Regime Analysis

Regime Analysis is a discrete multi-assessment method suitable to assess projects as well as policies. The strength of the Regime Analysis is that it is able to cope with binary, ordinal, categorical and cardinal (ratio and interval scale) data, while the method is also able to use mixed data. This applies to both the effects and the weights in the evaluation of the alternatives.

The fundamental framework of this method is based upon two kinds of input data: an impact matrix (structured information table) and a set of (politically defined) weights (Nijkamp et al 1990). The impact matrix is composed of elements that measure the effect of each considered action in relation to each policy relevant criterion. The set of weights incorporates information concerning the relative importance of the evaluation criteria. In case there is no prioritization of the criteria in the evaluation process, all criteria will be assigned the same numerical weight value.

Regime Analysis is a discrete multi-criteria method, and particularly, it is generalized from the concordance analysis, based in essence on a generalization of pair wise comparison methods. In order to gain a better understanding of Regime Analysis, the main principles of concordance analysis are presented below.

Concordance analysis is an evaluation method in which the basic idea is to rank a set of actions by means of their pair wise comparisons in relation to the chosen criteria. We consider a choice problem when we have a set of alternatives i and a set of criteria j. We begin the analysis by comparing alternative i with alternative k in respect to all criteria. Subsequently, we select all criteria for which alternative i performs better or equal to k. This class of criteria form the "concordance set". Similarly, we define the class of criteria for which alternative i performs worse than or is equal to alternative k. This set of criteria is called the "discordance set".

We now need to rank the alternatives. In order to do so we introduce the concordance index. The concordance index will be the sum of the weights that are related to the criteria for which i is better than k. We call this sum C_{ik}. Then we calculate the concordance index for the same alternatives, but this time by considering the criteria for which k is better than i, i.e., C_{ki}. After having calculated these two sums, we subtract these two values in order to obtain the net concordance index $\mu_{ik} = C_{ik} - C_{ki}$ (the procedure is similar with one presented under the ELECTRE and PROMETHEE families).

Because in most cases we have only ordinal information about the weights (and no trade-offs), our interest is in the sign of the net concordance index μ_{ik}. If the sign is positive, this will indicate that alternative i is more attractive than alternative k; otherwise the opposite holds.

We are now ready to rank the alternatives considered. We note that due to the ordinal nature of the information in the indicator μ_{ik} no information exists regarding the size of the difference between the alternatives; it is only the sign of the indicator that matters.

We may also solve the complicating situation that it may not be able to determine an unambiguous result, i.e. a complete ranking of alternatives, because of the problem of ambiguity in the sign of the index μ. In order to solve this problem we introduce a performance indicator – as a semi-probability measure – p_{ik} for the dominance of criteria i with respect to j as follows:

p_{ij} = prob ($\mu_{ij} > 0$)

Next, we define an aggregate probability measure, which represents the success (performance) score as follows:

$$p_i = \frac{1}{I-1}\sum_{j \neq i} p_{ij}$$

where I is the number of chosen alternatives.

The problem here is to assess the value of p_{ij} and of p_i. The Regime Analysis then assumes a specific probability distribution of the set of feasible weights. This assumption is based upon the Laplace criterion in the case of decision-making under uncertainty.

In the case of a probability distribution of quantitative information, in principle, the use of stochastic analysis will suffice, which is consistent with an originally ordinal data set. This procedure helps to overcome the methodological problems we may encounter by applying a numerical operation on qualitative data.

From the viewpoint of numerical analysis, the Regime method identifies the feasible domain within which feasible values of the weights w_I must fall in order to be compatible with the condition imposed by their probability value. By means of a random generator, numerous values of the weights can be calculated. This allows us at the end to calculate the probability score (or success score) p_I for each alternative i. We can then determine an unambiguous solution and rank the alternatives.

Regime Analysis is able to examine both quantitative and cardinal data. In case of choice problems with qualitative data, we first need to transform the qualitative data into cardinal data and then apply the Regime method. Due to its necessity Regime Analysis is often classified as an indirect method for qualitative data. This is an important positive feature. When we apply the cardinalisation of qualitative information through indirect methods such as Regime Analysis, we do not lose information like in direct methods. This is due to the fact that in the direct methods only the ordinal content of the available quantitative information is used.

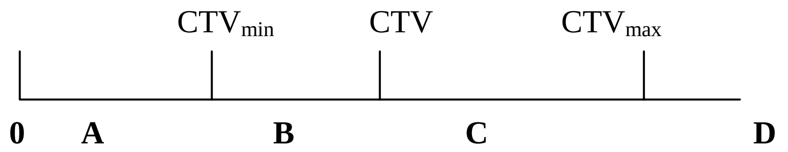
The Flag Model

The main purpose of the Flag Model is to analyse whether one or more policy alternatives can be classified as acceptable or not in the light of an a-priori set of constraints. The model does so by comparing impact values which set of reference values (called Critical Threshold Values). The Flag Model has been designed to assess the degree to which competing alternatives fulfil pre-defined standards or normative statements in an evaluation process. There are four important steps in applying the method:

- Identifying the set of measurable indicators;
- Assessing the impact of the alternatives on the above-mentioned indicators;
- Establishing a set of normative reference values (standards);
- Evaluation of the relevant alternatives

The input of the Flag Model is formed by an impact matrix containing multi-dimensional information on a set of policy relevant variables or criteria; this table contains the values that the indicators assume for each alternative considered. Therefore, the methodology requires the identification and definition of relevant indicators, which are suitable for further empirical treatment in the evaluation process. The choice of indicators depends on the choice problem to be addressed; in general the indicators should be in agreement with the nature of the choice issue under scrutiny and also consider the objectives to be taken into consideration. One significant threat always encountered when defining indicators is the likelihood that the number of indicators to be considered tends to grow limitless; and, to complicate matters, some indicators are encompassed within other indicators. In order to avoid the complication of a large number of indicators (which would be difficult to examine) and which often contain less relevant or unnecessary information, it may be a helpful approach to use a hierarchical approach based on a tree-like structure. Such an approach corresponds to the idea of aggregation and dissagregation of indicators that are deemed fundamental to the issue examined. For instance, a distinction could be made between macro, meso and micro indicators, or on the basis of relevant time or geographical scale. The indicators in the Flag Model have two formal attributes, class and type. There are normally three classes of indicators in the Flag Model, which correspond to the following dimensions: (1) environmental, (2) social, and (3) economic. The second attribute, type, relates to the fact that some indicators, e.g. accessibility to water, have high scores showing a preferable situation, whereas others, such as pollution, have low scores showing also a preferable situation. This difference, in terms of benefit or cost criteria, is captured in the model under the attribute "type of indicator".

For each indicator, a Critical Threshold Value (CTV) has to be defined. These values represent the reference system for judging alternatives. Since in many cases experts and decision-makers may have conflicting views on the precise level of the acceptable threshold values, a bandwidth of CTV – by way of sensitivity analysis – can be used. This ranges from a minimum value (CTV_{min}) to a maximum value (CTV_{max}), as follows:



Section **A**	Green	no reason for specific concern
Section **B**	Yellow	by very alert
Section **C**	Red	reverse trends
Section **D**	Black	stop further growth

The assessment module of the Flag Model provides a number of instruments for the analysis of the alternatives. This practice can be carried out in two ways. The first option is the inspection of a single alternative. The second is the comparison of choice options. In the first case, a decision regarding the acceptability of an alternative is taking place. In the latter case we decide which alternative performs best. This last option is interpreted as a basis of multi-criteria analysis.

On of the major merits of the Flag Model is its potential for representation. There are three approaches to such a task: a qualitative, a quantitative and a hybrid approach. The qualitative approach takes into account the colours of the flags. This entails flag counts and cross-tabulation. This approach merely displays in various insightful ways the results obtained from the evaluation. The quantitative approach defines the values of the standards that may be acceptable or not. To achieve this, we need to standardise the indicator (values), because they refer to different aspects, which are expressed by different measurement scales. Finally, the hybrid form regards the xistence of both qualitative and quantitative aspects.