The Informatization of Economic Life Through Artificial Intelligence and the Shaping of Social-Economic Processes

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Abstract: The economic, social, demographic, technological achievements, uneven distribution of raw materials, energy resources, require the opening of all economic systems. Mathematical models, came to help the arguments in this case, I propose a way to "experience" what the real situation is impossible. Need shift in the language of symbols has everything to do economist has neither a theoretical coverage. This can not be done and it is not something necessary. But, there are attempts to computerization economic activities, which in our present more than a hypothetical, but not the appropriate practice.

Keywords: *marginal economic efficiency, artificial intelligence, logistic curve, price equilibrium, mathematical model, request, offer.*

INTRODUCTION

Economic processes can be described verbally, spreadsheet, graphics or analytical. Each exposure, depending on the purpose of his investigator has plusurile. Analytical descriptions often rely on intuitions, assumptions or emprical. The dependent forms were not always accepted a theoretical evidence. For example, advanced technologies, ensuring increased efficiency, but this increase is specific to the economic situation again.

STRUCTURE RESEARCH

Logistic model dependence: deduction

Note the marginal economic efficiency ***E,*** economic efficiency at a time ε Then efficiency will $(E\text{-}\varepsilon)$. The rate increase efficiency $\frac{d\varepsilon}{dt}$ is in direct dependency efficiency we realized $(E\text{-}\varepsilon)$:

$$\frac{d\varepsilon}{dt}=k\varepsilon(E-\varepsilon),\ \int\frac{d\varepsilon}{\varepsilon(E-\varepsilon)}=\int kdt$$

$$\frac{1}{E}\int\frac{E-\varepsilon+\varepsilon}{\varepsilon(E-\varepsilon)}d\varepsilon=k\int dt\,;\quad \frac{1}{E}(\ln\varepsilon-\ln(E-\varepsilon))=kt+C\,,\quad \frac{1}{E}\ln\frac{\varepsilon}{E-\varepsilon}=kt+C$$

$$\ln\frac{\varepsilon}{E-\varepsilon}=kEt+EC\,,\quad \frac{\varepsilon}{E-\varepsilon}=e^{kEt}e^{EC}\,,\quad \varepsilon=\frac{Ee^{kEt}e^{EC}}{1+e^{kEt}e^{EC}}\,,\quad \varepsilon=\frac{E}{1+e^{-EC}e^{-kEt}}\,.$$

For $t=0,\ \varepsilon=\varepsilon_0,\quad \varepsilon_0=\frac{E}{1+e^{-EC}}\,,\quad e^{-EC}=\frac{E-\varepsilon_0}{\varepsilon_0}$ - the share of unrealized economic efficiency of the initial amount of efficiency, until the emergence of new technologies .

So, economic efficiency is currently calculated on the basis of marginal effectiveness, while changing the formula: $\varepsilon=\dfrac{E}{1+\dfrac{E-\varepsilon_0}{\varepsilon_0}e^{-kEt}}$ Graphic that can be expressed (Figure 1).

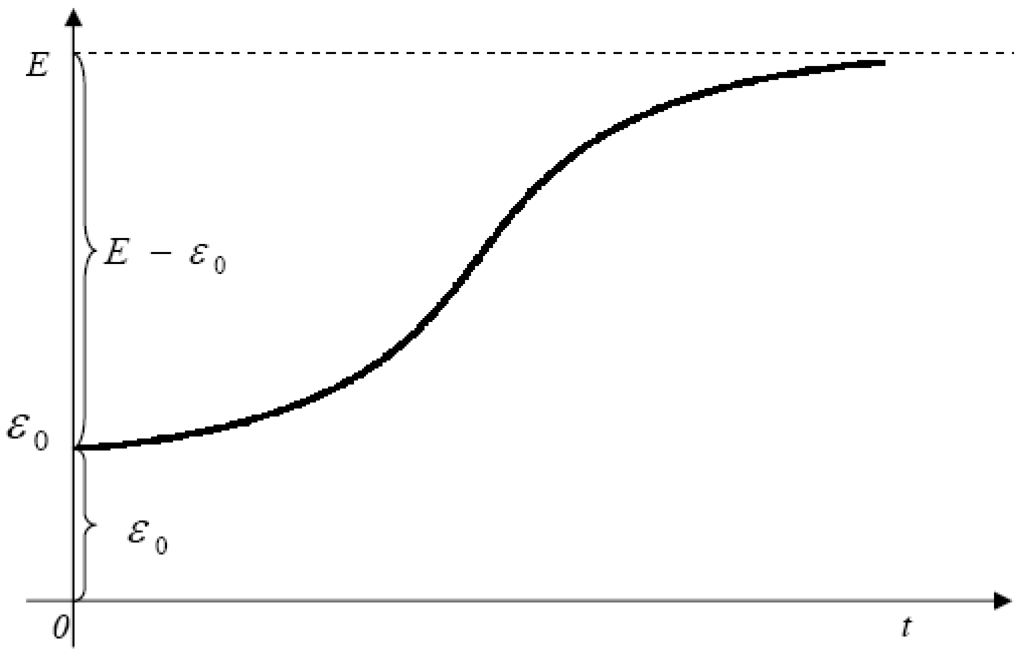

Figure 1. Logistics Function

This curve, called logistics, depending on the amount of marginal efficiency change its asymptote where $E_i,\ \varepsilon_i\ (i=1,2,3)$ Economic efficiency recpectiv marginal at baseline for each technology is taken for analysis (Figure 2).

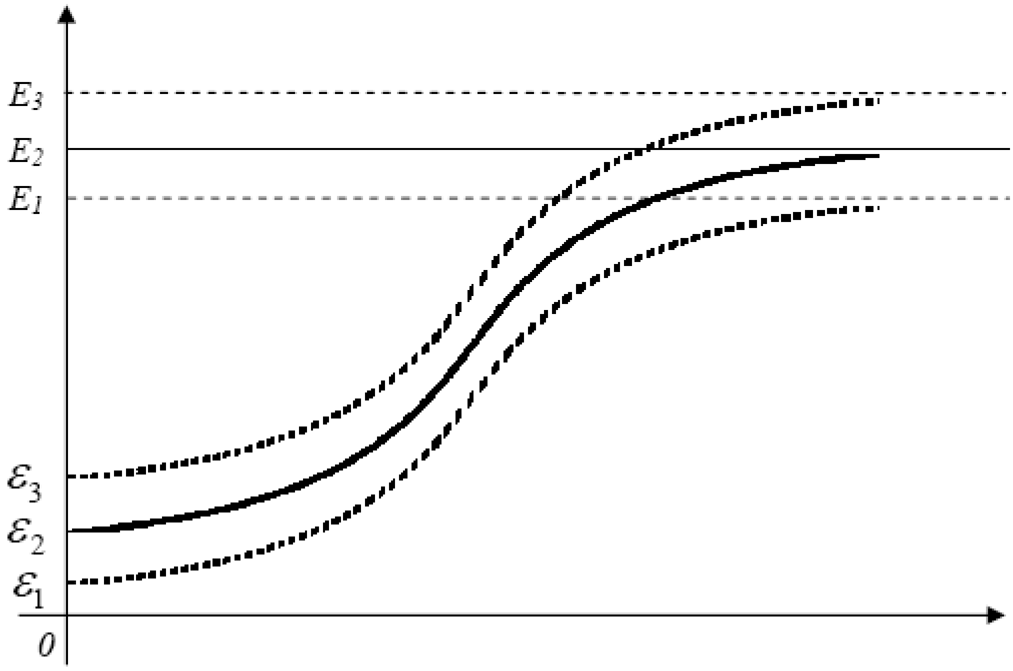

Figure 2. Function logistics efficiency for different

The model for determining the price balance
Another issue that must be present to find an answer is: the market price of the products to maintain balance between supply and demand. To note that the equilibrium price ***p***; $\frac{dp}{dt}$ - change in the price of a unit of time under the influence of certain factors that can change the request or offer. In this respect, developing dependence correlative demand for ***x.***

$$x = \alpha p' + ap + m$$

Y to offer:

$$y = \beta p' + bp + n$$

Thus, the balance between supply and demand is determined by the relationship:

$$\alpha p' + ap + m = \beta p' + bp + n$$

$$(\alpha - \beta)\frac{dp}{dt} + (a - b)p - (n - m) = 0$$

$$(\alpha - \beta)\frac{dp}{dt} = (b - a)p + (n - m)$$

$$\int \frac{(\alpha - \beta)\,dp}{(b-a)p + (n-m)} = \int dt$$

$$\frac{(\alpha - \beta)}{(b-a)} \int \frac{(b-a)\,dp}{(b-a)p + (n-m)} = \int dt$$

$$(b-a)p + (n-m) = Z\,; \quad (b-a)\,dp = dZ$$

$$\frac{(\alpha - \beta)}{(b-a)} \int \frac{dZ}{Z} = \int dt\,; \quad \frac{(\alpha-\beta)}{(b-a)} \ln Z = t + C; \quad \ln Z = \frac{(b-a)}{(\alpha-\beta)} t + \frac{(b-a)}{(\alpha-\beta)} C$$

$$Z = e^{\frac{(b-a)}{(\alpha-\beta)} t} e^{\frac{(b-a)}{(\alpha-\beta)} C}\,; \quad (b-a)p + (n-m) = e^{\frac{(b-a)}{(\alpha-\beta)} t} e^{\frac{(b-a)}{(\alpha-\beta)} C}$$

$$p = \frac{1}{(b-a)} e^{\frac{(b-a)}{(\alpha-\beta)} t} e^{\frac{(b-a)}{(\alpha-\beta)} C} - \frac{n-m}{(b-a)}.$$

Method prognosis Gross Domestic Product (GDP)
Noted by ***K*** and ***L*** that the amount of capital and labor. GDP becomes:

$$Y = AK^{\alpha} L^{\beta}$$

If we recognize that $\alpha + \beta = 1$, and:

$$Y = AK^{\alpha} L^{1-\alpha} \text{ și } \frac{Y}{L} = A\left(\frac{K}{L}\right)^{\alpha}$$

Where:

$\frac{K}{L}$ - Technical capacity is labor;

$\frac{Y}{L}$ - is productivity

So the ratio between capital and labor is given:

$$\frac{K}{L} = \frac{1}{A}\left(\frac{Y}{L}\right)^{\frac{1}{\alpha}}$$

On a unit of work goes $\frac{1}{A}\left(\frac{Y}{L}\right)^{\frac{1}{\alpha}}$ a capital units.

If the current amount of work is ***x*** units, then the amount of capital will be:

$$\frac{1}{A}\left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x \quad \text{units.}$$

The potential increase in gross domestic product ***Y*** in a time unit is in direct dependence with the potential of unused capital, labor, namely:

$$\frac{dx}{dt} = A\left(K - \frac{1}{A}\left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x\right)(L - x) = \left(AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x\right)(L - x)$$

$$\int \frac{dx}{\left(AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x\right)(L - x)} = \int dt$$

$$\frac{\left(\frac{Y}{L}\right)^{\frac{1}{\alpha}}}{\left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} L - AK} \int \frac{dx}{AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x} + \frac{1}{AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot L} \int \frac{dx}{L - x} = \int dt$$

$$\frac{1}{AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot L} \ln\left|AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x\right| - \frac{1}{AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot L} \ln\left|L - x\right| = t +$$

$$\frac{1}{AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot L} \ln\left|\frac{AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x}{L - x}\right| = t + C$$

$$\ln\left|\frac{AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x}{L - x}\right| = AKt + AKC - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} Lt - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} LC$$

$$\frac{AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x}{L - x} = e^{\left(AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} L\right)(t + C)}$$

$$AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \cdot x = Le^{\left(AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} L\right)(t+C)} - xe^{\left(AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} L\right)(t+C)}$$

$$x \cdot \left(e^{\left(AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} L\right)(t+C)} - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} \right) = Le^{\left(AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} L\right)(t+C)} - AK$$

$$x = \frac{Le^{\left(AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} L\right)(t+C)} - AK}{e^{\left(AK - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}} L\right)(t+C)} - \left(\frac{Y}{L}\right)^{\frac{1}{\alpha}}}$$

Determination analytical balance: REVENUE- EXPENDITURE

Recognize that income and expenditure of the budget are linear functions of the gross domestic product and is concerned **Y,** respectively $aY + b$ și $\alpha Y + \beta$. Then in a time of balance can be described: $\frac{dY}{dt} = (aY + b) - (\alpha Y - \beta)$

$$\frac{dY}{dt} = (a - \alpha)Y + (b - \beta), \quad \int \frac{dY}{(a - \alpha)Y + (b - \beta)} = \int dt$$

$$\frac{1}{a - \alpha} \ln\left|(a - \alpha)Y + (b - \beta)\right| = t + C$$

$$(a - \alpha)Y + (b - \beta) = e^{(t+C)(a-\alpha)}$$

$$Y = (a - \alpha)^{-1} e^{(t+C)(a-\alpha)} - (a - \alpha)^{-1}(b - \beta) = C_1 e^{(a-\alpha)t} + C_2 .$$

See, if $a > \alpha$ the balance will tend to increase for $a < \alpha$ - to decrease. To examine the case, when revenues increased linearly (***AY***), and expenditure of the budget be increased neliniar (***aY***^{2}). Such a situation can occur when the economy is in crisis. Income-expenditure balance in a unit of time is: $\frac{dY}{dt} = aY - \alpha Y^2$, where a, α parameters are positive. Recognize when $t=t_0$ gross domestic product is $Y=Y_0$.

Then: $Y(t) = \frac{1}{\frac{\alpha}{a} + \left(\frac{1}{Y_0} - \frac{\alpha}{a}\right) e^{-a(t-T_0)}}$

If t tends to infinity, $Y(t) = \frac{a}{\alpha}$. Gross domestic product since the originally $t = t_0$ tends to

$\frac{a}{\alpha}$. If $\frac{a}{\alpha} > Y_0$,gross domestic product is growing, if $\frac{a}{\alpha} < Y_0$, falling. This can be interpreted graphically (Figure 3).

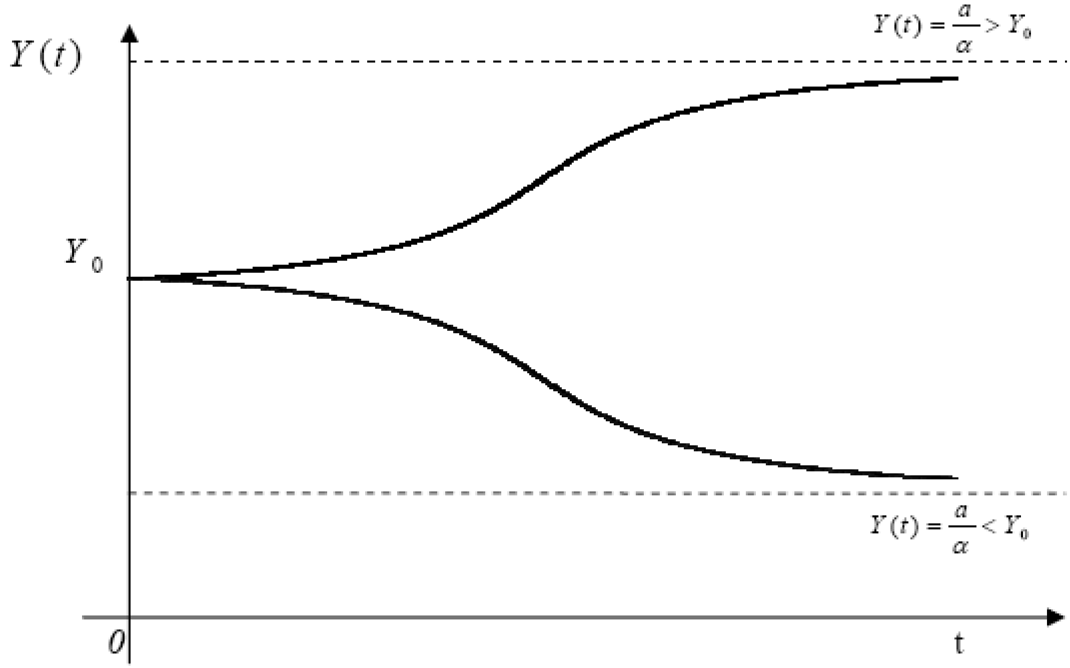

Figure 3. Chart GDP evolution

Mathematical modeling of macroeconomic problems

The economic system can not be formalized as we do with the technical, mathematical modeling, but it generates economic ideology, which can be made based on economic decisions. Not all economic activities can be shaped. But records of key factors, imitating economic activities than the aggregate leads to unacceptable variations are evident, to be drawn "margins" which should not be infringed. To this end mathematical modeling brings great economic benefit analysts.

As is known, mathematical model of economic equilibrium based on the aggregate supply and demand.

Admit “unit S” that converts ***x*** factor (labor, capital, ...) into a finished product ***Y***. Factors of production is the vector $x = (x_1, x_2, ..., x_n)$, Y - Y - the finished product in a unit of time.

The above can be demonstrated with the help function:

$$Y = F(x_1, x_2, ..., x_n), \quad x_i \geq 0, \quad i = 1,2,...,n, \quad F(x) > 0, \quad \frac{dF}{dx_i} > 0$$

(increasing marginal product), $\frac{d^2F}{dx_i^2} < 0$ (following the increase is lower than the previous one). So, the function ***F(x)***, called the production our negative, monotonous increasing, the supply function. Function application is developed based on utility theory, namely products ***Y = (Y1, y2 ..., Yn)***. Are estimated by the consumer using the function:

$$U(Y_1, Y_2, ..., Y_n), \quad (U(Y) \geq 0, \quad \frac{dU}{dY_i} > 0, \quad i = 1,2,..., n, \quad \frac{d^2U}{dY_i^2} < 0, \quad i = 1,2,..., n).$$

In

✓ offer is decreasing relative productivity of each production factor is decreasing;

✓ demand is decreasing relative usefulness of products is decreasing. Taking into account these postulated the offer is designed to maximize the profit the manufacturer, the application - based on maximizing utility, taking into account budgetary restrictions. This can be considered sketchy. If the manufacturer can be described by the aggregate function ***Y = F(x)***, and consumer needs of the **U(Y).** Note by ***p*** - price of product ***Y, R*** - the price of production factor ***X***. Then the producer profits ***pY - RX***. This expression causes: the application of resources ***x(p)***; offer products ***Y(p) =F(x(p))***. Chart this is expressed in accordance with figure 4.

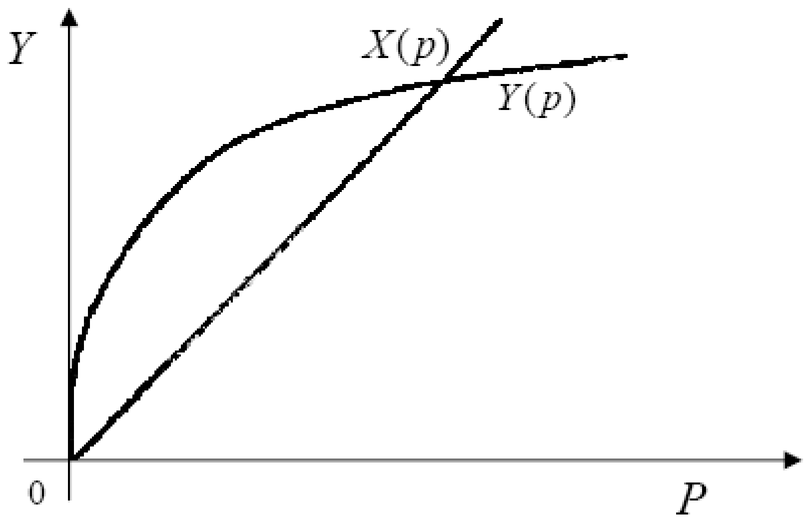

Figure 4.

The price increase ***p***, ***Y*** increase supply, increase the production factor ***x***. Demand for consumer products is determined by the problem solutions:

$$max\ U(Y)$$

Conditions:

$$pY < RX + D$$

(finished products (***pY***) can not be consumed more than financial resources obtained from the sale of production plus reserves ***x*** money ***D***).

Some interpretations can be obtained explicitly determine whether products in the form:

$$\max Y = \frac{Rx + D}{p}.$$

Modeling economic balance, the balance of reproductive processes, growth has been the object of investigation. Economic equilibrium theory as a treat ideology of the market economy. That is why mathematical modeling is only one component of this ideology. For example: Keynes Multiplier serves only "substance" in the theory of market regulation by the state and yet, some economists, insist on a more pragmatic point of mathematical models. Economic balance, in principle, can not be achieved without input-output model. This model can be successfully used in empirical economic analysis. Mathematical models have two aspects: to influence practice, to influence the design.

CONCLUSIONS

The desire for change in the language of symbols has everything to do economist I have no theoretical coverage. This can not be done and it is not something necessary. But, there are attempts to "computerization" economic activities, which in our present more than a hypothetical, but not the appropriate practice. In a systemic analysis of economic development we will start the following assumptions:

- ✓ The economy is made up of economic subjects, the subjects of competition is perfect, each competitor purpose is to obtain maximum profit;
- ✓ All products, resources are distributed in the economy through the sale;
- ✓ Currency unit is unique, the price of the capital markets, consumer products, labor resources is unique;
- ✓ Price is determined by supply and demand, demand is always satisfied, the shopping is limited capacity to purchase the matter economically;
- ✓ The company consists of owners and workers;
- ✓ The state regulates economic development through emission securities, acquisitions state taxes.

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