Journal of Economic Dynamics & Control 55 (2015) 39–56

Contents lists available at ScienceDirect

Journal of Economic Dynamics & Control

journal homepage: www.elsevier.com/locate/jedc

Cohort and target age effects on subjective survival probabilities: Implications for models of the retirement phase

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A R T I C L E I N F O

Article history:
Received 22 October 2014
Received in revised form
10 February 2015
Accepted 17 March 2015
Available online 27 March 2015

JEL classification:
D14
D84
J11
I10

Keywords:
Subjective life expectancy
Unobservable heterogeneity
Rational expectations
Life cycle model

A B S T R A C T

Subjective survival scaling factors are often estimated from one observation of life expectancy and treated as constant to any target age. Using new survey data on subjective survival probabilities, we estimate a model incorporating cohort- and target age-varying beliefs in scaling factors. Both cohort age and target age matter: respondents are pessimistic about overall life expectancy but optimistic about survival at advanced ages, and older respondents are more optimistic than younger. We propose a new theoretical model incorporating cohort- and target age-varying beliefs and illustrate their effects on the perceived value of annuities and on retirement phase consumption plans.

1. Introduction

In most forward-looking economic models, agents' subjective survival expectations are critical. Standard life cycle models, for example, predict that people will weight utility by their subjective survival probabilities, shifting resources towards the times of life when their chances of being alive to enjoy them are highest. To make such far-sighted plans, people need to have a complete set of survival expectations, extending from their current age out to the oldest age to which they could possibly live. Since this information is usually not available to researchers, many calibrated life cycle studies assume that the shape of each person's subjective survival curve matches the population average, after some constant adjustment for personal optimism or pessimism.

Here we collect and model new survey data that captures the subjective survival expectations of 920 middle aged men and women from their current age to extremely old ages, giving the comprehensive set of expectations needed for life-cycle

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http://dx.doi.org/10.1016/j.jedc.2015.03.003
0165-1889/

modelling.[3] We show that even after averaging out idiosyncratic differences, individual subjective survival curves do not match the shape of population survival curves. People underestimate their chances of living to near ages and overestimate their chances at much older ages. Ludwig and Zimper (2013) find this pattern among people of different ages, and propose a learning model to account for the persistent bias. We go further and show that this pattern of early pessimism followed by later optimism is actually anticipated by individuals of different ages. On average, people in our survey also underestimate their overall life expectancy, women more than men, and younger cohorts more than older cohorts, consistent with results reported in many studies from a wide range of countries (e.g., Hamermesh, 1985; Wenglert and Rosén, 2000; Hurd and McGarry, 2002; Banks et al., 2004; Gan et al., 2005; Elder, 2013; O'Donnell et al., 2008; Teppa and Lafourcade, 2013; Kutlu-Koc and Kalwij, 2013).

Subjective survival models that use constant or target-age-independent rescalings of population survival curves cannot match the shifting pessimism and optimism we see in our data. We estimate and reject constant rescalings using several consistency tests. Instead we propose and implement a more general cubic model that adjusts population survival by scaling factors that change with cohort age and target age.

We then extend a theoretical life cycle model to allow for more general expectations dynamics. In the extended model, individual decision makers' survival expectations are allowed to vary by their own current age and by target ages. Incorporating these new dynamics into an inter-temporally separable CRRA optimization model sharpens predictions. For example, early retirement survival pessimism followed by later retirement survival optimism can partly explain the high rates of drawdown in early retirement and slow decumulation very late in life of some cohorts (Börsch-Supan et al., 2003). Pessimism among younger cohorts can help explain under-saving for retirement. Near age pessimism could motivate low rates of annuitization among younger retirees (Teppa and Lafourcade, 2013) or a dislike of deferred annuities.

Our study adds to the extensive literature on individual survival expectations and their use in life cycle modelling, beginning with Hamermesh (1985). Individual estimates of survival probabilities are coherent and useful for prediction and modelling (e.g., Smith et al., 2001; Hurd and McGarry, 2002; Hurd, 2009; Salm, 2010; Rohwedder and Delavande, 2011), but vary widely between people, often in ways that correlate with known risk factors such as personal health and parents' mortality (e.g., Bissonnette et al., 2012; Khwaja et al., 2007; Ludwig and Zimper, 2013; Perozek, 2008; Wang, 2014). The fact that we have expectations to a range of target ages from the same individual means we can verify the view of Ludwig and Zimper (2013) that younger age pessimism followed by later age optimism is not a cohort effect. We also add to the literature on the effect of survival expectations on annuitization decisions (e.g., Hurd et al., 2004; Milevsky and Young, 2007; Hainaut and Deelstra, 2014) and of retirement consumption and savings decisions (e.g., Horneff et al., 2009; Post and Hanewald, 2013; Salm, 2010).

Other studies have shown that subjective survival expectations behave like probabilities (e.g., Hurd and McGarry, 1995, 2002; Gan et al., 2004; Smith et al., 2001) so that if complications caused by focal points can be managed (Hurd et al., 1998; Gan et al., 2005; Kleinjans and Soest, 2014), researchers can use them to model individual subjective survival curves (e.g., Bissonnette et al., 2012; Elder, 2013; Gan et al., 2005; Khwaja et al., 2007; Perozek, 2008). Our data allows us to make much more precise estimates of subjective survival curves than we could using only a life expectancy or one probability (Gan et al., 2005) and introduce these new dynamics to the life cycle model.[4]

In the next section, we describe the survey data. In Section 3 we test and reject the hypothesis that the subjective scaling factor is independent of target age within the same individual. Section 4 sets out a new model for subjective survival curves that allows for individual and cohort-level heterogeneity. We model the effect of subjective survival probabilities on the perceived value of immediate and deferred annuities, and solve an extended life-cycle consumption model with subjective survival dynamics in Section 5. Section 6 concludes.

2. Data

Data on subjective survival expectations comes from the Retirement Plans and Retirement Incomes: Pilot Survey, conducted in May 2011.[5] We selected a representative sample of 920 respondents aged between 50 and 74 years from the PureProfile online panel of over 600,000 Australians. Australian mortality patterns and longevity improvement rates are similar to other developed western countries.

After some deletions, our final sample comprised subjective survival probabilities of 855 respondents to seven target ages. Respondents answered the questions, "What are the chances that you will live to be age t_a?", where the target age "t_a" took the values of 75, 80, 85, 90, 95, 100, 105, 110, 120, and 120^+ years. Respondents chose probabilities from the list shown in Table 1 that most closely matched their expectation of survival at each age. We exclude subjective survival probabilities to

[3] The widely-used Health and Retirement Survey (HRS) collects forecasts to a single target ages that can be different for respondents of different ages. Recent exceptions where ranges of probabilities were collected include Payne et al. (2013) and Teppa and Lafourcade (2013).

[4] Bernheim (1989, 1990) find that survey collected expectations contain significant reporting errors because "expectation" may not be fully understood by respondents and/or may not well defined in a survey.

[5] Agnew et al. (2013b) gives more details about the survey sample. The full survey is available at: http://www.censoc.uts.edu.au/researchareas/Super_Screenshots.pdf.