

A MODEL FOR ASSESSING ECONOMIC RISK IN FINANCING INNOVATION PROJECTS OF VENTURE CAPITAL FUNDS

In regard to the content, each business venture carries an element of risk, which includes both threats and favorable opportunities.

Risk assessment makes it possible to manage the business more effectively, which is a prerequisite for avoiding unwanted or unexpected events. Moreover, it enables the enterprise to operate more closely to the unforeseen costs limits. It also makes possible the release of resources for developing the activity and assessing the opportunities for profitable investments.

The aim of this study is to present a model for economic risk assessment using some methods developed by the author. In order to achieve this aim, the author has applied the model for risk assessment to a real innovation project related to the production of drones, which is the subject of research in the present paper.

The results of the study will show the practical suitability of the model presented. Applying an adaptive model for risk assessment to innovation projects is an important condition for the increase in risk financing in Bulgaria in the context of the need for increasing competitiveness of the Bulgarian economy.

JEL: G24; O31; O35

1. The Importance of Risk Capital for Innovation Development

The main prerequisite and, at the same time, characteristic of the environment for the realization of innovation projects is the presence of favorable opportunities for using appropriate funding instruments. The variety of such instruments and, especially, the terms of their usage define, to a certain extent, the horizon of planning the general development of enterprises, their innovation development as well as the possibilities they have for realizing innovation projects of different size and complexity.

In the process of providing a financial resource for realizing innovations, risk capital funds play the leading role. Their importance is related to the possibilities ensured by financing

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through equity participation defined also as equity financing (Stevenson, Roberts, Sahlman, 1999). Another advantage enterprises whose innovation activity is financed through risk capital can take is providing know-how, enterprising directions, expert advice, contacts, external consultant services and total expert support in the realization of innovation projects.

The generators of ideas which do not have enough finances for realizing their innovative ventures can benefit from the intermediary role of risk funds, which actually connect those who have money but do not have ideas with those who have ideas but need a financial resource for their realization. The intermediary of the funds providing risk capital is expressed in the way they find finances for the realization of their activity.

The main investors in risk financing funds are pension funds, corporate funds, individual investors, financial and insurance companies, mutual investment funds (Zider, 1998). The capital invested in high-risk investments gives an opportunity for effective risk diversity to those investors who want to achieve higher market profitability together with a way of decreasing the general risk for the capital they have invested.

An important characteristic of the activity of risk funds stems from the fact that they practically invest finances in other people's conceptions, i.e. they do not generate innovative ideas. This means that, after an enterprise becomes stable and starts working well, it can be sold at a good profit.

Actually, a risk fund strives for sending its equity participation in the enterprise at a price that is higher than the invested capital. In this way, the profitability of the managing fund is formed. The objective of the fund is to invest successfully as its investors also have expectations related to ensuring certain profitability of the capital they have invested.

The activity of risk funds has certain specific characteristics. Some of them, for example, invest in the early periods of an enterprise's development while some other ones wait and invest after noticing a clear evidence of market success. Some risk companies tend to wait for exiting from an enterprise's property through an initial public offer, through merging and taking over or through buying back.

2. Risk Capital in Bulgaria

Although providing risk financing is perceived as a relatively new phenomenon in Bulgaria, this type of financing is developing very fast globally. There are hundreds of professional risk funds in the world managing a significant amount of capital. The nature of their activity contains opportunities to provide new business ventures with financial support as well as to finance every following stage of the enterprise's development.

The author's research shows that risk funds in the country invest the capital they have attracted in three main groups of enterprises classified, according to the stage of their market development, and positioned in the segment of micro, small and medium-size.

- Capital investments in start-up enterprises without any turnover that have no customers but have a product, which is not compulsory.
- Investments in enterprises having basic customers and certain turnover and reporting income of repeated character. Their product satisfies real customers' needs in a convenient for them way.
- Investments in well-established enterprises demonstrating a stable trend towards market developing.

Special attention deserve the opportunities provided by "JEREMIE" program aimed at financing highly risky innovation projects with the participation of risk capital funds in the country.

„JEREMIE“ program is a joint initiative set in motion by European Commission and European Investment Bank and aimed at improving the access of micro, small and medium-sized enterprises in the European Union to financing through the Union's structural funds.

The investment strategy of „JEREMIE“ combines in a balanced way debt instruments and share capital instruments aimed at improving the access of micro, small and medium-size Bulgarian enterprises to financing. Thus the existing differences between the demand and the offer of finance engineering instruments are addressed.

In Bulgaria, "JEREMIE" holding fund is financed by European Region Development Fund and 15% of finances come from a state budget operational program named Development of Competitiveness of Bulgarian Economy from 2007 to 2013. In relation to this, former Ministry of Economics, Energy and Tourism provided budget on the basis of Priority Axis 3, including national co-financing, of 199 million euros for implementing "JEREMIE" initiative in the country.

Due to the requirement of raising private capital on financial instruments, private financing is added to public financing on "JEREMIE"(199 million euros). As a result, the total sum on the initiative is up to 563 million euros aimed at developing Bulgarian SMSE in the form of equity investments and loans. Thus, to each euro of public financing on the initiative, a sum of 1.83 euro of private financing is added. In "JEREMIE" program there is a fund for risky investing whose capital is 30 million euros, a great part of which (70%) comes from the financial resources provided by the program.

"JEREMIE" program provides the opportunity to combine effectively joint forms of financing which include providing financial resources on the operational programs of the EU, budget funds and funds provided by individual and institutional investors in highly risky innovation projects. It is beneficial for Bulgarian micro, small and medium-sized enterprises working on innovation projects as, apart from financial support, the beneficiaries are given an opportunity to receive consultant support, when needed, provided by financial intermediaries.

Table 1

Classification of financing through risk capital in Bulgaria

According to the enterprise's economic history	Investment goal	Degree of risk for investors
Start-up enterprises (mainly micro-enterprises)	Seed financing	High
Enterprises in a process of market/product establishing	Extended financing of development	Relatively lower
Enterprises well-established in a market and product sense (mainly SMSE)	Finance and consultant support for late financing of development	Low

Source: Author's research work.

3. Specificity of analyzing risk by risk funds in the country

The summarized results of the author's survey conducted in most of the risk funds in the country proved a practical need for a systematic model approach to assessing economic risk in choosing an alternative investment project intended for financing through risk capital. Generally, the survey showed that:

- In relation to the assessment models specified in the survey and used in practice by risk capital funds, it was confirmed that they are well-known and widely used in risk assessment. In assessing risk in start-up enterprises, risk capital funds mainly rely on available market information about the enterprises having the same or similar purpose.
- It was confirmed that a step-by-step approach to risk assessment has practical benefits. However, what has to be considered is frequent market changes of the enterprises' business environment. This requires a full evaluation of risk threats, respectively, the economic effectiveness of financed projects at every stage of the project implementation.

As it had been expected, the key role of a selective approach to defining risk effects and the degree of their risk manifestation was confirmed. This means that it is necessary to make a precise and objective assessment of the basic threats for the economic profitability of an innovation project, including risk managers' good knowledge of the specific characteristics of the business environment in Bulgaria. However, there is one more important thing to consider in this issue. It is the segmentation of risk effects according to the degree of their risk manifestation and developing a map of risks on this basis. In relation to this, including a map of most significant risks in the model for risk assessment was considered to be an approach of great practical importance in risk assessment and its more effective management in innovation projects financed by means of risk capital funds.

The choice of an approach used in assessing economic effectiveness in innovation projects according to the criterion of a stage in the enterprise's development is another important issue proved by the survey. The results support the thesis that there are certain similarities in the practices used for risk assessment irrespective of whether or not enterprises have economic histories. For example, in assessing economic effectiveness of enterprises, risk funds successfully use so-called "Model DCF" based on the presumption that the assessed

enterprises will achieve good results. Cost determination of the enterprise's assets by using "Model DCF" requires: defining the discounting norm of free cash flows for investors; correctly defining free cash flows; finding an appropriate solution in relation to the long-term functioning of the business.

The assessment by means of the model mentioned above is used successfully both in new enterprises without economic activities and in well-established enterprises that develop or are in the process of developing a new product.

- In relation to what indicators of business environment are used by risk funds, the summarized answers show that, in the practice of risk funds in the country, there is not a preliminarily established group of indicators of business environment included in risk assessment. The main reason for this is the lack of unified criteria for making a classification of basic risk factors derived from the change in system indicators of internal and external business environment. At the same time, the projected change in the indicators of business environment is in the basis of making a decision about a risk investment in enterprises, respectively, innovation projects.

On the basis of the conducted survey and the detected lack of a unified practice of risk assessment in Bulgarian risk capital funds, the author developed a model approach for risk assessment. It is not meant to be unique by nature, but it is based on good practices which are crucial for increasing the importance of risk capital for innovation development of Bulgarian enterprises. The presented model provides an opportunity to limit the number of approaches in risk analysis and to choose the ones that are praised by risk funds in the country. On this basis, it can be considered to be a model of important practical use for establishing risk capital as an alternative form of financing.

4. Requirements for Risk Analysis

The analysis of economic risk (and the model for risk assessment) should consider some specific characteristics in which an enterprise functions. At the beginning, it is necessary to analyze the business environment, the potential and market position of the enterprise, its market share, the quality and competitiveness of the manufactured product or provided service.

At this initial stage, the preliminary analysis of the business environment gives a possibility to make a general assessment of the enterprise's risk profile before using any specific analytical methods and methodologies.

As a rule, risk capital funds (RCF) in Bulgaria invest in micro-small and average-size enterprises. Such enterprises have a smaller market share and very limited possibilities to influence the change of market prices in general. Their position is less favorable from the point of view of economic risk in comparison with big enterprises-monopolists.

In particular, the model for economic risk assessment has to meet certain requirements, as follows:

- **First**, the model is supposed to provide some results based on an objective assessment of risk factors that form the specific conditions of the environment in which an innovative enterprise functions.
- **Second**, the choice of business environment indicators and their determining factors respectively should be made on the basis of their connection with the overall financial state of the enterprise. This clarification is necessary due to the fact that risk capital in Bulgaria is directed to innovative enterprises that have relatively limited market presence and have developed, or are still developing very few new products or services, and, as a result, the change in quality indicators of business environment can provoke significant deterioration of their financial situation.
- **Third**, the model should not be too complex to be applied.
- **Fourth**, the indicators included in the model are defined on the basis of the importance of economic risk assessment in the current period. However, in order to assess the economic effectiveness of the enterprise's activity and its innovation activity in particular, it is necessary to consider the probable changes in environment parameters as well as the factors that provoke them. Thus, in making the model, predicted data for a period of 12 months are used. The argumentation refers to the practical possibility of relatively precise forecasting the change in business environment parameters as well as to the big database provided by official statistics and used in forecasting the expected changes in the practical research. The importance of predicting environmental changes requires selecting data including two scenarios at least – a realistic prediction and a pessimistic version containing the most negative possible development in business environment indicators. Created in this way, the model will provide acceptable precision in defining the meanings of some variables such as the expected profitability of the innovation project and the enterprise in general as well as a probable loss.
- **Fifth**, data selection is based on a relatively wide range of sources such as the overall assessment of the enterprise's project plans, its accountancy documents and statistical data on the state of the business environment, economic sector and region in which it functions and sells its product. Here, it is important to emphasize the significance of official statistical sources providing a huge base of data, real and prognostic, on the state and the changes in the business environment.
- **Sixth**, a process approach should be applied in risk assessment, i.e. the model should be based on following a certain sequence of actions defined as composite phases of a model. In this respect, the omission or the change of a certain phase can lead to an unrealistic assessment of risk factors and the final investment decision of the risk investor.

The beginning stage of developing the model for economic risk assessment starts by localizing one basic risk factor or a group of potential risk factors which an innovative enterprise can face or which can directly influence its financial state. Their range can be wide as there are numerous risk factors influencing the extent of risk that innovative enterprises face. This assessment is made by the innovation enterprise as well as by the risk fund assessing the potential of the innovation project in which the enterprise is interested.

On the basis of the author's research on Bulgarian business environment, a group of basic risk factors can be identified and used in assessing economic risk in the presented model. Such factors are the demanded volumes of the product or the service, the market where the enterprise offers its produce, the expectations for a change in the volume of market demand. The risk factors mentioned above make it possible to plan more precisely the enterprise's activity and, in particular, to predict the necessary production expenditure necessary for realizing the basic activity of the enterprise in the period of survey.

The following system factors have also been included in the model for risk assessment: the level of household consumer expenses and their expected change, gross formation of the enterprise's basic capital, the level of consumer trust, expected change in the level of households' financial state, consumers' assessment of the general economic situation in the country at the present moment and expected changes in it, expected inflation, the enterprise's expenditure on labor, GDP produced per working hour, consumers' expectations for the change in the level of nominal incomes, the unevenness coefficient of labor force in the enterprise's region of functioning assessed on the basis of the indicator of acquired bachelor's and master's degrees, the size of tax-insurance burdens and the marginal size of corporate tax on profit and expected changes in them, the assessed enterprise's expenditure on acquiring LTI. It is assumed that some indicators determine the overall assessment of the enterprise's financial state in the direction of improvement while some other ones provoke deterioration and are defined as de-stimulators. The range of indicators can vary according to the assessment aims, to the factor of time necessary for implementing the innovation project as well as to the assessor's risk profile.

After identifying the main risk factors, their influence is assessed in regard to the preliminary aims related to the activity of the assessed innovative enterprise.

5. A Stage Approach to Determining the Level of Economic Risk

Stage 1 – Identifying the basic groups of risk areas, risk groups and the risks they contain

The approach used at this stage is based entirely on expert assessment, which does not mean it is improbable numerous different suggestions to be made. However, in the completed version, it is important to achieve certain consensus around a group of factors considered to be factors of great risk importance in relation to the aims set. It is a crucial condition as the aim is achieving a maximum objective risk assessment corresponding to the specific characteristics of the environment in which the enterprise functions.

At this initial stage, the model for economic risk assessment includes a graphic presentation of risk areas containing the main potential threats for the enterprise. It is important to define them clearly in order to localize precisely all the probable reasons for the occurrence of risk effects. Therefore it is possible to apply Ishikawa method also known as Fishbone.

The reasons for the occurrence of risks can be positioned in every one of the main risk areas depending on the classification risk indicator defined as an indicator of the greatest importance.

Before starting the Fishbone presentation, it is necessary to clarify that risk factors are defined on the basis of three groups of characteristics such as:

- Characteristics related to the nature of the enterprise's activity and characteristics that are specific for the project implementer respectively;
- Characteristics related to the nature of the innovation product;
- Characteristics related to the environment in which the enterprise functions.

On the basis of the whole information the risk fund has, six main risk groups are localized:

- Technological risks related to manufacturing drones for video-monitoring and data transmission in real time. These risks also include normative requirements for the quality characteristics of drones and, respectively, the possibility for technological applicability of improved technology of better quality; the expiry date of the drones adapted for video-monitoring, data transmission, installation of sensors, etc. This group includes also project security in terms of research and development activities, and faster development of technologies in particular. It should be noted that the implementation of projects of manufacturing high-technology products, access to modern designs and novices as well as the availability of well-trained personnel is of vital importance for the success of the project implementation. Thus technological risk in the areas mentioned above should be considered in regard to the specific characteristics of the innovation and the enterprise that realizes it.
- Regulation risks related to insecurity in regard to general requirements in drone exploitation. It is important to note here that although the European Commission has assigned European Agency for Aviation Security (EAAS) to set a number of rules of using drones, there is still a lack of clear and single regulation. At this stage, the rules in the area of aviation require drones of more than 150 kg to be regarded and regulated as all other means of aviation.³ The lack of clear regulation requirements poses a risk for both investors and manufacturers of drones. It should be taken into consideration in the overall risk assessment at the stage of localizing main risk factors. Thus it can be expected that, in a short period of time, innovations in manufacturing drones and technologies related to expanding their application will be developed mainly in Asia⁴, where the introduction of regulation laws in this area is more advanced than in Europe or the USA.
- Market risks according to the following three groups of specific characteristics: heavy dependence on several final customers; dependence on a limited number of suppliers of production materials and equipment; clearly segmented market in terms of the market application of the final product; difficulty in providing insurance protection.

³ For more information about the regulations governing the use of drones see: Regulation (EO) № 216/2008.

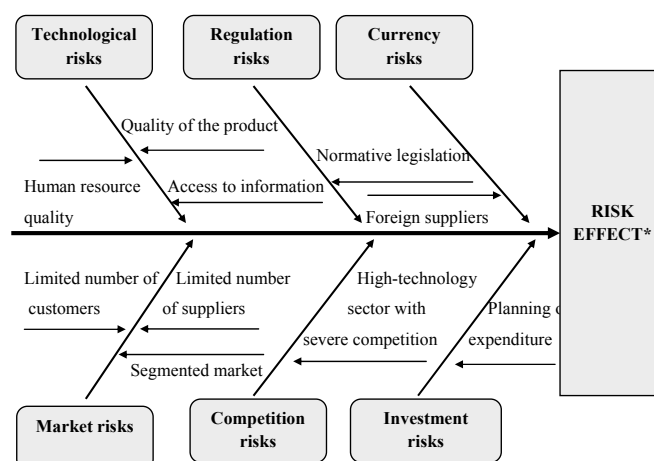
⁴ According to Forbs magazine, the biggest manufacturer of drones is Chinese company DJI worth about 10 billion USD. For more information:
<http://www.forbes.com/sites/ryanmac/2015/04/14/worlds-largest-drone-manufacturer-dji-seeking-to-raise-at-10-billion-valuation/#c7b37cc77dbb>.

- Risks related to the competition on the market of drones. In general, these risks are a direct consequence of the nature of the market of drones, i.e. this is a new industry and the number of manufacturers is limited; the product is innovative and thus it poses a risk of greater level for investors.
- Currency risks, namely risks related to unexpected changes in the rate of local currency to US dollar. This risk should be taken into account as the suppliers of production materials and equipment are from abroad and about 80% of them are paid in US dollars. Meanwhile, the main part of expenditure is related to obtaining goods for production purpose, i.e. they form the main part of production expenditure of drone manufacturing.
- Investment risks, especially risks related to managing expenditure which, to a certain extent, is related to the currency risks mentioned above.

The main risk areas, the reasons for their occurrence and the risk effect they provoke are presented on the graph of Fishbone type.

Figure 1

Main risk areas, the reasons for their occurrence and the risk effect they provoke during the implementation of the project of manufacturing drones for video-monitoring and data transmission in real time⁵



*High dependence on a limited number of main suppliers functioning on the same market, a currency risk posed by the suppliers' profile and the payments to them predominantly in one currency; high dependence on several big customers; limited market possibilities for selling the final product; lack of legal regulation and lack of information about the quality characteristics of the product in relation to the degree of applicability in regard to the application characteristics of the final product preliminarily set by the manufacturer; high level of risk related to research and development activity, including project security due to the lack of well-trained human resources; a risk related to managing expenditure as well as its effective planning at every stage of implementing the project.

Source: Author's research work.

⁵ Stage 1 (sub-stage 1.1) of the model for economic risk assessment.

At the second stage of the model for risk assessment, the economic effectiveness of the innovation project is assessed, so-called Analysis of Assessment Sensitivity. This stage has a key importance for economic risk assessment as it gives information about the economic significance of risk investment.

Stage 2 – Assessment of the economic effectiveness of an innovation project

In the present model for economic risk assessment, it is suggested to use statistical assessment methods, particularly the method of net current value. It is a successful method which makes it possible to measure the financial effect of risk investment during the whole implementation period of the project, respectively, the possibility for the risk investor to get a return on their investment if a certain risk event happens.

The assessment of economic effectiveness is based on some data about the project presented in Table 2.

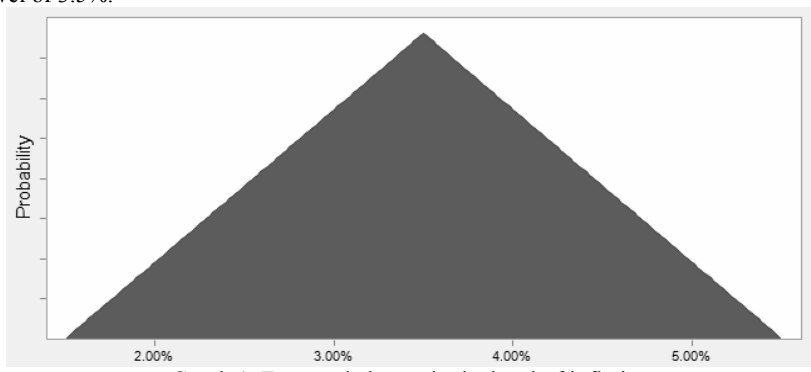
Table 2

Data about Development and Introduction of Autonomy Aviation Machines innovation project

EUR/BGN	1,95583					
USD/BGN	1,75					
Inflation	5,00%					
Real salary growth	10%					
Taxes	10%					
Discount rate	2%					
Period	2015	2016	2017	2018	2019	2020
Income	95880,2	162030	239462	310022	390494	456764
Sales of drones	12	24	36	48	60	72
Prices of drones	4900	4900	4800	4800	4700	4700
Income from drones sold	58800	117600	172800	230400	282000	338400
Spare parts (% sales)	15,00%	20,00%	25,00%	30,00%	35,00%	35,00%
Spare parts (% sales)	50,00%	50,00%	50,00%	50,00%	50,00%	50,00%
Income from spare parts	4410	11760	21600	34560	49350	59220
Services (hours, years)	576	576	768	768	864	864
Price of services per hour	56,7191	56,7191	58,6749	58,6749	68,4541	68,4541
Income from services	32670,2	32670,2	45062,3	45062,3	59144,3	59144,3
Expenditure	105737	146577	183770	298900	337607	477056
Number of employed programmers	2	2	2	3	3	4
Programmers' salaries	3200	3696	4268,88	4930,56	5694,79	6577,49
Expenditure on programmers	76800	88704	102453	177500	205013	315719
Number of other employed people	0	0	1	2	2	3
Average salary of other employees	830	958,65	1107,24	1278,86	1477,09	1706,04
Expenditure on the salaries of other employees	0	0	13286,9	30692,7	35450,1	61417,3
Cost of drones (% price)	50%	50%	40%	40%	35%	30%
Production expenditure	26306	52611,9	61845,9	82461,2	88312,9	90836,1
Other fixed expenditure	2630,6	5261,19	6184,59	8246,12	8831,29	9083,61
Predicted financial result	-9856,4	15453,1	55691,9	11122,3	52887,5	-20292
Predicted cash flow	-9856,4	13907,8	50122,7	10010,1	47598,8	-20292
Current value of cash flow	-9710,7	13499,7	47933,2	9431,34	44184	-18558

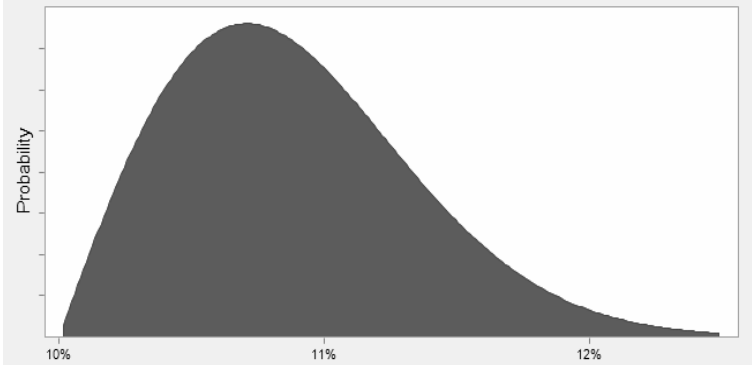
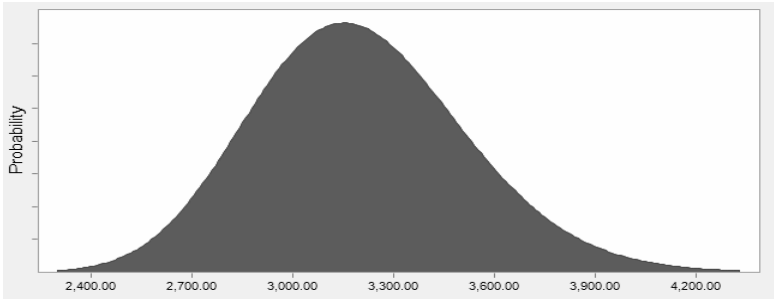
In Table 3, the results of the analysis of risk factors are presented, respectively, the results of economic risk assessment based on the data presented above

Table 3

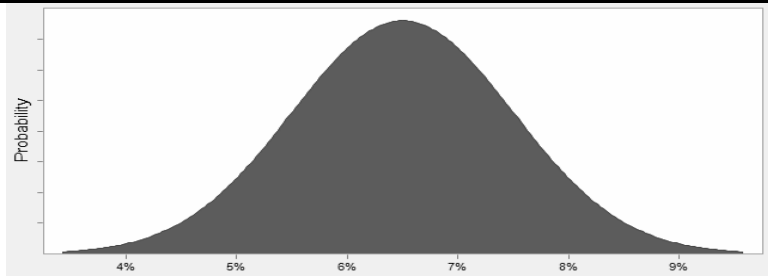
Expected changes in system factors	
Inflation	<p>It is presumed that the average inflation rate will be between 1.5% and 5.5% (3.5% per year is most probable).⁶ The level of inflation is directly related to the enterprise's expenditure on acquiring LTI, including acquiring intellectual property rights on innovations; acquiring, respectively, developing specialized software for introducing the innovation product; consultant services of engineering-technical character related to the process of introducing the innovation product. According to the data of studying business environment in the country, the managers of the enterprise, who have taken part in the survey and who form 75 % of the internal investments in the country, consider expenditure on acquiring DMA to be the main indicator of the level of innovation activity. According to the conducted survey, the pace of the increase in the expenditure on acquiring LTI is rising, which supports the assumption that, for the whole period of investment, inflation expenditure of the enterprise will be formed at an average annual level of 3.5%.</p>  <p>Graph 1. Expected change in the level of inflation</p>
Payment in IT sector	<p>It is assumed that salaries in IT sector will rise by 10% to 13% per year. Weibull distribution has been chosen considering the characteristics of labor market for IT specialists. It is not expected the payment to be below 10% on average every year.⁷ The tendency of an increase in the expenditure on labor is proved by the survey of the business environment. The conclusion is that, for the period 2009-2014, it grew steadily. The reason for this can be low incomes in the country that fall behind the average incomes in the EU as well as the lack of well-trained people in certain economic areas. These conclusions show the situation in IT sector which, together with the favorable possibilities for developing outsourcing services in this area, allow experts to suggest that the predicted annual growth of expenditure on paying IT specialists will reach 13% per year.</p>

⁶ The data about expected inflation are based on the analysis of the enterprises' expenditure on LTI and medium term budget forecast for the period 2016-2018 due to predicted strengthening of world economy.

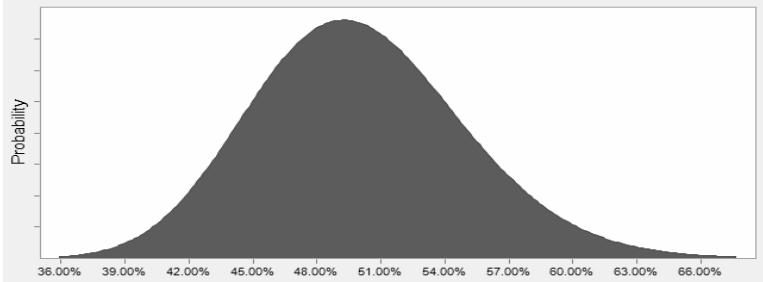
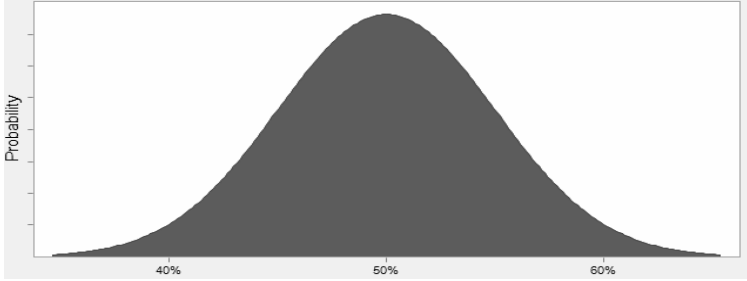
⁷ The expected increase in the expenditure on wages is based on the change in the amount of average wage in the sector of IT services, which rose by 70% on average (14% per year) in Plovdiv, where the enterprise is located, from 2008 to 2013.

	 <p>Graph 2. Predicted percentage of the change in the level of expenditure on labor force</p>
Project expenditure on labor force for the employed IT specialists	<p>It is predicted that gross expenditure on one employed IT specialist follow lognormal distribution of the average value of a wage of 3,200 lv. and standard deviation of 320 lv. It is assumed that wages change due to inflation and the growth of incomes for the sector of IT services.</p>  <p>Graph. 3 Predicted change in the value of labor expenditure</p>
Scale of taxation	<p>It is assumed that corporate tax will not change during the period of project implementation, i.e. it will not exceed 10%. This prediction is based on the medium-term fiscal forecast not predicting a change in the scale of corporate taxation until 2018.⁸ Higher expenditure can be added to tax expenditure due to the increase in maximum insurance income. However, this is less important for the sector of IT services as the average wages for the sector exceed significantly its amount. If this fact is not taken into account, it can be assumed that the amount of minimum insurance income is directly related to the enterprise's expenditure on labor. This assumption is supported by the survey of business environment showing that about 80% of interviewed managers of small and average-size enterprises consider taxation-insurance burden to be heavy or very heavy. To a certain extent, this also refers to the present project as, during the first year of the implementation of the project, the enterprise cannot generate significant income from sales.</p>
Discount percentage	<p>Considering the specific characteristics of the project and the nature of activity, distribution of 6.5% on average and standard deviation of 1% is considered to be normal. The amounts have been calculated by finding the closest distribution corresponding to the yield of corporate stocks of BBB rating. The result has been used to motivate this assumption.</p>

⁸ For more information: Medium term budget forecast for the period 2017-2019.

	 <p>Graph 4. Predicted change of discount percentage</p>
Amount of sales	<p>The planned sales on internal market are as follows:</p> <ul style="list-style-type: none"> 1st year – expected level of sales of 12 units; 2nd year – expected level of sales of 24 units; 3rd year – expected level of sales of 36 units; 4th year – expected level of sales of 48 units; 5th year – expected level of sales of 60 units; 6th year – expected level of sales of 72 units; <p>It is acceptable for sales to vary by +/-10% every year. The amount of the units sold is small as the final product is specialized.⁹ Although, according to the analysis of consumer expenditure for the period between 2009 and 2014, the increase reaches about 13%, it should not be expected to find a direct connection with the expected sales of drones as the specific characteristics of the product limit its practical use. A further factor behind the low percentage increase in sales is market competition.</p>
Price of the product	<p>The sale price is planned to be formed as follows:</p> <ul style="list-style-type: none"> 1st year – expected price of 4,900 lv., normal distribution and standard deviation of 490 (10%); 2nd year – expected price of 4,900 lv., normal distribution and standard deviation of 490 (10%); 3rd year – expected price of 4,800 lv., normal distribution and standard deviation of 480 (10%); 4th year – expected price of 4,800 lv., normal distribution and standard deviation of 480 (10%); 5th year – expected price of 4,700 lv., normal distribution and standard deviation of 470 (10%); 6th year – expected price of 4,700 lv., normal distribution and standard deviation of 470 (10%). <p>The expected price of an item of the product decreases from the first year to the end of the period due to expected increase in competition based on the factor of market success of the innovation project. This is supported by the survey on the business environment, in which the managers give the highest mark exactly to the factor of competition. The project realization of the product should consider mainly the factor of external competition due to the specific characteristics of the innovation product mentioned above and the presence of established world leaders in the area of drone manufacturing.</p>
Income from the sales of spare parts	<p>It is assumed that spare parts are a percentage of sales, as follows:</p> <ul style="list-style-type: none"> 1st year – income from the sales of spare parts of 4,410 lv; 2nd year – income from the sales of spare parts of 11,760 lv.; 3rd year – income from the sales of spare parts of 21,600 lv.;

⁹ For more information: See Table 1.

	<p>4th year – income from the sales of spare parts of 34,560 lv.; 5th year – income from the sales of spare parts of 49,350 lv.; 6th year – income from the sales of spare parts of 59,220 lv.</p> <p>It is expected the price of spare parts to vary around 50% of the price of the final product. The distribution is lognormal as it is assumed that the share of the income from spare parts will rather increase than decrease or fall below zero. The distribution is presented in Graph 5.</p>  <p>Graph 5. Predicted change of the incomes from the sale of spare parts</p>
The cost of the final product	<p>It is assumed that the cost of the final product is about 50% of the sale price. The data are presented in Graph 6.</p>  <p>Graph 6. Predicted change in the cost of the final production product</p>
Other incomes	<p>It is assumed that the enterprise can allocate between 30% (at the beginning of the project) and 40% (in the last years) from the total working hours to generate other incomes (outsourcing, providing external services). These incomes reach 29 EUR per hour, which matches normal wages in IT sector for qualified labor force in Bulgaria. Thus it is important to consider the fact that, during the last several years, Bulgarian enterprises invest more and more money in research and development activities. A great part of these sums is directed to the high-technology sector. Using Fishbone method and the suggestions in the studied model, it is possible to give solutions and different versions respectively of the time that the enterprise can spend on outsourcing and external services. The nature of these potential revenues is not related to the main subject of the project activity - the production of drones, which enables additional revenues to be realized. Their size does not depend directly on the sales of the main product, of the market competition for the drones market. This increases revenue generating sources while reducing reliance on market competition, which can be defined as risk diversification, including market, competitive and price risks.</p>

Risk analysis results

After the risk fund defines the predictions on the basis of the expected changes in the value of risk factors, it is possible to start defining the expected net advantages of financing the innovation project. For the purpose of this, Monte Carlo model is used.¹⁰

At this stage, the risk fund is very much interested in the following two questions:

- **First**, what is the distribution of the expected net advantages of the project?

The answer to this question can be found in the results of the carried out simulation presented in Table 4.

Table 4

Simulation results	
Indicator	Value
Average value	87,513.25
Median value	88,536.46
Mode	87,513.25
Standard deviation	95,922.54
Asymmetry coefficient	-0.1411
Excess coefficient	3.12

- **Second**, what is the probability that the advantages of the project will be smaller than or equal to the amount of risk financing (i.e. net effect for the fund will be zero or sub-zero)?

The results presented that it is expected net result to be below or equal to 58,675 BGN which means a probability of 37.03%. The analysis of the results shows that the distribution of expected advantages is close to normal, i.e. despite expected risks, the innovation project will bring economic advantages and it can be implemented.

Conclusion

In graphs, the model for economic risk assessment in innovation projects can be presented as a unified system consisting of three main parts: entrance dimensions, a simulation model for assessing risk effect and exit dimensions.

Entrance dimensions have expected probability parameters so they can be defined as random entrance dimensions. Their expected values can be identified on the basis of the data about past periods or by examining and summarizing expert opinions and analyses based on business environment assessment.

¹⁰ The results reached by using Monte Carlo simulation (by using software Oracle Crystal Ball) in 10,000 repetitions. The studied goal variable is the current value of the received net cash flows.

In its final version, the presented model makes it possible to measure precisely the parameters of risk level, which gives an answer to the main question that every potential investor asks: what are the possibilities for market return on invested capital?

Risk is assessed regularly at every stage of the project implementation. The purpose of this is embracing as many indicators of the business environment as possible and, as a result, achieving a high level of predictability of the changes in market conjuncture in a medium or a long period of time.

Despite the fact that project investments in innovation projects are characterized by a potentially higher level of risk, the application of the model for risk assessment based on a unified methodology is a condition for increasing risk financing of Bulgarian enterprises as well as for increasing innovation potential of national economy respectively.

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