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DIAGNOSTIC OF ANTI-CRISIS STABILITY OF AGRIBUSINESS ENTITIES AT INTRODUCTION OF INNOVATIONS INTO THE CYCLE OF PRODUCTION

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ABSTRACT

The article considers the diagnostic of anti-crisis stability of agribusiness entities at the introduction of innovations into the cycle of production. A methodical approach to the diagnosis of target parameters of anti-crisis stability of agribusiness entities, based on a complex composition of cost-oriented components of equity growth which allows binary selection of the scenario of the crisis-free state of financial capacity and profitability according to modified indicators of economic growth. The composition of deterministic factors of anti-crisis stability for diagnosing the relationship of investment with the capitalization of equity is determined. It is proposed to change the state of financial capacity of agribusiness entities in the medium term, calculated through the modification of net profit to retained earnings. The basis for calculating profitability are total assets, current assets, equity, operating income from the sale of innovative products, as well as staff costs. The indicators of innovation activity are analyzed and the share of agribusiness entities in the EU and Ukraine, which introduce innovations into the cycle of production, is determined. The share of costs for the introduction of innovations in the agricultural business from the GDP of Ukraine and EU countries is set. The dependence of equity on the volume of sales of innovative products and the total amount of financing of innovations in the technological cycle of agricultural production of Ukraine is established. The tree of classification of financial coefficients for observations of agribusiness entities of Ukraine on the level of anti-crisis stability is determined.

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INTRODUCTION

The high volatility of world food markets and the recession in the global market for agricultural raw materials require agribusinesses to set development priorities and strategic prospects to avoid future excessive losses in the face of sharp fluctuations in market conditions. Prerequisites for assessing the prospects for the development of agricultural enterprises is a significant resource base, which allows obtaining an acceptable level of profitability. However, under the influence of destabilizing factors of the uncertainty of the external environment and intensification of competition in the market, it causes the emergence of crisis phenomena of different nature and genesis in the functioning of agribusiness entities.

External influences increase the imperfection and lack of flexibility of anti-crisis management of enterprises, worsening the reproduction processes, shortcomings in

the organization of production and work motivation. Given this, the development of agribusiness entities should be considered as one of the key priorities of the agricultural sector of the economy in terms of forming their market value. However, the instability of agricultural enterprises in a dynamic market environment leads to an untimely response to it, which leads to a failed policy of innovation in agriculture. Sustainable functioning and development of business structures in the agricultural sector of the economy are possible only if all stages of their life cycle are protected from factors that act systematically and increase the impact on innovation. To ensure the sustainable functioning and development of agricultural businesses, it is necessary to use cost-oriented components of anti-crisis stability, which provide prospects for growth of their total value and enable the effectiveness of mechanisms of stable innovation (Mazur *et al.,* 2021).

The following works Arefieva *et al.* (2018), Altman *et al.* (2017), Lihonenko (2000), Liubenko and Herasymenko (2014), Ortina (2013), Otenko and Preobrazhenska (2014), Rabinovich (2018) are devoted to research and solution to problems of anti-crisis stability and its monitoring at different levels of the national economy. The issue of crisis, as a natural phenomenon of economic system development, is conceptually substantiated in the works by Hasanov *et al.* (2012), Heiets and Hrytsenko (2012), Kuzmin *et al.* (2011), Tiurina and Shatailo (2018). The developments of Altman and Sabato (1968; 2013), Beaver (1966), Bondar and Samsonova (2006), Buhai and Burka (2016), Cheng *et al.* (2006), Yarish (2013), Deakin (1972), Endovitskiy and Isaenko (2007), Fulmer *et al.* (1984), Fedoruk (2013), Ivashkovskaya and Yangel (2007), Shapurova (2009), Yankovets (2016), Dziuba (2021) are devoted to the research of conceptual-ontological and scientific-methodical bases of anti-crisis management. However, some issues objectively require guidelines for the implementation of anti-crisis management tools that ensure consistency of innovation of agribusiness entities with stabilization measures at all stages of the asset use cycle over time, risks, taking into account the specifics and cyclical development of innovation in agricultural sectors, multiplicative and diffusion processes that allow not only to adequately respond to existing crises but also to predict potential risk factors (Hevchuk and Christoffers, 2021). The priority of our study is to develop a methodological approach to diagnosing the target parameters of anti-crisis stability of agribusiness entities, which is based on a complex composition of cost-oriented components of equity growth, given the probability of "zones of the uncertainty of innovation", which allows binary selection of the scenario of the crisis-free state of financial capacity and profitability according to modified indicators of economic growth.

METHODOLOGY

Agricultural entities operating in an open market economy are under the influence of external and internal environmental factors, which are partially controlled and outside their sphere of influence in the formation of competition in the market (Trusova *et al*., 2021). Diagnosis of target parameters of anti-crisis stability of agribusiness entities, which are based on cost-oriented components of equity growth, allows focusing on assessing the quantitative and qualitative indicators of the market value of enterprises. Quantitative target parameters of anti-crisis stability (market value) diagnose the approximate growth of the value of agribusiness entities, qualitative parameters (company image, business relationships, experience, etc.) need to determine in a differentiated mode the amount of investment to increase the value of equity (Deakin, 1972; Masalitina, 2006; Yaremko, 2018).

Depending on the type of anti-crisis stability, quantitative cost-oriented components of equity growth by financial indicators (return on capital, assets, investments, economic value-added, net cash flow, cost of capital, etc.), and by operational indicators (asset turnover, fixed assets renewal, market share, increase (decrease) in assets, etc.), allow identifying indicators that characterize the return on investment in innovation and the safe process of production of agribusiness entities (Trofymenko, 2021). Innovations, in this case, are a factor that creates conditions for increasing the profits of entities with increasing dividend resources for investments, and, at the same time, is a source of additional risk, which, conversely, demonstrates the probabilistic risk scenario of innovative investment (Marchuk, *et al*., 2017; Trusova *et al.,* 2020; Zahoretska *et al*., 2020). In addition, numerous variations in the calculation of target parameters of anti-crisis stability through the cost-oriented components of equity growth of enterprises provides the following indicators: added economic value, economic profit, net residual profit, added monetary value, market value, strategic value,

additional value, the total return on invested capital of the enterprise (Julan *et al.,* 2017; Ohlson, 1980; Rabinovich, 2018; Zahoretska *et al*., 2020). This allows agribusiness entities to choose those diagnostic methods that are most fully consistent with the characteristics of their operating, investment and innovation activities, industry affiliation and other conditions of operation in the agricultural sector of the economy.

In the context of the cost-oriented approach, the authors propose the Fama-French model, which describes the dependence of changes in the market value of equity for agribusiness entities in the implementation of innovations in a safe production process from the level of financial capacity under different environmental conditions (Trusova *et al.,* 2021; Zahoretska *et al.,* 2020). The Fama-French model allows to more accurately diagnose the process of anti-crisis stability of agribusiness entities in the investment market, the risks of which are associated purely with innovation and belong to specific (idiosyncratic) risks, which unfortunately are not taken into account when analyzing only systemic (market) risks. Additional parameters introduced in the Fama-French model allow to take into account the industry specifics of agribusiness entities with a critical value of financial capacity. At the same time, depending on the industry affiliation of agribusiness entities (group of large enterprises or group of small enterprises) in the agricultural sector of the economy, the need for investment expected results from innovations and probabilistic parameters of financial capacity, in general, is determined.

In general, the three-factor Fama-French model can be represented by the following equation (formula (1)) (Taffler, 1984; Trusova *et al*., 2021; Zahoretska *et al.,* 2020):

$$r_{i=}\gamma_i + \beta_{i1}(r_m - r_f) + \beta_{i2}r_{smb} + \beta_{i3}r_{hml} + \varepsilon_i, \qquad (1)$$

where, r_i – the return on the i-th asset when investing equity in innovation; γ_i – the expected return on the i-th asset when investing in innovation in the absence of influence of risk factors; r_m– return on investment portfolio in assets (market as a whole); r_f – crisis-free rate; r_{smb}– the difference between the return on the weighted average portfolio of investments in assets of enterprises with small and large capitalization; r_{hml}– the difference between the profitability of the weighted average portfolio of investments in the assets of the enterprise with a large low ratio of book value to market; β_{i1}, β_{i2}, β_{i3}– coefficients that characterize the impact of the relevant parameter (r_m, r_{smb}, r_{hml}) on the return on the i-th asset when investing equity in innovation; ε_i– error.

To diagnose systemic and idiosyncratic risks, the Fama-French model uses regression coefficients that characterize the ratio of return on equity to the total level of return on investment in a safe process of innovative products in terms of each cost-oriented component of anti-crisis stability. To this end, equation (1) of the Fama-French model is transformed with the selection of an additional parameter of anti-crisis stability of agribusiness entities (characteristics of the level of excess return on equity), formula (2) (Taffler, 1984; Trusova *et al*., 2021; Zahoretska *et al.,* 2020):

$$r_i - r_f = \alpha_i + \beta_{i1}(r_m - r_f) + \beta_{i2}r_{smb} + \beta_{i3}r_{hml} + \varepsilon_i, \quad (2)$$

In the general case, the return on equity is determined taking into account changes in net income and the number of dividends paid on it (Taffler, 1984; Trusova *et al*., 2021; Zahoretska *et al.,* 2020):

$$r_{ik} = \frac{(P_{ik} - P_{ik-1} + D_{ik})}{P_{ik-1}}, \qquad (3)$$

where, P_{ik} and P_{ik-1}– net profit of agribusiness entities i at the end of the quarter k and k-1, respectively; D_{ik}– the amount of dividends paid by the enterprise i at the reporting period per quarter k.

The crisis-free rate r_f is the rate of return set on three-month US Treasury bills (Deakin, 1972). Market returns r_m should reflect the average level of return on the portfolio of investments in assets that ensure the innovation of agribusiness entities. To calculate the market return on the investment portfolio, the growth rate of the PFTS index for the relevant period is used (formula (3)) (Rabinovich, 2018; Taffler, 1984; Trusova *et al*., 2021; Zahoretska *et al.,* 2020):

$$r_{mk} = \frac{(I_k - I_{k-1})}{I_{k-1}}, \quad (4)$$

where, I_k and I_{k-1} – are the values of the PFTS index at the end of the quarter k and k-1, respectively. The rate r_{hml} is defined as the difference in profitability received by investors when investing in the assets of agribusiness entities with a low capitalization of equity in innovation. The starting point is that investors prefer the assets of agribusiness entities with a higher capitalization of equity in innovation as less risky and the rate r_{smb} reflects the additional return on investment at which investors agree to buy assets with a low capitalization of equity in innovation and sell assets with a large capitalization of equity in innovation. The positive value

of the indicator r_{smb}indicates that the return on the portfolio of investments in the assets of agribusiness entities with a small capitalization of equity in innovation is higher than the assets with a large capitalization of equity in innovation. A negative value, on the other hand, signals a higher return on investment in the assets of agribusiness entities with a large capitalization of equity in innovation (Trusova *et al.,* 2021; Zahoretska *et al*., 2020). In turn, the rate r_{hml} – is an additional return received by investors who invest in agribusiness entities with a high ratio of the book value of assets to market, expecting that this group of assets will bring more profit from innovation. Investors who prefer to purchase such assets expect to increase their value in the future, in which case they make a profit by changing their market value. The strategy of investors who prefer the assets of agribusiness entities with a low ratio of book value and market value of assets (growth assets), is designed for both profit growth and equity growth, which activates positive investment expectations in innovation (Trusova *et al.,* 2021; Zahoretska *et al.,* 2020). To calculate the components r_{smb} and r_{hml} it is necessary to divide the studied agribusiness entities into groups according to the parameters of anti-crisis stability – market capitalization of equity in innovation (ME) and the ratio of book and market value of assets (BMA). The use of the first parameter has some differences: the division of agribusiness entities into small and large can occur equally 50% / 50% (Fulmer et al., 1984) or by the proportion (!!!) of large and small agribusiness entities, respectively (Deakin, 1972). The first approach to anti-crisis stability is more acceptable, with an equal distribution of agribusiness entities according to the parameters of the market capitalization of equity in innovation. According to the second parameter, agribusiness entities are divided into groups in proportion 30% / 40% /30% (Arefieva et al., 2018) i.e., with low, medium and high values of the ratio of book value and market value of assets. In this case, to calculate the rates $r_{smb}$and r_{hml} in the study period, it is necessary to group agribusiness entities according to the market capitalization of equity in innovation and the ratio of book and market value of assets calculated for the previous period. The matrix used for the distribution of agribusiness entities according to the considered parameters of anti-crisis stability is presented in Table 1.

Table 1. Matrix for calculating the parameters $r_{smb}$and r_{hml} of anti-crisis stability of agribusiness entities.

Distribution criteria		The level of the ratio of the balance and market value of assets (BMA)		
		Low (L) –30% agribusiness entities	Medium (M) – 40% agribusiness entities	High (H) –30% agribusiness entities
Market capitalization of equity in innovation (ME)	Малі (S) – 50% agribusiness entities	SL	SM	SH
	Big (B) – 50% agribusiness entities	BL	BM	DH

Source: generated by the authors according to data (Rabinovich, 2018; Taffler, 1984; Trusova *et al*., 2021; Zahoretska *et al*., 2020)

The indicator of the market capitalization of equity in innovation is defined as the product of the number of innovatively active agribusiness entities with capitalized equity in the investment market and their market value of assets in the investment market. Cost-oriented components of equity growth from innovation activities of agribusiness entities when calculating the ratio of book and market value of assets (BMA) characterize their level of anti-crisis stability in the redistribution of equity into innovative assets of property potential (created value of innovative assets), which is reduced by the amount of liabilities (Trusova *et al.,* 2021). In the next step, the values of indicators $r_{smb}$and $r_{hml}$are calculated directly.

Additional return r_{smb} is defined as the difference between the average return on the portfolio of investments in assets of agribusiness entities with a small capitalization of equity in innovation and the average return on the portfolio of investment in assets with a large capitalization of equity in innovation (formula (5)) (Rabinovich, 2018; Taffler, 1984; Trusova *et al*., 2021; Zahoretska *et al*., 2020):

$$r_{smb} = \frac{SL+SM+SH}{3} - \frac{BL+BM+BH}{3}, \quad (5)$$

To determine the values r_{hml} there is a difference between the arithmetic mean return on the asset portfolio with a high ratio of their book and market value and the average return on the asset portfolio with a low ratio of their book and market value (formula (6)) (Rabinovich, 2018; Taffler, 1984; Trusova *et al*., 2021; Zahoretska *et al.,* 2020):

$$r_{hml} = \frac{SH+BH}{2} - \frac{SL+BL}{2}, \quad (6)$$

According to the proposed approach, a set of deterministic parameters of anti-crisis stability to diagnose the impact of investment on the capitalization of equity, which is aimed at innovation of agribusiness entities, is shown in Table 2.

To assess the anti-crisis stability of an agricultural enterprise, indicators can be used that characterize the amount of relevant costs - for research and development, acquisition of patents, technological upgrades, the volume of innovative products sold, registered patents, etc. (Liubenko and Herasymenko, 2014; Marchuk *et al*., 2017). Each of these parameters as mentioned in Table 2 is evaluated on a scale from 0 to 100 points.

Table 2. The composition of deterministic factors of anti-crisis stability to diagnose the relationship of investment with the capitalization of equity, which is directed to the innovation of the agribusiness entity.

Denoting a variable	Indicator	Economic content
Dependent variables		
ERI	Excessive return on investment	The level of deviation of real return on investment in the assets of the agribusiness entity from the estimates. Under an efficient market, this figure should be 0. Deviation from this value indicates that market participants "underestimate" or "overestimate" investment in assets of the enterprise, providing capitalization of equity in innovation
SR	Systemic risk	Characterizes the deviation of the return on investment of the agribusiness entity under influence of general market factors, calculated under the indicators of investment market in the country
IR	Idiosyncratic (non-systemic) risk	Reflects the deviation of the return on investment of the agribusiness entity under the influence of factors specific to the business entity (determined by the coefficients r_{smb} and r_{hml})
Independent variables (factor attribute)		
IA	Investment activity of an agricultural enterprise	Characterizes the level of innovation of the agribusiness entity, is determined by the ratio of innovation costs of the enterprise to the total value of assets in the property potential
Additional parameters		
IEF (Z1)	Index of economic freedom	An index that characterizes the general level of freedom of entrepreneurial activity and investor protection in the country
IC (Z2)	Innovation of the country	Defined as a component of the global competitiveness index; includes indicators of economic innovation and a safe level of agribusiness
Control variables		
ROA (Z3)	Return on assets	Indicator that is taken into account by investors when making decisions on the acquisition of innovative assets of the agribusiness entity
TVA (Z4)	The total value of the enterprise's assets	Reflects the scale of activity of the agribusiness entity; gives a general idea of its property potential
NSIP (Z5)	Net income from sales of innovative products	Characterizes the position of the agribusiness entity in the market of agricultural products and the scale of its innovation
NE (Z6)	Number of employees	An additional factor that characterizes the size of agribusiness, the scale of the agribusiness entity

To specify the proposed economic and mathematical model, it is necessary to consider several important aspects. First, since the array of input data on the profitability of assets and their inherent risks is formed

in terms of individual agribusiness entities, it is possible to group them according to the parameters of anti-crisis stability of the country in which they operate. Secondly, it is necessary to take into account the complexity and multifactorial relationship between the studied parameters of anti-crisis stability, as well as the presence of a number of additional factors influencing the capitalization of equity in innovation, but for objective reasons cannot be taken into account. To generalize the impact of these factors, it is necessary to introduce into the model additional parameters – β^0, δ^0, ω^0, which allow to quantitatively formalize the causal relationship of economic indicators based on regression analysis and demonstrate the adequacy of the constructed model, check the statistical significance of the parameters of anti-crisis stability by structural equations (formula (7)-(9)) (Cheng *et al*., 2006; Trusova *et al*., 2021; Yankovets, 2016).

$$AR_{ijkt} = \beta^0_{ijkt} + \beta^{IA}_{ikt} \times IA_{ijkt} + \sum_{p=1}^{p} \beta^Z_{ik,p} \times Z_{ijkt,p} + \varepsilon_{ijkt}, \quad (7)$$

$$SR_{ijkt} = \delta^0_{ijkt} + \delta^{IA}_{ijkt} \times IA_{ijkt} + \sum_{p=1}^{p} \delta^z_{ik,p} \times Z_{ijkt,p} + \mu_{ijkt}, \quad (8)$$

$$IR_{ijkt} = \omega^0_{ijkt} + \omega^{IA}_{ikt} \times IA_{ijkt} + \sum_{p=1}^{p} \omega^Z_{ik,p} \times Z_{ijkt,p} + \phi_{ijkt},$$
$$\varepsilon_{ijkt} \approx N(0, \sigma_\varepsilon),\ \mu_{ijkt} \approx N(0, \sigma_\mu), \phi_{ijkt} \approx N(0, \sigma_\phi),$$
$$Cov(\varepsilon_{ijkt}, \mu_{ijkt}) \neq 0,\ Cov(\varepsilon_{ijkt}, \phi_{ijkt}) \neq 0,\ Cov(\mu_{ijkt}, \phi_{ijkt}) \neq 0, \quad (9)$$

where, AR_{ijkt} – excessive return on investment in the assets of the i-th agribusiness entity of the j-th branch of the agricultural sector of the economy in the country k in year t; SR_{ijkt}– systemic risk for the i-th agribusiness entity of the j-th branch of the agricultural sector of the economy in the country k in year t; IR_{ijkt}– idiosyncratic risk for the i-th agribusiness entity of the j-th branch of the agricultural sector of the economy in the country k in year t; IA_{ijkt}– the level of innovation activity of the i-th agribusiness entity of the j-th branch of the agricultural sector of the economy in the country k in year t; $Z_{ijkt,p}$– other (additional) parameters of anti-crisis stability (p), that affect the capitalization of equity in innovation; β^0_{ijkt}, δ^0_{ijkt}, ω^0_{ijkt}– variables that reflect the differences between agribusiness entities, sectors of the agricultural sector of the economy, countries and periods studied; $\beta^Z_{ik,p}$,$\delta^z_{ik,p}$, $\omega^Z_{ik,p}$– coefficients that characterize the level of influence of anti-crisis stability parameters on the corresponding dependent variable; ε_{ijkt}, μ_{ijkt}, ϕ_{ijkt} – errors.

It should be noted that in addition to the functional relationships between variables reflected in the model (equations 7-9), there are many unaccounted-for latent factors, which may be specific to a particular agribusiness entity at the country level, starting from the basic parameters of the crisis model. Accordingly, the influence of heterogeneous factors that are not included in the basic model is described by the following equations (formulas (10)-(18)) (Cheng *et al*., 2006; Fedoruk, 2013; Trusova *et al*., 2021; Yankovets, 2016).

$$\beta^0_{ijkt} = \beta^0 + \sum_{d=1}^{D} \gamma^{cons}_d \times F_{i,d} + \sum_{J=1}^{J} \beta^0_j \times D_j + \sum_{r=1}^{R} \lambda^{cons}_r \times F_{k,r} + \sum_{v=1}^{V} \beta^{Inv}_v \times V_{kt,v} + \sum_{m=1}^{M} \beta^{year}_m \times W_t + \varsigma^0_{ijkt}, \quad (10)$$

$$\beta^{IA}_{ijkt} = \beta^{IA} + \sum_{d=1}^{D} \gamma^{IA}_d \times F_{i,d} + \sum_{r=1}^{R} \lambda^{IA}_r \times F_{k,r} + \sum_{v=1}^{V} \beta^{Mod\times IA}_v \times V_{kt,v} + \varsigma^{IA}_{ikt}, \quad (11)$$

$$\beta^Z_{ik,p} = \beta^z_p + \varsigma^Z_{ik,p}, \quad (12)$$

$$\delta^0_{ijkt} = \delta^0 + \sum_{d=1}^{D} \theta^{cons}_d \times F_{i,d} + \sum_{j=1}^{J} \delta^0_j \times D_j + \sum_{r=1}^{R} \phi^{cons}_r \times F_{k,r} + \sum_{v=1}^{V} \delta^{Inv}_v \times V_{kt,v} + \sum_{m=1}^{M} \delta^{year}_m \times W_t + \zeta^0_{ijkt} \quad (13)$$

$$\delta^Z_{ik,p} = \delta^z_p + \zeta^Z_{ik,p}, \quad (14)$$

$$\omega^0_{ijkt} = \omega^0 + \sum_{d=1}^{D} K^{cons}_d \times F_{i,d} + \sum_{j=1}^{J} \omega^0_j \times D_j + \sum_{r=1}^{R} \pi^{cons}_r \times F_{k,r} + \sum_{v=1}^{V} \omega^{Inv}_v \times V_{kt,v} + \sum_{m=1}^{M} \omega^{year}_m \times W_t + \xi^0_{ijkt}, \quad (15)$$

$$\omega^{IA}_{ijkt} = \omega^{IA} + \sum_{d=1}^{D} K^{IA}_d \times F_{i,d} + \sum_{j=1}^{J} \pi^{IA}_j \times D_j + \sum_{r=1}^{R} \pi^{IA}_r \times F_{k,r} + \sum_{v=1}^{V} \omega^{Mod\times IA}_v \times V_{kt,v} + \xi^{IA}_{ikt} \quad (16)$$

$$\omega^{IA}_{ik,p} = \omega^z_p + \xi^Z_{ik,p}, \quad (17)$$

$$V_{kt,v} = \varpi_{ov} + \tau_{kt,v}, \quad (18)$$

where, β^0, δ^0, ω^0 the average values of excess return on investment in assets, systemic risk and idiosyncratic risk, respectively; ϖ_{0v}– average value for v index of economic development and innovation of the country);

β^{IA}, δ^{IA}, ω^{IA}– basic parameters of the impact of innovation on the excess return on investment in assets, systemic risk and idiosyncratic risk, respectively; β_p^Z, δ_p^Z, ω_p^Z– three interdependent variables of specific parameters that affect the p-th agribusiness entity; $F_{i,d}$– d-th vector of influence of specific (latent) factors of influence on the subject of agribusiness i, which are not taken into account in the model; D_j– vector of dummy variables for each branch of the agricultural sector of the economy; γ– vector of multifactorial influence at the level of the agribusiness subject; $F_{k,r}$– r-th vector of influence of factors specific to the country k and not taken into account in the model; λ– vector of multifactorial influence at the national level; $V_{kt,v}$– vector of conditions influencing the diagnosis of innovation costs (v = 1 – for the index of economic development, v = 2 – for the country's innovation); $\beta_v^{Mod\times IA}$, $\delta_v^{Mod\times IA}$, $\omega_v^{Mod\times IA}$– coefficients characterizing the influence of additional parameters of diagnostics of innovation costs (v); W_t– vector of influence of dummy-variables, specific for a certain period; ς, ζ, ξ– random errors.

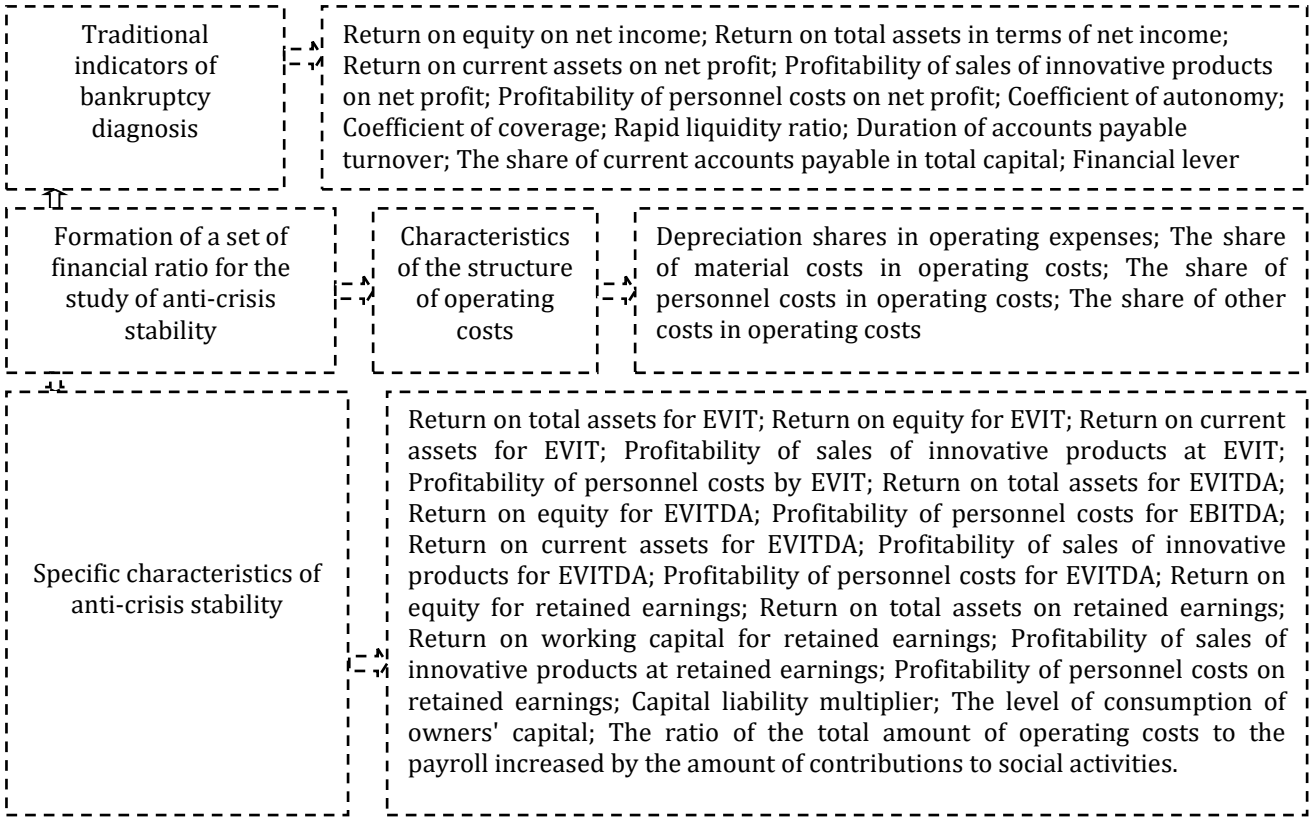

Figure 1. Diagnostic financial coefficients of anti-crisis stability of agribusiness entities.

The use of the proposed methodological approach to the diagnosis of anti-crisis stability allows us to analyze the competitive position of agribusiness in the market through indicators of excess return on investment in assets, systemic and idiosyncratic risks, the formation of which is considered in conjunction with innovation. This takes into account the attitude of investors to innovation in a particular country, which depends on factors at the national level (i.e., indices of economic development and innovation of the country). At the same time, the coordinates of indicators in the plane of general relationships between the variables of equity components, costs, financial results, confirms the need for a new technology of comprehensive study of anti-crisis stability through financial ratios for their interdependence. The set of financial ratios provides: first, the use in the model of the diagnosis of the probability of bankruptcy (Altman, 1968; Altman and Sabato, 2013; Beaver, 1966; Fulmer *et al*., 1984; Shapiro, 2015; Shapurova, 2009; Yankovets, 2016; Yarish, 2013) and indicators of liquidity, financial stability, profitability, as well as business activity; second,

analysis of the characteristics of the structure of operating costs; third, evaluation of specific characteristics of anti-crisis stability according to the modified value of profitability indicators, which are proposed to be calculated by dividing the profit before deducting financial costs, taxes (EVIT) and depreciation (EVITDA)). Moreover, the change in the state of financial capacity of agribusiness entities in the medium term is proposed to be calculated through the modification of net profit to retained earnings or uncovered loss. The basis for calculating profitability are total assets, current assets, equity, operating income from sales, as well as staff costs (i.e., payroll, including contributions to social activities), (Figure 1).

We note that according to the proposed hypothesis, the distribution of agribusiness entities into subgroups according to the financial ratios of anti-crisis stability will differ significantly due to their average group values, which will identify the state of financial capacity of the general population.

RESULTS AND DISCUSSION

From the standpoint of the cost-oriented concept of diagnosing the anti-crisis stability of agribusiness entities, the capitalization of equity in innovation of an individual agribusiness entity allows to create their social value in the formation of retained earnings for external effects of corporate interaction in innovation. For each of the identified groups of agribusiness entities, appropriate indicators of the growth of the value of assets in the property potential are used to ensure the crisis-free financial capacity of the latter. The leaders of innovation activity in the agricultural sector of the economy are the United States (21.6 from the global level of innovation in agribusiness), Germany and Japan (17.3%). France, South Korea, China, Great Britain, Italy, Switzerland and the Netherlands are also included in the TOP-10 in terms of the level of innovation in the development of the agricultural sector of the economy. At the same time, EU countries account for more than 40% of patents for innovation in agriculture. However, Ukraine lags behind such countries as Poland, Slovenia, Romania, Slovakia (Index of economic freedom: promoting economic opportunity and prosperity by country. 2021). A comprehensive assessment of the volume of innovation costs, the basic parameters of which are provided by the value of the invested share of retained earnings from the equity of agribusiness entities of Ukraine, for the introduction and implementation of innovations in the technological cycle of production for 2013-2020 is presented in Figure 2. Thus, the total amount of innovation costs directed from the equity of agribusiness entities to the introduction and implementation of innovations does not have a clear trend. Despite the resumption of the level of financing of innovations from the equity in 2016, which was accompanied by a sharp increase in total innovation expenditures (78.2%) and the achievement of the maximum absolute figure for 2015-2020 (more 442.9 million EUR), it is necessary to note the negative steady tendency to reduce the innovative activity of agribusiness entities in 2017-2019.

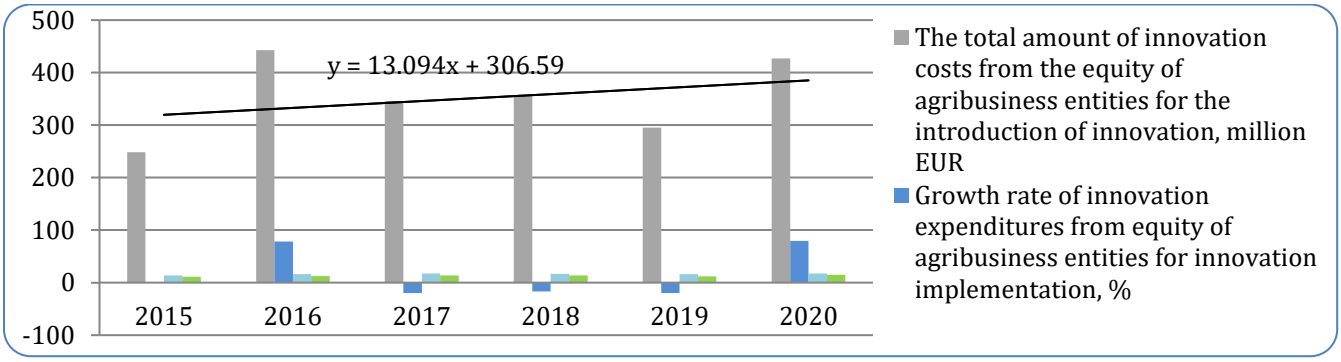

Figure 2. Indicators of innovation activity of agribusiness entities of Ukraine for the period 2015-2020

Source: built by the authors according to data Index of economic freedom: promoting economic opportunity and prosperity by country, 2021.

Thus, in 2017 their innovative activity decreased by almost 20% compared to 2016, in 2018 by 17%, in 2019 – again on 19%. In 2020, there is a resumption of growth rates of innovation costs from the equity of enterprises

to 79.5%, but in part, the figure is associated with a change in approaches to statistical monitoring of innovation of agribusiness entities. Therefore, compared to 2019, it does not objectively reflect the real state of the technological level of innovation in agriculture in Ukraine [(Index of economic freedom: promoting economic opportunity and prosperity by country, 2021; Innovation statistics, 2020). During 2013-2020, the share of agribusiness entities implementing innovations in their total number fluctuated within 11-18%. At the same time, the level of innovation activity of agribusiness entities in Ukraine is significantly lower than in the EU (Figure 3).

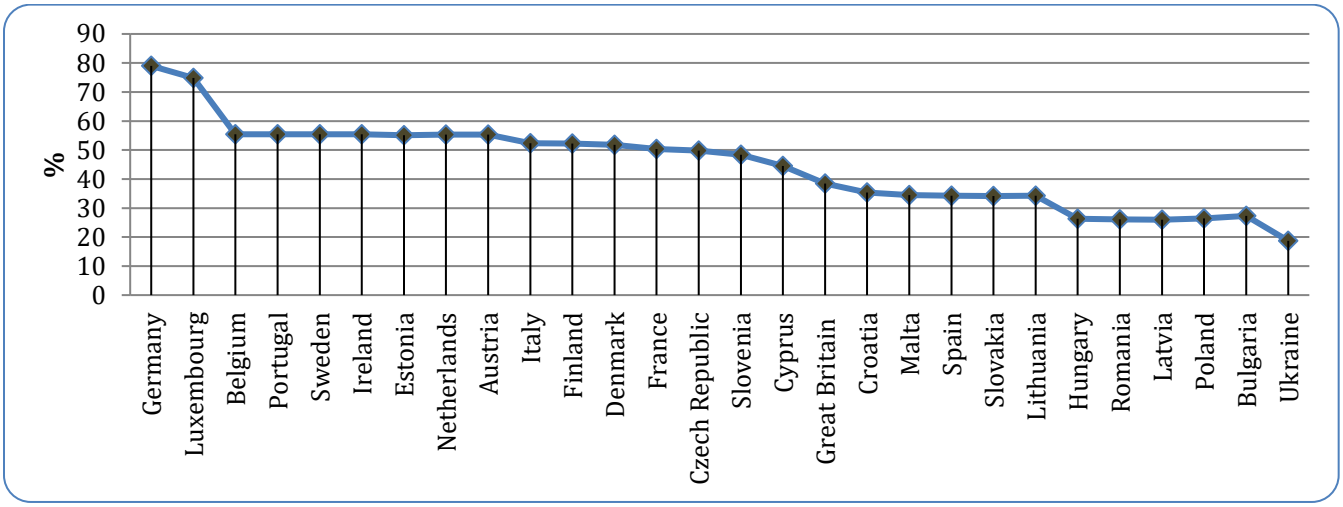

Figure 3. The share of agribusiness entities in the EU and Ukraine, which introduced innovations in the technological cycle of production for 2015-2020, %

Source: built by the authors according to data Index of economic freedom: promoting economic opportunity and prosperity by country, 2021; Innovation statistics, 2020.

Thus, among the EU countries, Bulgaria and Poland have the smallest share of agribusiness entities implementing innovations – the average for 2015-2020 is about 26-27%, which is 1.5-2 times more than in Ukraine. On average, in the EU countries, the share of agribusiness entities that implement innovations is higher than 50%. The leaders in the number of innovation-active subjects in the agrarian business are Germany (about 80% subjects) and Luxembourg (68%). At the same time, the level of innovation activity of agribusiness entities in Ukraine (during 2015-2020 the share of enterprises that introduced innovations in the technological cycle of production averaged 10-13%) [15; Innovation statistics, 2020).

In different countries of the world, the volume of total costs on the basic parameters of the invested share of retained earnings from equity for research and development of innovations in agricultural business differ. Thus, the leaders in terms of funding for innovation are Germany (80.2 billion EUR in 2018), France (47.2 billion EUR), Great Britain (32.8 billion EUR), Italy (20.2 billion EUR) and others. In 2014-2018, most countries around the world demonstrated the dynamics of increasing funding for innovation in agriculture. The highest growth rates for the analyzed period are demonstrated by China (+108.6%), Malta (+102.6%), Slovakia (101.6%); average growth rates at the level 40-60% are provided by Poland (64.0%), Estonia (65.2%), Latvia (64.7%), Lithuania (48.8%), Czech Republic (55.7%), Bulgaria (44.5%), Slovenia (42.3%), which is explained by the active transition of these countries to an innovative model of the development of the agricultural sector of the economy. The reduction of expenditures on research and development of innovations in agriculture during 2014-2018 took place in Spain, Portugal, Croatia, Greece, Serbia, Finland, Luxembourg [15; Innovation statistics, 2020). The share of expenditures for the introduction of innovations in the agricultural sector of the economy of Ukraine's GDP is 5-7 times lower than in Eastern Europe (in particular, in Poland, Slovakia, Bulgaria, Romania) and 20 times lower than the EU in average (Figure 4).

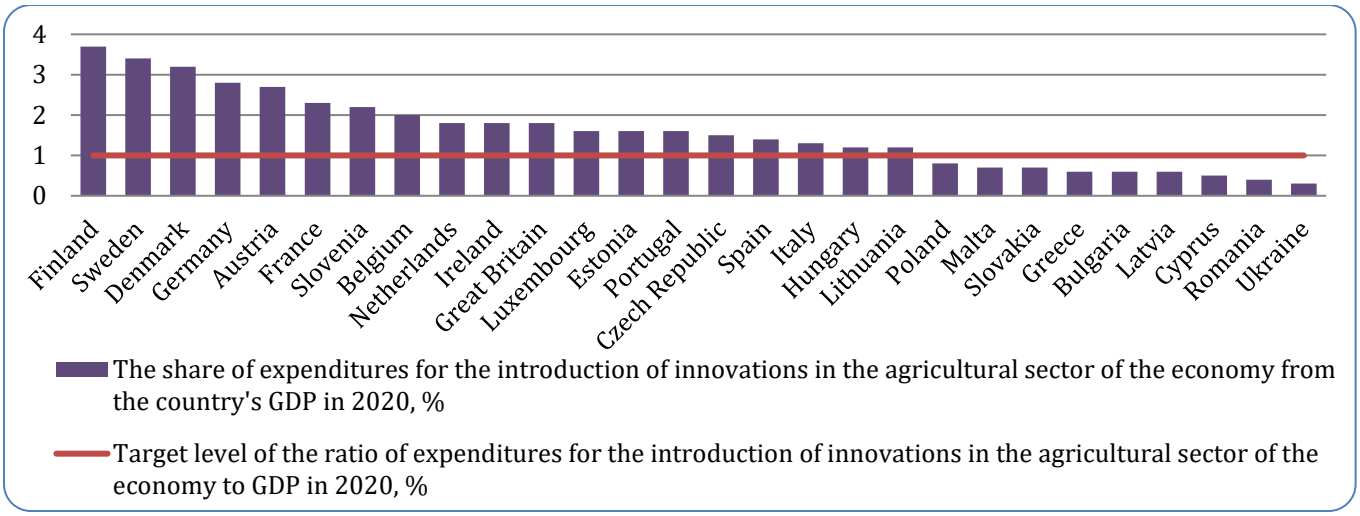

Figure 4. Share of costs for the introduction of innovations in agrarian business from GDP of Ukraine and EU countries, %

Source: built by the authors according to data Index of economic freedom: promoting economic opportunity and prosperity by country, 2021; Innovation statistics, 2020.

The EU has set a target for the share of spending on innovation in the agricultural sector of the economy to GDP at least 3%. This standard is met by only three Scandinavian countries – Finland (3.8%), Sweden (3.4%) and Denmark (3.2%). In addition, the leaders in the innovative development of agricultural production are Germany (2.8%), Austria (2.7%), France (2.3%) and Slovenia (2.2%) and Belgium (2.0%). Other countries have significantly lower rates of targeted use of equity for innovation and are close to 0.5-0.7%. This is 2-3 times lower than the European average. In particular, in Poland this indicator was 0.8 %, in Slovakia – 0.7%, in Greece, Bulgaria and Latvia – 0.6 %, in Romania – 0.4% (Index of economic freedom: promoting economic opportunity and prosperity by country; 2021; Innovation statistics, 2020).

During 2015-2020, the share of innovative products in the total sales of agricultural products in Ukraine was constantly declining. In 2016, this indicator was at the level 3-4%, in 2019 it decreased to 2.5% and in 2020 reached a minimum value – 1.4% (Innovation statistics, 2020). The unsatisfactory trend in the production and sale of innovative products in the agricultural sector of Ukraine is due to the country's belonging to the third and fourth technological system with the syndrome of "middle country". That is, the state, on the one hand, does not have sufficient own sources of financing and support of high-tech level of agricultural branches, and on the other – insignificant demand for innovative products does not allow industries to receive a high return on investment in assets of agribusiness and increase sufficient capitalization of equity. This affects the profitability of economic activity in general. In addition, insufficient legislative support for innovative activities of enterprises provokes the use of outdated technology and low production culture (Trusova *et al.,* 2020). Insufficient level of innovation in the agricultural sector of Ukraine negatively affects the anti-crisis stability of enterprises, because the focus on innovative development is the key to economic growth and the ability of entities to create benefit, which forms an additional source of capitalization and its use in the future. To confirm this thesis, we construct logarithmic regression models of the dependence of retained earnings and value-added on the dynamics of sales of innovative products by agribusiness entities of Ukraine for the period 2010-2020 (Figure 5). Thus, the increase in sales of innovative products contributes to the growth of value-added at a much higher rate, i.e., the growth of the factor – the sale of agricultural innovative products by 1-EUR leads to an increase in value-added by almost 4.02 EUR. In addition, this trend provides an increase in retained earnings by 2.14 EUR. To take into account the impact of the position of entities in the investment market and their ability to restore equity to stabilize anti-crisis stability, we adjust the book value of their

assets in property potential to the value of innovative objects (on off-balance-sheet accounts), taking into account the estimated value of business reputation (Figure 6).

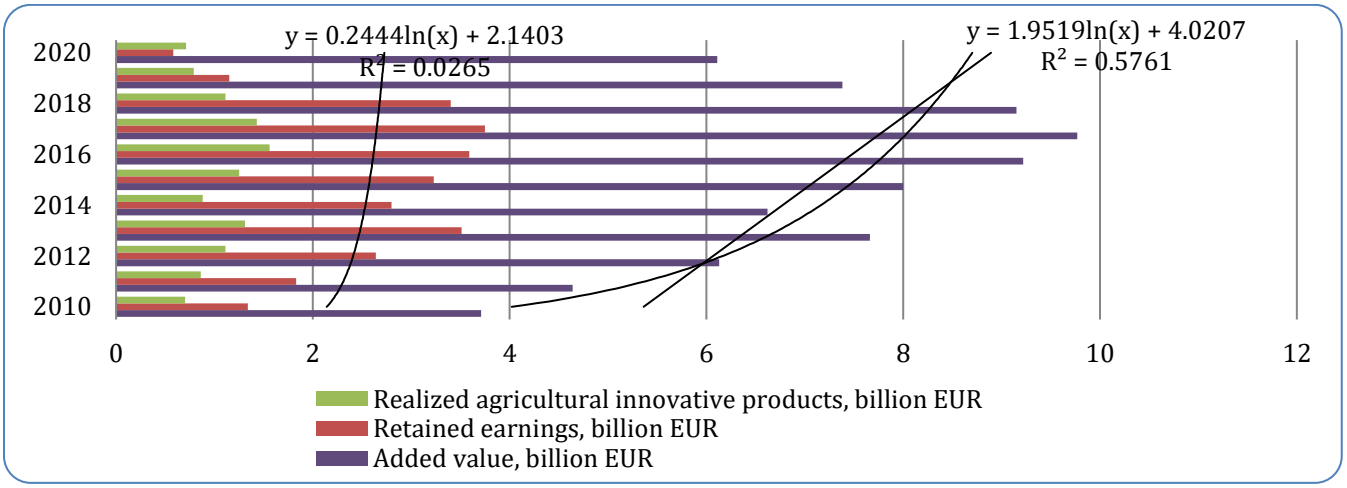

Figure 5. The value-added from the sale of innovative products and its impact on retained earnings of agribusiness entities of Ukraine for 2010-2020, billion EUR

Source: built by the authors according to data (Innovation statistics, 2020).

The initial hypothesis in determining the relationship between the studied indicators is the presence of a time gap between the introduction of innovations and an increase in the amount of retained earnings. This is due to the duration of the technological cycle of the production process in agriculture. Therefore, the preliminary stage in developing an econometric model of dependence of equity capitalization of agribusiness entities of Ukraine on the introduction of innovations is to determine based on autoregressive and correlation-regression analysis of the lag between the stage of innovation costs, production of innovative products and the stage of increasing retained earnings (Ivashkovskaya and Yangel, 2007). The calculations of the statistical significance of autoregressive equations at different values of the lag are summarized in Table 3. Based on the comparison of the values of the coefficient of determination for the linear function and polynomial functions of the second and third degrees, a formalized relationship between equity y and the volume of sold innovative products x1. is built. It is determined that the relationship between these performance and factor traits is described by both pairwise linear regression equations and second and third-degree polynomials.

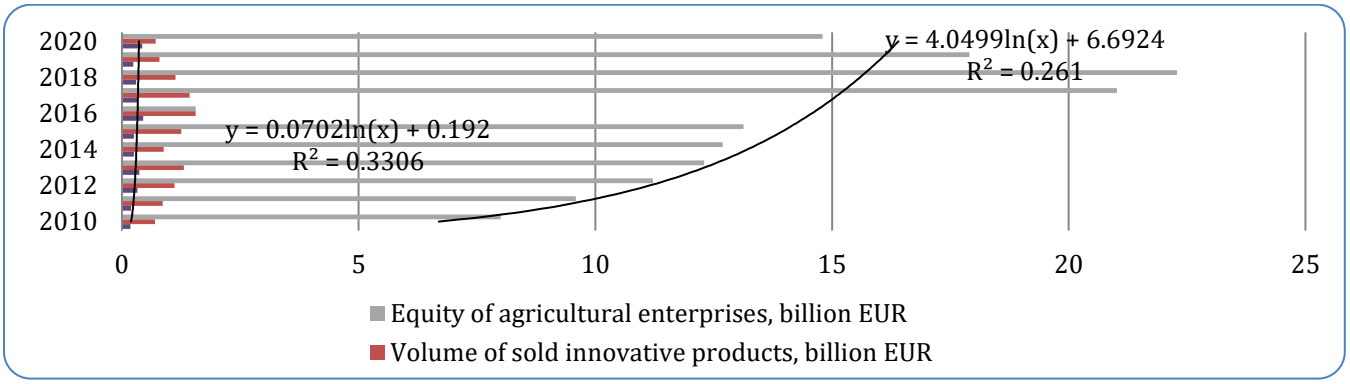

Figure 6. Dependence of equity on the volume of sales of innovative products and the total amount of financing of innovations in the technological cycle of agricultural production of Ukraine for 2010-2020, billion EUR

Source: built by the authors according to data Index of economic freedom: promoting economic opportunity and prosperity by country, 2021; Innovation statistics, 2020.

Table 3. Statistical significance of autoregressive equations.

Lag (year)	R2 (> 0.8)	Student's t-statistics (> 2.45)	Fisher's F-test (> 4.14)
y – equity, x1– the volume of sold innovative products			
Lag = 0	0.4566	1.95	3.98
Lag = 1	0.8707	4.99	25.96
Lag = 2	0.8400	3.60	13.40
Lag = 3	0.7384	1.87	8.01
Lag = 4	0.8360	4.21	15.44
y – equity, x2 – the amount of funding for innovation			
Lag = 0	0.4354	1.17	2.42
Lag = 1	0.7403	4.51	9.86
Lag = 2	0.7137	2.06	7.18
Lag = 3	0.6130	1.77	4.64
Lag = 4	0.8563	5.82	21.40

However, the highest closeness of the relationship between equity and the volume of sold innovative products of agribusiness entities of Ukraine is achieved by using the polynomial function of the third degree (coefficient of determination at the level 0.7135). That is, the variation of the factor trait by 71.35% explains the change of the resultant trait. Thus, the equation of dependence of equity y on the volume of sold innovative products x1 has the form:

$$Y = 5E^{-09} \times x_{1r-4}^{3} - 0.0006 \times x_{1r-4}^{2} + 30.255 \times x_{1t-4} + 790.76, \quad (19)$$

Similarly, the function of the relationship between equity y and total funding for innovation x2. is determined. A polynomial function of the third degree with a coefficient of determination at the level 0.7831 indicates that in 78.31% of cases the variation of the resultant feature is caused by the variation of the factor feature.

$$Y = 6E^{-07} \times x_{2r-4}^{3} - 0.0095 \times x_{2r-4}^{2} + 6.8157 \times x_{2t-4} + 6978.86, \quad (20)$$

Thus, the mathematical formalization of the dependence of equity (capitalization value of agribusiness entities) on the variety of indicators such as the volume of innovation costs and sales of innovative products proves the strong closeness of the relationship between the two groups of indicators, which occur with a lag in 4 years. This is due to the technological specifics of innovation activities of agribusiness entities.

For any agribusiness entity, the relationship between risk and innovation is ambiguous. On the one hand, innovation is inherently risky, due to the high degree of uncertainty about the sale of innovative products in the agricultural market, on the other hand, it allows achieving anti-crisis stability and the desired economic growth of enterprises. At the same time, the long-term sale of innovative products highlights the risks of negative changes in the macroeconomic conditions of the entities. Diagnosing anti-crisis stability through changes in the state of financial capacity (i.e., modification of net profit to retained earnings or uncovered loss) and profitability of agribusiness entities allows identifying of additional potential sources of the "zone of the uncertainty of innovation" related to the peculiarities of cash flow and investment gradual return on innovation. In case of incorrect forecasting of cash receipts from innovations in the direction of overestimation of their expected level, enterprises may be financially unstable and insolvent, with a limited amount of liquid assets. On the other hand, innovations can have a positive impact on the sustainability of enterprises, as they are a tool to reduce the risk of non-compliance with new consumer demands, new technological norms and standards.

The null hypothesis (H_0) was formulated that on average the values of financial ratios of agribusiness entities of Ukraine that are not able to continue in the medium term do not differ from the values of financial ratios of those enterprises that are financially viable and competitive in the market in the next 1-4 years. The

hypothesis was tested both for the full four-year horizon and with the clarification of the discrepancy of financial ratios in the interval of 1.2 and 3 years. To test the hypothesis of discrepancies in the average values of financial ratios, the student's t-criterion was calculated and compared with the index of statistical tables on the level of confidence probability p, which is equal to p = 0.05. If the calculated t-criterion exceeds the tabular – the differences in financial ratios are statistically significant (i.e., such ratios differ not only for selected enterprises but also for any of the general population). According to the theory of statistics, the t-criterion for two independent samples is calculated by the formula (Otenko and Preobrazhenska, 2014):

$$r^* = \frac{(\overline{x}_1 - \overline{x}_2)}{\sqrt{\left(\frac{1}{n_1}+\frac{1}{n_2}\right)\times\frac{(n_1-1)\times S^2_{x_1}+(n_2-1)\times S^2_{x_2}}{n_1+n_2-2}}}, \quad (21)$$

Where;

$\overline{x}_1$, $\overline{x}_2$, $S^2_{x_1}$, $S^2_{x_2}$, n_1, n_2 – respectively, the average values, variances and sizes of each of the two samples.

When determining the tabular value of the t-criterion (t*), in addition to the confidence probability, the number of degrees of freedom is determined, which for two small samples is $k = n_1 + n_2 - 2$ (Otenko and Preobrazhenska, 2014).

The hypothesis of discrepancies in the financial ratios of agribusiness entities of Ukraine, i.e., their ability to further economic growth, was tested using the function (t-criterion for independent samples with a grouping variable), (Otenko and Preobrazhenska, 2014). The affiliation of financially capable agribusiness entities to the crisis and crisis-free subgroup, as well as the number of years before the crisis has been determined (Table 4).

Table 4. Results of calculation of Student's t-criteria for crisis and crisis-free subgroups of agribusiness entities of Ukraine in the "zone of the uncertainty of innovation" for four years.

Financial ratio	Average values by subgroups		The results of calculations on the test H0, the number of degrees of freedom k=102(=48+56-2)		Standard deviations by subgroups		Disagreements of group averages		
	Crisis-free (48 c observations)	Crisis (56 observations)	t-criterion for samples	The significance of the t-criterion, p	Crisis-free (48 c observations)	Crisis (56 observations)	The difference between the mean values	The left limit of the reliable difference interval (1– p = 0.95)	The right limit of the reliable difference interval (1 – p = 0.95)
Return on total assets for EVITDA	0.03	-0.52	1.25	0.21	0.12	0.45	0.08	-0.05	0.22
Profitability of personnel costs for EVITDA	0.25	2.36	-1.44	0.15	1.63	9.99	-2.10	-5.00	0.78
The level of capital consumption of owners	0.87	4.19	-4.15	0.00 1	1.76	5.29	-3.32	-4.90	1.73
Loading daily income by staff costs	67.80	94.96	-1.85	0.06	51.52	89.40	27.15	-56.18	1.86
Return on total assets in terms of net income	-0.02	-0.15	1.76	0.07	0.19	0.45	0.12	-0.01	0.26
Return on total assets for EVIT	0.015	-0.09	1.51	0.13	0.11	0.47	0.10	-0.03	0.24
Return on total assets for EVITDA	0.03	-0.05	1.25	0.21	0.12	0.45	0.08	-0.05	0.22
Return on total assets on retained earnings	-0.11	-0.49	1.75	0.08	0.54	1.42	0.38	-0.04	0.81

Return on current assets in terms of net profit	-0.03	-1.37	2.55	0.01	0.32	3.61	1.33	0.30	2.37
Return on current assets for EVIT	0.06	-1.03	2.84	0.01	0.23	2.66	1.09	0.33	1.86
Return on current assets for EVIDTA	0.10	-0.69	2.30	0.02	0.25	2.38	0.79	0.11	1.48
Return on current assets on retained earnings	-0.22	-7.88	3.33	0.01	0.82	15.89	7.66	3.10	12.22
Profitability of sales of innovative products at net profit	-0.05	-0.30	3.24	0.01	0.23	0.48	0.25	0.09	0.40
Profitability of sales of innovative products for EVIT	0.01	-0.172	2.75	0.01	0.17	0.42	0.17	0.05	0.30
Profitability of sales of innovative products for EVITDA	0.03	-0.04	1.21	0.22	0.18	0.40	0.07	-0.04	0.20
Profitability of sales of innovative products at retained earnings	-0.67	-2.17	2.56	0.01	2.06	3.57	1.49	0.33	2.65
Profitability of personnel costs on net profit	-0.64	-2.78	1.068	0.28	2.95	13.59	2.13	-1.83	6.11
Profitability of personnel costs for EVIT	0.07	1.64	-1.19	0.23	1.57	9.03	-1.57	-4.20	1.04
Profitability of personnel costs for EVITDA	0.25	2.36	-1.44	0.15	1.63	9.99	-2.10	-5.00	0.78
Profitability of personnel costs on retained earnings	-3.36	-11.37	1.50	0.13	12.62	35.06	8.01	-2.57	18.60
Coefficient of autonomy	0.14	0.23	-0.74	0.45	0.59	0.67	-0.09	-0.34	0.15
Coverage ratio	2.19	6.83	-1.06	0.28	2.98	29.92	-4.63	-13.24	3.97
Rapid liquidity ratio	0.98	1.31	-0.78	0.43	1.36	2.62	-0.33	-1.16	0.50
The share of material costs in operating costs	0.52	3.61	-0.98	0.32	0.61	21.71	-3.08	-9.31	3.13
The share of personnel costs in operating costs	0.23	0.26	-1.22	0.22	0.14	0.15	-0.03	-0.09	0.02
Depreciation shares in operating expenses	0.03	0.13	-4.07	0.00	0.05	0.15	-0.09	-0.14	-0.05
Share of other expenses in operating expenses	0.54	0.39	2.51	0.01	0.27	0.30	0.14	0.03	0.25
Financial lever	35.69	100.9	-0.61	0.54	85.18	734.34	-65.28	276.87	146.31

Thus, the calculations confirmed the validity of the null hypothesis for most of the analyzed financial ratios (the values of Student's t-criterion turned out to be less than critical: only 10 of 38 financial ratios have statistically significant differences in the sample). Exceptions are only indicators of return on current assets and sales, as well as some characteristics of the cost structure. At the same time, the profitability of current assets under EVIT for the crisis-free subgroup of agribusiness entities is 0.06 for the crisis subgroup – (-1.03); return on current assets indicator for EVITDA for crisis-free subgroup – 0.10, for crisis subgroup – (-0.69); profitability of operating sales for EVIT for crisis-free subgroup – 0.01 and crisis subgroup – 0.17. The minimum statistically significant difference between the average values of indicators is in the range from 5.0% to 30.8% and corresponds to the profitability of operating sales for EVIT. In case the company falls into the loss zone in the next period, the profitability of sales of innovative products should increase by about 18%, but not less than 5%. At the same time, according to Table 5, the target parameters of anti-crisis stability of agribusiness

entities (crisis subgroup) due to the value of the profitability of sales of innovative products for EVIT in the 1-, 2-, and 3-year period have a loss in 34.1%. Exit of enterprises from the" zone of the uncertainty of innovation activity" will be if in the next period the increase of this indicator is not less than 31.8%. Using the method of "classification trees", which allows determining the patterns of change of characteristics in large samples, an in-depth study of the manifestations of weakening the anti-crisis stability of agribusiness entities (Fedoruk, 2013). The basis for constructing a classification tree is the probability of misclassification of financial ratios – "error price", which takes into account the proportions of the sample distribution into crisis and crisis-free subgroups of "zones of the uncertainty of innovation" of agricultural businesses. That is, the a priori probability of variables (indicators), based on which the classification of predictor variables (indicators) is established, is formed from financial coefficients, which are statistically significantly different in crisis and crisis-free subgroups. Predictors have been installed 9 which allow obtaining a tree of classification of financial ratios while ensuring the minimum error rate. The classification tree contains eight branching conditions and nine terminal vertices-leaves, in which branching stops (i.e., branching of the number of errors in the classification of financial ratios is allowed in each vertex no more than 5% of the sample), (Figure 7). During the check of the classification tree, the price of the error is determined, which is 0.25; its standard deviation is 0.04. That is, in the worst case, the tree of classification of financial coefficients of anti-crisis stability in the "zone of the uncertainty of innovation" of agribusiness entities of Ukraine can lead to misdiagnosis of cost-oriented components of equity growth to finance innovation–the probability is 0.29 or 29 cases out of 100.

Table 5. Results of calculation of Student's t-criteria for crisis and a crisis-free subgroup of agribusiness entities of Ukraine in the "zone of the uncertainty of innovation" for 1-, 2-, and 3-year period.

Financial ratio	Average values by subgroups		The results of calculations on the test H_0, the number of degrees of freedom k=102 (=48+56-2)		Standard deviations by subgroups		Disagreements of group averages		
	Crisis-free (48c observations)	Crisis (56 observations)	t-criterion for samples	The significance of the t-criterion, p	Crisis-free (48 c observations)	Crisis (56 observations)	The difference between the mean values	The left limit of the reliable difference interval (1– p = 0.95)	The right limit of the reliable difference interval (1 – p = 0.95)
Three-year prospect of no crisis									
The share of depreciation in operating expenses	0.04	0.12	-2.51	0.01	0.04	0.10	-0.08	-0.15	-0.01
The two-year prospect of no crisis									
The share of depreciation in operating expenses	0.03	0.15	-2.17	0.03	0.05	0.19	-0.12	-0.24	-0.01
The level of capital consumption of owners	0.98	4.68	-2.14	0.04	2.29	5.55	-3.69	-7.24	-0.14
The one-year prospect of no crisis									
The level of capital consumption of owners	0.31	6.66	-3.15	0.01	0.50	6.56	-6.02	-9.95	-2.08
Profitability of	-0.02	-0.34	2.15	0.04	0.15	0.48	0.31	0.01	0.62

operational sales of innovative products for EVIT	

Table 6. Significance of predictors for the diagnosis of anti-crisis stability and identification of the crisis "zone of uncertainty of innovation" and the state of financial capacity of agribusiness entities of Ukraine

Indicator	Significance, score in points on a 100 point scale
1. The share of depreciation in operating expenses	65
2. Return on current assets on net income	78
3. Return on current assets for EVITDA	70
4. Profitability of operating sales of innovative products at retained earnings	100
5. Coefficient of autonomy	63

Given the high accuracy of calculations, we consider it appropriate to recommend rating assessments of the importance of categorical predictors to identify the crisis "zone of the uncertainty of innovation" and the state of financial capacity of agribusiness entities (Table 6). In case of contradictory results of checking the probabilistic crisis zone of innovation and financial capacity of enterprises, preference should be given to those criteria in which the highest importance, i.e., profitability of sales of innovative products at retained earnings – 100 points out of 100. Thus, diagnosing the anti-crisis stability of agribusiness entities by cost-oriented components of equity growth allows establishing in time the period of crisis" zone of the uncertainty of innovation", after which any attempts to restore financial capacity, restructuring liabilities or assets are impractical. It provides simple procedures, namely: -systematization of the coefficients of the state of financial capacity of the enterprise and the calculation of the share of depreciation in the total operating costs of innovation, as well as the profitability of sales of innovative products at retained earnings for the last 2-4 years;-comparison of the obtained ratios with reasonable threshold values – respectively 6.44% and– 20.4% as well as establishing the presence of retained earnings or uncovered loss; if the actual indicators do not meet the conditions of anti-crisis stability, more than in 2 periods, it is concluded that the inefficient use of cost-oriented components of equity growth and its capitalization to finance innovation, which provokes a crisis of financial capacity of agribusiness, and therefore an insufficient level of their economic growth. To timely identify areas of aggravation of the crisis of financial capacity and attempts to resume innovation, agribusiness entities need to check (at least 2 times a year) the level of loss of sales of innovative products at retained earnings less than 20.4% as the share of depreciation in the operating costs of innovation, which should not be lower than 6.44%.

CONCLUSIONS

Thus, the anti-crisis stability of agribusiness entities with a long technological cycle of production has an unstable trend, as the time interval between their incoming cash flows is much longer than between the outgoing ones. This problem is especially acute when the return on assets of agribusiness entities largely depends on the state of investment demand for innovation in the agricultural sector of the economy. We believe that the structure of cost-oriented components of equity growth to finance innovation should be based on the mechanism of levelling the time distribution of threats and risks. In our opinion, this mechanism should help increase the economic growth and security of agribusiness in the long and medium-term. That is, the implementation of the mechanism through the controlling target parameters of anti-crisis stability should be aimed at timely determination of the time horizon of the crisis of the financial capacity of agricultural entities, and above all, in the long run. Given the high probability of adverse changes in the macroeconomic environment, the financial stability and profitability of agricultural market players may be levelled due to the low level of their rehabilitation capacity. In the medium term, as in the long term, an important mission for the economic growth of enterprises should play a reengineering of business processes, the development of which requires carefully justified target financial ratios. In conditions of economic instability, high volatility of the cost structure, considerable information flows, there is a need to

digitize the innovative activities of agribusiness entities and create on this basis a system of crisis protection of enterprises in the investment market until a threat to assets becomes acute. To ensure the realization of this goal, it is necessary to diagnose the degree of intensity of each threat and the degree of ability of agricultural businesses to counter them.

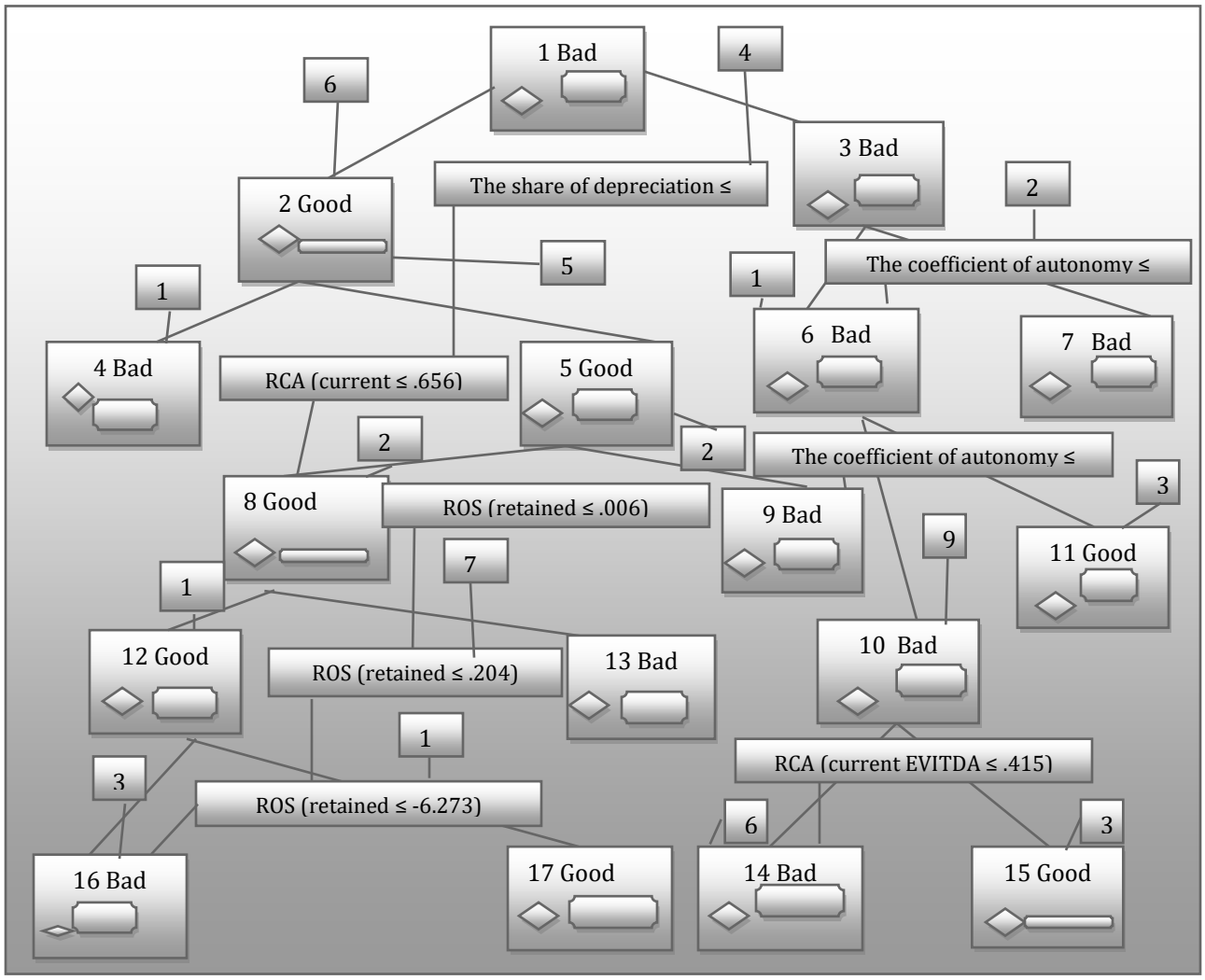

Figure 7. Tree of classification of financial coefficients for observations of agribusiness entities of Ukraine on the level of anti-crisis stability

Note. RCA (current) – return on current assets in net profit; ROS (retained) g – profitability of operating sales on retained earnings; RCA (current EVITDA) g – return on current assets for EVITDA

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