Economic potential of Ukraine: assessment and forecasting

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Abstract. Based on the results of the open statistical data analysis, the paper justifies indicators for an integral assessment of the economic potential of Ukraine by types of economic activity of business entities. Since the potential is implemented in the future, the paper uses trend analysis to determine the prospective values of previously selected indicators. At the same time, some relative indicators were decomposed into absolute elements (as each of the absolute indicators has its own dynamics of changes). Stepwise, logarithmic, exponential, and other dependencies are used to predict indicators. In addition, the prospective values of indicators were normalized in order to get the correct calculation of the integral indicator in the paper. The integral indicator of the economic potential of Ukraine for each type of economic activity of business entities for the year 2022 is calculated as a result of generalizing the normalized values of prospective indicators. The calculation results can be used to distribute budget funds that are planned to be used for ensuring the long-term development of the Ukrainian economy sectors.

1 Introduction

Conducting an assessment of the current and prospective level of industry potential is an important strategic task, which implementation involves the current state of business entities analysis in the context of economic sectors and allows identifying the most promising industries to ensure priority financial and resource support for the innovative development of such industries. The need to identify the most promising sectors of the economy is resulted from such factors as: a) limited financing of sectoral development using budget funds; b) the need to obtain a significant economic effect from the investment of public funds in order to improve the efficiency of investment. This explains the choice of the research topic.

A significant number of scientific papers are devoted to the problems of assessing and improving economic potential. For example, in the works of foreign scientists methods for quantitative assessment of global real economic activity are analyzed.

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The research proposes a method that can be used to model prices for manufactured goods and develop structural models of commodity markets and to predict prices for commodities [1-3].

The researches [4, 5] analyse and models the ways of development of these territories by increasing the efficiency of investments of budget funds in scientific, technical and innovative developments for certain industries. The study [6] conducted an extensive analysis of the forms, methods and sources of funding for innovation and research, focused on areas of research depending on the size of enterprises conducting R&D.

Taking into account the above, the *aim* of the study is to formulate and apply a methodological approach to the integral assessment of the economic potential of Ukraine.

2 Investigation stages and methods

Let us consider the main investigation stages, taking into account the methods which were used.

1. The choice of indicators for assessing the economic potential of the Ukrainian economy. For the investigation, one used statistical information of the State statistics service of Ukraine, that reflects the current state of business entities by type of economic activity [7]. Indicators were selected based on the analysis of official data, they generally characterize the economic potential of industries and will be used for its integral assessment (Table 1).

Table 1. Indicators for assessing economic potential.

Indicator`s name	Units of measurement	Economic content
Profitability of operating activities of enterprises	unit share	characterizes the efficiency of business entities by type of economic activity
Financial results of enterprises	Million UAH	
Specific yield	unit share	
Capital investment	Million UAH	reflects the volume of investment activity of business entities
Capital investments in progress	Million UAH	
Current financial investments	Million UAH	
Absolute liquidity ratio	unit share	describes the financial state and use of fixed assets of business entities
Coefficient of autonomy	unit share	
Physical wear ratio of capital assets	Million UAH	

Some of these indicators are relative, so one has to provide formulas for calculating them (1-4):

$$P_{op} = NP - E_{op} \tag{1}$$

$$SP = I / E \tag{2}$$

$$La = C / CL \tag{3}$$

$$Ca = E / TC \tag{4}$$

where: P_{op} – operating profit margin; NP – net profit; E_{op} – operating expenses; SP – specific profitability; I and E – income and expenses; L_a – absolute liquidity; C – cash; CL – current liabilities; C_a – coefficient of autonomy; E – equity; TC – total capital.

2. Indicators forecasting. Potential, as an economic category, denotes the expected opportunities of enterprises and other business entities, so only a long-term assessment of economic potential has practical importance (this also involves the use of quantitative forecasting tools). When comparing the most well-known forecasting methods, trend analysis was chosen to achieve the goals of the investigation, it allows to calculate the values of indicators using trend equations (while the period sequence number acts as a variable). Typical trend equations used to calculate prospective values of economic indicators are presented below (5-8).

$$y = kln(x) + b \tag{5}$$

$$y = kx^b \tag{6}$$

$$y = be^{kx} \tag{7}$$

$$y = kx+b \tag{8}$$

where: y – forecasting value of the indicator; x – variable value of the trend equation, represented by the period sequence number; k – coefficient of x; b – quantitative parameter of the trend equation.

Table 2. Examples of trend equations for certain types of economic activity.

Indicator name	Equation of trends by type of economic activity	
	Professional, scientific and technical activities	**Education**
Profitability of enterprises operating activities	$y = 0{,}2767ln(x) - 0{,}2337$	$y = 0{,}0563x^{-0{,}081}$
Financial results of enterprises	$y = 66503ln(x) – 71725$	$y = 55{,}002e^{0{,}1603x}$
Income	$y = 25828x + 236102$	$y = 1505{,}5e^{0{,}1998x}$
Expenses	$y = -34520ln(x) + 361339$	$y = 1453{,}8e^{0{,}2006x}$
Capital investment	$y = 2173{,}7e^{0{,}3287x}$	$y = 779{,}49x^{1{,}0527}$
Capital investments in progress	$y = 18289e^{0{,}0709x}$	$y = 63{,}807x^{0{,}1691}$
Current financial investments	$y = 25983x^{-0{,}208}$	$y = 2{,}635x + 4{,}465$
Funds	$y = 3061x + 20307$	$y = 209{,}05x^{0{,}453}$
Current liabilities	$y = 182742e^{0{,}1325x}$	$y = 300{,}3ln(x) + 498{,}54$
Equity	$y = 203513ln(x) + 277394$	$y = 1483{,}4e^{0{,}0625x}$
Total capital	$y = 267267ln(x) + 581304$	$y = 2193{,}8x^{0{,}2158}$
Physical wear ratio of capital assets	$y = 466{,}22x + 20445$	$y = 72{,}38x + 840{,}72$

The important feature in using trend analysis is the decomposition of relative indicators into absolute components, since each indicator has its own dynamics of changes. It is a result of applying the method, that a significant number of trend equations are formed, and it is complicated to present them in their entirety in the paper. Therefore, one present examples of trend equations for the indicators above that describe several types of economic activity in Ukraine below (Table 2).

Therefore, relative indicators are divided into absolute components (excluding the profitability of operating activities and the physical wear ratio of capital assets, this is explained by the peculiarities of statistical information presentation). Trend analysis allows to determine the prospective values of indicators for any period, but in our case, the period of actual information is 2013-2019, while the forecast and integral assessment of economic potential is determined for the year 2021. In addition, prospective values of relative indicators (absolute liquidity, autonomy coefficient, etc.) are calculated using their absolute components, which are determined using trend analysis.

3. Indicators normalization. The need to normalize the indicators selected for an integral assessment of economic potential is explained by the fact that they have different units of measurement. To normalize the indicators, the relation (9) was applied, which makes it possible to convert absolute indicators to relative ones. At the same time, the maximum value of the indicator equals to 1, and the minimum value is 0.

$$x_i = \frac{x_n - x_{min}}{x_{max} - x_{min}} \qquad (9)$$

where: x_i – normalized value of the i-th indicator; x_n – prospective value of the indicator for a particular type of economic activity; x_{min} and x_{max} – respectively, the minimum and maximum values of the indicator.

4. Integral assessment of economic potential. It is proposed to determine the integral indicator based on the prospective normalized values of the indicators given above (Table 1).

$$I_{ep} = \frac{n_1 + n_2 + \cdots + n_m}{m} \qquad (10)$$

where: I_{ep} – integral indicator for assessing economic potential unit share; $n_1, n_2 \ldots n_m$ – normalized indicators used for integral assessment of economic potential, unit share; m – number of indicators.

We further proceed to the results presentation of the research stages described above.

3 Results

To present the investigation results, one should apply designations for the indicators and types of economic activity of business entities. This need is explained by a significant amount of calculations (Table 3). Types of economic activity of business entities are designated as ($A_1 \ldots A_n$), and indicators are designated as ($F_1 \ldots F_n$).

Double numbering of some indicators shows that they are absolute and are used to calculate coefficients.

Using the above designations, we present the primary data for the year 2019 as the last year of the actual data array used for an integral assessment of the economic potential of business entities by type of economic activity (Table 4). At the same time, the list of indicators corresponds to the one given in Table. 1, and their decomposition is to occur at the forecasting stage.

Table 3. Indicators and types of economic activity designation.

Types of economic activity		Indicators	
Name	**Designation**	**Name**	**Designation**
Agriculture, forestry and fish industry	A_1	Profitability of enterprises operating activities	F_1
Industry	A_2	Financial results of enterprises	F_2
Construction	A_3	Specific return rate	F_3
Wholesale and retail trade; repair of motor vehicles and motorcycles	A_4	Income	F_{31}
Transport, warehousing, postal and courier services	A_5	Expenses	F_{32}
Temporary accommodation and catering services	A_6	Capital investment	F_4
Information and telecommunications	A_7	Capital investments in progress	F_5
Financial and insurance activities	A_8	Current financial investments	F_6
Real estate transactions	A_9	Absolute liquidity ratio	F_7
Professional, scientific and technical activities	A_{10}	Funds	F_{71}
Administrative and support services activities	A_{11}	Current liabilities	F_{72}
Education	A_{12}	Coefficient of autonomy	F_8
Healthcare and social assistance	A_{13}	Equity	F_{81}
Arts, sports, entertainment and recreation	A_{14}	Total capital	F_{82}
Other types of activities and unclassified ones	A_{15}	Physical wear ratio of capital assets	F_9

Among the most negative phenomena that characterize the state of Ukraine's economy should be noted such as:

1. Unprofitable activities of enterprises and other economic entities representing certain types of economic activity (in particular, this applies to the transport of warehousing, postal and courier activities, arts, sports, entertainment and recreation, etc.). In addition, sometimes there is a situation when negative financial results are accompanied by a positive value of profitability (which is possible in terms of losses not related to operating activities). This is typical of real estate transactions.

2. Relatively insignificant volumes of investments, which indicates low investment activity of enterprises. This is typical for such activities as: temporary accommodation and catering and education. This situation is explained in the first case - the traditional nature of

services, and in the second - the limited financial resources of local budgets, which finance the activities of state educational institutions in the regions of Ukraine.

3. Unsatisfactory financial condition in some areas of economic activity, the criterion of which in our case is an indicator of absolute liquidity. These are, first of all, real estate transactions, activities in the field of administrative and support services, as well as such important activities as industry and construction. At the same time, in the first two cases low liquidity ratios are explained by insignificant amounts of cash, and in others - by a significant amount of current liabilities (which is typical of the vast majority of Ukrainian enterprises and is explained by the need to compensate receivables).

Table 4. Information for integral assessment of the economic potential, 2019.

A_n	F_n								
	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9
A_1	0,18	71003	1,14	66104	18134	2161	0,06	0,48	112342
A_2	0,06	109289	1,03	199896	173187	11650	0,05	0,17	1479735
A_3	0,03	4414	1,01	55994	54575	13467	0,05	-0,04	52847
A_4	0,24	68810	1,02	51818	22319	41714	0,07	0,01	92268
A_5	-0,02	-24265	0,96	50078	30314	940	0,17	0,45	587914
A_6	0,09	2351	1,06	2675	2736	119	0,11	-0,11	9090
A_7	0,13	14676	1,09	29885	9630	2174	0,23	0,16	89675
A_8	0,01	23096	1,14	10652	5467	46578	0,18	0,43	3275
A_9	0,18	-1552	0,99	27557	34376	20442	0,04	-0,04	211121
A_{10}	0,09	20304	1,06	10798	26289	18834	0,1	0,63	22691
A_{11}	0	-493	1	11838	6317	8260	0,04	0,76	1149324
A_{12}	0,06	138	1,03	4460	62	8	0,48	0,73	1199
A_{13}	0,04	1022	1,03	8139	1207	227	0,18	0,34	6832
A_{14}	-0,01	-597	0,96	3663	3004	717	0,07	0,31	68344
A_{15}	0,03	110	1,02	572	1915	151	0,11	0,37	986

The application of trend analysis and models, which are partially given above (Table 2), allowed to determine forecasting indicators for an integrated assessment of economic potential, in accordance with the second stage of the study (Table 5).

Table 5. Forecasting values of indicators for integral assessment of the economic potential, 2022.

A_n	F_n									
	F_1	F_2	F_{31}	F_{32}	...	F_{71}	F_{72}	F_{81}	F_{82}	F_9
A_1	0,16	109772	654716	604640	...	27449	742740	71727	1332348	157607
A_2	0,12	292152	4335488	4679136	...	101452	2575875	171661	3731356	1285830
A_3	0,03	10397	498058	429258	...	14315	306241	-33654	360590	61350
A_4	0,35	163601	8475225	7124554	...	127195	1780909	-9564	2092170	125902
A_5	-0,01	-27610	687720	686148	...	41522	298351	1296501	1494082	2397208
A_6	0,17	8574	63340	52298	...	3810	29438	-8821	38617	11185
A_7	0,28	36987	209498	176599	...	18185	88017	38411	203511	147200
A_8	0,08	50542	173843	134724	...	23578	141122	112711	330470	4153
A_9	0,72	10949	218266	147802	...	14070	422314	-70133	583432	387470
A_{10}	0,34	66564	442726	289557	...	44795	527461	700587	1137070	24175
A_{11}	0,15	795	168146	148987	...	4432	186992	326553	363330	2299841
A_{12}	0,05	198	7445	7235	...	536	1123	2446	3436	1420
A_{13}	0,07	2108	99552	83788	...	2405	12338	4726	14250	9181
A_{14}	0,02	-1006	10599	11160	...	962	20566	6687	37780	112439
A_{15}	0,04	160	6086	6756	...	758	5166	3242	8308	1323

Based on these calculations, in the study the normalization of indicators selected as criteria for assessing economic potential was carried out. At the same time, such relative indicators as: specific profitability, absolute liquidity and autonomy ratio were determined on the basis of forecasting values of their absolute components (Table 6).

The results of normalization of forecasting indicators that characterize the economic potential, allow us to present the most serious problems in the activities of enterprises and other economic entities (because the lowest values of indicators are zero). Thus, the transport sector is expected to be the least profitable, educational activities will not be investment-oriented in the future, and real estate entities will have problems with capital structure. But this is confirmed by the actual data of 2019, which indicates the persistence of negative phenomena in the near future. At the same time, the industry demonstrates the highest potential among the presented types of economic activity.

Table 6. Forecasting normalized values of indicators for integral assessment
of the economic potential, 2022.

A_n	F_n								
	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9
A_1	0,2184	0,4296	0,2896	0,2963	0,1348	0,0663	0,2504	0,021	0,068
A_2	0,1569	1	0,0408	1	1	0,3014	0,2435	0,035	0,5588
A_3	0,047	0,1189	0,413	0,1958	0,2936	0,3329	0,1198	0,0775	0,0261
A_4	0,4645	0,598	0,4596	0,2618	0,1037	0,038	0,1986	0,2199	0,0542
A_5	0	0	0,1614	0,3434	0,159	0,0139	0,9725	0,6108	0,424
A_6	1	0,1132	0,4939	0,0086	0,0125	0,0007	0	0,5546	0,0043
A_7	0,3708	0,202	0,4544	0,0962	0,0736	0,038	0,3701	1	0,0635
A_8	0,1044	0,2444	0,6201	0,0386	0,0363	1	0,5052	0,7718	0,0012
A_9	0,9302	0,1206	0,9168	0,1102	0,1839	0,5547	0,096	0	0,168
A_{10}	0,4476	0,2945	1	0,082	0,1282	0,9741	0,7492	0,2978	0,0099
A_{11}	0,2069	0,0888	0,3625	0,0542	0,0334	0,1812	1	0,0555	1
A_{12}	0,0686	0,087	0,2039	0,017	0	0	0,8341	2,5632	0
A_{13}	0,098	0,0929	0,4573	0,0385	0,0045	0,0061	0,4969	0,9327	0,0034
A_{14}	0,0274	0,0832	0,0777	0,0293	0,0155	0,0134	0,3597	0,0778	0,0483
A_{15}	0,0547	0,0868	0	0	0,0085	0,0037	0,5489	0,6539	0

The integral indicator that characterizes the economic potential of Ukraine by types of entities` economic activity is the result of generalization of promising normalized values of indicators, in accordance with the final stage of the research. The results of ranking economic activities depending on the value of the integrated indicator of economic potential are presented below (Fig. 1).

The maximum level of realization of economic potential is 48%, which indicates significant unrealized opportunities for the Ukrainian economy.
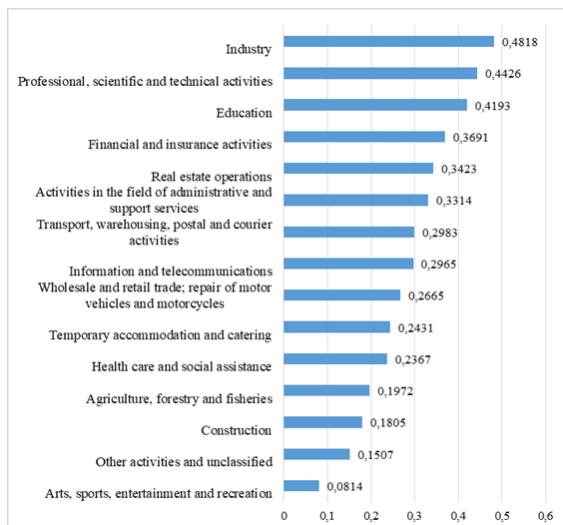
Fig. 1. Results of the prospective integrated assessment of the economic potential in 2022.

In the process of planning the development of the economy can take into account several opposite principles: a) priority financing of the most developed sectors of the economy to maximize the economic effect and rapid reinvestment of funds; b) priority financing of the least developed industries to ensure integrated economic development, taking into account not only economic but also social consequences of the implementation of state policy in this area.

4 Conclusions

According to the results of the analysis of official information from open sources, the paper substantiates the list of indicators for the integrated assessment of the economic potential of Ukraine, taking into account the division of economic entities by type of economic activity.

Based on the application of trend analysis (namely - exponential, logarithmic, power and other trend models that take into account the dynamics of economic indicators), the paper calculates the long-term values of the previously selected criteria for assessing the economic potential of Ukraine. At the same time, some relative indicators (specific profitability, absolute liquidity and autonomy ratio) were calculated using their absolute components. This allows to increase the validity of the calculations, taking into account the individual dynamics of changes in absolute indicators used to determine the coefficients.

To ensure the correctness of the calculation of the integrated indicator of economic potential, the paper normalizes the forecasting values of economic indicators. The results of this stage of the study also provide an idea of the problems of economic entities representing a particular type of economic activity.

As a result of generalization of normalized indicators in the work the integrated indicator of economic potential is defined. The ranking of economic activities according to this indicator indicates that the most perspective economic activities in the Ukrainian economy are industry, professional, scientific and technical activities and education. Construction, art, sports, entertainment and recreation, as well as other activities are conventionally considered "outsiders". The results of the integrated assessment of economic potential can be used to determine the amount of public funding for economic development by type of economic activity of economic entities.

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