

**THE ARGUMENT OF ERGODICITY IN BROADER CONTEXTS<sup>1</sup>**

*(Reflections on Iván Bélyácz's writing "The controversial role of ergodicity in [financial] economics")*

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Iván Bélyácz's study in the field of ergodicity can be regarded as professional self-reflexion, in which he has brought together countless professional dilemmas, theoreticians' exploratory solution-seeking and straightforward positions with a view to presenting a tableau of a history of ideas and to clarify matters in the field. We believe that in doing so, he has, firstly, filled a long-felt want and, secondly, it inspires further reflexion in both fundamental issues and the details.

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In a strict terminological sense, ergodicity belongs to economics; however, because time-series-based trend analysis is used in other areas of social sciences, the author of this paper approaches these issues at a broader level on account of his professional background. Sociology and social statistics – as well as “big” social issues – are chiefly concerned with mid- and long-term trends due to the fact that in the majority of underlying social processes short-term data sets afford no, or limited, relevant conclusions.

Unlike in economics, trend-based conclusions are seldom regarded as forecasts (although there are exceptions, notably population forecasts), especially since they invariably focus on “softer”<sup>2</sup> phenomena, and in particular determine these in the context of “softer” objectives.<sup>3</sup> The occurrence of trends in the future based on past time series is generally seen as stochastic. Accordingly, future changes in population numbers, health status, income situation and other phenomena that depend on multiple factors, can only be described

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<sup>1</sup> The writing was commissioned by the editors of the journal *Economy and Finance*, in part as a reflection on Iván Bélyácz's paper “*The controversial role of ergodicity in (financial) economics*” (*Economy and Finance*, 2017 4(1), pp. 4–57).

<sup>2</sup> Meaning “softness” as deemed so by the market.

<sup>3</sup> “Softer” objectives mean that the social indicators designed to facilitate “big” social issues and medium- and long-range social-political decisions, cannot be expected to indicate in the same way as economic/financial predictions, within a narrow margin of reliability, the event of a certain process. The situation is different for short-term indicators (1–2 years) used for making “routine” decisions, where the level of risk is lower.

in certain ranges of probability, or even with multiple scenarios. Consequently, the application of the hypothesis of ergodicity – i.e. the assumption that based on past development it is possible to determine relatively accurate probability values for the future development of any phenomenon – has a different meaning altogether.

In spite of “formal” differences there are, however, powerful similarities in content; specifically, the relative accuracy of long-term sociological and social-statistical trends and demographic forecasts is equally questionable as in the case of certain economic (financial) forecasts. Essentially, this is to say, that forecasting *more complex social and economic processes based on time series, has serious methodological limitations, which is associated with many theoretical fundamentals that apply different approaches*. It should be pointed out that all of this is natural, since, in a world of pluralistic vested interests and values, the viewpoints of theoreticians with different world views, specifically, difference views of world economics, will naturally differ. *These different viewpoints are the basis of their thought systems, where consistency is the main requirement. No more can be expected of them; consequently, no specific viewpoint (theoretical explanation) can be expected to be universal, no matter how hard it tries to declare itself as such.* In short, failure (temporary or lasting) to recognise this will lead to a “contest” of theories and methods, which in itself is useful; however, if those involved in the debate are unaware that, from the perspective of universality, their knowledge is necessarily partial, then irreconcilable conflicts will emerge between the individual paradigms.

This paper deals with two specific areas:

- 1) Taking what is, to a certain extent, an interdisciplinary approach, it seeks to interpret, along the lines raised by Iván Bélyác, the hypothesis of ergodicity widely used in economics, making the odd critical evaluation.
- 2) It seeks to establish analogous principles – in an interdisciplinary approach – concerning the ontological and epistemological uncertainties raised in the study.

## **ERGODICITY IN ECONOMICS. THE POSSIBILITY OF “PARALLEL” INTERPRETATION.**

Iván Bélyác presents a broad tableau of ideas regarding the applicability of the ergodic hypothesis in economics, which is highly informative to laymen in particular. The main characteristics of the hypothesis are summed up by the author, in reference to *O’Donnell* (2013), as follows: “Ergodic realities belong to

the terrain of risk and invariability, while nonergodic realities fall within the sphere of irreducible uncertainty and mutability.”<sup>4</sup>

The author states that, “representatives of mainstream economics were inclined to remain attached to their belief in the ergodicity of economic phenomena”;<sup>5</sup> To outsiders it would seem as if ideas about ergodicity were characterised by latent dichotomy, specifically the professionally dominant “camp” believed in the hypothesis, while others did not. However, it also transpires from this paper, that the situation is not black and white to that extent. The author quotes *Shackle* (1949, 1955) and is “principle of cruciality”, according to which in fundamental or “big” economic issues, the hypothesis of ergodicity does not work. “When the person concerned cannot exclude from his mind the possibility that the very act of performing the experiment may destroy forever the circumstances in which it was performed.”<sup>6</sup> Routine decisions are another matter, when the future status can be more or less predicted, including for example forecasts regarding consumer behaviour.

We believe that these two statements are not mutually inclusive; moreover, is appropriate to highlight the two together, because they clearly indicate the type of issues when the hypothesis of ergodicity can or cannot be applied. It should be noted in summary (and it will be discussed in greater detail later on) that *the application of hypotheses, the underlying theories and empirical apparatus depends on the objective, which means that neither is universally valid.* Taking into consideration this “premise” is one of the weaknesses not only of sociology, but also specifically of applied methodology, which frequently leads interpretation problems.

### Interpretation of a multi-dimensional social (economic) space

One of the central tenets of sociology is that social, economic, cultural etc. processes and phenomena develop in a multi-dimensional social space, and in that space, they continue to evolve. Interactions varying in direction, character and intensity develop between the individual dimensions. Certain ideas of the theoreticians quoted by Iván Bélyácz share these views. For example *Bronk* (2011) calls attention to “the social reality is multi-faceted”<sup>7</sup> Shackle asserted that individuals are incapable of quantifying all possible eventualities or states of the world.<sup>8</sup> *Keynes* “[...] took the view that the economy is too complex to lend itself

4 BÉLYÁ CZ I., op. cit., p. 40.

5 BÉLYÁ CZ I., op. cit., p. 41.

6 BÉLYÁ CZ I., op. cit., p. 36.

7 BÉLYÁ CZ I., op. cit., p. 43.

8 BÉLYÁ CZ I., op. cit., p. 36.

completely to modelling, from which he came to the conclusion that economic theory is the simplified presentation of close relations, and does not present the entirety.”<sup>9</sup>

All we would like to add, as a critical remark, is that the above recognition does not affect social theoreticians in creating their theoretical models (constructions), which is evident from, among other things, the fact that they do not (not adequately in any case) call attention to the limitations of their models; consequently, these will “live on” independently in areas where their relevance is somewhat uncertain.

### **Different “views of the economy” accounting for “different “viewpoints”**

In sociology, the difference in models offering dissimilar explanations is largely due to different underlying views of society, which they often fail to describe, given that the researcher (proponent of the theory) begins by finding/developing a theoretical model to solve the issue in question, and subsequently tries to adjust “input” data to this model, as well as the applied mathematical and statistical apparatus. The parametrisation all the selected/developed model rests on numerous theoretical assumptions, the management of which can be achieved by means of countless mathematical-statistical procedures; however, these assumptions I’m largely based on the researchers’ previous “notions and visions”. These cannot be subjected to preliminary control, only latterly, after the event, and so neither does the adequate consistency of the “demonstrating apparatus” afford sufficient guarantees that the results of the model concerning future events will be adequately relevant.

We believe that is this situation that the author is discussing when referring to certain theoreticians of economics. For example, “according to Bronk (2009: 221.) [...] Imagination fills the void left by the indeterminacy created by innovation and the freedom to choose between novel options; it sketches out visions of how the world might be and how we would like it to be.”<sup>10</sup>

Shackle (1992:8) stated that, given we have only fragmented and confusing evidence about what tomorrow brings, we must build a picture – with the help of imagination – of what may come.”<sup>11</sup>

Now, in economic sciences the above-mentioned “notions” and “visions” assume the role of what in sociology is understood to mean a view of society. Owing to the fact that very rarely are consensuses reached in these issues (which

9 BÉLYÁ CZ I., op. cit., p. 35.

10 BÉLYÁ CZ I., op. cit., p. 39.

11 BÉLYÁ CZ I., op. cit., p. 39.

in any case can only be achieved on the basis of thorough preliminary comparisons), these notions and visions for the most part coexist. That in itself is a good thing; however, since the relationships between those notions and visions have not been clarified, to the outside viewer all seems chaotic, if anything.

### **Developing constructions/models**

In connection with the foregoing it should also be mentioned that parallel views of society and economy afford the possibility to develop parallel constructions. In that respect, we need to quote *Bourdieu*, who argued that that “Like ‘being,’ according to Aristotle, the social world can be uttered and constructed in different ways. [...] To point out that *perception of the social world implies an act of construction* in no way entails acceptance of an intellectualist theory of knowledge: the essential part of the experience of the social world and of the act of construction that it implies takes place in practice, below the level of explicit representation and verbal expression.”<sup>12</sup>

It is little discussed that the formation of various models and constructions, as the possibility of comprehensively revealing reality, comes with certain “side effects”, to which Bourdieu draws attention. “The most resolutely objectivist theory has to integrate the agents’ representation of the social world; more precisely, it must take account of the contribution that agents make towards constructing the view of the social world, and through this, towards constructing this world, by means of the *work of representation* (in all senses of the word) that they constantly perform in order to impose their view of the world or the view of their own position in this world - their social identity.”<sup>13</sup>

To put it plainly, theoreticians as well as the empiricists behind them, as well as the “reality presentations” of the econometricists can be regarded as projections of reality according to different organising principles. In this reconstruction procedure, the creators and builders of the constructions assume a defining (subjective) role, in spite of every effort to eliminate subjective elements.

### **Applying the dynamic approach**

As it was pointed out in the introduction, one of the salient features of the processes and phenomena operating in the multidimensional space is continuous movement, that is, movement depending on the characteristics of the dimension. Consequently, this space, and certain groups of processes and phenomena

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12 BOURDIEU (2013 [1985]): 168.

13 BOURDIEU (2013 [1985]): 167.

in that space, can only be grasped in terms of dynamics. This thesis has also been confirmed by economic sciences, one of whose representative has been quoted by the author. “On several occasions Davidson (1981:61; 1982:16) gave voice to his conviction that the economy is a process moving through historical time. Accordingly, relevant probability distributions are time-dependent, the economic process is nonergodic, and consequently the economic world is not subject to statistical control.”<sup>14</sup> On these grounds, we believe that the author rightly asserts, “here we arrive at the most dubious point in the analogy of ergodicity in the natural sciences, the elimination of the role of time. If there is one thing that renders the applicability of the ergodic hypothesis to (fi nancial) economics fundamentally questionable, it is this.”<sup>15</sup>

Naturally, that is not say that the creator of the construction consciously wishes to eliminate the role of time; on the contrary he seeks to adequately hypothesise its role by means of certain processes. The accuracy of hypotheses, however, depends on the phenomenon, and in certain cases it is possible to build a good hypothesis, while in other cases it is not; and the extent of accuracy – depending on the examined phenomena – will vary vastly. Consequently, as it has been pointed out, instead of a dichotomous approach, it is better to envisage the extent of ergodicity in a determined domain.

### “REVEALING THE ONTOLOGICAL BASES OF UNCERTAINTY”. ANALOGIES.

We borrowed one half of the subtitle from the author, giving that, in agreement with him, we attach importance to revealing the ontological bases of uncertainty, with the proviso that this revelation should be performed in the context of epistemology. The second half of the subtitle offers analogies, which we borrowed from sociology and social statistics.

In connection with revealing the ontological bases of uncertainty the author refers to several theoreticians, only one of whom we shall mention here. According to O’Donell (2013), “*Ontological characteristics are primary and permanent, while cognitive attributes are secondary and eliminable.*”<sup>16</sup> Bronk’s (2011) following statement has already been mentioned, according to which, “ontological uncertainty implies the impossibility of knowing even the categories and possible nature of what has yet to be created or yet to evolve.”<sup>17</sup> Keynes believes

14 BÉLYÁ CZ I., op. cit., p. 46.

15 BÉLYÁ CZ I., op. cit., p. 50.

16 BÉLYÁ CZ I., op. cit., p. 41.

17 BÉLYÁ CZ I., op. cit., p. 32.

that, “it is not epistemological uncertainty but ontological uncertainty that arises here, separating insurable (forecastable) future economic events from uncertain ones.”<sup>18</sup>

We believe O’Donell’s assertion to be problematic, given that we attach similar significance to epistemological bases and to ontological ones. The fact that only in possession of adequate epistemological basis can one meaningfully understand the latter want to confirm the equivalent of the two.

We believe that in examining ergodicity and similar issues in broader contexts, it is necessary to develop a framework in which, as a starting point, it is appropriate to establish certain “practical” principles (Harcsea, 2015). These principles can be regarded as a kind of means of “quality assurance”, which help outline interpretation frameworks and facilitate accountability. (Meaning that we only call the creator of the construction to account over that was offered as an interpretation framework in the first place.) This also helps to set the perimeters of limitations and possibilities.

### **A few principles**

- 1) *Micro-processes (indeed, the majority of micro-processes) are shaped in the multi-dimensional socio-economic space, where interrelationships between the individual dimensions vary in strength, and where place and time assume a crucial role. Under such circumstances, the operation of the feedback index systems we have constructed can become haphazard, which, due to the lack of necessary information, hinders the inclusion of corrective measures, and consequently, the origin of the total of processes will evolve stochastically. Accordingly, it is virtually impossible to accurately predict certain complex phenomena.*
- 2) *The individual dimensions possess relatively independent organising principles, which also means that the dynamics of their development in space and time will be different; which accounts for a large number of possible configurations of change. It also follows that their development will, in the long run, be asynchronous, and the current values of development will not always provide sufficient grounds for making well-established predictions.*
- 3) The above circumstances alone explain why their concurrent observation, that is, their statistical measurability, covers a fairly broad range.

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<sup>18</sup> BÉLYÁ CZ I., op. cit., p. 34.

- 4) In the course of measuring and assessing, *the observer (the analyst) is guided to some extent by his or her view of society and the economy*, which reflects (a) determined value system(s). Owing to the fact that any value system is essentially normative, the same goes for views of society and the economy. It follows that any examined phenomenon/process can only be *presented and interpreted in the context of a determined view of society*. Since we live in a world of pluralist value systems, this circumstance explains the emergence and co-existence of different viewpoints. Consequently, for example, even where the same demonstration apparatus is applied, contrasting deductions can be made depending on whether the view of society focuses on continuous economic growth and bringing about a consumer society, or whether it focuses on sustainable development. (In each version, the possible constellations of growth and development will necessarily be differently constituted.)

“Normatives” determine the way we come to interpret certain phenomena, such as equality, fairness, etc.; which leads to the notions of these things. *The “what and how we see and let be seen” passes through the filtering system of the researcher/theoretician*, in whom it is decided at this level, among other things, *whether to make as a point of departure a view of society/economy in the narrow or broad sense.*

- 5) Due to the above, *more complex processes occurring in the multi-dimensional socio-economic field of force cannot be explained by means of a single (dominant) approach*. For example, in the world economic crisis, some common sense and intuition would have been useful alongside the siren-call of dominant modelling systems. (An old anecdote has it that from time to time modern-age meteorologists need to look out of the window from behind their cutting-edge instruments. By analogy, in the case of economic and financial forecasts, the mushrooming “bubble economy” should have been presented by means of more relevant measuring systems.) It can therefore be established that one of the main problems of the models applied in economic sciences and sociology is their effort to be universally valid, in spite of the fact that the conditions are not always met. Furthermore, it should be stressed that the models are not generally speaking “bad” or “good”, but rather, their “goodness” can be assessed on the basis of the purpose they are being used for.

Presumably many researchers are aware of the above. Moreover, it is certain that many share the above principles; however, for various reasons, *relatively “few are in the position” in the social sciences to use these principles in practice*. The key question is what sustains this “situation”? The answer to the question in



part lies outside of the realm of sciences (as it has been pointed out earlier) and in part requires close scrutiny of issues within the social sciences. *The direction of global social and economic trends is essentially governed by international power centres and they are able to use for their own ends the sciences and their representatives.* With a view to maintaining the status quo (what economists refer to as “balance”), these centres are selective when it comes to using scientific results, so as to legitimise their activities. They choose the models/constructions whose results are closest to what they would like to see and have others see.

This is probably well and good, which, however, does not mean that the sciences cannot have a relatively independent role in all of this. *It is the calling of science to be at least a step ahead of the drivers of global processes.* The problem is that, for various reasons, it rarely does that. Because of this, the social sciences actually contribute to the poor functioning of the global systems. Doubtless, however, their responsibility in this is considerably smaller than that of those who are directly involved in driving the world economy. That, however, does not exonerate the representatives of the social sciences from professional self-reflexion from time to time, or from reconsidering certain moral issues. This would include ideas like the one attributed to *Galbraith*, that the reason why *economists make predictions is not because they know, but because there asked to do so.* As we all know, the general validity of this saying is often disputable.

### **DOES THIS “THEOLOGICAL CONTROVERSY” HAVE A MORAL?**

In this article, we sought to call attention to the fact that underlying the economic interpretation of ergodicity there are fundamental ontological and epistemological determinations, and accordingly it is not merely a professional issue. Based on the principles of the theoreticians quoted in Iván Bélyácz’s paper we believe that the hypothesis of ergodicity is not unlike a “theological controversy”, since embracing it or not essentially depends on the preferences all of the researcher.

It also follows that the issue can be discussed at several levels; however, parallel with the relatively independent discussions of the individual levels, effort must be made to comprehensively interpret all of the levels, otherwise the individual viewpoints will pass each other unnoticed. We believe that, not unlike other similarly important issues, ergodicity, with its history of nearly 100 years, has also fallen in the same “trap”, partly because the debaters often fail to consider the fact that the issue can be discussed at several levels. The reason why it is important to stress this is because the logical complementariness (in part hierarchical and in part juxtaposed order) of the individual connections becomes blurred, which

can easily lead to the fact that they will no longer be talking about same thing. Naturally, this is a possible conclusion drawn from a possible viewpoint.

The concern is that *the lack of meaningful professional self-reflexion* has contributed to the current evolvement of the discourse. In this light, Iván Bélyácz's effort to outline a history of ideas by reviewing and projecting on one another "knowledge" directly or indirectly connected to ergodicity is commendable. This provides a basis for discussion to clarify certain fundamental issues, and to reach consensus within a professional framework.

If the culture of self-reflexion is not organically incorporated into the activity of the professional community, and especially its mainstream, and just a few researchers/ theoreticians made the effort, the result will be ambiguous. This happened for example in the case of the *Stiglitz* Report in connection with the economic crisis, which mainstream economic ostracised for making the desirable self-reflexion. It is very telling that mainstream economics did not meaningfully react to the report. Presumably that is no accident, because the majority of professional elite as a narrow view of the world and the economy, since it dominantly focuses on economic growth and profit. Also, considering their merits, other values have been overshadowed, such as solidarity, reducing inequality, protection of the natural environment, social sustainability, etc. However, it is fact that the majority of society will "buy into" the worldview dominantly focusing on economic growth, since consumer society as we know it, is rooted in this economic model. One might say that in this respect there is consensus between those "at the top" and those "below", which justifies the professional mainstream's exoneration from alternative thinking. In turn, this circumstance (as social feedback) puts the hypothesis of ergodicity in a position, which scientific reasoning cannot really challenge.

What might considerably mitigate the "theological controversy" character is if the dichotomous approach were to diminish in the context of ergodicity. In connection with a specific phenomenon ergodicity in itself means that based on certain information regarding the past we make a prediction regarding the event of the future state. *It is always the nature of the given phenomenon that determines the extent of ergodicity, consequently we need to stress "dependent on phenomenon" rather than the connection between past and future state.*

In a recent workshop discussion about time-series forecasts it came up that researchers have developed several new approaches and methodological processes to manage the fundamental issues of ergodicity. We believe it necessary to present the professional overview and critical summary of these, in an effort to gain better insight into these issues.

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