Explaining the Female Longevity Puzzle
Work in progress

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Motivation / Research Question
The Problem
The Data
The Modelling
  - Lee-Carter
  - Age-Period-Cohort
Results
  - Information Criteria
  - Forecast Measure
Different patterns for female mortality between mid 1980’s and the end of the 20th century, see e.g. Meslé and Vallin (2006)

- France, Japan, and Norway - women have experienced improved longevity
- Denmark, the Netherlands, and in the US - women have experienced decreased improvements in longevity
- Critical for Longevity Risk
Idea

- Detailed Register Data/ Individual Data
- Remove heterogeneity
- Financial/Socioeconomic Indicator Variables
The variable to be explained is the central death rate ($m(x, t)$). Following Lundström and Qvist (2004)

$$m(x, t) = \frac{D(x, t)}{(P(x - 1, t - 1) + P(x, t))/2}$$

Where $D(x, t)$ is the death count or number of deaths at age $x$ in calender year $t$, at year end. $P_{t,x}$ is the population aged $x$ in year $t$ at year end. The exposure-to-risk, $E(x, t)$ is similarly given by:

$$E(x, t) = (P(x - 1, t - 1) + P(x, t))/2$$
Female Life Expectancy

- Denmark
- Norway
Data

Figure: Plot of Exposure-to-Risk by year and age for Norwegian Data
Figure: Norway Data

Norway–Male

Year

Deaths


NS

HMD

Norway–Female

Year

Deaths


NS

HMD

Norway–Male

Age

Deaths

51 55 60 65 70 75 80 85 90 95

NS

HMD

Norway–Female

Age

Deaths

51 55 60 65 70 75 80 85 90 95

NS

HMD
Data Issues

Danish Data

- Unbalanced Panel Dataset
- Wealth for married couples are registered by the husband in the early 1980’s
  - Track and assign 50% of the wealth to the female
  - Assign the quintile of the husband
- Drop emigrants/immigrants

Norwegian Data

- Balanced Panel Dataset
- Delete Early and Late observations
- Drop emigrants/immigrants
Assign a specific quintile to each individual based on a financial indicator.

\[ U_{it} = L(\text{wealth}) + \alpha L(\text{income}) \]

Where L is the lag operator. Then rank the individuals \( R(i, x, t) \)

\[ q_{itx} = \frac{\text{rank}(i, x, t)}{N(x, t) + 1} \in (0, 1) \]

Sort into ten groups of equal size for each year and age (for the working age)
The model by Lee and Carter (1992) is applied for testing

$$\ln(m_{x,t}) = a_x + b_x k_t + \varepsilon_{x,t}$$

The age-period-cohort model by Currie (2006)

$$\ln(m_{x,t}) = \alpha_x + \kappa_t + \gamma_{t-x} + \varepsilon_{x,t}$$
Figure: Denmark

Figure: Plot of period life expectancy at age 50 for males and females for each of the 10 groups
Figure: Norway

Figure: Plot of period life expectancy at age 50 for males and females for each of the 10 groups
### Table: In-Sample Performance Measure DK: BIC

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<th>Male</th>
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