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## Determinants of the development venture financing of the subjects of agrarian market of Ukraine

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OLEKSANDR S. PRYSTEMSKYI<sup>3</sup>, OKSANA V. HRYVKIVSKA<sup>4</sup>  
and NADIYA O. ADVOKATOVA<sup>5</sup>

The article substantiates the determinants of the development of the Ukrainian venture industry in agriculture, taking into account the comprehensive methodological approach to ensuring the profitability of financial assets of agricultural market subjects in the distribution of investment resources of venture funds. The axiom of value and the universal method of discrete venture financing in agriculture are singled out. The basis of the favorable institutional infrastructure of venture funds and the existing mechanisms of state regulation of financial support of high-tech projects of agricultural market subjects at the macro level is determined. In the course of the research, synchronization of flexible methods for the gradual financing of investment projects, graphical and comparative methods of analysis of the dynamics of the innovation process of venture financing in Ukraine and countries of the world was used. The comparison method was used to select the optimal strategy, and the method of analysis and synthesis – to construct a scheme of a dual process of entering financial flows from venture investments. The binomial model of estimating the value of the basic financial assets of venture funds at a risk-free rate was constructed by transforming the “tree” of the financial flows of the latter into the “tree” value of sources of venture financing of high-tech investment projects of agrarian enterprises. It is proven that the attraction of long-term (due to Eurobonds) and non-maturity (at the expense of placement of shares) of venture financing in the amount of 1 EUR, in the foreign equity market of venture capital allows ensuring an increase in agricultural GDP in Ukraine by an average of 6.8 EUR. Under the ideal conditions of the financial environment and achieving the risk-free margin of the financial flow margin for all the same types of entities in the agrarian market and, in particular, agro holdings that form the volume of gross agricultural output, the same access to investment resources and equal rates of yield of financial assets in the investment portfolios of foreign venture funds.

**Keywords:** venture funds, venture capital, investment resources, innovations, agriculture, agrarian enterprises, Ukraine

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## INTRODUCTION

In the conditions of orientation towards the European experience of economic development and the search for new sources of financing, Ukraine's agriculture is experiencing difficult times, as in the state's economy there are imbalances in the distribution of financial resources for the modernization of production and innovation activities. The main reasons for this are: a budget deficit, a decline in national income, a violation of payment and trade balances, a significant excess of imports over exports. This in aggregate testifies to the insufficient financial capacity of the country to solve complex issues and to implement national and regional programs for the development of sub-sectors of agriculture, which require high financial and material investments.

The need for discussion of new approaches and requirements for the national policy of venture financing is due to the fact that at present Ukraine is in such a historical development point in which the internal processes of financing sub-branches of agriculture are combined with the sharp acceleration of global transformation processes of the stock market. Since the development of venture financing is closely linked to the stock market, which provides the agrarian market with financial innovations and innovative acceleration, the state should as soon as possible determine the directions of implementation of innovative ideas in the field of alternative sources of financial provision of agriculture. This will help to resolve the problem of inefficient use of financial resources in the high-tech sector, introducing risky investment projects for agricultural market subjects, creating new production technologies and expanding promising activities in innovation activities (Takhumova et al. 2016).

Research on the cyclicity of the development of the venture industry in the world and the reasons for its low level of application in Ukraine are found in many scientific works, among which one should distinguish N. Didyk (2017) and Yu. Yereshko (2015), M. Konina and K. Tuzova (2016). Along with this, the optimal ways of diversifying portfolio investments due to the fluctuation in the risk of financial assets in the field of venture financing are considered in scientific papers of R. Pradhan, M. Arvin, N. Mahendhiran and S. Bennett (2017). Macro-level influence of venture capital on the state of economic growth of the real sector of the economy is studied M. Cannice, J. Allen, M. Tarrazo (2016).

The liberalization of the stock environment in the financial markets system is supported by a significant number of securities, a wide range of participants and an extraordinary spectrum of interaction, which, in the background of investors' interest, in cooperation with the subjects of the agrarian market of Ukraine allows solving the urgent problems of financial provision of agriculture and relying on the prospect of the stock technology in this sector of the national economy (Plaskova et al. 2017, Kireev et al. 2016). We consider it expedient to substantiate the determinants of the long-term development of the Ukrainian venture industry in agriculture, taking into account the comprehensive universal methodological approach to ensuring the yield of financial assets of the subjects of the agrarian market in the distribution of investment resources of venture funds. This development is a research priority.

## METHODOLOGY

### **Axiom of the price of venture financing**

Today, the corporate model of venture financing of agriculture in Ukraine, in the context of the initial lag in development, seeks to quickly reduce the existing gap in terms of welfare. The components of this model are, firstly, the development and implementation of a national program for the development of the industry (with indicators for assessing the investment climate, returning to profitability, financial justification of expenditures, etc.) through initiation and creation of a favorable institutional infrastructure, existing mechanisms of state support for venture financing of projects of the agrarian market at the macro level: 1) co-financing of newly created agrarian enterprises with a clear description of the financial models of projects (allocating them within the framework of different industry and regional development programs in the form of grants and concessional loans, including the creation of working prototypes); 2) providing loan and guarantee support (equity participation through private state venture funds, special project vehicles (*SPV*) to

## Determinants of the development venture financing...

facilitate access to bank financing); 3) support exclusively for specialized enterprises-innovators (their activity corresponds to priority areas of agricultural development) and research and development enterprises, they are engaged in their implementation and commercialization (on the basis of a process approach, support, first of all, those economic entities, which invest their assets in other companies). At the micro-level, effective venture financing of investment projects of agrarian enterprises today requires careful analysis and evaluation of business models, strategies, calculations of the efficiency of cost growth and capitalization of financial assets in the stock market.

In today's practice of ensuring the profitability of financial assets of the subjects of the agrarian market, wide application has become the model of arbitrage pricing or price alignment (*APM*) (Hodgman 1978). According to the model, as the starting point for calculating the expected yield of financial assets, the share for each economic factor is taken when the average sensitivity to the factor is equal to one. Depending on the reaction of the venture fund to various factors, the proportion of income, which collectively determines the total value (profitability) of financial assets, changes accordingly. Therefore, if the arbitration strategy is provided  $r_i$ , the expected income consists of interest on a non-risk deposit  $\lambda_0$  and a certain number of economic factors that directly affect the value of financial assets that appear in the venture capital fund as a whole, taking into account the corresponding risk premiums:

$$r_i = \lambda_0 + \lambda_1 \times b_{i1} + \lambda_2 \times b_{i2} + \dots + \lambda_n \times b_{in}, \quad (1)$$

where  $\lambda_1, \dots, \lambda_n$  – a risk premium for the  $i$ -th financial asset;  $b_{i1}, \dots, b_{in}$  – the sensitivity of the  $i$ -th financial asset to the factors;  $n$  – the number of factors.

The more favorable the venture fund reacts to the change of a particular economic factor, the greater the positive value can be the yield of financial assets of agrarian enterprises, which in this case will be as follows:

$$r_p = \lambda_0 + \lambda_1 \times b_{p1} + \lambda_2 \times b_{p2} + \dots + \lambda_n \times b_{pn}, \quad (2)$$

where  $\lambda_1, \dots, \lambda_n$  – a premium for the risk of financial assets in the investment portfolio of the venture capital fund;  $b_{p1}, \dots, b_{pn}$  – sensitivity of the investment portfolio of the venture capital fund to the factors;  $n$  – number of factors.

The arbitrary pricing axiom is based on the model of capital asset pricing (*CAMP*) (Hodgman 1978). The main hypothesis of the *CAMP* model is the assumption that the venture fund is trying to achieve a state in which all subjects in the agrarian market in the implementation of investment measures maximize their utility (the function of benefits). According to this model, the rate of yield of financial assets of an agrarian enterprise is calculated as follows:

$$k_{vk} = Z + (\overline{k_m} - Z) \times \beta + e, \quad (3)$$

where,  $Z$  – the risk-free rate of yield of financial assets of the agrarian enterprise according to the stock market data;  $\overline{k_m}$  – expected average rate of return on the stock market;  $(\overline{k_m} - Z)$  – risk premium;  $\beta$  – the investment risk of the enterprise subject to diversification ( $\beta = 1$  indicates that the enterprise has an average risk level that has developed in the venture capital fund;  $\beta = -0.5$  – the investment risk is equal to half of the return on investment of the venture capital fund, but the direction of the investment income of the enterprise is the opposite of the return on investment of the venture capital fund);  $e$  is an error indicator that shows non-systematic risk (introduced into the formula, since actual yields with a high probability differ from the forecast).



$\beta$ -activity of the  $i$ -th agrarian enterprise is calculated as the ratio of the yield of financial assets to the variation in the yield of the investment portfolio of the venture capital fund ( $m$ ), taking into account the possible fluctuations of the risk rates for financial assets:

$$\bar{\beta} = \frac{\sum_{t=1}^n ((k_i)_t - Z_t - \bar{k}_i + \bar{Z}) \times ((k_m)_t - Z_t) - \frac{1}{n} \sum_{t=1}^n ((k_m)_t - Z_t)}{\sum_{t=1}^n ((k_m)_t - Z_t - \frac{1}{n} \sum_{t=1}^n ((k_m)_t - Z_t))^2}, \quad (4)$$

where  $(k_i)_t$  – the yield of financial assets of the  $i$ -th agrarian enterprise in period  $t$ .

In the countries of the world  $\bar{k}_m$  is calculated on the basis of stock market indices (for example, in the US, the Dow Jones and Standard & Poor's 500 indices). Ukrainian experts developed the indexes IPI-U, WOOD-15, ProU-50, PFTS, KAS-20 (Vaydaytseva 2010). Integration of the world experience of methodological developments into the domestic scientific base provides an assessment of the average return on financial assets of the enterprise as an investment object. If the long-term period does not foresee the opening of a new enterprise, then it is proposed in determining the  $\beta$ -activity the asset not to use the indicator of yield of financial assets of a specific agrarian enterprise, which includes investments of the venture capital fund, and the indicator of profitability of corporate financial assets in agriculture as a whole.

Taking into account the peculiarities of agriculture in the stock market and the direction of research, we proposed the basic equation of the model of pricing of financial assets of the subjects of the agrarian market in the investment portfolio of the venture capital fund to be completed by three constituent elements:

$$\bar{k}_i = Z + (\bar{k}_m - Z) \times \beta + x_1 + x_2 + x_3, \quad (5)$$

where  $x_1$  – an additional premium for the risk of return on financial assets for small and medium-sized agrarian enterprises (its introduction is justified by the need to compensate for the instability of income generation), which in other circumstances is more risky due to economic factors;  $x_2$  – an additional premium for the risk of return on financial assets for a joint-stock company (compensates for the risk of blocking financial investments for shareholders and uncertainty of dividend payments);  $x_3$  – an additional premium for the profitability of a particular branch of agriculture for a foreign venture investor (introduced only in the assessment of the rate of discounting of its own investment resources of a foreign venture capital investor). According to the widespread practice of rating the venture capital investment, amendments  $x_1$  and  $x_2$  are taken in the range of approximately 5/6 of the risk-free rate of yield of financial assets of agrarian enterprises according to the stock market data (Rating Agency).

In the basic equation of the *CAMP* model, in the defined market premium for the risk of return on financial assets of an agrarian enterprise, it is proposed to use not only the expected average return on venture capital in the stock market, but also the average agricultural return on investment (the ratio of the total financial flow from its own and attracted investment resources of the industry to the total cost of short-term and long-term investment of venture funds in agriculture), calculated from the data of the last quarter or a year. The average value is the  $\beta$ -index of return on investment, with a range of resources (for a certain type of activity) where funds are invested, with an unexpressed critical resource (which accounts for an increased share of the investment cost of the venture capital fund), will have the following form:

## Determinants of the development venture financing...

$$\bar{\beta} = \frac{\sum_{t=1}^n ((I_p)_t - \bar{I_p}) \times (i_t - \bar{i})}{\sum_{t=1}^n (i_t - \bar{i})^2}, \quad (6)$$

where  $(I_p)_t$  – indices of changes in the value of resources invested in a venture capital fund in the field of agriculture, for a separate quarter (year);  $n$  – the retrospective period ( $t = 1, 2 \dots n$ );  $i_t$  – index of inflation for the t-period;  $\bar{I_p}$  and  $\bar{i}$  are the average index of changes in the value of resources invested in a venture capital fund in agriculture, taking into account inflation fluctuations (throughout the retrospective period) (Trusova 2015).

If among the nomenclature of investment resources there is a clearly expressed critical resource, then in the proposed model of the market premium for the risk of return of financial assets, instead of the value of the index of inflationary fluctuations, it is necessary to adopt a cost index for a critical investment resource. The modified model should be used if in the retrospective period the market premium for the risk of return is negative, according to the stock market data (or there are reasons to believe that it is understated for the calculation of the indicator  $(\bar{k}_m)$ ).

### Axiom of the price of venture financing

The investment portfolio of venture funds provides a discrete flow of financial flows at certain intervals, based on the principle of discretionary financing of agricultural development. At the same time, the process of venture financing of investment projects of subjects of the agrarian market in accordance with the stages of the innovation cycle is uneven, both at different stages of its implementation, and in different time periods. But the transition from one stage to another, more developed, proceeds spin-off (from the moment of the decision on the need for further financing of the project). Accordingly, the risk of return on financial assets of enterprises is associated with a high degree of uncertainty about obtaining potential profits both as a venture capital investor and as agents in the agrarian market. This requires constant monitoring of the effectiveness of the project implementation and the need for financing at each stage of its implementation. Thus, in Europe, the average industry's viability in the venture industry is 30% per annum, and the yield of venture funds is 50-70% per annum (Venture funds for venture net assets 2016). Practice shows that for venture financing 3:3:3:1 ratio is typical when (despite careful selection) of every 10 projects of agricultural enterprises about 3 are failed to complete, 3 give a moderate profit, 3 are highly profitable and only 1 is really «super-profitable», for which, frankly speaking, there is a venture business.

It is thanks to such successfully implemented projects that the average rate of return on investors is high, which largely covers the costs associated with the failures of venture financing (Bertoni *et al.* 2011; Fairchild 2011; Reid and Naughtingale 2011). The process of ensuring the minimum risk of return on financial assets of agrarian enterprises in the investment portfolio of venture funds is carried out at three levels: 1) in the process of choosing organizational forms of risk capital investments (diversification of investment portfolio, co-financing, creation of joint venture funds and financial partnerships with limited liability, formation of the institute of professional managers); 2) in the process of selection of investment projects for venture financing (creation of specialized databases and information services; definition of criteria for evaluating projects on the basis of content analysis of the business plan, processes and terms of decision-making; harmonization of mutually acceptable conditions; formation of market share of venture funds in projects with high growth potential); 3) in the process of dividing financial flows into venture financing of investment projects: seed and start-up financing, early expansion and rapid growth, and liquidity stage. The bulk of investment in risky financial assets of agrarian enterprises



(approximately 2/3) falls on the first three stages of venture financing, but they bring the highest rate of return in the event of successful implementation. The duration of a full cycle of risky investments in one enterprise may be within a fairly wide range: the famous examples, when from the moment of the birth of the business entity to its registration on the exchange less than 3 years past.

However, in most cases it takes 5-10 years, and therefore the prerequisite for risky investments of venture funds in financial assets of agrarian enterprises is to provide financial assets without paying interest and repayment of debt over a sufficiently long period of time (Dmitriev 2008). The peculiarities of the universality of using the method of discrete venture financing of investment projects as an integrated system for managing financial assets of the subjects of the agrarian market and the obligations of the investor are as follows. First of all, it combines: a) the method of a progressive discrete financing of the project throughout the innovation cycle; b) the method of «decision tree»; c) the binomial model of Cox-Ross-Rubinstein's options estimation. Secondly, it is an effective tool for financial tranches at the stages of the innovation cycle of the investment project of agrarian enterprises and the development of agriculture in general. Thirdly, it provides for continuous support of the project by the investor and monitoring of its indicators (this allows to increase the efficiency of sources of financing selected in the portfolio of venture capital investment projects).

We should note that the basic complexity of this method is the need to determine the discount rate at each stage of the venture financing of the investment project, which varies during its implementation depending on the level of risk. To do this, it is necessary to use a risk neutral approach under conditions where discounting is carried out at a risk-free rate, and risk factors are determined using a risk-neutral probability ( $P$ ), that takes into account the probability of occurrence of a non-risk situation (that is, the problem solved by the traditional *DCF*-method consisting in the need to define variable discount rates other than *WACC*, taking into account the different levels of risk on each «floor» of the binomial «decision tree»). This method allows all financial flows of the investment project to be discounted at a single risk-free rate ( $R_r$ ), while the presence of risk factors in the model helps to determine the risk-neutral probabilities that indicate the probability of occurrence of a non-risk situation  $P_u$  and  $P_d$  (Limitovskiy 2004):

$$P_u = \frac{1 + R_r - d}{u - d} \quad (7)$$

$$P_d = 1 - P_u \quad (8)$$

where  $R_r$  – the non-risk rate from the calculation of a separate period of time between two adjacent «floors» of the binary «decision tree»;  $u$  – the rate of growth of the cost of sources of venture financing of the investment project in the case of an optimistic scenario;  $d$  – the rate of reduction of the cost of sources of venture financing of the investment project in the case of an optimistic scenario.

The calculation of the value of the underlying financial asset for each level of the binomial «decision tree» and financial flows ( $CF$ ), taking into account the growth rates ( $u$ ) and the decrease ( $d$ ), is carried out as follows:

$$CF_{i1} = CF_{i1} \times u, CF_{i1} = CF_{i-1} \times k_i \quad (9)$$

$$CF_{i2} = CF_{i1} \times d, CF_{i2} = CF_{i-1} \times k_i \quad (10)$$

where  $k_i$  is the forecasted growth rate of the financial flow in the period  $i$ .

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Having determined the present value of financial flows ( $PV_i$ ) in period  $i$  and discounting the value of the basic financial assets of venture funds at a non-interest rate ( $R_r$ ), the «tree» of the option tree option is constructed by transforming the «tree» of the financial flows of the latter into the «tree» of the source value of venture financing of high-tech investment projects, taking into account options abilities:

$$PV_i = \frac{p \times (CF_{i1} + PV_{i1}) + (1 + p) \times (CF_{i2} + PV_{i2})}{1 + R_r} \quad (11)$$

Excess of the liquidation value of the investment project by the end of the year  $i$  over the project cost ( $PV_i$ ) determines the need to terminate venture financing by obtaining liquidation value plus the financial flow of the current period (that is, when the financial flows below the liquidation value are financed by the venture capital investor). Using the formula of the project cost, taking into account the real option ( $NPV_{option}$ ) by the formula:

$$NPV_{option} = NPV + ROV \quad (12)$$

where  $NPV_{option}$  – the cost of the project, taking into account the real option;  $ROV$  – the cost of the real option provides the opportunity to make a rational decision on the expediency of further venture financing of the investment project at each stage of the innovation cycle. This allows to maximize the cost of the project (to continue the venture capital investment into the project, taking into account the cost of the current project based on the option, to finance the project to introduce the latest production technologies of development in the sub-sectors of agriculture).

Thus, the universal method of discrete venture financing of investment projects is based on: a) continuous monitoring of cycles that are cyclically repeated; b) synchronization of flexible methods of progressive financing; c) determining the reasons for suspending the financing of inefficient project developments depending on the degree of risk; d) taking into account the factors influencing the cost of sources of venture financing in time and the strategic value of the project, taking into account the ability of the investor to react promptly to negative changes and to minimize losses; e) applying a risk-neutral approach, when discounting is carried out at a non-interest rate, and risk factors of influence are determined by risk-neutral probability ( $P$ ); e) on the receipt of financial results, taking into account the real sources of uncertainty (a significant number of decision-making dates).

## RESULTS AND DISCUSSION

### Development of venture financing of agriculture

The competitive struggle on the international stock market is due to the expansion of its sphere of influence on the formation of alternative sources of financial provision of agriculture in Ukraine. Under current conditions, the vector of development of the industry is focused on the innovative way through the attraction of venture capital, which is characterized by such a property as riskiness and unpredictability of the use of financial resources in highly investment projects, modern innovation developments and ensuring the competitiveness of agricultural products. Recently, the development of venture activities has given a new impetus to the introduction of new technologies, increasing national scientific potential. In Europe, the ratio of venture capital and equity capital is 1:1, while in the US this ratio is close to 1:5. Comparing the cyclicity of partial values in the total volume of European direct investment, the investment of venture capital at an early stage of the US is 7.4% versus 5.7%, at the expansion stage – 35% versus 16%, at a late stage – 8%, compared with 4.4% (Krasovskaya 2013). Venture capital financing mechanisms are well reflected in the cycles of economic growth of the agrarian market subjects. But they got the most

out of it through venture funds, such as: bridge financing; management buy-out; management buy-in; turnaround; replacement; replacement capital (Fig. 1).

Bridge Financing – providing an investor with funds in exchange for a share in the future equity of a joint-stock company (JSC). This method is used for projects of those JSC that require additional investments to bring their assets into line with the requirements of specific standards. At the same time, the interest of venture capital investors in these operations increases with the presence of their share in the project, which receives quotations on the securities market and the possibility of realization with high profits.

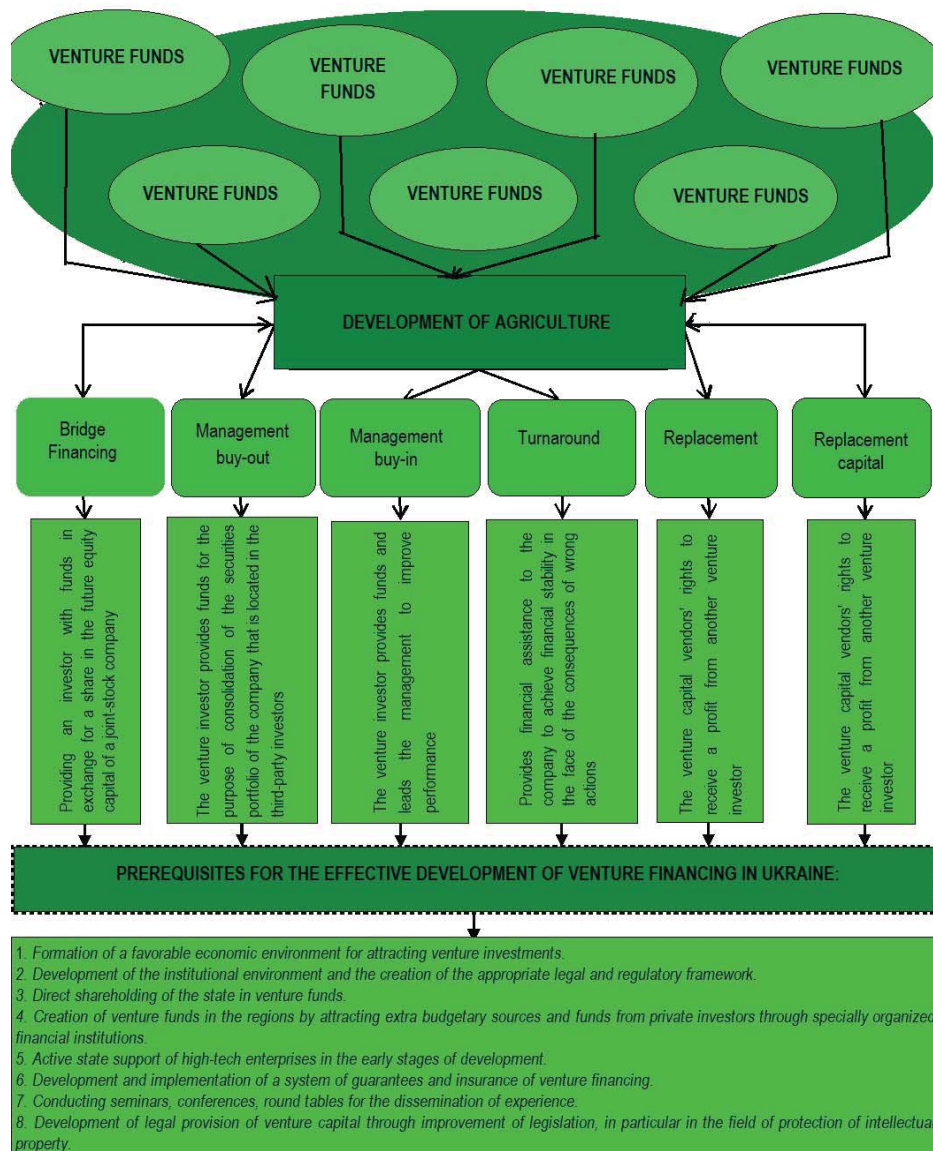


Figure 1. Mechanisms of venture financing of subjects of agrarian sector market in the context of strengthening agricultural development

Management Buy-out – this method of financing is carried out with the purpose of strengthening the role of management in the enterprise and making strategic decisions on expansion of production, refusal of short-term profitability for the sake of future profits, etc. At the same time, the venture investor provides funds to the company to consolidate a package of its securities with the subsequent redemption of shares held by third parties.

Management Buy-in – differs from the previous one by the fact that the company buys a team of managers of other enterprises in order to achieve better results in the future. The actions of

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the same venture investors are similar to the previous version. Turnaround – provides financial support to the company to achieve financial stability in order to overcome the consequences of inefficient management of financial assets of the past management. That is, the use of venture funds as investments is a necessary measure when all traditional ways of financing the enterprise are exhausted (namely, exhausted within the limits of mortgage liquidity of property for loans). In this case, the fund for a certain share in the investment project provides assistance to the enterprise on terms of satisfaction of the interests of the venture investor.

Replacement Capital – the method of investment, or an agreement between venture capital investors when one of the investors tries to acquire other rights to receive profits after the project is implemented (Romanishyn 2001). At the same time, the introduction of venture funds as promising investors in agriculture is possible provided: the formation of a favorable environment with the involvement of venture investments; development of the institutional environment and the creation of an appropriate regulatory framework; direct shareholding of the state in venture funds; the creation of venture funds in the regions by attracting extra budgetary sources and funds from private investors through specialized financial institutions; active support of the state of high-tech projects; development and implementation of a system of guarantees and insurance of venture financing; development of legal provision of venture capital through improvement of legislation, in particular in the field of protection of intellectual property.

## Determinants of venture financing of entities of the agrarian market

The development of innovative processes in agriculture of Ukraine and in the world is closely linked to alternative sources of financial support, including venture financing, the largest volumes of which are distributed in the United States. That is why the country has a significant development of agriculture with the latest biotechnology. Thus, in general, the volume of financing by venture funds of innovations in agriculture increased by 2.3 times (from 36.9 bln. USD in 2008 to 84.2 bln. USD in 2017) (Fig. 2). The highest rise occurred during 2013-2015.

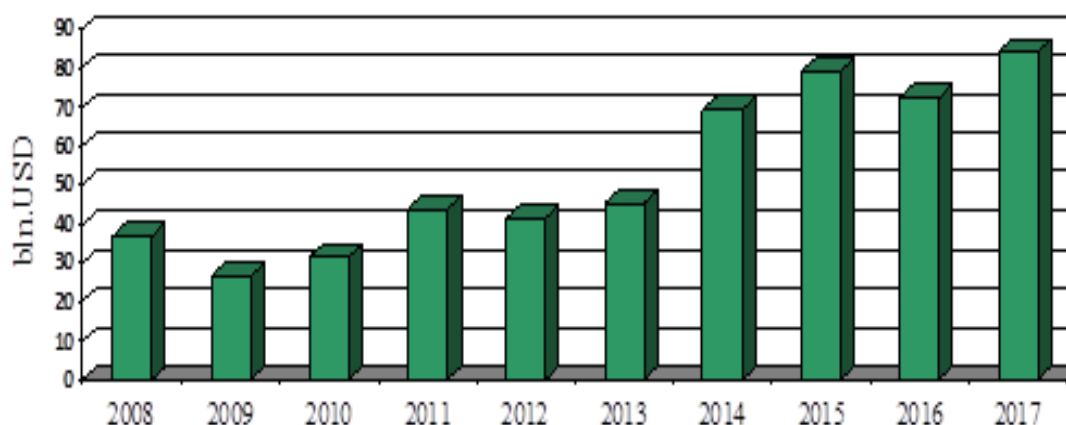


Figure 2. Funding of venture funds of innovations in agriculture US, bln. USD (Venture monitor 2019)

The desire of venture capitalists to avoid risk encourages them to focus on projects that are in the late stages of development. This behavior is especially characteristic of economic recessions. For example, during the current economic crisis, most venture funds have switched to financing the agrarian market subjects that are in the growth or maturity stages. The experience of developed countries shows that newly created small agricultural enterprises need the greatest support at an early stage of their development, and the proposal to finance these stages by the private sector is not sufficient, especially outside the United States. At the same time, for small high-tech enterprises, costs in the early stages are much higher than for all other small firms. It is clear that without the normal development of start-up agribusinesses it is senseless to develop a system of support for



final stages. Worldwide practice also shows that the rate of return in the early stages is increasing as experience gains and the development of venture capital reaches a critical mass (The role of venture capital... 2007). That is why in this area the government's support of venture financing for long-term investments in agrarian enterprises was most widespread in 2016 at the stage of expansion. At the end of 2017, the largest volume of venture financing was directed at enterprises at the initial and late stages of development (Fig. 3).

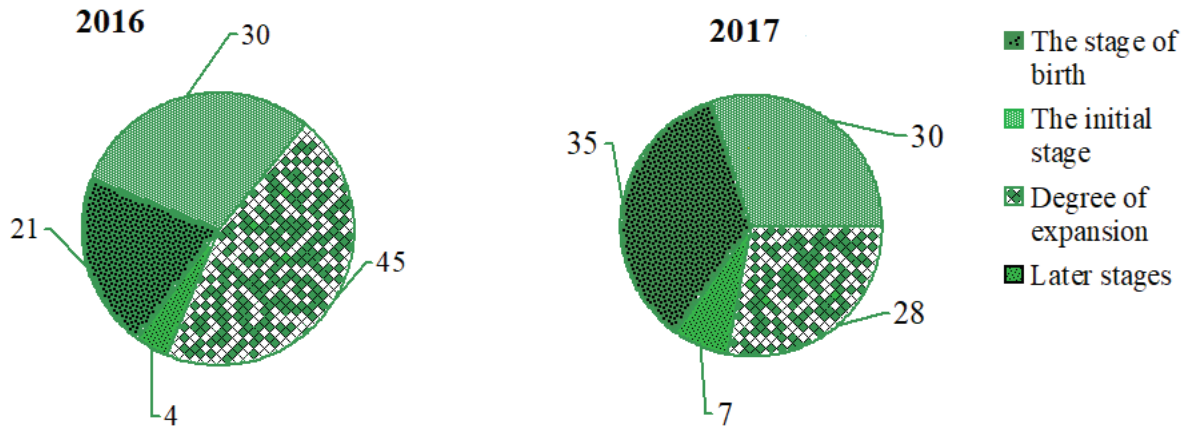


Figure 3. Venture financing in the US for investment objects and stages of development of subjects of the agrarian market (Venture monitor 2019)

In 2017, European investors hold the dominant position among venture capital sources in agriculture – 11.1 bln. EUR. About 30% of capital is used to finance the development of agricultural market subjects in the world. Asia's share is the smallest, although in the 2016-2017 periods it has more than doubled (from 1.4 bln. EUR to 3.4 bln. EUR) (Fig. 4).

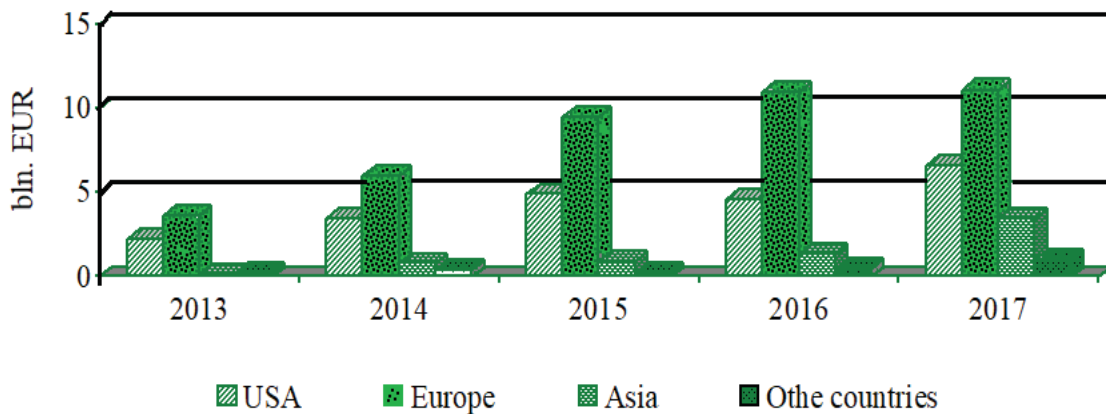


Figure 4. Volumes of venture capital to finance the development of agricultural market subjects in the countries of the world, bln. EUR (Annual European venture... 2017)

In Europe, the overall dynamics of venture financing of high-tech investment projects of agricultural market subjects is not as rapid as in the US, but it is characterized by frequent fluctuations (Fig. 5).

### Determinants of the development venture financing...

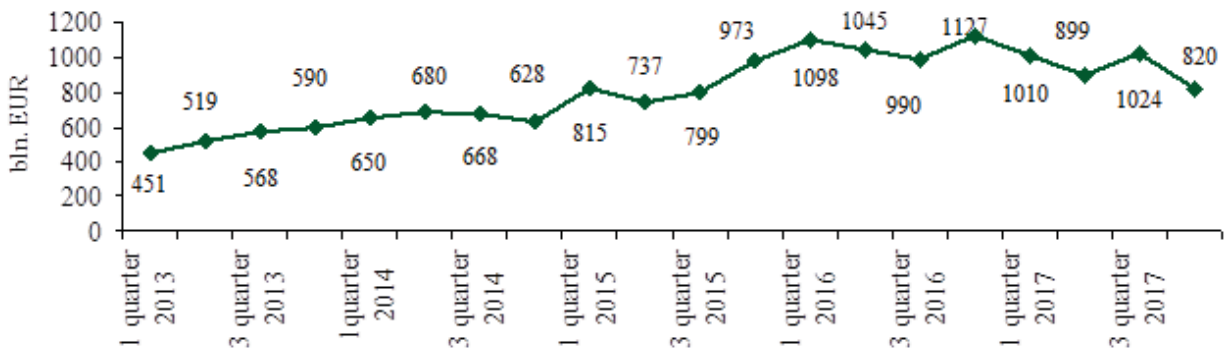


Figure 5. Volumes of venture capital in financial assets of subjects of the agrarian market of Europe, bln. EUR (Annual European venture... 2017)

Thus, the overall increase in venture capital changes in investment projects of agrarian enterprises in Europe for the period 2013-2017 was 76.4%. (from 2128 bln. EUR to 3753 bln. EUR). Venture capital funds are the largest investors in the agrarian market in Europe (Fig. 6). Thus, in 2017, the share of venture funds in the structure of the total volume of financing of investment projects of subjects of the European agrarian market is 67.7%, which has a positive tendency for growth. The share of corporate financing is 29.1% and business angels, crowdfunding and other investors – 3.2%.

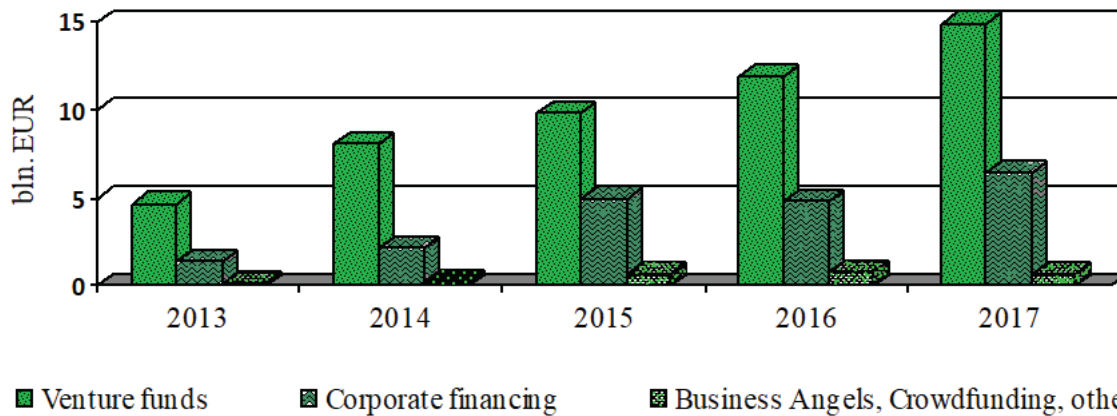


Figure 6. Sources of high-tech venture financing investment projects of subjects of the agrarian market of Europe, bln. EUR (Annual European venture... 2017)

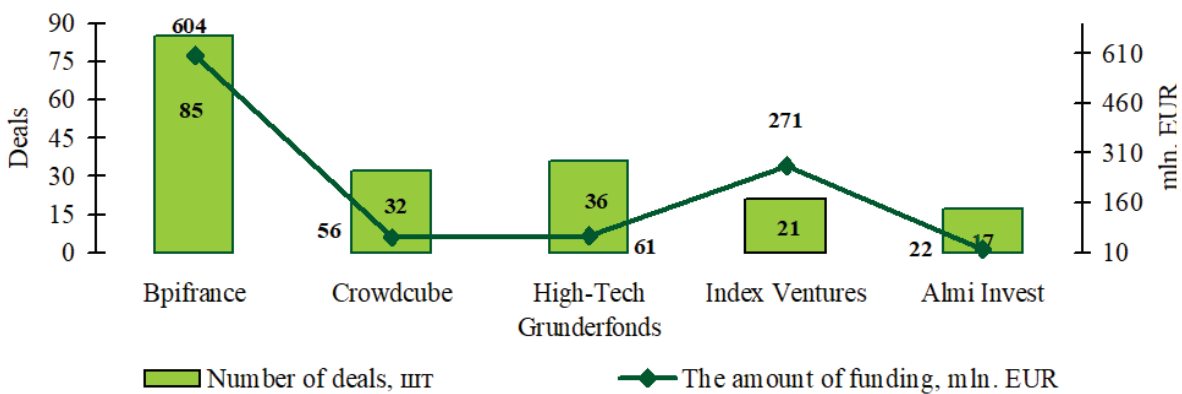


Figure 7. The activity of European venture funds in financing high-tech projects of subjects of the agrarian market (European venture capital report 2017)

In Fig. 7., the five largest venture funds of Europe, which invest their own financial assets into high-tech projects of agrarian enterprises, are listed. Their investment amounts from 4.0 to 380 mln. EUR. Fund infrastructure of venture financing in Ukraine is formed by collective investment institutions (CII), that is, investment funds that accumulate funds from individual investors in order to receive discounted income by investing financial assets in high-tech projects of agricultural market subjects. They are divided into several types, among which are the most venture capital investment institutions (Fig. 8). Thus, at the end of the third quarter of 2017, out of 1021 venture institutions of Ukraine, only 67% invested their own financial assets in the development of high technology projects of agrarian enterprises.

The largest venture funds are: Private Joint-Stock Company «Avarezh»; Private Joint-Stock Company «Closed-Non-Diversified Venture Capital Investment Fund «Avisto», Private Joint-Stock Company «NNV CIF «Optimal» (Yereshko 2015). For open and interval venture funds, the bulk of the resources invested in securities of agrarian enterprises is 20% (Fig. 9).

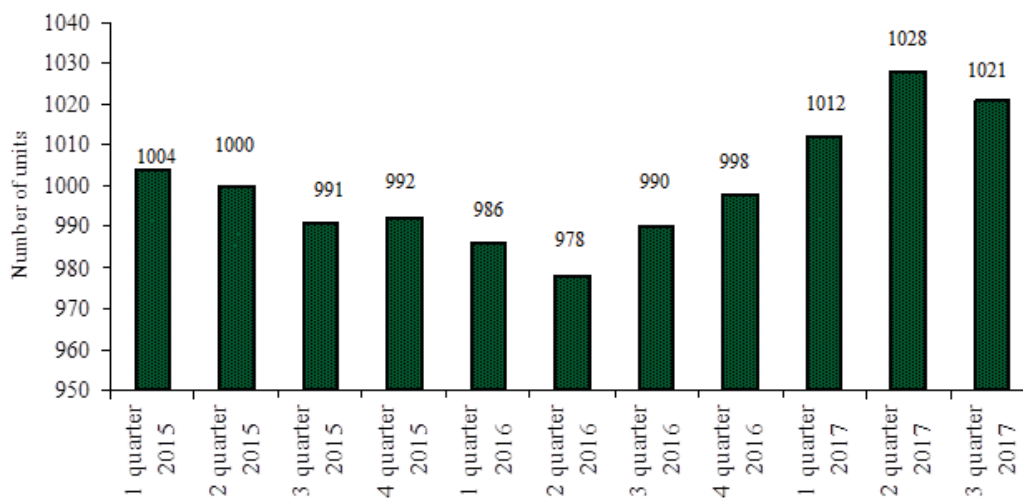


Figure 8. Venture institutes of joint investment of high-tech projects of subjects of the agrarian market of Ukraine (Annual European venture... 2017)

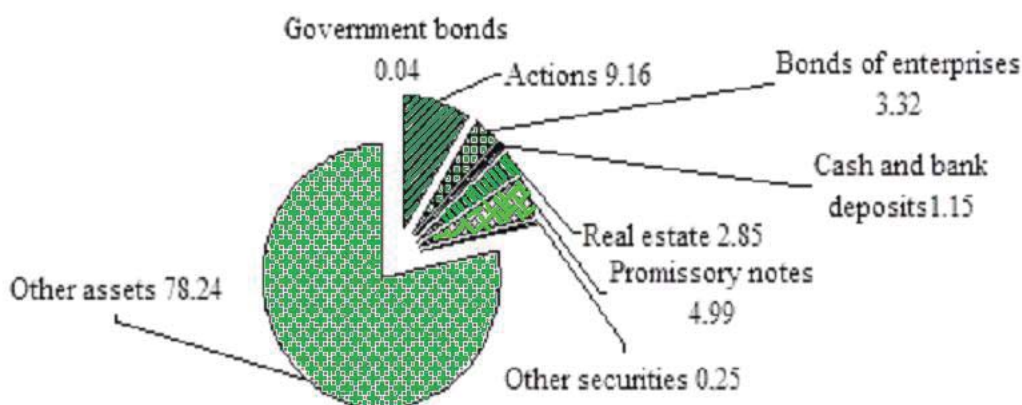


Figure 9. Structure of investment resources of venture institutions in financial assets of subjects of the agrarian market of Ukraine as of September 30, 2017 (The asset structure...)

In this case, assets are formed mainly from corporate rights and loans, as well as other assets, which in 2017 amounted to 78.24%. Shares are common among securities – 9.16%. At the end of the third quarter of 2017, the investment resources of venture capital institutions in financial

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assets of Ukraine agrarian enterprises amounted to 195.6 bln. UAH. This is 12.2% more than in early 2015, but this tendency is rather low compared to the countries of Europe and the USA.

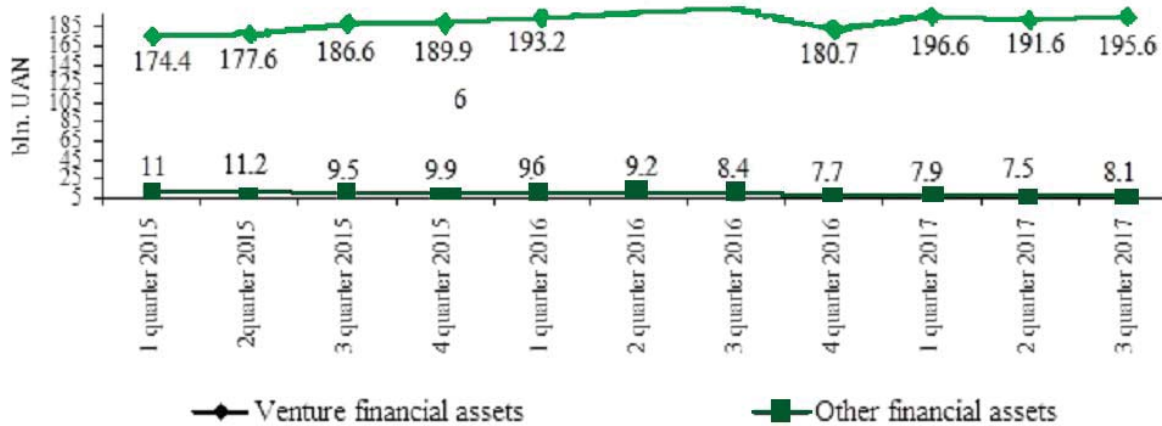


Figure 10. Value of investment resources of venture institutions in financial assets of subjects of the agrarian market of Ukraine, bln. UAH (Ratings of joint investment...)

## Forecast of venture financing development

The modern stock market is a multicomponent system with a large number of infrastructure subjects designed to ensure the interaction of key market agents, promote market transparency, overall financial stability, and implement measures to protect users of services, in particular, of the agrarian market subjects. Agricultural commodity producers, who formalize their own needs in financial instruments and try to place temporarily free funds through investors, face the potentially low expectation of additional income that does not adequately provide the optimal level of resource base for their effective management (Quarterly and annual reviews).

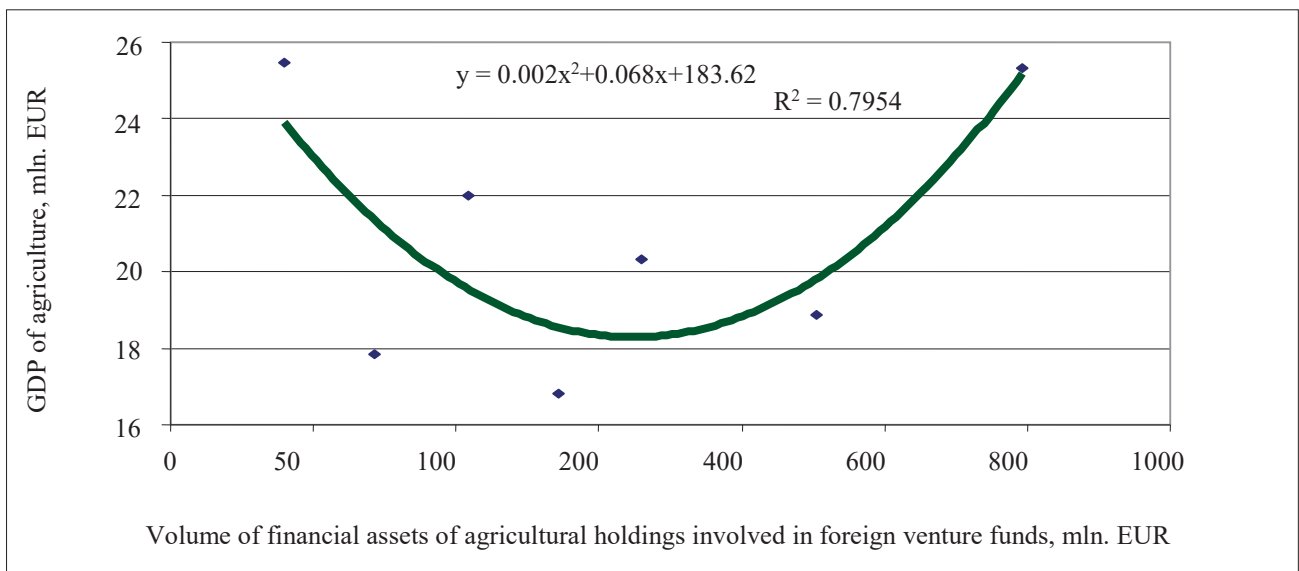


Figure 11. Dependence of agricultural GDP of Ukraine on the volume of financial assets attracted at the expense of placement of shares and Eurobonds by domestic agro holdings in the foreign stock market in 2015-2017

The influence of the foreign stock market on the development of agriculture in Ukraine is confirmed by the results obtained on the basis of constructing a binomial model for evaluating the value of the basic financial assets of venture funds at a non-interest rate by transforming the «tree»



of the financial flows of the latter into the «tree» value of sources of venture financing of high-tech investment projects of agrarian enterprises (Fig. 11).

The constructed model shows that attracting long-term (at the expense of Eurobonds) and perpetual (at the expense of placement of shares) of venture financing in the amount of 1 euro in the foreign equity market of the venture capital can provide an increase in agricultural GDP in Ukraine by an average of 6.8 EUR. Under the ideal conditions of the financial environment and achieving a risk-free margin of the financial flow threshold for all the same type of entities in the agrarian market and, in particular, agricultural holdings that form the volume of gross agricultural output and have similar venture financing operations, should have equal access to investment resources and level returns on financial assets in the investment portfolio of foreign venture funds. On the one hand, the average weighted price of financial assets of venture funds is important in this process, and on the other hand, the ability of agricultural holdings to provide potential discounted income on invested venture capital of foreign investors, in accordance with the terms of the contract.

## CONCLUSION

Thus, a stable foundation for a real business model of the development of venture financing of the subjects of the Ukrainian agrarian market is possible only under the following conditions: protection against fluctuations in the volume of accumulated capital of agrarian enterprises in direct and venture capital funds, as well as the aggressive environment of existing foreign venture funds on design mechanisms simplified admission to trading on an organized segment of the stock market of securities issued by representatives of small and medium agribusiness; modernization of preferred shares; expansion of a set of corporate debt securities instruments at the expense of exchange bonds, as well as through the recognition of agrarian receipts and warehouse certificates; development of the mechanism of taxation of securities transactions; optimization of the system of monitoring indicators of the situation on the securities market in Ukraine and control over the level of financial security of the country; improvement of the legal structure of the publicity of business entities, as well as systems of protection and mechanisms for the development of venture financing for small subjects of the agrarian market.

A strong investor syndicate (venture capital fund) with a sufficient capital reserve allows you to extend the time to create additional value for financial assets of large agrarian enterprises and optimize the possibility of obtaining cheaper investment resources in the next round of financing. At the same time, the dominance of the state in the distribution of national financial resources, in general, or the activity of state institutions in the primary segment of the stock market of Ukraine, in particular, should ensure market saturation by instruments that have a positive effect on the market liquidity of agro holdings that ensure the sustainable development of agriculture. It will suspend the national resource deficit, which inhibits the development of the agrarian sector of the domestic economy and the processes of formation of the corporate securities market for investment processes, focusing on foreign venture funds.

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