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A stochastic dynamic model to evaluate the influence of economy and well-being on unemployment control

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Abstract

This paper presents a stochastic dynamic mathematical model to study the evolution of the unemployment rate and other relevant related variables in a country. This model is composed by three basic interrelated subsystems: demographic, economic and well-being ones. A key aspect of this model is that it considers three UN well-being variables simultaneously: Human Development Index, Gender Empowerment Index and Gender Differentiation Index. These variables involve key concepts for human development, as Health, Education, Economy and Female Labor.

With this model, the most outstanding variables found in the literature in relation with unemployment control can be used to design strategies and scenarios to reduce the unemployment rate in the future. The model has been fitted for the case of Spain in the 2002-2014 period, the largest one with information about all the variables involved in the model. Finally, several tentative scenarios and strategies have been tested to reduce the unemployment rate in Spain in the horizon of year 2025, and the corresponding forecast evolution of the Gender Differentiation Index, National income per capita, Public debt and the ratio between Public debt and Gross domestic product are shown.

***Keywords*:** Unemployment rate; United Nations well-being variables; sex/age-structured population dynamics; stochastic model; forecasting.

1. Introduction

Unemployment is one of the most important problems today in the world, and particularly in many southern European countries. For instance, Greece had a 24.14% unemployment rate in March 2016 and Spain had a 21% unemployment rate also in March 2016. But there are countries with more than 40% of jobless rate, like Bosnia and Herzegovina, Congo or Haiti [1].

This is not only an economic problem, but also a social and a physical and mental health problem. In addition, politicians and professionals do not succeed in reducing the current unemployment rate and in the way to create jobs without reducing the well-being of a country. In order to progress in the way to provide a tool to tackle this problem, a mathematical model that relates the unemployment rate with demographic, well-being and economic variables is presented in this paper. Some of the input variables can be controllable and others do not. With this information, governments can design feasible strategies to be simulated under different

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