

Coherent Projections of Age, Period, and Cohort Dependent
Mortality Improvements

Matthias Börger* and Marie-Christine Aleksic†

Presented at the Living to 100 Symposium

Orlando, Fla.

January 8–10, 2014

Copyright 2014 by the Society of Actuaries.

All rights reserved by the Society of Actuaries. Permission is granted to make brief excerpts for a published review. Permission is also granted to make limited numbers of copies of items in this monograph for personal, internal, classroom or other instructional use, on condition that the foregoing copyright notice is used so as to give reasonable notice of the Society's copyright. This consent for free limited copying without prior consent of the Society does not extend to making copies for general distribution, for advertising or promotional purposes, for inclusion in new collective works or for resale.

* Institute for Finance and Actuarial Sciences (ifa), Ulm & Institute of Insurance, Ulm University, Lise-Meitner-Straße 14, 89081, Ulm, Germany. Phone: +49 731 20644 257. Fax: +49 731 20644 299. Email: m.boerger@ifa-ulm.de

† Kern Mauch und Kollegen, Stuttgart & Institute of Insurance, Ulm University

Coherent Projections of Age, Period, and Cohort Dependent Mortality Improvements

Matthias Börger

Institute for Finance and Actuarial Sciences (ifa), Ulm & Institute of Insurance, Ulm University

Lise-Meitner-Straße 14, 89081 Ulm, Germany

Phone: +49 731 20644 257. Fax: +49 731 20644 299

Email: m.boerger@ifa-ulm.de

Marie-Christine Aleksic

Kern Mauch und Kollegen, Stuttgart & Institute of Insurance, Ulm University

March 2014

Abstract

The projection of future mortality experience constitutes a challenge for both actuaries and demographers. As we show, some of the currently used standard mortality projections have several shortcomings which might pose a serious threat to insurers, pension funds, and social security systems.

In this paper, we propose a new projection methodology which overcomes these shortcomings. We introduce a model which allows mortality improvements to depend on age, period, and cohort, and we explain how the model can be estimated and applied. In particular, we show how coherent projections for several populations, i.e. males and females of the same country and populations from closely related countries, can be derived. The basis for these projections are coherent extrapolations of historical life expectancies. As aggregated mortality statistics, life expectancies typically exhibit steady patterns which often makes forecasting rather obvious. We observe that the incorporation of information on the mortality experience of other populations can have a significant impact on the projection for a given population. A comparison with other commonly used projection models shows that our methodology provides stable and highly plausible projections. Finally, we discuss uncertainties in our projection approach and explain how they can be accounted for. In order to illustrate our methodology, we derive fully specified projections for German males and females as members of a large reference set of European populations.