CORRELATION BETWEEN FACTORS AND EXPENDITURES OF THE CHERNIVTSI REGION DEPARTMENT OF SOCIAL INSURANCE FUND FOR TEMPORARY DISABILITY

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Abstract: To determine the correlation dependence between the total sum of expenditures incurred by the Social Insurance Fund for Temporary Disability (“SIFTD”) and social, economic factors: average daily wages, number of the paid temporary disability days, number of the days of the maternity leave, average daily temporary disability financial aid, number of vouchers for sanatorium and resort measures, number of the children who were sent for recreation, number of children who attended sport schools for children and young people, the author has established the regression equation and defined the correlation ratios for all factors by way of verification whether the equation is significant in aggregate as per the F – statistics, the stage-by-stage exemption of the variables from the given equation in accordance with the principle of the minimum module t–statistics, and calculation at every stage of the new t–statistics.

Keywords: social insurance, social fund, temporary disability, social care, Chernivtsi, Ukraine.

Introduction

Decrease of the expenditure budget of the SIFTD by means of determination of the level of impact and availability of the relationship between the expenditure budget of the SIFTD and main factors: average daily wages, number of the temporary disability days, number of the days of the maternity leave, average daily temporary disability aid, number of vouchers for sanatorium and resort measures, number of the children who were sent for recreation, and number of children who attended sport schools for children and young people.

Method

Correlation models are the most important in the group of economic and statistical models. The index, which dependents of other parameters, called output indicators and affects. Using correlation and regression can solve the following main tasks:

1) to establish the relations and closeness of the connection between the phenomenon and different factors;
2) to identify and quantify the degree of influence of individual factors on the phenomenon;
3) to calculate quantitative changes of the analyzed phenomenon in predicting performance and provide an objective assessment of institution.

Results

Activities of the Social Insurance Fund for Temporary Disability depend on the economic, social and political factors that influence the social insurance system. Low dynamics of the wages increase is a negative factor of the impact on the level of the receivables of the Social Insurance Fund for Temporary Disability that affects the financial condition of the Social Insurance Fund for Temporary Disability, material security of the insured individuals in the event of the insurance case, as well as the provision of the social services, i.e. the expenditures. Therefore, all these factors shall be taken into account for effective functioning of the Social Insurance Fund for Temporary Disability and increase of the material security of the insured individuals.

The purpose is to analyze the dependence of the expenditures of the budget on the various factors for the purpose of further minimization of the expenditures.

Deficit of the budget of the Social Insurance Fund for Temporary Disability (excess of the expenditures over income) in 2008 was UAH 4874 thousand. In 2009 excess of the expenditures over income was UAH 10009 thousand, and given the fulfillment of the budget of the SIFTD, the deficit of the budget amounted to
UAH 8475 thousand.

In 2010 the expenditures exceeded the income over UAH 4282 thousand, and given the result of the fulfillment of the budget – over UAH 74086 thousand, and given the result of the fulfillment of the budget for the previous year – UAH 81780 thousand. The respective figures in 2012 were UAH 94039 thousand and UAH 96087 thousand accordingly.

Thus, within the period analyzed the budget of the Social Insurance Fund for Temporary Disability is deficit. In the course of the budget fulfillment, average daily temporary disability aid and maternity leave aid exceeded the average daily income of the insured individuals who are registered as the taxpayers under the simplified tax system, as well as the insured individuals who are registered on a voluntarily basis. There are cases when private entrepreneurs indicate in their reports that they have calculated the social contributions independently. Certain insured persons, who were voluntarily registered, do not file the reports in the form of F4-SIFTD. All these cases significantly influenced the expenditures incurred by the Social Insurance Fund for Temporary Disability.

Therefore, the aggregate of the social and economic factors influences the formation of the expenditures incurred by the Social Insurance Fund for Temporary Disability. It is necessary to perform the econometric regressive analysis of the impact of these factors on the formation of the expenditures incurred by the Social Insurance Fund for Temporary Disability.

From the economical perspective, the main factors that will affect the expenditures incurred by the Social Insurance Fund for Temporary Disability are as follows:

- average daily wages;
- number of the paid temporary disability days;
- number of the days of the maternity leave;
- average daily temporary disability financial aid;
- number of vouchers for sanatorium and resort measures;
- number of the children who were sent for recreation;
- number of children who attended sport schools for children and young people.

Data are taken for 2003-2012 and are given in Table 1.

**Table 1**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total expenditures (thousands, UAH)</th>
<th>Average daily wages (UAH)</th>
<th>Number of the payable temporary disability days</th>
<th>Average daily temporary disability financial aid (UAH)</th>
<th>Number of the children who were sent for recreation</th>
<th>Number of children who attended sport schools for children and young people</th>
<th>Number of vouchers for sanatorium and resort measures</th>
<th>Number of the days of the maternity leave</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>23071</td>
<td>17,36</td>
<td>529000</td>
<td>15,71</td>
<td>8719</td>
<td>-</td>
<td>1317</td>
<td>311000</td>
</tr>
<tr>
<td>2004</td>
<td>30339</td>
<td>20,19</td>
<td>592605</td>
<td>19,67</td>
<td>9682</td>
<td>7195</td>
<td>3092</td>
<td>344060</td>
</tr>
<tr>
<td>2005</td>
<td>38784</td>
<td>27,72</td>
<td>635931</td>
<td>25,46</td>
<td>7801</td>
<td>6768</td>
<td>2888</td>
<td>357116</td>
</tr>
<tr>
<td>2006</td>
<td>47932</td>
<td>35,33</td>
<td>528455</td>
<td>34,47</td>
<td>8265</td>
<td>6705</td>
<td>3707</td>
<td>369970</td>
</tr>
<tr>
<td>2007</td>
<td>56244</td>
<td>45,79</td>
<td>516614</td>
<td>42,85</td>
<td>10881</td>
<td>6371</td>
<td>3519</td>
<td>367328</td>
</tr>
<tr>
<td>2008</td>
<td>80892</td>
<td>61,71</td>
<td>502620</td>
<td>58,72</td>
<td>8029</td>
<td>6091</td>
<td>3620</td>
<td>410466</td>
</tr>
<tr>
<td>2009</td>
<td>86108</td>
<td>66,84</td>
<td>452832</td>
<td>71,31</td>
<td>6051</td>
<td>4723</td>
<td>3241</td>
<td>401307</td>
</tr>
<tr>
<td>2010</td>
<td>91001</td>
<td>77,77</td>
<td>435670</td>
<td>79,87</td>
<td>5659</td>
<td>4877</td>
<td>3168</td>
<td>564697</td>
</tr>
<tr>
<td>2011</td>
<td>77969</td>
<td>87,97</td>
<td>350237</td>
<td>89,73</td>
<td>5115</td>
<td>-</td>
<td>1274</td>
<td>527649</td>
</tr>
<tr>
<td>2012</td>
<td>98790</td>
<td>101,06</td>
<td>339649</td>
<td>104,87</td>
<td>4973</td>
<td>-</td>
<td>2849</td>
<td>557041</td>
</tr>
</tbody>
</table>

First, let us determine the correlation dependence between the total amount of the expenditures incurred by the Social Insurance Fund for Temporary Disability and each of the given factors. For this purpose, we will use MS Excel package and reflect the final results in Table 2 as follows.

Based on the analysis of the indexes obtained, we can see that the correlation ratio for such factors as the number of the children who were sent for recreation and the number of children who attended sport schools for children and young people is quite low. Therefore, we may conclude that these factors insignificantly affect the expenditures incurred by the Social Insurance Fund for Temporary Disability. As regards other factors, we can observe the significant linear relationship with the expenditures incurred by the Social Insurance Fund for
Temporary Disability, in particular, the closest linear is established between the average daily wages and average daily temporary disability aid (correlation ratio $\rho = 0.95$). It also worth noting that in the regression equation for the number of the paid temporary disability days, variable X has a negative ratio, i.e. as per the equation, the number of such days decreases the expenditures incurred by the SIFTD; though, generally, it is not correct. However, we should remember that we deal only with one factor, and in the process of building of the models of multiple regression, this index will obtain the adequate order.

### Table 2

Analysis of the Relationships between the Expenditures Incurred by the Social Insurance Fund for Temporary Disability and the Impact Factors

<table>
<thead>
<tr>
<th>No</th>
<th>Indexes Analyzed</th>
<th>Correlation ratio</th>
<th>Regression equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Expenditures incurred by the SIFTD – Average daily wages</td>
<td>0.95</td>
<td>$Y = 15346,18 + 881,73 \cdot X$</td>
</tr>
<tr>
<td>2</td>
<td>Expenditures incurred by the SIFTD – Number of the paid temporary disability days</td>
<td>0.81</td>
<td>$Y = 175054,57 − 0,23 \cdot X$</td>
</tr>
<tr>
<td>3</td>
<td>Expenditures incurred by the SIFTD – Number of the days of the maternity leave</td>
<td>0.85</td>
<td>$Y = −40950,17 + 0,25 \cdot X$</td>
</tr>
<tr>
<td>4</td>
<td>Expenditures incurred by the SIFTD – Average daily temporary disability aid</td>
<td>0.95</td>
<td>$Y = 18352,51 + 824,84 \cdot X$</td>
</tr>
<tr>
<td>5</td>
<td>Expenditures incurred by the SIFTD – Number of vouchers for sanatorium and resort measures</td>
<td>0.18</td>
<td>$Y = 84497,72 − 7,01 \cdot X$</td>
</tr>
<tr>
<td>6</td>
<td>Expenditures incurred by the SIFTD – Number of the children who were sent for recreation</td>
<td>0.74</td>
<td>$Y = 138577,04 − 10,04 \cdot X$</td>
</tr>
<tr>
<td>7</td>
<td>Expenditures incurred by the SIFTD – Number of the children who attended sport schools for children and young people</td>
<td>0.26</td>
<td>$Y = 72968,39 − 2,31 \cdot X$</td>
</tr>
</tbody>
</table>

Source: developed by the author

Further, we will analyze in detail other five factors and build the model of dependence between the expenditures incurred by the Social Insurance Fund for Temporary Disability and their aggregate. As a result, we will get:

$$y = −72818,89 + 122X_1 + 0,14X_2 − 0,06X_3 + 1350,51X_4 + 1,39X_5$$

$Y$ – expenditures incurred by the SIFTD, thousands, UAH;

$X_1$ – average daily wages, UAH;

$X_2$ – number of the paid temporary disability days;

$X_3$ – number of the days of the maternity leave;

$X_4$ – average daily temporary disability financial aid, UAH;

$X_5$ – number of the children who were sent for recreation.

$t$ – statistics for the parameters of this equation are as follows: $t_0 = 0.06$, $t_{66} = 1,66$, $t_{62} = −0,62$, $t_{65} = 0,65$, $t_{0,4} = 0,4$, $t_{0,4} = 2,78$. We see that all these parameters are non-significant that is explained by a big number of variables in the model and insignificant number of observations. However, in aggregate this equation is significant as per $F$ – statistics given that $F^* = 14,38$ when $F_{0,4} = 6,26$.

Therefore, further we will exclude the variables from this equation in accordance with the principle of the lowest module $t$ – statistics, and at each stage calculate new $t$ – statistics and check the obtained regression models for their significance as per $F$ – statistics. We should also note that for the purpose of this model the multiple determination index is 0.947, i.e. receivables to the Social Insurance Fund for Temporary Disability depend for 94.7% on the above-stated 5 factors.

We will exclude factor $X_1$, f, since $t$ – statistics as per module is the lowest in relation to it. As a result, we will obtain the model as follows:

$$y = −7457,172 + 0,14X_2 − 0,06X_3 + 1469,38X_4 + 1,51X_5$$

All indicators are similar to those that were used in the previous equation.
The $t$-statistics for the parametric variables of this equation are as follows: $t_{b_1} = 1.89$, $t_{b_2} = -0.7$, $t_{b_3} = 4.31$, $t_{b_4} = 0.59$ when $t_{b_5} = 2.57$. We see that there appeared one significant factor $X_4$, in relation to which $t$-statistics is higher than the appropriate critical value. Generally, this equation is also significant as per $F$-statistics since $F^{*} = 22.45$, when $F_{cr} = 5.19$. Determination ratio at this stage is 94.7%.

At the next stage we exclude variable $X_5$ and build new equation. Thus, we will get:

$$
y = -55685.12 + 0.14X_2 - 0.06X_3 + 1424.15X_4
$$

(3)

The $t$-statistics for the parametric variables of this equation are as follows: $t_{b_1} = 2.003$, $t_{b_2} = -0.94$, $t_{b_3} = 4.55$ when $t_{b_4} = 2.45$. We observe that, again, we have one significant factor $X_4$, in relation to which $t$-statistics is higher than the appropriate critical value.

However, in total all $t$-statistics increase that evidence the correct direction of the research. Moreover, in aggregate this equation is significant as per $F$-statistics, since $F^{*} = 33.45$, when $F_{cr} = 4.76$. Accordingly, determination ratio is 94.4%.

At the next stage we exclude variable $X_3$ and build new equation. Thus, we will get:

$$
y = -70460.93 + 0.14X_2 + 1215.12X_4
$$

(4)

t - statistics for the parametric variables of this equation are as follows: $t_{b_1} = 1.94$, $t_{b_2} = 5.58$ when $t_{b_3} = 2.37$. We see that factor $X_4$ remains significant, in relation to which $t$-statistics is higher than the appropriate critical value; however, in relation to factor $X_2$ $t$-statistics is close to the critical value. In addition, generally, this equation is significant as per $F$-statistics, since $F^{*} = 50.64$, when $F_{cr} = 4.74$. Accordingly, determination ratio is 93.5%.

At this stage, the research itself may be finished because after factor $X_3$ is excluded, we will come back to the paired regression which was reflected in Table 2.

Let us analyze the last equation. The index near factor $X_2$ is 0.14; and it means that increase of the number of the paid temporary disability days in 1 leads to the increase of the expenditures incurred by the Social Insurance Fund for Temporary Disability in UAH 140, ratio near variable $X_4$ is 1215.12, i.e. increase of the average daily temporary disability aid results in the increase of the Social Insurance Fund for Temporary Disability in UAH 1215.12 thousand. In addition, it should be noted that for the purpose of the forecast and study of the relationships between the expenditures incurred by the Social Insurance Fund for Temporary Disability, any of the models built may be used because, generally, as per $F$-statistics all of them are adequate. Non-significance of $t$-statistics in this context may be ignored because, as stated above, these models were built in terms of the limited selection of data.

Fig. 1. Correlation field of factors: x – number of the paid temporary disability days, y – average daily temporary disability financial aid, UAH, z – Social Insurance Fund for Temporary Disability (UAH, million).

In conclusion, we will build the correlation field for two factor models of linear regression which was obtained at the last stage of the research by means of the use of the package Mathcad 2001 Professional (fig. 1).
Based on the picture obtained, linear dependence exists between the given factors. Thus, the assumptions (which were used herein) regarding the linear relationship, are fully confirmed in the course of the building of the models of multiple regressions.

**Discussion**

Increase of the average daily wages in UAH 1 will lead to the increase of the expenditures incurred by the Social Insurance Fund for Temporary Disability in UAH 881,73 million. The indexes of the number of the paid temporary disability days, number of the vouchers for sanatorium and resort measures, number of the children who were sent for recreation and number of the children who attended sport schools for children and young people, have negative ratio. This tendency is explained by the fact that these indexes within 2003-2012 decreased. The payments made by the Social Insurance Fund for Temporary Disability for each identity of these indexes, and in total the expenditures incurred by the Social Insurance Fund for Temporary Disability increased. Therefore, taking into consideration these indicators with other factors, the situation will adequately reflect the reality.

Increase of the number of the days of the maternity leave in 1 day will result in the increase of the expenditures incurred by the Social Insurance Fund for Temporary Disability in Chernivtsi region in UAH 250.

Increase of the average daily temporary disability financial aid in UAH 1 will lead to the increase of the expenditures incurred by the Social Insurance Fund for Temporary Disability in Chernivtsi region in UAH 0,824 million.

The model built (4) defines the dependence between the expenditures incurred by the Social Insurance Fund for Temporary Disability, the number of the paid temporary disability days and average daily temporary disability aid. In accordance with this model, additional paid temporary disability day given the average daily wages will lead to the increase of the expenditures incurred by the Social Insurance Fund for Temporary Disability in Chernivtsi region in UAH 140. Increase of the average daily wages in UAH 1 will result in the increase of the expenditures incurred by the Social Insurance Fund for Temporary Disability in Chernivtsi region in UAH 1.215 million.

Determination index for model (4) is 93,5%, i.e. expenditures incurred by the Social Insurance Fund for Temporary Disability depend for 93.5% on the number of the paid temporary disability days and average daily temporary disability aid. Moreover, as regards the model, the correlation field was built that confirms the linear character of the relationships between these indicators.

**References**


