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BASIC IMPERATIVES FOR MODELING PENSION PAYMENTS IN THE PENSION SECURITY SYSTEM OF UKRAINE

ABSTRACT

The purpose of the article is to research and analysis of the amount of indexation of pension payments related to inflationary processes. The object of the study is the state of pension provision in Ukraine. The subject of the study is the process of indexation of pension payments as a result of the implementation of social policy in Ukraine. An analysis of the history of the development and reform of pension provision in Ukraine was carried out. This allowed for a deeper understanding of the content of events related to the establishment of pension provision in Ukraine. The research methodology involves the synergy of mathematical methods of analytical geometry and economic-mathematical modelling. It is shown that the presence of inflationary processes in the national economy leads to the need to increase the pension provision of citizens. At the same time, the size of the increase in pension payments should be differentiated in order to ensure social "justice". The scientific task set in the article is to demonstrate a modern approach to choosing a strategy for implementing the state pension policy in Ukraine. As a result of the research, two models of appropriate indexation of pension payments in Ukraine are presented. The calculation made it possible to choose the most significant model. In the future, it is advisable to direct the research to the search for other more effective ways of indexing pensions. It is assumed that for this it is necessary to formalize the mathematical formulation of the problem of finding the optimal value of the index of pension payments as extreme, taking into account the necessary restrictions. A scientific novelty in solving this issue is the receipt of practically significant recommendations regarding the indexation of pensions. The practical significance of the obtained results lies in the elimination of social defects in the indexation of pension payments. Further research should be directed to the search for rational solutions that will stimulate the creation of an effective pension system in Ukraine.

Keywords: pension payments, indexation, inflation, reform, economic-mathematical model

JEL Classification: C19, D29

INTRODUCTION

The implementation of market reforms in Ukraine has brought with all urgency the need to solve a whole chain of issues related to the pension provision of its citizens. The pension system, which was created during the times of the USSR, could not solve the issues, because it did not correspond to the transformational processes taking place in the country. Scientific developments regarding the analysis and forecast of pension provision with particular acuteness confirmed the relevance of the study of the specified problem. At the same time, at present, scientific publications do not fully reflect possible approaches using modern model methods. The use of modern economic-mathematical models will make it possible to fully analyze and determine the directions for making optimal quantitative decisions in the process of indexation of pension payments.

An attempt to legislatively regulate social justice for workers and peasants was made in 1967. During this period, the resolution «On measures to further improve the welfare of the Soviet people» was adopted. In this resolution, some discriminatory norms were excluded, but in general, socially oriented norms were not implemented. Changes in the pension provision of citizens were preceded by the Declaration of Independence of

Ukraine. Starting from 1991, a step-by-step reform of the pension provision of citizens began, which has been improved until now (Shumylo, 2020).

It should be noted that there is a discussion among experts regarding the time period of the first stage of the pension reform. Authors Stavers'ka & Shevchuk determine the first period of the pension reform - 2004. The historical stages of the transformation of the pension reform are studied. A comparative analysis of the pension provision of citizens in foreign countries was carried out. The disadvantages and advantages of appropriate social security for citizens are highlighted. Factors influencing the formation of legislative norms regarding pension provision of citizens are analyzed (Stavers'ka & Shevchuk 2017).

We support the opinion of the author M. Shumylo, who singles out the time frame for the first period - 1991. During this period, the Law of Ukraine's «On pension provision» was adopted (Shumylo, 2020). The main defect of this Law is the lack of flexibility in the preferential part. The next stage of the reform began in 2003-2004 when a number of basic Laws "On universal mandatory pension insurance" and «On non-state pension insurance» were adopted. These legislative acts are considered the basis of the modern pension provision of citizens. Insurance mechanisms providing for mandatory pension insurance were legislated. It was this mechanism that became the basis for the formation of voluntary pension insurance. In 2011, the Law of Ukraine «On Measures for Legislative Support of Reforming the Pension System» was adopted, and the next stage of pension reform began. At that time, there was a budget deficit and, accordingly, there was a need to reduce it. Therefore, the changes proposed in the legislative field did not have a significant impact on the reform of citizens' pension provision. The stage of pension reform in 2015 was marked by the adoption of the Law of Ukraine «On Amendments to Certain Legislative Acts of Ukraine Regarding Pension Provision». This law introduced the reform of the special pension system. Accordingly, the retirement age and insurance length of service were revised upwards. The Law of Ukraine «On Amendments to Certain Legislative Acts of Ukraine Regarding Pension Increases» adopted in 2017 can be considered a continuation of pension reform. An indexing mechanism is introduced, but not on a permanent basis. Starting from 2019, indexation has been determined on a permanent basis for pensioners, in addition, the date - March 1 for the recalculation of pension payments of citizens on the basis of indexation has been approved. The introduction of such legislative initiatives creates the basis for reforming social institutions for the formation of social justice in society. Currently, our country has a mixed pension system, and despite the efforts of legislative initiatives, society is not ready to accept the accumulative component.

At the same time, at present, scientific publications do not fully reflect possible approaches using modern model methods. The use of modern economic-mathematical models will make it possible to fully analyze and determine the directions for making optimal quantitative decisions in the process of indexation of pension payments.

LITERATURE REVIEW

Reforming the pension system is currently attracting the attention of leading scientists. Analyzing scientific publications, we focus on national scientific works. The depth of the historical essence of the issue allows for a more meaningful assessment of the problem of pension provision in Ukraine. So, scientists N.P. Hryhoruk and O.P. Valchuk (2015) investigated the application of economic-mathematical modelling tools in the processes of formation of trends in the pension system. Selected approaches to pension modelling processes. Highlighting the main trends of development does not take into account the level of inflationary processes. Among the scientific works related to the economic and mathematical modelling of pension provision in Ukraine, the publications of scientists V.I. Brediuk (2013) should be noted, L.P. Yakymova (2013), A. Yakymiv (2003) in which the issue of economic and mathematical modelling of trends in the development of the pension system of Ukraine is studied in detail. It should be noted that modelling issues have been covered in the scientific literature for more than ten years. Despite the fact that inflationary processes constantly accompany the national economy, the urgency of the question of their inclusion in pension payments arose only in time. N.V. Tkachenko and O.V. Shabanova (2014) pay attention to updating non-state pension funds, highlighting their investment component. The authors do not take into account the influence of inflation on the formation of the specified fund. Scientist N. Pokhyl (2018) studied the legislative processes in relation to social insurance. Attention is paid to the analysis of non-state pension provision in Ukraine and ways of its improvement are determined. Scientists V.V. Datsenko and I. I. Tubolets (2012) studied the mechanism of pension reform. Attention was focused on the formation of a three-level insurance pension system. The activities of the pension fund in the Dnipropetrovsk region were analyzed, and the shortcomings of its work were identified. The author L. I. Shalievska (2020) in her scientific study, namely a monograph, singles out the peculiarity of taking into account pension provision in the system of economic security of the state, which is particularly related to the indexation of pensions. In the dissertation research of O. M. Solomka (2006) special attention is paid to pension provision in the system of social protection of the population in Ukraine, the need for pension indexation as an element of

such protection is emphasized. The scientific works of scientists L.H. Tkachenko (2017), N.M. Khutorian (2015), A.A. Shyrant (2012), and M.M. Shumylo (2016) are devoted to the analysis of pension legal relations and the results of the implementation of the pension reform in Ukraine, in accordance with modern conditions. The need for further improvement of the reform of the pension provision of citizens is indicated, but the authors do not touch on the issue of indexation of pension payments. Scientist V.I. Shulha (2012) points out the problems and prospects of pension provision in Ukraine, connecting them in particular with the growth of the number of pensioners by age and the need to index their pensions. Particular attention is drawn to the work of the authors M. Shumylo and I. Komotska (2018) in which the history of the formation and development prospects of pension provision in Ukraine is analyzed, and its features are highlighted in comparison with Belarus. The author L. I. Shalievska (2019) examines in detail the problems of the development of mandatory pension provision in Ukraine and points out the need to solve them, in particular by applying indexation of pensions. Scientists I.V. Tarasov and L.M. Filipishyna (2023) investigated three-level pension provision. A regression model was proposed, the analysis of which allowed scientists to offer certain proposals for ensuring an appropriate level of citizens' lives. The difference in content is the work of the authors O. Cheberiako and V. Bykova (2020), who investigated the essence of the national model of pension provision. Its structure was defined in accordance with the concept of the Organization for Economic Cooperation and Development. Conducted a comparative analysis of pension models in foreign countries and Ukraine. R.V. Ruska's (2018) research is devoted to the problems of accumulating pension payments in non-state pension funds. A regression model was built, the analysis of which makes it possible to determine certain analytical dependencies regarding future pension payments in dynamics. The scientific publication of D. Leonov (2019) is devoted to the problems of law-making modelling. Author-scientist L.P. Yakymova (2013) researched approaches to modelling the evolutionary dynamics of pension systems. She proposed relevant models of the dynamics of pension insurance.

Without diminishing the importance of scientific developments in the plane of modelling pension payments, their diversity, the direction of indexation of pension payments remains little researched. In our opinion, the possibility of applying economic-mathematical modelling in the sense of pension indexation requires further research.

AIMS AND OBJECTIVES

The purpose of the article is to research and model the indexation of pension payments in connection with inflationary processes in the national economy. Implementation of the method of differentiation of indexation of pension payments for their rational distribution.

METHODS

With all the diversity and depth of scientific research, not enough attention is paid to the differentiation of indexation of pension payments according to each individual citizen. At the same time, the differentiation of indexation of pensions means the need to take into account the dependence of the amount of indexation of pension payments on the amount of pension provision of an individual citizen. The search for rational solutions that make it possible to stimulate the creation of an effective pension system indicates the feasibility of the indexation of pension payments. In order to take inflation into account, pension payments are indexed.

Table 1 and Figure 1 show the dependence of the inflation index on time in Ukraine Analysis of the given data shows that the inflation index changes depending on time.

Table 1. Dependence of the inflation index on time in Ukraine.

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Inflation index (%)	143.3	112.4	113.7	109.8	104.1	105.0	110.0	126.6	100.7

It is clear that these changes are caused by the economic situation in Ukraine. At the same time, for the corresponding time, the fluctuations are quite insignificant. Only in 2015 and 2022, the value of the inflation index is quite large, which is explained by the corresponding changes in the national economy.

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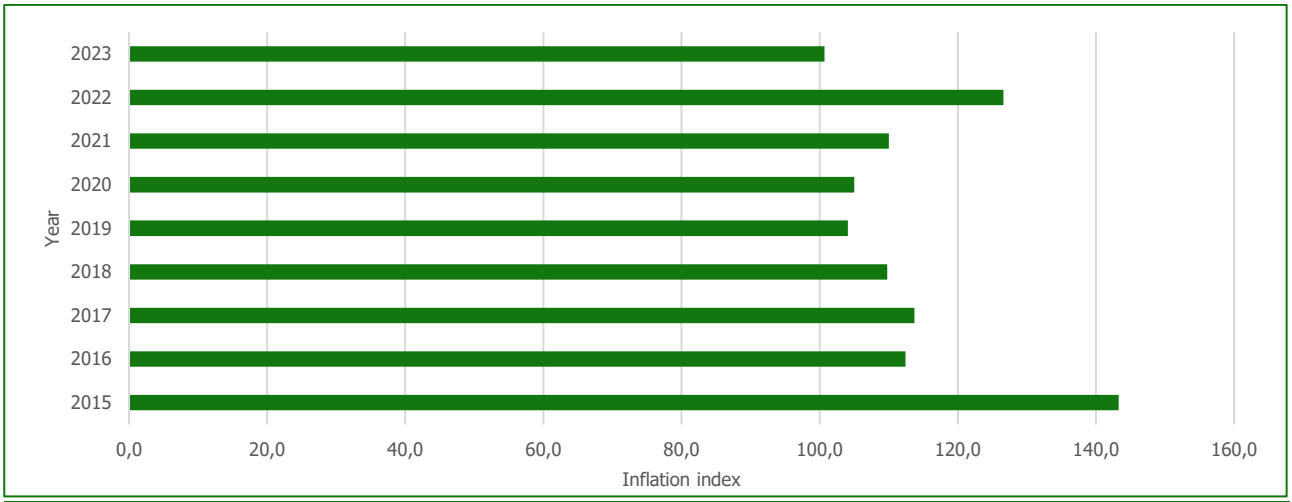

Figure 1. Dependence of the inflation index on time in Ukraine (2015 - 2023).

It is important to note that the given value of the inflation index does not depend on the amount of pension provision. It is clear that this causes dissatisfaction among those segments of the population that have minimum pensions.

One of the tasks of social policy is to justify the fairness of indexation payments in the sense that smaller pension payments should have a larger index compared to larger pension payments. When making this or that decision, one cannot simply proceed from their positive impact on the further increase of pension payments. There must be confidence that this decision is the best under the existing conditions. This leads to the need to use economic-mathematical modelling as one of the effective methods of researching complex economic processes (Sokolovska, Andriienko and Ivchenko, 2016). Analysis of the indexation of pension payments as an economic process indicates the possibility of choosing a linear continuous structure of the model. For the analytical record of the selected structure of the model, it is necessary to enter a notation. Let us denote the amount of pension payment that can be received by a citizen. It is clear that the amount of the pension payment is limited, i.e.:

$$\underline{y} \le y \le \bar{y} \tag{1}$$

where $\underline{y}$, $\bar{y}$, are the lower and upper limits of pension payments, respectively, UAH.

Taking into account (1) and the assumption of linearity of the structure of the pension model, the amount of pension payments is calculated using the formula:

$$y = \underline{y} + x \cdot (\bar{y} - \underline{y}), 0 \le x \le 1 \tag{2}$$

In formula (2), the argument acts as a parameter that takes into account the features of calculating pension payments.

When indexing pension payments, an indexation coefficient is used, which is indicated and takes into account the current level of inflation. Then the indexed level of pension payments is calculated according to the formula:

$$y_i = (1 + \delta) \cdot y \tag{3}$$

It should be emphasized that the indexation coefficient is given in relative units.

Taking into account the indexation of pension payments, formula (1) takes the form:

$$y_i = \underline{y}_i + x \cdot (\bar{y}_i - \underline{y}_i), 0 \le \mathrm{x} \le 1, \tag{4}$$

Where:

$$\underline{y}_i = (1 + \delta) \cdot \underline{y} \tag{5}$$

$$\bar{y}_i = (1 + \delta) \cdot \bar{y} \tag{6}$$

The analysis of formulas (3) and (4) shows that the disadvantage of the presented formulas is a significant increase in the maximum amount of pension payments ($\bar{y}_i$) in comparison with the minimum amount ($\underline{y}_i$), i.e.:

$$\bar{y}_i - \underline{y}_i = (1+\delta)\cdot\bar{y} - (1+\delta)\cdot\underline{y} = (1+\delta)\left(\bar{y} - \underline{y}\right) > \bar{y} - \underline{y} \quad (7)$$

Such inequality determines, in some sense, social "injustice". That is, the use of such a method of indexation of pension payments determines a decrease in the amount of pension payments in comparison with citizens with larger pension payments. The analysis of the given method gives reasons to indicate the expediency of changing the method of indexation of pension payments.

In order to avoid social defects, we will carry out a different correction of the indexed limits of pension payments (5) and (6), using the formulas:

$$\underline{y}_{1i} = \underline{y} + \delta\cdot\bar{y} \quad (8)$$

$$\bar{y}_{1i} = \bar{y} + \delta\cdot\underline{y} \quad (9)$$

Substituting (8) and (9) into formula (4), we successively obtain:

$$y_{1i} = \underline{y}_{1i} + x\cdot(\bar{y}_{1i} - \underline{y}_{1i}),$$

$$y_{1i} = \underline{y} + \delta\cdot\bar{y} + x\cdot(\bar{y} + \delta\cdot\underline{y} - (\underline{y} - \delta\cdot\bar{y})),$$

$$y_{1i} = \underline{y} + \delta\cdot\bar{y} + x\cdot(\bar{y} + \delta\cdot\underline{y} - (\underline{y} - \delta\cdot\bar{y})),$$

$$y_{1i} = \underline{y} + \delta\cdot\bar{y} + x\cdot(\bar{y} - \underline{y} - \delta(\bar{y} - \underline{y})),$$

$$y_{1i} = \underline{y} + \delta\cdot\bar{y} + x\cdot(1-\delta)(\bar{y} - \underline{y}) \quad (10)$$

Using (5) and (8), we find how much the smallest amount of pension payments will increase thanks to the second method of indexation of pension payments.

$$\frac{\underline{y}_{1i} - \underline{y}}{\underline{y}_i - \underline{y}} = \frac{\bar{y}}{\underline{y}} \quad (11)$$

On the other hand, using (6) and (9), we find how much the largest amount of pension payments will decrease thanks to the second method of indexation of pension payments:

$$\frac{\bar{y}_{1i} - \bar{y}}{\bar{y}_i - \bar{y}} = \frac{\underline{y}}{\bar{y}} \quad (12)$$

Analysis of formula (10) shows that it includes an argument x, which is unknown.

Let's use formula (4) to go to the known value y. To do this, we will solve this equation relatively x.

$$x = \frac{y - \underline{y}}{\bar{y} - \underline{y}} \quad (13)$$

Substituting (13) into formula (10), we consistently find:

$$y_{1i} = \underline{y} + \delta\cdot\bar{y} + \frac{y - \underline{y}}{\bar{y} - \underline{y}}\cdot(1-\delta)(\bar{y} - \underline{y}),$$

$$y_{1i} = \underline{y} + \delta\cdot\bar{y} + \left(y - \underline{y}\right)\cdot(1-\delta),$$

$$y_{1i} = \underline{y} + \delta\cdot\bar{y} + y\cdot(1-\delta) - \underline{y}\cdot(1-\delta),$$

$$y_{1i} = \delta\cdot\bar{y} + y\cdot(1-\delta) + \delta\cdot\underline{y},$$

$$y_{1i} = y\cdot(1-\delta) + \delta\cdot(\bar{y} + \underline{y}) \quad (14)$$

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Formula (14) allows you to calculate the result of the indexation of pension payments relative to the previous amount of pension payments in the second approach.

Thus, formulas (3) and (14) make it possible to evaluate the results of indexation of pension payments according to two options.

Let's find the point of intersection of the graphs given by formulas (3) and (14). To do this, we will solve the relative equation:

$y_i = y_{1i}$,

$(1+\delta)\cdot y = y\cdot(1-\delta)+\delta\cdot(\underline{y}+\bar{y})$,

$(1+\delta)\cdot y - y\cdot(1-\delta) = \delta\cdot(\underline{y}+\bar{y})$,

$y\cdot(1+\delta-1+\delta) = \delta\cdot(\underline{y}+\bar{y})$,

$2\delta\cdot y = \delta\cdot(\underline{y}+\bar{y})$,

$$y_0 = \frac{\underline{y}+\bar{y}}{2} \quad (15)$$

Thus, the graphs, which are given by formulas (3) and (14), respectively, intersect in the middle between the limits of the available pension payment (1). In turn, the ordinate of the intersection point of the graphs, which determines the equality of the first and second options for the indexation of pension payments, is given by the formula:

$$y_i(y_0) = (1+\delta)\cdot\frac{\underline{y}+\bar{y}}{2} \quad (16)$$

It should be emphasized that the funds allocated for the indexation of pension payments are fully implemented in the first indexation option. They grow at a constant rate along with the growth of available pension benefits. At the same time, it should be emphasized that the growth rate with the second option of indexing is lower because

$$\frac{dy_i}{dy} = 1+\delta > \frac{dy_{1i}}{dy} = 1-\delta \quad (17)$$

As a result, it turns out that up to the point of intersection of the graphs of functions (3) and (14), more funds are spent on the indexation of smaller pension payments, and after the point of intersection - on the indexation of significantly larger pension payments. If we take into account the general financial costs related to the indexation of pension payments, they remain unchanged in the first and second cases of indexation of pension payments.

After indexation according to the second option, the smallest pension will increase by the amount:

$$\frac{\underline{y}_{1i}}{\underline{y}} = 1+\delta\frac{\bar{y}}{\underline{y}} \quad (18)$$

In turn, the largest pension will also increase

$$\frac{\bar{y}_{1i}}{\bar{y}} = 1+\delta\frac{\underline{y}}{\bar{y}} \quad (19)$$

But the increase in the smaller pension payment will be greater, since, according to (18) and (19), we consistently have:

$\frac{\underline{y}_{1i}}{\underline{y}} > \frac{\bar{y}_{1i}}{\bar{y}}$,

$1+\delta\frac{\bar{y}}{\underline{y}} > 1+\delta\frac{\underline{y}}{\bar{y}}$,

$\frac{\bar{y}}{\underline{y}} > \frac{\underline{y}}{\bar{y}}$,

$$\bar{y}^2 > \underline{y}^2 \quad (20)$$

which is true.

The current indexed pension will increase relative to the non-indexed pension payments according to the formula

$$\frac{y_{1i}}{y} = 1 + \delta\left(\frac{\bar{y}+y}{y} - 1\right) \quad (21)$$

RESULTS

Let's consider a graphic representation of the obtained results.

Let's accept that.

$$\underline{y} = \text{UAH } 2000,\ \bar{y} = \text{UAH } 20000,\ \delta = 0.15 \quad (22)$$

Then formula (3) will take the form:

$$y_i = 1.15 \cdot y \quad (23)$$

and formula (14):

$$y_{1i} = 0.85 \cdot y + 3300 \quad (24)$$

Analysis of the graphs shown in Figure 2 shows that in both the first and second variants of indexation of pension payments, the graphs pass above the line of the graph "pension payments without indexation", which indicates monetary costs when indexing pension payments in both variants. As can be seen, on the graph of the first variant of the indexation of pension payments, with small values of pension payments, the increase to the initial pension payment is small and gradually increases with the increase of the pension payment, reaching the largest value at the maximum value of the pension payment. In turn, the graph of the second option of indexation shows that with not large amounts of pension payments, the increase to the initial pension payment is large and gradually decreases, reaching the smallest value for the largest pension payment.

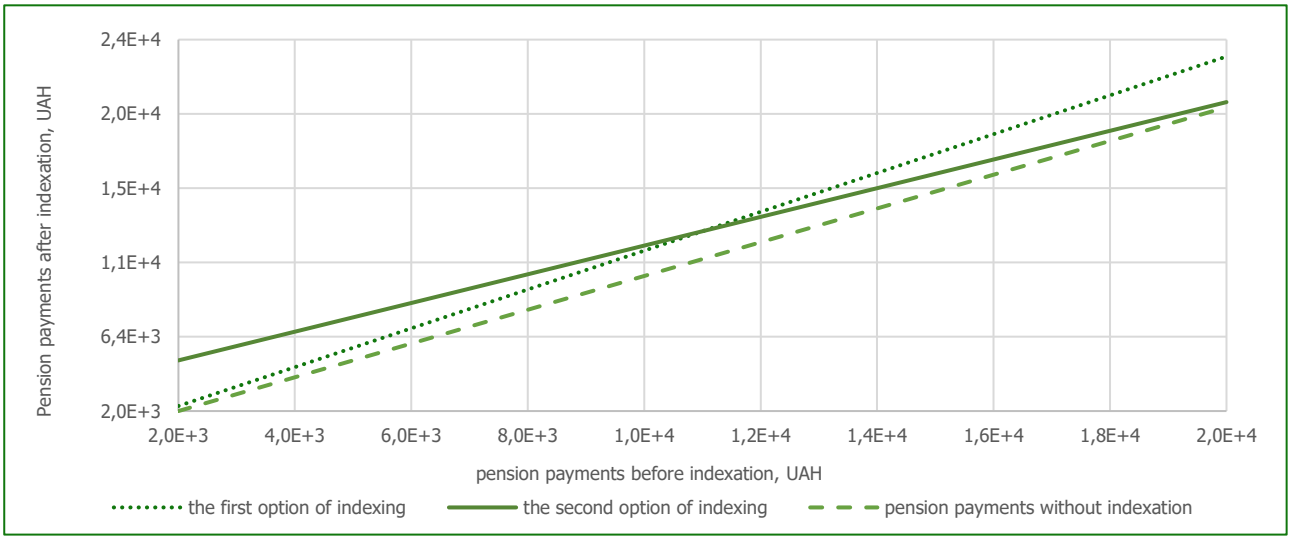

Figure 2. Graphs of indexation of pension payments.

In addition, it should be emphasized that the graphs of the first and second variants of the indexation of pension payments intersect with each other, according to formula (15), within the interval regarding the amount of pension payments before indexation, i.e.:

$$y_0 = \frac{\underline{y} + \bar{y}}{2} = \frac{2000 + 20000}{2} = \text{UAH } 11000$$

In the first variant of indexation of pension payments, the limits of indexed pension payments are values:

$$\underline{y_i} = 2000 \cdot 1.15 = 2300, \quad \bar{y}_i = 20000 \cdot 1.15 = 23000,$$

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with the second variant of indexation of pension payments, the limits of indexed pension payments are values:

$\underline{y}_{1i} = 2000 \cdot 0.85 + 0.15 \cdot (2000 + 20000) = 5000, \quad \bar{y}_{1i} = 20000 \cdot 0.85 + 0.15 \cdot (2000 + 20000) = 20300$

Thus, according to formula (18), with the second variant of indexation of pension payments, the lower limit of pension payments will increase, i.e.:

$\frac{\underline{y}_{1i}}{\underline{y}} = 1 + \delta \frac{\bar{y}}{\underline{y}} = 1 + 0.15 \cdot \frac{20000}{2000} = 2.5$ times

and, according to formula (19), the upper limit of pension payments will also increase, i.e:

$\frac{\bar{y}_{1i}}{\bar{y}} = 1 + \delta \frac{\underline{y}}{\bar{y}} = 1 + 0.15 \cdot \frac{2000}{20000} = 1.015$ times

Thus, with the second variant of indexation of pension payments, the lower limit of pension payments is much higher than the upper limit of pension payments.

DISCUSSION

Historically, the pension reform in Ukraine has undergone several stages. Starting in 2004, the approaches to the indicators of pension provision of citizens began to change. The main indicators forming the pension system include insurance experience (years); amounts of minimum and maximum pensions (UAH); the amount of contributions to the pension fund of Ukraine (UAH); one-time payment (UAH); salary for calculating pension payments (UAH); recalculation of pension payments (UAH); indexation of pension payments (%). Each of the stages of the pension reform was fixed accordingly at the legislative level. Thus, the first stage (2004) - the Law of Ukraine "On mandatory state pension insurance". The second stage (2011) - the Law of Ukraine "On Measures for Legislative Support of Reforming the Pension System". The third stage (2017). - Law of Ukraine «On Amendments to Certain Legislative Acts of Ukraine Regarding Pension Increases». Currently, Ukraine has a mixed pension system. Such a system provides for a joint component and an accumulative one. It should be noted that the accumulative component is carried out by citizens on a voluntary basis. Accordingly, the solidarity system of mandatory state pension insurance provides pension payments at the expense of the Pension Fund of Ukraine. All employees and employers pay contributions to the Pension Fund, and these funds go to the needs of current retirees. According to demographers, the share of the population over 65 years of age in Ukraine is about 16% of the active population and is constantly growing. In the near future, there will be more and more pensioners per employee.

Today's realities have actualized the problem of reforming the pension system in the direction of fairer pension payments for citizens. One of the directions of such social justice can be the indexation of pension payments.

In 2004, the indexation of pension payments was approved by law. Since 2005, pensions have been indexed by at least 20 per cent of the increase in average wages. In the period from 2014 to 2016, indexation of pension payments was not carried out due to the difficult economic situation. Consequently, the growth of pension payments to citizens lagged behind wages. The pension reform of 2017 provided for the uncertainty of the indexation date. That is, it was noted that the order of indexation is determined by the Government's decision, in the amount of at least 50% of the increase in consumer prices and 50% of the increase in average wages. In 2019, the indexation of pension payments was introduced on a permanent basis with a fixed date. All the carried-out reforms were aimed first of all at filling the Pension Fund, and then at introducing the social component. The question of filling the Pension Fund of Ukraine to ensure "fair" pension payments is logical. This issue needs a serious public discussion. The martial law introduced in Ukraine provoked corresponding negative processes in the national economy. Currently, it is proposed to introduce a point system in the formation of pension payments. The purpose of implementing such initiatives is to modernize the pension payments of citizens of the state.

The presence of inflation in the national economy leads to the need to increase pension payments due to the introduction of indexation. At the same time, the increase in pension payments should be differentiated in order to ensure social balance in society. At the same time, it means that smaller amounts of pension payments should have a greater value in terms of the value of the index in comparison with larger amounts of pension payments. It is clear that there can be many ways to implement such an approach. Along with this, it makes sense to consider one of the approaches regarding the implementation of the proposed method.

CONCLUSIONS

Having systematized the experience of scientific research, we can note the following: the pension provision of citizens is represented in the scientific realm by a historical and epistemological analysis of legislative initiatives. Scientists deeply analyze the historical origins of pension legislation. Elements aimed at reforming pension provision are being studied. At the same time, measures to reform pension provision announced by the government have not yet been implemented. An increase in pension payments to citizens who have reached the age of 70 by UAH 300, and for those who are 80 years old, monthly payments are UAH 500 do not solve the problem of fair pension provision. Among the government's social initiatives, one can mention the possibility of early pensions for certain categories of citizens. However, all these steps do not systematically solve the problem of fair pension provision for citizens. This leads to social injustice, and therefore to social tension in society. The theoretical understanding and development of the pension system should be based on the application of formal, meaningful economic and mathematical models. Current processing of statistical information of indicators related to the demographic situation, state budget policy, etc. should be applied. The proposal to introduce a point system for calculating pension payments has been widely discussed. It is proposed to introduce a points system that will avoid the disparity that exists among pensioners. It is believed that such a norm will allow to modernize the pension payments of that category of citizens who retired a long time ago. Such a step is considered questionable because the point system involves the involvement of certain expert groups. The models presented by scientists emphasize the activities of non-state pension funds. Undoubtedly, there should be non-state pension funds. They form the basis of the corresponding accumulated level of pension provision. Today, the country operates a solidarity system with voluntary accumulative contributions. It was assumed that the accumulative component would become mandatory. Taking into account the need to replenish the Pension Fund of Ukraine with money, the accumulative component could compensate for a certain part of the deficit of the Pension Fund of Ukraine. Insufficient awareness of the population, as well as mistrust of non-state funds, made it impossible to form a voluntary component in the pension provision of citizens. It is logical here for state institutions to justify their guarantees in accordance with private institutions. Restoring citizens' trust in private institutions that participate in the formation of voluntary contributions will allow to form an effective part of pension provision. The second level of the pension reform, which provided for the introduction of a mandatory accumulation component, also did not really work. The essence of this level provided for mandatory contributions of citizens to the accumulation accounts of the pension fund. The existence of a mixed system of pension provision - joint and voluntary accumulation does not meet the requirements of modernity. The demographic composition of the state changes every year. These changes also affect the formation of the pension budget, but also the pension provision of citizens. Therefore, it is advisable to build well-founded analytical models that will enable government officials to build a strategy for pension reform.

Currently, models are offered without taking into account internal and external disturbances, that is, without a systematic understanding of pension reform processes. Modernity requires adequate quick, thorough actions to ensure at least relatively righteous pension costs. As time shows, short-term responses to situations with pension payments do not relieve social tension. One such approach may be the indexation of pension benefits. The existing indexation is directly proportional in nature. That is, the gap between small and large pension payments is increasing. That is the formation of the indexation component, which is approved at the legislative level, can compensate for the discriminatory component that exists in the formation of pension payments of citizens. Paying attention to the need to develop a pension reform strategy, it is appropriate to include the issue of indexation of pension payments. The question of indexation should not be considered as a permanently fixed value. The formation of indexation should be preceded by consideration and analysis of many influencing factors, namely: citizen's income, general demographic situation, working capacity, etc. Modernity requires new approaches to the strategy of building pension provision for citizens of Ukraine. The formula for the joint component of pension payments needs to be replaced. The formula for the solidarity component consists of the amount of salary and length of service. Therefore, the goal of the modern pension reform proposed by the government is to stimulate the activation of the accumulation component.

The government aims for pensioners to receive benefits that are at least thirty per cent of their average salary. Taking into account the accumulative component should ensure a level of at least 50%. The realities of modern times delay the realization of the corresponding goal. Therefore, it is necessary to provide new approaches in the development of the strategy of pension payments. One such approach suggests paying more careful attention to calculating the indexation of pension benefits. As one of the alternative options for calculating indexation payments, there is a transition from directly proportional to inversely proportional dependence.

The inversely proportional dependence of the indexation coefficient on the amount of pension payments within the respective minimum and maximum value is proposed. The proposed approach made it possible to build an analytical dependence on the calculation of the amount of indexed, in the new version, pension payments.

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The given calculation example showed the possibility and expediency of the proposed approach when implementing the pension reform strategy.

It is clear that the proposed approach is not the best option. The given analytical dependencies should attract the attention of the scientific community in the sense of introducing analytical models. Pension reform has long demanded a solution. Delayed and partial responses to society's challenges lead to social tension. The division of society regarding pension provision should be decided on the basis of modern foreign experience with appropriate adaptation to the modern realities of the state. Such reformation is not possible without the effective synergy of economic and mathematical modelling and taking into account temporal changes in the social life of citizens. It should be taken into account that any reform in general and the pension reform separately must ultimately ensure fair and decent pension payments.

For further improvement of the proposed method, it is advisable to formalize the mathematical formulation of the problem of finding the optimal value of the index of pension payments as extreme, taking into account the necessary restrictions.

ADDITIONAL INFORMATION

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The Authors declare that there is no conflict of interest.

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ЗАСАДНИЧІ ІМПЕРАТИВИ МОДЕЛЮВАННЯ ПЕНСІЙНИХ ВИПЛАТ У СИСТЕМІ ПЕНСІЙНОГО ЗАБЕЗПЕЧЕННЯ УКРАЇНИ

Метою дослідження є вивчення та аналіз розміру індексації пенсійних виплат у зв’язку з інфляційними процесами. Об’єктом дослідження є стан пенсійного забезпечення в Україні. Предметом дослідження є процес індексації пенсійних виплат за результатами реалізації соціальної політики в Україні. Методологія дослідження передбачає синергію математичних методів аналітичної геометрії та економіко-математичного моделювання. Проведено аналіз історії розвитку й реформування пенсійного забезпечення в Україні. Це дозволило глибше зрозуміти зміст подій, пов'язаних зі становленням пенсійного забезпечення на території України. Показано, що наявність інфляційних процесів у національній економіці призводить до необхідності підвищення пенсійного забезпечення громадян. При цьому розміри підвищення пенсійних виплат мають бути диференційовані з метою забезпечення соціальної «справедливості». Наукове завдання, поставлене в статті, – продемонструвати сучасний підхід до вибору стратегії реалізації державної пенсійної політики в Україні. У результаті дослідження представлено дві моделі відповідної індексації пенсійних виплат в Україні. Розрахунок дозволив вибрати найбільш значиму модель. Надалі дослідження доцільно спрямувати на пошук інших, більш ефективних шляхів індексації пенсій. Передбачається, що для цього необхідно формалізувати математичну постановку задачі знаходження оптимального значення індексу пенсійних виплат як екстремального з урахуванням необхідних обмежень. Науковою новизною в розв’язанні цього питання є отримання

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практично значущих рекомендацій щодо індексації пенсій. Практичне значення отриманих результатів полягає в усуненні соціальних недоліків при індексації пенсійних виплат. Подальші дослідження мають бути спрямовані на пошук раціональних рішень, які стимулюватимуть створення ефективної системи пенсійного забезпечення в Україні.

Ключові слова: пенсійні виплати, індексація, інфляція, реформа, економіко-математична модель

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