Optimal Retirement Spending and Insurance
When Biological Age and Chronological Age Differ

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Extended Abstract

There is a growing body of medical evidence suggesting that an individual's biological age can be measured using telomere length (which is the protective ends of chromosomes) and that it provides incremental information above-and-beyond other biomarkers of aging. Moreover, it seems biological age can diverge by as much as 10 to 15 years from chronological age as measured by calendar years. In other words, a 65 year-old retiree might in fact be as young as 50 or as old as 80 when measured in terms of forward-looking mortality and morbidity rates. Stated simply, calendar age is just another number -- and perhaps the wrong one on which to focus.

And, while the technology to accurately estimate biological age is still being refined – and other biomarkers of aging might emerge triumphant – all this does raise the possibility that individuals will soon have access to another number that is extremely relevant to wealth management and retirement planning. In fact, it's not inconceivable that chronological age will take a back seat to biological age in the public discourse around retirement policy.

Furthermore, its quite clear from the literature that biological age should **not** be viewed simply as an age set back on a (deterministic) mortality table or a fixed health adjustment factor, both of which are common in actuarial practice. Indeed, the joint dynamics of biological (B) age and chronological (C) age are subtle and mathematically non-trivial. For example, the divergence between B-age and C-age is highest around middle age and lowest at younger and older ages. Intuitively, a (live) centenarian's B-age is quite close to her C-age and vice versa.

Motivated and inspired by this idea, I discuss an economic lifecycle model of consumption and longevity insurance in which the (rational) economic agent has two distinct ages at every point in time; B-age and C-age. I assume a canonical retiree with a fixed endowment plus some exogenous pension income and derive the optimal spending rate – and demand for longevity insurance -- as a function of the two ages. The framework collapses to Yaari (1965) when B-age is forced to equal C-age at all times.

Technically speaking, I connect the two ages via the mechanism of stochastic mortality rates. Namely, by (i.) formulating a plausible model for individual mortality rates and then (ii.) inverting the standard Gompertz-Makeham curve to arrive at ones B-age. I also discuss the dispersion of B-age vs. C-age calibrated from the medical literature.

Theoretically, I discuss the preference conditions under which B-age (or how young "you feel") is or isn't a sufficient statistic for making retirement spending and insurance decisions. Practically speaking I offer a normative model for (i.) how retirees should draw down their nest egg, and (ii.) insure longevity risk, once they have knowledge of both ages and the "elastic band" that links them together.

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