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## *Economic Modeling at a Turning Point*

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**Abstract:** *This presentation contains a series of ideas to the current of the economic system during an economic crisis generated by a pandemic like the one that took place in 2020. It also tries to give solutions for the future recovery of these crisis situations.*

**Keywords:** *economies, economic models, economic crises, pandemic crises*

### **Introduction**

The pandemic, which is now raging around the world, is putting the economies of many countries, especially the economically underdeveloped, at risk. It is no secret that this pandemic will be followed by a global economic crisis, a crisis at least as severe as that of 1929-1933 of the last century. A number of questions are asked about this, such as:

1. Was it such a pandemic and the economic crisis that would follow predictable?
2. What are the real causes of these factual states?
3. What measures should have been taken in advance to minimize the negative effects of such a crisis?
4. Are there models that can provide acceptable solutions to problems that have arisen with such economic crises?
5. Are there models to prevent such situations?
6. Are there economic bodies that monitor the national and international economic system, and if so, what have they done to prevent this crisis?
7. Can current economic models signal the emergence of such a crisis and support the reasonable passage through such a crisis, or to warn of its imminent?
8. What are the lessons to be learned from such a situation?

From the way we see that the economic factors in our country react, as well as those from abroad, it seems that many of the answers to the above questions are negative. Whether such problems have not been posed so far or have been posed but their answers have been inadequate, it is certain that this situation risks escaping human rational control and evolving chaotically. As unbelievable as it may seem, such situations can be kept under rational control, monitored, prevented, and even more, managed well enough and with minimal negative effects. It all starts from the idea that an economy is a system like any other system, but with certain characteristics that characterize it from other systems in nature. The next section attempts a systemic look at the current situation and demonstrates that such situations can be prevented in the future.

### **The Main Result**

Like any other system, the economic system at any level, company level, national, zonal or international level, has component parts that are interconnected with each other within that system, but also in direct or less direct connection with others, entities external to the respective economic system, entities of economic nature or not. This truth has been known to everyone for a long time. Also, the general theory of systems has sufficient theoretical results to make available to those who research economic phenomena, research and investigation. The motivation is often invoked that an economic system possesses a great complexity and that it is almost impossible to approach with sufficient precision certain aspects of some economic phenomena related to that economic system. This is partly true, but the mathematical sciences have enough theories to investigate inaccurate areas of reality, or areas of great complexity of natural phenomena. Not to mention that mathematical sciences have many disciplines with great predictive and investigative power. What have not the researchers of the economic sciences had to allow them to shed some light on the darkness of economic crises? At this

moment, the natural question is whether there is an economic model that describes the laws of economic activity in situations of economic crisis. Well, suppose we agree with economists who say that it is difficult or almost impossible to prevent such situations that generate an economic crisis. But at least we have economic models that tell us clearly and precisely how we should act economically if the crisis has started? If the answer is yes, it is strange, at least logically, because we would have models for managing an economic crisis, models that are clearly more complex than the models that would have allowed us to anticipate these crises. Political factors are not considered now, although they often have a neither strong disruptive potential, nor are purely human factors (human errors, disturbing emotional factors, etc.) in the economic decision-making act, although they should have been considered in an extremely in-depth analysis of these situations. What I mean is that we do not have, even theoretically, a model that allows us to make the right decisions in such situations created by pandemics.

I also think it is worth emphasizing here the following fact: the virus that created the current pandemic (I do not call it because what I mean does not depend on a particular virus) will attack economic systems (regardless of their size) indirectly through the factor of production- the man. So if we ignore the human intermediary at this moment, this virus will attack the economies of most countries of the world, directly. So, abstractly speaking, this biological virus attacks a system (the economic system), which is a non-biological system (in general). So the lever of transmission of this virus (the carrier vector) to the economic system is the human entity. Schematically this fact could be formally represented as follows:

The virus (biologic) → the man → the economic system (1)

In relation (1) man is generally seen as part of a socio-economic system, not necessarily as an economically active entity. This means that even individuals who are no longer economically active (in the workplace) can be vectors through which the biological virus acts on the economic system. For example, retirees who are not retired due to illness, through their contamination with such a virus can negatively influence an economic system in several directions such as: actions of society for hospitalization and medical care (significant economic effort), stress in belonging families and whose members are economically active, travel restrictions cause their non - participation in consumption processes etc.

Relation (1) shows that the virus attacks an economic system in a medium way (its mediator of action being the human being). But the relation (1) looked at directly (abstracting from the human intermediary) looks like this:

The virus (biologic) → The economic system (2)

Relationship (2) reveals an interesting fact, namely, a biological entity can "infest" a non-biological entity (economic system). This is due to the fact that an essential component of any economic system is the human component. But the advantage of researching this problem in terms of relation (2) consists in certain biological analogies, as we will see below. We could ask ourselves at this moment the following question: what analogies exist between the symptoms of human infection (now seen as a biological system) and the symptoms of the occurrence and development of economic crises of this type (generated by pandemics), or what analogies exist between treatment of human infection with the biological virus and the way of "treatment" in case of an economic crisis. We could obtain such analogies if we consider the economic systems similar (at least from certain points of view) with the biological systems (the human one in particular), a system marked with economic system\_1, thus we have the scheme:

The virus (biologic) → the economic system\_1 (the biologic system) (3)

In relation (3) the economic system\_1 is in fact an ordinary economic system, in which some of its elements are of a biological nature (the human factor) and its functioning is modeled analogously to

the functioning of a biological system. Also in relation (3) both systems that are influenced are of the same (biological) nature, while in (2) they were of different natures. Something very similar is in the case of computer viruses, only in this case the correspondent of the economic system in relation (3) is an inanimate system (the computer with its 2 components: hardware and software) and the correspondent of the biological virus in (3) is a software specialized, which acts on the computer very similar to the action of a biological virus on a living system. I think that such analogies can be made in our case, with the benefits that derive from them. In the case of computer viruses, some protection strategies against them are analogous to those in the case of biological viruses. But relationship (1) also has the merit of highlighting some aspects, such as:

1) The interruption of the chain from (1), so not affecting the economic system, could occur, mathematically speaking, through 4 actions, namely:

a) elimination of the first link (biological virus) -that is, there is no source of infection, so the problem disappears, or (if this failed);

b) elimination of the influence link between the first 2 links of the chain, the virus (biological) and man, that is, man (in a generic way) should never be infected with any possible virus - or if he has already become infected to heal without serious economic consequences, which is not always possible, as demonstrated by the current pandemic ( and "never to be infected with any possible virus again" sounds like a utopia, considering that biological viruses also evolve and adapt to new conditions), but in the distant future this hypothesis could be true. But even in this case, the place of the virus could be affected by another serious danger to the human being, so the problem remains and so this option seems almost impossible in the future;

c) the effective elimination from scheme (1) of the second link, i.e. man, a situation that is absurd (the total extinction of man would relentlessly lead to the disappearance of the last link-economic system), so this possibility will not be considered;

d) or the elimination of the connection between the second link (man as a direct active part in the economic system) and the economic system itself (which can be achieved by not involving the human being in the activity of the economic system). This fourth option leads to an idea that could surprise anyone, but which can be an aspect of the economic future of mankind (taking into account that we will face in the future with such extremely difficult situations as the current one). ). It is about "automatic economy" or "cyber economy" (in which economic activities-not only industrial, to be taken over almost entirely by intelligent computers coordinated by computers and artificial intelligence), a situation that we will talk about in future articles. As an irony of this possible future situation, let's not forget that computers also have (and will have) their viruses, and so this problem now will move to another plane in the "society" of cars (but will persist in essence). Concluding on this first aspect (if we analyze the situation in terms of relation (1)), the only case that would definitively protect the economic system from such a disastrous action by a biological virus, is case 4, the elimination of the direct link between man and the economic system that is, the creation of an "automatic" economic system in which the human being would be only the supervisor-supervisor of this automatic economic system and at the same time the beneficiary of the results of his activity). It seems science fiction, but let's not disregard the other dangers that may appear in the future to the human being (some predictable, others not), dangers that would be the first link in the relationship (1);

2) The action of the first link(virus) on the second (man) in (1) determines, from the point of view of the economic system, the loss of capacities (partial or total, temporary or definitive-by death or retirement) of the second link to influence the economic system;

3) Chains similar to that of (1) can be made for all factors that can negatively influence and under different intensities an economic system, in its proper functioning. Let's call these factors with factor\_1, factor\_2, ..., factor\_n. In the assumption that all these factors act mediated (through man) on an economic system denoted with (S), at different times, denoted with: t1,t2, ... tn , we will have the following n schemes:

$$\begin{aligned}
 &\text{The factor}_1 \rightarrow (\text{the man}) \rightarrow (S) , \text{ to the } t_1 \text{ moment} \\
 &\text{The factor}_2 \rightarrow (\text{the man}) \rightarrow (S) , \text{ to the } t_2 \text{ moment} \\
 &\dots\dots\dots \\
 &\text{The factor}_n \rightarrow (\text{the man}) \rightarrow (S) , \text{ to the } t_n \text{ moment} .
 \end{aligned}
 \tag{4}$$

As an example of such factors with negative action on the human being, we can cite: diseases generalized to a large number of active individuals (such as pandemics), armed conflicts - which economically inactivate a large number of individuals, large-scale social movements (revolutions, large-scale strikes), large migrations of individuals from one area to another, other natural phenomena that would lead to the economic and social inactivation of a significant number of economically active individuals. The truly disastrous part would appear in the future (and no one can tell the opposite now) when the moments  $t_1, t_2, \dots, t_n$  would coincide with each other (ie:  $t_1 = t_2 = \dots = t_n$ , which could be called the coincidence of crises) , or will be close enough that there is no possibility of an effective system adaptation reaction (S). Another extremely difficult situation is presented by the succession of these moments, but at very close intervals, which do not allow the system (S) to "recover" after the last crisis (from the previous moment), which could be called rapid succession of crises.

### **Conclusions**

The conclusion that emerges from this article is that the current pandemic must lead to a thorough rethinking of the entire mathematical modeling system in the economy, so that we can predict and counteract the negative effects of future economic crises due to future pandemics or other natural or social causes. The near future must lead to the emergence of economic models in which to appear the concept of "automation".

### **Supplementary recommended readings**

<https://europolitics.ro/istorie/marile-crize-economice/ce-putem-invata-din-marile-crize-economice-ale-istoriei/>  
[https://www.researchgate.net/publication/268047888\\_SCURT\\_ISTORIC\\_AL\\_CRIZELOR\\_ECONOMICE\\_MONDIALE\\_DIN\\_SECOLUL\\_XX\\_PANA\\_IN\\_PREZENT\\_INVESTITIILE\\_-\\_SOLUTIA\\_ANTICRIZA\\_PENTRU\\_ROMANIA](https://www.researchgate.net/publication/268047888_SCURT_ISTORIC_AL_CRIZELOR_ECONOMICE_MONDIALE_DIN_SECOLUL_XX_PANA_IN_PREZENT_INVESTITIILE_-_SOLUTIA_ANTICRIZA_PENTRU_ROMANIA)  
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