The Characteristics of the Evolution of the Economical Indicators

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10 October 2008

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Abstract: After the criterion of time to examine the evolution of the indicator values that can be given at the time (eg number of human population in year t) or the time (eg GDP in year t). The indicators characterizing economic development are absolute growth, growth rate, the rate increase.

Keywords: indicators economic, absolute growth, growth rate, rate increase.

INTRODUCTION

In order to extend the analysis methods applied in absolute economic growth indicators, the pace of growth, the pace of growth may be examined in the case continue. This allows the use of differential calculus.

In an economic analysis importance acceleration has a specific indicator, that is required to determine the acceleration of change indicator of the absolute growth.

Evolution absolute increase in time can be represented by a constant growth, increasing, decreasing, increasing the qualitative changes.

STRUCTURE RESEARCH

Evolution economic indicator Y can be represented as a function of time (Figure 1).

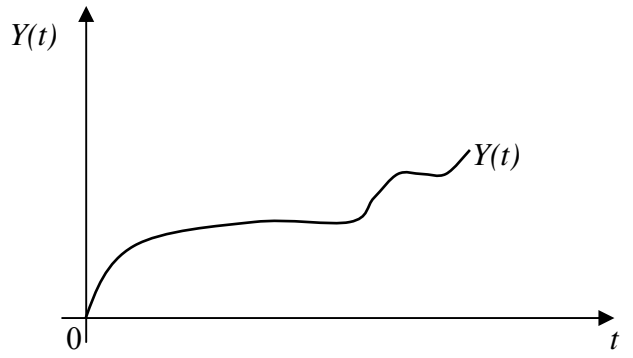

Fig.1. Indicator values are a function of time

The argument t may be represented intervals or, if the analysis is subject to retrospective and then ranges may be $(-\infty;0]$; $(-\infty;T]$; $[-T_1;0]$; $[-T_1;T_2]$; $[-T_1;\infty)$. Y indicator values can be continuous or discrete. After the criterion of time to examine the evolution of the indicator values that can be given at the time (eg. number of human population in year t) or the time (eg. GDP in year t).

The indicators characterizing economic development are absolute growth, growth rate, the rate increase.

Absolute growth (δ_{10}) is the difference between the indicator values Y in the base year t=0, ie $\delta_{10} = Y_1 - Y_0$ (Figure 2).

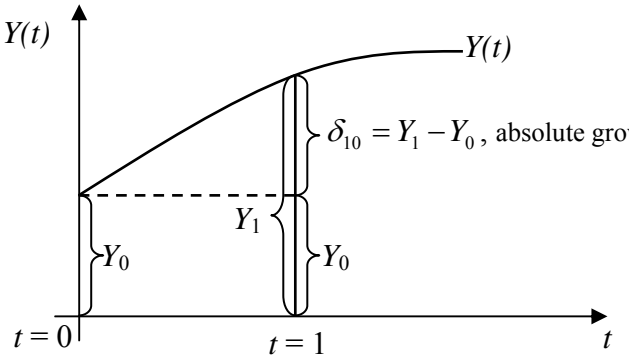

Fig.2. Absolute increase in the (0; 1)

The pace of growth (η_{10}) he called indicator is a de facto economic index or growth factor that determines how often the Y_1 year $t = 1$ exceeded the mean Y_0,

$$\eta_{10} = \frac{Y_1}{Y_0} \text{ (Figure 3; 4; 5)}$$

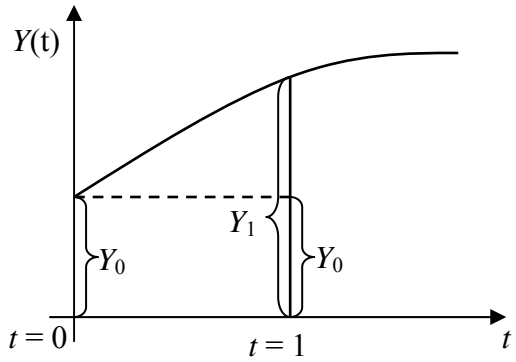

Fig.3 The pace of growth indicator

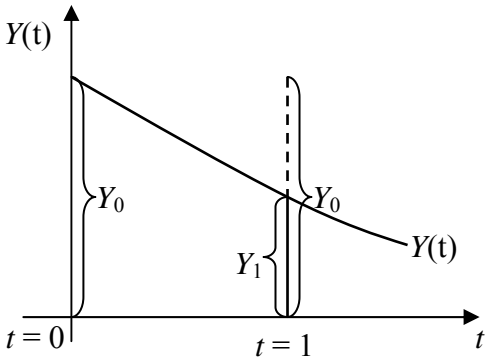

Fig.4 The pace of growth indicator

$$\eta_{10} = \frac{Y_1}{Y_0} > 1$$

$$\eta_{10} = \frac{Y_1}{Y_0} < 1$$

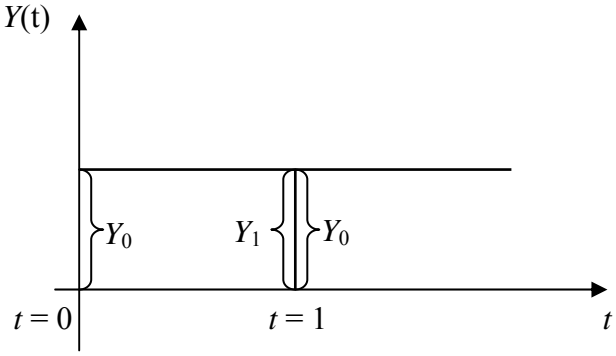

Fig.5 The pace of growth indicator $\eta_{10} = \frac{Y_1}{Y_0} = 1$

In other words, the pace of growth is equivalent to the percentage indicator Y_1 from Y_0,

$$\eta_{10} = \frac{Y_1}{Y_0} \cdot 100\% .$$

The pace of growth (ρ_{10}) the increase is the absolute indicator Y_0 ie,

$$\rho_{10} = \frac{Y_1 - Y_0}{Y_0} \text{ (fig. 6; 7; 8)}$$

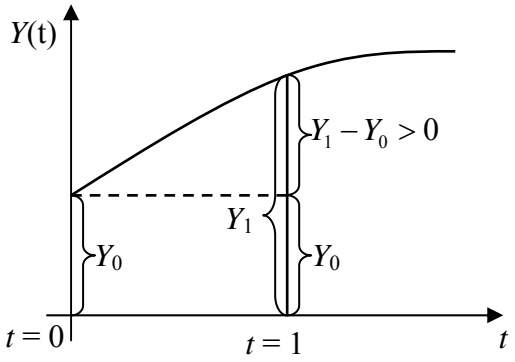

Fig. 6. The pace of positive growth

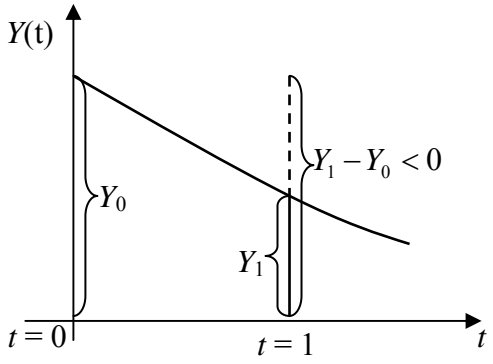

Fig. 7. The pace of negative growth

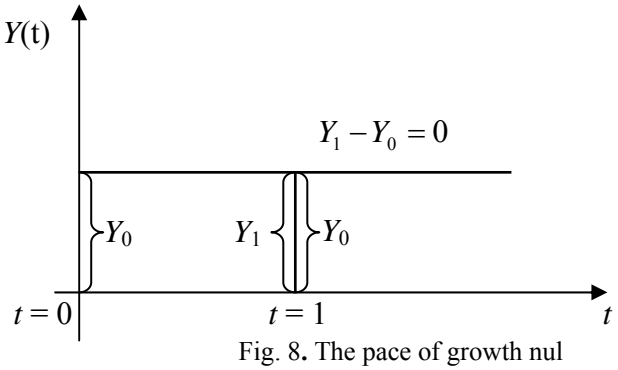

Fig. 8**.** The pace of growth nul

The base year is an arbitrary and therefore he can maintain the same or may change. For each year considered, the previous year may have been an evolution for comparison. In this case the variable comparisons being made "in the chain". So characteristics: absolute growth, growth rate, growth rate can be calculated from the base year $(t=0)$, compared to the previous year $(t-1)$.

Absolute growth, the pace of growth, the pace of growth indicator Y in t, expressed in the prices of basic $(t=0)$,are:

$$\delta_{t0} = (Y_t - Y_0);\ \eta_{t0} = \frac{Y_t}{Y_0};\ \rho_{t0} = \frac{Y_t - Y_0}{Y_0};$$

expressed in the prices of the previous year –

$$\delta_{t,t-1} = Y_t - Y_{t-1};\ \eta_{t,t-1} = \frac{Y_t}{Y_{t-1}};\ \rho_{t,t-1} = \frac{Y_{t-Y_{t-1}}}{Y_{t-1}}.$$

Indicators, $\delta_{t,t-1}$, $\eta_{t,t-1}$, $\rho_{t,t-1}$, compiled basic variable can be interpreted graphically (Fig.9).

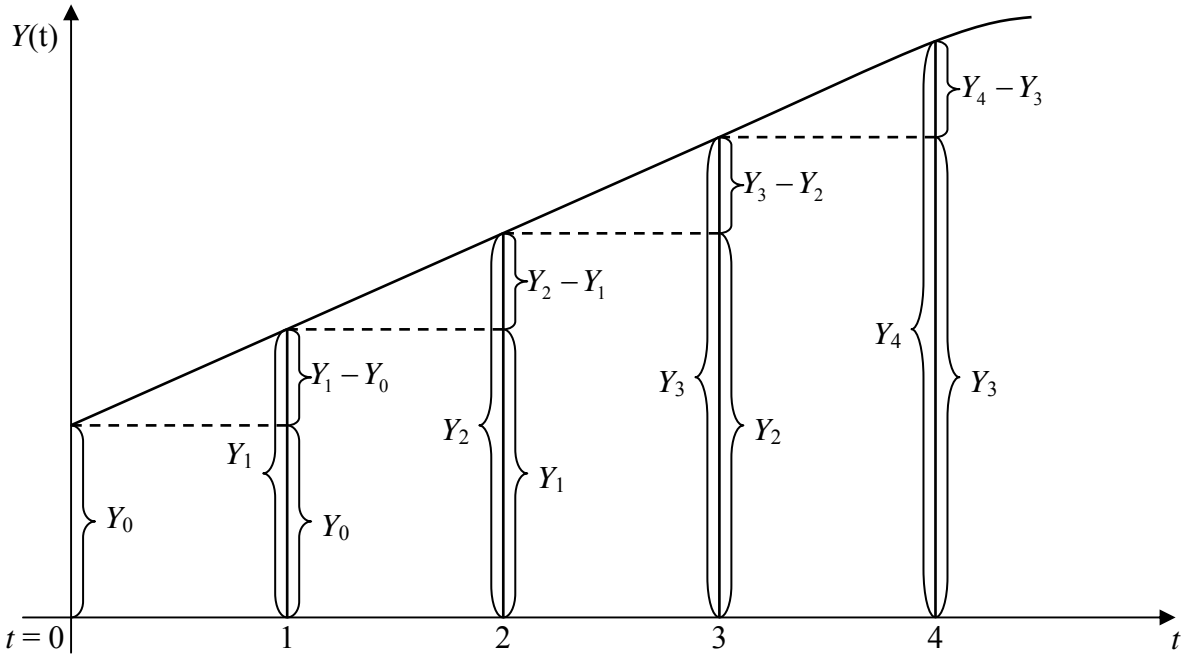

Fig. 9. Indicators expressed "chain" discrete values

Among the indicators δ_{t0}, η_{t0}, ρ_{tu} şi $\delta_{t,t-1}$, $\eta_{t,t-1}$, $\rho_{t,t-1}$ some may be established relationships:

The amount increases: $(Y_1 - Y_0) + (Y_2 - Y_1) + (Y_3 - Y_2) + (Y_4 - Y_3) = Y_4 - Y_0$ or

$(Y_1 - Y_0) + (Y_2 - Y_1) + ... + (Y_t - Y_{t-1}) + ... + (Y_T - Y_{T-1}) = \delta_{10} + \delta_{21} + ... + \delta_{t,t-1} +$

$+ ... + \delta_{T,T-1} = \sum_{t=1}^{T} (Y_t - Y_{t-1}) = \sum_{t=1}^{T} \delta_{t,t-1} = Y_T - Y_0$;

Differences:

$(Y_2 - Y_0) - (Y_1 - Y_0) = Y_2 - Y_1$ or $\delta_{20} - \delta_{10} = \delta_{21}$

$(Y_3 - Y_0) - (Y_2 - Y_0) = Y_3 - Y_2$ or $\delta_{30} - \delta_{20} = \delta_{32}$

Product:

$\frac{Y_1}{Y_0} \cdot \frac{Y_2}{Y_1} \cdot \frac{Y_3}{Y_2} \cdot \ldots \cdot \frac{Y_t}{Y_{t-1}} \cdot \ldots \cdot \frac{Y_T}{Y_{T-1}} = \frac{Y_T}{Y_0}$ or

$\eta_{10} \cdot \eta_{21} \cdot \eta_{32} \cdot \ldots \cdot \eta_{t,t-1} \cdot \ldots \cdot \eta_{T,T-1} = \eta_{T,0}$;

or $\eta_{10} \cdot \eta_{21} \cdot \eta_{32} \cdot \ldots \cdot \eta_{t,t-1} = \frac{Y_t}{Y_0}$ where

$Y_t = Y_0 \cdot \eta_{10} \cdot \eta_{21} \cdot \eta_{32} \cdot \ldots \cdot \eta_{t,t-1}$;

Catul:

$\frac{Y_2}{Y_0} : \frac{Y_1}{Y_0} = \frac{Y_2}{Y_1}$ or $\frac{\eta_{20}}{\eta_{10}} = \eta_{21}$

$\frac{Y_3}{Y_0} : \frac{Y_2}{Y_0} = \frac{Y_3}{Y_2}$ or $\frac{\eta_{30}}{\eta_{20}} = \eta_{32}$

.....

$\frac{Y_t}{Y_0} : \frac{Y_{t-1}}{Y_0} = \frac{Y_t}{Y_{t-1}}$ or $\frac{\eta_{t0}}{\eta_{t-1,0}} = \eta_{t,t-1}$

.....

$\frac{Y_T}{Y_0} : \frac{Y_{T-1}}{Y_0} = \frac{Y_T}{Y_{T-1}}$ or $\frac{\eta_{T0}}{\eta_{T-1,0}} = \eta_{T,T-1}$

In order to extend the analysis methods applied in absolute economic growth indicators, the pace of growth, the pace of growth may be examined in the case continue. This allows the use of differential calculus.

Absolute increase in the case of discrete $\delta_{t,t-1} = Y_t - Y_{t-1}$ or $\delta_{t,t-\Delta t} = Y_t - Y_{t-\Delta t}$, at a time, ie $\frac{\delta_{t,t-\Delta t}}{\Delta t} = \frac{Y_t - Y_{t-\Delta t}}{\Delta t}$, the assumption that variable Y_t is still can move to limit:

$$\lim_{\Delta t \to 0} \frac{\delta_{t,t-\Delta t}}{\Delta t} = \bar{\delta}(t) = \lim_{\Delta t \to 0} \frac{Y_t - Y_{t-\Delta t}}{\Delta t} = \frac{dY(t)}{dt}$$

The pace of growth in case of discrete $\rho_{t,t-1} = \frac{Y_t - Y_{t-\Delta t}}{Y_{t-1}}$ au $\rho_{t,t-\Delta t} = \frac{Y_t - Y_{t-\Delta t}}{Y_{t-\Delta t}}$, calculated values proceed, can be written $\bar{\rho}(t) = \lim_{\Delta t \to 0} \frac{\frac{Y_t - Y_{t-\Delta t}}{\Delta t}}{Y_{t-\Delta t}} = \frac{d \ln Y(t)}{dt}$.

As an established $\delta_{t+1,t}$, $\delta_{t,t-1}$ (figure 10) is the increase (or decrease) indicator Y in a unit of time, that is the speed of change.

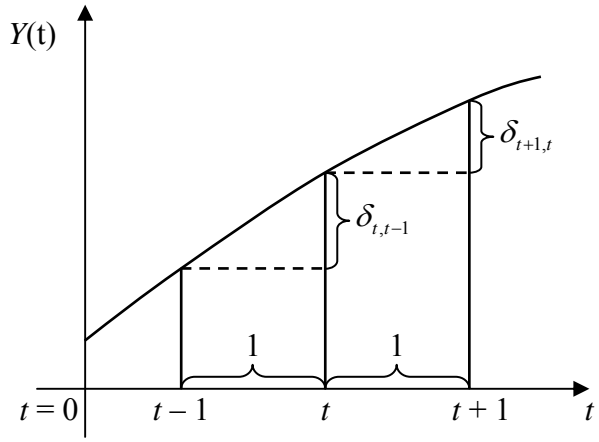

Fig. 10. Speed, acceleration change indicator

Velocity difference $\left(\delta_{t+1,t}-\delta_{t,t-1}\right)=\varphi_t$ is the acceleration of change indicator Y. The difference in unit time can be written:

$$\frac{\delta_{t+\Delta t,t}-\delta_{t,t-\Delta t}}{\Delta t}=\varphi_t$$

Since the assumption Y that a function is continuous

$$\lim_{\Delta t\to 0}\frac{\delta_{t+\Delta t,t}-\delta_{t,t-\Delta t}}{\Delta t}=\overline{\varphi}_t=\frac{d\overline{\delta}_{(t)}}{dt}=\frac{d^2Y(t)}{dt^2}$$

In an economic analysis importance acceleration has a specific indicator, that is required to determine the acceleration of change indicator of the absolute growth

$\frac{\delta_{t+1,t}-\delta_{t,t-1}}{Y_{t+1}-Y_t}$ (Fig. 11)

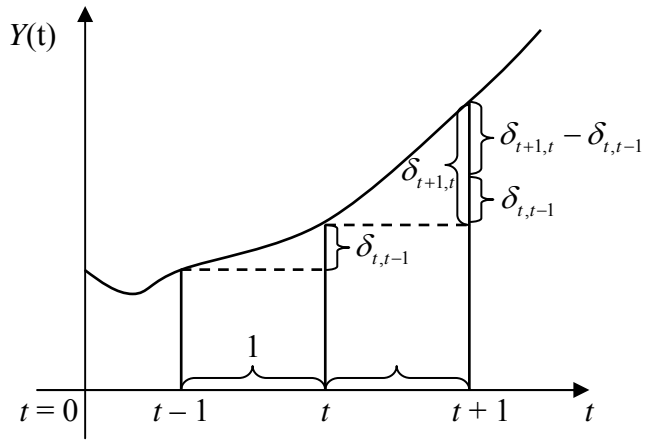

Fig. 11. Acceleration relative

From fig. 11: $\frac{\delta_{t+1,t}-\delta_{t,t-1}}{Y_{t+1}-Y_t}=\frac{\left(Y_{t+1}-Y_t\right)-\left(Y_t-Y_{t-1}\right)}{Y_{t+1}-Y_t}=1-\frac{Y_t-Y_{t-1}}{Y_{t+1}-Y_t}$

Since assuming that Y is continuous variable gain:

$$\frac{\frac{d\overline{\delta}(t)}{dt}}{\overline{\delta}(t)}=\frac{dlu\overline{\delta}(t)}{dt}.$$

CONCLUSIONS

In this case the economic intervals increases are growing in others - in decline.

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