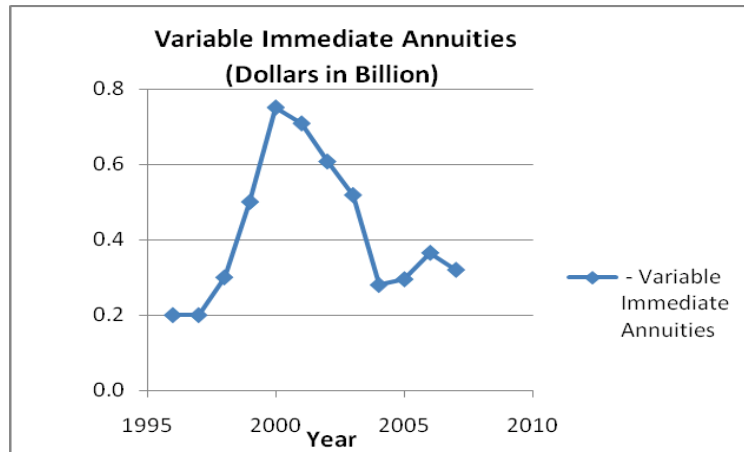


Data Source: U.S. Department of Labor (2004). Abstract of 1999 Form 5500 Annual Reports, Private Pension Plan Bulletin (12) and authors calculations from U.S.

³⁰ The denominator in the replacement rate is the average wage of all workers in the year that the individual retired, as reported in the Social Security Trustees report for the relevant year.

Department of Labor, 2001-2006. Annual Return/Report Form 5500 Series for Plan Years 1999-2004. Washington, DC.

Figure Three: Variable Immediate Annuity Sales for the Period 1996 – 2007
(Dollars in Billion).



Data Source: LIMRA 2006 Annuity full report & Q2 08 Annuity report.