

## Indexation: A Methodological Perspective

### Dripto Mukhopadhyay

#### **1. Indexation – A critical tool for comparing entities on a common platform**

Indexation has emerged as an important tool for research in recent years. This is particularly true for government sector since performance analysis has taken a central place in policy related research for the central as well as the state governments. Various departments including NITI Aayog opt for indexation for performance analysis of the states or districts on various fronts. However, indexation methodologies always and also others for long years as a critical tool for comparison purpose across geography as well various sectoral entities.

Why indexation is important? The prime reason is it provides the researchers a platform to compare geographic or entities on a common platform. It is important here to explain “common platform”. It is well known that one of the critical steps for any research across disciplines is to choose the right variable/s. Comparison is possible using single criterion or multiple criteria. One needs to make sure that choice of variable/s considers the relevance of those from representativeness point of view of the phenomenon in question.

As an example, assume one needs to compare various urban local bodies (ULBs) in terms of their performance. One should consider that variable/s that are performed by all ULBs of the concerned geography. If one includes certain variables that are non-existing as part of service delivery for some of the ULBs in the same geography, it will distort the analysis by creating discrimination across ULBs. Therefore, common platform signifies an apple-to-apple comparison since their characteristics are comparable.

#### **2. Unbiased and scientific way to capture an unobserved phenomenon**

It is also important to mention here is that certain phenomena are notional by nature and representing an unobserved concept in general. For example, indexation for good governance look into an unobserved or notional concept which is governance. It is non-existing otherwise, unless someone attempts to define the same with the help of relevant indicators that suggests governance related measures. An indexation exercise involving relevant indicators helps in arriving at rankings of entities under study in an “unbiased” and “scientific” manner. The indexation helps only if it is done fulfilling these two critical criteria as mentioned if one needs to make it actionable.

To understand the implications of errors or lacking at this stage, we need to deep dive further. A composite index can be expressed mathematically as follows:

Indexation using multiple criteria leads us to the concept of a composite index. As the nomenclature composite index suggests, it composites or combines multiple criteria into one single indicator. Converting multiple indicators into one single indicator makes it more easily comparable, interpretable, implementable and holistic in nature. When multiple variables are involved to arriving at a composite index, the most important question is to decide on whether the variables to be used are equally important or they differ in terms of importance. Though apparently it looks simple, but this is extremely critical to capture the phenomenon that bears impacts on real life scenario. Any lacking at this stage impacts the

results significantly, and therefore the interpretation and implementation based on such results are faulty.

Indexation is preferable using multiple criteria. The reason being no single activity or phenomenon can be explained robustly through a single criterion. When a single criterion is used at times for indexation, the primary purpose is to make sure that the data looks comprehensive and can be easily understood when compared across entities and/or over time. However, in most cases indexation methodologies are used by researchers when complex phenomena are represented by several indicators in producing a comprehensive and simpler final output.

### **3. How to compute a composite index**

Now it is time to introduce the concept of relative position. This is extremely critical to understand rest of the argument. Relative position implies “ranking” of the entities under study for any given phenomenon exclusively within the set of chosen entities through selected variables only. The comparison is strictly restricted within these. It cannot be compared with any entity that is not covered in the analysis or for any indicator that was not included in computation process. Depending on the objective, one can use single-stage or multi-stage composite index based on parameters or sub-parameters involved in explaining the phenomenon.

$C_i = W_1 * X_{i1} + W_2 * X_{i2} + W_3 * X_{i3} + \dots + W_n * X_{in}$ , where  $C_i$  is composite index for  $i^{th}$  observation and  $X_{ij}$  represents variables involved in computing the composite index. In this equation  $W$  represents the importance or weight assigned to every variable. As seen from the equation, weight plays a critical role in composite index. So, the question remains is how to determine the weight to be assigned to each variable for any complex phenomenon needs to be represented through a composite index.

There can be three different ways to assign weight to variables as given below.

- Assigning equal weight to each variable
- Assigning perception subjective weight
- Assigning weights in an objective manner that is unbiased in nature

Assigning equal weight signifies assuming equal importance of each variable in explaining the phenomenon under study. Though this is not robust, but at times produces relatively unbiased results. Perception based subjective weights are seen to be used more frequently, especially for non-academic exercises. In this case the weights are decided by the researchers involved based on their perception, be it right or wrong. Without doubt it is always questionable since perception varies from person to person depending on agenda and motif. At times assigning subjective weights can be grossly misleading depending on the extent the involved researchers perceive the importance of the indicators realistically. However, whatever realistic the perceptions are, assigning subjective weights will always suffer from the clarity in terms of biasness.

To overcome biasness or lack of robust weighting scheme as seen in case of subjective weights or equal weight methodology is to opt for weight determined in an objective

manner. This can be done using statistical technique called “Principal Component Analysis” which is a part of factor analytic model. In simple words, this model helps in assigning weights based on correlations across variables. When the theoretical constraints are understood and applied, one can understand the robustness of the model and efficacy of including the set of variables used for arriving at the composite index. The most crucial point to highlight here is that the weights assigned and the results obtained through this modelling is unbiased since it is completely data driven and results do not depend on any subjective perception.

#### **4. Key takeaways**

To conclude, indexation is a useful tool that can throw light on obtaining a comparative ranking of entities under study. Though various methodologies are used to compute composite index, for instance, using equal weights or perception based subjective weights or objective weights through modelling techniques, one should know the advantages and disadvantages of each of these techniques. To obtain results that are unbiased and more scientific in nature, the best method is using objective modelling technique that uses a hard data-based approach in determining the weighting scheme instead of subjective perception.