

Brown, Jeffrey R.

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Life Annuities and Uncertain Lifetimes

Jeffrey R. Brown*

As the baby boom generation begins the transition into retirement, concerns about retirement income security are rising in importance on the agenda of policymakers and academic researchers across the globe. Recent decades have witnessed many changes to the retirement income landscape, including the shift from defined benefit to defined contribution pension plans in the United States and the introduction of personal accounts as part of public pensions systems in dozens of other countries. A common theme in these changes has been a shift toward increased individual self-reliance in retirement planning.

While researchers and policymakers have placed enormous attention on the accumulation phase of retirement accounts, such as how individuals save and invest, they are becoming increasingly aware that asset accumulation is only part of the retirement security equation. The other part is how individuals convert their accumulated savings into a retirement consumption stream, particularly when most of us do not know how long we will live. Indeed, uncertainty about length-of-life is one of the most significant sources of financial risk facing today's retirees.

Dramatic advances in life expectancy over the last century mean that today's typical 65-year old man and woman can expect to live to age 81 and 85 respectively. Perhaps even more striking is the fact that almost a fifth of

65-year-old men and nearly one-third of 65-year-old women will live to age 90 or beyond. Without appropriate financial planning during retirement, increased longevity means that individuals face a greater risk of being forced to substantially reduce their living standards at advanced ages.

Life annuities are financial instruments that allow an individual to exchange a stock of wealth for a stream of income that continues for life. An annuity provider, such as an insurance company or the government, pools the resources of annuitants and uses the resources of those who die young to fund increased consumption for those who live a long time. Because of their ability to insure against the consumption uncertainty that arises from longevity risk, life annuities have played an important role in economic models of consumption for at least four decades, and recently have begun to attract considerable policy attention as well. This article provides a brief summary of the rapidly growing body of research dedicated to better understanding annuity markets in the United States and abroad.

Annuities in Economic Theory

In a seminal article published over four decades ago, Menachem Yaari incorporated lifespan uncertainty into a standard life-cycle consumption model.¹ He showed that a rational consumer with no bequest motives ideally would place all of his wealth into actuarially-fair life annuities instead of conventional bonds. My recent work with Tom Davidoff and Peter A. Diamond² extends this result by showing that,

with complete markets, this full annuitization result holds in a much more general set of circumstances than originally believed. Indeed, many of the usual assumptions imposed on consumer preferences in standard economic models (exponential discounting, adherence to expected utility axioms, lack of habit formation) are unnecessary. Neither must annuities be actuarially fair, nor longevity risk the only source of consumption uncertainty. We further show that this result holds for annuities backed by risky assets as well as bonds, including variable annuities offered by private insurers such as TIAA-CREF. All that is required is that consumers have no bequest motive and that annuities pay a rate of return for survivors greater than those of otherwise-matching conventional assets, net of administrative costs. While the addition of a bequest motive makes complete annuitization less than optimal, some annuitization is still desired under standard parameterizations.

Given these theoretical results, the natural “jumping off point” for economists studying retirement income is that annuities ought to play an important role in the portfolios of elderly households.

So Why is the Annuity Market So Small?

If ever there were a prediction of economic theory that was blatantly violated by the empirical evidence, it is that of full annuitization. Indeed, outside of Social Security and traditional defined benefit pension plans, very few assets in the United States are converted into life annuities. As I have documented in various papers with Olivia S.

* Brown is a Faculty Research Fellow in the NBER's Programs in Public Economics and the Economics of Aging and an Assistant Professor of Finance in the College of Business at the University of Illinois at Urbana-Champaign. His profile appears later in this issue.

Mitchell, James M. Poterba, and Mark Warshawsky³, the market for privately purchased individual annuities in the United States is very small. Furthermore, few individuals avail themselves of the opportunity to “purchase” a higher level of annuitized income through Social Security, which can be done by delaying the claiming of benefits.⁴

Given the remarkable disconnect between theory and practice, it is natural to ask why more individual do not purchase life annuities. A large body of work has examined various explanations for this phenomenon, with somewhat mixed results. In order to test the empirical validity of the standard economic model itself, I studied the annuitization intentions of near-retirees in the Health and Retirement Survey.⁵ I found that a measure of annuity value, derived from a life-cycle model with mortality uncertainty, is significantly correlated with intentions to annuitize assets in defined contribution plans. However, I also found that most of the variation in annuity decisions is unexplained by the standard model. In fact, for the approximately one-fifth of the population that have very short time horizons, the standard model has virtually no predictive power. One key factor that did not have empirical power to explain annuitization decisions is a bequest motive, that is, a desire to leave wealth to one's children.

Given the rich focus in the economics literature of the past few decades on the role of asymmetric information in insurance markets, a natural hypothesis to consider is the role of pricing. In particular, is it the case that private market annuities are just too expensive, either because of high industry costs and/or profits, or because of adverse selection? Mitchell, Poterba, Warshawsky, and I⁶ find that mortality differences between annuitants and the general population reduce annuity payouts by about 10 percent, and that other cost factors reduce payouts by an additional 5 percent. Similar findings hold in other private annuity markets around the world, for example the United Kingdom.⁷ However, using a standard life-cycle consumption model, we also find that risk averse consumers ought to be will-

ing to pay even more for these annuities than current market prices require. This finding remains true even after accounting for the presence of pre-existing annuities such as Social Security.

In later work⁸, we explore how inflation uncertainty and asset market risk interact with longevity risk, a particularly relevant concern given that most annuity contracts offered in the United States are fixed in nominal terms. Our research underscores the fact that inflation-indexed annuities serve an important role as a core holding in the portfolio of retirees, but that some exposure to equity-linked annuity products can further improve individual welfare. However, this research also finds that the lack of privately available inflation-indexed annuity products, driven at least in part by the pre-1998 lack of inflation-indexed government bonds that are desired by insurers to hedge the inflation risk, was probably not the cause of the limited consumer demand.

A more promising result, from the perspective of attempting to solve the “annuity puzzle,” came from the recognition that families can serve as partial substitutes for private annuity markets, a point first recognized by Laurence J. Kotlikoff and Avia Spivak⁹. Poterba and I¹⁰ find that married couples who pool their retirement resources using a common budget constraint are able to pool mortality risk fairly effectively. As a result, couples should value annuities significantly less than single individuals. And, when combined with existing market-based pricing loads, this may be enough to explain the lack of annuity demand by a large segment of the population. It also suggests that it may be worthwhile for a survivor to annuitize upon the death of a spouse.

In recent work, Davidoff, Diamond, and I explain in a theoretical model how market incompleteness can “undo” the full annuitization result. One interesting implication of this work is that it may be the incompleteness of other markets that ultimately may limit the purchase of life annuities. This is because most standard annuity contracts impose liquidity constraints on individuals, constraints that can be costly in welfare terms if they cannot be undone through the use of

other asset markets.

A brief summary of the literature suggests that, within the standard economic framework of a rational life cycle decisionmaker, the most promising explanations for limited demand are risk sharing within couples and families and the imposition of liquidity constraints. The evidence does not support a major role for pricing, inflation risk, or bequest motives.

Annuities and Public Policy

Aside from theoretical interest in the question of who annuitizes and why, annuitization has become an increasingly visible issue within retirement policy circles. The policy debate has been ignited by two issues. First, one result of the shift from defined benefit to defined contribution plans has been a reduction in opportunities for annuitization, for example, because few 401(k) plans even offer an annuity option.¹¹ Second, the debate about the role of personal accounts in Social Security has elevated the issue of how best to structure payout rules to provide for lifelong financial security of participants.

A central question in regulating withdrawals from public or private pension systems is the extent to which life annuitization should be required or encouraged. The standard economic models provide one rationale for compulsory annuitization, namely that many individuals would find it welfare enhancing. And in the absence of compulsion, adverse selection might limit the market and lead to unfavorable pricing. Furthermore, in the presence of means-tested anti-poverty programs, policymakers may wish to guard against allowing individuals to deplete their retirement savings rapidly and then become reliant on these programs. However, compulsory annuitization may over-annuitize some individuals because of bequest motives or liquidity constraints. Furthermore, compulsory annuitization has the potential to lead to significant financial redistribution from poorer to richer families.

An influential paper on over-annuitization previously had suggested

that significant life insurance holdings among the elderly were evidence of over-annuitization by Social Security.¹² Using a more recent and richer set of data on retirees, I re-examined the implications of this “annuity offset” hypothesis and found little evidence to support the idea that retirees are trying to sell annuities by purchasing life insurance.¹³ Instead, a substantial portion of life insurance ownership among the elderly appears to be a residual of decisions made earlier in life to insure against the loss of human capital.

Concerns about redistribution arise from the fact that life annuities, by their very design, transfer resources from individuals who die young to individuals who live a long time. The policy issue arises from the fact that not all individuals face the same mortality probability distribution. Numerous studies have documented the negative correlation between mortality rates and various measures of socioeconomic status, such as income, wealth, education, race, and ethnicity.¹⁴ Using mortality rates that differ by age, gender, education and race/ethnicity, I have examined distributional issues in two papers. The first documents how a system of mandatory annuitization at a uniform price leads to substantial expected transfers from high mortality risk individuals (for example, low education groups)¹⁵ to low mortality risk individuals (for example, high education groups). A second paper embeds this analysis into a life-cycle valuation framework, and finds that the extent of redistribution is significantly mitigated when viewed from a utility-based perspective.¹⁶ This is because high mortality-risk individuals have more to gain from access to annuity markets: in the absence of such markets, they would have to set aside resources to provide consumption for an old age that they are highly unlikely to reach.

Conclusions

Taken as a whole, the growing literature on annuities underscores the

importance of considering how individual consumers treat mortality risk when making portfolio decisions. Despite important advances in this area, however, there is much that we still do not understand. It is important that research in this area continue to improve our understanding of how retirees make retirement portfolio decisions and thus inform the design of retirement income policies.

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³ J. R. Brown and J. M. Poterba, “Joint Life Annuities and Annuity Demand by Married Couples,” *Journal of Risk and Insurance*, 67 (4) (December 2000), pp. 527-53. J. R. Brown, O. S. Mitchell, and J. M. Poterba, “Mortality Risk, Inflation Risk, and Annuity Products,” in O. Mitchell, Z. Bodie, B. Hammond, and S. Zeldes, eds., *Innovations in Retirement Financing*, Philadelphia: University of Pennsylvania Press, 2002, pp. 175-97. O. Mitchell, J. M. Poterba, M. J. Warshawsky, and J. R. Brown, “New Evidence on the Money's Worth of Individual Annuities,” *American Economic Review*, 89 (5) (December 1999), pp. 1299-318.

⁴ C. Coile, P. A. Diamond, J. Gruber, and A. Jouten, “Delays in Claiming Social Security Benefits,” *Journal of Public Economics*, 84 (3) (June 2002), pp. 357-85.

⁵ J. R. Brown, “Private Pensions, Mortality Risk, and the Decision to Annuitize,” *Journal of Public Economics*, 82 (1) (October 2001), pp. 29 - 62.

⁶ See O. S. Mitchell, J. M. Poterba, M. J. Warshawsky, and J. R. Brown, “New Evidence on the Money's Worth of Individual Annuities.”

⁷ A. Finkelstein and J. M. Poterba, “Selection Effects in the United Kingdom Annuities Market,” *The Economic Journal*, 112 (476) (January 2002), pp.

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⁸ J. R. Brown, O. S. Mitchell, and J. M. Poterba, “The Role of Real Annuities and Indexed Bonds in an Individual Accounts Retirement Program,” in J.Y. Campbell and M. Feldstein, eds., *Risk Aspects of Investment-Based Social Security Reform*, Chicago: University of Chicago Press, 2001, pp. 321-60.

⁹ L. J. Kotlikoff and A. Spivak, “The Family as an Incomplete Annuities Market,” *Journal of Political Economy*, 89 (2) (April 1981), pp. 372-91.

¹⁰ See J. R. Brown and J. M. Poterba, “Joint Life Annuities and Annuity Demand by Married Couples.”

¹¹ J. R. Brown and M. J. Warshawsky, “Longevity-Insured Retirement Distributions from Pension Plans: Regulatory and Market Issues,” forthcoming in W. Gale, J. Shoven, and M. Warshawsky, eds., *Public Policies and Private Pensions*, Brookings Institution.

¹² B. D. Bernheim, “How Strong Are Bequest Motives? Evidence Based on Estimates of the Demand for Life Insurance and Annuities,” *Journal of Political Economy*, 99 (5) (October 1991), pp. 899-927.

¹³ J. R. Brown, “Are the Elderly Really Over-Annuitized? New Evidence on Life Insurance and Bequests,” in D. Wise, ed., *Themes in the Economics of Aging*, Chicago: University of Chicago Press, 2001, pp. 91-124.

¹⁴ J. R. Brown, J. B. Liebman, and J. Poller, “Estimating Life Tables that Reflect Socioeconomic Differences in Mortality,” in M. Feldstein and J. Liebman, eds., *The Distributional Effects of Social Security Reform*, Chicago: University of Chicago Press, 2002, pp. 447 - 57.

¹⁵ J. R. Brown, “Differential Mortality and the Value of Individual Account Retirement Annuities,” in M. Feldstein and J. Liebman, eds., *The Distributional Effects of Social Security Reform*, Chicago: University of Chicago Press, 2002.

¹⁶ J. R. Brown, “Redistribution and Insurance: Mandatory Annuitization with Mortality Heterogeneity,” *The Journal of Risk and Insurance*, 70 (1) (February 2003) pp. 17-41.