RETIREMENT INCOME INSTITUTE
Alliance for Lifetime Income

Who Should Read This Insight:
Policymakers, financial market regulators, corporate strategists for annuity provider

Institute Research Agenda Topic:
New takes on the annuity puzzle.

Insight: VALUE FOR MONEY AND PRUDENTIAL REGULATION OF ANNUITIES

Definitions of **bolded key terms** are at the end of this article.

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Authors, Titles and Publication Dates of the Articles Addressed in the Insight
Edmund S. Cannon and I. Tonks. 2016. "Cohort Mortality Risk or Adverse Selection in Annuity Markets?" Journal of Public Economics 141:68–81. https://research-information.bris.ac.uk/en/publications/cohort-mortality-risk-or-adverse-selection-in-annuity-markets.

IDEAS IN THIS INSIGHT YOU CAN PUT INTO ACTION

Understand the interaction between selection effects and regulatory reserving for annuities. Claims that annuities are poorly priced due to adverse selection should be treated as unproven. Regulation of annuity products may result in them becoming more expensive.

PRINCIPAL INSIGHTS

Cannon and Tonks (2016) evaluate different **lifetime annuity** products in the United Kingdom using the **money's worth (MW)**, which is a measure of **value for money (VfM)**. They confirm that the MW is lower for back-loaded annuities than it is for **level annuities**. That result is consistent with the theory of adverse selection and has been used as evidence that adverse selection is present in **annuity** markets; it may also explain the fact that few people purchase annuities voluntarily, a phenomenon known as the **annuity puzzle**. Cannon and Tonks (2016) show that back-loaded annuities are associated with more risk (and hence higher cost) for **annuity providers** because a higher proportion of their present values are paid in the future where there is greater uncertainty, which provides an alternative explanation for differences in the MW. Using the Lee and Carter (1992) mortality model (discussed below) to quantify the importance of this effect, Cannon and Tonks (2016) show that it is not possible to identify whether there is adverse selection in annuity markets.

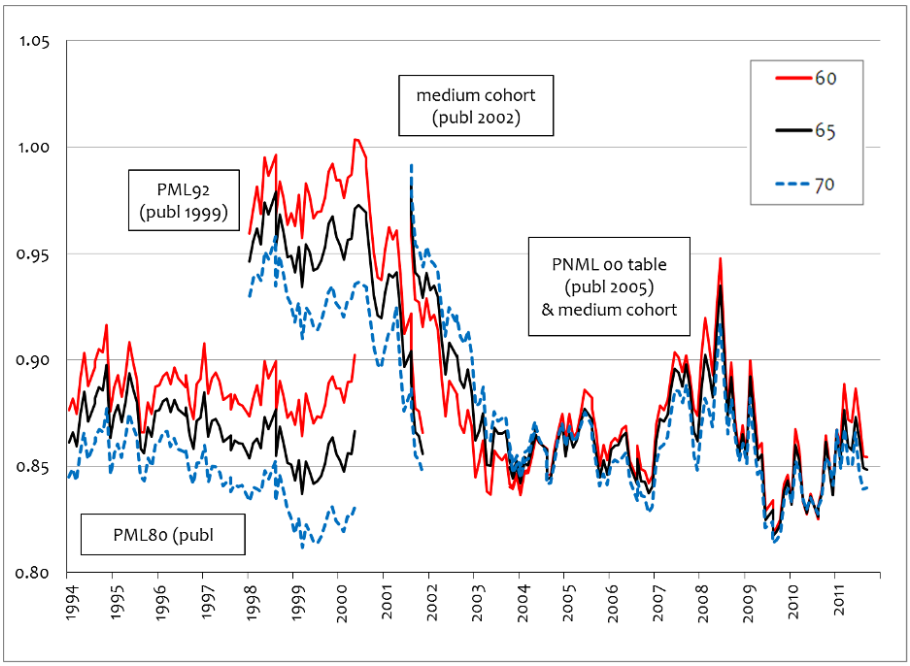
A lifetime annuity is an insurance product that an individual purchases, typically around retirement, from an insurance company. The individual exchanges a lump sum of wealth (the premium) for a regular income stream for the remainder of his or her life. This exchange insures the individual against **longevity risk**; that risk is pooled by the insurance company by selling the same product to individuals who will die at different ages. We can assess the VfM of this exchange using the MW metric (Mitchell et al. 1999), which is defined as the ratio of the expected value of future annuity payments to the premium that was paid. Finkelstein and Poterba (2002) and Cannon and Tonks (2004) have estimated the MW of lifetime annuities in the United Kingdom.

Cannon and Tonks (2016) provide time-series estimates of the MW of lifetime annuities in the United Kingdom's compulsory purchase market, which was the largest annuity market in the world from 1994 to 2012. They report MW by age (see figure 1), by gender, and by product type (for level, real, and escalating annuities, discussed next).

Cannon and Tonks (2016) start by considering level annuities, which pay a constant nominal income for life. Summarizing one of their main results, they find that, over the whole sample, level annuities for men aged 65 had an average MW of 0.935, which is extremely

high for an insurance product. They demonstrate that MW calculations need to include estimates of survival probabilities and are sensitive to the relevant mortality tables provided by the British Institute and Faculty of Actuaries. New sets of mortality tables are published every few years based on the most recent deaths of **annuitants**, recorded at discrete time intervals. As we see in figure 1, the introduction of each new mortality table results in a discrete increase in the MW due to longer projected life expectancies. Before 2002 there was a systematic pattern that annuitizing at younger ages had a higher MW, but this pattern was reversed for the medium cohort 2002–5, and over the fourth subsample the pattern across ages appears to have converged. Within the sample period for a particular mortality table there were gradual declines in MW (with the exception of the financial crisis beginning in 2008). In fact, there was a decline in annuity rates of about 2.5 percent between 1994 and 2000, but this fall does not correspond to as large a change in the MW, and is mainly explained by accompanying falls in interest rates and increases in life expectancy. In the period 2004–12, the most recent mortality table (PNML00) suggested an average MW for level annuities of 0.859 for men aged 65.

Figure 1. Money's worths for level annuities for different ages at purchase, 1994–2011



Note: Figure shows MW of level annuities for men aged 60, 65, and 70 (at time of purchase) over four subperiods corresponding to relevant mortality tables. PML80 refers to data from 1994 to 2001; PML92 refers to data from 1999 to 2002; medium cohort refers to data from 2002 to 2005; and PNML00 refers to data from 2005 to 2012.

While level annuities pay a constant nominal income, real and escalating annuities are back loaded because the income payments are initially lower for these annuities than they are for a level annuity. The income payments also rise over time: more of the payments are made in the more-distant future. In technical financial terms, real and escalating annuities have a higher duration. Cannon and Tonks (2016) confirm that back-loaded annuities have significantly lower MWs than level annuities for each of the subsamples.

In general, the MW of back-loaded annuities are lower than the MW of level annuities, which have the highest MW. For example, in the period 2004–12, the average MWs for the two types of back-loaded annuities were 0.768 for real annuities and 0.802 for escalating annuities, compared to the MW for level annuities of 0.859.
These MW estimates provide a starting point for revisiting the suggestion that there is adverse selection in annuity markets where individuals with different life expectancies self select into purchasing different types of annuity: longer-lived individuals—who have private information about their anticipated longevity—who purchase back-loaded annuities. Cannon and Tonks (2016) show that an alternative model in which regulated annuity providers must reserve against cohort mortality risk yields exactly the same pattern in annuity prices: back-loaded annuities have lower MWs than front-loaded annuities.

The intuition for this result is that the model with cohort mortality risk relies on the fact that life insurers need to protect themselves against the uncertain evolution of cohort mortality, both for reasons of prudence and because government regulation requires that they do so. Idiosyncratic mortality risks do not really matter in a large pool of annuitants since individual differences are averaged away. Cohort mortality risk, however, relates to the risk that an entire cohort of annuitants might experience shifts in longevity, which would have a negative impact on annuity providers. Annuity products that might attract different annuitants with different life expectancies also have different risks for the provider. Because back-loaded annuities have a higher proportion of payouts in the more distant future, they are inherently riskier products and require greater reserves. In publicly available information required by the UK financial regulator, annuity providers report that their liabilities of real (inflation-indexed) annuities are matched with bonds that are also indexed to inflation; those bonds can be more costly to purchase.

Having explained that reserving for cohort mortality risk can generate lower MWs for back-loaded annuities, Cannon and Tonks (2016) go on to quantify the importance of cohort mortality risk by estimating the uncertainty in forecasting mortalities. They start with the Lee and Carter (1992) mortality model that is based on Gompertz's Law, which is that the logarithm of mortality rates tends to increase approximately linearly with age. Cannon and Tonks (2016) estimate this model using the United Kingdom's life office pensioner mortality data for ages 61–100 for the period 1983–2000. Then, using the model's estimated parameters, they project survival probabilities into the future using Monte Carlo methods with 10,000 replications to calculate the probability distribution of the relevant stochastic variables: the survival probabilities and the corresponding annuity value for a unit annuity payment. There is relatively little uncertainty about these stochastic variables for the first few years since the probability of dying is small, but by age 75 there is considerable uncertainty. Note that an annuity that is more back-loaded has a higher proportion of its present value paid in the period of greater uncertainty and thus is a riskier liability for a life insurer. Cannon and Tonks (2016) demonstrate that a substantial proportion of observed differences in MWs for different annuity products may be due to the relative risks of level and back-loaded annuities, and life insurers pricing back-loaded annuity products conservatively.

Both the adverse selection and prudential pricing models depend on the feature that real and escalating annuities are more back-loaded than level annuities. The adverse selection model relies on the fact that high-risk individuals choose back-loaded annuities. The prudential pricing model depends on the fact that uncertainty associated with back-loaded annuities increases with the time horizon, since these products have a great percentage of the present value at longer time horizons. Importantly, since both models have the same implications for pricing across annuity products, tests for adverse selection in annuity markets using prices are not identified.

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KEY TERMS ARE SOURCED FROM THE ALLIANCE FOR LIFETIME INCOME'S ANNUITIES LANGUAGE GLOSSARY AND INVESTOPEDIA.

annuitant: *A person who will receive the income payments from an annuity. (They could be the direct owner of the annuity or another person chosen by the direct owner, and they are the person whose lifetime income the payments are based on.)*

annuity: *A financial product that can offer protected lifetime income and even potentially grow your money.*

annuity providers: Financial firms selling annuities. In the United Kingdom these are usually life insurance companies.

annuity puzzle: *The annuity puzzle refers to the fact that few people choose to annuitize even a portion of their accumulated savings even though they have many good and rational reasons to do so.*

back-loaded annuity: *A type of lifetime annuity where the initial income payments rise over time (either for real (inflation-linked) annuities in line with inflation or for escalating annuities at a constant rate, usually 3 per cent per year); initially payments on a back-loaded annuity are lower than for a level annuity and eventually (assuming the annuitant lives sufficiently long) they are higher.*

lifetime annuity: *A lifetime annuity is an investment vehicle that functions as a personal pension plan. Sometimes referred to as "single life," "straight life," or "non-refund," these are a form of immediate annuity that provides income for your entire life. The payments can be increased to cover a second person. This is called a "Joint and Survivor" annuity. While most provide income for life, some may offer the option of payments for a fixed number of years.*

level annuity: *A type of lifetime annuity where the payments are constant in nominal terms.*

longevity risk: *The chance that you may live longer than your income will last.*

money's worth (MW): *A measure of value for money (VfM) comparing the expected value of the payments received by the annuitant to the premium paid by the annuitant. The MW will be less than one: the closer it is to one, then the better value for the annuitant.*

value for money (VfM): *The term "value for money" (VfM) is used as a synonym for cost-effectiveness, among other definitions. The four key terms that agencies use in defining VfM are economy, efficiency, effectiveness, and equity.*

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