Málaga, 15 de junio de 2017

EL PARADIGMA ECONÓMICO TRADICIONAL: CRÍTICAS Y EXTENSIONES DESDE EL PENSAMIENTO MULTICRITERIO

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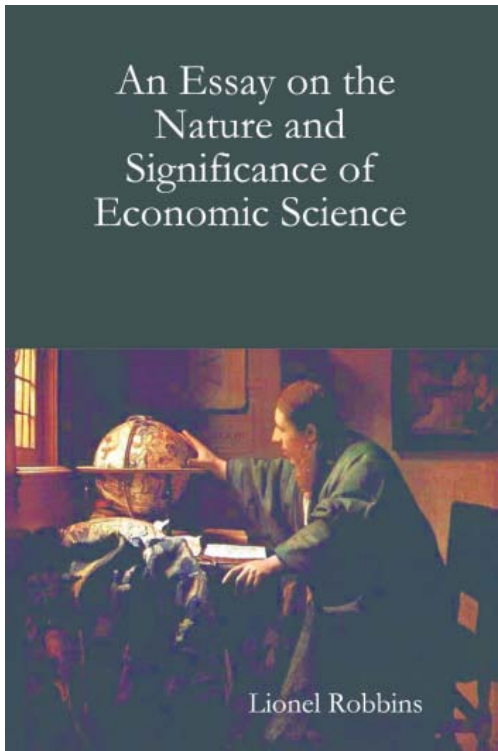
OUTLINE OF THE PRESENTATION

1. **OPTIMIZATION AND ECONOMICS: AN INTRIGUING RELATIONSHIP.**
2. **THE BASIC ECONOMIC PARADIGM: STRENGTHS AND WEAKNESSES.**
3. **A PRIMARY MODEL BASED ON DISTANCE FUNCTIONS.**
4. **UTILITY OPTIMIZATION WITHOUT UTILITY FUNCTIONS.**
5. **A GENERATOR OF SOCIAL CHOICE FUNCTIONS AS A SECONDARY MODEL.**
6. **SATISFICING LOGIC AND BOUNDED RATIONALITY: SOME EPISTEMIC REFLECTIONS.**
7. **A FINAL REFLECTION.**

ECONOMICS EXPLAIN AND PREDICTS HUMAN BEHAVIOUR IN RELATION TO **CHOICE PROCESSES** DERIVED FROM THE EXISTENCE OF **LIMITED RESOURCES** TO SATISFY **UNLIMITED NECESITIES**.

SCARCITY

Lord Robbins, 1932



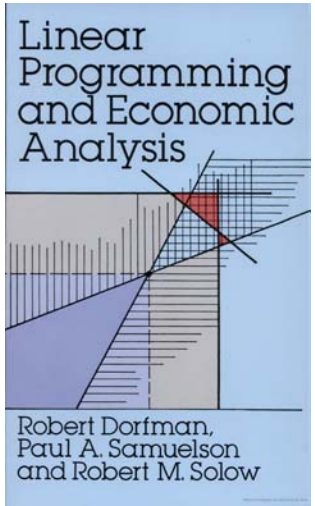
-ECONOMICS ATTEMPTS TO OPTIMIZE THE USE OF THE SCARCE RESOURCES.

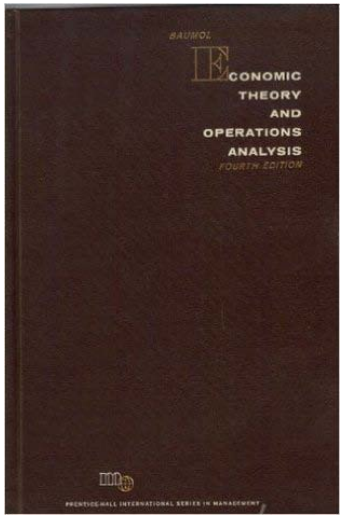
- A "ROBINSON CRUSOE ECONOMY"

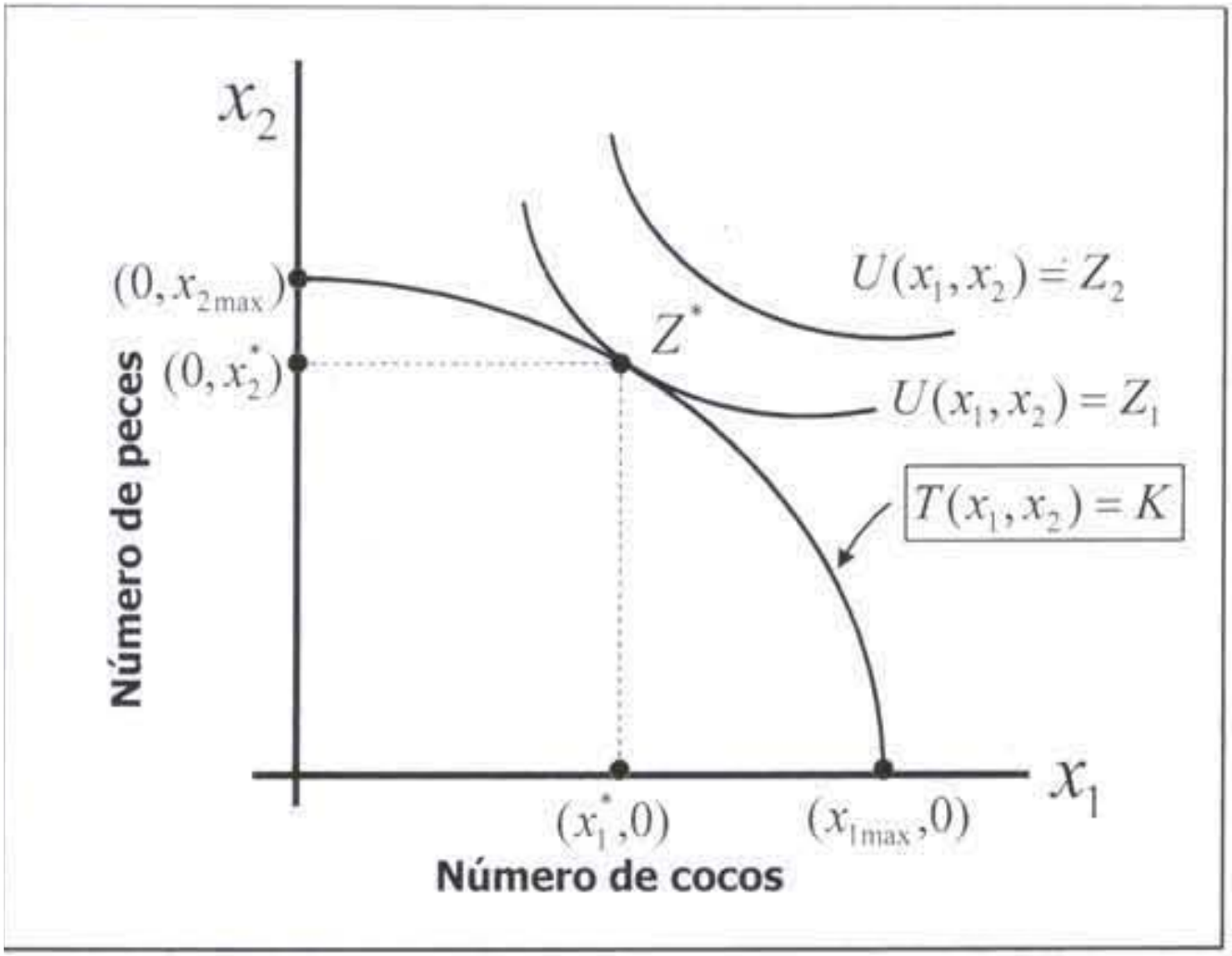
-A "GLOBAL ECONOMY"

-"ECONOMIC PROBLEMS" ARE PARTICULAR CASES OF "OPTIMIZATION PROBLEMS" (INTRILIGATOR, 1971)

-ARROW, BAUMOL, DORFMAN, HICKS, KOOPMANS, LEONTIEF, SAMUELSON, SOLOW…







Condición de Equimarginalidad de Jevons (Restricción General)

-ECONOMICS CAN BE REVITALIZED WITH NEW FORMULATIOS AND ANALYTICAL PROCEDURES TAKEN FROM THE OPTIMIZATION FIELD

-OPTIMIZATION FIELD CAN BE ENRICHED WITH THE INTRODUCTION OF NEW PROBLEMS AND AREAS OF APPLICATION.

-THE MCDM OPTIMIZATION PARADIGM CAN REVITALIZE THE LINKS BETWEEN THESE TWO FIELDS

2. THE BASIC ECONOMIC PARADIGM: STRENGTHS AND WEAKNESSES

THE CORE OF ECONOMICS

a)A SINGLE OR A COLLECTIVE DECISION MAKER (DM).

b)THE ECONOMIC SCARCITY DUE TO THE EXISTENCE OF LIMITED RESOURCES. THE SCARCITY IS LOGICALLY DEFINED BY A SET OF CONSTRAINTS (MATHEMATICALLY SPEAKING EQUALITIES AND INEQUALITIES). THE SET OF VALUES OF THE DECISION VARIABLES HOLDING THE CONSTRAINTS ESTABLISH THE FEASIBLE OR OPPORTUNITY SET.

c)A FUNCTION OF THE DECISION VARIABLES THAT IS ASSUMED REFLECTS THE DM PREFERENCES. THIS FUNCTION MAPS A NUMBER TO EACH ELEMENT OF THE FEASIBLE SET.

BASIC ANALYTIC FRAMEWORK

MAX/MIN $Z = Z(x_1, x_2, ...,x_n)$

Subject to:

$T(x_1, x_2, ...,x_n) = k$

$(x_1, x_2, ...,x_n)$→ decision variables or elections for the DM

$Z(x_1, x_2, ...,x_n)$ → preference function for the DM

$T(x_1, x_2, ...,x_n) = k$→ feasible or opportunity set

EXISTENCE OF A SOLUTION

THE EXTREME VALUE THEOREM

CRITERION FUNCTION	FEASIBLE SET	OUTCOME
CONTINUOUS	COMPACT	LOCAL OPTIMUM
CONCAVE(CONVEX)	COMPACT&CONVEX	GLOBAL OPTIMUM

(WEIERSTRASS THEOREM)

COMPUTATIONAL ISSUES

CRITERION FUNCTION	FEASIBLE SET	APPROACH
CONCAVE(CONVEX)	EQUALITIES	LAGRANGE
CONCAVE(CONVEX)	INEQUALITIES	FOURIER
LINEAR	CONVEX POLYTOPE	DANTZIG
QUADRATIC	CONVEX POLYTOPE	WOLFE
NON-LINEAR	COMPACT	KUHN-TUCKER
POSYNOMIAL	COMPACT	GEOMETRIC PROG

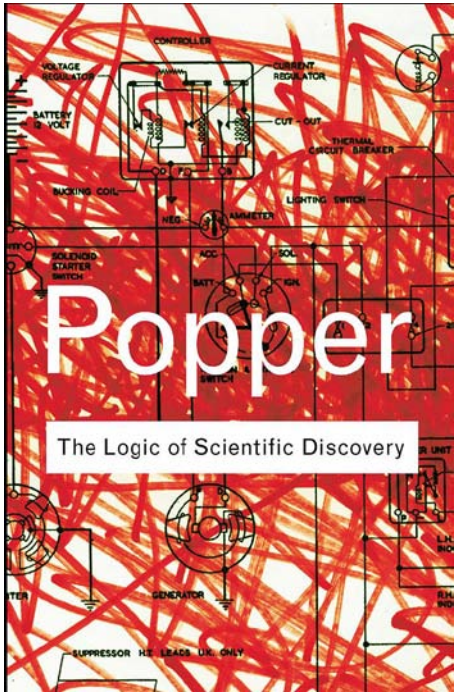
METAHEURISTICS

-INTERNAL COHERENCE IS ONLY A NECESSARY CONDITION FOR THE ACCEPTATION OF AN EMPIRICAL THEORY

-EXTERNAL COHERENCE ; EMPIRICAL CORROBORATION

(POPPER LOGIC OF SCIENTIFIC DISCOVERY, 1959, PAGES 32-33):

"THE INTERNAL CONSISTENCY OF AN EMPIRICAL THEORY IS THE FIRST STEP TO UNDERTAKE ITS DEDUCTIVE TESTING, BUT THE LAST STEP IN THE TESTING PROCESS CONSISTS IN THE FACTUAL CORRESPONDENCE OF THE EMPIRICAL IMPLICATIONS DEDUCED FROM THE THEORY"



1. IN MANY REAL ECONOMIC SCENARIOS, THE DM PREFERENCES ARE NOT WELL CHARACTERISED BY A SINGLE CRITERION FUNCTION.

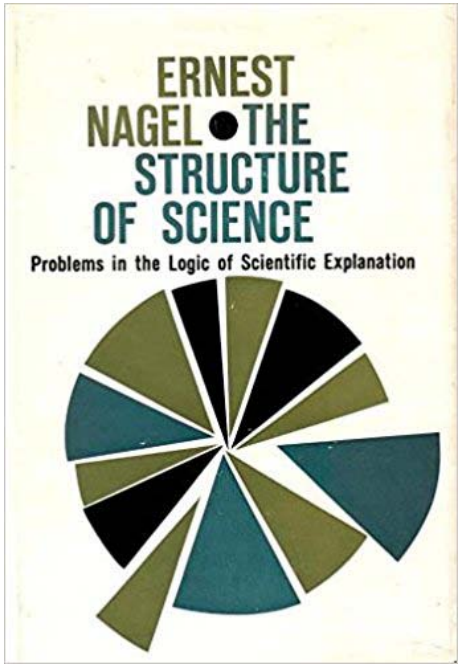
2. THE CHARACTERISATION OF THE FEASIBLE SET BY RIGID CONSTRAINT WHICH DO NOT ALLOW ANY TYPE OF VIOLATION MIGHT BE UNREALISTIC IN MANY REAL SITUATIONS.

3. IN SOME CASES THE CHARACTERIZATION OF THE CRITERION FUNCTION IS PROBLEMATIC, SINCE REQUIRES THE ACCEPTATION OF STRONG ASSUMPTIONS ABOUT THE DM´S PREFERENCES

3. A PRIMARY MODEL BASED ON DISTANCE FUNCTIONS

PRIMARY AND SECONDARY MODELS (NAGEL, 1961, CHAP. 11)

PRIMARY MODEL-FIRST STEP



Min $$\left[\sum_{i=1}^{q} W_i^p \left|\frac{\hat{f}_i - f_i(X)}{K_i}\right|^p\right]^{1/p}$$

Subject to:

$$\mathbf{X} \in \mathbf{F}$$

Yu (1973, 1985)

FEASIBILITY, UNIQUENESS, SYMMETRY, PARETO OPTIMALITY,....

p→"balancing factor"

p=1→ "maximum average achievement"

p= ∞ →"Maximum discrepancy or maximum individual regret"

PRIMARY MODEL-SECOND STEP

ACHIEVEMENT SCALARIZING FUNCTION

$$\text{Min } (1-\lambda)D + \lambda \sum_{i=1}^{q} W_i \left| \frac{\hat{f}_i - f_i(X)}{K_i} \right|$$

s.t.

$$W_i \left| \frac{\hat{f}_i - f_i(X)}{K_i} \right| - D \leq 0 \qquad \forall i$$

$$\boldsymbol{X} \in \boldsymbol{F} \qquad \lambda \in [0,1],$$

$\lambda = 1$ or $p=1 \rightarrow$ "maximum aggregated achievement solution".

$\lambda = 0$ or $p = \infty \rightarrow$ " minimum discrepancy or minimum regret solution".

λ compromises or trade-offs between these two opposite solutions.

4. UTILITY OPTIMIZATION WITHOUT UTILITY FUNCTIONS

COMPOSITE PROGRAMMING

$$\text{Min } (1-\lambda)D + \lambda \sum_{i=1}^{q} W_i \left(\frac{f_i^* - f_i(X)}{f_i^* - f_{i*}} \right)$$

s.t.

$$W_i \left(\frac{f_i^* - f_i(X)}{f_i^* - f_{i*}} \right) - D \leq 0 \quad \forall i$$

$$X \in F \qquad \lambda \in [0,1].$$

$\lambda = 1 \rightarrow L_1$ bound of the compromise set.

$\lambda = 0 \rightarrow L_\infty$ bound of the compromise set.

For bi-criteria problems assuming a weak condition, the optimum of the utility function lies within the limits of the compromise set.

"Given a utility function $U(f_1(\mathbf{X}), f_2(\mathbf{X}))$ the necessary and sufficient condition for the maximum of U to belong to the compromise set is that the marginal rate of substitution be equal to W1/W2 in the balanced mix $W_1 f_1(\mathbf{X}) = W_2 f_2(\mathbf{X})$ on the iso-utility curves of U"

- Enrique Ballestero, Carlos Romero, 1991, Ballestero and Romero, 1994
- Manuel A. Morón, Carlos Romero, Francisco R. Ruiz del Portal,1996.
- Fernando Blasco, Eduardo Cuchillo Ibáñez, Manuel Alonso Morón, Carlos Romero,1999.
- Francisco J André, Carlos Romero, 2008.

Through the idea of the "displaced ideal" (Zeleny, 1974) the compromise set can be contracted even to a single point, reminding me the literary idea of "An Aleph" by the Argentine writer Borges:

"..., since in an angle of the basement there was an Aleph. I clarify that an Aleph is one of the points in the space that contains all the points"

"..., pues en un ángulo del sótano había un Aleph. Aclaro que un Aleph es uno de los puntos del espacio que contiene todos los puntos". Jorge Luis Borges, El Aleph (1957), Emecé Editores, Buenos Aires, page 254.

In short, the determination of the utility optimum without utility functions is neither a pun nor a paradox, but a practical devise that derives from some extensions from the primary model.

5. A GENERATOR OF SOCIAL CHOICE FUNCTIONS AS A SECONDARY MODEL

General Setting

i = 1,2,...q objects (alternatives, candidates, etc.)

j= 1,2,...m entities (DM, social groups, electoral committee, etc), which have to give judgement values over the q objects.

$$Min \left[\sum_{i=1}^{q} W_i^p \left| \frac{\hat{f}_i - f_i(X)}{K_i} \right|^p \right]^{1/p}$$

Subject to:

$X \in F$

Parameter changes

$f_i(X) = f_i^j$ →valuation provided by the jth DM to the ith object (data)

$\hat{f}_i = f_i^S$ →consensus value attached to the ith object (unknown)

"Generator" of collective rules:

$$\text{Max U} = -\left[\sum_{i=1}^{q} \sum_{j=1}^{m} W_j^p \left| f_i^S - f_i^j \right|^p \right]^{1/p}$$

s.t

$f_i^j \in F$ (set of conditions)

$$U_1 = -\left[\sum_{i=1}^{q}\sum_{j=1}^{m} W_j \left| f_i^S - f_i^j \right|\right]$$

the average agreement is maximized. In other words, this social compromise consensus represents the "best solution" from the point of view of the majority (i.e., the classic Benthamite or utilitarian solution).

$$U\infty = -\left[Max_{i,j} W_i \left| f_i^S - f_i^j \right|\right]$$

The disagreement of the DM more displaced with respect to the average consensus (i.e., the minority group) is minimized. Hence, this social compromise consensus represents the "best solution" from the point of view of the minority (i.e., the Rawlsian solution).

U∞ represents in mathematical terms the "Second Principle of Justice" proposed by John Rawls (1971, pp. 65-75)

A NON-COMPUTABLE GENERATOR OF COLLECTIVE RULES

(SECONDARY MODEL)

$$U\lambda = -(1-\lambda)\left[Max_{i,j} W_i \left| f_i^S - f_i^j \right|\right] - \lambda\left[\sum_{i=1}^{q}\sum_{j=1}^{m} W_i \left| f_j^S - f_j^i \right|\right]$$

AN EQUIVALENT COMPUTABLE GENERATOR OF COLLECTIVE RULES

(SECONDARY MODEL)

$$U_\lambda = -(1-\lambda)D - \lambda\left[\sum_{i=1}^{q}\sum_{j=1}^{m} w_j (n_i^j + p_i^j)\right]$$

s.t.

$$w_j \sum_{j=1}^{m} (n_i^j + p_i^j) - D \le 0$$

$$f_i^S + n_i^j - p_i^j = f_i^j \quad \forall i, j$$

$f_i^j \in F$ (set of conditions)

ACCORDING TO THE STRUCTURE OF THE SET OF CONDITIONS F:

a) ordinal and complete preferences,

b) ordinal and partial preferences

c) cardinal and complete preferences through utility functions and through pairwise comparison matrices.

González-Pachón and Romero (1999, 2001, 2004, 2006, 2011)

FORMAL PROPERTIES:

Decisiveness, neutrality, anonymity, monotonicity, unanimity,....

González-Pachón and Romero (ITOR, 2015)

6. SATISFICING LOGIC AND BOUNDED RATIONALITY: SOME EPISTEMIC REFLECTIONS

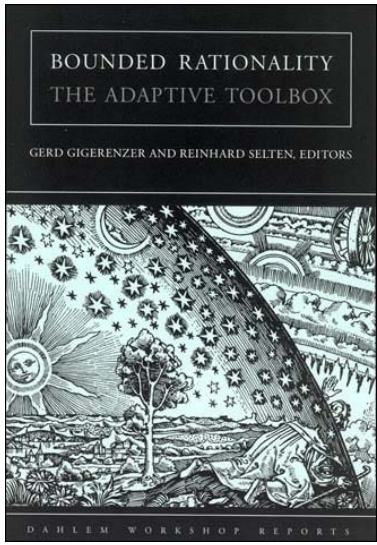
What is the epistemic status of bounded rationality and the "satisficing" logic?

An Hypothesis?

An Empirical Theory?

A Scientific Research Program?

A Research Tradition?



It been interpreted and applied in different ways, perhaps in too many ways. As Gigerenzer states: "Today, bounded rationality has become a diluted, fashionable term, used by proponents of quite disparate visions of reasonableness..." (Gigerenzer, 2001, page 37).

The view of bounded rationality by Sargent (1993) for macroeconomic problems, by Rubinstein (1998) modelling bounded rationality within a substratum of games or by the authors of the book edited by Gigerenzer and Selten (2001) who try to address how humans make decisions in real life within the commented Simonian philosophy.

G GIGERENZER, R SELTEN
BOUNDED RATIONALITY-THE ADAPTIVE TOOLBOX. MIT PRESS, 2001

GOAL OF THIS DAHLEM WORKSHOP

“TO PROMOTE BOUNDED RATIONALITY AS THE KEY TO UNDERSTANDING

HOW ACTUAL PEOPLE MAKE DECISIONS WITHOUT UTILITIES AND

PROBABILITIES”

To frame Simon´s proposal within which Laudan defined as a "Research Tradition".

Thus, for Laudan (1977, chapter 3 and more specifically pages 78-79) a Research Tradition (RT) has a number of traits, like:

a) A plurality of theories underlying each RT,
b) A common set of metaphysical and methodological commitments for every RT, and
c) Each RT provides different and sometimes contradictory formulations.

Assuming the above plural perspective, a "satisficing" orientation with the status of a Laudian RT should imply in all its possible formulations scenarios where the DM attempts to achieve a set of relevant goals as close as possible to the set of targets previously established. Following this orientation, an "operational satisficing" model can be accommodated with the straightforward particularizations of our primary model.

7. A FINAL REFLECTION

a) In logic terms basic distance function model can be considered as a primary model and all the models presented can be deduced as its secondary models, just by implementing different parameters specifications. In short, all the models presented are actually particular cases of our initial model.

b) In consequence, all the valid properties for primary model are also valid properties for its secondary MCDM models and their respective economic interpretations.

c) By attaching different meaning to the variables and functions underlying basic distance function model, some problems in the core of the rational behaviour in economics can be re-formulated with a different and possible richer perspective.

THE POPULARITY OF THE MCDM PARADIGM AS A POWERFUL TOOL KIT FOR SOLVING APPLIED ECONOMIC PROBLEMS IS UNQUESTIONABLY SUPPORTED BY THE OR/MS LITERATURE PUBLISHED IN THE LAST 30 YEARS OR SO.

HOWEVER, THE POSSIBLE LINKAGE BETWEEN SOME BASIC ECONOMIC PROBLEMS AND THE MCDM PARADIGM IS A RELATIVELY NEW ISSUE THAT RAISES MANY CHALLENGES AND DIRECT US TO SEVERAL OPEN PROBLEMS.


THANK YOU VERY MUCH FOR YOUR PATIENCE, ATTENTION AND SPECIALLY FOR YOUR ENDURING FRIENDSHIP