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## Introduction

One of the fastest growing areas in the economic sciences is broadly defined area of finance, with particular emphasis on the financial markets, financial institutions and risk management. Real world challenges stimulate the development of new theories and methods. A large part of the theoretical research concerns the analysis of the risk of not only economic entities, but also households.

The first Wrocław Conference in Finance WROFIN was held in Wrocław between 22nd and 24th of September 2015. The participants of the conference were the leading representatives of academia, practitioners at corporate finance, financial and insurance markets. The conference is a continuation of the two long-standing conferences: INVEST (Financial Investments and Insurance) and ZAFIN (Financial Management – Theory and Practice).

The Conference constitutes a vibrant forum for presenting scientific ideas and results of new research in the areas of investment theory, financial markets, banking, corporate finance, insurance and risk management. Much emphasis is put on practical issues within the fields of finance and insurance. The conference was organized by Finance Management Institute of the Wrocław University of Economics. Scientific Committee of the conference consisted of prof. Diarmuid Bradley, prof. dr hab. Jan Czekaj, prof. dr hab. Andrzej Gospodarowicz, prof. dr hab. Krzysztof Jajuga, prof. dr hab. Adam Kopiński, prof. dr. Hermann Locarek-Junge, prof. dr hab. Monika Marcinkowska, prof. dr hab. Paweł Miłobędzki, prof. dr hab. Jan Monkiewicz, prof. dr Lucjan T. Orłowski, prof. dr hab. Stanisław Owskiak, prof. dr hab. Wanda Ronka-Chmielowiec, prof. dr hab. Jerzy Różański, prof. dr hab. Andrzej Sławiński, dr hab. Tomasz Słoński, prof. Karsten Staehr, prof. dr hab. Jerzy Węclawski, prof. dr hab. Małgorzata Zaleska and prof. dr hab. Dariusz Zarzecki. The Committee on Financial Sciences of Polish Academy of Sciences held the patronage of content and the Rector of the University of Economics in Wrocław, Prof. Andrzej Gospodarowicz, held the honorary patronage.

The conference was attended by about 120 persons representing the academic, financial and insurance sector, including several people from abroad. During the conference 45 papers on finance and insurance, all in English, were presented. There were also 26 posters.

This publication contains 27 articles. They are listed in alphabetical order. The editors of the book on behalf of the authors and themselves express their deep gratitude to the reviewers of articles – Professors: Jacek Batóg, Joanna Bruzda, Katarzyna Byrka-Kita, Jerzy Dzieża, Teresa Famulska, Piotr Fiszeder, Jerzy Gajdka, Marek Gruszczyński, Magdalena Jerzemowska, Jarosław Kubiak, Tadeusz Kufel, Jacek Li-

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*Wanda Ronka-Chmielowiec, Krzysztof Jajuga*

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## METHODS OF VALUING INVESTMENT PROJECTS USED BY VENTURE CAPITAL FUNDS FINANCED WITH PUBLIC FUNDS

## METODY WYCENY PROJEKTÓW INWESTYCYJNYCH STOSOWANE PRZEZ FUNDUSZE VENTURE CAPITAL FINANSOWANE ZE ŚRODKÓW PUBLICZNYCH

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**Abstract:** In the following article, specific aspects of Venture Capital funds' functioning – financed from public funds – and their impact on methods used to measure investment objectives are analysed. Author compares the ways of valuation, which ought to be used by Venture Capital funds (according to specialist literature) with the results of empirical research conducted. The research concerns methods of investment objectives' valuation, used by individual Venture Capital funds, which were operating in Poland between 2008 and 2015, and were financed with public funds.

**Keywords:** Venture Capital, Valuation Methods, Start-up Valuation.

**Streszczenie:** Niniejszy artykuł przedstawia specyficzne aspekty funkcjonowania funduszy Venture Capital finansowanych ze środków publicznych i ich wpływ na modele wyceny stosowane przez wspomniane fundusze. Autor porównuje sposoby wyceny projektów inwestycyjnych przedstawianych w literaturze z metodami stosowanymi przez wybranych inwestorów. Analiza została przeprowadzona na grupie funduszy, które funkcjonowały w Polsce w latach 2008-2015.

**Słowa kluczowe:** Venture Capital, modele wyceny, wycena start-up.

### 1. Introduction

In Poland, between the years 2008 and 2015, a phenomenon concerning the increased availability of financing for newly established companies took place. It caused a decrease of the equity gap on the market of newly arising ventures. Involvement of the government in the support of initiatives developing the Venture



Capital (VC) funds market, had a significant impact on the phenomenon described above. The main goal of the article is to point out specific aspects of Venture Capital funds financed with public funds, and to find their impact on the methods used for investment project valuation.

In the next paragraphs, with references to the scientific literature, the author discusses the definition of VC funds and characterizes the programs which supported the development of the VC market in Poland. Special attention is paid to raising of capital and to functioning of the VC funds supported by public funds. Analysis of the programs supporting the development of the VC market enables the identification of VC funds financed with public funds.

In the next part of the article, the valuation methods, which can be used for valuation of the investment objectives in the initial phase of development, are presented. The author introduces self-selected, most relevant methods and proposes their classification by dividing them into classes. On the basis of the conducted research, concerning the previously selected funds, the author points to the methods, which should be used by the selected subjects, as well as adjusts them to their specific needs.

The paper presents the results of surveys and the analysis of applications for VC funds financed with public funds. Answers received from the survey allow to verify which valuation methods are preferred by the reviewed funds. The survey also answers if the sector, in which the valuated companies operate, affects the approach towards the valuation of the fund. Finally, the carried analysis of the applications allows to compare the expected rate of return between VC funds financed form public funds and other VC funds.

## **2. Principles of programs supporting Venture Capital funds**

### **2.1. Venture Capital definition**

There are many definitions referring to the term *Venture Capital*. According to these definitions, by Venture Capital we understand: ‘funding ideas, which are not verified yet on the market, but which may be expected to bring extraordinary profits’ [Węclawski 1997]. Another definition describes Venture Capital as the capital provided by the companies investing in new enterprises, which are not listed on stock market. The purpose of this investment is to increase the value of young companies and the implementation of a high rate of return [OECD 1996].

Venture capital is also defined as the ‘investments in new enterprises’. This category includes the investments in new ideas, new businesses. Venture Capital investments usually finance seed, start-up and third stage of funding [Kornasiewicz 2004]. One other interesting definition of VC, describes it as the private equity capital, invested in companies which did not yet reach market maturity. Simply put, it refers to investing the ‘seed capital’ in an idea (the concept of a business) in order to investigate the possibility of its commercialization by establishing a new

company, or to investing in company in the early stages of development, starting its activities on the market (start-up, post-creation), or to investing in the expansion phase [Sobańska-Herman, Sieradzan 2013].

Referring to the above definitions, it should be noted that the state programs, listed below, support the investors who fulfill the above-mentioned definitions of VC.

## 2.2. National Capital Fund

National Capital Fund (NCF) operates as a fund of funds. Its mission is to raise capital in VC funds which invest in small and medium-sized enterprises, operating in Poland. NCF is a passive investor, however, it has supervision over the activities of the fund by taking part in the inspection body and the investment committee.

The NCF's contribution amounts to 50% of the total capitalization of the fund. NCF also prefers the financing structure, which is based on 85% equity and 15% bonds. In addition, NCF can finance the costs associated with the analysis and monitoring of investments. The funding is based on non-returnable money for the management team and cannot be higher than 10% of the NCF's total contribution.

When deciding to obtain financing from NCF, private investors gain additional protection which consists in favoring of payments from completed investments. The preference for payments from the fund is made in the following ways:

1. Private investors, until receiving the amounts equal to payments made to the fund capital.
2. NCF, until they receive an amount equal to the payments made to the fund.
3. Private investors, until receiving the minimal rate of return (the hurdle rate).
4. NCF, until receiving the minimum rate of return (the hurdle rate).

The preferred legal form of VC raised by the NCF includes limited joint-stock company or closed non-public investment fund (FIZAN), located on the territory of Poland. The duration of the fund is 10 years and may be extended to 12 years. Time for implementation of a single investment is four years, with an option to extend for a year, and its value must not exceed 1.5 million EUR. Funds which are willing to obtain the grant, compete against each other in an open competition of offers. During this competition the following parameters are evaluated [www.kfk.org.pl]:

- capitalization of a capital fund as high as possible;
- experienced and professional management with great success in PE/VC investments (measured by the number of deals and the IRRs), with a special attention to:
  - experience in managing of PE/VC projects, especially these connected with the investments in SMEs, innovative companies carrying out R&D projects and investments in SMEs at early stages of development,
  - experience in investment exits, where these were exits from greater investments,
  - experience in establishing and managing enterprises, where these were greater enterprises;

- funds with investment strategy prognosticating high rate of return;
- compatibility of managements' experience with the fund's investment strategy inclusive of the knowledge about Polish market and the specificity of its business lines;
- management with a proper potential for investment strategy realization considering raising, verification and realization of investment projects;
- management making up an effective team;
- capital funds with optimal operating budget compatible with the investment strategy;
- capital funds with the hurdle rate exceeding the average profitability of ten-year wholesale bonds;
- capital funds with management bodies contributing to the fund's share capital pay-out.

Detailed terms and conditions of functioning of the fund, its form, its management fee are all negotiated individually during the selection of funds for the NCF portfolio. So far, the NCF has conducted six competitions, where 17 funds were established, with a total capitalization of 983 million PLN.

### **2.3. Innovative Economy Operational Programme 3.1.**

The next group of funds, which are supported by public funds are entities financed by the Ministry of Infrastructure and Development, through Innovative Economy Operational Programme 3.1. (IEOP). These funds are, in contrast to the NCF, grants for the implementation of the project, which is focused on investing in start-up companies. Within the project, the funds raise capital, which may be allocated in the area of management costs, making pre-investment analysis, and in raising capital for start-ups.

Entities that may apply for capital were units operating in the field of promoting entrepreneurship and innovation in Poland. An important criterion for classifying an entity as eligible to apply for capital is an obligated non-profit or not-for-profit activity. This means no dividends to owners of the entity. This is due to the commitment of the fund to continue investing in activities of the start-ups in an indefinite period of time. Therefore, here, the capital for further investment should come from all profits generated by the investments. The duration of a single investment for IEOP is up to 10 years. During this period, the fund must complete disinvestment.

In the last recruitment arranged by the Polish Agency for Enterprise Development (PAED), the ranking was based on the following technical criteria:

- the share of equity capital for the entry,
- own funds per total eligible expenses,
- provision of private co-investor for investment,
- provision of support at the level of pre-incubation,
- experience in investments on the private market,

- place of activity,
- implementation of the project with a partner which is a Venture Capital Fund or a network of Business Angels,
- investment in industries preferred by PADE.

Entities, willing to apply, are not required to submit their own contribution to the financing of the investment portfolio.

The program introduces two important limitations on the size of the investment. In accordance with the rules, the value of individual investment may not exceed EUR 200,000. In addition, the fund may not cover more than 49.99% of the share in the new company. As part of its supervisory powers, PADE oversees each investment decision by giving or refusing permission to invest in the project. The regional scope of the fund is limited to the territory of Poland. Up to date, four selections of projects were made, supporting 77 funds to the amount of over 830 million PLN.

#### **2.4. Definition of the VC fund, financed with public money**

Taking into account the above criteria and the VC fund definitions quoted in the literature, it can be concluded that the abovementioned entities meet the definition of the VC funds. Each of them invests on the private market in companies at an early stage of development. The second criterion, limiting the study sample, is financing the fund with public money. In the case of funds financed by the NCF, we may talk about co-financing under privileged terms for private investors. The VC supported by the IEOP may be financed only from public funds. Therefore, let us focus on these funds in the rest of the article.

### **3. Valuation Methods**

#### **3.1. Valuation Methods and their usability for start-up projects**

When analyzing scientific literature, we come across many valuation methods. The most common classification involves [Zarzecki 1999]:

- Income methods – based on estimating the value of a company on the basis of future cash-flows, which are discounted to current value by rate adequate to their risk,
- Comparative methods – based on referencing project's value to value of other projects' possessing similar characteristics,
- Asset-based approaches – the value of a company is confronted with possessed assets, without including the potential for development and growth,
- Mixed Methods – a combination of abovementioned methods mixed in different proportions.

All of the given methods are suitable for valuation of companies, which already generate cash-flows and have elaborate business models. The implementation of

income methods in the case of newly established businesses is difficult, because of the hard-to-predict forecast of future financial cash-flows and the issue of establishing the cost of capital. Similarly, the implementation of comparative methods, when it comes to a company which does not generate any income, excludes the possibility of implementing most of the multipliers.

Another common difficulty is the lack of the comparative group, which is caused by the innovativeness of the solutions proposed by start-ups, as these solutions are not available on the market yet. Lastly, the use of asset-based methods is difficult, because a typical start-up is based on the knowledge of the founder and does not actually possess any assets yet [Timmons, Spinelli 2004; L. Carver 2011].

Some funds admit that the valuation of a start-up type of a project is often not more but a guess [May, Simmons 2001]. The empirical research, where different teams of experts, who had access to the same information, valued a company in the range from \$6 to \$17.5 mln [Hubbard, Waldron 1991], seems to confirm the previous statement and shows the difficulty of a seed project valuation.

When estimating new venture's value, the model applied should also allow the VC to explain the valuation method in a simple way, which is communicable to the originator of new venture. Taking into account all before discussed factors, and the characteristics of the VC investments, the models destined especially for the valuation of a seed-type projects were created. Based on the analysis of the literature, the following classification of models may be proposed:

1. Models based on the forecasted valuation of a company:
  - a. Venture Capital Method (VCM),
  - b. Modified Venture Capital Method (mVCM),
  - c. First Chicago Method (FCM);
2. Rules of thumb:
  - a. Models involving multiple factors:
    - i. Berkus Method,
    - ii. Morbitzer Method,
    - iii. Scorecard Method,
    - iv. The risk factor summation method;
  - b. Models taking into account the next stages of financing:
    - i. The rule of thirds.

The VCM presents the value of venture as the valuation of a functioning company in the period of planned divestment [Sahlman, Scherlis 1987]. The value of a company in the future is discounted by the investor's expected return rate:

$$POST = \frac{FV}{(1+r)^t}$$

- *POST* – value of a company after disinvestment by an investor,
- *FV* – a company's value at the planned disinvestment,

- $r$  – expected return rate from investment,
- $t$  – time from the start till disinvestment.

For obtaining the  $FV$ , multipliers such as  $EV/EBITDA$  or others are used, depending on investment specification and fund's preferences. The next step towards setting the value of a company before the VC investment is to subtract the contribution to cover by the investor from the  $POST$  value.

$$PRE = POST - I$$

- $PRE$  – present value of an idea before its financing,
- $I$  – value of an investment.

The ratio of shares that the VC investor needs to hold is equal to:

$$share = \frac{I}{POST}$$

mVCM differs from the standard VCM in the explicit recognition of the costs of VC's investing: management fees and carried interest [Metrick, Yasuda 2011]. Taking into account these costs may cause the final valuation of a company to be different for the two funds, which during the assumed period build twin companies. The overall cost of investment ( $KI$ ), which includes the costs of managing a fund in the mVCM, is calculated according to the following formula:

$$KI = \frac{CC}{IC} \times I$$

- $CC$  – committed capital,
- $IC$  – capital for investments,
- $I$  – investment's size.

A second modification to the standard VCM is the deduction for carried interests. It is imperative to take into consideration the fact that despite fixed functioning costs of a fund, the team collects a variable payment for success in the case of achieving the assumed rate of return. With the assumption that an investment in the valuation phase reaches the assumed return rate (assumed by the fund), it is necessary to include this cost in the profitability of the whole investment:

$$mPV = PV \times (1 - SF)$$

- $mPV$  – valuation of a company for fund's owners, which takes into account the part belonging to fund's managers,
- $SF$  – share of an income from an investment attributed to fund's managers.

Having the above information, investor can make a final decision about an investment through the means of comparing  $mPV$  and  $KI$ . If  $mPV > KI$ , then the fund should make a decision about an investment.

First Chicago Method is a model whose name comes from the first VC fund to present this method. Its specification is based on building three development scenarios (positive, basic and negative), and assigning adequate probabilities for selected company's development scenarios [Achleitner, Lutz 2005]. The value of a company in each scenario consists of two parts, the first one is the value of current company at the moment of sale, and the second is the current value of cash flows until the moment of the planned sale transaction:

$$PV_i = \frac{TV_i}{(1+r)^h} + \sum_{t=1}^h \frac{CF_t^i}{(1+r)^t} \quad PV = \sum_{i=1}^3 p_i PV_i$$

- $i$  – scenario index,
- $h$  – time to exit,
- $PV$  – present value,
- $CF$  – cash flow in period  $t$ ,
- $TV$  – future value.

The advantage of the FCM over the VCM is the inclusion of the financial flows generated until company's selling period, and the establishment of a forecast containing 3 different scenarios for company's development. In comparison with the DCF model, the residual value is replaced by the expected divestment price, and this is in accordance with the VC investor's intentions. Taking into account the similarities between the VCM and the FCM, in relation to FCM it is possible to perform a modification by including the managing costs and success fee in line with the calculations for the mVCM.

The second group of models, described previously as the rules of thumb, is used by experienced investors for conducting valuation in a short time. When analyzing the literature, it is imperative to take notice of the scientific research concerning the key factors for the success of a new venture, which overlap the factors used in the models. Research conducted by Hill and Power [2001] points out the key factors for new venture success: quality of management – 4.5, size of the market – 3.8, product qualities – 3.7, rate of market growth – 3.5, competition – 3.5, barriers to entry – 3.4, company's stage of development – 3.2, industry that the company is in – 3.0.

On the other hand, the research conducted by Silva [2004] indicates that the key factor in investment decision-making is the managing team. The following crucial factors indicated in the research include the business idea, the growing potential and the competitive advantages. Similarly, the paper prepared by Dimov and Shepherd [2005] shows that a skilled managerial team in VC portfolio companies has a positive effect on the increase of its value.

Berkus Method was proposed as a simplified model for project valuation in their early stages of development. The method was successfully accepted into practice by many VC investors and business angels, as it allows for the seed type projects valuation. The calculation presented below was proposed by Dave Berkus for investment projects' valuation in the U.S. in 2009.

**Table 1.** Valuation of key success factors for seed-type projects via the Berkus Method

Factor	Add to Pre-money Valuation
Management Team Quality	Zero to \$ 500,000
Sound Idea	Zero to \$ 500,000
Working Prototype	Zero to \$ 500,000
Board of Directors Quality	Zero to \$ 500,000
Product Rollout or Sales	Zero to \$ 500,000

Source: Author's own study, based on Berkus Method.

According to the methodology accepted above, value of a pre-money investment project can range from 0 to USD 2,500,000 million. Person using the Berkus Method decides by themselves about the valuation each of the categories indicated above. This causes for the method to be implementable only by people, who possess knowledge about the functioning of the valued project. The other requirement for applying this method is experience in VC investments. Recently, the Berkus Method was proven useful for the Polish market [Gemzik-Salwach 2014].

Morbitzer Method, like the Berkus Method, is based on the VC fund's valuation of several key aspects influencing the chance of the project's success.

**Table 2.** Valuation of key success factors for seed-type projects via the Morbitzer Method

Factor	Add to Pre-money Valuation
Management Team Quality	Zero to EUR 1 million
Sound Idea	Zero to EUR 0.5 million
Working Prototype	Zero to EUR 0.5 million
Cooperation with a successful investor	Zero to EUR 0.5 million

Source: Author's own study, based on Morbitzer Method.

In reference to the Berkus model, a significant difference is in paying attention to the added value, which can be brought about by a known investor.

Scorecard Method (SM) is based on the comparison of the valued venture with other start-ups, recently financed by investors. The first step toward executing the SM valuation is market analysis and the calculation of pre-money value for other recent VC investments. Therefore, the value will be influenced by investment's location, as well as the current situation in the market. The next step is the evaluation of the venture in terms of the following factors:



**Table 3.** Valuation of key success factors for the seed-type projects via the Scorecard Method

Factor	Share in valuation
Managing team's strength	30%
Market size	25%
Product/technology	15%
Competition	10%
Marketing/sales/partners	10%
Demand for additional capital	5%
Others	5%

Source: Author's own study, based on Scorecard Method.

Knowing the factors and their influence on the valuation, we can move to estimating individual indicators, compared to other factors.

**Table 4.** An example of using the Scorecard Method

Factor	Weight	Estimation of selected company's attractiveness	Factor
Managing team's strength	30%	200%	0,6
Market size	25%	100%	0,25
Product/technology	15%	100%	0,15
Competition	10%	50%	0,05
Marketing/sales/partners	10%	50%	0,05
Demand for additional capital	5%	100%	0,05
Others	5%	0	0
Sum		1,25	

Source: Author's own study.

The last element of the valuation is the multiplication of an average transactional value and the sum of individual factors. For the selected example, the project's value would be  $1,25 \times \text{PLN } 700,000 = \text{PLN } 875,000^1$ .

The risk factor summation method includes 12 factors influencing the valuation: the board, the stage of company's development, the risk associated with acquiring capital, the risk associated with concessions, political risk, production risk, sales and marketing risk, competition, technology, the risk of disputes, international risk, reputational risk, the possibility of divestment. Valuation using this method is based

<sup>1</sup> The median of the transaction prices in the years 2013-2015 on a sample of 60 ventures in Poland was measured at the level of PLN 700,000.

on summing up the influence of each factor on the final company's valuation and adding the average start-up value in the given region. Every factor can assume the following values: -2, -1, 0, 1, 2 and this corresponds to the respective values, which should be considered during valuation: USD -500,000; USD -250,000; USD 0; USD 250,000; USD 500,000.

The rule of thirds presumes that an investor, when deciding to invest in a start-up, should take control over the 1/3 of the company's shares. There are two theories which explain this method. The first states that 1/3 of shares belongs to originators, 1/3 of shares belongs to the investor, and 1/3 should be reserved for the managerial options for the key employees. The second reason for this approach towards valuation is justified by the necessity of retaining the majority by originators in the context of the following rounds of financing: giving away more than 33% of the company in the first round can cause a situation, where every next potential investor can take the control over a company away from its originators, and this can negatively influence their commitment to work.

The method described above finds confirmation in the reasoning of Polish start-ups. In the group covering 120 investment projects analysed by the article's author in years 2014-2015, as an answer to the question: "What percentage of the company, are the originators willing to share in return for the capital expected by the company?", 87 start-ups, i.e. 72,5% of the surveyed firms, declare the possibility of giving away shares in the range of 30% to 35%.

### **3.2. Approach to valuation by the VC funds financed from public funds**

In this study, the investment projects realized by funds, managers' opinions and their investment policies were analysed with the use of survey. The survey involved conducting interviews with 22 people involved in making investment decisions in the case of 56 business. Valuations and investments were made between the years 2011-2014. The first surveyed aspect was the fund's approach towards investment projects' valuation. The analysis conducted considered 56 investments' valuation methods, which covered diverse business lines.

Taking into account the differences in business models of each sector's representatives, it was assumed that the project's valuation methods are dependent on selected line of business. The analysis of individual investments shows that project's valuation was in fact dependent on the approach of the chosen fund towards the valuation method. The chart presented below shows the quantity of using the individual valuation methods for estimating project's value. Funds decided to choose between 1 and 3 valuation methods.

Among the indicated models we find: the discounted cash flow model (DCF), multiplication models (MM), the VCM, and the Constructive Cost Model method (COCOMO).

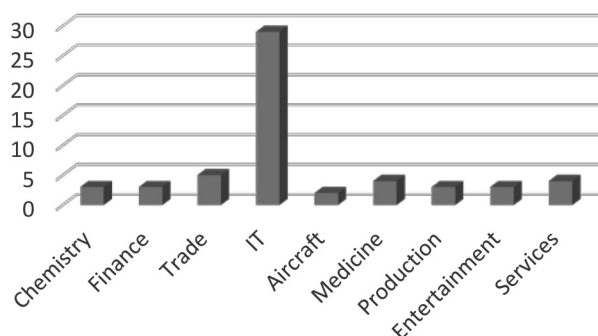


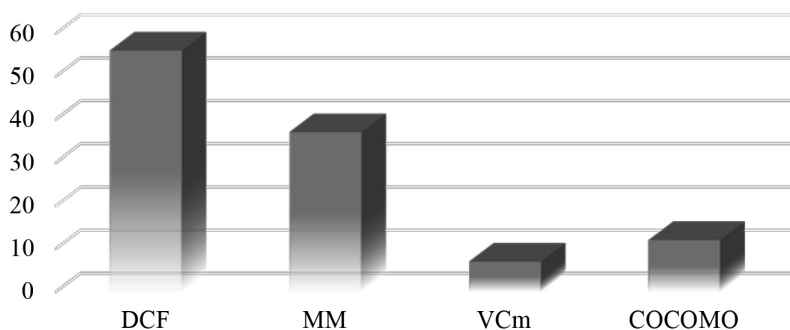
Figure 1. The number of companies per industry

Source: Author's own study.

**Table 5.** The number of valuation methods used for each investment

Number of valuation methods	Number of investments
1	12
2	32
3	12

Source: Author's own study.



**Figure 2.** The number of requests per model

Source: Author's own study.

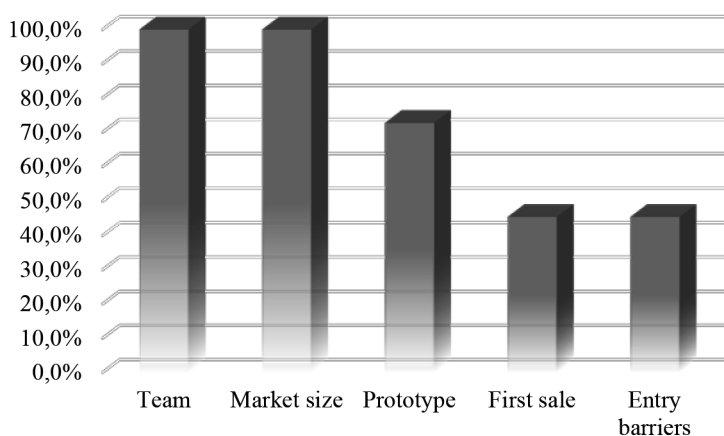
Taking into account the data presented above, we may notice that only in the case of 8 valuations, the method destined specifically for the needs of start-up projects' valuation was actually used.

The analysis of applications for financing under IEOP, allowed for the estimation of the expected return rate from investments by individual funds. Among the

applications analysed, 5 funds did not point to the expectations towards the return rate on investments. Six funds indicated values between 10% and 40% IRR per project. The median and the sample's average are both 22,5%. This departs from the values given in literature, where IRR for this kind of projects is at the level of 50% to 100%, depending on research [Sahlman, Scherlis 1987; Carver 2011; Sobańska-Herman, Sieradzan 2013].

The next part of the survey involved interviewing people responsible for making investment decisions in funds financed with public funds. The surveyed group consists of 22 people. To a question about maximal value of a seed-type project in Poland, 73% of the VC representatives indicated the value of 1 mln PLN, while 27% indicated 500,000 PLN as a value of PRE-money investment. This consistency of the answers comes unexpected, as the surveyed could point to any value from an unlimited range.

The next question adhered to pointing out key factors for the success of an investment, taken into consideration during decision-making about investments. The surveyed could point to between 1 and 5 factors as key factors. The result of the survey is shown by the figure below. The team's crucial influence on the success of a project coincides with results reported by others [Hill, Power 2001; Silva 2004; Sobańska-Herman, Sieradzan 2013].



**Figure 3.** Key factors for the success of an investment considered by VC investors

Source: Author's own study.

The last question considered the ability to verify the initial estimation of an expert with the valuation obtained using valuation models chosen by the fund. Thirty-six percent of the subjects surveyed stated that in the case of all projects realized, their initial estimation was in accordance with the valuation obtained by the valuation models. Sixty-four percent of the surveyed reckoned that in the case of 3 out of 4

of analysed projects, their initial valuation was in accordance with the valuation obtained based on the basis of precise valuation. These results show that managers who took part in the survey in fact may be using the rule of thumb, pointed to in Section 3.1., to estimate the value of the new venture.

### 3.3. The possibility of using selected valuation models by the analyzed funds

The analysis of indications managing VC IEOP pointed in Section 3.2, restrictions resulting from the program and the approach towards valuation, allows for adaptation of the methods described in the article to the funds' needs. Let us now focus on models based on the forecasted company valuation, due to a lack of rule of thumb implementation by chosen funds in their practice (figure 2).

In order to use VCM, FCM and their modifications, it is necessary to adapt the restrictions resulting from the IEOP rules, according to which an investor cannot take over more than 49,99% of the shares in the company. Under the assumption that the maximal period of an investment is 10 years, and the expected return rate is 22,5%, an investor spending EUR 200,000 can select projects, whose valuation after 10 years will be higher than EUR 3,043,800. Accordingly, the investors may be forced to give up on many projects, which might otherwise have brought them equally high return rates, however because of the necessity of taking over the majority in a company, they cannot be realized. A way to realize an investment, despite this restriction, is to obtain a co-investor for a project. The VCM modified for the needs of the VC IEOP projects presents itself in the following way:

$$POST = \frac{FV}{(1+r)^t}$$

$$PRE = POST - I$$

$$\text{if } I < PRE \text{ then share} = \frac{I}{POST}$$

$$\text{if } I \geq PRE \text{ then } I = I_{VC\ OPIE} + I_{co-investor} \text{ where } \frac{I_{VC\ OPIE}}{POST} < 50\%$$

VC IEOP must resign from investment in case not finding a co-investor.

Results presented in the table above indicate that the first investor would not decide on investing in the considered undertaking, due to the lack of possibility to achieve the presumed return rate. The second investor and the third one would be forced to look for a co-investor, who would decide on taking over no less than 41,9% and 12,1% of the company. The fourth and the fifth investor could invest on their own.

The implementation of the mVCM requires the calculation of the fund's functioning costs and the amount of additional success-dependent salary for the company's board. When analysing the data adhering to IEOP VC, we can notice

**Table 6.** Using the VCM in hypothetical funds

VC	1	2	3	4	5
Expected IRR	35%	30%	25%	20%	15%
FV	3,000,000 EUR				
t	10 years				
POST	149,205 EUR	217,614 EUR	322,123 EUR	484,517 EUR	741,554 EUR
I	200,000 EUR				
I/POST	134.0%	91.9%	62.1%	41.3%	27.0%

Source: Author's own study.

that none of them assumes the success fee for managing personnel in return for generating the determined rate of return. All of the indicated IEOP VCs have operational budgets.

Let us now subject funds 4 and 5 to further analysis. Operational budget for fund 4 is equal to 30% of the overall fund's value, while for fund 5 it's 7% of its value. According to the mVCM model, the overall investment cost for funds is, respectively:

$$KI_{Investor4} = \frac{100\%}{70\%} \times 200.000 \text{ EUR} = 285.714 \text{ EUR}$$

$$KI_{Investor5} = \frac{100\%}{93\%} \times 200.000 \text{ EUR} = 215.053 \text{ EUR}$$

The calculations above indicate, that the funds should acquire more shares in the companies in order with the VCM. For fund 4 this is 59% and this involves the necessity of finding a co-investor. Fund 5, in order to realize the expected return rate, should acquire 29% of shares in the newly established venture. The implementation of the mVCM increases the value of the shares that have to be taken over by a fund in order to realize its return rate.

Taking into consideration the FCM's construction, and the fact that all funds used the DCF model, it should be considered that funds possess the necessary knowledge for using this method. Additionally, FCM allows for the inclusion of the risk associated with the VC investments that should be included in the IRR for single investment, and which, in the case of the analysed funds, significantly diverges from the market conditions.

Returning to the example analysed above, with the assumption, that, during the investment period, the venture will be focused on its value and all cash-flows generated by the project will be invested in the subsequent development, we can assume the following:

$$PV_i = \frac{TV_i}{(1+r)^h} + \sum_{t=1}^h \frac{CF_t^i}{(1+r)^t} \quad \text{if } \sum_{t=1}^h \frac{CF_t^i}{(1+r)^t} = 0 \quad \text{than } PV_i = \frac{TV_i}{(1+r)^h}$$

If the project was well priced, we can assume that the valuation using the VCM should correspond to the valuation with FCM:

$$PV = \sum_{i=1}^3 p_i PV_i = POST = \frac{FV}{(1+r)^t}$$

The assumption of a lack of cash-flows from operating activities to the investor in the first 10 years from the establishment of the company is confirmed by companies such as Google, Amazon or Microsoft [Carver 2011]. With the assumption that the value of a company at the time of sale, as in the previous example, refers to a real variant, fund 3 forecasted company's valuation at the time of sale at EUR 9,000,000 in best-case scenario and 0 in worst-case scenario. The table below presents how, according to the presumed probabilities, the expected share of an investor would change.

**Table 7.** Using the FCM for Investor 4

Scenario	1	2	3	4	5
IRR	25%				
FV best-case	9,000,000 EUR				
FV mid-case	3,000,000 EUR				
FV worst-case	-				
P1 best-case	10%	20%	25%	30%	40%
p2 mid-case	70%	60%	50%	50%	50%
p3 worst-case	20%	20%	25%	20%	10%
t	10 years				
PV	322,123 EUR	386,547 EUR	402,653 EUR	450,972 EUR	547,608 EUR
I	200,000 EUR				
I/PV	62.1%	51.7%	49.7%	44.3%	36.5%

Source: Author's own study.

The first variant corresponds to the valuation obtained using the VCM. The next variants of valuation, in conjunction with other parameters concerning the probability of individual scenarios' realization, change in a way, which allows for the realization of an investment without a co-investor in the case of scenarios 3 to 5. The implementation of the FCM allows for the inclusion of a greater amount of variables influencing company's valuation. However, the example given above shows that its usage and of the high degree of flexibility in selecting the parameters, may lead to situations, where the managing personnel would pick model's parameters according to valuation presumed in advance.

Taking into account the similarities between the VCM and the FCM, it is possible to modify the FCM correspondingly as the VCM into mVCM. With the lack of bonus for the managing personnel in return for achieving the pre-determined return rate, it is necessary to take notice of the costs of fund's functioning, which consist in 30% of the managing resources.

$$KI_{Investor3} = \frac{100\%}{70\%} \times 200.000 \text{ EUR} = 285.714 \text{ EUR}$$

Taking into account the above calculations, in order for the fund to reach the expected return rate, after including the functioning costs, it should take respectively: in S1 = 88,7%, S2 = 73,9%, S3 = 71%, S4 = 63,4%, S5 = 52,2%. This causes the necessity of acquiring a co-investor for a project in all of the presumed scenarios.

#### 4. Conclusion

The analysis of the approach towards valuation by funds financed with public funds allows for the following conclusions. The first one is the dependence of the selected investment project's valuation model on the executor, and not on the business model. The reason for this state of things is the need to unify the decision-making process of the analysed funds. Thanks to the implementation of the same valuation models in different projects, the managing team has equal decision-making criteria.

The second observation adheres to the vast popularity of the DCF method, which was used in all of the valuations. This may be explained with the popularity and the recognition of the method. It is important to remember that when it comes to the functioning of the VC funds, teams that manage the funds need to obtain Polish Agency for Enterprise Development's permission for making an investment. The asymmetry of information leads to the solution, in which the VC managers actually use the valuation model known to their superiors.

A crucial observation may also be the lack of declaring the return rate expected of the realized investments at the stage of providing application documentation by some of the funds. The possibility of the IRR selection for each project without having a minimal value may lead to a situation, in which the VC managers would be able to manipulate the valuation models by accepting the IRR below the market standards. Average declared rate of return from the analyzed funds was 22,5% which is way below the market standards of 50% to 100% [Sahlman, Scherlis 1987; Carver 2011; Sobańska-Herman, Sieradzan 2013].

The surveys conducted on the managers indicated a high certainty when it comes to the convergence of the company's initial valuation with the final valuation by experienced managers. This confirms the possession of knowledge sufficient for the decision-making, based on rule of thumb. On the other hand, the research made by A. Gemzik-Salwach [2014], confirms that the Berkus Method can be applied on the Polish market.



The surveys conducted confirmed, in accordance with the quoted literature [Hill, Power 2001; Silva 2004; Dimov, Shepherd 2005], that people are of the greatest value in the new venture.

In the article, the VCM [Sahlman, Scherlis 1987] and the FCM [Achleitner, Lutz, 2005] were also adjusted to valuation of projects financed with public funds on the basis of the rules determined in the Section 2.3. It was also indicated that the analysed restriction may cause many investment projects to be dismissed, despite reaching the return rate presumed by the relevant fund. In the case of both methods, the rule is to make an investment with a co-investor, who would decide on investment based on the rules equal to IEOP. This extends the investment process and can make further managing of an investment difficult. Considering how the VCM was modified by Metrick and Yasuda [2011], here it was proposed to modify the FCM in the same way.

Due to the group's homogeneity, despite its small size, surveys show some dependencies, which have to be confirmed by conducting surveys on subsequent subjects. However, taking into consideration large confidentiality of the data, and reluctance in sharing the possessed know-how, this may prove difficult. The sample should be surveyed after divestments, which would allow for the ex-post analysis.

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