QUALIFICATION AVERAGE PERIOD OF PERMANENT CENTRES EXPLOITATION WITH UTILIZATION FUZZY NUMBERS OF TYPE α-β

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Abstract

In work one characterized process of reproduction of capital material and proprieties of reproduction cycle of permanent centres. Then one passed considerations relating delimitations this of cycle at help of fuzzy numbers of type α and β. One gave also example of calculation average period of exploitation of permanent centres with utilisation of fuzzy numbers.

1. Identification processes of material capital reproduction

Realization of strategic firms aims this continuous process of undertaking decision, which should assure him maximum advantages at maintenance suitable structures, technical and economic quality of material capital. It brings acceptable of proper strategy of reproduction. In this composition of theoretical analysis is basic component of material capital – permanent centres.

In advance of production exists so it is necessary renovation used centres of production. This of renovation process of centres we call reproduction [9]. In gaining to permanent centres straight reproduction is process solid of withdrawing centres permanent and introducing on their place of new centres.

Needs of economic height in every country will demand of permanent centres development, what one can execute mostly across enlargement their supplies, that is to say reproduction widened. Common content of straight reproduction: straight line entire and widened is introduction new permanent centres instead used or their widening. This process of introducing to exploitation new permanent centres qualifies oneself in present work with renovation. According to [6] renovation of work centres relies on reproducing natural -

material of physically features and morally obsolete components on new technically to base, in more effective and effective form [6].

2. Proprieties and dependences of cycle permanent centres reproduction

Cycle of permanent centres reproduction is narrower notion from circuitous movement these centres. Cycle of reproduction as economic category characterizes time, in the course which realizes oneself reproducing values useful permanent centres. Expresses so speed and periodicity of exchange used centres of work that is to say periodicity full renovations of centres in new natural form.

Differentiates oneself average cycle of reproduction all masses of centres permanent and individual cycle of reproduction separate objects. All mass of permanent centres is introduced gradually in social process of production in different time and with different periods of use. During average period of waste permanent centres all their mass should be reproduced in new, natural form. Because average cycle of reproduction permanent centres does not drive to hesitate size their useful values, in distinction from individual cycle of reproduction. Cycle of reproduction separate permanent centres runs otherwise. Every separate permanent object introduced in productive process is fully exploited during one's own of individual reproduction cycle and exchanged new, with natural form [10].

In gaining to masses of permanent centres in scale of firm step out considerable deviations among averages with real periods of exploitation and with cycles of reproduction. In a scale of all economies industry whether branch one can found mutual drift oneself of difference between averages real periods of exploitation and with length of reproduction cycle. In this last cause one can accept equality:

$$T_c = \overline{T} \tag{1}$$

where:

T_c – length of permanent centres reproduction cycle, in years,

$\overline{T}$ – average real exploitation period of work centres, in years.

Acquaintance of reproduction cycle length for each branch of industry has large value cognitive, informs about changing tendencies in supplies of permanent centres, about tempo their renovations(changes and widening) in examined period. Is this generalizing coefficient characterizing course of reproduction in time.

At widened reproduction in natural form, in every year moves size of permanent centres topping needs their reproductions. However in scale all national economies , division

or branch of industry with difficulty is to demarcate destination of permanent centres on reproducing and on widening. Cycle of reproduction one can treat not only as process of exchange, reproducing, but and as process of liquidation permanent centres in consequence wastes physical and moral. Because time of duration cycle one can enumerate as section of time, in the course which all given mass of permanent centres will be withdrawn from exploitation in consequence wastes. Time this reflects average duration of exploitation gathering of permanent centres to moment of their liquidation. In works [3] [8] one led out following formula of marking average period of exploitation permanent centres $(\bar{t})$ in conditions of reproduction widened

$$\bar{t} = \frac{\log\left(\frac{p}{d}+1\right)}{\log(1+p)} \tag{2}$$

where:

p – one year's increase of permanent centres,

d – coefficient of liquidation permanent centres.

3. Fuzzy model of average exploitation period of permanent centres in reproduction winded conditions

In further considerations we will accept, that sizes p and d in example(2) are fuzzy numbers of type α-β [1], [2], [4], [5], [7].

This number is represented by four parameters (a, b, α, β). Real counts a and b qualify section, which function of membership attains value 1. α and β mean left and right width of schedule. Function of membership such numbers is defined as follows:

$$\mu_L(x) = \begin{cases} 0 & \text{for} \quad x < a-\alpha, \\ (x-a+\alpha)/\alpha & \text{for} \quad x \in [a-\alpha, a), \\ 1 & \text{for} \quad x \in [a,b], \\ (b+\beta-x)/\beta & \text{for} \quad x \in (b, b+\beta], \\ 0 & \text{for} \quad x > b+\beta. \end{cases} \tag{3}$$

Figure 1 introduces graph of this function

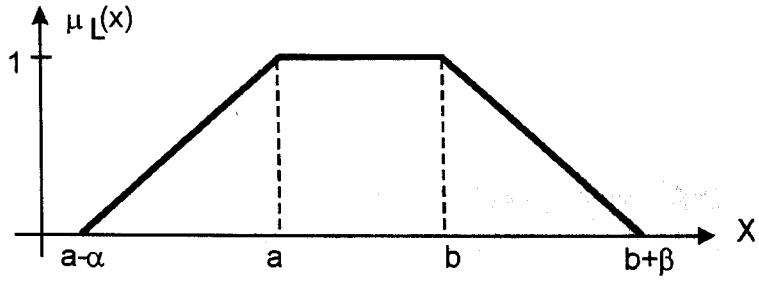

Fig. 1. Graph of membership function of fuzzy number type of α - β

Membership function of fuzzy number type of α – β has shape of trapezium. Fuzzy number L about triangular function of membership we record as L=(a, a, α, β). At calculation of size $\bar{t}$ on the ground of example(2) we will use following operations on fuzzy numbers

- addition of real fuzzy number and fuzzy number,
- division of fuzzy numbers,
- logarithm of fuzzy numbers.

For two fuzzy numbers $L_1=(a_1, b_1, \alpha_1, \beta_1)$ and $L_2=(a_2, b_2, \alpha_2, \beta_2)$ sum we qualify as follows

$$L_1+L_2 = (a_1+a_2, b_1+b_2, \alpha_1+\alpha_2, \beta_1+\beta_2). \quad (4)$$

In chance of adding 1 to fuzzy numbers L=(a, a, α, β) we have

$$L+1 = (a, b, \alpha, \beta) + (1, 1, 0, 0) = (a+1, b+1, \alpha, \beta). \quad (5)$$

Quotient of fuzzy numbers we qualify in following manner(L1>0 and L1>0) 6

$$L_1 / L_2 = (a_1 / b_2, b_1 / a_2, (a_1\beta_2 + b_2\alpha_1)/(b_2(b_2 + \beta_2)), (b_1\alpha_2 + a_2\beta_1)/(a_2(a_2 - \alpha_2))) \quad (6)$$

Taking pattern of work [4] we qualify in manner approximate logarithm of fuzzy number

$$\log(L) = (\log(a), \log(b), \log\left(\frac{a}{a-\alpha}\right), \log\left(\frac{b+\beta}{b}\right)). \quad (7)$$

Executing arithmetical operations stepping out in example(2) and using examples(5)–(7) we count in demand size $\bar{t}$

Example

One should qualify average period of permanent centres exploitation in conditions of reproduction widened. One year's increase of permanent centres p carries out 14%±1%, and coefficient of permanent centres liquidation d contains oneself in section [5%,10%] and can be smaller 1% or enlarged about 2%. On base these given numbers p and d we will treat as fuzzy type of α-β in form

$$d=(0.14, 0.14, 0.01, 0.01), \qquad p=(0.05, 0.10, 0.01, 0.02). \quad (8)$$

In turn counting we have

$$p/d=(1.4, 2.8, 0.3167, 0.95),\ p/d+1=(2.4, 3.8, 0.3167, 0.95), \quad (9)$$

$$\log(p/d+1)=(0.3802, 0.5798, 0.06145, 0.09691), \quad (10)$$

$$\log(p+1)=(0.05690, 0.05690, 0.003826, 0.003793). \quad (11)$$

In result we receive number $\bar{t}$ in form

$$\bar{t}=(6.68, 10.19, 1.43, 2.56). \quad (12)$$

This means, that average period of permanent centres exploitation hesitates in borders from 6 years and 8 of months to 10 years and 2 months. Instead insecure is fact, that period this can be diminished to 5 years and 3 of months(6. 68-1. 43) or elongated to 12 years and 9 of months(10. 19+2. 56).

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