

## How Efficient is the Individual Annuity Market?

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### Abstract

As the burden of retirement income provisions shifts from Defined Benefit (DB) to Defined Contribution (DC) pensions, there is a growing interest in the financial dynamics of the individual annuity market. In this paper we use a unique time-series consisting of over three million U.S. life annuity quotes over an 8-year period. We find that annuity prices do not respond to changes in interest rate in a way one might expect from (theoretical) models used in the portfolio choice and lifecycle literature.

Our main results can be summarized as follows.

- 1.) The *annuity factors* change frequently and are more volatile than underlying interest rates. Roughly speaking, the standard deviation of the annuity factor is 5 to 10 times greater than the standard deviation of a pricing swap rate. In that sense, we have identified an unexplained excess annuity factor volatility puzzle.
- 2.) It takes approximately 5 to 6 weeks for annuity factors to adjust and fully react to changes in interest rates. Thus, in contrast to theory which suggests that annuity factors should instantaneously adjust to changes in interest rates, we find a lag and corresponding predictability.
- 3.) In time-series regressions of weekly changes in the annuity factor on weekly changes in the 10-year swap rate, we find a maximum R-squared of 45% at the above-mentioned five week lag. Short lags produce R-squared values that are lower than 45%, and higher lags do not result in higher values. Thus, a full 55% of the variation in annuity factors can't be explained by changes in interest rates. There is something else driving annuity prices.
- 4.) Finally, the response of annuity factors to changes in interest rates is asymmetric. When interest rates decline, annuity factors (i.e. prices) react to these changes more rapidly and with greater sensitivity. In contrast, when interest rates increase, annuity factors react more slowly and with less sensitivity. In other words, the empirical annuity duration coefficient depends on the direction and magnitude of the change in interest rates. This, again, is inconsistent with the conventional pricing model and once again raises the possibility of benefits from market-timing one's annuity purchase.

Taken together, however, they imply that one must be extremely careful when trying to (i.) dynamically model the evolution of annuity prices, and (ii.) vice versa when trying to extract information about mortality expectations from market prices.