Longevity Risk and the Econometric Analysis of Mortality Trends and Volatility

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$m(t, x) =$ crude death rates

Paper: “non-parametric” analysis of data

$\Rightarrow$ stylised facts for subsequent model building

Trend

- H_0: $m(t, x)$ has a unit root

  "stochastic trend"

- H_0: $m(t, x) - \alpha - \beta t$ is stationary

Results seem mixed, although mainly unit root

Principal component analysis (PCA)

- One or two big PC's
- 6+ smaller factors
- Crude $m(t, x) \Rightarrow$ Poisson noise not filtered out $\Rightarrow$

  [a] $\epsilon(x, t)$ contain modest negative serial correlation

  [b] Underlying $m(t, x) \Rightarrow$ fewer PC's ???
- Poisson noise $\Rightarrow$ randomness in PC3, PC4, ...

Cointegration of different countries

H_0: no cointegration

No evidence to reject H_0, but limited data

Theme: Biological reasonableness

- All ages closely interconnected $\Rightarrow$ one conclusion for all ages (e.g. unit root)

  $\Rightarrow$ here ??? portmanteau test across ages ???

- Unit root is reasonable

- Principal components should have a smooth shape

Theme: Biological reasonableness

- Two populations should not diverge over time (Li and Lee, 2005)

  BUT: Limited data $\Rightarrow$ difficult to prove

- $m(t,x) > 0 \Rightarrow$ e.g. model with $\log m(t,x)$