



# Longevity risk, subjective survival expectations, and individual saving behavior

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## ARTICLE INFO

### Article history:

Received 8 February 2012  
Received in revised form  
23 November 2012  
Accepted 24 November 2012  
Available online 6 December 2012

### JEL classification:

D14  
D84  
D91  
H31  
J11

### Keywords:

Longevity risk  
Subjective survival expectations  
Forecast dispersion  
Saving behavior

## ABSTRACT

We provide evidence of individuals' awareness of longevity risk (the uncertainty about future survival probabilities) based on subjective survival expectations elicited in the Survey of Health, Ageing and Retirement in Europe (SHARE) and matching data on longevity risk from the Human Mortality Database. We find a positive relationship between the forecast dispersion in subjective survival estimates and longevity risk which indicates that individuals are to some extent aware of longevity risk. Our analysis of savings behavior shows that the dispersion in survival estimates is primarily explained by individuals disagreeing on the survival probability and not by their true awareness of the underlying uncertainty. Individuals do not save more on average when faced with longevity risk although theory suggests they should.

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## 1. Introduction

Over the past decades, the industrialized world has experienced rapid improvements in life expectancies and survival rates. The annual rates of these improvements exhibit variations, as illustrated in Fig. 1 for the survival rates of individuals aged 65 in five European countries. The erratic paths of the survival rates reflect the underlying complex interaction of mortality determinants such as medical innovation, nutrition habits, or environmental factors (e.g., weather and climate) whose progress and impact over time are non-deterministic. The resulting uncertainty about future survival rate improvements, that is longevity risk, adds an important systematic component to the life span uncertainty that individuals need to consider when planning their life-cycle savings.

In theoretical models longevity risk is an important determinant of individual decisions on savings (Levhari and Mirman, 1977; De Nardi et al., 2009; Cocco and Gomes, 2012), asset allocation and retirement timing (Menoncin, 2008; Stevens, 2009; Horneff et al., 2010; Schulze and Post, 2010; Cocco and Gomes, 2012; Huang et al., 2012; Post, 2012; Cheng and Han, 2013).

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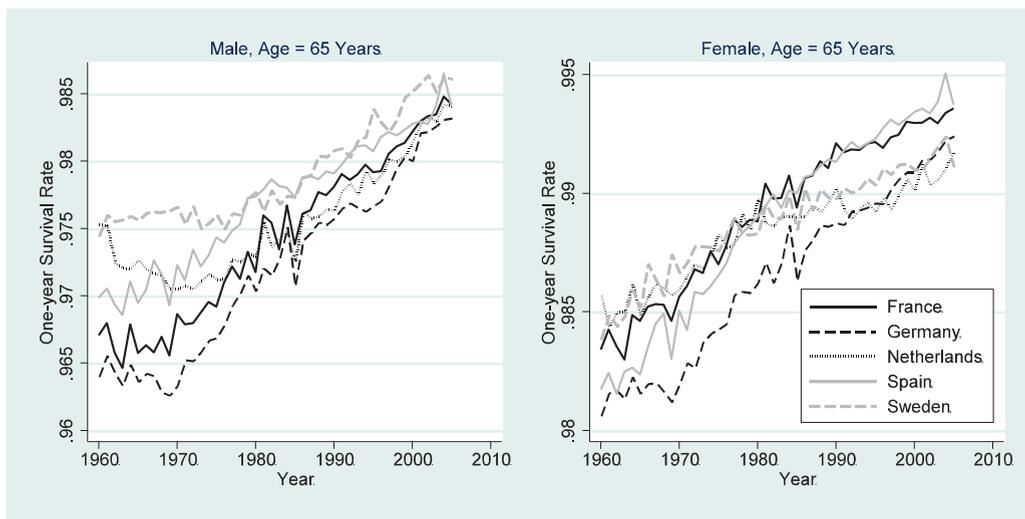


Fig. 1. Trends in the mortality decline: 1-year realized survival rates. Mortality data is from the Human Mortality Database.

These models extend the classical life-cycle model with lifespan uncertainty (Yaari, 1965) in which individuals base their decisions on expected survival probabilities by allowing for randomness in survival probabilities. The presence of longevity risk is found, for example, to change individuals' saving behavior (Huang et al., 2012), to induce the use of longevity bonds as hedging instruments (Menoncin, 2008; Cocco and Gomes, 2012), and to increase investment in deferred annuities (Stevens, 2009; Horneff et al., 2010; Post, 2012).

Our study provides first empirical evidence on individuals' perception of longevity risk and their economic reaction to longevity risk. In particular, we test whether individuals are aware of longevity risk and, if so, whether this awareness affects their actual saving behavior. We analyze survey data on subjective survival expectations and savings indicators elicited from more than 26,000 individuals in the Survey of Health, Ageing and Retirement in Europe (SHARE) and corresponding objective survival data from the Human Mortality Database (University of California; Berkeley and Max Planck Institute for Demographic Research, 2009). Previous literature shows that mean subjective survival expectation forecasts are informative with respect to the mean of objective survival probabilities. This study relates the dispersion in individual survival probability forecasts to objective longevity risk measures. We find a positive relationship between longevity risk and the dispersion of survey responses. Based on a large literature on the determinants of forecast dispersion, we conclude that this link provides evidence that individuals are to some extent aware of longevity risk. Our analysis of savings behaviors shows that individuals on average do not save more when faced with longevity risk. This reaction to longevity risk is at odds with the predictions of a life-cycle model with uncertain income and longevity risk. We conclude that the positive relationship between longevity risk and the dispersion of survey responses results primarily from disagreement effects between individuals and not from individuals' true awareness of the uncertainty.

These findings have implications for public policy and regulation. Many developed countries have undergone a shift from pay-as-you-go to individually managed defined contribution (DC) pension plans. The success of such plans depends on individuals making informed saving decisions based on a correct assessment of the involved risks, including longevity risk. Our findings on saving behavior highlight that communication and education regarding longevity risk should be improved.

The remainder of the article is structured as follows. In Section 2 we review the literature and develop research hypotheses. In Section 3 we introduce the data. We present results in Section 4. In Section 5 we provide robustness checks. In Section 6 we summarize the results and conclude.

## 2. Related literature and hypotheses

### 2.1. Subjective survival expectations

This study examines awareness of longevity risk based on subjective survival expectations elicited in the Survey of Health, Ageing and Retirement in Europe (SHARE). SHARE respondents are asked about their survival probabilities to a specific target age. Such probabilities have been shown to be informative with respect to the mean of objective survival probabilities. Similar to their objective counterparts, subjective survival probabilities exhibit differentials according to, for example, age, gender, health, and socioeconomic status (Hamermesh, 1985; Hurd and McGarry, 1995; Mirowsky and Ross, 2000; Khwaja et al., 2007; Popham and Mitchell, 2007; Delavande and Rohwedder, 2011). Subjective probabilities are found to match the shape of survival curves according to actual life tables, although they exhibit some underestimation at younger ages and some overestimation at older ages (Hamermesh, 1985; Hurd et al., 2009; Elder, forthcoming). Furthermore, subjective

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