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FACTORS OF VENTURE CAPITAL INVESTMENT ACTIVATION

ABSTRACT

The relevance of the topic consists in the fact that due to limited start-up capital, high risk and uncertainty about profitability, lack of experience and, consequently, a positive credit history, venture capital is recognized as the main source of financing the development of many companies in the early stages. The purpose of the paper is to prove the hypothesis of the determining influence of fiscal factors of stimulation of research and development and a set of stable economic and political preconditions for expanding the presence of venture capital in the country. Based on the data of twenty European countries for 2007—2018 (240 observation points), a regression dependence of the amount of invested venture capital on tax preferences in research and development, research and development costs and country risk were constructed. The assessment of the parameters of the created regression model made it possible to prove that it can be used for forecasting volumes of investment of venture capital at the change of the factors of fiscal policy and reduction of macroeconomic risks. The directions of activation of venture financing for the countries are formed: for the development of high technologies and the implementation of innovative ideas, the state should apply tax benefits and preferences for research activities of small and medium enterprises; expansion is necessary for state support for innovation through the consolidation of state and local budgets on research programs, the creation of research and production clusters, technology incubators, support for individuals in their innovation initiatives; the high risk of the country not only leads to a decrease in the inflow of foreign venture capital: domestic investors will withdraw their venture capital and direct it to countries where the political and economic situation is more stable, which further deepens the economic shocks of the national economy and leads to political ones. The implementation of these measures will promote the development of high-tech enterprises, job creation in the country by overcoming the problem of limited financial resources through investment of venture capital.

Keywords: venture capital, factor, fiscal policy, risk, model

JEL Classification: G24, H20, G32, O10, O30

INTRODUCTION

Due to limited start-up capital, high risk and uncertainty about profitability, lack of work experience and, consequently, a positive credit history, venture capital is recognized as the main source of financing the development of many companies at the early stages. It is a long-term investment in innovative and high-tech projects. Due to the high risk and, at the same time, the possibility of obtaining high profits, venture financing activities are influenced by a number of factors. The task of a venture investor is to assess business initiatives, the conditions of their implementation, the potential for profit.

According to the association *Invest Europe* [1], whose statistics are recognized by the European Commission and the OECD (Organization for Economic Cooperation and Development) as an authoritative source of data on European private and venture capital, venture capital in 2020 reached almost 15.5 billion Euros. The predominant sources of financing for venture capital in Europe are government agencies (30 %), family offices & private individuals (18 %), and funds & other asset managers (16 %) [1].

Venture capital investments in 2020 reached 12 billion Euros. If in 2019 most investments took place at the stage of formation of companies (product or service was fully

developed, technologies were tested for mass production and sale), then in 2020 the initial investment is 52 % of total venture capital. The most funded companies are in the field of ICT, biotechnology and healthcare, and consumer goods and services [1].

However, it should be noted that the data on the presence of venture capital differ across European countries, confirming the view that there are macroeconomic preconditions that act as incentives or disincentives for the development of venture capital.

THE ANALYSIS OF THE RESEARCH AND STATEMENT OF THE TASK

Research by foreign scholars [2] on the venture capital impact on socio-economic indices of countries indicates that venture capital has a positive influence on company growth, and the effect of its investment is manifested in the growth of the economy and employment increase.

A number of studies by foreign authors deal with identifying risk factors in venture financing. J. Brander, R. Amit, W. Antweiler [3] study the pooling of investment capital in venture funds and prove their effectiveness through the possibility of portfolio diversification and risk reduction. M. Cherif, S. Elouaer [4] point out that, in addition to contracting, phased financing is an effective mechanism for venture capitalists via reducing problems within formation a symmetry and controlling the risks posed by managerial behavior.

Other researchers determine the dependence of venture financing models due to the differences in venture capital sources. Comparing the sources of funds and investment activities of venture capital in Germany, Israel, Japan and the United Kingdom, scientists [5] find out that the sources of venture capital funds differ significantly in different countries: bank capital predominates in Germany, corporate capital in Israel, insurance companies in Japan and pension funds in the United Kingdom. The authors point out that this difference in funding sources creates differences in investment models: banks and pension funds support venture capital investment at a later stage than individual and corporate funds, especially in Israel and the UK. G. Andrieu [6] proves the existence of differences between different types of venture funds, in particular, related to banks or industrial companies. A team of researchers [7] on the basis of econometric analysis finds out that funds with bank venture capital show a lower financial risk than companies that do not attract it. Other authors [8] argue that a larger state share in venture capital is associated with a longer duration of the investment.

Y. Li and S. Zahra [9] study the level of venture capital activity in different countries and suggest that its differences depend on the levels of formal institutional development, namely the response to incentives provided by formal institutions depending on different cultural conditions. The authors prove that formal institutions have a positive effect on the level of venture capital activity.

In our opinion, the study of venture capital should continue in the direction of determining the fiscal and economic-political factors influencing its formation and investment, namely: influence on the formation of venture capital in the country of state support for innovation through a system of expenditures and tax preferences for research and development, as well as systems of possible political, financial, credit and economic shocks, which are specific to a particular country and are embodied in the risk assessment of the country.

THE PURPOSE OF THE PAPER

The purpose of the paper is to prove the hypothesis of the determining influence of fiscal factors of incentives of research and development and a set of stable economic and political preconditions for expanding the presence of venture capital in the country.

To achieve this purpose, it is necessary to use methods of econometric modeling in the processing of a sufficiently representative statistical sample.

To compile the statistical base, annual data for twenty European countries in the period 2007—2018 were used, i.e. modeling is based on 240 observation points.

RESEARCH RESULTS

OECD statistics were selected as the information base for the data on venture capital (y) by European countries [10] (*Table 1*).

Table 1. The amount of invested venture capital by European countries, USD million

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	85.42	90.77	103.99	57.48	135.35	56.14	78.76	79.25	124.72	62.96	121.76	102.02	90.42	116.67
Belgium	268.89	180.36	214.96	124.12	167.00	121.51	157.75	164.38	109.17	167.38	230.76	343.27	395.83	431.92
Czech Republic	3.46	60.85	38.60	30.60	12.80	6.75	5.90	7.35	2.84	5.00	6.80	17.97	27.20	16.23
Denmark	259.02	260.46	110.48	85.28	202.25	100.23	113.27	89.65	80.62	102.52	114.19	363.32	352.44	284.32
Estonia	2.22	6.11	6.39	9.11	2.25	9.70	6.58	14.10	4.21	8.02	1.75	17.90	40.06	25.21
Finland	183.40	221.76	130.06	137.03	121.75	103.49	169.66	163.87	121.35	143.68	156.83	265.47	321.57	564.49
France	1079.59	982.68	718.03	735.73	703.62	609.87	880.42	798.35	942.55	960.59	1,423.64	1751.67	2164.94	2326.90
Germany	1097.06	1614.46	908.71	933.25	1010.17	734.43	972.55	910.65	969.84	1,212.78	1,459.84	1772.35	2379.67	2218.85
Hungary	12.45	15.53	1.75	24.97	52.70	45.34	29.13	58.50	67.49	46.85	42.74	86.97	154.87	143.38
Ireland	100.28	132.74	111.98	64.56	89.42	96.23	158.94	99.84	97.94	240.10	140.14	352.40	184.93	388.13
Italy	171.66	277.63	122.60	106.90	149.53	133.16	111.95	73.09	76.69	87.56	119.07	221.06	261.12	386.28
Luxembourg	21.53	49.14	7.99	4.65	7.70	15.09	9.25	5.70	6.54	4.37	18.78	18.73	17.31	51.02
Netherlands	350.76	407.82	226.85	199.34	233.90	225.04	266.96	242.53	190.09	250.04	394.58	489.65	701.94	1029.89
Norway	368.06	266.38	181.60	226.55	179.24	133.88	92.44	120.30	72.12	111.28	100.02	98.31	158.31	118.40
Poland	65.73	97.18	1.61	5.15	39.53	13.33	21.71	31.69	33.85	50.59	55.27	43.82	112.98	127.83
Portugal	154.63	84.16	48.65	73.41	17.68	19.54	51.81	72.85	65.11	22.95	29.25	42.68	51.49	43.52
Slovenia	0.66	0.74	1.00	0.44	2.93	1.93	5.96	2.88	3.81	3.92	2.58	0.35	-	3.01
Spain	368.56	406.37	285.82	283.18	343.94	268.64	229.82	376.08	477.79	487.90	618.95	632.09	655.18	918.38
Sweden	572.69	598.42	318.84	364.78	356.34	288.43	324.16	382.61	193.09	261.57	279.73	517.07	402.57	526.29
United Kingdom	2033.48	2188.74	951.77	959.95	1124.94	944.49	820.15	1101.27	1207.20	1006.67	2405.17	2747.64	3349.98	3192.65

Source: OECD data [10]

It is a recognized fact that venture capital is mostly used to finance innovative projects. In our opinion, the factors of fiscal policy (taxation and public funding of research and development) contribute to attracting investment in the form of venture capital.

The statistical base on the level of tax preferences for research expenditures for small and medium-sized enterprises (it is mostly their research that mainly requires funding from venture funds) is formed on the basis of [11] (*Table 2*).

Table 2. The level of tax preferences for research expenditure

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	0.09	0.09	0.09	0.09	0.12	0.12	0.12	0.12	0.12	0.15	0.15	0.17	0.17	0.17
Belgium	0.1	0.13	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.15
Czech Republic	0.27	0.23	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Denmark	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0	0	0.07
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.28	0.22	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
France	0.21	0.43	0.43	0.43	0.44	0.44	0.45	0.45	0.45	0.43	0.43	0.43	0.43	0.41
Germany	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	0.19
Hungary	0.24	0.24	0.24	0.16	0.11	0.11	0.26	0.25	0.25	0.25	0.22	0.2	0.2	0.19
Ireland	0.21	0.21	0.26	0.26	0.25	0.27	0.26	0.27	0.29	0.29	0.29	0.29	0.29	0.32
Italy	0.12	0.12	0.12	-0.02	-0.02	-0.02	-0.02	-0.02	0.04	0.04	0.09	0.09	0.07	0.11
Luxembourg	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Netherlands	0.24	0.24	0.29	0.29	0.29	0.28	0.27	0.26	0.26	0.31	0.31	0.31	0.31	0.31
Norway	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.23	0.22
Poland	0	0	0	0	0	0	0	0	0	0.06	0.11	0.22	0.22	0.22
Portugal	0.28	0.28	0.41	0.41	0.41	0.41	0.41	0.4	0.39	0.39	0.39	0.39	0.39	0.39
Slovenia	0.04	0.04	0.04	0.08	0.08	0.2	0.19	0.19	0.19	0.19	0.21	0.21	0.21	0.21
Spain	0.39	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.34	0.33	0.33	0.33	0.33	0.33
Sweden	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.11
United Kingdom	0.11	0.18	0.18	0.18	0.23	0.28	0.28	0.28	0.29	0.29	0.27	0.27	0.27	0.27

Source: OECD data [11]

Gross input for research work, which we propose to determine as the second factor (x_2) – *Table 3*, include the total input of all resident companies, research institutes, university and government laboratories.

Table 3. Gross input for research, USD million

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	9,946	10,721	10,427	11,148	11,232	12,351	12,524	13,159	13,143	13,699	13,758	14,272	14,653	14,127
Belgium	8,923	9,384	9,487	10,068	10,792	11,411	11,712	12,098	12,648	13,310	14,294	15,595	17,616	8,923
Czech Republic	4,247	4,152	4,129	4,361	5,167	5,873	6,234	6,643	6,853	6,122	6,818	7,557	7,904	*
Denmark	6,824	7,485	7,841	7,627	7,802	7,917	7,962	7,937	8,516	8,901	8,674	8,967	9,056	*
Estonia	417	467	444	514	806	767	631	539	563	492	537	619	743	*
Finland	8,098	8,650	8,395	8,596	8,607	7,972	7,605	7,290	6,688	6,523	6,739	6,895	7,085	*
France	52,675	53,766	56,044	56,271	57,850	58,969	59,574	61,190	61,629	61,077	61,945	62,813	64,053	*
Germany	88,724	95,206	94,163	97,655	104,287	107,565	106,323	110,276	114,098	116,904	124,577	128,824	132,511	*
Hungary	2,385	2,468	2,660	2,690	2,863	3,007	3,378	3,420	3,534	3,180	3,703	4,467	4,577	*
Ireland	3,129	3,365	3,706	3,727	3,673	3,682	3,739	3,943	3,839	3,882	4,421	4,572	5,084	*
Italy	27,435	27,911	27,762	28,240	28,057	28,594	28,932	29,761	29,995	31,017	31,620	33,119	34,254	*
Luxembourg	824	830	820	770	769	667	707	716	769	802	798	761	752	*
Netherlands	13,743	13,641	13,490	13,985	15,680	15,807	17,761	18,158	18,282	18,724	19,518	19,614	20,423	*
Norway	4,688	4,933	4,957	4,885	5,040	5,199	5,349	5,533	6,062	6,258	6,683	6,814	7,021	*
Poland	4,460	4,957	5,621	6,351	6,900	8,279	8,294	9,249	10,232	10,134	11,410	14,052	16,079	*
Portugal	3,643	4,693	4,977	4,920	4,591	4,167	3,967	3,893	3,820	4,014	4,280	4,503	4,782	*
Slovenia	941	1,110	1,143	1,311	1,556	1,608	1,594	1,510	1,433	1,352	1,317	1,434	1,556	*
Spain	20,706	22,312	22,098	22,075	21,467	20,291	19,637	19,392	19,815	19,883	20,818	21,864	22,468	*
Sweden	13,850	14,794	13,848	13,689	14,212	14,320	14,625	14,284	15,489	15,949	16,940	17,056	17,743	*
United Kingdom	41,543	41,340	41,036	41,165	41,888	40,643	42,696	44,476	45,666	46,830	48,268	50,275	51,702	*

* Data are not published.
Source: OECD data [12]

Of course, public sources make up only a part of funding, but the effect of such an infusion into the field of science should become the basis for the public policy of financing innovative development.

It is appropriate to determine the indicator of the country risk premium as the last factor (x_3) of the model. Its statistics are published by the famous expert A. Damodaran [13], and it compiles a number of political, financial, credit and economic components (*Table 4*).

Table 4. Country risk premium

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.006	0.005	0.006	0.000	0.004
Belgium	0.005	0.011	0.005	0.004	0.011	0.011	0.009	0.009	0.010	0.009	0.007	0.008	0.001	0.006
Czech Republic	0.011	0.021	0.014	0.013	0.013	0.013	0.011	0.011	0.011	0.010	0.008	0.010	0.005	0.006
Denmark	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Estonia	0.011	0.021	0.014	0.013	0.013	0.013	0.011	0.011	0.011	0.010	0.008	0.010	0.006	0.007
Finland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.006	0.005	0.006	0.000	0.004
France	0.000	0.000	0.000	0.000	0.000	0.004	0.006	0.006	0.008	0.007	0.006	0.007	0.002	0.005
Germany	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hungary	0.012	0.026	0.024	0.036	0.036	0.036	0.038	0.038	0.039	0.031	0.025	0.031	0.011	0.021
Ireland	0.000	0.000	0.005	0.023	0.036	0.036	0.038	0.024	0.019	0.017	0.010	0.012	0.002	0.008
Italy	0.008	0.015	0.009	0.008	0.015	0.026	0.029	0.029	0.030	0.027	0.022	0.031	0.018	0.021
Luxembourg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Netherlands	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Norway	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Poland	0.012	0.024	0.016	0.015	0.015	0.015	0.013	0.013	0.013	0.012	0.010	0.012	0.009	0.008
Portugal	0.008	0.015	0.009	0.013	0.041	0.049	0.054	0.038	0.039	0.036	0.029	0.031	0.006	0.021
Slovenia	0.008	0.015	0.009	0.008	0.013	0.026	0.038	0.038	0.035	0.031	0.018	0.022	0.011	0.012
Spain	0.000	0.000	0.000	0.004	0.013	0.030	0.033	0.029	0.030	0.027	0.022	0.022	0.007	0.016
Sweden	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
United Kingdom	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.006	0.006	0.006	0.006	0.007	0.002	0.006

Source: Damodaran online data [13]

Based on the above data, regression modeling was performed by 260 points (because of the lack of data on gross expenditures for research work for 2020, the indicators for 2007-2019 are included). It allowed determining the dependence

of the amount of invested venture capital (y) on the preferences in taxation of research and development (x_1), the amount of research and development expenditure (x_2) and the country risk (x_3):

$$y = 10.2829 + 689.2021 \cdot x_1 + 0.0136 \cdot x_2 - 6296.2675 \cdot x_3. \tag{1}$$

Let us assess the parameters of the created model. The multiple correlation coefficient is $R = 0.7857$, the determination coefficient, respectively, $R^2 = 0.7857^2 = 0.6173$. Thus, it is possible to confirm the existence of a close relationship between the amount of invested venture capital and the above factors.

Let us check the significance of the parameters of the multiple regression equation by t-statistics.

$$T_{table} = (256; \ 0.025) = 0; \tag{2}$$

$$t_0 = 0.304 > 0; \ t_1 = 5.052 > 0; \tag{3}$$

$$t_2 = 18.263 > 0; \ t_3 = 3.667 > 0. \tag{4}$$

Thus, the statistical significance of all regression coefficients is confirmed. Let us check the hypothesis about the general significance of the created regression equation by F-statistics:

$$F = 137.625; \ F_{kp}(3;256) = 0. \tag{5}$$

As factual value $F > F_{kp}$, the coefficient of determination is statistically significant and the created regression equation is statistically reliable. Besides, paired correlation coefficients $/r/<0.7$, which indicates the lack of multicollinearity of factors. The significance of the additional inclusion of the factor (private F - criterion) was also assessed, which made it possible to determine that all the factors listed in the model (x_1, x_2, x_3) should be included in the model after the introduction of factors x_j.

Thus, the created regression model can be used to forecast the amount of venture capital investment during changes in fiscal policy factors and reduction of macroeconomic risks.

We consider that the hypothesis of the determining influence of fiscal factors of stimulating research and development and a set of stable economic and political preconditions on the expansion of the presence of venture capital in the country is proved. This allows us to form directions for intensifying venture financing for countries:

▪ for the development of high technologies and the implementation of innovative ideas, the state should apply tax benefits and preferences for research activities of small and medium enterprises. Taking into account the lack of direct and rapid economic effect from research (compared with industrial or commercial enterprises), the tax load hinders the development of research, limiting venture capital investment;

▪ expansion requires state support for innovation through the consolidation of state and local budgets on research programs, the creation of research and production clusters, technology incubators, support for natural persons in their innovation initiatives;

▪ the high risk of the country not only leads to a decrease in the inflow of foreign venture capital: domestic investors will withdraw their venture capital and direct it to countries where the political and economic situation is more stable, which further deepens the economic shocks of the national economy and leads to political ones. Accordingly, the government should seek to resolve political conflicts or overcome political instability, provide a high-quality legal framework for business, reduce corruption, and lay the grounds for macroeconomic stability [14; 15].

It is believed that the implementation of a set of these measures will promote the development of high-tech enterprises, and job creation in the country by coming to the problem of limited financial resources through the investment of venture capital.

CONCLUSIONS

Based on the data of twenty European countries for 2007—2019 (260 observation points), a regression dependence of the amount of invested venture capital on tax preferences in research and development, research and development costs and country risk has been created. The assessment of the parameters of the created regression model made it possible to

prove that it can be used for forecasting the amounts of investment of venture capital at the change of factors of fiscal policy and reduction of macroeconomic risks.

On the basis of the conducted econometric analysis, the directions of practical realization of its results have been established. They consist in proving the hypothesis of the determining influence of fiscal factors of stimulating the research and development and a set of stable economic and political preconditions on the expansion of the presence of venture capital in the country. The directions of activation of venture financing for the countries have been formed.

The prospect of further research is to identify institutional factors that hinder the development of venture funds in countries.

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ФАКТОРИ АКТИВІЗАЦІЇ ІНВЕСТУВАННЯ ВЕНЧУРНОГО КАПІТАЛУ

Актуальність теми полягає в тому, що через обмеження стартового капіталу, високий ризик і невизначеність щодо прибутковості, брак досвіду роботи й, відповідно, позитивної кредитної історії венчурний капітал визнається основним джерелом фінансування розвитку багатьох компаній на ранніх стадіях. Метою роботи визначено доведення гіпотези про визначальний вплив фіскальних факторів стимулювання наукових досліджень і розробок та сукупності стабільних економіко-політичних передумов на розширення присутності венчурного капіталу у країні. На підставі даних двадцяти країн Європи за 2007—2018 рр. (240 точок спостереження) побудовано регресійну залежність обсягів інвестованого венчурного капіталу від преференцій в оподаткуванні діяльності з наукових досліджень і розробок, обсягів витрат на наукові дослідження і розробки та від ризику країни. Оцінка параметрів побудованої регресійної моделі дозволила довести, що вона може бути використана для прогнозування обсягів інвестування венчурного капіталу під час зміни факторів фіскальної політики і зниження макроекономічних ризиків. Сформовано напрями активізації венчурного фінансування для країн: для розвитку високих технологій і впровадження інноваційних ідей державою мають застосовуватися податкові пільги та преференції для науково-дослідної діяльності суб'єктів малого і середнього підприємництва; розширення потребує державна підтримка інноваційної діяльності через консолідацію коштів державного і місцевих бюджетів на програмах наукової діяльності, створенні науково-виробничих кластерів, технологічних інкубаторів, підтримки фізичних осіб в їхніх інноваційних ініціативах; високий ризик країни не тільки зумовлює зниження притоку іноземного венчурного капіталу: внутрішні інвестори за цієї умови будуть виводити свій венчурний капітал у країни, де більш стабільна політична та економічна ситуація, що ще більше поглиблює економічні шоки національної економіки і призводить до виникнення політичних. Реалізація комплексу означених заходів сприятиме розвиткові високотехнологічних підприємств, створенні робочих місць у країні через подолання проблеми обмежених фінансових ресурсів за допомогою інвестування венчурного капіталу.

Ключові слова: венчурний капітал, фактор, фіскальна політика, ризик, модель

JEL Класифікація: G24, H20, G32, O10, O30