REVISTA ESPACIOS

Valuation of alternative investments in agricultural land (On the example of Ukraine)

Valoración de inversiones alternativas en tierras agrícolas (en el ejemplo de Ucrania)

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Abstract
The study purpose is to formulate the concept and methodology of valuation of investments in agricultural land. The methodology proposed by the authors is based on economic and mathematical modeling of land value dependence on the amount of rent and interest on deposits.
The simulation results allow comparing the market and estimated value of the land and evaluating investments feasibility. The value of land in Ukraine, which lacks a transparent market and market price, has been determined.
key words: alternative investments, estimated value of land, land market of Ukraine, investments feasibility

Resumen
El propósito del estudio es formular el concepto y la metodología de valoración de las inversiones en tierras agrícolas. La metodología propuesta por los autores se basa en modelos económicos y matemáticos de la dependencia del valor de la tierra en la cantidad de renta e intereses sobre los depósitos.
Los resultados de la simulación permiten comparar el mercado y el valor estimado de la tierra y evaluar la viabilidad de las inversiones. Se ha determinado el valor de la tierra en Ucrania, que carece de un mercado transparente y un precio de mercado.
palabras clave: inversiones alternativas, valor estimado de la tierra, mercado de tierras de Ucrania, factibilidad de inversions

1. Introduction

In scientific literature, the content of alternative investments is defined mainly as an appraisal concept based on the practice of their implementation by specialized financial companies. In undeveloped economies (including Ukraine) there are no such companies. Accordingly, the concept of alternative investments is little known, and, consequently, definitions are incomplete, contradictory and incorrect. This requires setting up the definition for specific areas for alternative investing.

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In addition to the lack of theoretical foundations and the practice of systematic alternative investing, Ukraine has for the last 18 years banned the sale of agricultural land, much of which remains in state and communal ownership. The processes of lifting sales bans and creating a transparent land market require its analysis and forecasting.

In order to objectively evaluate the feasibility of alternative land rights investments, it is advisable to calculate their cost on the basis of profitability. This is especially true in the context of significant influence on the market value of other factors (economic and socio-political state of a particular country, limited supply of land, conditions of state regulation of the market, etc.) and the absence of a transparent, legal market in Ukraine. Estimated value should be based on objective, accessible, simple and common economic indicators for all countries of the world.

Based on these problems, the goals of this study are: to define the concept of alternative investments; to analyze the land market of Ukraine; to form the economic-mathematical model of land value calculation and to develop on its basis economic feasibility estimation method of alternative investments in land.

2. Methodology

The following methods are used in the article: graphical to construct the Lorentz curve and graphs to determine the objectivity of price modeling; economic and mathematical calculations of Gini coefficient to determine the competitive situation regarding the equality of land distribution between producers in Ukraine; grouping and comparison to form an array of countries for analysis and comparison of land valuation results; generalization and concretization to define the concept of alternative investments; economic-mathematical, including correlation-regression analysis of the dependence of land value on rent payments and deposit rates; analogy, regression modeling of economically justified land value according to the formed correlation-regression model; logical and heuristic to study the return on investment in land and the impact of introduction of the land market on the value of Ukrainian agricultural companies.

3. Results

3.1. The alternative investments concept

Generalizing the concepts of investment, namely Law of Ukraine On Investment Activity (1991), Shkvarchuk and Rusjan (2018), Demin et al. (2018), investments can be defined as all types of property and intellectual values that are invested in objects of business and other activities, which generate profit (income) and / or social and environmental impact is achieved.

Due to Aubry (2017), Yau et al. (2007) and Preqin the 2018 Alternative Assets Performance Monitor (2018) all investments can be divided into traditional (stocks and bonds); traditional alternatives (private equity, commodities and real estate, including natural resources); the latest alternatives (hedge funds, managed futures funds, problem securities).

Based on the analysis and synthesis of theoretical and applied analytical research, we propose the concept of alternative investments as low-value investments in securities, derivatives, real estate, property rights, goods and currency, mainly in unorganized high-risk and highly profitable markets, which require complex analysis and successful management decisions in a context of considerable uncertainty.

3.2. General characteristics of Ukrainian agricultural land market

Due to State Service of Ukraine for Geodesy, Cartography and Cadastre (2017, 2018) the total area of agricultural land in Ukraine is 42.7 million hectares. State owned are 10.4 million hectares, communal owned 0.025 million

hectares, private owned 31.11 million hectares. About 40% of this land is black earth. The majority of private lands consist mainly of Ukrainian citizens' shares (27.7 million hectares). These are small plots of land with an average size of 4 hectares.

Since 2001, Ukrainian legislation has introduced a moratorium, as a ban on the sale of 96% of agricultural land, including private land. During this time, work on the introduction of a regulated, open market for land ownership was unsuccessful.

The moratorium has led to the formation in Ukraine of two markets for land rights: one legal for rights of use and other shadow for "quasi-property – almost property". The latter is legally subject to the rights of use, emphitheusis, mortgage and other obligations, which are designed in such a way that virtually it is impossible to return the right of use to the owner. The latter is put into legal and economic conditions that actually compel him to transfer ownership to the quasi-owner when the moratorium is lifted. Agribusinesses have formed so-called "land banks" in the form of ownership and land use rights.

On March 31, 2019, the Parliament of Ukraine passed a law on the removal of bans on land acquisition within 10,000 hectares: from 2021 for individuals, and from 2024 for legal entities owned exclusively by residents of Ukraine. Therefore, land leasing will be a major part of the land rights market in Ukraine.

At the same time, agro-companies have a need in investment funds for the purchase of leased land in Ukraine. This gives investors an advantage when purchasing their corporate and debt securities.

3.3. Ways to invest in agricultural land

Investment in agricultural land rights can be direct (in the acquisition of land rights) and indirect (tin the acquisition of unit or debt securities by real estate (land) management companies and trust funds). The acquisition of land rights is carried out in the form of the conclusion of leases or emphitheusis (right of use) and purchase of sale (ownership). However, these agreements are based on personal contacts with landowners (public authorities or individuals). This situation complicates foreign direct investment. It is much easier to make indirect investments.

3.4. Characteristics of the competitive environment in the Ukrainian market

Due to State Service of Ukraine for Geodesy, Cartography and Cadastre (2017, 2018) in Ukraine, 42.1 thousand agricultural enterprises with different land banks are formed (Table 1). They cultivate 18.6 million hectares of land, which is 41.0% of Ukraine's agricultural land.

Table 1
Distribution of agricultural enterprises by area of use

#	Characteristics of grouping	Groups of agricultural enterprises			
		All	Group 1 (S < 100 ha)	Group 2 (S 100 – 10000 ha)	Group 3 (S > 10000 ha)
1.	Number of producers (thousands)	43,4	27,7	15,5	0,2
2.	% of a number of producers	100	63,82	35,71	0,46
3.	Land area of a group (million hectares)	18,6	0,9	14,2	3,5
4.	% of a land area of a group	100	4,84	76,34	18,82
5.	% of an area of agricultural land	-	2,11	33,26	8,20

Source: Created by the authors according to the Ukrainian
State Service of Geodesy, Cartography and Cadastre.

Based on the data of the Table 1, the Lorentz curve is constructed, which shows the unequal distribution of agricultural enterprises in Ukraine (Figure 1).

Figure 1
Land distribution among agricultural enterprises in Ukraine
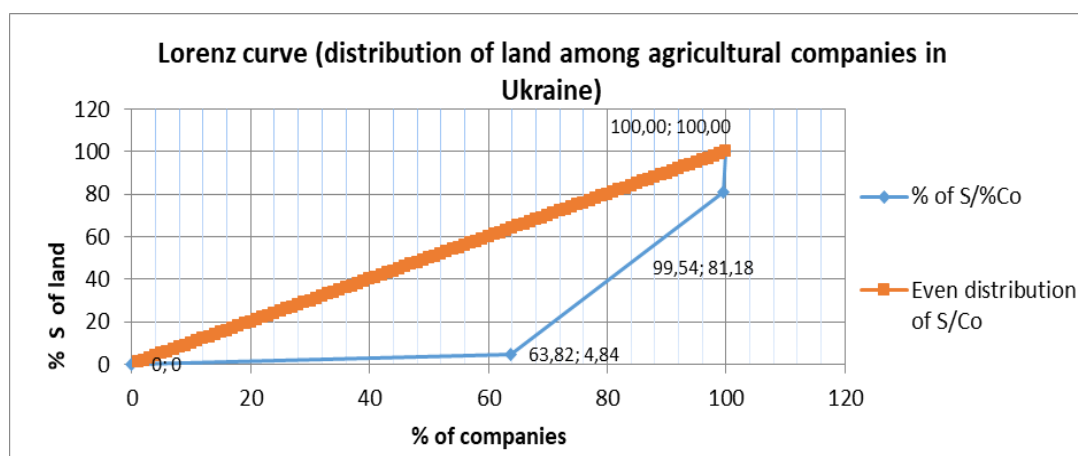
Source: Created on the basis of the Ukrainian State Service of
Geodesy, Cartography and Cadastre (2017, 2018) data and
own calculations of the authors.

The actual land distribution curve (% of S / % Co) is much lower than the absolutely equal distribution curve (ED of S / Co). 2/3 of the area of the triangle formed by the straight ED of S / Co lies between it and the curve (% of S /% Co), indicating a high degree of unevenness in the distribution of land area. So, 63,82% of producers, who have land banks up to 100 hectares occupy only 4,84% of the land of enterprises and 2,11% of all agricultural land in Ukraine. Instead, 35,71% of enterprises occupy 76,34 and 33.26 million hectares, respectively. The 200 largest producers (0,46%) concentrated the areas, which make up 18,82% of the enterprise land area and 8,20% of all land (Table 1). Mathematically, this inequality is calculated as a Gini coefficient of 0,6535. The coefficient is in the range of $0,5 \leq G \leq 1$, which mathematically demonstrates a significant degree of inequality of land distribution between Ukrainian agricultural producers.

As can be seen from Table 1, the market situation is competitive in terms of the number of producers (42,1 thousand) who are potential subjects of attracting alternative investments. Under the conditions of investment funds scarcity and high interest rates in Ukraine, this situation is favourable for investors. A large number of producers are formed by large and oversized land banks (Groups 1 and 2 in Table 1), which facilitates the creation of large production facilities for growing and processing their own products, regardless of third-party suppliers. The advantage of such producers is the territorial limitation of the market for rent of small private (unitary) lands: the owners can attract tenants mainly from those who already have adjacent plots to form sufficient territory for industrial production of the area. Thus, enterprises from Groups 2, 3 and often 1 occupy a dominant position in the land rental market of the local community, which reduces the cost of renting or buying land.

Due to Latifundist Media (2020) Ukraine's largest agricultural companies have already become active participants in the world agricultural market. In addition to cereals, agricultural holdings enter other markets: oils – Kernel Group (530 thousand hectares of land); eggs and meat – UkrLandFarming (500 thousand hectares of land) and MHP (370 thousand hectares of land). The vast majority of companies are owned by Ukrainian owners. Some of them are controlled by foreign investors: AgroGeneration (396 thousand hectares of land), Agroprosperis (396 thousand hectares of land), Continental Farmers Group (137 thousand hectares of land).

3.5. Calculation of land value by indirect methods

Land value can be defined by direct methods – as a market price based on market demand and supply. However, there is a need for indirect estimates, as this product is very diversified: it varies in location, fertility, processing conditions. There is also a significant dependence of the value of land rights on the number of subjects of the regional land market, rules of state regulation, socio-economic and political status of the country. So, Ukrainian lands have some of the best terms of use in the world, but their value is underestimated by the moratorium that created the shadow market for quasi-property. Data for the indirect estimation of land value of any country in the world can be obtained by calculating the dependence of land value on rent and the possibility of alternative risk-free use of capital by depositing it on a bank deposit.

In classic form, the formula is as follows:

$$LP = \frac{LR}{DR} \times 100\%$$

(1)

where LP is the estimated value of the land, LR is the land rent in the form of rent, DR is the percentage rate of the deposit.

Table 2 is formed to analyse land value and land rent situation in Ukraine.

Table 2
Land value and land rent cost in Ukraine (EUR)

# for cost	Region (2018 - 2019)	Regulatory monetary valuation	Private land rent cost	State land rent cost	Value for R/%	Cost calculated by regression
1	Cherkasy	1056,06	110,63	116,86	4515,55	2752,11
2	Chernivtsi	1044,07	42,83	124,70	1748,08	3254,18
3	Kharkiv	1011,83	78,30	107,90	3196	2177,62
10	Ternopil	911,33	45,98	131,26	1876,83	3674,59
20	Chernihiv	755,34	35,40	81,60	1444,71	492,58
23	Lviv	674,58	54,10	92,69	2208,13	1203,04
24	Zhytomyr	672,03	52,95	95,09	2161,37	1356,92
	Average	865,10	50,64	1742,49	2066,96	2272,93

Source: Created by the authors according to the Ukrainian State
Service of Geodesy, Cartography and Cadastre (2018) and
own calculations.

As we can see, rent costs for state lands are on average three times higher than private ones. This situation may be explained by the tenants' use of their regional dominant position with respect to the owners – individuals, small size of the leased units and the shady nature of the market with the payment of part of the lease. Lease for state lands is calculated in accordance to statutory standards.

Therefore, the available rental rates and, consequently, the value of the land in Ukraine will change after the introduction of the free land market. In order to predict market prices for land, one can analyse the situation in other related macro-region countries, where this market exists. For Ukraine, these are the countries of the European Union, which also formed the land market in the process of transition from the administrative-command system and other countries-regions with developed agricultural industry (Table 3).

Table 3
Land value and land rent cost in European countries (EUR)

# for cost	Country name	Deposit interest rate (%) 2014	Rent cost for agricultural land	Actual land prices	Estimated land prices (R/%)	Estimated land prices (Reg)	ALP / LP Reg
1	Netherlands	0,40	720	56944	180000	51280	1,11
2	United Kingdom	0,41	171	26410	41707,32	16048	1,65
3	Ireland	1,22	48	25903	3934,43	4264	6,07
4	Slovenia	1,25	136	16009	10880	9759	1,64
5	Greece	2,49	377	14538	15140,56	19231	0,76
6	Spain	1,45	138	12192	9517,24	8924	1,37
7	Poland	0,58	217	7723	37413,79	18177	0,42
8	France	1,15	172	5940	15010,91	12568	0,47
9	Slovak Republic	1,35	44	5300	3259,26	3381	1,57
10	Croatia	1,35	90	3744	6650,25	6313	0,59
11	Bulgaria	1,66	209	3619	12622,17	12483	0,29
12	Czech Republic	0,70	73	3202	10406,27	8364	0,38
13	Hungary	1,78	104	2865	5851,04	5167	0,55
14	Latvia	0,46	38	2552	8260,87	7284	0,35
15	Romania	3,02	105	2423	3476,82	-754	-3,21
16	Lithuania	0,62	80	2330	12903,23	9205	0,25
	Average	1,24	170,13	11980,88	14777,6	11980,88	-
Ukraine	state	2,45	109,38	-	4464,66	2272,93	-
	private	2,45	50,64	-	2066,95	-1491,78	-

Source: Created by the authors according to EU (2016) and IMF (2014) data.

Based on Formula 1 calculations an average land value is calculated that is 1,23 bigger than the market average for the sample countries (Table 3). This indicates that the value of agricultural land, in addition to rent and deposit interest, is influenced by other factors. Therefore, we propose to determine the dependence of land value on rent and interest through regression coefficients, which will allow to take into account the degree of influence of these and other factors.

The calculation is performed for the macro-region countries according to the multiple regression equation:

$$LP_{reg} = b_0 + b_1 \times LR + b_2 \times DR \qquad (2),$$

where LV_{reg} – land value by regression method; LR – land rent, DR – interest on deposit; b – regression coefficients indicating the calculated dependence of the LV_{reg} variable on LR and DR factors.

The results of regression modelling of land value for European macro-region countries are presented in Table 4.

Table 4
Model of factors influence on the land value

Factors	Regression coefficient (b)	Correlation coefficient (r)	Determination coefficient (R^2)	F-statistics = 2,6	t-statistics for y and x = 1,341	Statistical significance of the factor
LP_{reg}	7064,33				1,36	significant (0,8)
DR	-64,09	0,82	0,67	13,11	4,70	significant (0,9)
LR	4816,94				-1,56	significant (0,8)

Source: Authors' calculations

According to the obtained indicators of t-statistics and F-statistics, the dependence of land value on the deposit rate and the amount of rent is decisive (see Table 4).

Obtained in accordance with Formula 2 model of land value in Europe looks like the following:

$$LP_{reg} = 7064,33 + 64,09 \times LR - 4816,94 \times DR \qquad (3),$$

Correlation coefficient r = 0,82 shows a high degree of dependence between the value of land and model's factors. Determination coefficient R^2 =0,67 shows a 67% dependence of the change in the value of land on the change of model factors.

3.6. Comparison of market and estimated land values to assess the economic feasibility of investments

The calculations according to Formula 3 give the average land value, which is equal to the average market value for the sample countries (Table 3).

The results of calculating the land value by the obtained regression equation are sufficiently accurate, which confirms the comparison of the market and estimated price schedules (Figure 2).

The proposed method allows to determine the feasibility of investing in agricultural land of any country in terms of the available market value and the ratio of profitability with other countries in the region. For example, from Table 3 we can see that the market value of United Kingdom agricultural land is 1,6 times higher, while in Ireland it is 6 times higher than the economic one (estimated LV_{reg}).

In other words, the market price-to-earnings ratio of such areas is much worse than the generalized one through the regression model of the ratio for European countries. Conversely – in Latvia, Lithuania, Bulgaria the market value of land is 0,25 – 0,35% of the estimated value (Table 3). This makes it worthwhile to invest in terms of comparing the price / profitability ration with other countries in the region. Therefore, investments in the countries of the "young" post-socialist market economy are more profitable compared to the highly developed countries of Europe.

Figure 2
The comparison of the market and estimated price schedules in European countries
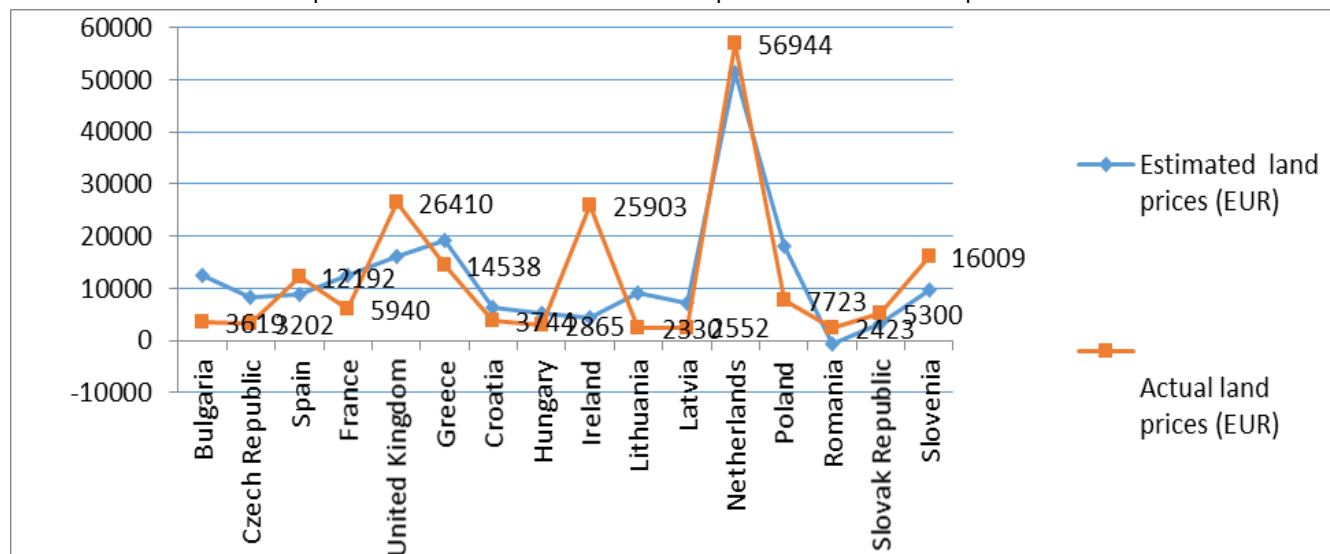
Source: Created on the own calculations of the authors on the basis of EU (2016) data.

Using Formula 3, the value of large arable agricultural land in Ukraine can be calculated:

$$UALP_{reg} = 7064,33 + 64,09 \times 109,38 - 4816,94 \times 2,45 \qquad (4),$$

Similarly, for small units:

$$UALP_{reg} = 7064,33 + 64,09 \times 50,64 - 4816,94 \times 2,45 \qquad (5),$$

A negative result (5) demonstrates that investing in individual small units is inappropriate.

Thus, the agro-enterprises that have formed land banks become especially attractive. On the other hand, the price of redemption from a private owner when the moratorium is lifted will be formed as on a small unattractive investment. Due to Kernel Holding S.A. (2020) on February 2020, Ukraine's largest agro-holding company (Kernel Group) estimates leases in equity as EUR 338520000 euros. The regression value (EUR 2,272.93 / hectare) of all Kernel leased land (524 thousand hectares) [13, p. 9] is EUR 1204652,9, which is 3,5 times higher than the balanced value. As the experience of the post-socialist countries of Europe demonstrates, the market value of land in the initial stages of market formation will be lower than the estimated one (Table 3), which ensures high return on investment in their redemption. If, however, the lease de facto attests to the "quasi-ownership", which has already been paid and only needs a legal redesign, then after the opening of the land market in Ukraine, such assets of companies will increase four times.

In addition, the high fertility of land in Ukraine causes an increase in land rent. At the same time, the authorities are pursuing policies that result in a reduction of interest rates on deposits. According to the proposed model (Formula 3), this will increase the estimated value of land and assets of agro-enterprises.

A similar situation with the estimated and market value of land assets exists in most companies managing land banks in Ukraine. Therefore, investments in these assets are likely to generate significant returns.

The proposed model of regression calculations (Formula 3) also allows to estimate the return on investment in other countries where the market value of the land differs from the calculated one – ALP/ LP_{reg} ratio is less than

or greater than 1 (Table 3). The most investment-attractive ratio is observed in Lithuania, where the market value (ALP) is 0,25 or 25% of the estimated ($\mathrm{LP_{reg}}$). Unattractive is investing in Ireland, where the market price is 6,07 times higher than estimated. Accordingly, the investment will have an extremely high payback period of 539 years, compared to 39 years in Lithuania. Over time, the value of the land will weigh up to the estimated level.

Therefore, in countries where ALP/ $\mathrm{LP_{reg}}$ is significantly less than 1, the value of land is likely to decrease and, where more than 1, increase. Thus, in addition to rent, the return on investment will also be affected by changes in land value.

Our method of estimating the land value makes it possible to determine the attractiveness of the country for alternative investment in land rights. It can be applied to countries in other macro-regions or the world as a whole. In this case, it is advisable to form an appropriate regional or global sample of countries to calculate the regression coefficients. The latter will be slightly different from the sample of European countries, which will affect the land value calculation results.

4. Conclusions

In our definition, alternative investment is characterized by high risk and high uncertainty in decision making. Investing in land has a high payback period if they are calculated solely on a rent basis. At the same time, there is a high probability of a significant increase in the value of land rights. The model (Formula 3) proposed in the article allows to predict (regression to calculate) the probability of increasing the value of land to the level $\mathrm{LP_{reg}}$, based on public indicators. This greatly simplifies the assessment of the feasibility of alternative investment in land rights in different countries of the world. Based on this methodology and Ukrainian land market analysis, it is possible to draw conclusions about the feasibility of investing in agricultural enterprises of Ukraine: the land banks formed by them have a high estimated value, and lifting the ban on the sale of land will increase the value of land rights and assets of agricultural enterprises.

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