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INTEGRAL EVALUATION OF OPPORTUNITIES OF INVESTMENT SUPPORT OF GRAIN PRODUCTION IN TERNOPIL REGION

Statement of the problem. Ukraine is rather diverse country both in terms of geographical terms and in terms of socio-economic development. This geographic and socio-economic diversity indicates significant potential, because it allows you to offer various "packages" of investment conditions, which provides a wide range of potential investors, because each investor is focused on very specific characteristics of areas that are crucial for him.

Analysis of recent research and publications. Theoretical - methodological bases and practical problem-solving software investment Ukraine meaningfully represented in the works of Geets , B. Danilishina , G. Dobrova , M.Malika , V. Seminozhenko , statistical modeling of socio - economic indicators are devoted to the study of S.A. Ayvazian , A.M. Yerinoyi , T. Kuhel , M.I.Skrypnychenko . Analysis of the results revealed a lack of research study on integrated assessment of investment opportunities to provide agricultural sectors in the regions.

Problem. The study aims to identify opportunities for integrated assessment of the investment to ensure grain Ternopil region on the basis of principal components and justify their rating.

The main material of research. Prediction of social and economic processes becomes an inherent part of management at all levels - from small firms to the national economy as a whole. Very little information that allows for the analysis, prediction and decision making needed information reliable ways to convert raw materials into precise knowledge. So, in economic forecasting using a methodology underpins the information society.

The software package GRETL (GNU Regression Econometrics and Time Series Library) is a tool for practical implementation of complex computational procedures econometric modeling [1,3,5,6,7,8].

The method of principal components was proposed by Pearson in 1901 and then reopened and elaborate Hottelinhom (1933) This method is used, for example, to compress the volume of stored information and simplifying its interpretation or multivariate comparison of the objects, allowing you to reduce the dimensionality of the original feature space (- Closed sign) and go to the new aggregate attributes (- the main component). In this case, the new values are linear combinations weekend correlated with each other, the formula (1).

$$\begin{cases} y_j(x) = w_{1j}\left(\dfrac{x_1 - \bar{x}_1}{\sigma_1}\right) + \ldots + w_{pj}\left(\dfrac{x_p - \bar{x}_p}{\sigma_p}\right); \\ \sum\limits_{i=1}^{p} w_{ij}^2 = 1 \qquad (j = 1 \ldots p); \\ \sum\limits_{i=1}^{p} w_{ij} w_{ik} = 0 \qquad (j,k = 1 \ldots p,\ j \neq k); \end{cases} \tag{1}$$

where - mean and standard deviation features xi.; wij - coefficients of principal components, maksymyzuyuche variance of yj, which are out of the equation that has a solution if, where S-covariance (or correlation) matrix [2].

Traditional algorithm of calculation of principal components includes the transition from the original observation matrix X to the covariance (or correlation) matrix S between the original characters, then to calculate the eigenvalues . Based on the largest eigenvalues , best explain the initial space signs transition is made to the principal components by determining their coefficients wj = (w1j, ..., wpj), maximizes the variance of the projections set of objects on the axis of the main component. Thus, only those selected principal components , the variability of which covers most of the variability.

To form the rating assessment of the investment to ensure grain Ternopil region and seventeen districts (Berezhansky, Borschevskogo, Buchatsky, Gustynskogo, Zalishchytsk, Zbarazh, Zborivsky, Kozova, Kremenetskogo, Lanivtsi monastery, under Volochysk, Pidhaitsi, Terebovlia, Ternopil, Chortkiv, Shumsky) for 2008 - 2011 pp. uses the following components [4]:

1. The arable land in the ownership and use of agricultural enterprises and citizens;

2. Production of cereals in all categories;
3. Yields of crops in all categories;
4. Having combine harvesters agricultural enterprises;
5. The number of enterprises and number of employees engaged in crop;
6. Results from the sale of cereals and legumes;
7. State support to agriculture through budgetary grants;
8. Investments in crop production.

Then, Ternopil region - a multidimensional object, characterized by a vector function = (y1, y2, y3, y4)',

where each element of the vector yi - the main component (with the largest contribution), due to a set of initial symptoms. Actually the number corresponding to each yi (i = 1 .. 4) is rated area in the relevant field (1,2,3 or 4), and arithmetic mean values of the eigenvalues (corresponding y1, y2, y3, y4) will be generalized index (rating) sustainable development of the region as a whole.

I. The implementation of principal component among GRETL The set of indicators characterizing multidimensional object that describes the vector functions

1. Determine the initial attributes Xij for each component of sustainable development Y1.

1.1. Y1 - component of sustainable development (productivity)

Y1 = (X11, X12, ..., X18),

where Hij - initial signs

1.2. Determine the initial attributes Xij for each component of sustainable development Y2. Y2 - component of sustainable development (area)

Y1 = (X21, X22, ..., X28),

where Hij - output characteristics (Table 1)

Table 1

The dynamics of the yield of crops and agricultural land in the Ternopil region

Yields of crops in all categories of (1 ha ts) ***X11 - X18***				**The arable land in the ownership and use of agricultural enterprises, ha** ***X21 - X28***			
2008	**2009**	**2010**	**2011**	**2008**	**2009**	**2010**	**2011**
34,0	**33,6**	**27,7**	**41,0**	**958,5**	**958,8**	**959,9**	**959,4**
20,8	19,6	17,5	34,6	34,0	34,0	34,0	34,1
28,2	28,7	25,6	40,2	67,4	67,4	67,2	67,3
42,1	47,3	35,5	52,5	55,9	55,8	55,8	56,0
38,7	39,9	30,7	43,1	69,9	70,0	70,0	70,0
35,2	32,8	29,1	44,1	44,0	43,9	43,9	43,8
27,4	28,2	26,6	38,2	64,4	64,8	65,6	65,8
25,6	27,4	21,6	31,4	67,3	67,3	67,3	67,2
37,8	34,2	22,5	41,1	54,6	54,9	55,0	54,9
22,1	20,2	19,7	28,8	60,0	60,3	60,3	60,1
38,4	33,0	35,8	50,0	51,7	51,5	51,4	51,1
24,0	27,9	20,8	38,7	33,3	33,2	33,2	32,6
48,7	46,1	37,1	52,8	67,5	67,5	67,7	68,0
34,2	51,3	17,2	31,2	32,8	32,7	32,7	32,7
33,8	32,7	31,1	42,4	86,2	86,2	86,4	86,6
34,1	30,4	27,4	37,6	53,0	53,0	53,0	52,9
36,9	33,6	26,1	39,7	63,1	63,2	63,3	63,2
28,8	23,3	21,1	38,2	51,6	51,3	51,3	51,3

Source: compiled by the author based on [4]

1.3. Determine the initial attributes Xij for each component of sustainable development Y3. Y3 - component of sustainable development (sales)

Y1 = (X31, X32, ..., X38),

where Hij - initial signs

1.4. Determine the initial attributes Xij for each component of sustainable development Y4. Y4 - component of sustainable development (manufacture)

Y4 = (X41, X42, ..., X48),

where Hij - output characteristics (Table 2).

Table 2

Dynamics of grain and leguminous crops and grain crops in the Ternopil region

Results from the sale of grain and leguminous crops ***X31 - X38***				**Production of cereals in all categories of farms (thousand tons)** ***X41 - X48***			
2008	**2009**	**2010**	**2011**	**2008**	**2009**	**2010**	**2011**
10946632	**6989101**	**10946632**	**9277604**	**1598,0**	**1573,9**	**1261,0**	**1882,8**
25740	–	25740	–	24,2	13,8	15,6	28,2
35173	23911	35173	40326	91,2	88,8	78,6	127,4
245635	269236	245635	414353	111,2	112,8	89,7	127,6
1018191	459433	1018191	536868	146,9	167,5	118,1	165,8
1490415	716163	1490415	1382236	89,5	83,2	73,6	104,8
352356	196568	352356	213102	84,4	91,0	79,7	128,2
542541	460336	542541	428329	82,4	89,4	61,9	104,6
489983	536709	489983	363637	96,9	87,4	65,9	118,1
435222	195732	435222	446579	43,8	41,6	34,9	57,5
149284	108086	149284	132279	76,6	62,9	76,6	109,9
439032	461072	439032	542894	25,6	26,1	19,8	49,4
151567	61881	151567	242606	183,6	168,7	139,9	179,8
1352756	805547	1352756	1057688	49,5	78,4	21,4	40,0
449294	140750	449294	239225	173,7	171,9	158,2	219,8
1052231	773470	1052231	936836	115,3	99,6	87,3	110,9
932878	705490	932878	768150	143,0	144,2	104,9	144,1
1447210	906310	1447210	1271131	58,2	45,1	33,5	65,6

Source: compiled by the author based on [4]

1.5. Determine the initial attributes Xij for each component of sustainable development Y5. Y5 - component of sustainable development (harvesters)

Y5 = (X51, X52, ..., X58),

where Hij - initial signs

1.6. Determine the initial attributes Xij for each component of sustainable development Y6. Y6 - component of sustainable development (employees)

Y6 = (X61, X62, ..., X68),

where Hij - initial signs

1.7. Determine the initial attributes Xij for each component of sustainable development Y7. Y7 - component of sustainable development (the company)

Y7 = (X71, X72, ..., X78),

where Hij - output characteristics (Table 3).

Table 3

Dynamics of combine harvesters, number of employees and the number of companies engaged in crop production in the Ternopil region

Having combine harvesters agricultural enterprises (T) ***X51 - X58***				**The number of workers employed in crop, people** ***X61 - X68***				**Number of enterprises, units.** ***X71 - X78***			
2008	**2009**	**2010**	**2011**	**2008**	**2009**	**2010**	**2011**	**2008**	**2009**	**2010**	**2011**
1129	1018	840	757	9658	7826	10429	8122	301	289	292	269
38	30	14	13	161	115	18	16	3	3	2	1
58	49	48	48	119	111	149	85	8	8	8	12
85	82	65	52	363	220	540	299	13	14	18	11
163	120	115	98	464	633	905	495	19	19	26	13
40	39	36	29	1527	1206	1209	1705	28	24	24	27
85	74	63	55	399	268	403	129	12	12	15	12
70	65	45	39	659	386	723	432	22	23	18	22
43	46	33	30	505	368	631	453	18	17	13	16
27	27	18	15	258	249	258	215	12	12	11	12
59	52	50	42	389	208	483	184	12	8	10	6
30	31	31	32	584	452	430	498	16	14	12	14
43	38	35	40	232	172	255	132	11	10	10	9
26	20	13	14	809	681	809	728	20	22	19	18
89	86	70	63	125	82	233	78	8	5	9	4
108	106	81	72	779	754	809	630	29	28	31	32
124	115	89	83	688	519	790	587	30	29	24	24
39	36	31	29	1199	1099	1388	1097	28	30	30	27

Source: compiled by the author based on [4]

1.8. Determine the initial attributes Xij for each component of sustainable development Y8. Y8 - component of sustainable development (investment)

Y8 = (X81, X82, ..., X88),

where Hij - initial signs

1.9. Determine the initial attributes Xij for each component of sustainable development Y9. Y9 - component of sustainable development (official support)

Y9 = (X91, X92, ..., X98),

where Hij - output characteristics (Table 4).

Where (Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8, Y9) - components of sustainable development

Table 4

The dynamics of investment resources and state support for agriculture in the Ternopil region

Investment in plant, thousand ***X81 - X88***				**State support to agriculture through budgetary grants, (thousand).** ***X91 - X98***			
2008	**2009**	**2010**	**2011**	**2008**	**2009**	**2010**	**2011**
619051	214307	464024	480013	38929,2	2005,7	17279,0	23296,9
3	40	6	98	80,0	124,0	125,2	–
815	476	1108	464	160,0	–	224,0	–
7218	7641	4920	7252	351,7	8,0	795,8	–
42357	10088	15479	29976	2057,8	42,8	1813,2	1185,0
274282	62785	157882	118359	6630,6	102,0	2208,6	7914,9
1968	1701	831	8820	664,2	–	582,4	155,0
7598	5505	8622	13076	2602,4	92,7	890,7	617,5
27504	4021	3206	11587	4032,0	143,1	1126,4	607,5
31848	2354	2943	66824	1319,6	42,4	283,9	1222,5
3772	2257	9164	16165	973,3	7,9	386,1	250,0
62148	14457	13650	15864	1168,1	551,6	836,3	464,0
2992	20468	498	203	268,7	30,1	185,3	545,5
39320	28866	45662	39663	3201,5	228,1	1356,4	1620,5
97	1301	95	63	1164,4	–	321,0	2777,0
29889	16782	151564	62223	3312,4	–	1560,7	742,5
25392	13487	18248	41173	2584,2	392,0	1728,4	948,5
37143	13129	18272	36989	6400,6	241,0	2428,5	3496,5

Source: compiled by the author based on [4]

2. Since the method of principal components is based on the correlation of initial symptoms, before the construction of the principal components necessary to check the correlation between x1 ... xr for each component of sustainable development. Construct a correlation matrix using the appropriate function package Gretl. Coefficient of linear Pearson correlation calculated by using the main menu View \ Correlation Matrix.

3. Construction of the principal components Y1 PC1 - Gain value shows the principal components ● Construction of the main components of Y1 (PC1) Y1 = 0,256 R11 + 0,245 R12 + 0,247 R13 + ... + 0,247 R118 yield in 18 districts of the Ternopil region. Finding the eigenvalues of the correlation matrix (Table 5)

Table 5

Yields of crops in all categories

Number main components	The number of the correlation matrix, which describes the absolute contribution importantly Components of the total variance of output attributes	Percentage contribution of the main components of variance (percentage of total eigenvalues)	Percentage contribution of the main components of an accrual basis,%
1	**15,1399**	0,8411	0,8411
2	2,2009	0,1223	0,9634
3	0,6592	0,0366	1,0000
4	0,0000	0,0000	1,0000
5	0,0000	0,0000	1,0000
6	0,0000	0,0000	1,0000
7	0,0000	0,0000	1,0000
8	0,0000	0,0000	1,0000
9	0,0000	0,0000	1,0000
10	0,0000	0,0000	1,0000
11	0,0000	0,0000	1,0000
12	-0,0000	-0,0000	1,0000
13	-0,0000	-0,0000	1,0000
14	-0,0000	-0,0000	1,0000
15	-0,0000	-0,0000	1,0000
16	-0,0000	-0,0000	1,0000
17	-0,0000	-0,0000	1,0000
18	-0,0000	-0,0000	1,0000

Source: Calculated by the author

- Absolute contributions (λ) of the first principal component in the total variance of observational features (X11, X12, ... X18) (yield).

λ1 = 15,1399

● The relative contribution of the first principal component Y1 of the total variance of the observational features (X11, X12, ... X18) (yield).

84.11 % = (15.1399 / (15.1399 + 2.2009 + 0 , 6592 + ... + 0.000) x 100%)

● Other major components (RS2 , RS3 , ..., RS18), with minor contributions to the overall variance notinto account .

● selectable RS1 (or Y1), the first element of the vector function characterizes component of sustainable development.

λ = 15,1399 - consider how ratings

● Similarly, define the major components to other components of sustainable development. The arable land in the ownership and use of agricultural enterprises and citizens

Y2 = - 0,231 R21 - 0,228 R22 + 0,194 R23 + …. + 0,242 R218

where λ2 = 11,1870

Results from the sale of cereals and legumes

Y3 = 0,280 R31 + 0,183 R32 + ... + 0,281 R318

where λ3 = 12,6725

Production of cereals in all categories of

Y4 = 0,266 R41 + 0,219 R42 + ... + 0,255 R418

where λ4 = 14,0214

Having combine harvesters agricultural enterprises

Y5 = 0,252 R51 + 0,248 R52 + ... + 0,252 R518

where λ5 = 15,7457

Number of employees employed in crop

Y6 = 0,270 R61 + 0,259 R62 + ... + 0,206 R618

where λ6 = 13,0247

Number of enterprises engaged in crop

Y7 = 0,230 R71 + 0,269 R72 + ... + 0,289 R718

where λ7 = 8,8054

Investment in plant

Y8 = 0,323 R81 + 0,069 R82 + ... + 0,229 R818

where λ8 = 8,5507

State support to agriculture through budgetary grants

Y9 = 0,274 R91 + 0,177 R92 + ... + 0,269 R918

where λ9 = 12, 5016

So we got the vector functions:

a = (Y1, Y2, ... Y9)

Determine the overall rating of the investment to ensure sustainable development of grain Ternopil region, as an average of their components

Wed λ = (λ1 + λ2 + λ3 + ... + λ9) / 9

λ = cf (15.1399 + 11.1870 + 14.0214 + ... + 12, 5016) / 9 = 12.40

This index is used to compare the values of ratings in the analysis of their sustainability.

Conclusions and further research. Analyzing the meaning of ratings, it can be concluded that the development of investment support grain Ternopil region affect indicators such as high yield of crops in all categories of farms producing crops in all categories of farms, enough grain harvesters agricultural enterprises, the number of workers employed in crop. Become less influential figures result from the sale of grain and leguminous crops, state support for agriculture through budgetary subsidies.

However, there are also indicators that hinder the development of investment support grain Ternopil region, including: a small amount of investment in plant, number of enterprises engaged in crop and agricultural land in the ownership and use of agricultural businesses and citizens.

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Vytvytska O.D. INTEGRAL EVALUATION OF OPPORTUNITIES OF INVESTMENT SUPPORT OF GRAIN PRODUCTION IN TERNOPIL REGION

Purpose. The aim of the article is to determine the integral evaluation of the development of investment implementation of the grain production in Ternopil region on the basis of principal components and substantiate their rating.

Methodology of research. The methodological basis of research served econometric modeling based on the method of principal components with using the software package GRETL to define the rank of sustainable development of of investment implementation of the grain production in Ternopil region and the analysis and synthesis to substantiate the indicators that contribute and prevent the development of investment implementation of the grain production in Ternopil region

Findings. The rating of evaluation of the development of investment implementation of the grain production in Ternopil region has been defined. It was emphasized that the development of grain production investment in Ternopil region was influenced by such factors as high grain crop capacity in all categories of farms, grain production in all categories of farms, sufficient number of combine harvesters at agricultural enterprises, the number of workers employed in crop production. The indicators of the result from the realization of grain and leguminous plants, state support for agriculture through budgetary subsidies have gained less influence.

Originality. It has been substantiated the main component for the definition of an integrated assessment of the investment opportunities of grain production, which is based on the application of the method of principal components in the area of GRETL.

Practical value. The practical significance of the obtained results is the possibility of their use in the development of mechanisms and strategies of innovation and investment development of grain production, formulating programs for innovation and investment development in the Ternopil region.

Key words. Investment implementation, indicators of grain production, forecasting of social and economic processes, the main components, sustainable development.