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FACTOR-MODELS OF FORMATTING OF FINANCIAL RESOURCES OF THE STATE SOCIAL PENSION INSURANCE

Factor-models of financial resources of the state social pension insurance are researched. The necessity of increasing the proportion of internal financial resources of the state social pension insurance is reviewed. The ways of balancing the financial resources of the state social pension insurance are proposed.

Keywords: *financial resources, social pension insurance, factor-models, balancing.*

Formulation of the problem. A practice shows worsening in the balance of financial resources of the state social insurance. It concerns the financial resources of the state pension insurance to a greater extent.

This situation was triggered by social pension policy of Ukraine. The level of increase pensions was declared did not correspond to the rates of increase of the internal financial resources of the Pension Fund of Ukraine (PFU). Corresponding growth rates of internal resources were not done due to the high level of taxation, which is confirmed by this indicator - only 65% of the wage fund in the state economy is taxed by pension insurance payments.

This resulted in a budget deficit of PFU and starting of the practice of covering its expenditures with funds of the State Budget of Ukraine. That is, the source of expenditures of PFU became external financial resources [1; 2, p. 64; 3, p. 15; 4, p. 18; 5].

Balancing of financial resources of the state social pension insurance can be achieved by increasing the number of internal payments to PFU. In order to determine the influence of individual factors on the volumes of such resources, it linear and two-factor models of correlation and regression analysis were considered.

An analysis of recent research and publications. The problem of public finances in general and the balance of financial resources of the state social pension insurance, in particular, attracts the attention of many researchers. Among Ukrainian researchers, it is worth mentioned S. Rzhevsky, V. Piskunenko, Y. Ovsienko, M. Shavarina, N. Shamanska, S. Yuriy and others.

Despite the considerable interest of economists, the question of balancing the financial resources of social pension insurance needs complete and comprehensive coverage. This is confirmed by the practice of their formation at the expense of both insurance payments and state budget funds. Which testifies to the lack of proper theoretical substantiation of the financial base of state social pension insurance and makes it impossible to develop long-term financial policy in this area. This determines an **actuality** of the article.

The aim of the publication is to consider the influence of a number of factors (the wage fund in the economy of the state, its share in GDP and the rates of taxation of insurance payments) on the effective indicator - the size of the internal financial resources of the state social pension insurance, both individually and in combination.

Results. On the basis of the correlation and regression analysis methods, we investigated the relationship between the factor indicator - the labor payroll fund in the economy (I1) - and the resulting indicator - the size of the internal financial resources of the state social pension insurance (I2). The main task of using these methods was:

(a) to analyze the statistical data;

(b) to detect the relationship between the indicates (I1)-(I2) we have investigated the

form of a certain mathematical formula and the estimate of the correlation coefficient in this relationship.[6, p. 59; 7, p. 78]

In the research, we observe a straightforward form of communication that characterizes the change in the average level of (I2) y depending on the change in the factor's characteristic (I1) x .

In this case, such a regression equation will characterize the change in the average level of the internal financial resources of the state social pension insurance (y) from the change in the payroll fund (x).

In addition, it will determine the mathematical expectation of group mean values of (I2, y) under the influence of different values of (I1, x).

In the case of a linear form of communication, the resultantly indicate (I2) varies evenly under the influence of the factor (I1). This form of communication is expressed by the equation (1):

$$y_x = a_0 + a_1 x \quad (1)$$

where y_x the equalized average value of the resultant indicator (I2);

x - The value of the factor indicator (I1);

a_0 and a_1 - parameters of the equation;

a_0 - The value y at which x = 0;

a_1 - The coefficient of regression [8, p. 212].

The coefficient of regression a_1 shows how much the resultant sign changes y when the factor sign is changed to one. If t a_1 here is a positive sign, then the connection in the studied set is straight, if the negative - then the connection is inverse.

Parameters of the equation of communication are determined by the method of least squares of a compound and unbundled system of two equations with two unknowns:

$$\begin{cases} \sum y = na + a_1 \sum x \\ \sum yx = a_0 \sum x + a_1 \sum x^2 \end{cases} \quad (2)$$

where *n* is the number of members in each of the two comparative rows;

$\sum x$ - a sum of values of factor indicator;

$\sum x^2$ - a sum of squares of values of factor indicator;

$\sum y$ - the sum of the values of the resultant indicator;

$\sum yx$ - the sum of products of the values of the factor indicator on the value of the resultant indicator.

Having solved this system of equations, we obtain the following parameter values:

$$a_0 = \frac{\sum x^2 \sum y - \sum x \sum xy}{n \sum x^2 - \sum x \sum x} ; \quad (3)$$

$$a_1 = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - \sum x \sum x} . \quad (4)$$

Calculating the actual amounts of all the above amounts and substituting them in the formulas above, we find the parameters of the equation y_x (1).

Constantly substituting in this equation the value of the factor indicator, we obtain the aligned values of the resultant indicator, which will show what theoretically should be the average size of the internal financial resources of social pension insurance (in other equal terms).

Aligned (theoretical) values (with rounding to tens of hundreds) indicate the correctness of the selected parameters of the equation - equality $\sum y$ and $\sum y_x$. The verification of the correctness of the parameters of the researched equation is carried out in the last column of each of the tables in our study.

Consider the calculation of the parameters of the linear equation of relation between the labor payroll fund in the country's economy and the internal resources of the state social pension insurance according to the data of 2002-2016 [5; 9:10] (Table 1).

Then the desired linear regression equation between the size of the payroll and the volume of the internal financial resources of social pension insurance will look like this:

$$y = 3{,}938 + 0{,}203\,x$$

Table 1

Results of calculations (1)

Year	The labor payroll fund in the economy, billion UAH (x) (I1)	The size of the internal financial resources of the state social pension insurance (y) (I2)	x^2	$x * y$	y^2	Audit $y_x = 3{,}938 + 0{,}203\,x$
2002	103,12	19,78	10633,73	2039,14	391,05	24,91
2003	122,19	22,71	14930,40	2775,26	515,88	28,79
2004	157,45	33,11	24790,50	5212,66	1096,06	35,96
2005	216,60	43,58	46915,56	9440,48	1899,64	47,99
2006	268,63	51,58	72162,08	13855,19	2660,19	58,57
2007	355,15	71,97	126131,52	25560,04	5179,72	76,17
2008	465,49	101,95	216680,94	47456,66	10393,93	98,61
2009	444,92	111,41	197953,81	49568,54	12412,19	94,42
2010	537,88	124,82	289314,89	67138,28	15580,03	113,33
2011	634,11	150,21	402095,49	95250,21	22563,04	132,90
2012	732,44	163,63	536468,35	119848,51	26774,78	152,90
2013	759,79	168,62	577280,84	128115,10	28432,70	158,46
2014	734,74	166,93	539842,87	122650,42	27865,62	153,37
2015	777,52	172,46	604537,35	134090,95	29742,45	162,07
2016	837,25	109,9	700987,56	92013,78	12078,01	174,22
Total	**7147,27**	**1512,66**	**4360725,90**	**915015,22**	**197585,3**	**1512,66**
Average	**476,49**	**100,84**				

Consequently, with an increase in the payroll fund in the economy by 1 billion UAH the volume of the internal financial resources of the state social pension insurance grew by 0.203 billion UAH.

For the economic interpretation of the linear relationships between the two-factor, we use the elasticity coefficients calculated on the basis of regression equations, which show how much percentage of the resultant indicator y_x will change when the factor indicator changes by 1%.

For linear dependence, the coefficient of elasticity is determined by the following formula:

$$\varepsilon = a_1 \frac{\overline{x}}{\overline{y}} \quad (5)$$

where ε - the coefficient of elasticity;

$\overline{x}$ - average value of factor indicator;

$\overline{y}$ - average value of the resultant indicator.

On the basis of data in Table 1, we will define the elasticity coefficient, which is equal to:

$$\varepsilon = 0{,}203 \frac{476{,}49}{100{,}84} = 0{,}96$$

The value we get is interpreted as follows. With an increase in the payroll fund in the economy by 1%, the volume of internal financial resources of the social pension insurance will increase by 0,96%.

Also, we examined the influence of the factor of the share of the payroll fund in GDP on the sizes of internal financial resources of the state social pension insurance. For this, we used the formulas (1)-(4).

Consider the calculation of the parameters of the linear equation of relation between the size of the labor payroll fund in the country's economy and the internal resources of the state social pension insurance according to the data of 2002-2016 [5; 9:10] (Table 2).

Table 2

Results of calculations (2)

Year	The share of the payroll fund in GDP, billion UAH (x) (I1)	The size of the internal financial resources of the state social pension insurance (y) (I2)	x^2	$x * y$	y^2	Audit $y_x = 192{,}23 - 1{,}953\,x$
2002	45,67	19,78	2085,29	903,25	391,25	103,03
2003	45,71	22,71	2089,04	1037,98	515,74	102,95
2004	45,62	33,11	2081,46	1510,58	1096,27	103,11
2005	49,07	43,58	2407,37	2138,25	1899,22	96,39
2006	49,37	51,58	2437,1	2546,35	2660,5	95,8
2007	49,81	71,97	2481,44	3585,11	5179,68	94,92
2008	49,01	101,95	2401,59	4996,16	10393,8	96,5
2009	44,9	111,41	2016,01	5002,31	12412,19	104,52
2010	48	124,82	2304	5991,36	15580,03	98,47
2011	47	150,21	2209	7059,87	22563,04	100,42
2012	50,2	163,63	2520,04	8214,23	26774,78	94,17
2013	49,9	168,62	2490,01	8414,14	28432,7	94,76

2014	46,3	166,93	2143,69	7728,86	27865,63	101,79
2015	39,1	172,46	1528,81	6743,19	29742,45	115,85
2016	42,1	109,9	1772,41	4626,79	12078,01	109,99
Total	**701,76**	**1512,66**	**32967,25**	**70498,43**	**197585,29**	**1512,66**
Average	**46,78**	**100,84**				

The equation searched by us is linear regression equation between the share of the payroll fund in GDP and the size of the internal financial resources of the social pension insurance. This is will look like this:

$$y = 192{,}23 - 1{,}953\,x$$

So, with a change in the share of the payroll fund in the economy by 1 billion UAH the size of the internal financial resources of the state social pension insurance reduced by 1.953 billion UAH.

On the basis of data in Table 2, we will define the elasticity coefficient, which is equal to:

$$\varepsilon = -1{,}953\frac{46{,}78}{100{,}84} = -0{,}91$$

The value we get is interpreted as follows. With a change in the share of the payroll fund in the economy by 1%, the volume of internal financial resources of the social pension insurance will decrease by 0,91%.

At first view, this paradoxical conclusion is due to a has decreased in the rate of united social fee since 2016 in Ukraine. Therefore, despite the increase in the size of the payroll fund in the economy, at the expense of a reduction in the rate of this fee, the size of the internal financial resources of state social pension insurance has decreased.

As result, we examined the influence of the factor of the rate of united social fee on the sizes of internal financial resources of the state social pension insurance. Also, for this, we used the formulas (1)-(4).

Consider the calculation of parameters of the linear equation of relation between the rate of the united social fee and the internal resources of the state social pension insurance according to the data of 2002-2016 [5; 9:10] (Table 3).

Table 3

Results of calculations (3)

Year	The rate of the united social fee, billion UAH (x) (I1)	The size of the internal financial resources of the state social pension insurance (y) (I2)	x^2	$x * y$	y^2	Audit $y_x = 128{,}959 - 0{,}866\,x$
2002	33,2	19,78	1102,24	656,7	931,25	100,2
2003	33,2	22,71	1102,24	753,97	515,74	100,2
2004	33,2	33,11	1102,24	1099,25	1096,27	100,2
2005	33,2	43,58	1102,24	1446,86	1899,22	100,2
2006	33,2	51,58	1102,24	1712,46	2660,5	100,2
2007	33,2	71,97	1102,24	2389,4	5179,68	100,2

2008	33,2	101,95	1102,24	3384,74	10393,8	100,2
2009	33,2	111,41	1102,24	3698,81	12412,19	100,2
2010	33,2	124,82	1102,24	4144,02	15580,03	100,2
2011	33,2	150,21	1102,24	4986,97	22563,04	100,2
2012	33,2	163,63	1102,24	5432,52	26774,78	100,2
2013	33,2	168,62	1102,24	5598,18	28432,7	100,2
2014	33,2	166,93	1102,24	5542,08	27865,63	100,2
2015	33,2	172,46	1102,24	5725,67	29742,45	100,2
2016	22	109,9	484	2417,8	12078,01	109,9
Total	**701,76**	**1512,66**	**15915,36**	**48989,43**	**197585,29**	**1512,66**
Average	**32,45**	**100,84**				

Consequently, with a decrease in the rate of the united social fee by 1% the size of internal financial resources of the state social pension insurance also decreased by 0.866 billion UAH.

On the basis of data in Table 3, we will define the elasticity coefficient, which is equal to:

$$\varepsilon = -0{,}866\frac{32{,}45}{100{,}84} = -0{,}28$$

The value we get is interpreted as follows. With a change in the rate of the united social fee by 1%, the volume of internal financial resources of social insurance will decrease by 0,28%.

On the basis of the above correlation communication models, we will summarize the results of the influence of factor indicators on the resultant indicator in table 4.

Table 4

Influencing of factors of the payroll fund in the economy, its share of GDP and the rate of the united social fee on the size of internal financial resources of the state social pension insurance

Models	Factor indicators	Influencing of factors	
1	The payroll fund in the economy	1 billion UAH	0,203 billion UAH
		1%	0,96%
2	The share of payroll fund in the economy in GDP	1 billion UAH	-1,95 billion UAH
		1%	-0,91%
3	The rate of the united social fee	1 billion UAH	-0,87 billion UAH
		1%	-0,28%

Comparing the data of tables 1-3 with each other, we can see that the factor of the share of the payroll fund in the economy has a stronger negative effect on the change in the size of the internal resources of the state social pension insurance than the factor of the rate of united social fee. Among the factors considered by us, only the factor of the size of the payroll fund in the economy carried out a positive effect on the resultant indicator.

Conclusions. Improving the balance of state social pension insurance in Ukraine can be achieved by:

(a) increasing the size of its internal financial resources. The only reserve is the payroll fund in the economy;

(b) does not change the united social fee in Ukraine.

In our case, the result indicator (I2) can be affected not one, but several factors, between which there are complex interconnections, so their influence is complex and can not be considered as a simple set of isolated effects. The multi-factor correlation-regression analysis allows estimating the degree of influence on the researched result indicator (I2) of each of the factors introduced in the model with a fixed on the average of other factors. The study of the multi-factor correlation-regression models proposed by us opens the prospects for future research in this area of financial science.

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ФАКТОРНІ МОДЕЛІ ФОРМУВАННЯ ФІНАНСОВИХ РЕСУРСІВ ДЕРЖАВНОГО СОЦІАЛЬНОГО ПЕНСІЙНОГО СТРАХУВАННЯ

У статті досліджено одно факторні моделі формування фінансових ресурсів державного соціального пенсійного страхування. Факторними індикаторами стали показники фонду оплати праці в економіці, питома вага фонду оплати праці в економіці у ВВП та ставка єдиного соціального внеску. Результативним показником визначено обсяг внутрішніх фінансових ресурсів державного соціального пенсійного страхування за період 2002-2016 рр.

Встановлено, що за незмінності інших умов найбільше на обсяги внутрішніх фінансових ресурсів державного соціального пенсійного страхування впливає обсяг фонду оплати праці в економіці країни: його збільшення на 1% приводить до зростання таких ресурсів на 0,96%. Решту два факторні індикатори упродовж досліджуваного періоду чинили негативний вплив на результативний показник, а саме зміна питомої ваги фонду оплати праці у ВВП на 1% скорочувала обсяги внутрішніх фінансових ресурсів державного соціального пенсійного страхування на 0,91%, зміна ставки єдиного соціального внеску у бік скорочення на 1% зумовлює відповідне скорочення результативного показника на 0,28%

Запропоновано шляхи підвищення збалансованості фінансових ресурсів державного соціального пенсійного страхування в Україні. Такими шляхами визначено збільшення питомої ваги оплати праці у ВВП та не скорочення ставки єдиного соціального внеску.

Ключові слова: фінансові ресурси, державне соціальне пенсійне страхування, факторні моделі, збалансованість.

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Дячек В. В.

ПЕРСПЕКТИВИ РОЗВИТКУ ЕКСПОРТНИХ АГЕНТСТВ В УКРАЇНІ ШЛЯХОМ ОБ'ЄДНАННЯ ЗУСИЛЬ КІЛЬКОХ ПІДПРИЄМСТВ АБО ЇХ АСОЦІАЦІЙ

У статті розглянуто механізм функціонування експортного кредитного агентства (ЕКА), проаналізовані основні моделі експортного фінансування танаведені переваги та недоліки ЕКА порівняно з іншими кредитними інститутами.