

HUMAN DEVELOPMENT INDEX AND ITS ENHANCEMENT WITH SELECTION PROCEDURE OF ITS COMPONENTS

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Abstract

This paper aims to identify the rational components and statistical technique to measure of performance in key dimensions of human development. The study uses desk review particularly the literature that focused quantitative techniques and human development. Different ideas, models, concepts and knowledge of human development are drawn from various literature. Those models and concepts of human development are evolving over time and building on the strengths and weaknesses of the previous models and concepts. Many recent studies suggest that the Human Development Index (HDI) is incomplete and so there is an urgent need to modify and develop new measuring tool for human development. In connection with this issue the study focuses to identify and develop rational components and appropriate model that can overcome the deficiency of the existing models. The study recommends to use Principal Component Analysis (PCA) and Multiple Regression Analysis (MRA) which are found statistical techniques to develop the estimators for measuring the level of human development. The appropriate components and modified models are proposed on the basis of derived components with statistical techniques for measuring the level human development in rational manner.

Keywords: Human Development Index, Principal Component Analysis, Multiple Regression Analysis, Modified model, Estimator,

1. Introduction:

In the 21st century, the points of view regarding human development have become a center of assessment. The topics such as human development, human culture and tradition, human skill are urgent areas of study. The definition of development has changed over time and across different scholars from economics, social sciences, environment and development studies. Economic growth was considered the main measure and component of development before 1990. After 1990, the concept of human development came in to existence, which triggered debate on measuring overall development. The level of human development is defined on the basis of health, education and income. At the same time, many experts contended the idea and argued for treating human welfare and human freedom in similar way as of health, education and income. After examining different components of development in which most of the components are the essential parts of human life. Debate of defining human development is not new, since the time of Adam Smith and Karl Marx the concepts of development and human life seem to subject of debate. Different Philosophers, economists, and politicians have long stressed that development and human welfare has to be the purpose of human development. Therefore, development has been and should be connected with real life (Jiyad, 1998). According to Sen (1993), improving the economy to improve the prosperity of human life is only one element; it isn't the complete method of development.

The existing components used to measure the level of human development are criticized for not being comprehensive enough to integrate all the essential components of human life. Human development Index (HDI) is an estimator to find the level of human development but weak to reflect the real situation of human development. Only three components such as income, health, and education are using to develop the composite index and measure the level of human development, which is found

less efficient, less sufficient and weak. It is urgent need to derive better estimator using rational components with appropriate weight for measuring human development. In this context, this study is important to identify the components of and appropriate tools related to measuring human development.

2. Literature Review:

The measurement procedure of human development and different techniques are coming in to exist in different time period since 1990. Different report, articles and journal are publishing about the concept and measuring techniques for human development.

Human Development Paradigm.

Before 1990s various countries were used GNP to measure development, however many mistakes were discovered in GNP. Still, it remained an important tool for measuring development. It could not give clear picture of the society and quality of people. In the context of human development various strategies can be seen urgent. However, in 1990s, the whole world's strategy for development changed, and come in to new concept i.e. upliftment of various ethnic groups, minorities, back warded were the main focus in the development process (World Bank, 1980). In the concept of economic development, its purpose is to improve the standard of living of the members in the society. Similarly, many policies and strategies are found for this process. Because lots of countries rely on Gross National Income (GNI) to calculate their development status. Various aspects like political, cultural, social development and community participation were found neglected. Amartya Sen criticized the claims of economist Paul Streeton (1994). According to him, the growth in income must be used for human welfare. Growth in income itself is not the purpose of development. (Sen, 1998, Streeton 1994). Human development emerged as a development concept because of the flaws of GNP as the index of development. (Martin Sen 1996, Engler 2005). This new development perspective brought a serious challenge to the perspective of economic growth. (Englar, 2005). UNDP's first human development report was observed in 1990 in international forum led by Pakistani economist Mahbub Haq and new human development model was noted in first human development report. Mahbub Haq was the key person behind the globalization of the agenda of human development and its measurement procedure. These concepts of development have been authorized as the reports of human development for the last two decades and this is different than Washington consensus.

Measuring Human Development

The measurement of level of human development is very important and came in to exit to reduce the shortcomings of GNP. In this context, it's important to observe as an alternative model of development. Since 1990 the human development index is a tool to measure the level of human development and various disagreements has been rising up in terms of measuring practices. The disagreements are related to the process of measurement, provided scale, weight and components (Stewart, 2005). UNDP, in the early 1990, for measuring human development it was accepted that human development index is the most appropriate and effective tool which is proposed by the Pakistani economist, Mahbubul Haq and regularly use since 1993 by the UNDP. By the help of this tool, countries could be kept in order and have the basis for the categorization of countries. It is understood as a measurement tool; and useful in categorizing the countries about the level of developed, developing and underdeveloped situation. The incorporation of three basic components of human development which are longevity, knowledge, and income are useful and played significant role in measuring the level of human development. In this context, Amartya Sen has presented the

idea of human development as human capability (Stewart, 2005). Today, various aspects of human development model are being developed and Sen has presented his opinion. There are various modifications on HDI such modifications include Gender-related Development Index (GDI) and Gender Empowerment Measure (GEM) both of the term examines whether women and men are able to actively participate in economic, political life and decision-making process. In this way, GDI is concerned on the enhancement of basic capabilities and empowerment of women. A new multidimensional measure of human deprivation i.e. The Capability Poverty Measure (CPM) was introduced in 1996. This measure is comprised of three aspects having equal weight. Likewise, CPM being less in value meant more human development and progress. It was replaced by Human Poverty Index (HPI) and found to measure deprivation in five different areas which are correlated with the components of HDI. The words 'capabilities and 'freedom' are usually associated with the concept of Amartya Sen in 1998. He is regarded as contributor to the beginning of a new division of human science. In this context, his ideas of programs and capabilities are significant in the context of human development. According to Amartya Sen, "human development is defined as the functioning and enlargement of such process". The ranges of things such as work capabilities, social development, human effort and could be happening in human life (Sen 1989). He was capable to address the conflict between the notion of positive and negative about the subject of Human development. These aspects can be implemented in agency's perspective. Since 1990, Human Development Reports have used the concept of Sen; A. (1993) capability approach and observed then, his capability approach is important as a conceptual framework analysis of development challenges. Fukuda Par (2003). According to Sen, development is the expansion of capabilities and purpose of development is the improvement in human lives. According to him, expanding the range of things that a person can do and can be, such as to be educated, healthy and nourishing, and to participate in community life. All kinds of progress, and development need capabilities. The main effort and concern is to increase the capability and it helps in development. Education is such that facilitates the individual to realize and maximize his/her potentials. The development of potentials requires pledge and efforts at learning and applying knowledge gained. It also prepares them to gain greater access to resources for enhanced standard of living and better quality of life. In connection with this background various debate came in to exist about to select the rational components, their weight, and models to develop the HDI. As we know the estimator of human development is Human development Index (HDI). It is not the perfect estimator for the human development. The arguments against "composite indices may drive and misleading policy messages if they are poorly constructed or misunderstand. Some critics have developed and proposed alternative and novel indices Noorbakhsh (1998) Sagar and Najim (1998) Lind (2002) Chakravarty (2003) Despotis (2005) Herrero et al (2010), which are essentially modified in one way or another. A large group of assessment is concerned with the fact that the current HDI cover wide disparities in distribution of human development. They suggest the inequality adjustments HDI or develop the better index Hicks (1997). Foster et al, (2005) Farhad (1998). In summary, the critiques have centered on two general areas, first, how to define human development and how to observe and measure its components and determinants factors. Second, how to aggregate the different indicators to obtain a commonly acceptable single index of human development in order to measure its improvement. Over the time, the detailed composition of each index in the human development family has been subject to change as methodological advances have been found urgent. Recognizing and accepting the valid and valuable critiques, the HDI has been modified on different occasions. It is common awareness that a number of socio-economic phenomena cannot be measured by a single descriptive indicator and should be represented with multiple dimensions. The 'combination' of different dimensions, to be considered together required for developing the good estimator to measure

the level of human development. The alternative of the HDI can be the estimator of human development. It can be derived the good estimator with rational components related to development. According to Carmen; H.et al. (2012) .HDI has experienced substantial modification made by UNDP in 2010 edition of Human Development Report. In the report inequality adjusted components were used to measure the level of human development. Similarly Patrick(2014) present his view that knowledge and skill acquisition constitute the foundations for building all other capabilities by which human choices are enlarge and human well-being enhanced which is the similar statement given by Amartya Sen(1997).Hence the measurement of human development require the strong statistical tools covering those mention issues.

3. Methodology

This study primarily develops a new model of measuring level of human development with rational components by using appropriate statistical tools and techniques. The desk review included literature related to HDI associated with quantitative techniques. Similarly, the components and equations used by those articles were compared for selecting rational components and weight used in the models. Those concepts, components, techniques and models were evaluated with reference to time. The study draws the ideas from the previous models and indexes to develop a more complete measures of human development by expanding the components and use of the appropriate statistical techniques. The models reviewed and drawn from composite index developed by Haq, the models developed by Farhad Noorbaksh (1997) and Hicks (1998), PCA and MRA are used by Basudev Biswas and Adediran (2010). The details of the models reviewed and proposed the model and components are discussed in the results and discussion section below.

Result and Discussion:

The first report published by UNDP in 1990 related to human development is measured by composite index, i.e. $HDI = \sqrt{(Education\ Index * Health\ Index * Income\ Index)}$ developed by Haq (1990). The formula used by UNDP to measure human development was criticized by many scholars against the components, weightage and logic included in the model. The basis of selecting the components were not adequately convincing, making the model inadequate to measure human development. According to Niels (1991) the HDI and its components are examined critically with respect to accuracy, sensitivity and judgment power. According to McGillivray. et al (1993) determine that income is inappropriate; the lack of year to year comparability is opposing; it is hard with respect to measurement error. Similarly, during the period of 1990 to 2020 various scholars made efforts to design the formula and models by overcoming the weaknesses of the model used by UNDP. The new models proposed to correct the deficiency of the UNDP model can be categorized in three groups discussed below:

i) Composite Index Model:

Composite Index model is based on simple indexes such as education index, income index, and health index and so on. The components and weightage used in those indexes were found subjective. There are various exercises to cope these issues. The used components in composite index are not independent to each other. In addition, UNDP still using HDI based on geometric mean, which is not an effective model to measure human development (Jack 2014), and develop another composite index model by replacing life expectancy by mortality rate under 5, which he claimed to be more effective. The composite index model would have been more effective if the components and weightages were

selected using advance statistical tools.

ii) **Error Deduction Model:**

Farhad (1997) and Nathan (2008) developed error deduction models in which deduction scale of error is derived through the ratio of country's error with total error from all countries, which become more reliable than previous models as claimed by them. The real value of human development can be attained by deducing the error from one. It is clear that developed countries have less error than least developed countries.

Farhad (1997) developed the following formula

$HDI = 1 - d_i / (\text{mean of } d_i + 2Sd)$ where $d_i = \sqrt{\sum_{j=1}^3 (Z_{ij} - Z_{oj})^2}$, the distance is made from the ideal country about the selected components. His formula is found more impressive.

Similar effort is made by the formula given by Nathan (2008):

$HDI = 1 - \frac{\sqrt{(1-h)^2 + (1-e)^2 + (1-y)^2}}{\sqrt{3}}$ If components and weightages are assigned using advance statistical tools it would be more effective and become more reflective.

Regression and PCA Model:

Hicks (1997) gives the new concept about the weightage allocation using formula of $HDI = (\alpha X_1 + \beta X_2 + \gamma X_3) / (\alpha + \beta + \gamma)$ where X_1, X_2, X_3 are the components of health, education and income. Here α, β, γ are the allocated weightage to the components and the value of $\alpha + \beta + \gamma = 1$, which is more rational to manage the weightage but incomplete to address the issue about the components. It is like regression analysis based on three components which is weak about the components. These issues can be resolved by the help of Multiple Regression Analysis (MRA). If we add rational components using MRA then the model would be more reflective. Similarly, Basudev (2004) used PCA to find rational model to measure the level of human development. PCA and MRA both are the powerful statistical tools to handle these issues arises in different formula with reference to time. According Purusottam (2008), human development is an approach have methodological issue on its measurement. In connection with this issue Adediran (2010) gives suitable practice to address these issues. He used multiple regression model on variables from the Millennium Development Goals (MDG). From the discussion above, it is clear that there is no universal measurement tools for the human development. It requires the advance statistical tools like PCA and (MRA) to make the model more scientific, unbiased, consistent and effective in relation to weight allocation and selection of the components.

In this context following procedures are proposed to derive rational model for measuring human development:

Step1: Use PCA for selecting the rational components and appropriate weight allocation to develop estimator of human development.

Step2: Develop the regression equation using selected components from the PCA. i.e. $Y = \alpha + \beta_i X_i + e_i$, where α =intercept of the equation, β_i =coefficients of the different components and e_i = The error term

in the equation.

Step3: Find the maximum and minimum value of exogenous variable (Y_i) using the formula of 99% confidence interval (here the maximum value will be upper bound and minimum value will be lower bound, i.e. $(Y_{max} = \text{mean} + 3 \cdot \text{standard error of estimate}$ and $Y_{min} = \text{mean} - 3 \cdot \text{standard error of estimate}$).

Step4: Develop the Exogenous Index ($EI = Y \square EI = (Y_{\text{exist}} - Y_{\text{min}}) / (Y_{\text{max}} - Y_{\text{min}}) \square HDI$

Y_{exit} is the value of chosen country or chosen location.

Step5: Categorize the countries or region according to the $EI = Y \square EI \square HDI$.

These exogenous values are derived using various endogenous variables' values using PCA. Different formula, ideas and their concept pollinate each other and can draw new model based on the above-mentioned steps.

4. Conclusion:

The measurement of human development is relatively complex. In the past, it was measured using income base which is found narrow and limited. The perspective of human development has concerned with human well-being and emerged as an alternative development model. It is a dynamic process; thus, it implies the expansion of people's choices. The level of human development can be measured by different methods. The traditional method of measuring human development is composite index, i.e. HDI consisting three components: longevity, knowledge and standard of living. Those components and allocated weightages are found insufficient to measure the level of human development in global context. There are various practices to develop the better index. The measurement of human development required necessary and sufficient components with appropriate weightage and components. All formula needs to modify using statistical techniques such as PCA and MRA both are the rational concept to identify the necessary components, assigning appropriate weightages and suggest rational alternative model to measure the level of human development.

5. Recommendation:

Based on the analysis and discussion of this research, it is recommended to develop the model for measuring human development and other dimensions. Principal Component Analysis and Multiple Regression Analysis are the appropriate techniques for the component selection and weightage allocation for the new HDI. This method of analysis can be replicated to conduct the research to other dimension of human development. Out of those three categorical formulae it is urgent to find the best index using statistical techniques which is the new scope of research.

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