Truth Values in the Economic Logics

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Abstract: The bivalent logic usually performed in the economic discipline and thinking seems be unsatisfactorily because in the social field almost all the actions are based on teleology, i.e. on the goals. Consequently, the paper discusses a proposal to introduce tetravalent logics in the social field (so, in the economic one), that exhibits four truth values. In this context, the paper develops some considerations regarding the conceptual and methodological issues associated with the tetravalent logics proposal.

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1. General Framework

We consider that the following g coordinates should underlie a possible solution to clarify the matter of truth in economy (broader, within the social field):

- In economy (broader, within the social field), due to the presence of the subject within the structure of the economic phenomenon/process, the purpose is the dominant cause of any such phenomenon/process. For the moment, we are not interested whether this purpose is individual or not, whether it is decided at the individual level or not. As shown, the economic phenomenon/process doesn't exist per se; rather it is generated by the decision, the action of the subject (all the economic phenomena/processes being artefacts)[2];

- The immediate consequence of the previous trait is that the prescriptive statements are dominant in economy. By prescriptive statement we understand a statement or assertion which indicates goals or procedures/means to reach the

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[2] Hence, in the economic (social) field, the future doesn't come, rather it is built; it is not emergent, rather planned (even if the matter of the future as intellectual project has yet to wait until approached within this paper).

goals[1]. The prescriptive statements are, like the predictive statements, prior to the relevant factual, but they don't refer just the factual itself, like the predictive statements, but rather concomitantly to the factual, to the subject and to its action to generate the factual. The formal presentation of the two categories of statements (predictive, and prescriptive) might look like this:

- F: concerned factual;
- t_{-1}: moment when the prescriptive or predictive statement about the concerned factual is formulated;
- t_0: moment when the factual concerned by the prescriptive or predictive statement occurs;
- t_1: moment when the descriptive statement is formulated;
- $t_{-1} < t_0 < t_1$: time arrow condition;
- F_0: actual factual;
- $\dot{F}_{-1}$: factual concerned by the predictive statement;
- $\ddot{F}_{-1}$: factual concerned by the prescriptive statement;
- $\dddot{F}_1$: factual concerned by the descriptive statement;
- P_{-1}: predictive statement;
- N_{-1}: prescriptive statement;
- D_1: descriptive statement.

We might then have the following formal presentations (which we will subsequently use):

$$P_{-1}(F) = P\left(t_{-1}, \dot{F}_{-1}\right)$$

$$N_{-1}(F) = N\left(t_{-1}, \ddot{F}_{-1}\right)$$

$$D_1(F) = D\left(t_1, \dddot{F}_1\right)$$

- Based on the first two explanations, we can now make the third one: in the economic field (broadly, in the social field), the correspondence-truth is not relevant because the economic factual is not described by predictive statements, rather by prescriptive statements. Within this context, the descriptive statement

[1] In terms of semiotics, such statements are of the same type as Austin's perlocutionary statements (statements which change the situation within the context of their formulation; for instance, Habermas' concept of communicative action is a species of perlocutionary statement, because it aspires to change the polemic stance of the interlocutor).

doesn't inform about the factual only, but about three elements too: a) the factual itself; b) the subject which h issued the prescriptive statement which, most times, at the individual, collective or representative levels, is the same with the subject which generates the prescribed factual; c) the action which led to the appearance of the factual[1]; on this basis, the formal description above concerning the prescriptive statements and the descriptive statements associated to them, will change as follows:

$$\mathcal{N}_{-1}(F) = \mathcal{N}\left(t_{-1}, \ddot{F}_{-1}, SN_{-1}, SA^{N}_{[-1,0]}, AN_{[-1,0]}\right), \text{ where:}$$

SN_{-1}: deciding subject (or normative subject); $SA^{N}_{[-1,0]}$: actional subject as it is set by the normative subject; $AN_{[-1,0]}$: the action required (normed) to turn objective factual $\ddot{F}_{-1}$.

$$\mathcal{D}_{1}(F) = \mathcal{D}\left(t_{1}, \ddot{\ddot{F}}_{1}, SA^{A}_{[-1,0]}, SE_{1}, AR_{[-1,0]}\right), \text{ where:}$$

$SA^{A}_{[-1,0]}$: actual actional subject (or praxeological subject); SE_1: evaluating subject (or observing subject); $AR_{[-1,0]}$: action accomplished (implemented) which produced factual F_0.

- Therefore, in the economic field, testing the "truth" is done by comparing the prescriptive and descriptive statements, as they were described above:

$$\mathcal{N}_{-1}(F) \setminus \mathcal{D}_{1}(F), \text{ or}$$

$$\mathcal{N}\left(t_{-1}, \ddot{F}_{-1}, SN_{-1}, SA^{N}_{-1}, AN_{[-1,0]}\right) \setminus \mathcal{D}\left(t_{1}, \ddot{\ddot{F}}_{1}, SA^{A}_{[-1,0]}, SE_{1}, AR_{[-1,0]}\right), \text{ where:}$$

\: our choice of noting the logic constant *is compared with*.

- Due to the complex character of the economic system/process (generated by the structural presence of the subject), any prescriptive statement will have two components: an eutaxiological one, aimed to capture, within the economic process, the necessary type of causality[2], and a teleological one, aimed to capture the contingent type of causality (in our case, the causality based on purpose). We may accept[3] that we have a linear overlapping of these two types of causality. If we

[1] Here, the expression appearance of the factual must not be taken ad litteram, because in the economic field, as mentioned before several times, the factuals don't emerge, rather are objectivised by the decision and, subsequently, by the action of the subject.

[2] Although the proportion of the eutaxiological causality still is very small within the economy (broadly, within the social field), there is, however, what we call an intra-contingent necessity, which overlaps this type of causality (for instance, the exhaustion of the fossil resources is a necessity within a process decided within a contingent manner).

[3] We are using here an analogy with the situation from the quantic mechanics of the linear overlapping of the potential states of a quantic object before proceeding to an experiment with that object. The accomplishment of the experiment collapses the wave function which describes the state of the quantic object, so that the observer (the scientist) notices a unique state. Although the

describe a prescription based on this linear overlapping as: $\mathcal{N}_{-1}(F) = \alpha \cdot E + \beta \cdot T$, where E is the eutaxiological component, and T is the teleological component, while α and β are weighing coefficients ($\alpha \ll \beta$, and $\alpha + \beta = 1$), then, a prescriptive statement can be represented as in Figure 1.

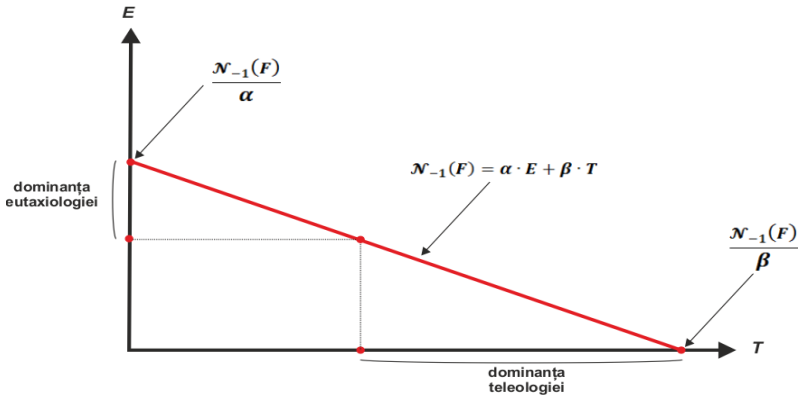

Figure 1. Linear overlapping within the structure of the prescriptive statement

The prescriptive statement will thus have the following formulation:
$\mathcal{N}\left(t_{-1}, \dot{F}_{-1}, \ddot{F}_{-1}, SN_{-1}, SA^{N}_{-1}, AN_{[-1,0]}\right) =$
$\alpha_{-1} \cdot E\left(t_{-1}, \dot{F}_{-1}, SN_{-1}, SA^{N}_{-1}, AN_{[-1,0]}\right) + \beta_{-1} \cdot T\left(t_{-1}, \ddot{F}_{-1}, SN_{-1}, SA^{N}_{-1}, AN_{[-1,0]}\right)$

The descriptive statement will thus have the following formulation:

$$\mathcal{D}\left(t_1, \ddot{F}_1, SA^{A}_{[-1,0]}, SE_1, AR_{[-1,0]}\right) = \alpha_1 \cdot E\left(t_1, \ddot{F}_1, SA^{A}_{[-1,0]}, SE_1, AR_{[-1,0]}\right) + \beta_1 \cdot T\left(t_1, \ddot{F}_1, SA^{A}_{[-1,0]}, SE_1, AR_{[-1,0]}\right)$$

As α_1 depends on β_{-1} (the proportion "allocated" to normativity in developing the prescriptive statement introduces restrictions for the accomplishment of eutaxiology when the factual occurs, therefore within the linear structure of the descriptive statement), we may write:

$$\mathcal{D}\left(t_1, \ddot{F}_1, SA^{A}_{[-1,0]}, AR_{[-1,0]}\right) = f(\beta_{-1}) \cdot E\left(t_1, \ddot{F}_1, SA^{A}_{[-1,0]}, SE_1, AR_{[-1,0]}\right) + \beta_1 \cdot T\left(t_1, \ddot{F}_1, SA^{A}_{[-1,0]}, SE_1, AR_{[-1,0]}\right)$$

collapsing method used to explain the transition from the quantic state to its macroscopic description is rather unsatisfactory, it remains, nevertheless, an explicative alternative until ne suppositions emerge.

Purely theoretically, and simplifying the algebraic formulations just with an illustrative role, we may have the following cases of the prescriptive statement, depending on the values taken by coefficients α and β (Figure 2):

	α	β_{-1}	β_1	β_1 vs. β_{-1}	β	$\mathcal{N}(t_{-1}, \ddot{F}_{-1}, SN_{-1}, AN_{[-1,0]})$
Case 1	$\alpha \neq 0$	$\beta_{-1} = 0$	$\beta_1 = 0$	$\beta_1 = \beta_{-1}$	$\beta = 0$	Exclusive eutaxiology
Case 2			$\beta_1 \neq 0$	$\beta_1 \neq \beta_{-1}$	$\beta \neq 0$	Linear overlapping eutaxiology-teleology
Case 3		$\beta_{-1} \neq 0$	$\beta_1 = 0$	$\beta_1 \neq \beta_{-1}$	$\beta \neq 0$	
Case 4			$\beta_1 \neq 0$	$\beta_1 = \beta_{-1}$	$\beta = 0$	Exclusive eutaxiology
Case 5				$\beta_1 \neq \beta_{-1}$	$\beta \neq 0$	Linear overlapping eutaxiology-teleology
Case 6	$\alpha = 0$	$\beta_{-1} = 0$	$\beta_1 = 0$	$\beta_1 = \beta_{-1}$	$\beta = 0$	No prescriptive statements are formulated
Case 7			$\beta_1 \neq 0$	$\beta_1 \neq \beta_{-1}$	$\beta \neq 0$	Exclusive teleology
Case 8		$\beta_{-1} \neq 0$	$\beta_1 = 0$	$\beta_1 \neq \beta_{-1}$	$\beta \neq 0$	
Case 9			$\beta_1 \neq 0$	$\beta_1 = \beta_{-1}$	$\beta = 0$	No prescriptive statements are formulated
Case 10				$\beta_1 \neq \beta_{-1}$	$\beta \neq 0$	Exclusive teleology

Figure 2. Theoretical cases of prescriptive statements

➢ *Cases 1 and 4*: pure phenomenological predictive statements (exclusively eutaxiological).

- For instance: predictions regarding the evolution of the fossil fuel reserves.

➢ *Cases 7, 8 and 10*: pure normative prescriptive statements (exclusively teleological).

- For instance: prescribing (norming) the maximal public budget deficit.

➢ *Cases 6 and 9*: impossibility (or uselessness) of formulating prescriptive statements in economy.

➢ *Cases 2, 3 and 5*: standard prescriptive statements, relying on the linear overlapping between eutaxiological and teleological.

- For instance: prescribing the annual inflation (average or at the end of the year), or prescribing the nominal exchange rate.

2. Concept of "truth" in Economy

It is strongly recommended that the paper should have an even number of pages, but no longer than 4 to 14 pages. In some cases papers with more than 14 pages will be accepted by the editorial board if they contain the report of a wider research activity which can not appear separated in two papers.

2.1. Four Values of Occurrence[1] in the Economic Field

Let us see how must be done the comparison between the prescriptive and the descriptive statements and how to decide on the "truth" of the prescriptive statement.

First, we set, within the new framework of the discussion, the differences between the predictive and the prescriptive statements. This is shown in Figure 3.

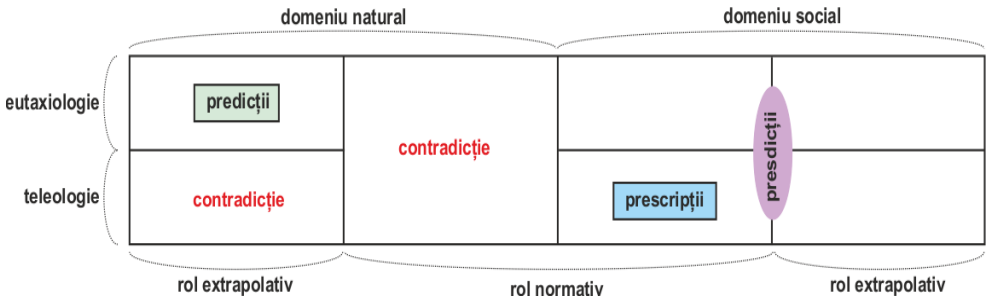

Figure 3. Cases of predictions, prescriptions and presdictions

NB: the term invented by us for the present necessities – *presdictions* – signifies the linear overlapping of predictions and prescriptions, when eutaxiological or teleological causalities also appear concomitantly.

Second, remember that we have to compare three entities which can be found, at the particular moments of time, both in the prescriptive statement, and in the descriptive statement[2]: 1) the factual itself; b) the subject which issued the prescriptive statement; c) the action which caused the appearance of the factual.

[1] We prefer to replace the term of truth with the term of occurrence. The justification of this action lies in the higher possibility to persist, in our memory, the significance of the correspondence-truth when we are discussing about the concept of truth as such. As it resulted from several arguments presented so far, the correspondence-truth has no relevance for the economic field. Therefore, when we will approach the matter of the tables of truth, we will call them tables of occurrence.

[2] We are ignoring the fact that the prescriptive statement contains, many times, eutaxiological causality too (that is, cases when $\alpha \neq 0$, using the notation used above). This disregarding doesn't compromise the generality of our considerations, although technically, in this disregarded case we will have two "modules" to analyse: a) the eutaxiological module, for which the eutaxiological

- For the factual: $\ddot{F}_{-1} \setminus \ddot{F}_{1}$;

- For the subject: $SN_{-1} \setminus SA^{N}_{[-1,0]}$; $SN_{-1} \setminus SA^{A}_{[-1,0]}$; $SN_{-1} \setminus SE_{1}$; $SA^{N}_{[-1,0]} \setminus SA^{A}_{[-1,0]}$;
$SA^{N}_{[-1,0]} \setminus SE_{1}$; $SA^{A}_{[-1,0]} \setminus SE_{1}$;

- For the action: $AN_{[-1,0]} \setminus AR_{[-1,0]}$.

Therefore, unlike the standard case (for instance, that of the correspondence-truth), this time we don't just compare semantically the content of the prescriptive and descriptive statements (in terms of the coincidence of denotations signified by each of the two statements); rather we also check the two "coincidences": between the involved subjects and between the involved actions.

Third, we consider, relying on what we have already shown, that in the economic field (broadly, in the social field) it is necessary that the bivalent logics, with two truth values – true (*A*) and false (*F*) – which is compatible with the correspondence-truth (inadequate, irrelevant and impossible to verify because, in this field, we almost don't have predictive statements) – must be replaced by tetravalent logics[1], with four "truth" values:

1. A: nominal accomplishment, "with no rest", of the prescribed purpose;

2. $\bar{A}_{+}$: nominal missing of the purpose[2], however, accompanied by unintentional[3] consequences, convenient to the subject;

3. A_{-}: nominal accomplishment of the purpose, but accompanied by unintentional consequences, non-convenient to the subject;

4. $\bar{A}$: nominal missing, "with no rest", of the purpose.

One may notice the following issues regarding this proposal:

a. We don't raise the issue of the discrete levels of accomplishing the purpose, because that would lead to logics with an infinite and countable multitude of values (polyvalent logics); we also don't raise the issue of the continuous levels of purpose accomplishment, because it would lead to logics with an infinite and

component plays a role of predictive statement; b) the teleological module, for which the teleological component plays the role of normative statement.

[1] For instrumental reasons, we propose to call this possible logics: $4\mathcal{A}$ logics .

[2] The negation sign $(\bar{A})$ has the same significance as in the classical logics, which allows formulating the principle of identity $(A = A)$, the principle of non-contradiction $(A \wedge \bar{A})$, and the principle of the excluded third party $(A \vee \bar{A})$.

[3] The concept of unintended consequence has been highly theorized by Karl Popper, who was saying that the most important task of the social sciences is to make predictions about the unintended consequences of the taken decisions.

uncountable multitude of values (fuzzy logics); therefore, the purpose is either accomplished, or unaccomplished, only that for each of these cases we introduce the possibility that the accomplishment or unaccomplishment is accompanied by unintended consequences with opposite significance: non-convenient to the subject (nominal accomplishment, "with rest", of the purpose), or convenient to the subject (nominal missing, "with rest", of the purpose).

b. The nominal missing, "with rest", of the purpose is not equivalent with the partial accomplishment (therefore with a partial level of accomplishment of the purpose) because the convenient unintentional consequences, by definition, are not part of the purpose; similarly, the nominal accomplishment, "with rest", of the purpose is not equivalent with the full (more precise, accurate) unaccomplishment of the purpose, because the non-convenient unintentional consequences, by definition, are not part of the purpose

c. Applying Karl Popper's suggestion to make predictions about the unintended consequences of our decisions leads, in terms of logics, in our opinion, to the classical prediction: indeed, an unintended consequence, not being part of a purpose (case in which it would become intended), it can't have a contingent character, rather a necessary one; therefore, it will not submit to the teleological causality, rather to an eutaxiological causality. However, as seen in Figure 14, such situation can only be dealt with using predictions;

d. We will also notice that we have no less than six comparative situations regarding the subject involved in the matter of the economic truth, while in the case of predictions (the correspondence-truth) the subject doesn't appear neither in the predictive statement, nor in the descriptive statement, because we only have eutaxiological causality generated by necessity.

e. The two values of truth in the cases "with rest" are generated by the fact that, in the economic field, the normative subject (SN) can differ from the actional subject (SA) and from the evaluating subject (SE). Here are the possible situations:

(1) $SN \equiv SA \equiv SE \equiv S^{NAE} \rightarrow$
$\mathcal{N}\left(t_{-1}, \ddot{F}_{-1}, S_{-1}^{NAE}, AN_{[-1,0]}\right) \setminus \mathcal{D}\left(t_1, \ddot{F}_1, S_1^{NAE}, AR_{[-1,0]}\right)$ (NB: the sign $\equiv$ has the significance of *identical* or *equivalent*): therefore, in this case we have only two elements to compare: a) $\ddot{F}_{-1} \setminus \ddot{F}_1$; b) $AN_{[-1,0]} \setminus AR_{[-1,0]}$; we may formulate this comparison as follows: the prescribed factual is compared to the produced factual[1] under the conditions in which the prescribed action is compatible with the actual action. But what does it actually mean that the prescribed action is compatible with the actual action? Here are some considerations:

[1] A more exact term, which to replace produced is accomplished, because, as already shown, the economic factuals are always artefacts; they don't appear or are produced, rather they are accomplished by the subject.

– *First*, what does it mean that all the three involved subjects are identical (or equivalent, more generally)? It means, of course, that all subjects aim the same purpose, which means that we have the following expectation: $\ddot{F}_{-1} \equiv F_0 \equiv \ddot{F}_1 \equiv F$. Of course, the equivalence of the subjects doesn't involve their ontological identity: this means that the three subjects may be ontologically different[1] (each of them is a different person) but praxeologically equivalent (have the same purpose, each in terms of his "role": prescribing the purpose, accomplishing the purpose, evaluating the accomplished purpose). In order to suggest in a formal manner too this difference between the ontological equivalence and the praxeological equivalence, we will adjust the above notation as follows:

✓ ontological equivalence: $x \overleftarrow{\equiv} y$;

✓ praxeological equivalence: $x \overrightarrow{\equiv} y$.

On the other hand, the subjects can be ontologically identical, but praxeologically different. This situation occurs when the initial conditions of the subjects change either in the temporal interval $[-1,0]$, i.e., between the time of formulating the prescription and the time of accomplishing the action, or in the temporal interval fie $[0,1]$, between the time of accomplishing the action and the moment of evaluating its result. In terms of our scientific interest, important is the praxeological equivalence of the subjects, not their ontological equivalence[2];

- *Second*, it is obvious that the prescribed factual is the very purpose, therefore comparison $\ddot{F}_{-1} \setminus \ddot{F}_1$ tells us whether the purpose has been accomplished or not;

– *Third*, from comparison $AN_{[-1,0]} \setminus AR_{[-1,0]}$ we should find out whether unintended consequences appeared after $AR_{[-1,0]}$; in our opinion, if the three involved subjects are praxeologically equivalent, the prescribed action will be identical (or equivalent, in terms of significance) with the accomplished action, namely $AN_{[-1,0]} \equiv AR_{[-1,0]}$;

– *Fourth*, therefore, the compatibility between the prescribed action and the accomplished action (actual action) means that the two stances of the action (prescribed and actual) have the same significance for the evaluating subject.

(2) $\overrightarrow{SN} \equiv \overrightarrow{SA} \equiv S^{NA} \not\equiv \overrightarrow{SE} \rightarrow$
$\mathcal{N}\left(t_{-1}, \ddot{F}_{-1}, S_{-1}^{NA}, AN_{[-1,0]}\right) \setminus \mathcal{D}\left(t_1, \ddot{F}_1, SE_1, AR_{[-1,0]}\right)$: in this case we have a praxeological equivalence between the normative subject and the actional subject,

[1] The expression ontological difference involved by the reasoning of this study has, of course, nothing to do with the complicated concept of ontological difference (distinction being/person-being/existence) discussed by Heidegger. We hope we didn't confuse our scrupulous readers.

[2] Nevertheless, from other perspectives (social, political etc.) the ontological identity (equivalence) of the subjects is also relevant.

but the evaluating subject is different from the two subjects. The comparison between the prescriptive statement and the descriptive statement is also done for two components of the two statements, a) $\ddot{F}_{-1} \setminus \ddot{F}_1$, and b) $, AN_{[-1,0]} \setminus AR_{[-1,0]}$, but there is the possibility that $\ddot{F}_{-1} \not\equiv \ddot{F}_1$ because of the different evaluation of $AN_{[-1,0]}$, or of $AR_{[-1,0]}$. Therefore, we may have here the following sub-cases:

- $\ddot{F}_{-1} \,\hat{\not\equiv}\, \ddot{F}_1$ (where $\hat{x}$ denotes the situation "with rest", convenient, which accompanies the logical constant x), showing that the prescribed (normed) purpose was not accomplished, but unintended consequences, convenient for the evaluating subject[1] appear; formally, we have a situation of the type $\bar{A}_+$;

- $\ddot{F}_{-1} \,\hat{\equiv}\, \ddot{F}_1$ (where $\hat{x}$ denotes the situation "with rest", non-convenient, which accompanies the logical constant x), showing that the prescribed (normed) purpose was accomplished, but unintended consequences, non-convenient for the evaluating subject appear; formally, we have a situation of the type A_-;

- $\ddot{F}_{-1} \equiv \ddot{F}_1$: the prescribed (normed) purpose is accomplished, "with no rest"; although the normative subject is different praxeologically (but possibly equivalent ontologically[2]) from the evaluating subject, we cannot exclude the situation in which the two have the same evaluation about the accomplishment of the prescribed purpose; formally, we have a situation of the type A;

- $\ddot{F}_{-1} \not\equiv \ddot{F}_1$: the prescribed (normed) purpose is not accomplished, "with no rest"; formally, we have a situation of the type $\bar{A}$;

(3) $\overrightarrow{SN} \equiv \overrightarrow{SE} \equiv S^{NE} \not\equiv \overrightarrow{SA} \rightarrow$
$\mathcal{N}\left(t_{-1}, \ddot{F}_{-1}, S_{-1}^{NE}, AN_{[-1,0]}\right) \setminus \mathcal{D}\left(t_1, \ddot{F}_1, S_1^{NE}, AR_{[-1,0]}\right)$: in this case we have a praxeological equivalence between the normative subject and the evaluating subject, and a difference between them in relation to the actional subject. Similarly to the above situation, the differences in accomplishing the purpose (leading to the same four situations as those described at pct. (2) above) are generated by the fact that the actional subject, being different both from the normative subject and from the evaluating subject, can implement an action which deviates from the normed action, namely $AN_{[-1,0]} \not\equiv AR_{[-1,0]}$;

(4) $\overrightarrow{SA} \equiv \overrightarrow{SE} \equiv S^{AE} \not\equiv \overrightarrow{SN} \rightarrow$
$\mathcal{N}\left(t_{-1}, \ddot{F}_{-1}, SN_{-1}, AN_{[-1,0]}\right) \setminus \mathcal{D}\left(t_1, \ddot{F}_1, S_1^{AE}, AR_{[-1,0]}\right)$: in this case we have a praxeological equivalence between the actional subject and the evaluating subject, as well as a difference between the two on the one hand, and the normative subject,

[1] Which, of course, may not have the same significance for the prescriptive (normative) subject, or may even not exist for it (meaning that the purpose is accomplished "with no rest").
[2] The praxeological non-equivalence concomitant with the ontological equivalence can be also explained by the Oedipus effect.

on the other hand. The possible consequences are, again, the four situations which we already analysed, because, although the evaluating subject and the actional subject can "agree" on the implemented action, therefore about the accomplishment of the purpose, and on the unintentional consequences that occurred by the implementation of that particular action, the normative subject may have a different "opinion".

Based on types of occurrence we may now state the types of statements.

We have seen that in the economic (more generally, social) field, almost all statements fall into two categories: a) prescriptive statements[1] $(.)$; and b) descriptive statements – $\mathcal{D}(.)$. In terms of their form, these statements are function of five variables: moment of formulation, involved subjects (two in each case), purpose and action (see paragraph 3.9.1). We may strike out the time variable, because it is decided that the prescriptive statement will be formulated before the accomplishment of the action associated to the prescribed purpose, while the descriptive statement will be formulated after the accomplishment of that action. We may also remove the variable referring to the action because we may presume that the differences between the prescribed action and the actually accomplished action are preserved in the differences between the prescribed purpose and the actually accomplished purpose (of course, only nominally, because the differences between the prescribed purpose and the actually accomplished purpose are of a different nature than the differences between the prescribed action and the accomplished action). We may also remove the variable referring to the actional subject, because the differences between the prescribed actional subject and the actual actional subject can also be found (nominally, too) within the differences between the prescribed purpose and the accomplished purpose. Therefore, according to the previous notations, the two types of statements have the following form:

- Prescriptive statement: $\mathcal{N} = \mathcal{N}(SN, \ddot{F})$;
- Descriptive statement: $\mathcal{D} = \mathcal{D}(SE, \ddot{\ddot{F}})$.

All the four occurrence values proposed earlier (A, $\bar{A}_+$, A_-, $\bar{A}$) are possible because of the differences between $\ddot{F}$ and $\ddot{\ddot{F}}$, correlated with (forcing the language we might also say: generated by) the praxeological differences between SN and SE[2].

[1] In some cases, they will be of a mixed type: predictive-prescriptive, that is, what we earlier named presdictive (or presdictions).

[2] The reader has already learned that the differences between the two categories of subjects are praxeological differences, namely differences of design and evaluation of the purpose. Although it is not impossible that the two subjects also are ontologically different (i.e., different natural persons), we are only interested in the praxeological differences.

We will no give names to the statements of $4\mathcal{A}$ logics, as they verify the occurrence values (Table 1).

Table 1. Typology of statements within $\underline{4\mathcal{A}}$ logics

Value of occurrence	Type of statement[1]
A	Performative statement ($\mathcal{N}_{[p]}$)
$\bar{A}_{+}$	Convenient, non-performative statement ($\mathcal{N}_{[\bar{p}c]}$)
A_{-}	Non-convenient performative statement ($\mathcal{N}_{[p\bar{c}]}$)
$\bar{A}$	Non-performative statement ($\mathcal{N}_{[\bar{p}]}$)

2.2. Significance of the Values of Occurrence

It is obvious that the significance of the occurrence values proposed in $4\mathcal{A}$ logics, which we find adequate to the economic field (otherwise, broadly, to the social field) is no longer related to the correspondence-truth concept, specific to the natural field. In conclusion of this chapter we would like to make some comments on the significance of the prescriptive statements[2] associated to the values of occurrence.

- *Performative statement* ($\mathcal{N}_{[p]}$). The value of occurrence of this prescriptive statement a is noted with A. A performative statement signifies that the purpose prescribed within it has been accomplished through the action associated to that purpose. Furthermore, this statement "specifies" that no unintended consequences[3]

[1] This typology of the statements refer, of course, to the prescriptive statements, after they were tested by comparing them with the associated descriptive statements (the same procedure as for the values of truth from the classical bivalent logics, where the typology of the statements made reference to the predictive statements, after they were tested by comparison with the associated descriptive statements).

[2] Actually, prescriptive statements can also be found in the natural domain, but they are conditional prescriptive statements, while in the economic field, the prescriptive statements are unconditional. A prescriptive statement is conditional if the involved norm depends on (is function of) the occurrence some random condition(s) stipulated by that specific norm, and is unconditional if no such conditions are stipulated. Usually, the conditional prescriptions are called instructions of procedures (they are of the following general form: "if condition x occurs, then act in manner y" or, "if you aim x result, then act in manner y", etc.). on the contrary, the unconditional prescriptions are of the following general form: "you have to act in manner x" or "you have to do this or that", etc. Grammatically, we may also have formulations such as "this or that objective is to be accomplished" or, "this or that action is to be carried out", or even more vaguely "this or that phenomenon will have the following evolution…". Although no imperatives appear explicitly in the latter three types of formulations ("must to", "have to", etc.), these imperatives are implicit because, as mentioned several times before, they cannot take existence unless being accomplished by the subject.

[3] The problem of evaluating the unintended consequences while accomplishing a purpose is not that simple. Logically, the assessment of the appearance or not appearance of consequences beyond the purpose can not be done unless there is a benchmark. But the prescriptive statement expresses no such

appeared while accomplishing the purpose, therefore this was done "with no rest". Purely analogically, this type of statements corresponds to the type of true statements from the bivalent logics;

- *Convenient, non-performative statement* ($\mathcal{N}_{[\bar{p}c]}$). The value of occurrence of this prescriptive statement a is noted with $\bar{A}_{+}$. A convenient, non-performative statement signifies (by the term *non-performative*) that the prescribed purpose has not been accomplished; however, some consequences unintended by the normative subject were produced, which are convenient to the evaluating subject (by the term *convenient*). We have two things to notice here: a) the unintended consequences must also be convenient for the normative subject, because the attribute of *convenient* also bears on the prescriptive statement, which has been formulated by the normative subject; b) the unintended convenient consequences don't mean a partial accomplishment of the purpose, but they merely, and unavoidably, accompany the unfulfillment of the purpose. The suggestion of benefit associated to a failure cannot be circumvented here[1]. Purely analogically, this type of statements corresponds to the types of statements from the bivalent logics;

- *Non-convenient performative statement* ($\mathcal{N}_{[p\bar{c}]}$). The value of occurrence of this prescriptive statement a is noted with A_{-}. A non-convenient performative statement signifies (by the term *performative*), that the prescribed purpose has been accomplished and that consequences unintended by the normative subject were produced during the process, which are non-convenient to the evaluating subject (shown by the term *non-convenient*). Same as before, there are two things to notice: a) the unintended consequences must be non-convenient to the normative subject too, because the attribute of *non-convenient* bears on the prescriptive statement formulated by the normative subject; b) the unintended non-convenient consequences don't mean a partial failure of the purpose, but they merely, and unavoidably, accompany the accomplishment of the purpose. The suggestion of transaction cost associated to a performance cannot be circumvented here[2]. Purely analogically, this type of statements has no correspondent in the types of statements from the bivalent logics

consequences. Would they have been expressed, they would no longer be unintended, thus being part of the purpose. We revert thus to the initial problem, not having a benchmark to evaluate the unintended consequences. The situation "worsens" further when praxeologically, $SN_{-1} \not\equiv SE_1$.

[1] This is an idea to be developed subsequently, because it seems to us that it has a great explanative potential for the process of evaluating the human action in general.

[2] The concept of cost of transaction is well known to the economists: that cost (not necessarily monetary) which accompanies any transaction (here, the term of transaction is taken in its most general meaning, of voluntary, inter-subject, interaction), and it ads to the price of the transaction. Therefore, we have a price of transaction (p_t), we have a cost of transaction (c_t) and we have a transactional price (p^T), so that: $p^T = p_t + c_t$. NB: c_t must be recalculated in units equivalent with those used to measure p_t (for instance, in monetary units).

- *Non-performative statement* ($\mathcal{N}_{[\overline{p}]}$). The value of occurrence of this prescriptive statement a is noted with $\bar{A}$. A non-performative statement signifies that the prescribed purpose has not been accomplished through the action associated to that purpose. Furthermore, this statement "specifies" that no unintended consequences appeared while trying to accomplish that purpose, therefore this was done "with no rest".

Purely analogically, this type of statements corresponds to the type of false statements from the bivalent logics.