ON THE HOMO ŒCONOMICUS MODEL OF RATIONALITY

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Abstract:

The study intends to deliver a logical analysis of the well-known (and too much used) model of rationality named homo œconomicus. To this end, it is put into evidence the reductionism of the model (more, its cartesianism and mechanicism), by logically assessing the basic principle and the axioms and, also, the relaxations introduced over time. The paper gets the conclusion that economists tried successively to save the homo œconomicus model over time, but all these attempts did nothing but block the developments of the economic theory. Finally, the research organizes into a diachronic matrix the different ways in which economists actualized the genuine model in order to put it in line with the actual behaviour of the economic subject.

Key words: homo œconomicus, model of rationality, cartesianism, logic

1. Introduction

A model of rationality can be described, in essence, by three components: a) the fundamental principle/s; b) the set of axioms; c) the set of inference rules. The three components will therefore be identified and examined for each of the rationality models discussed, so that the similarities and differences among the three rationality models under consideration can be established (generally, a rationality model is simply a model of justification, although, if desired, it could contain also axioms or principles of optimizing - usually of maximizing).

My approach does not have the character of a history of economic doctrine, so the analysis I am proposing is rather a logical and semantic one than one that follows the evolutionary dynamics of the concept (s) in question. As a result, the reader will not find some encyclopaedic information (arising, evolution, use, etc.) of the rationality models examined, but he/she will rather find a structural, conceptual assessment of them.

2. About rationality model

The paper examine a species of the rationality model in the economic field – called *homo œconomicus* – in the conceptual framework the economic discipline is „classified" as a soft science, namely a praxeology, as figure 1 suggests. So, Economics, as praxeology, has as fundamental target the relationships between subject and object, aiming to clarify the subject, while a science has as fundamental target the relationships between object and object, aiming to clarify the object.
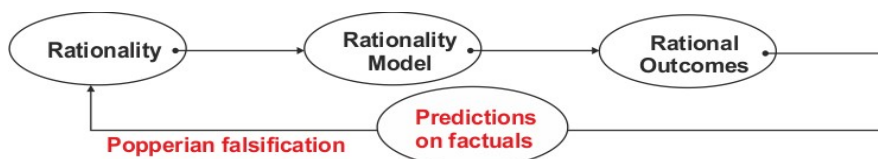
Relationship Concerning	Object-object (O-O)	Subject-object (S-O)	Subject-subject (S-S)
The object	**Sciences** - physics - biology - cosmology - chemistry	**Arts** - music - peinture - sculpture - literature - architecture	**Hermeneutics** - criticism - politics - history
The subject	**Logics** - logic - accounting - mathematics - linguistics	**Praxiologies** - *economics* - sociology - psychology - theoretical philosophy	**Ethics** - religion - morals - social philosophy

Figure 1. Scentificity is a predicate of the object-object relationship which concerns the object
Source: author

The above definition of rationality implies a source for it. This source is the concept of rationality model, i.e. the model containing the mechanisms or procedures to obtain the conclusion from the premises. So, by rationality model we will understand a logically invariant intellectual device that necessarily generates conclusions from premises, based on its own semiotic principles (the semiotic principles (or fields) are: a) *semantics*: relationships between sign and their referential (denotation); b) *syntax*: relationships among signs (when forming utterances like propositions); c) *pragmatics*: relationships between sign and the user of the sign.).

Figure 2 visualizes the Popperian model al rationality.

Figure 2. The Popperian model of rationality
Source: author

Of course, the possibility of predictions on factuals, and, correlatively, the Popperian falsifiability are not constitutive for the rationality model in general, but only for the scientific rationality model. For example, any metaphysical rationality model doesn't need to enact predictive propositions on the future factuals (events, phenomena, processes) in order to be tested (i.e. corroborated (as it is known - this is **Karl Popper**'s opinion, no theory or hypothesis can be factually confirmed/verified, but - in the best case - corroborated, i.e. not rejected, yet or rejected) through the associated descriptive propositions. So, the only condition for an outcome be rational (i.e. to have the property of rationality) is to be an outcome of a rationality model, no matter its nature. This means, like in the rationality case, the rationality model is completely neutral from the moral point of view.

A rationality model is not the entire theory in a field, but it is the core of the presumed theory. A rationality model must contain the following structural components:

- a *grounding principle*: this principle not needs to be of a positive nature; moreover, it is, in the most cases, of a metaphysical nature, so it not needs to be proved or explain. Simply, the grounding principle is based on belief. As consequence, the grounding principle is absolutely not questionable; a *system of* axioms - (the system of axioms forms the so-called $\alpha - set$ of a theory) (Roegen, 1971): they must be independent between them, consistent each other, and forming a complete set/system, i.e. the number of axioms must be sufficient to completely describe the phenomenology of interest; the smaller the number of axioms, the more mature the theory involved;

- a kind of *logic implied*: a logic contains three structural components: a) the number of truth values accepted, and the respective truth values; b) the logical principles accepted; c) the types of inferences accepted (the inferential rules).

If, in addition to the rationality model, a set of theorems and lemma are listed (this set is known as the so-called $\beta - set$.), then we obtain a theory.

So, the rationality model is a „calculation machine" that produces calculated (a calculus is, simply, any finite episode of a rationality model functioning. An outcome of a rationality model is any comprehensible result of a calculus.) conclusions. This means the rationality model and the free will are, principled, inconsistent each other. We will see, below, the consequences of such an affirmation, when the issue of irrationality will be discussed.

A question arises here, however: what about the case when we obtain a conclusion, delivered by a rationality model, but which is of an in-determination kind? We think in this case we still have a rationality model, because we still have a conclusion correctly derived inside the rationality model through its own logical procedure – inference – (so, the Gödel in-determination of the concluding utterance, if occurs, doesn't compromise the rationality model.). Principled, an in-determined conclusion implies that at least one of the premises be in-determined (we don't address here the probabilistic premise, that will necessarily generate a probabilistic conclusion, but the in-determined premise, that will necessarily generate an in-determined conclusion. Both the probabilistic inference and the in-determined inference are developed, in different degrees, in the dedicated literature.).

The rationality model is the only generator of the rationality, i.e. of the propositions having the property of rationality. If such a rationality model doesn't exist, we cannot talk about rationality anymore (below, we will introduce the concept of the a-rationality in this case.).

3. Rational decision (outcome)

Based on the above considerations, a strong conclusion, completely independent from the context, should be accepted: any conclusion logically derived inside a rationality model must be considered as rational. So, the rational is a property derived from the rationality which, in its turn, is ensured by the functioning of a rationality model. Here a semantic separation must be made between rationality and rational: rationality is a property of an inference hosted by a rationality model, while rational is a property of a conclusion obtained as consequence of the inference in cause. Figure 3 shows the relationship between the rationality model and the rational.

Figure 3. **From rationality model towards rational**
Source: author

A proposition is rational if and only if it is a conclusion generated by a valid inference inside a rationality model. No other qualifications are needed to establish a rational outcome, because is presumed the grounding principle and the set of axioms chosen for the rationality model include all the goals desired by the users of that rationality model. The most propagated definition of the rational decision is related to the (maximum) adequacy (although we will ignore here the optimization suggestion of the term „maximum", we principled think that the quality of rational mustn't be correlated with the extremization (maximization or minimization), but only with adequacy. And the most appropriate adequacy is between the conclusion and the inference inside a rationality model, not between the means and the goal, because the last is logically contained in the first.) of the means to the goal. It is easy to see this definition is not a primary one, because it is a logical consequence of the inference possible inside a rationality model. Or, a definition cannot be done in a secondary way, but in a primary one only.

What about a conclusion based on an inference inside a rationality model, but that lead us to an inappropriate relationship between the goal and the means? Could we say the conclusion is non-rational (as we will see soon, the non-rational has two species: a) the irrational; b) the a-rational.)? Of course, not. But a kind of falsifiability arises here, not the same of Popper's suggestion. We think we have a falsifiability delivered also by the factuals, but not in the standard way. In the standard way, the falsifiability process implies the followings: a) a theory (or a hypothesis, or a conjecture) about a fact; b) enacting a predictive proposition about the fact in case; c) performing an experiment, or experience (the distinction between the experiment and the experience consists in the type of time implied: the laboratory (accelerated) time is implied by the experiment, while the historic

(non-accelerated) time is implied by the experience. For example, the construction of the sovietised communist society was an experience not an experiment. In the social field (including the economic one) the experiments are extremely non-significant, despite the sympathy of the Nobel Prize Committee for such experiments.) to actualize the fact in case; d) enacting a descriptive proposition about the fact actualized; e) comparing the signification of the predictive proposition, respectively of the descriptive proposition. If the two significations are coincident, so the theory (or hypothesis, or conjecture) is corroborated, if not, it is rejected. In the case studied here, the points b) and e) are absent. The failure of applying the rational decision could lead us to re-examine the rationality model (for example, the current massive anomalies delivered by the homo œconomicus rationality model (even in its modern adjustments) will lead, without doubts, towards a new paradigm in the economic field, in the sense of Thomas Kuhn), but not to consider the decision be non-rational. So, although the way is a bit different from the standard case, a kind of falsification still exists in the rationality matter.

Like in the case of rationality, rational conclusions can be derived, based on valid inferences inside a rationality model, by a computer (or, larger, by the artificial intelligence). This fact strengths the above assertion about the calculus nature of the rational conclusion: indeed, the computer cannot be „accused" of free will but it delivers, however, rational conclusions. How? Of course, only based on calculus.

A last issue should be examined at this point: the issue of responsibility of undesirable (or even dangerous or immoral) consequences of applying a rational decision (either in the cognitive or in the praxiological way). Generally, the philosophers tend to exonerate from the responsibility the decision-makings which do not decide under their free will (for example, the theism generates such a lack of responsibility, while the deism introduces some nuances (degrees) in the responsibility of decision-makings.). However, accepting the rationality model (as it was been described above) means taking a decision based on the free will (remember, for example, that the grounding principle – and even the axioms set – are chosen based on belief), so the responsibility is held by this choice. Nobody can hide itself behind the rationality model to exonerate himself from the responsibility of applying the rational decisions obtained from that rationality model (except the case of theism, of course).

4. The homo œconomicus (HE) rationality model

The concept of homo œconomicus was proposed by Vifredo Pareto, but its content is best reflected in Adam Smith's description of the market and the way in which the market equilibrium is reached in an impersonal way. What I am here interested in is its relevance from the perspective of rationality.

The name œconomicus comes from the Greek terms oikos (house) and nomos (regulation, organizing). So, oikos means house, housekeeping, household, and nomos means rule, law, norm. It results the term economy refers to the rules to be observed within a household. Even the syntagm homo œconomicus suggests that it is the standard, generic, exemplary behaviour of an individual within a household (by extension, the term economy is used to address the economic space as a whole, for example, national

economy or even the world economy - although for such uses Hayek (Hayek, 1998) or von Mises (von Mises, 2018) suggested the term catalactics .

(1)   the fundamental principle

The fundamental principle of the homo œconomicus (HE) rationality model is the principle of selfishness. We consider the following predicates of sufficiency to define selfishness or egoism:
• the criterion of behaviour is the objectifying of the own interest;
• own interest is understood as an exteriorization (by axiologizing) of an intention;
• axiologizing of intention uses exclusively individual utility values - minimizing the individual opportunity cost (the setting of the individual cost of opportunity should take into account individual preferences, including their contextual variation, i.e. in terms of time, space and socio-economic and institutional conditions);
• the interest of another person from which his/her own interest - causal or conditional (conditional dependence is weaker than causal dependence, consisting in the need to gather certain properties of the environment in which causality manifests itself. From a logical point of view, cause and conditionality form a multiple cause, but many authors prefer to consider the conditionality separately. To avoid some inaccuracies of understanding, I mention both causal dependence and conditional dependence) depends will be considered to be his/her own interest as long as and to the extent that dependence is maintained (therefore, the interest of another person is not one of the criteria of behaviour of that individual, but only by virtue of the constitution of that interest as a conditionality or a cause of its own interest).

(2)   the set of axioms

I consider that the homo œconomicus (HE) model of rationality operates on the basis of the following four axioms, compatible and consistent with the fundamental principle, and with each other:
• (HE-A1) economic play is pure and perfect (or equivalent, the economic market is pure and perfect - the pure and perfect market is understood here in the sense that the standard economic theory proposes, namely the simultaneous verification of the following five predicates of sufficiency: a) the atomicity of the economic actors, whether individuals or organizations (including families): the economic actors have no power market (market power means the ability to influence the market price on the market); b) homogeneity of economic assets; c) free access (entry/exit) to/from the market; d) free movement of production factors; e) perfect transparency of the market, from informational perspective);
• (HE-A2) the economic decision is taken in order to minimize the opportunity cost (we recall that the opportunity cost of a decision is the maximum benefit to be given up when making that decision. Taking into account the fundamental principle of the HE model of rationality, the minimum opportunity cost refers to the individual taking the decision in question);
• (HE-A3) the individual has the unlimited capacity to instantly process the available (no information of interest is un-available.) information on the economic act;

- (HE-A4) the logical consistency of the economic calculation performed by the individual is infallible.

    (3)   the qualitative analysis of the set of axioms

    (a)   the consistency

- (HE-A1/HE-A2) the five pure axioms (principles) of the pure and perfect market are not contradictory to the choice based on minimizing the opportunity cost;
- (HE-A1/HE-A3) the five pure axioms (principles) of the pure and perfect market are not contradictory to the individual's maximum computing capacity;
- (HE-A1/HE-A4) the five pure axioms (principles) of the pure and perfect market are not contradictory to the inferential infallibility of the individual;
- (HE-A2/HE-A3) minimizing the opportunity cost is not contradictory to the unlimited processing capacity of the information;
- (HE-A2/HE-A4) minimizing the opportunity cost is not contradictory to inferential infallibility;
- (HE-A3/HE-A4): free, complete, and instantaneous access to information is not contradictory to inferential infallibility.

    (b)   the convergence

- the axioms (HE-A1) and (HE-A2) are convergent in that the minimization of the cost of opportunity in decision-making is supported by pure and perfect market conditions; the reverse relationship is also obvious;
- the (HE-A3) and (HE-A4) axioms are convergent to obtain a behavioural decision (perfect processing of information and assurance that inferences are valid);
- concerning the convergence of the two groups of axioms (the first two and the last two), I consider that again we can accept it, even if a relationship of direct determination between them is not obvious; in any case, the two groups are not divergent but, at worst, indifferent. I would think that indifference „bends" towards convergence rather than divergence (here is a problem of greater generality. The fact that indifference signifies agreement rather than disagreement is corroborated from two empirical directions: a) Karl Popper's falsification criterion (Karl Popper, 1981): if a test is not conclusive in rejecting a hypothesis, the hypothesis must be considered "corroborated"; b) legally, the silence means consent. In both cases, we have a situation of indifference that has been capitalized in the "positive" sense, that is, in our case, in the sense of convergence rather than that of divergence.).

    (c)   the completeness

The completeness of the axioms system is analysed in a qualitative way, namely by highlighting the functionality of the axioms system concerned. To be functional, the set of axioms must ensure a complete decision-making system. If this can be shown then the set of axioms will be considered complete or, in other words, it will be considered to check the completeness criterion. In general, the functionality of a decision-making system involves the existence (of course, consistently and coherently or convergently) of the following „devices": a) the institutional criterion (including the information base); b) the criterion of decision (or of stopping of deliberation); c) deliberative performance or

competence (i.e. the potential to actually take decisions); d) quality control of the decision taken.

I will perform two qualitative analyses here: (i) analysis of axioms independence (i.e. non-redundancy); (ii) analysis of the functioning of the decision system provided by the set of axioms.

(i) independence (non-redundancy) of axioms:

• (HE-A1/HE-A2) from the pure and perfect market conditions cannot be deduced the possibility of taking the decision by minimizing the opportunity cost; also, making the decision by minimizing the opportunity cost is also possible under other conditions than those provided by the pure and perfect market axioms;

• (HE-A1/HE-A3) from the pure and perfect market conditions cannot be deduced the possibility of unlimited processing capacity of the information; the unlimited capacity of information processing does not lead to pure and perfect market conditions;

• (HE-A1/HE-A4) from the pure and perfect market conditions cannot be deduced the inferential infallibility; at the same time, inferential infallibility does not logically lead to pure and perfect market conditions;

• (HE-A2/HE-A3) from the minimization of the opportunity cost, the unlimited capacity of information processing cannot be deduced; from the unlimited capacity of information processing cannot be inferred the minimization of opportunity cost;

• (HE-A2/HE-A4) the inferential infallibility cannot be deduced from the opportunity cost minimization; from the inferential infallibility cannot be inferred the minimization of the opportunity cost;

• (HE-A3/HE-A4) unlimited inferential infallibility cannot be deduced from the unlimited data processing capacity; from the inferential infallibility cannot be deduced the unlimited processing capacity of the information.

We conclude that the set of axioms proposed for HE contains only primitive axioms (none of the axioms is a theorem of any of the others).

(ii) the functionality of the decision-making system:

• the institutional criterion/(HE-A1) the pure and perfect market axioms represent the institutional framework of HE model operation. As we have seen above, this axiom encompasses five institutional conditions (by institutional conditions we understand not only formal – codified - institutions but also informal institutions - customs, moral norms, habits, traditions, etc.).) in which the economic decision is made and the economic action takes place;

• the decision (behaviour) criterion/(HE-A2) the axiom of decision-making based on the opportunity cost integrates the rationality criterion of the HE model (by integrating its fundamental principle - the principle of egoism); therefore, the rational decisions taken within this model will check this axiom, otherwise they will be considered irrational related to the HE model;

• the performance competence/(HE-A3) the axiom of unlimited and instantaneous computing capacity (information processing) refers to the competence of the individual within the HE rationality model; through competence (analogous to the case of language - performance competence refers to the ability to correctly, according to the morphological and syntactic norms of that language, form verbal enunciations aimed at to be understood

- in their meaning - by individuals who know the language in question.) is meant the ability of the individual to carry out the specific and sufficient actions in a performative model, in our case, the ability to execute the specific and sufficient calculations for substantiating the decision taken on the basis of the (HE-A2) axiom;

• the decision quality control/(HE-A4) the axiom for inferential infallibility is the „unit" of controlling the HE rationality model; although it seems to be dependent on the previous axiom (HE-A3), it is still noticed that this impression is false: the ability to process the information does not imply the correctness of this processing. As a result, this axiom assures that, in the HE rationality model, the calculation made by the economic individual is correct in the sense that it is logically valid (non-logical - mathematical, qualitative, etc. - issues are not of interest here, referring rather to calculation tools than to calculation procedures. Calculation procedures, or inference, must be valid according to the logic accepted by the rationality model in question - for the HE model, the logic accepted is the bivalent one) .

We conclude that the set of axioms proposed for HE is operable, i.e. it has the minimum structure required (sufficient) to work.

Based on the two previous conclusions, we draw the final conclusion that the HE model's axiom set is a complete system.

(4)   some logical consequences of the set of HE axioms

• the optimal decision is unique: indeed, given an function-objective and a restrictions system, the optimal value of this pair is unique (either minimum or maximum);

• there is a unique theoretical model HE: the theoretical model HE is the model in which the axioms are verified as formulated above; obviously, these formulations are unrealistic, they are not (and cannot be) verified in the real world, but the theoretical model is a benchmark against which we can relate more realistic HE models, i.e. models in which the maximum formulations of axioms suffer adjustments to bring them closer to the real world;

• the fundamental principle of the HE model (principle of selfishness) is integrated into the HE-A2 axiom (minimizing the cost of opportunity in economic decision-making) because, as we have already mentioned, minimizing the opportunity cost of the decision refers to the decision taken by the individual concerned, so it serves exclusively for his interest;

• there are many potential HE models that can be practiced: by a practicable model HE I understand a model that deviates from the theoretical model by relaxing some axioms (that is, by formulating them closer to the real condition of the economic individual). Depending on which particular axiom is adjusted, as well as the actual adjustment, these practicable patterns can be assigned to certain classes. Here's a suggestion on how to build these classes (see below figure 4, where by HEP was noted the potential more realistic HE).

		THE ADJUSTED (RELAXED) CHARACTERISTIC			HE
		COMPLETENESS	EXTREMALITY		
HEP/1	HE-A1	(HE-A1/c) Limited access to information; paid access to information[1]; delayed access to information[2]			HE with informa
			(HE-A1/e) Non-atomicity of the economic actors; non-homogeneity of the products		HE with semi-fr
				(HE-A1/a) Barriers from accessing the market; barriers from free moving of the production factors	HE with semi-a
		(HE-A1/c)	(HE-A1/e)		HE with opaque
		(HE-A1/c)		(HE-A1/a)	HE with rigid m
			(HE-A1/e)	(HE-A1/a)	HE with closed
		(HE-A1/c)	(HE-A1/e)	(HE-A1/a)	HE with blocke
HEP/2	HE-A2	(HE-A2/c) The opportunity cost doesn't take into account all the alternatives			HE informationa
			(HE-A2/e) The opportunity cost is not always minimized		HE informationa
		(HE-A2/c)	(HE-A2/e)		HE informationa
HEP/3	HE-A3	(HE-A3/c) Limited capacity of calculus			HE computatio
		(HE-A4/c) Limited infallible inferential capacity			HE inferentially
			(HE-A4/e) Non-infallibility in making inferences		HE inferentially

Figure 4. Practical and potential HE models
Source:autor

Note:
[1] From a theoretical point of view, this adjustment is equivalent to the presence of transac
[2] From a theoretical point of view, this adjustment is equivalent to the informational ineffi
[3] This would be the model of *HE with bounded rationality* proposed by Herbert Simon

Adjustment to the level of completeness (i.e. relaxation of the completeness) leads to the attribute called isolated; adjusting to the extremality level leads to the attribute called local; adjusting to the accuracy level leads to the attribute called undecidable. So, by combining the three attributes can be, conceptually, obtained as follows:

• isolated & local involves opaque;
• isolated & undecidable involves rigid;
• local and undecidable involves closed;

Combining the three attributes: isolated & local & indecisive, involves the attribute called blocked.

Figure 4 tries a systematization of the above considerations.

5. Conclusions

The logical modelling of economic behaviour could not (and never could) avoid the "rational key". The adaptation of the originary homo œconomicus model in order to capture the realistic and empirical elements of actual economic behaviour has only made adjustments, without affecting the fundamental axioms, a pattern of behaviour which in its essence remains in the "territory" of rationality. In fact, even an attempt to integrate into the homo œconomicus model topics of i-rationality or a-rationality cannot escape the rational method of doing that.

The study, in essence, is not so much about an adjustment/adaptation of the homo œconomicus model so as to provide reasonable predictions, as Milton Friedman's

fundamentalist positivism (Friedman, 1953) asks, rather for an ab ovo construction of economic behaviour in a psycho-sociological and anthropological keys, face to the mechanistic key, which I would call homo socionomicus "rationality" model (in relation to which I will return with a later intervention).

6. References

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