Background to CFAR-m

CFAR-m was developed by two research economists Nouri CHTOUROU and Rochdi FEKI.

Project History:

Co-operation between Rochdi FEKI and Nouri CHTOUROU began when the latter ascertained that many of the relationships within economics are non-linear and that there was a need to establish models which the dynamic aspects of these relationships. Occurrences of non-linearity had been encountered during research by CHTOUROU into Governance and Economic Development. Indeed, his goal was to seek verification through appropriate linkages between the institutional structure of a country and its levels of economic and social performance. From then appeared two obviousnesses: for each country, institutional retroactive compartments between them and their effects on growth follow nonlinear transmission ways. Furthermore, since we cannot treat a phenomenon that cannot be subject to measurement (intangibles) he also addressed the difficulty of how to measure the quality of governance within an institutional setting. This latter (intangible) quality that governance includes multidimensional layers indicated that any attempt to measure it required using some form of aggregation technique to construct a composite indicator.

FEKI's solution was to propose using Artificial Neural Network (ANN) models which contained proven qualities in modelling complex relationships. The major advantage of neural networks is their ability to learn dependencies between variables based on a finite number of observations. This feature makes them flexible enough to model complex relationships without needing any a priori assumptions about the distribution of variables (a major constraint of conventional statistical techniques).

Initial mathematical results have shown that ANNs produce excellent nonlinear models, particularly through the features of the sparse approximation they have. In addition, the development of algorithmic techniques for rapid and accurate learning, allowed neural networks to increasingly establish themselves as the methodology of choice in fields such as robotics, pattern recognition, signal analysis, medical diagnosis, financial, etc..

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There are a large number of artificial neural networks, the most popular being multilayer perceptrons and self organizing maps developed and introduced by Teuvo Kohonen in the 80s. Kohonen's neural model is a data visualization technique, (according to a fixed topology), for projecting an input space into a multidimensional output space, usually one-dimensional or two dimensional. This projection is such that those elements having similar characteristics are grouped in the same class of a previously defined map. Thus, Kohonen maps perform two tasks: the first is the reduction in size, while the second is to reveal similarities. In the context of data analysis, this technique appears to be a particularly useful method of clustering. Individuals are grouped into classes according the topology of the input space. This means that we define a priori the notion of neighbourhood between classes, ensuring that the elements contained in a neighbourhood area (within the same class or related classes) have similar characteristics.

The application of these self-organizing (Kohonen) maps to analyze the problem of macroeconomic governance initiated the collaboration and subsequent research between CHTOUROU and FEKI. Significantly, these early uses for the purpose of analysis and typological clustering generated sufficient positive results and evidence leading to the development of a new method of constructing composite indicators and rankings. This ambitious programme has taken several years of research and led to the design of CFAR-m (Chtourou Feki Aggregation and Ranking method).

CFAR-m operates as a three stage process:

Step 1: It enables, through a learning process, the positive and negative feedback between the variables, a self-organization of individuals into homogeneous subsets (compared to similar phenomena being studied).

Step 2: It determines the appropriate weights for each *Item* *(items are quoted as "exemple" on the preliminary stage picture hereunder.*

Step 3: These weights are then applied to the original data to calculate the composite indicator and establish the overall standings.

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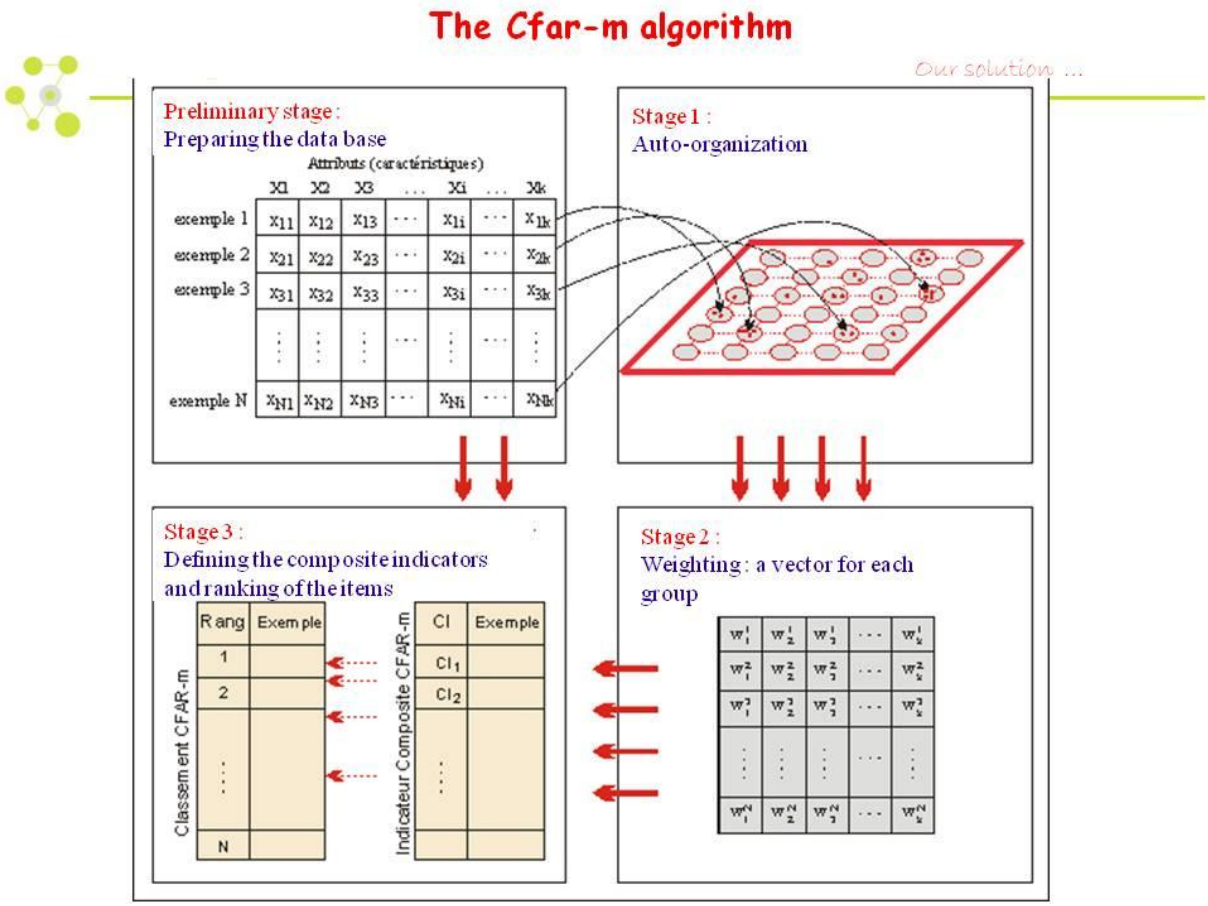
CFAR-m

Advanced Aggregation & Ranking Method

"Transforming Information into Knowledge"



CFAR-m's USP

Ranking is based on a novel technique which, unlike previous techniques, has the following unique features:

- Objectivity: No manipulation of weights:

The weighting is a resolutely clear objective since it emanates from the content information of the variables themselves and their internal dynamics. This last feature of the model is a major step forward and is a major improvement over current method in terms of ranking / aggregation.

- Specificity: A specific equation calculates each individual indicator
- Decision support: allows for the running of simulations and then proposes to decision makers' plans of action and optimal sequence of reforms.

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Early user uptake of CFAR-m has focused on data relating to multilateral organizations rankings of countries by the aggregate level of governance, institutional quality, poverty and human development. The novelty of this approach and the relevance of the results have quickly attracted experts in the fields of governance and anti-corruption. With the World Bank Institute we have immediately run a diagnostic programme for the governance of Algeria in 2007. CFAR-m has been used in many research projects to build new composite indicators and integrate them into econometric models applied to the particular problems of governance and macroeconomic development of the financial system.

Other typical ranking based applications CFAR-m can be used for is a unique tool for sensitivity analysis, the selection of relevant variables, the study of the interaction between the variables and their effects over time. These characteristics allow CFAR-m to engage in a whole realm of research and study into the modelling and simulation of complex phenomena. There are many fields of applications for CFAR-m such as: economics, social issues, finance, capital markets, insurance, medical, pharmaceutical, geostrategic, aerospace, ecology, research, marketing, etc...

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