Functional time series
with applications in demography

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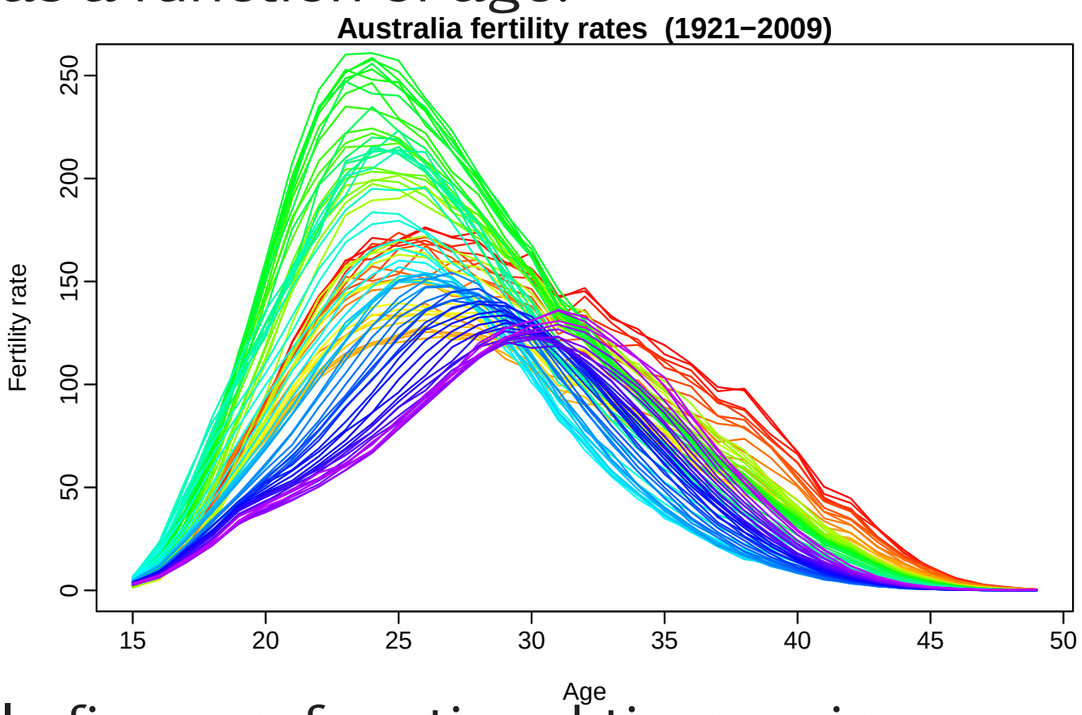
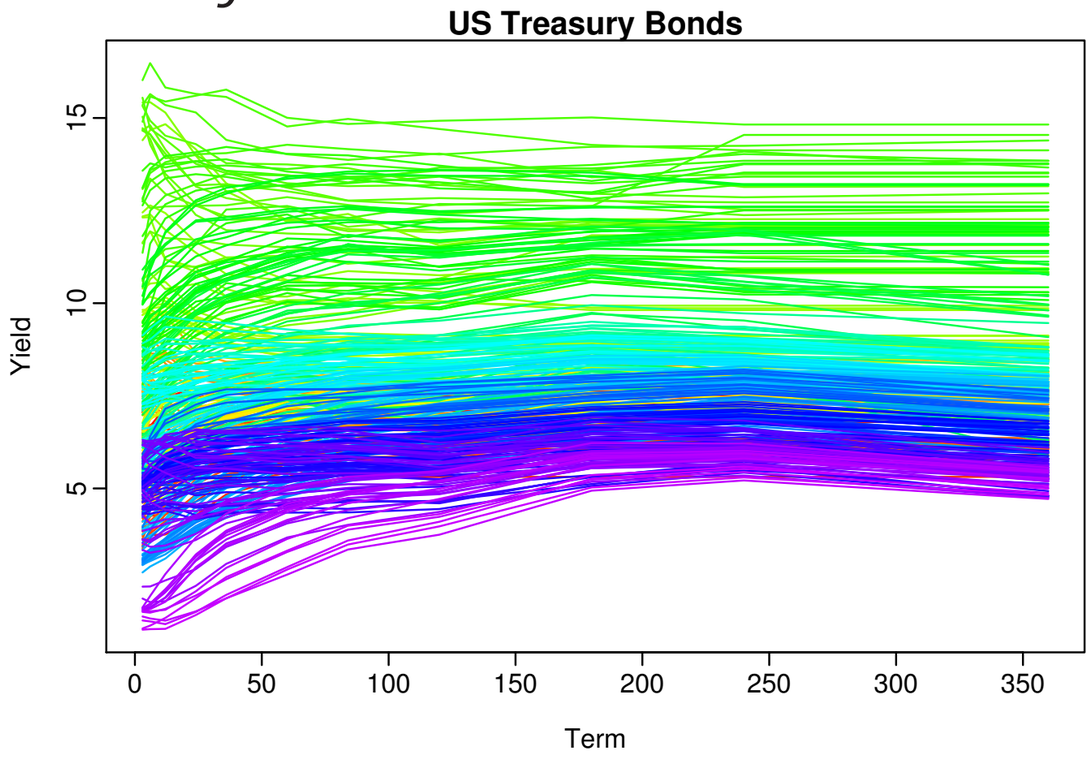
Functional time series

Functional time series are curves that are observed sequentially in time, one curve being observed in each time period. In demography, examples include curves formed by annual death rates as a function of age, or annual fertility rates as a function of age.

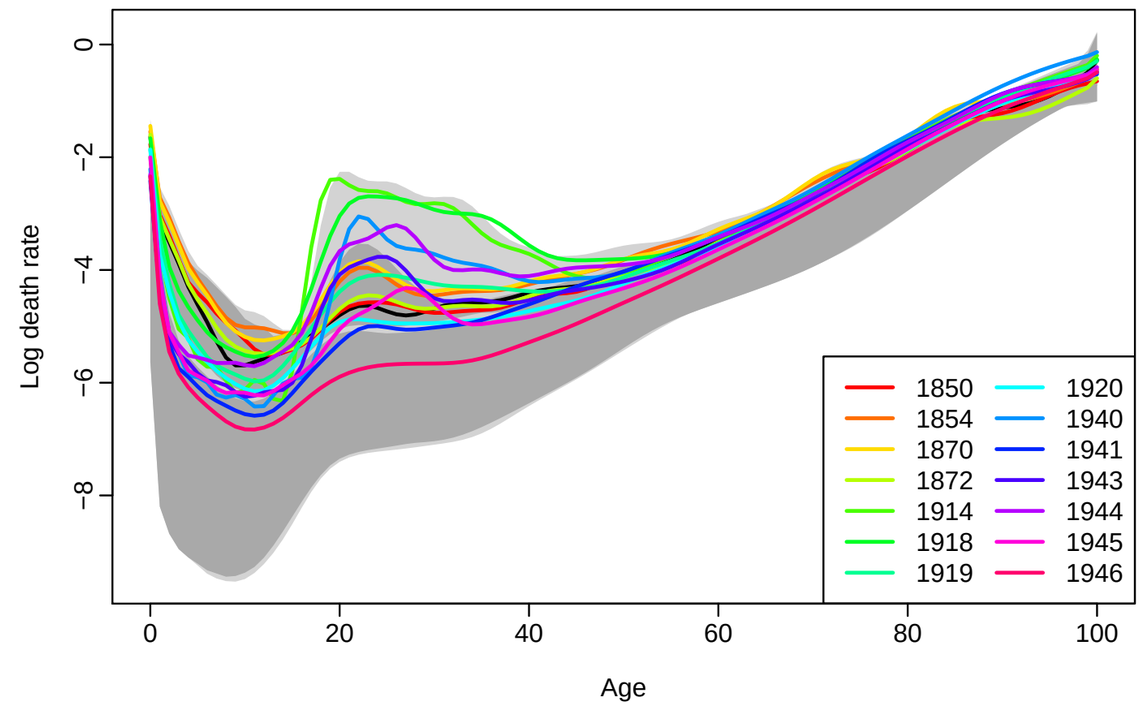


In finance, functional time series can occur in the form of bond yield curves, for example, with each curve being the yield of a bond as a function of the maturity of a bond.



I will discuss methods for describing, modelling and forecasting such functional time series data.

A functional boxplot



Challenges

- developing useful graphical tools (such as the functional version of the boxplot above);
- dealing with outliers (e.g., death rates have outliers in years of wars or epidemics);
- cohort effects (how can we identify and allow for these in the forecasts);
- synergy between groups of functional time series;
- deriving prediction intervals for forecasts;
- how to combine mortality and fertility forecasts to obtain forecasts of the total population;
- how to use these ideas to simulate the age-structure of future populations and use the results to analyse proposed government policies.

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