ABSTRACTS

DEMOGRAPHY FOR ACTUARIAL STUDENTS

John A. Beekman

One purpose of this paper is to draw attention to several ideas from demography, which could be useful to an actuary. An actuarial course of study might not have considered these concepts at great length. The ideas are: (1) stable populations and pension applications; (2) population statistics and their uses; (3) analytic expressions for P(t), the population at time t; (4) probabilistic models in demography; (5) population projections; and (6) finding probabilities from observed rates.

A second purpose is to focus on several excellent demography-based papers which could serve an actuary. They are illustrative of works which could strengthen the professional work of an actuary.

A third purpose is to provide a list of references for study by actuarial students.

AN INTRODUCTION TO FORECASTING WITH TIME SERIES MODELS

William R. Bell

The use of ARIMA time series models in forecasting is reviewed. In connection with this, some important points about forecasting are discussed, including: (1) difficulties in forecasting by fitting and extrapolating a deterministic function of time; (2) the importance of providing reasonable measures of forecast accuracy; and (3) the need to incorporate subject matter knowledge with time series models when forecasting.

POPULATION WAVES AND FERTILITY FLUCTUATIONS: SOCIAL SECURITY IMPLICATIONS

Phelim P. Boyle and Ruth Freedman

The demographic consequences of periodic movements in fertility rates are explored. Different types of periodic fluctuations are examined and incorporated into long range population projections. In some cases the resulting population waves can have a profound impact on a national social security system. These impacts are illustrated numerically in the context of the Canadian situation.

A BAYES ESTIMATOR FOR ORDERED PARAMETERS AND ISOTONIC BAYESIAN GRADUATION

James D. Broffitt

The problem is to estimate the parameters $\theta_1,\ldots,\theta_k$ under the order restriction $\theta_1 < \ldots < \theta_k$. A prior distribution is specified such that the probability of the set $[(\theta_1,\ldots,\theta_k): \theta_1 < \ldots < \theta_k]$ is one. This guarantees that the mean of the posterior distribution (Bayes estimator) satisfies the order restriction. This technique, which produces a smoothing effect, is applied to the problem of estimating mortality rates over consecutive age intervals. In this application the result may be viewed as an isotonic Bayesian graduation. A real data example is provided.

MAKING DEMOGRAPHY RELEVANT: THE CANADIAN BABY BOOM

Robert L. Brown

The paper presents a model for teaching demography used at the University of Waterloo which requires student projects. Three projects are described in some detail. They are analyses of unemployment rates, future housing requirements in the Province of Ontario, and the need to modify the normal retirement age of 65 used in the Canada/Quebec Pension Plan.

TRANSFORMATION OF GROUPED DATA TO NEAR NORMALITY

Victor M. Guerrero and Richard A. Johnson

Box and Cox (1964) proposed a power transformation which has proven utility for transforming ungrouped data to near normality. In this paper, we extend its applicability to grouped data. Illustrative examples are presented and the asymptotic properties of the estimators derived.

CRITICAL LINKAGES IN HIGHER EDUCATION: AGE COMPOSITION AND EMPLOYEE COSTS

W. Lee Hansen and Karen C. Holden

The purpose of this paper is to trace the linkage among age composition changes, employment opportunities, and compensation costs in higher education.

TECHNOLOGY, EMPLOYMENT, AND THE SUCCESSION OF GENERATIONS

Nathan Keyfitz

This keynote address at the conference discusses the 20 or so million increase of the labor force around the age of 40 between now and the end of the century, and how to employ them.

U.S. NATIONAL POPULATION PROJECTIONS METHODS: A VIEW FROM FOUR FORECASTING TRADITIONS

John F. Long

Four traditions -- judgmental, time-series, demographic accounting, and explanatory -- represent different approaches to national population projections. The U.S. Census Bureau's methodology for national population projections is mainly within the demographic accounting tradition incorporating selected aspects of the other three traditions. Several avenues for combining the best methods from each of the four forecasting traditions in future projections activities are outlined.

THE IMPLICATIONS OF DEMOGRAPHIC CHANGES FOR PUBLICLY FUNDED MEDICAL INSURANCE COSTS

David McKusick, Roland King, and Solomon Mussey

This paper explores the changes in public expenditures for Medicare and Medicaid that would result between 1980 and 2040 under the ceteris paribus assumption, under the age, sex, and family structure projections of John Wilkin of the Social Security Administration. Inflation aside, costs are shown to approximately double as a percent of the payroll of active workers. The most dramatic increases occur in nursing home costs: Costs for welfare recipients under age 65 change little except for medical care inflation. This latter results from the assumed low birth rates assumed in the population forecast.

EVALUATION OF TRANSFORMATIONS IN FORECASTING AGE SPECIFIC BIRTH RATES

Robert B. Miller

The value of power transformations in forecasting age specific birth rates is expressed in terms of a relative mean squared forecast error for five powers and two ARIMA models. Of the transformations studied, the reciprocal of birth rates appears to be of greatest value, but the gains from using the transformation are quite modest, even when the model fitted to the data is chosen with care.

IMPLICATIONS OF POPULATION CHANGE ON SOCIAL INSURANCE SYSTEMS PROVIDING OLD-AGE BENEFITS

Robert J. Myers

This paper discusses the elements that determine the cost of social insurance programs, the interdependence of the benefit structure and the nature of the population covered, the elements affecting the constitution of the population covered, and the problems in making actuarial cost estimates.

POPULATION PROJECTIONS FOR SOCIAL SECURITY COST ESTIMATES

John C. Wilkin

The study, "Social Security Area Population Projections, 1983," describes the assumptions and methods used to project the populations that underlie the cost estimates presented in the 1983 Annual Report of the Board of Trustees of the Old-Age and Survivors Insurance (OASI) and Disability Insurance (DI) Trust Funds. The purpose of this article is to discuss things that are not mentioned in the study. In particular, the author describes the context in which the projections are made, including the overall mission of the Office of the Actuary, the uniqueness of our population projections, and the important characteristics that we desire in our assumptions.