

Stochastic Population Forecasting: An Application to Florentine Area

*Previsione Stocastica della Popolazione:
Un'Applicazione all'Area Fiorentina*

Chiara Bocci, Alessandra Petrucci, Silvana Salvini
Dipartimento di Statistica "G. Parenti,
Università degli Studi di Firenze, viale Morgagni, 59 – 50134 Firenze
bocci@ds.unifi.it, alex@ds.unifi.it, salvini@ds.unifi.it

Riassunto: I modelli a componenti di coorte sono usati da lungo tempo per la costruzione di scenari di popolazione. Tuttavia non sono molte le ricerche che includono in questa metodologia l'elemento di incertezza. In uno studio precedente la popolazione dell'area fiorentina è stata proiettata secondo un approccio deterministico al fine di descrivere gli effetti di modelli di mortalità, fecondità e migratorietà alternativi. In questo studio si intende integrare quanto ottenuto per la popolazione di Firenze e dei comuni limitrofi considerando nelle proiezioni anche la componente stocastica.

Keywords: Cohort-component, Demographic forecasting, Stochastic demography

1. Introduction

Cohort-component models have been used for many years to project future population under a variety of scenarios. However, little work has been carried out on the effects of uncertainty in the model inputs on projection outcomes (Alho and Spencer, 2005). During a previous research, population of Florence has been projected according to deterministic cohort-component models to describe the consequences of different trends of fertility, mortality and migration models (Regina *et al.*, 2003). This paper aims to investigate the effect of uncertainty using a stochastic projection model for florentine area, considered as a small area (Schnabel and Dahmen, 2005).

2. Data and Methods

The data of the resident population derive from the municipal register (anagrafe comunale); the data on mortality trends are deduced from provincial life tables built by ISTAT (<http://demo.istat.it>); the data on fertility models are obtained both from ISTAT and municipal sources. Finally, migration data originate from the regional statistical office. These series refer to the period 1995-2004 and represent the base for the future estimates. In this period we observe a decline in age-specific mortality rates: life expectancy at birth starts from 76.21 years for males and 82.24 years for females in 1995 to reach 78.75 and 83.89 respectively in 2004. The total fertility rate (around 1 in 1995) shows a weak sign of increase at the beginning of 21st century. Moreover

migration shows a continuous increase.

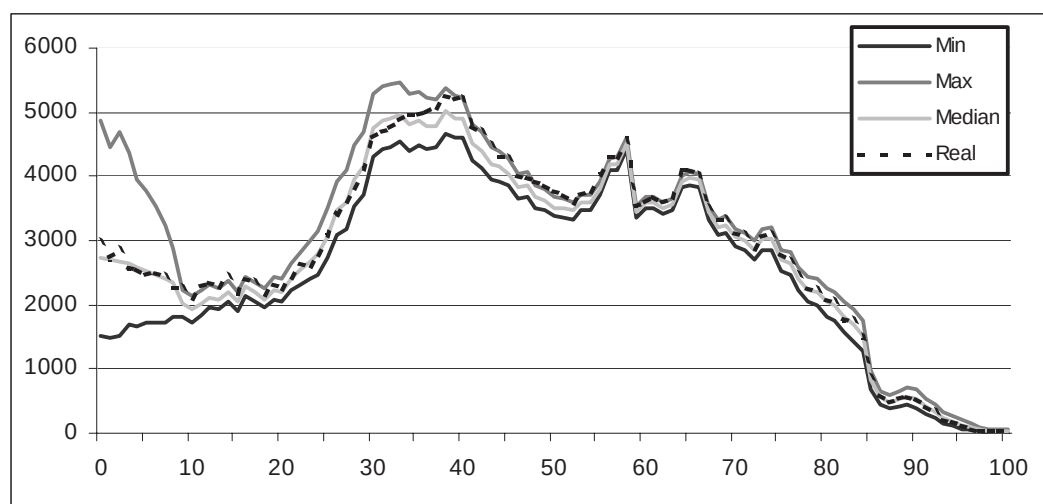
In this paper we perform two projection studies: the first estimates population in 2004 starting from population in 1995 and from the demographic flows in the considered period and compares the predicted population with the real one; the second projects 2004 population up to 2024, under the same demographic assumptions.

We use the program PEP (Program for Error Propagation) developed by Prof. Juha Alho from the University of Joensuu - Finland, implementing a stochastic version of cohort-component model which treats the vital rates as realization of random processes (Alho, 1990).

3. Preliminary results

The results of the first application in terms of male population by age is reported in figure 1. The comparison between the real and the projected age distribution confirms the good fit of the model, excluding the first age groups where the range is strongly influenced by fertility assumption. This is the issue that we have to deal with in the second phase of our study.

Figure 1: Male population at 2004: real and estimated.



References

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