

# Predicting Global Economic Crises: New Scientific Approach

By Sergey Chernyshov, PhD in Engineering, President of PJS LEMMA Insurance Company



*Currently, there is no lack of forecasts. Everything is being forecast: world climate changes, the world's new political order, stabilisation of the US dollar and the Euro, as well as their substitution by a new global currency. Most of forecasts, however, are based on the situation that existed at the time of forecasting and, at best, take into account the realities of last decades. However, should they be trusted? The time of blind trust, especially in economic sphere, is over. Dr. Sergey Chernyshov, President of Ukraine-based Insurance Company Lemma, talks about one of his scientific papers, "The problem of modelling of economic dynamics" <sup>1</sup>, which offers the scientific community and the society a new look on the reasons of occurrence of crises in the world economy. We asked Dr. Chernyshov about the essence of this new approach of the Ukrainian scientists and its role in forecasting.*

The topic is indeed very interesting. The prominent, so to say, the Harrod model is considered the basis of the economic growth theory. From this model it follows that key indices of the national economy, i.e., capital (K), income (Y), consumption (C) and investment (I), may grow simultaneously and exponentially in an unlimited perspective (Fig 1,  $t$  is time).

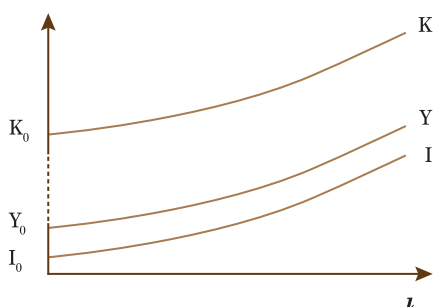


FIG. 1

In this case, the rule governing the management of an economy is very simple: just keep the ratio  $v = K / Y$  constant. Accordingly, the absolute value of income  $Y$  must grow progressively. In the former USSR, a similar "result-based planning" approach used to be heavily criticised. Consider, however, the US mortgage crisis of 2007. A bank employee has to ensure an annual increase in income; however, there comes a moment when an influx of clients falls. The scenario of events that follow is universal: disregard of risks and a deplorable outcome.

At the same time, there are theories of a cyclic development of economy, which is confirmed by practice to a greater extent than continuous growth: hence,

a contradiction. We have not found any discussion of this contradiction in literature and regard the situation as follows. Each scientific community focuses on the area of its own specialisation. The theory of cycles is of more heuristic nature; cycles are supposed to be different in duration. The Harrod model of economic growth is supported by a differential equation, which looks more attractive. If we take a close look at the derivation of this equation, it turns out to be erroneous due to incorrect treatment of basic notions of mathematical analysis. These notions are included in academic programs that are taught to first-year students of Ukrainian universities!

However, the made mistake should be admitted as rather subtle. There is an angle of view from which it is "masked" as an approximate equality. In our opinion, the reason for this mistake is the statement of Nobel Prize Winner P. Samuelson that the dimensional representation of employed quantities is inessential for "economic laws" (see the well-known work "Foundations of Economic Analysis"). By the way, the same mistake is also present in other classical economic models. They are more sophisticated, therefore having different effects, but in the first place it is necessary to verify the validity of initial relations (despite their classical nature).

In the course of our investigation, we have come to a conclusion that the heuristic premises of Roy Harrod are rather fruitful. The development of these premises, in correct interpretation, has led to the construction of a refined Harrod model that reflects principally different

behaviour of a national economy. Hyperbolic growth of the key indices is replaced by a crisis when the initial capital  $K_0$  (it can be also called "outdated") depreciates momentarily (Fig 2). Alternatively, one can imagine its "fall" on the economy with equally negative consequences. We will not ponder on the fact that here  $I$  and  $Y$  are the intensities of the flows of investment and income, respectively.

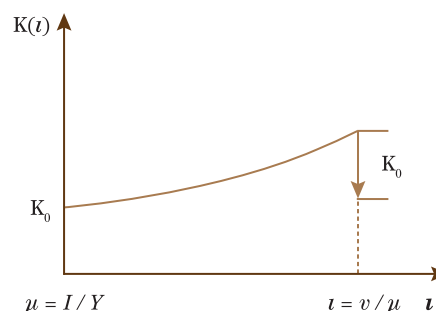


FIG. 1

It should be emphasised that the moment of the advent of the crisis is amenable to computational estimation that can be corrected in view of particular economic realities. In particular, the dependence of the parameters  $\mu$  and  $v$  on time  $t$  is implied. Obtaining such estimation should also be regarded as anti-crisis means of a dampening nature. (Any further explanations are hardly necessary here.) At the same time, there are radical means that belongs to the prerogative of the state management of the economy, namely: without waiting for an advent of the crisis, the outdated capital  $K_0$  should be driven out of the production sphere.

<sup>1</sup> S.I. Chernyshov, A.V. Voronin, S.A. Razumovsky, *The Problem of Modelling of Economic Dynamics*. <http://lanl.arxiv.org/abs/1003.4382>, [www.ttr.com.ua](http://www.ttr.com.ua)

It seems that it should be redirected to consumption needs. This process will take some time, so an important role is played by an amortisation policy. Generalising, the crisis can be passed “softly”!

The more active the economic development, the closer the crisis is. Everyone is interested in the state of the global leader: the crisis in the US automatically becomes the world crisis, following which almost every country must adjust to the stage of the economic growth. In other words, “internal” crises of these other countries are of minor importance. Using the results of our paper and available statistical data (John W. Kendrick, “The Formation and Stocks of Total Capital”, 1976), specialists of the North-Eastern Scientific Centre of the National Academy of Sciences of Ukraine have established that periods of growth of the US economy during the 20th century and the beginning of the 21st century constituted 20 years. This was influenced only by the energy crises of 1973 and of 1980-1982. In light of the above, the notion of “long-term perspective” in the title of our paper becomes rather concrete.

Returning to the content of our paper “The problem of modelling of economic dynamics”, we note that here another topic of methodological character has appeared. It is embodied in the following question: Does a systematic approach to modelling of economic processes exist? R.G.D. Allen answers this question: economists should construct their equations like engineers<sup>2</sup>. In contrast, we think that abilities of the counterparts are, figuratively speaking, of opposite vector directions. Whereas an engineer has a material point for the construction of his equations (the derivative of time is velocity, and then Newton’s law follows), an economist has a balance of financial flows that constitutes a rather strong argument.

It is implied that the cost of production for each participant of an economic system can be expressed as a sum of the cost of his own production that comprises labour and income, part of costs of the production of the partners, and purchases from the outside. We denote the above-mentioned parts as coefficients  $a_{ij}$  and will return to them later. As a matter of fact, we are dealing with the well-known Leontieff “expenses-output” model interpreted in terms of cost. Exactly this model,

in our opinion, contains systematic elements. In a dynamic formulation, one can construct on this basis systems of differential and, after that, of integral equations that are efficient in forecasting of economic situations including critical complications.

However, even in statics, the participants, if they know  $a_{ij}$ , can quickly estimate the competitiveness of the final product and make necessary corrections. Certainly, in this regard, there emerges an economic cluster that is characterised by information exchange between the participants. Nowadays, due to globalisation, clusters can hardly be regarded as belonging to traditional-level enterprises. Indeed, what is the EU in reality?

To conclude, we present some arguments that, generally speaking, follow from the above, but have not been discussed so far. As a matter of fact, there exists a permanent crisis that manifests itself in feverishness of business management, which is accepted as its objectively intrinsic feature. Let us ask the following question: How the status of a subject (an enterprise, a bank or a country) can be estimated at the current moment and in the middle term from the point of view of the existing criteria? Certainly, one must take into account various factors, including technological equipment, aspects of humanitarian and political nature, etc.

At the same time, the main role is reserved for financial indices, which seems to be obvious. The derivation of corresponding conclusions and recommendations, based on special processing of these indices, is a prerogative of scientific and financial analysis. In this field, a number of branches exist that differ both by choices of the most representative indices and by the way of data processing. We start from a seemingly trivial statement that in most cases financial analysis treats an enterprise or a country as a subject. What is implied by this and what other treatment is possible?

Let’s take an ordinary schoolboy as an example. Parents judge him by his journal, behaviour, health, etc.: all this is done from the position of the subject. The parents, however, also monitor carefully the schoolboy’s adjustment to the society: e.g. some friends may be

unsuitable. Possibly, they are not so bad, but several years older, and the parents want to change the situation. In other words, they consider the schoolboy not only as a subject, but also as an element of the social system. By developing this kind of arguments, we inevitably come to a conclusion that financial analysis judges an enterprise or a country “by the journal”!

Therefore, we insist on the necessity to judge the subject also from the position of its participation in the system of economic relations. More precisely, from the angle of financial flows, that can be either favourable or have rather negative effects. In reality, these effects are by no means exotic: there are serious premises for their realisation, including the desire to buy at a lower price and to sell at a higher price. It is a paradox that to identify and overcome the above-mentioned situation, a very constructive (especially in combination with a cluster-type activity) technique of computational estimation exists. It is unclaimed, however (both at the micro- and macroeconomic level), probably as a result of the deeply rooted paradigm.

Thus, by using solely functional analysis, we find ourselves in the position of a man who is looking for a lost thing in the place where there is light and not in the place where he has lost it. In addition to such an approach, for the subject to “stand firmly” under financial flows, the following thing is necessary: the sum of  $a_{ij}$  coefficients must satisfy an elementary rule, and payments between the subjects must constitute prototypes of closed paths. As a rule, these requirements (especially the second one) are not fulfilled; however, there are relatively simple means to make corrections.

In other words, we direct financial flows along technological chains, but they possess their own internal laws of motion that cannot be violated. These laws (of linear algebra) are stronger than “the invisible hand of the market” that, allegedly, smoothes everything. One should adjust himself to these laws, and not vice versa! We do not ponder here on an interesting question about periods of time during which one should take into account dimensions of the flows while carrying out computational estimates. Finally, note a very interesting operation of mutual payments that efficiently removes the problem we have raised. This is true, especially, under the conditions of computer globalisation.

<sup>2</sup> Roy George Douglas Allen, “Mathematical Economics”