SOME EPISTEMOLOGICAL CONSIDERATIONS CONCERNING QUANTITATIVE ANALYSIS[1]

Emilian DOBRESCU
PhD, Member of Romanian Academy, Bucharest, Romania

Ladies and Gentlemen,

I am honored by this award for many reasons. The mission assumed by the Journal of Applied Quantitative Methods is generous, and its profile fascinating. From the very first editions, the publication has complied with the high scientific standards. I am also pleased by the fact that the award addresses to my life-time passion. Bringing to my attention the jury's decision, Professor Alexandru Isaic-Maniu suggested that, on this occasion, I reveal some thoughts inspired from my experience in research, teaching and practice.

My contact with the fabulous universe of Economics has indeed given rise to many reflections, and I will share with you some of them that refer to three theses that question the gnoseological and operational efficiency of quantitative methods in the social domain.

1. The first refers to the symbolical analysis, where the connections between different

qualitative categories are transposed into equation systems, including different types of inequalities or existence conditions. The essence of this thesis is the following: "the utility of the mathematical operations depends on the correctness of the initial non-mathematical premises, whereas the mathematical deduction can never reveal an error made in the initial statements". With this assertion the utilisation of mathematics in socio-economic theories, that has considerably developed since the end of the 19th century, is discredited.

I don't deny the fact that along this road abuses were committed; Nicholas Georgescu-Roegen, among others, magisterially incriminated such cases. But he also admitted that, and I quote: "Perhaps the most obvious merit of an arithmomorphical model is the one recognized by most of the mathematical economics critics: the merit of bringing to light important errors in the papers of literate economists that had dialectic reasoning." ("The Entropy Law and Economic Process", Harvard University Press, 1971; Romanian version Editura Politică, 1979, p. 540).

1.1. Relevant in this regard was the dispute generated by the so-called "transformation problem" that preoccupied the economic thinking for a long period. I wish to remind you its main moments.

- The English classical school (Adam Smith, David Ricardo) committed some inconsistencies in the price theories, sometimes granting the role of bench-mark exclusively to direct labour, while other times not only to direct labour but also the entire invested capital.
- In "The Capital", Karl Marx supported the first principle in volume I and the second in volume III, thus accrediting "the static compatibility" of the two types of economic measurement.
- His proposal generated acute controversies. Around 1895, Eugen von Böhm -Bawerk considered that "The theory of average profit and production price cannot be reconciled with the theory of value" (Böhm-Bawerk: "Zum Abschluss des Marxschen System", 1896, p.218, quoted by N. N. Constantinescu: "The theory of the labor value in contemporary world", Bucharest, Editura Politică, 1984, p. 73). Brilliant minds have then been involved but, due to ambiguities, the polemic seemed to be enveloped in mystery.

It was the contribution of Ladislaus von Bortkiewicz – at the beginning of the 20-th century – that defined the problem using the rigorous terms of inter-branches relations and thus revealing the vulnerability of the Marxian construction. The problem was that Marx's table was based on an incongruent mix, in which the input prices complied with the principle of value, but the output prices, with the market prices principle. The translation of the literary-descriptive statements into matrix-language has undoubtedly solved this incoherence. It was later proved that "the transformation issue" can be solved logically, but only by dynamic models. (E. Dobrescu: "Again about "The transformation problem", Romanian Economic Review, Tome 33, No.2, 1989, p205-232).

1.2. I shall mention another famous case. I think there is no economist or at all educated person that didn't hear about Adam Smith's miraculous "invisible hand". What the author meant was that, under perfect competition conditions, free markets lead to an efficient distribution of resources, articulating around it the economic equilibria. But everything was given as a metaphor, uncorroborated with the unanimously or at least widely accepted by the scientific community assumptions. Getting over the road from the intuitive statement to the authentic theorem required efforts that increasingly resorted to the mathematical apparatus. I mainly refer to the contribution of Alfred Marshall and the Austrian School, that focused on the producers' and consumers' behavioural typology, and then to the unparalleled walrasian formalization of the general equilibrium.

The progress was huge, but still insufficient to elucidate Smith's collocation. From the equality between the number of equations and the number of endogenous variables did not automatically result – as Leon Walras and his disciples thought - that the system has a solution. Later laborious investigations – sustained by new, important acquisitions of the modern mathematics – made possible the settlement of the debate through the superb Arrow-Debreu model. About the first thesis against quantitative analysis, I stop here.

2. The second one already refers to the empirical research. Of course, social sciences as well as natural sciences have to face multiple difficulties of the inductive inference, pointed out by David Hume, and thoroughly analyzed before First World War by the Vienna Circle

and afterwards by Hans Hahn, Hans Reichenbach, Otto Neurath, Rudolf Carnap, Ludwig Wittgenstein, Bertrand Russel, Carl Gustav Hempel, Alfred North Whitehead, Nelson Goodman, Karl Popper and others. What we can make appeal to in order to support the quantitative analysis in the social domain is its extraordinary availability, especially in the last decades, of using the probabilistic fundamentals of induction, with all its afferent arsenal of significance tests, confidence intervals, sampling methods, estimation algorithms. The available nowadays econometric software is eloquent. But the thesis we discuss does not refer to this matter.

2.1. It invokes mainly the "impossibility of discovering – similar to natural sciences – some universally valid empirical constants" **(**Ludwig von Mises Institute: "Epistemological Problems of Economics - Sociology and History", http://mises.org/epofe/c2sec8.asp). The observation cannot however be denied. In what concerns the Economics for example, all attempts to identify generally applicable parameters, have failed – starting from the duration of various cycle types to the Phillips curve slope or the Okun relation. But, the social-economic research has understood that, in order to remain relevant, it must explicitly remain circumscribed in a strict perimeter delimited in space and time. While in our domain the appearance of scientific products similar to the laws of Physics and Chemistry is not to be expected, conceptual schemes and sets of recommendations, perfectly viable for the reference conditions, as varied as they may be, can be substantiated. This was the starting point for Milton Friedman, when he structured his vision upon positive economy. Stanford Encyclopedia of Philosophy states: "The great advantage of induction is not that it can be justified or validated, as can deduction, but that it can, with care and some luck, correct itself, as other methods do not" (Stanford Encyclopedia of Philisophy-The Problem of Induction, http://plato.stanford.edu/entries/induction-problem/).

2.2. Referring exactly to the diversity of the research object, the quantitative analysis is questioned also from the perspective of the passage from primary data concerning the elements of a collectivity to the parameters characterizing it as a whole. The impossibility of aggregation theorem, associated to the Arrow paradox, is often brought to support such an approach. What can we say in this case?

- It would be superfluous for me to try to convince you that aggregation is indispensable to any scientific process of classifying direct information, that it takes part in all the functional processes of mankind. Let's at least think about the fact that we understand each other by using languages that abound in cumulative terms. After all, what withdraws itself from taxonomy in our social existence? Almost nothing.

- Besides, neither Kenneth Arrow, nor the Romanian mathematicians that worked on this issue, did not present this incriminated paradox as imminent, but only as possible. This is more justified in Economics, where aggregated indicators usually have a double dimension – an accounting one and a behavioural one. The first one, based on algebraic operations, involves by definition the compensation effect. Even the presence of the second one does not seem suspicious if the systems are relatively stable from the structural point of view. The problems start when the object of the analysis is made of variable structures. For example, if we would use the GDP per capita as one of the possible expressions of the productive potential of some communities, the in-between comparisons will not be vitiated by aggregation operations. However, if we would seek to configure the wealth differences

through the same indicator, ignoring the income distribution, we will fell under the incidence of the discussed theorem. Even in this situation, the respective indicator remains useful if it is completed with appropriate structural parameters.

3. The third thesis, that I wish to comment, refers to the skepticism concerning the predictive capacity of the quantitative analysis. It has been manifested in radical forms, such as the Austrian School and the doctrinaire current dominated by Ludwig von Mises, as well as in mitigated forms, occasioned by the errors of some punctual socio-economic prognoses.

3.1. What is the problem? Concerning the human actions – because after all, they are the subject – two attributes are essential.

- On one hand, psychology certifies the presence in the past and present economic behaviour, of some ingredients that modify in a relatively narrow range. If we accept the assertion, we do not have logical background to reject the hypothesis of also finding them in a future human actions. Identifying them, by studying historical data series, can thus be a solid predictive bench-mark. Usually, the forecasting models are based on this kind of premise. Even the more elaborated and complicated ones, that do not limit to trends but also involve endogenous discontinuities – from shocks or cycles to stochastic perturbations or the simulation of the "time memory" – are built on the examination, systematization and interpretation of the previous economic evolutions. In modelling, we already operate commonly with evaluations regarding the expectations and bounded rationality, with perceived economic parameters. The utility functions have also been considerably diversified. Other sciences came to help – fuzzy sets, mathematics of chaos and in general of complexity, experimental psychology.

However, we cannot deny the fact that no matter how far we go down this road, the decisions of people – endowed with conscience and will – will always have an imponderable subtext. These conditions do not invalidate the predictive modelling, but disqualifies the possible side-slips from its legitimate cognitive frame. All scientific disciplines obey this type of restriction.

3.2. The quantitative analysis was blamed also in the context of the recent global crisis. In my opinion, some were justified, some not.

What is it about? Although it has sometimes been strongly denied, the world economy – with its traditional locomotive (USA) – faced a descendent trend of the Kondratieff macro cycle, after the oil-shocks of the '70s. Naturally, the real business cycles (of shorter duration) continued to function, but they grafted on this trend, sometimes transparently, other times, not. Essentially, we refer to the fact that the economic pattern – based on an oversized private and public consumption, on the excessive use of primary resources and on the alarming pollution of the environment – had generally exhausted its progress potencies. Of course, many positive technological reactions appeared, but they proved to be insufficient. In this regard, one can hardly impute something to the quantitative analysis, which – through the studies made around bio-economics and durable development – insistently emphasized the historical dilemma we are headed to.

Why did the necessary corrections get to be so postponed? This was mainly accomplished through the artificial stimulation of demand, considerably accompanied and facilitated by the sophistication of the payment instruments. According to some sources, the

ratio between the world financial assets and the world GDP increased from approximately 1 in 1980, to almost 2 in 1993 and to over 3.1 at the end of 2005 [http://bulatlat.com/main/2008/09/21/the -global-financial-crisis-and-its-implications-for-workers-of-the-world/].

Here at least two problems appear, that already concern the quantitative analysis.

- The models for the potential output were conceived and econometrically specified mainly in relation to the equilibrium, especially inflation. The CPI however, as well as other price indices in USA and other developed countries did not send alarming signals, FED practicing for a long period of time small interests in the monetary policy. Nonetheless, in reality, the internal disequilibrium was beclouded by the external one. The USA covers 65% of its total oil consumption through imports [http://www.blgould.net/NAC_RevA.html]. At the same time, directly or indirectly the external labour resources were used (through immigration as well as the cheap import of labour intensive products). These valves narrowed step by step through both the growing relative prices for some resources (as fuels) and the improvement of the life standard in China, India and other countries, implying the increase of labour costs in these areas. Thus, it became more and more difficult for the domestic disequilibrium to be absorbed by the external one. If the potential output models would have incorporated the implications of the external balance of payments, perhaps the appearance of the crisis would have been more accurately anticipated.
- Some comments are also required regarding the monetary phenomenon itself.

Although not shared by some colleagues, my opinion remains that, one way or another, behind the avalanche of financial derivatives in the past few years, was also a monetary creation parallel to the circuit controlled by the central bank. This kind of innovations in themselves cannot however be blamed. Their forerunners, during history, made the money supply to evolve from M0 to M1 and M2 and so on. What matters is that the process must not be fraudulently distorted and that it must not become unpredictable for the emission authorities. The macroeconomic models however, did not adequately follow this phenomenon in due time.

I hope that my message did not cause sadness; after all, it is an optimistic one. The socio-economic research is in front of a major challenges that I am confident can be overcome. The most reliable ally in such a process is represented by the amplification of quantitative analyses, their refinement to the highest professional level.

Finally, I wish to express my gratitude to the editorial college of the Journal of Applied Quantitative Methods, to Professors Isaic-Maniu and Ivan, to the jury that awarded me this distinction, and to all of you present here today. I am also grateful to the National Institute of Statistics and the Academy of Economic Studies, especially to Professors Voineagu and Rosca. The statisticians who know me – and they are not few – know also that I always enjoyed being among them. Thank you!

November 20, 2008

[1] Address at the 2007 JAQM prize awarding festivity. The festivity was included in the opening of 4th International Conference on Applied Statistics, November 22, 2008, Bucharest, Romania.