DYNAMIC MODELLING OF INDIVIDUAL TRAJECTORIES OF CARDIOVASCULAR RISK FACTORS

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Although many epidemiological studies have been carried out where cardiovascular risk factors have been measured repeatedly in the same individuals over years, attempts to model the trajectories of these risk factors in individuals from these data are relatively scarce. Such models are needed in the construction of simulation models used in for instance cost-effectiveness calculations of preventive interventions, and for adjusting epidemiological disease models for measurement error. Current approaches either

1) model the mean-covariance structure of the data without caring about the possibility for interpretation in terms of a data generating mechanism,
2) use hierarchical models in which trajectories are subject specific with only measurement error on top (ignoring residual serial correlation), or
3) use stochastic models ignoring population heterogeneity.

We combined the latter two approaches by fitting hierarchical Ornstein-Uhlenbeck processes (OUP). We used data from the Zutphen study, comprising 878 men aged 40-60 in 1960, augmented in 1985 with 498 men from the same birth cohort. During 40 years up to 19 measurements of cholesterol, blood pressure and Body Mass Index (BMI) were carried out. We used data from 982 men with 3 or more measurements (812 of the 1960 cohort).

An OUP converges to an AR(1) process with constant variance. As our data, especially systolic blood pressure, show increasing variance during middle age, we also fitted a non converged OUP, and compared this to a more conventional random coefficient model with additional serial correlation of the residuals, which can be seen as a OUP that has reached convergence. We will discuss the suitability of these models for our goals.