Does the analysis of principal components effectively help in determining actual weights for dimensions of an index? An appraisal in Indian context

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Abstract: Weights are generally supposed to indicate the relative importance of a dimension variable to explain a particular dependent variable (i.e., a final index), and these weights can be assigned either through individual value judgment, or by using some relevant techniques based upon relative importance of the indices concerned as revealed from the data. Principal Component Analysis (PCA) is playing a major role in determining weights and this principle is clearly based on the degree of variability of the individual dimension-indices. The more the variability, the more will be the assigned weight. Thus, in PCA, the weights are not supposed to be equal and are determined from factor loadings and Eigen-values. In PCA that indicator receives a higher weight which has a higher variance even if that indicator is not directly and even not strongly indicating higher level of importance. In this research agenda, we are to show some major limitations of the Principal Component Analysis and the present study proposes an alternative method to determine actual weights for the underlying dimensions of Human Development Index and in the way has carried out two empirical studies on HDI components of India for the years 1999-2000 and 2007-08.

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Introduction

Development of human beings is considered as a multi-faceted phenomenon and it covers a broad spectrum of economic, social, political, cultural and technical developments. Traditionally development of a nation was understood by the capacity of its economy, whose initial economic condition has been more or less static for a long time, to generate and sustain an annual increase in its GNP or later on, in its per capita GNP. However, as the focus of understanding shifted with the passage of time, development strategies have started emphasizing achievements in the fronts of social indicators like gains in literacy, schooling, health conditions and services etc.

As development involves different aspects of human lives and society as a whole, its measurement is to be done through a composite measurement procedure and this procedure tries to measure average attainment of different ends of human or social lives. Therefore, construction of a composite measurement scale related to development involves three basic instruments: choice of variables, indexing the variables in a suitable manner so that those can be

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