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## A stochastic dynamical social model involving a human happiness index

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### Abstract

This paper presents a new human happiness index built through five dimensions: development, freedom, solidarity, justice and peace. These five dimensions are evaluated through quantitative variables obtained from the Human Development Reports, World Data Bank and Eurostat. The new happiness index has been built following the guidelines set by the Human Development Reports of the *UN* for the construction of quality indices, and it has been compared on a set of 13 EU countries with the Overall Life Satisfaction Index, which is used by the *UN*. Moreover, the new index has been included in a dynamic mathematical model through the demographic rates to study the evolution of the population. The obtained model has been calibrated for the period 2004-2009 and validated for the period 2010-2015 for the case of Spain. Finally, the model has been used to maximize the happiness index in Spain for the period 2016-2030, with the conclusion that to achieve this purpose, it is necessary to invest in education, research and development.

**Keywords:** Stochastic dynamical model; happiness index; population dynamics; forecasting.

## 1. Introduction

Happiness, as a permanent trait, can be defined as a feeling of satisfaction with life [1], and therefore, most people believe that it is the basis of a meaningful life [2]. For this reason, the intention to measure happiness is increasing. The literature reflects two different ways to measure this concept.

On the one hand, there are authors that try to measure the individual happiness of each person. The International Institute of Management created the Gross National Happiness Index [3], in which the state of a person is measured from 1 to 10. It consists of 7 dimensions: economic, environmental, physical, mental, work, social, and political. The Scale of Life Satisfaction [4] is designed to measure global cognitive judgments of satisfaction with one's life, and it is measured from 5 questions that are answered on a scale ranging from 1 to 7. The Scale of Subjective Happiness [5] asks four questions to measure the happiness, also on a scale from 1 to 7. There are other authors [6,7,8] who measure the happiness of a person and relate it with economic variables.

On the other hand, there are institutions that try to measure the happiness of a country. The Happy Planet Index (*HPI*) [9] captures the degree to which long and happy lives are achieved per unit of environmental impact. It is calculated through four parameters, a) life expectancy at birth (the average number of years an infant born in that country is expected to live); b) experienced well-being (the average of all responses from within the population to a question that measures how people's lives are going overall); c) inequality outcomes (a measure of how

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