



Universitatea
Transilvania
din Braşov

INTERDISCIPLINARY DOCTORAL SCHOOL

Faculty of Technological Engineering and Industrial Management

Eugen-Silviu VRĂJITORU

Alternative financing opportunities adapted with entrepreneurial strategies in the context of Industry 4.0

SUMMARY

Scientific supervisor

Prof.PhD.Eng.Ec. Mircea BOŞCOIANU

BRAŞOV, 2023

Contents

Introduction	3
Chapter 1 – The financial management of modern technological SMEs as well as the active management of industrial project portfolios	5
Chapter 2– Integration of option games in the investment decisions of technological firms.....	9
Chapter 3 – Analysis of the strategic implications of the Industry 4.0 transformation	18
Chapter 4 – Applied research specific to investments in technology companies	20
Chapter 5 – Strategic perspectives.....	28
Chapter 6 - Final conclusions, original contributions, dissemination of results, future research directions	30
Bibliography.....	38

Introduction

This paper aims to deepen the intercorrelations between investors, entrepreneurs and investment fund managers for choosing an advantageous financing option on the basis of which a successful entrepreneurial strategy can be formulated for technological SMEs in the context of Industry 4.0. This is because, nowadays, any SME to establish itself or develop requires financial investment.

The main objectives pursued in this thesis are:

- knowledge of the different possible financing options for modern technological companies;
- knowledge of successful methods regarding the positioning-repositioning of a technological investment project within a portfolio of industrial projects, taking into account the internal and external factors that can influence these complex efforts;
- understanding how to evaluate the performance (expected return) of a financial asset as a supporting element of technological investment projects;
- determining the specific timing (opportune moments to make an investment in an element within a portfolio of industrial projects) taking into account the internal and external factors that can influence this aspect;
- understanding the impact of technological evolution and entrepreneurial innovation in the context of Industry 4.0 on the evolution dynamics of companies;
- understanding the attitudes, behaviors and opinions of investors, entrepreneurs and investment fund managers in Romania;
- understanding the complex relationships between investors, entrepreneurs and investment fund managers in Romania;
- formulation of a financing strategy for technological entrepreneurial businesses in the context of Industry 4.0.

To fulfill the objectives of this work, the doctoral thesis is divided into six chapters.

In the first chapter entitled „The financial management of modern technological SMEs as well as the active management of industrial project portfolios” the possible future financing options of technological SMEs in the context of Industry 4.0 are presented. Also, this chapter addresses both the issue of positioning-repositioning a project (defined in the extended sense, of the vision in which the company and its strategies are configured based on a continuous flow of projects) within a portfolio of industrial projects, as well as the issue of forecasting the expected return of a financial asset. For this, the current and real context governed by the multiple crises (medical and macroeconomic), as well as the war in Ukraine, is taken into account.

The second chapter named „Integration of option games in the investment decisions of technological firms” continues the paper by addressing the issue of choosing the moment to make an investment in a project within a portfolio of industrial projects.

The work continues, with the third chapter entitled „Analysis of the strategic implications of the Industry 4.0 transformation”, addressing the current issue of technological SMEs in the context of Industry 4.0. starting from the industrial revolutions and those of the industrial internet, as well as from the other types of revolutions that overlap with the four industrial revolutions, respectively: energy, environment, financial technologies, manufacturing production, as well as transport, travel and tourism.

The most developed section of the work is represented by the fourth chapter entitled „Applied research specific to investments in technological companies”, in which three quantitative researches are developed to understand the attitudes, behaviors and opinions of investors, entrepreneurs and investment fund managers in Romania . This research was carried out online and the results were the starting point for choosing an efficient and adaptable financing strategy for technology SMEs in the context of Industry 4.0, taking into account the current context (high inflation, war, post-pandemic period).

In the fifth chapter of the work entitled „Strategic Perspectives” the results obtained, following the completion of the three quantitative researches, are analyzed in a Brainstorming session and an advantageous financing option for SMEs is chosen through a multi-criteria analysis on the basis on which to build a successful entrepreneurial strategy in the context of Industry 4.0.

The last chapter of the work, namely chapter six, includes the final conclusions, personal contributions, ways of disseminating the research results and future research directions.

This doctoral thesis contains a number of 186 bibliographic sources, 71 figures and 25 tables.

In this work, as a research methodology, we start from a critical analysis, deciphering the branches of literature from the areas of interest of the thesis (analysis of the performance of financial assets; active/passive management of portfolios), studying many articles and books found in both physical and electronic formats. It should be noted, that there is a possibility that not all existing and previously published articles in this field have been found to discuss them in this work. At the same time, within this work, in chapter four, three quantitative researches are carried out, the data of which are collected with the help of three questionnaires applying the Computer Assisted Web Interviewing (CAWI) method. Research is conducted on the Internet, questionnaires are uploaded online, and respondents complete the questionnaires directly in the browser.

This PhD thesis is the result of three years of research. The preparation of this work could not have been achieved without the permanent guidance provided by the scientific leader, Prof. PhD. Eng. PhD. Ec. Mircea Boşcoianu, who supported me during the preparation of my doctoral thesis.

I also want to thank Prof. PhD. Eng. Gavrilă Calefariu who guided me during doctoral school and whom I admired for combining engineering elements with other fields.

At the same time, I want to thank Prof. PhD. Eng. Tudor Deaconescu, who guided me during the period 2020 – 2023, suggesting many good ideas in the research activity.

Last but not least, I would like to thank Conf. PhD. Ec. Eng. Flavius Aurelian Sârbu who guided me during doctoral school and whom I admired for his involvement.

Along with the nominees, I would like to thank the entire team of the Faculty of Technological Engineering and Industrial Management, the Faculty of Economic Sciences and Business Administration and the Faculty of Psychology and Educational Sciences at the Transilvania University in Braşov, for all the support I had during of the bachelor's, master's and doctorate cycle, respectively of the postgraduate psycho-pedagogy course level 1 and 2.

Chapter 1 – The financial management of modern technological SMEs as well as the active management of industrial project portfolios

This chapter presents:

- possible financing options for modern technological SMEs in the context of Industry 4.0;
- positioning-repositioning models of a project within a portfolio of projects;
- models for forecasting the expected return of a financial asset within a portfolio of projects.

The main possible future financing options for technology SMEs may be new equity issues and loan contractions. The financing of the company's activity by issuing new shares is carried out following their purchase by investors, and the financing of the company's activity by obtaining loans can be carried out by issuing corporate bonds and/or by contracting tangible bank loans.

Other financing options can be obtained by SMEs as follows:

- using online platforms and calling on groups of people (investors) to receive funding to develop their business. These people can finance the company with the desired amount, in the order of 1 Euro. This financing technique is known as crowdfunding;
- contracting a loan from an investment fund. This loan along with the interest charged must be repaid in full and at the term of the investment fund, otherwise there is an option for the outstanding debt to be converted into the shares of the borrowed company. In general, this loan has a repayment term of 5-8 years, thus representing a long-term loan. This financing technique is known as mezzanine financing;
- selling shares to an investment fund in order to get money to grow. This financing technique is known as private equity;
- selling shares to an investment fund in order to get money to start the business. This financing technique is known as venture capital;
- selling shares to a share fund;
- selling corporate bonds to a bond fund;
- selling shares and/or bonds to a mutual fund;
- selling shares or contracting loans from a hedge fund in order to obtain money to develop.

A permanent problem within companies is that of an effective position-repositioning of a project within a portfolio of projects. Starting from this reality in the last decades there were several position-reposition models, which will be developed by project portfolio managers, such as: „The model proposed by Guy Serraf“, „SWOT analysis“, „Boston Consulting Group (BCG) Matrix“, „General Electric – Mc Kinsey Matrix“, „Royal Dutch-Shell Matrix“, „Arthur D. Little Matrix“, „Hofer Matrix“, „Porter Model“ and „Tomato Garden Analogy“.

Another problem within firms is to forecast the expected return on a financial asset. Thus, models have been developed that highlight the market and asset-specific risk (non-diversifiable), which will be risks of project portfolio managers, such as: „CAPM Model (Capital Asset Pricing Model)“ and „Fama-French Model with three factors“.

Also, within this chapter, an economic-financial analysis is carried out for technological companies. I consider it effective to make this application within this chapter because:

- a) company shareholders must always know the economic and financial situation of the companies in which they own shares in order to decide whether the company in question can continue to develop in

its current form or must look for possible future financing options that derive from issues of new actions or contracting of loans (issues of bonds, bank credits). Also, this application is also useful for future potential investors because they too must be aware of the economic - financial situation of the companies in which they are going to invest their money;

b) shareholders and future potential investors must know if the market values of existing financial assets at companies are undervalued or overvalued in relation to the amounts that should be spent to replace those financial assets.

Within this application, point a), the situation of three companies (Visual Fan S.A., Arobs Transilvania Software S.A. and Agroland Business System S.A.) is analyzed from an economic-financial point of view for the period 2019-2021. For this, the balance sheets of the three companies for the years 2019-2021 are taken from the website of the Ministry of Finance, whose values are updated to the prices of 2021, taking into account the inflation recorded in 2019, respectively in 2020. Thus, the prices of the year 2019 are updated to the prices of the year 2021 by multiplying, in part, the existing amount next to each indicator in the balance sheet related to the year 2019 by $[1 + (\text{the inflation rate related to the year 2019}/100)]$ and by $[1 + (\text{the related inflation rate of the year 2020}/100)]$, and the prices of the year 2020 are updated to the prices of the year 2021 by multiplying, in part, the existing amount next to each indicator in the balance sheet for the year 2020 by $[1 + (\text{the inflation rate for the year 2020}/100)]$. The amounts found on the balance sheet in 2021 will remain the same. The inflation rate in 2019 is 3,83% and in 2020 it is 2,63%.

Next, in this summary, only the economic-financial analysis carried out on the company Visual Fan S.A. is presented.

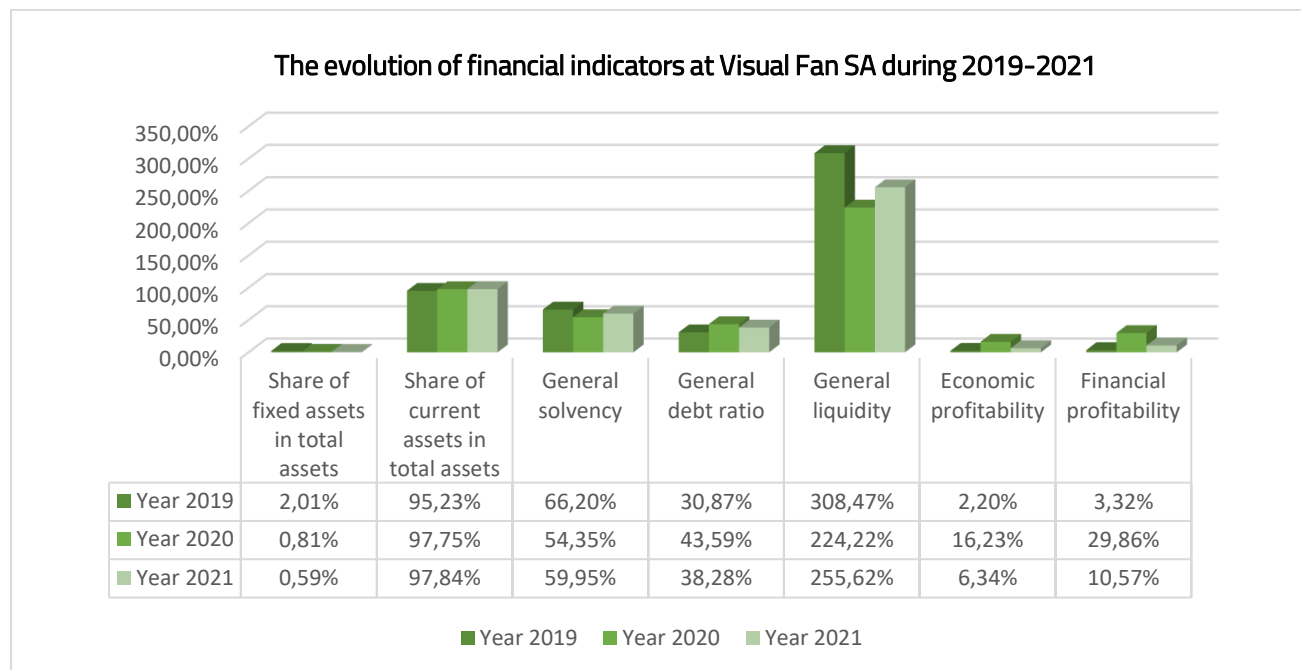


Figure no. 1. - The evolution of financial indicators at Visual Fan S.A. in the period 2019 -2021

(at 2021 prices)			
Formula	Year 2019	An 2020	An 2021
Net situation = Total Assets - Total debt	61.934.210,32	83.462.722,68	81.901.110,00

Table no. 1. - The net situation of the company Visual Fan S.A. in the period 2019-2021

Following the calculation of the asset structure indicators at Visual Fan S.A. it was found that the share of fixed assets in total assets decreased in 2021 by 0,22 percentage points compared to 2020 and by 1,42 percentage points compared to 2019, and the share of current assets in total assets increased in 2021 by 0,09 percentage points compared to 2020 and 2,61 percentage points compared to 2019.

Also, following the calculation of the structure indicators of the liability at the Visual Fan S.A. company it was found that in 2021 compared to 2020 the general solvency is increasing and general debt ratio is decreasing, which means that the company's debts are decreasing and the value of its own financing sources is increasing.

At the same time, following the calculation of the liquidity indicator at Visual Fan S.A. it was found that in none of the analyzed years does the general liquidity fall within the optimal level of 180-200%, being higher (so the level of current assets is very high).

Moreover, following the calculation of profitability indicators, at Visual Fan S.A., it was found that in 2020 compared to 2019, the company's profitability increases, after which it decreases again in 2021.

Also, following the calculation of the net situation at Visual Fan S.A. it was found to be higher in 2021 compared to 2019, but lower compared to 2020.

Within this application, point b), it is analyzed whether the market values of the existing financial assets of the companies are undervalued or overvalued in relation to the amounts that should be spent to replace those financial assets using the Tobin Q indicator. This analysis is carried out on three companies (Microsoft Corp., Tesla Inc., Apple Inc.) following the period 2018 – 2022. As a first stage of work in this analysis, the Q Tobin financial indicator is defined and its rules are presented. It continues with a second stage, in which on 22.02.2023, the Q Tobin indicator related to the three companies is graphically edited on the website <https://www.tradingview.com>. In the last stage, the analyzed indicator is interpreted by comparing the graphs related to the three analyzed companies, resulting from their editing.

Q Tobin

This is a financial indicator and represents the ratio between the market value of the existing financial asset at the company and the amount that should be spent to replace that asset.

About this indicator it can be stated that:

- the market value of the financial asset existing at the company is overvalued when its market value is greater than the amount that should be spent to replace it. Then Tobin's Q factor > 1 , and the company has a competitive advantage (supply increases; demand decreases);
- the market value of the existing financial asset at the company is undervalued when its market value is lower than the amount that should be spent to replace it. Then Tobin's Q factor < 1 , and the company is at a competitive disadvantage (supply falls; demand rises);

- there is equilibrium in the market when the market value of the existing financial asset is identical to the amount that should be spent to replace it. Then Tobin's Q factor = 1.

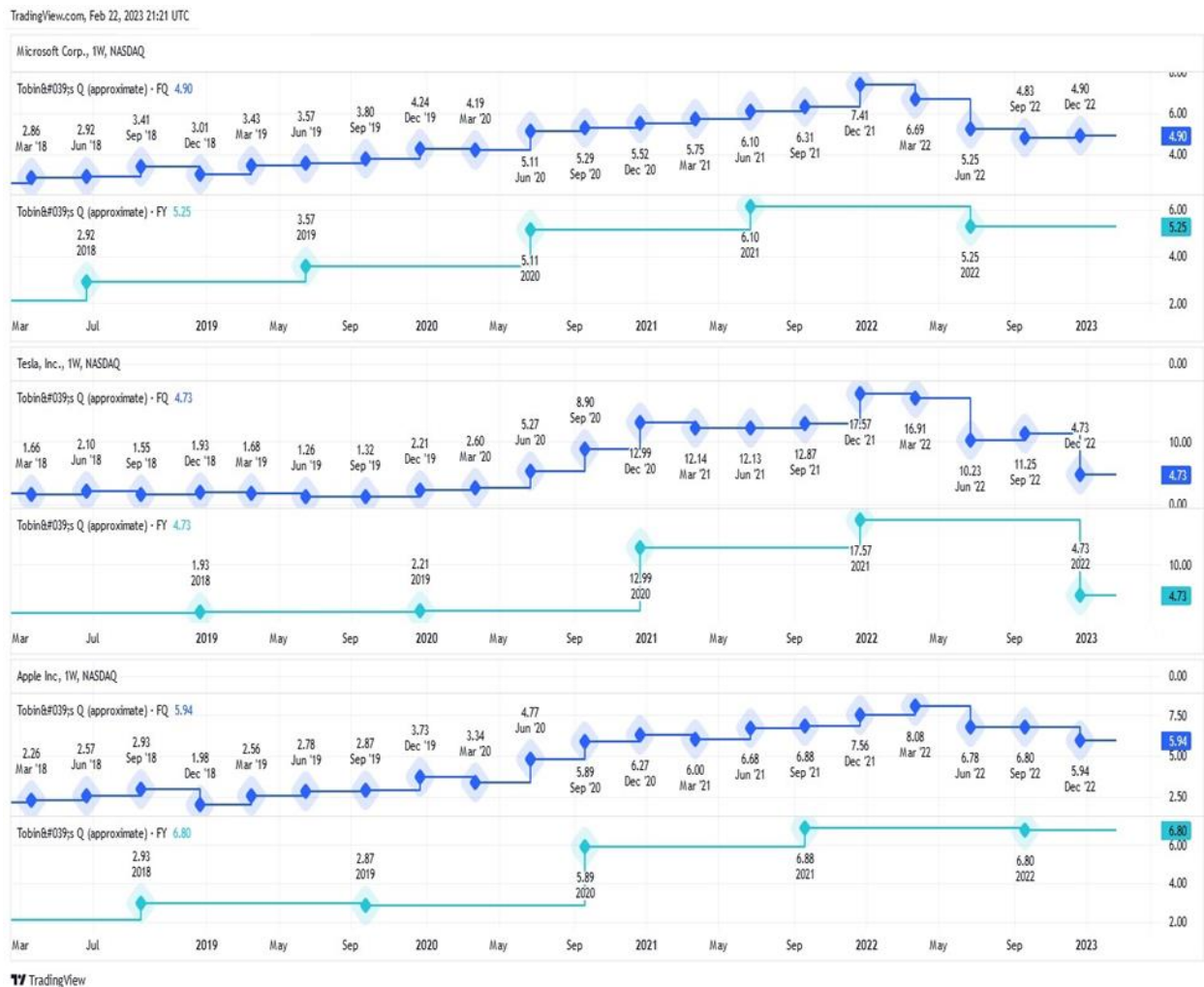


Figure no. 2. - Graphic representation of the Tobin Q indicator related to the period 2018 – 2022 for Microsoft Corp., Tesla Inc., Apple Inc.

(Source: Edited on 22.02.2023 on <https://www.tradingview.com>)

Figure no. 2. highlights the graphic representation of the Q Tobin indicator related to the period 2018 – 2022 for the companies Microsoft Corp., Tesla Inc. and Apple Inc. Analyzing this indicator for the three previously mentioned companies, it is found that always, in the studied period, the Tobin Q factor has a value greater than 1. This shows that the market values of the existing financial assets of all three companies are overvalued because they are always greater than the amounts that would have to be spent to replace these assets. Thus it can be concluded that all three companies analyzed in the period 2018-2022 have a competitive advantage, because within these companies the offer for sale of these financial assets increases while the demand for the purchase of these assets decreases.

These economic-financial analyzes are an example of good practices for all shareholders and investors who want to know the financial situation of a company.

Chapter 2– Integration of option games in the investment decisions of technological firms

This chapter presents:

- the theoretical bases of „Game Theory“;
- theoretical models for determining the possible strategies that can be adopted in games with two players played in a single stage;
 - theoretical models for determining the possible strategies that can be adopted in two-player games conducted in two stages;
 - theoretical models for determining the most favorable moment in games (with sequential move) to make investments;
 - a theoretical model for determining the possible strategies that can be adopted within the games depending on the type of technology used.

To accurately understand „Game Theory“ take into account: the general rules of games (i.e. by: existing players, the order of the game, the strategies and information that exist and the reward given according to each possible obtainable), possible ways of solving games (according to Dixit and Nalebuff these can be: finding the dominant strategy, eliminating the dominant strategy, finding the Nash equilibrium in pure strategies, finding the Nash equilibrium in mixed strategies, using the results derived from using previous strategies for solving sequential games, finding a sub-game for perfect balance and adding another rule) and the taxonomy of base games („Prisoner's Dilemma“, „Grab the Dollar“, „Burning the Bridge“, „Spikes Market“ and „Battle of the Sexes“).

In order to choose the strategies that can be applied by the players in a game with two players, various theoretical models have been developed depending on the number of stages in which the respective game can be played. Thus, for games played in one stage, the best-known models are: „Cournot model of quantitative competition“ (the price is influenced by market demand) and „Bertrand price competition model“, and for games played in two stages, Fudenberg and Tirole created, in 1984, a model in which they state that the reaction of the competing player depends on: the type of investment strategy adopted and the hardness or adaptability of the investment strategies adopted.

A permanent problem faced by players in the games is that of choosing the most favorable time to make investments. Starting from this reality, several theoretical models have been developed in recent decades, such as: „Pindyck's model“ (1988 - when to make an investment knowing that market demand is uncertain), „Kulatilaka and Perotti's model“ (1998 – when to make an investment knowing that there is imperfect competition in the market), „Folta and O'Brien's Model“ (2004 – when to make an investment to determine the timing of market entry) and „The Model of Lin and Kulatilaka“ (2007 – when to invest considering consumer expectations).

Depending on the type of technology used and the amount of money invested in an enterprise, Grenadier and Weiss classify the strategies that can be adopted by players as follows:

The strategy adopted	Description of the strategy
Compulsive	The player currently uses and invests in current technology, but will also use and invest in future technology as it emerges

Buy and hold	The player uses and invests in current technology, but will refuse to use and invest in future technology when it appears
Laggard	The player will use and invest in the current technology only after the future technology appears
Leapfrog	The player refuses to use and invest in current technology, but will use and invest in future technology as it becomes available
Spectator	The player refuses to use and invest in both current and future technology

Table no. 2. - Classification of strategies according to Grenadier and Weiss

Also, within this chapter, two applications are made.

The first application concerns the balancing mechanisms of supply and demand in the capital market. I consider it effective to make this application within this chapter because when you want to make an investment in a project (financial asset) you have to take into account the market demand for the respective product (financial asset). It is also known that the price of a product (financial asset) always influences the demand and supply for that product (financial asset).

In this application, three models of balancing demand and supply on the capital market are theoretically presented („Kaldor Model“, „Kaldor Model with rational anticipations“ and „Kaldor Model with Goodwin-type price anticipation“), which are exemplified by calculating price trajectory for each individual model. Then the evolution of prices in the moments T-2, T-1 and T is graphically represented for each individual model. After that, the graphical trajectory of the prices related to each individual model is compared with the graphical trajectory of the price of a financial asset from 12.05.2022 from three different companies. At the end, the following hypothesis is verified: „Is the choice of the moment to make an investment in a project (financial asset) influenced by the price of the respective product?“.

Graphical representation of the three exemplified models following the calculation of the price trajectory for each individual model

Evolution over time	PT-2	PT-1	PT
The Kaldor model	28,24	23,20	26,00
The Kaldor model for t	-2,00	-1,00	0,00
The Kaldor model with rational anticipations	100,00	-56,25	25,00
The Kaldor model with rational anticipations for z	0,10	0,20	0,30
The Kaldor model with Goodwin-type price anticipation	20,00	26,00	20,28
The Kaldor model with Goodwin-type price anticipation for v			1,25

Table no. 3. - The evolution over time of the prices related to the three exemplified models respectively: the Kaldor Model, the Kaldor Model with rational anticipations and the Kaldor Model with Goodwin-type price anticipation

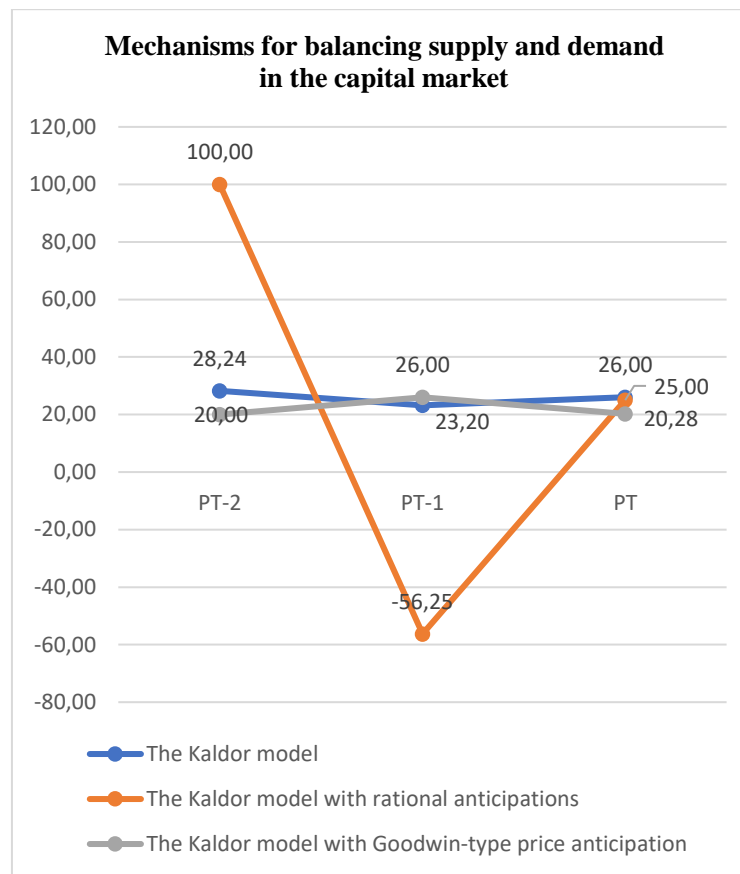


Figure no. 3 - The evolution over time of the prices related to the three exemplified models, respectively: the Kaldor Model, the Kaldor Model with rational anticipations and the Kaldor Model with Goodwin-type price anticipation

Comparison of the graphic trajectory of the prices related to the three models of balancing supply and demand on the capital market with the graphic trajectory of the prices of 12.05.2022 from three companies

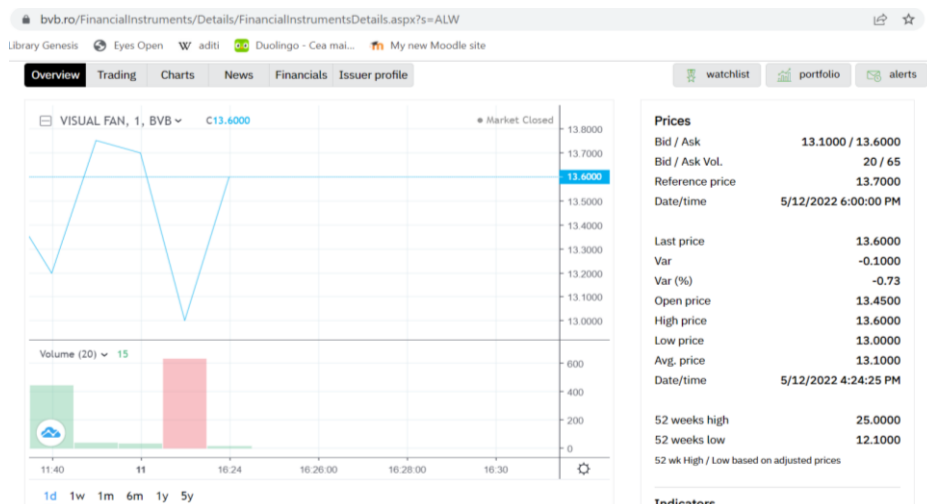


Figure no. 4. - Price evolution on 12.05.2022 at Visual Fan S.A.

(Source: <https://bvb.ro/FinancialInstruments/Details/FinancialInstrumentsDetails.aspx?s=ALW>)

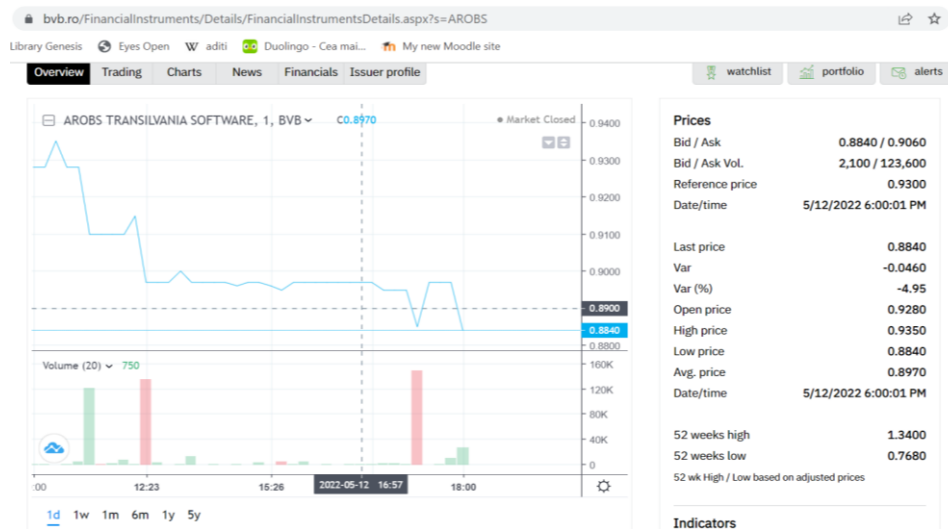


Figure no. 5. – Price evolution on 12.05.2022 at Arobs Transilvania Software S.A.

(Source: <https://bvb.ro/FinancialInstruments/Details/FinancialInstrumentsDetails.aspx?s=AROBS>)

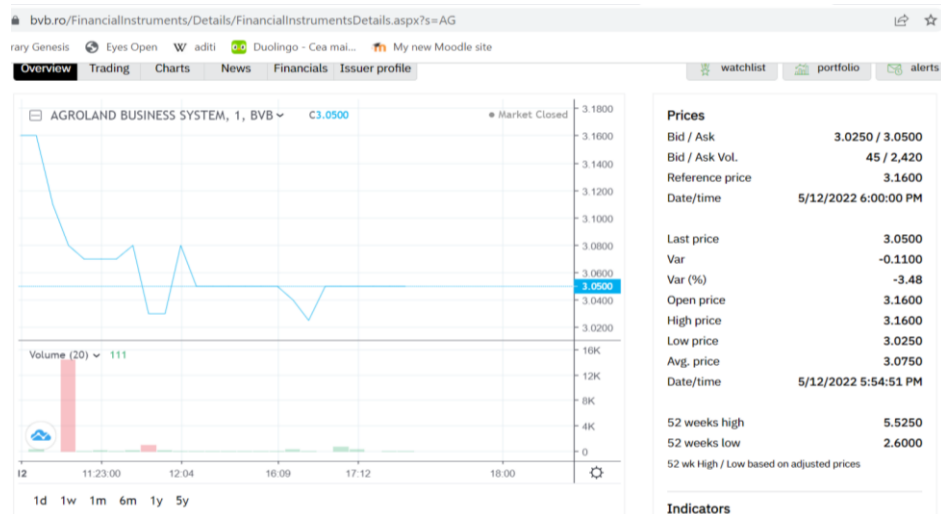


Figure no. 6. – Price evolution on 12.05.2022 at Agroland Business System S.A.

(Source: <https://bvb.ro/FinancialInstruments/Details/FinancialInstrumentsDetails.aspx?s=AG>)

Interpretations

The Kaldor model is that model in which the price trajectory is as follows: it falls slightly from time T-2 to time T-1, after which at time T it rises almost to the level from where it started to fall at time T-2. This price trajectory can be found on 12.05.2022 at Arobs Transilvania Software S.A. in the moments: T2 → 15:00; T-1 → 15:28 and T → 15:56.

In this case, the following hypotheses are confirmed:

- the prices of the current period (T) influence the demand in the sense in which the price is increasing, the demand is decreasing;

- the prices of the previous period (T-1) influence the supply of the current period (T) in the sense that the supply of the current period is increasing when the price of the previous period is low;
- the prices related to each period is established by the capital market, taking into account the existing deviation between demand and supply.

The Kaldor model with rational anticipations is that model in which the price path is as follows: it falls sharply from time T-2 to time T-1, after which it rises sharply at time T. This price path is found on 12.05.2022 at:

- Visual Fan S.A. at the times: T-2 → 11:00; T-1 → 13:42 and T → 16:24;
- Arobs Transilvania Software S.A at the times: T-2 → 17:30; T-1 → 17:44 and T → 17:45;
- Agroland Business System S.A. at the moment: T-2 → 16:09; T-1 → 16:27 and T → 16:36.

In this case, the following assumptions are confirmed:

- the prices of the current period (T) influence the demand in the sense in which the price is increasing, the demand is decreasing;
- the prices of the current period (T) will be the expected price on the capital market at the time of making the offer only if a contract will be concluded at the moment, which will be executed at the time of making the offer, at the time agreed by the parties;
- the prices related to each period is established by the capital market, taking into account the existing deviation between demand and supply.

The Kaldor model with Goodwin-type price anticipation is that model in which the price trajectory is as follows: it rises slightly from time T-2 to time T-1, after which at time T it falls almost to the level from which it started to rise at time T-2. This price trajectory can be found on 12.05.2022 at Arobs Transilvania Software S.A. in the moments: T-2 → 12:23; T-1 → 13:41 and T → 14:59.

In this case, the following hypotheses are confirmed:

- the prices of the current period (T) influence the demand in the sense in which the price is decreasing, the demand is increasing;
- the prices of the previous period (T-1) influence the supply of the current period (T) in the sense that the supply of the current period is decreasing when the price of the previous period is high;
- the prices related to each period is established by the capital market, taking into account the existing deviation between demand and supply.

Following the results obtained from the comparisons presented above, the hypothesis can be validated that the choice of when to make an investment in a project (financial asset) is influenced by the price of the respective product (financial asset) because, in all three demand balancing models and the market offer presented in this chapter, the following can be observed:

- the increase in the price of a product (financial asset) influences both the demand and the supply for the respective product (financial asset), in the sense that the demand will decrease and the supply will increase, so the option to invest in the product (financial asset) respectively, it is postponed until the moment when the price of that product (financial asset) will decrease simultaneously with the increase in demand for that product (financial asset);

- the decrease in the price of a product (financial asset) influences both the demand and the supply for the respective product (financial asset), in the sense that the demand will increase and the supply will decrease, so this is the moment when the option to invest in the respective product (financial asset).

The second application of this chapter concerns the performance of technical analysis for technology firms. He considers it effective to make applications within this chapter, because investors must always know the favorable moment to buy or sell a financial asset. Thus, within these applications, a technical analysis is carried out to measure the level of market volatility and to anticipate the evolution of the prices of some financial assets from three companies (Visual Fan S.A.; Arobs Transilvania Software S.A.; Agroland Business System S.A.). This application is made in three stages. In the first stage, the three indicators („Bollinger Bands”, „Double Bollinger Band” and „Moving Average Convergence Divergence (MACD)”) are defined and their rules are presented. In the second stage, on 21.01.2023, respectively on 31.01.2023, the graphs of the three indicators related to the three companies are edited on the website <https://www.tradingview.com>. In the last stage, the analyzed indicators are interpreted by comparing the graphs related to the three analyzed companies, resulting from their editing.



Figure no. 7. - Graphic representation of the Bollinger Bands and Double Bollinger Band indicators for the period 01.01.2023 – 20.01.2023 for Visual Fan S.A., Arobs Transilvania Software S.A. and Agroland Business System S.A.

(Source: Edited on 21.01.2023 on <https://www.tradingview.com>)



Figure no. 8. - Graphic representation of the Moving Average Convergence Divergence indicator related to the period 01.11.2022 – 30.01.2023 for Visual Fan S.A., Arobs Transilvania Software S.A. and Agroland Business System S.A.

(Source: Edited on 31.01.2023 on <https://www.tradingview.com>)

Interpretations

Figure no. 7. indicates the graphic representation of the Bollinger Bands and Double Bollinger Band indicators for the period 01.01.2023 – 20.01.2023 for the companies: Visual Fan S.A., Arobs Transilvania Software S.A. and Agroland Business System S.A.

The following notations appear within this figure:

- M – the central band (line), representing the simple moving average;
- B2 – the lower band (line) related to the Bollinger Bands indicator;
- B1 – upper band (line) related to the Bollinger Bands indicator;
- D2 – the lower band (line) related to the Double Bollinger Band indicator;

- D1 – upper band (line) related to the Double Bollinger Band indicator.

Analyzing the Bollinger Bands indicator for the three previously mentioned companies, it can be seen that on 20.01.2023 the highest market volatility has Visual Fan S.A. trading its assets at prices between 8,90 lei (related to the lower band (line) – B2) and 9,91 lei (related to the upper band (line) – B1), with a difference of 1,01 lei between the two prices. Also, on the same date, it was found that Arobs Transilvania Software S.A. has the lowest market volatility trading its assets at prices between 0,922 lei (related to the lower band (line) – B2) and 0,942 lei (related to the upper band (line) – B1), with a difference of 0,020 lei.

At the same time, analyzing this indicator, it can be seen that the volatility of the market, during the examined period, had a variable trend in all three evaluated companies. Thus, we can state that:

- the highest levels of asset volatility are recorded at:
 - Visual Fan S.A. during the period 01.01.2022 – 05.01.2022;
 - Arobs Transilvania Software S.A. in the periods 01.01.2023 – 05.01.2023 and 15.01.2023 – 20.01.2023;
 - Agroland Business System S.A. in the periods 01.01.2023 – 06.01.2023 and 19.01.2023 – 20.01.2023;
- the lowest levels of asset volatility are recorded at:
 - Visual Fan S.A. during the period 16.01.2023 – 18.01.2023;
 - Arobs Transilvania Software S.A. during the period 06.01.2023 – 14.01.2023;
 - Agroland Business System S.A. in the periods 06.01.2023 – 07.01.2023 and 16.01.2023 – 18.01.2023.

Analyzing the Bollinger Bands indicator in combination with the Double Bollinger Band indicator we can conclude that for the most part in all three companies examined, the prices of its assets are found in the neutral zone (D1 – D2) and in the selling zone (D2 – B2). Thus, it can be stated that investors should not trade assets whose prices are in the neutral zone (D1 – D2) and wait to see in which direction the prices of these assets will evolve, towards the buying zone (B1 – D1) or towards sales area (D2 – B2). Assets whose prices have reached the selling zone (D2 – B2) should be sold by investors because there is a possibility that the prices of these assets will have to continue a downward trend thus, it can be argued that the assets of the companies examined at the end of the period under review should be sold. At Arobs Transilvania Software S.A. in the period 01.01.2023 – 05.01.2023, respectively on 07.01.2023 and at Agroland Business System S.A. in the period 10.01.2023 – 12.01.2023 asset prices are in the buy zone (B1 – D1) which means that they should be purchased by investors because there is a possibility that the price of these assets will continue to have an upward trend. In reality, however, the price of these assets fell in a very short time, leaving the buy zone (B1 – D1).

Figure no. 2.11. indicates the graphic representation of the Moving Average Convergence Divergence indicator related to the period 01.11.2022 – 30.01.2023 for the companies: Visual Fan S.A., Arobs Transilvania Software S.A. and Agroland Business System S.A.

Within this figure we have:

- the blue Moving Average Convergence Divergence line;
- orange signal line;

- line 0, being the line on which the histogram is drawn.

Analyzing the Moving Average Convergence Divergence indicator for the three previously mentioned companies, it was found that:

- the existence of the signal to buy financial assets appear in an intensified form (because the blue line called Moving Average Convergence Divergence intersects the signal line (orange) from the bottom up; after which the blue line continues its way crossing the 0 line) at:
 - Visual Fan S.A. at the beginning of November 2022;
 - Arobs Transilvania Software S.A. at the end of December 2022;
 - Agroland Business System S.A. at the beginning of December 2022;
- the existence of the signal to sell financial assets appears in an intensified form (as the blue line called Moving Average Convergence Divergence intersects the signal line (orange) from top to bottom; after which the blue line continues its journey passing below the 0 line) at:
 - Visual Fan S.A. in a third decade of November of the year 2022;
 - Arobs Transilvania Software S.A. in the third decade of December of 2022;
 - Agroland Business System S.A. in mid-January 2023.

Chapter 3 – Analysis of the strategic implications of the Industry 4.0 transformation

This chapter presents:

- Industry 4.0, as well as previous industrial revolutions;
- Industrial Internet;
- other types of revolutions (energy, environment, financial technologies, manufacturing production, as well as transport, travel and tourism);
- models: „Triple Helix“, „Quadruple Helix“ and „Qunituple Helix“.

The industrial revolution can be defined as the process of transformation of technologies, resulting in important changes in the economic, social and cultural structures of people.

The first industrial revolution, called „**Industry 1.0**“, took place in the 18th and early 19th centuries. It represented the process of transition in production from work done by hand to work done mechanically with the help of machines, which required industrial equipment. It was characterized by the appearance of steam engines, cast iron products and textile products. One of the important inventions during this stage was the invention of the mechanical computer, made by Charles Babbage, in the period 1822–1834. In addition to the development of science and technology, this revolution contributed to changing the structure of society, to urbanization and the emergence of new specialists.

The second industrial revolution, called „**Industry 2.0**“, took place from the end of the 19th century to the beginning of the 20th century. It was characterized by the advent of electrification (systems that produce and distribute electricity), gasoline, chemicals, railroads, high-quality steel products, and mass production. Thus, through this revolution, electricity replaced steam, increasing the efficiency of work and the standard of living of the population. During this stage, advertising began to be developed more and more, helping to sell products. Even professional advertising offices were created. The national market was also formed. Social problems have worsened.

The third industrial revolution, called „**Industry 3.0**“, took place in the second half of the 20th century. It was based on the following:

- obtaining profit from the development and design stages, not from the production stage;
- increasing labor efficiency by reducing employees involved in production processes and employees involved in physical labor (use of robots in production automation);
- replacing traditional business models with digitized business models.

From an energy point of view, within this industrial revolution, the use of nuclear energy began to increase considerably. Mobile phones (3G) with video facilities, vacuum tube computers, and computers with microprocessors and integrated circuits were also developed. At the same time, the Internet began to be used. During this stage, with the help of digital technologies, global production appeared, which required digital equipment and global infrastructure. Also, during this phase, the notion of „country of origin“ of a product disappeared because the product design was done by the specialists of one country, the assembly of the product was done in another country, the laboratories and testing grounds of that product they were found in another country and the product was sold by another person.

The fourth industrial revolution called „**Industry 4.0**“ took place at the beginning of the 21st century. It was based on the integration of different technologies, such as artificial intelligence (AI), robotics, quantum computing, augmented and virtual reality, mobile phones (5G), 3D printing, industrial

internet of things, with the aim of creating more advanced systems. Thus, cybernetic physical systems (CPS) (automated machines, processing centers) connected to the Internet have been integrated into the production processes. Within this industrial revolution every physical object had embedded a piece of equipment that contained a digital technology that allowed interconnection with other objects. Moreover, during this phase, all machines, assembly lines, and entire factories were networked, which required high-speed Internet networks. At this stage of the industrial revolution, the formation of a fully automated production was desired.

The term Industrial Internet was invented by General Electric in 2012.

According to it, the Industrial Internet developed in three stages, as follows:

- the first stage was during the first two industrial revolutions when the entire production system had started to be made mechanically with the help of machines and communication had started to be made with mobile phones (1 G);
- the second stage was during the third industrial revolution when robots began to be used in the automation of production, mobile phones (3G) and computers were developed, and the Internet was used. Long-distance communications via the Internet and smartphones were some of the most remarkable achievements of this period;
- the third stage was during the fourth industrial revolution when different technologies began to integrate, such as artificial intelligence (AI), robotics, quantum computing, augmented and virtual reality, mobile phones (5G), 3D printing, with the aim of creating more advanced systems. Thus, cybernetic physical systems (CPS) (automated machines, processing centers) connected to the Internet have been integrated into the production processes.

To protect domestically connected systems from various cyber-attacks, safeguards have started to emerge. These measures are called cyber security measures. Cyber-attacks can be at a personal level, carrying out identity theft, or at an organizational level, affecting the normal functioning of the entire organization.

In parallel with the industrial revolutions and those of the Internet, other types of revolutions took place, such as those of energy, of the environment, of financial technologies, of manufacturing production, respectively of transport, travel and tourism.

The national innovation system has also started to develop. The main five elements that contributed to the evolution of the national innovation system are presented in the three models („Triple Helix”, „Quadruple Helix”, „Quintuple Helix”), respectively the university (higher education sector, academic environment), industry (business sector business), the state (government sector), the public (media and culture (values, value systems, lifestyles)), as well as the natural environment.

Chapter 4 – Applied research specific to investments in technology companies

Within this chapter, three quantitative researches are carried out in which attitudes, opinions and behaviors are analyzed:

- participants in investment funds (investors) regarding the investment solutions offered on the Romanian market;
- entrepreneurs regarding the financing solutions they use;
- investment fund managers from Romania regarding the financing solutions they recommend to entrepreneurs.

To carry out these three quantitative researches in this chapter:

- studies the current state of the three market researches;
- establish the objectives of market research;
- establish market research hypotheses;
- establishes the research population, the sample size and the appropriate sampling method;
- analyze the questions applied in the three questionnaires and test the differences between means and the differences between percentages between certain characteristics of the people questioned and certain research variables;
- determines the limits of market research.

For the research in question, the objectives of the three studies are presented in the table below.

Basic aspects	The researcher's questions	Research objectives
1. Attitudes, opinions and behaviors of investment fund participants (investors) regarding the investment solutions offered on the Romanian market	1. What type of investment fund do investors prefer? 2. Which is the fund manager that best meets the demanding investors? 3. What is the level of investor satisfaction regarding the performance of the investment solutions offered on the Romanian market? 4. To what extent do investors believe that fund managers can influence the performance of investment solutions in similar classes? 5. How often did investors purchase fund units?	1. Identification of the type of investment fund preferred by investors. 2. Identifying the fund manager that best meets the investors' requirements. 3. Determining the level of satisfaction of investors regarding the performance of the investment solutions offered on the Romanian market. 4. Determining the extent to which investors believe that fund managers can influence performance for investment solutions in similar classes. 5. Determining the frequency of purchase of fund units by investors.

	<p>6. Do investors prefer investment products offered by top banks?</p> <p>7. Why do investors buy fund units?</p> <p>8. How important is the past historical performance of fund units for investors when choosing to purchase them?</p> <p>9. How important is the manager's brand to investors when choosing to purchase fund units?</p>	<p>6. Identifying the number of investors who prefer the investment products offered by top banks.</p> <p>7. Determining why investors buy fund units.</p> <p>8. Determining the level of importance of the previous historical evolution of fund units for investors at the time of their purchase.</p> <p>9. Determining the level of importance of the administrator's brand for investors when purchasing fund units.</p>
2. Characterization of the participants in the investment funds (investors) who have the quality of respondents	What is the method of classifying investors according to: age, gender, last school graduated, net income, experience in the field of investment funds and the development region they come from?	Classification of participants in investment funds according to: age, gender, last school graduated, net income, experience in the field of investment funds and the development region they come from.
3. Attitudes, opinions and behaviors of entrepreneurs regarding the financing solutions they use	<p>1. Did the entrepreneurs understand the harmonization between long-term financing and short-term financing?</p> <p>2. How important do the problems deriving from short-term financing seem to entrepreneurs when they want to make an investment?</p> <p>3. Do entrepreneurs want to access financing funds through PNRR projects?</p> <p>4. Which of the following forms of complementary financing do you prefer?</p> <p>5. How good is the collaborative relationship between entrepreneurs and banks in order to obtain funds to make long-term investments?</p>	<p>1. Identifying the number of entrepreneurs who understood the harmonization between long-term financing and short-term financing.</p> <p>2. Determining the level of importance of entrepreneurs regarding the problems arising from short-term financing when an investment is desired.</p> <p>3. Identification of the number of entrepreneurs who wish to access financing funds through PNRR projects.</p> <p>4. Identifying the form of complementary financing that entrepreneurs prefer.</p> <p>5. Determining the type of collaboration relationship between entrepreneurs and banks in order to obtain funds to make long-term investments.</p>

	<p>6. What is the reason why entrepreneurs make investments in the company?</p> <p>7. What form of long-term financing would entrepreneurs be interested in the future?</p> <p>8. How important is the cost of capital for entrepreneurs when they want to make an investment?</p> <p>9. What is the age of the company in which the entrepreneurs want to invest?</p>	<p>6. Identifying the reason why entrepreneurs make investments in the company.</p> <p>7. Identifying the form of long-term financing that would arouse the interest of entrepreneurs in the future.</p> <p>8. Determining the level of importance of entrepreneurs regarding the cost of capital when it is desired to make an investment.</p> <p>9. Determining the age of the company in which the entrepreneurs want to invest.</p>
4. Characterization of entrepreneurs who have the quality of respondents	What is the method of classifying entrepreneurs according to: age, gender, last school graduated, net income and the development region they come from?	Classification of entrepreneurs according to: age, gender, last school completed, net income and the development region they come from.
5. Attitudes, opinions and behaviors of investment fund managers in Romania regarding the financing solutions they recommend to entrepreneurs	<p>1. Do investment fund managers support the importance and relevance of involvement in long-term financing of entrepreneurial businesses?</p> <p>2. What financing solutions do investment fund managers propose / offer to entrepreneurs?</p> <p>3. How important do investment fund managers consider the issues arising from short-term financing when proposing a fund strategy?</p> <p>4. How do Romanian investment fund managers assess the impact of the interest rate gap compared to developed European countries and to countries in Central and Eastern Europe?</p>	<p>1. Identifying the number of investment fund managers who support the importance and actuality of involvement in the long-term financing of entrepreneurial businesses.</p> <p>2. Identification of solutions proposed / offered to entrepreneurs by investment fund managers.</p> <p>3. Determining the level of importance investment fund managers place on issues arising from short-term financing when they propose a fund strategy.</p> <p>4. Determining the level of appreciation of Romanian investment fund managers regarding the impact of the interest rate gap compared to developed European countries and to the countries of Central and Eastern Europe.</p>

	<p>5. Do investment fund managers propose financing solutions for high-risk projects?</p> <p>6. Do investment fund managers want to add AERO (BET – AERO index) market picks to your portfolios?</p> <p>7. What is the main criterion for selecting companies on the AERO market for investment fund managers?</p> <p>8. What form of complementary financing do investment fund managers recommend to entrepreneurial firms?</p> <p>9. How important is it for investment fund managers to collaborate with other financial institutions to provide long-term financing to entrepreneurial firms?</p> <p>10. What is the objective that investment fund managers consider to be the most important for establishing the development strategy of investment solutions in Romania?</p>	<p>5. Identification of the number of investment fund managers who proposed financing solutions for high-risk projects.</p> <p>6. Identifying the number of investment fund managers who want to add issuers from the AERO market to your portfolios.</p> <p>7. Identification of the main selection criteria of companies on the AERO market for investment fund managers.</p> <p>8. Identification of the form of complementary financing that investment fund managers recommend to entrepreneurial firms.</p> <p>9. Determining the level of importance of investment fund managers regarding collaboration with other financial institutions to grant long-term financing to entrepreneurial firms.</p> <p>10. Identification of the objective that investment fund managers consider to be the most important for the establishment of the development strategy of investment solutions in Romania.</p>
6. Characterization of investment fund managers who have the quality of respondents	What is the way to classify investment fund managers according to: the age of the investment management company they manage, the total value of the assets they manage, experience in portfolio management, respectively age, gender, education and net income?	Classification of investment fund managers according to: the age of the investment management company they manage, the total value of the assets they manage, experience in portfolio management, respectively age, gender, education and net income.

Table no. 4. - The objectives of market research

In the framework of these quantitative researches, the data is collected on the Internet with the help of three questionnaires addressed to participants in investment funds, entrepreneurs and managers

of investment funds in Romania, as the case may be. These surveys are uploaded online and respondents complete the surveys directly in their browser. This research technique is called Computer Assisted Web Interviewing (CAWI).

This quantitative research method was chosen because:

- it is much cheaper than a quantitative survey in which data is collected directly by operators from respondents;
- data collection time is shorter;
- the geographical area of data collection has no limits, it can be much wider;
- the respondent cannot be identified;
- the respondent cannot be influenced by the operator;
- protects the environment, not having to print the questionnaire.

It should also be stated that this method of data collection through the online questionnaire presents the following disadvantages:

- people who do not have an internet connection cannot access the questionnaire;
- certain types of scales cannot be used on online platforms;
- the results obtained following the centralization and analysis of the responses received cannot be extrapolated to the level of the entire researched population.

These researches target investment fund participants and entrepreneurs from all existing localities in the 8 development regions of Romania, of both genders, who have the possibility to connect to the Internet, as well as investment fund managers from Romania, as appropriate. Thus, the number of people who will define the size of the three samples is not known from the beginning. As a working method, we look for groups on social media platforms on the Internet that are concerned with investment funds and entrepreneurship. Then, some of the people enrolled in the respective groups are randomly contacted, being asked if they are participants in investment funds or if they are entrepreneurs. If they receive a positive answer, they are asked to complete a questionnaire, as appropriate. At the same time, Romanian investment fund managers are searched for and contacted on internet social media platforms, with the request that they also complete a questionnaire. If the response of investment fund participants, entrepreneurs or investment fund managers is positive, the questionnaire in question was sent either by email or on social media sites according to the preferences of the people who were going to answer the questions in the questionnaire.

Moreover, some of the investors, entrepreneurs and investment fund managers in Romania who respond to the message sent on social networks are asked to send the questionnaire to other people, found in one of the three categories, so that and the latter to answer the questions written in the questionnaire. This method is called „snowballing”.

Data related to the three questionnaires were collected over an eight-week period between October 4 and November 28, 2021.

The first questionnaire is addressed to the participants of the investment funds (investors), comprising a number of 15 questions of which:

- 9 questions refer to their attitudes, opinions and behaviors regarding the investment solutions offered on the Romanian market;

- 6 questions refer to their characterization as respondents.

Based on this questionnaire, a total of 140 investment fund participants were interviewed.

The second questionnaire is addressed to entrepreneurs in Romania, comprising a number of 14 questions of which:

- 9 questions refer to their attitudes, opinions and behaviors regarding the financing solutions they use;

- 5 questions refer to their characterization as respondents.

Based on this questionnaire, a number of 105 entrepreneurs were interviewed.

The third questionnaire is addressed to managers of investment funds in Romania, comprising a number of 17 questions of which:

- 10 questions refer to their attitudes, opinions and behaviors regarding the financing solutions they recommend to entrepreneurs;

- 7 questions refer to their characterization as respondents.

Based on this questionnaire, a number of 10 entrepreneurs were interviewed.

Following the centralization and analysis of the answers obtained from the participants of the investment funds who answered the questionnaire, it was established that:

- 54,29% prefer share funds;
- 34,29%, as a relative majority, believe that the fund manager that best meets their requirements is BT AM;
- 53,57% believe that the performance of the investment solutions offered on the Romanian market is relatively good;
- 65,71% appreciate that fund managers can largely influence the performance of investment solutions in similar classes;
- 37,86%, like the relative majority, purchase fund units monthly;
- 57,86% prefer investment products offered by top banks;
- 42,86%, like the relative majority, buy fund units for yield;
- 45,71%, like the relative majority, believe that for the purchase of a fund unit, its previous historical evolution is an important factor;
- 47,86%, like the relative majority, believe that for the purchase of a fund unit, the manager's brand is a very important factor.

Also, after centralizing and analyzing the answers obtained related to the characterization of the people participating in the investment funds, it can be mentioned that:

- 57,14% are aged between 31 and 50;
- 65,71% are male;
- all have higher education, but 57,86% have a master's degree as their last school;
- 48,57%, like the relative majority, have a net income over 10.001 lei;
- 32,14%, like the relative majority, have experience in the field of investment funds between 6 and 10 years;
- 26,43%, as a relative majority, come from the Central Development Region.

At the same time, in this research applying the Z Test, it was found that it can be guaranteed with a probability of 95% that:

- there are significant differences within the sample between men and women in assessing the extent to which fund managers can influence the performance of investment solutions in similar classes;
- there are significant differences within the sample between men and women in the assessment of the importance of the previous historical evolution of fund units, when they are chosen to be purchased;
- there are no significant differences in the sample between men and women in the assessment of the importance of the manager's brand of fund units, when they are chosen to be purchased;
- there are significant differences within the sample between the percentage of men and the percentage of women who prefer the investment products offered by top banks.

Following the centralization and analysis of the answers obtained from the entrepreneurs who answered the questionnaire, it was established that:

- 74,29% understood the harmonization between long-term financing and short-term financing;
- 54,29% consider that the problems arising from short-term financing are important when making an investment;
- 82,86% want to access financing funds through PNRR projects;
- 48,57%, like the relative majority, prefer shares as a form of complementary financing;
- 34,29%, like the relative majority, appreciate that they have a good collaboration with banks in order to obtain funds to make long-term investments;
- 88,57% invest in the company to develop;
- 48,58%, as a relative majority, would be interested, for the future, in a form of mixed financing;
- 42,85%, like the relative majority, consider that the cost of capital is an important factor for making an investment;
- 40,00%, like the relative majority, want to make investments in companies whose age is between 3 and 5 years.

Also, after centralizing and analyzing the answers obtained related to the characterization of entrepreneurs, it can be noted that:

- 62,86% are between 31 and 50 years old;
- 51,43% are female;
- all have higher education, of which 51,43% have completed the master's degree;
- 31,43%, as a relative majority, have a net income between 5.001 - 10.000 lei;
- 32,38%, as a relative majority, come from the Central Development Region.

At the same time, in this research applying the Z Test, it was found that it can be guaranteed with a probability of 95% that:

- there are no significant differences within the sample between men and women in assessing the level of importance of entrepreneurs regarding the problems deriving from short-term financing when it is desired to make an investment;
- there are no significant differences within the sample between men and women in assessing the level of importance of entrepreneurs regarding the cost of capital when making an investment;

- there are no significant differences in the sample between the percentage of men and the percentage of women who understood the harmonization between long-term financing and short-term financing;

- there are significant differences within the sample between the percentage of men and the percentage of women who want to access financing funds through PNRR projects.

Following the centralization and analysis of the responses obtained from investment fund managers in Romania who answered the questionnaire, the following were established:

- all investment fund managers support the importance and actuality of involvement in the long-term financing of entrepreneurial businesses;

- 60% of investment fund managers propose venture capital / private equity as financing solutions for entrepreneurs; appreciates as important the impact of the gap in interest rates vis-à-vis developed European countries and vis-à-vis the countries of Central and Eastern Europe; propose financing solutions for high-risk projects;

- 80% of investment fund managers want to add issuers from the AERO market to their portfolios;
- there are questions to which the investment fund managers surveyed had different answers, not being able to exceed the 40% threshold as the most chosen answer, as follows:

- to the question „When you choose to propose a fund strategy, how important do you think the problems deriving from short-term financing?“, two weights of 40% were obtained for the answer variants „very important“ and „not important“;
- to the question „Do you indicate the main criterion for selecting companies on the AERO market?“, a weight of 40% was obtained for the answer option „market capitalization“;
- to the question „Which of the following forms of complementary financing do you recommend to entrepreneurial companies?“, two weights of 40% were obtained for the answer variants „shares“, respectively „venture capital“;
- to the question „On a scale from -3 to +3, do you specify the importance of collaboration with other financial institutions in providing long-term financing to entrepreneurial firms?“, two weights of 40% were obtained for the answer variants „very important“, respectively „important“;
- to the question „Which of the following objectives do you consider to be the most important for the development strategy of investment solutions in Romania?“, two weights of 40% were obtained for the answer variants „development of various dedicated products“, respectively „absolute return“.

Also, after centralizing and analyzing the answers obtained related to the characterization of investment fund managers, it can be noted that:

- they all manage investment management companies whose age is over 10 years, manage assets whose value exceeds 100 million Euros, are male and have a net income over 10.001 lei;

- 80% have experience in managing portfolios between 11-20 years, they are between 31-50 years old and they have a master's degree as their last school.

These results will represent a starting point for future research.

Chapter 5 – Strategic perspectives

This chapter analyzes the results obtained from the three quantitative researches dedicated to investment fund participants (investors), entrepreneurs and investment fund managers in Romania, as the case may be, during a Brainstorming session. Then an advantageous financing option for SMEs is chosen through a multi-criteria analysis on the basis of which a successful entrepreneurial strategy can be formulated in the context of Industry 4.0.

The Brainstorming session took place on 07.03.2022, in a group of 12 people consisting of four ladies and eight gentlemen.

No. Crt.	Gender F/M	Function
1	M	PhD student
2	M	coordinating professor
3	M	investment fund manager
4	M	investment fund manager
5	F	entrepreneur
6	F	entrepreneur
7	M	entrepreneur
8	M	entrepreneur
9	F	investor
10	F	investor
11	M	investor
12	M	investor

Table no. 5. - The people participating in the Brainstorming Session

Following the discussions held during this meeting, the following results were reached:

- venture capital/private equity financing, crowdfunding and shares are solutions of the future;
- in order to determine which of the financing options mentioned above is the most advantageous to obtain profit, it was decided to carry out a multi-criteria analysis. For this, it was decided to analyze these financing options, taking into account the following points: the degree of risk, the amount of the amount required to make the investment, the size of the profit that can be obtained after making the investment, the brand (fame) of the investor, the time required to obtain profit, as well as the reason for making investments in the company.

The stages of this multi-criteria analysis are:

- establishing the criteria;
- determining the weight of each criterion;
- identification of all possible variants;
- assigning a grade to each variant;
- calculation of the final ranking.

After carrying out the multi-criteria analysis, it is found that the crowdfunding version is on the first position of the final ranking, accumulating the highest score, namely 97,63.

The starting point in the formulation of a successful entrepreneurial strategy in the context of Industry 4.0. it represents the choice of an advantageous financing option for both the investor and the company. In the present case, it was decided that an advantageous financing option for both parties is crowdfunding. Also, for the formulation of a successful entrepreneurial strategy, one must take into account:

- the current technological context of Industry 4.0 which is in continuous progress;
- the problem of positioning-repositioning a project within a portfolio of projects, as well as the problem of forecasting the expected yield of a financial asset. For this one must take into account the current and real context governed by the multiple crises (medical and macroeconomic) as well as the war in Ukraine (ie in which project to invest?);
- the issue of choosing when to make an investment in a project within a portfolio of projects (ie when to invest?, now or over a period of time).

Chapter 6 - Final conclusions, original contributions, dissemination of results, future research directions

Final conclusions

The present and the future of entrepreneurial companies require paying special attention to: access to financing, the place where the company is positioned-repositioned on the market, forecasting the expected yield of a financial asset, the opportune moment to make an investment, the current technological context of Industry 4.0 which is in continuous progress and understanding the attitudes, behaviours and opinions of Romanian investors, entrepreneurs and investment fund managers and the complex relationships that form between them. All this contributes to the formulation of a successful entrepreneurial strategy for technology SMEs in the context of Industry 4.0, taking into account the current and real context governed by the multiple crises (medical and macroeconomic) as well as the war in Ukraine.

The main forms of SME financing derive from the sale of newly issued shares and the contracting of loans (issuance of corporate bonds and/or tangible bank loans). At the same time, there are other financing options known under the following names: crowdfunding, mezzanine financing, private equity, venture capital, mutual funds (shares, bonds, mixed) and hedge funds.

A company to establish its position on the market, respectively of its products and services within the company can carry out analyzes using the following: „the model proposed by Guy Serraf”, „the SWOT analysis”, „the Boston Consulting Group (BCG) matrix”, „the General Electric – Mc Kinsey matrix” , „the Royal Dutch-Shell matrix”, „the Arthur D. Little matrix”, „the Hofer matrix”, „the Porter model”, and „the Tomato Garden analogy”. With the help of these models, both internal and external factors that can influence the development of the company can be analyzed, objectives can be established, the resources needed to achieve these objectives and the available available. Strategies can also be developed.

For forecasting the expected return of a financial asset by a company, analysis can be done using „CAPM (Capital Asset Pricing Model)” and „Fama-French models with three factors”. These models highlight market risk and asset-specific (non-diversifiable) risk.

Knowing the opportune moment for a company to make an investment is important to be able to manage the competitive relationship in its favor, in case the investment strategy adopted by a rival affects the profit of the other, or even to obtain a competitive advantage by adopting a strategy that involves making an early investment. Making an early investment can result in diminishing the competitor's profit or even causing them to exit the game. Hiring an early investment does not always create an advantage for that company. To have favorable results in the market a company must take into account: the existing competition, the order of the game (with sequential or simultaneous movement), the existing strategies and information, as well as the reward given according to each possible outcome that can be obtained. It is also important to know when a company should adopt a strategy that involves making an investment in a tough, aggressive way and when it should collaborate with the competing firm. A firm in order to determine the most favorable time (present or future) to make investments can perform analysis using the following: „Pindyck's model (1988)”, „Kulatilaka and Perotti's model (1998)”, „Folta and O'Brien's model (2004)” and „Lin and Kulatilaka's (2007) model”.

The continuous progress of today's technology is due to industrial revolutions and the evolution of the industrial internet. In parallel, other types of revolutions took place, such as: energy revolutions,

environmental revolutions, financial technology revolutions, manufacturing revolutions, as well as transport, travel and tourism revolutions. All of these have the same goal, i.e. increasing people's well-being from an economic, social and cultural point of view. Over the years, these revolutions have greatly influenced the functionality of companies. Thus, they began to do business globally through laptops or smartphones connected to the Internet; manufacturing processes began to be automated and controlled remotely by humans via the Internet; cyber security has been developed to protect companies' laptops, smartphones, tablets from cyber attacks; the population began to have access to the products and services of companies around the world; and traditional markets began to transform into emerging markets (contributing to global gross domestic product growth). The national innovation system has also started to develop. The main five elements that contributed to the evolution of the national innovation system are presented in the three models („Triple Helix”, „Quadruple Helix”, „Quintuple Helix”), respectively the university (higher education sector, academic environment), industry (business sector business), the state (government sector), the public (media and culture (values, value systems, lifestyles)), as well as the natural environment.

An important part of the work is the three quantitative research conducted between October 4 and November 28, 2021, a period that includes the preparation of the three questionnaires and data collection. Data processing took place between November 29 and December 9, 2021. These three researches had as their main objectives the determination of the attitudes, opinions and behaviors of: participants in investment funds (investors) regarding the investment solutions offered on the Romanian market; entrepreneurs regarding the financing solutions they use; as well as investment fund managers from Romania regarding the financing solutions they recommend to entrepreneurs. A general conclusion resulting from all three quantitative researches carried out is that the majority of respondents, be they investors, entrepreneurs or investment fund managers, prefer the forms derived from the sale of newly issued shares as future financing options for companies. Most of the responding investors believe that the performance of the investment solutions offered on the Romanian market is relatively good and that they purchase fund units monthly and for yield. Most of the responding entrepreneurs invest in the company to develop and say that they would not rule out a form of mixed financing in the future. All the responding investment fund managers support the importance and timeliness of involvement in long-term financing of entrepreneurial businesses. Most of the investor respondents were male and the entrepreneur respondents were female. All responding investment fund managers were male. In the case of the respondent investors there are significant differences between the male and female persons in appreciating the importance of the previous historical evolution of the fund units when choosing to be bought and in the case of the respondent entrepreneurs there are significant differences between the percentage of men and the percentage of women who want to access financing funds through PNRR projects.

In order to establish an advantageous financing option for both the company and the investors, a Brainstorming session was held, during which the results of the three quantitative studies were reanalyzed. During this meeting, it was decided to carry out a multi-criteria analysis in order to choose an advantageous form of financing, considering as options: venture capital/private equity, crowdfunding and shares. At the same time, during this meeting, the criteria that will be taken into account in the multi-

criteria analysis were established, respectively: the degree of risk, the amount of the amount necessary to make the investment, the size of the profit that will be obtained after making the investment, the brand (fame) to the investor, the length of time needed to obtain profit, as well as the reason for making investments in the company. After carrying out this analysis, it was established that the most advantageous financing option is „crowdfunding”.

In conclusion, for the formulation of a successful entrepreneurial strategy in the context of Industry 4.0, one must take into account: a possible future advantageous financing option (in our case - crowdfunding); of the current technological context of Industry 4.0 which is in continuous progress; of the place of positioning-repositioning of the company on the market, respectively of its products and services within the company; forecasting the expected yield of a financial asset; as well as the opportune moment to make investments in the company.

Moreover, in this work I have made three applications. The first application consisted in carrying out an economic-financial analysis (using the following indicators: asset structure, liability structure (general solvency and general debt ratio), liquidity (general liquidity), profitability (economic profitability and financial profitability), as well as the net situation of the company on the accounting documents of some companies (Visual Fan S.A., Arobs Transilvania Software S.A. and Agroland Business System S.A.). The purpose of this analysis is to help the shareholders to know the economic and financial situation of the company they own shares to decide whether the company in question can continue to develop in its current form or will have to look for future possible financing options deriving from new share issues or borrowing (bond issues, bank loans). Also, this application is also useful for future potential investors because they too must be aware of the economic-financial situation of the companies in which they are going to invest their money. At the same time, within this application, an analysis was carried out to determine whether the market values of the financial assets of some companies (Microsoft Corp., Tesla Inc. and Apple Inc) are undervalued or overvalued in relation to the amounts that should be spent to replace those assets using the Q Tobin financial indicator. The second application addressed a problem related to the equilibrium of supply and demand in the capital market using: „the Kaldor model”, „the Kaldor model with rational anticipations” and the „Kaldor model with Goodwin-type price anticipations”, with the ultimate goal of determining whether the choice of the timing of the of an investment in a project (financial asset) is influenced by the price of the respective asset, study carried out on the following companies: Visual Fan S.A., Arobs Transilvania Software S.A. and Agroland Business System S.A. In the third application, a technical analysis was carried out to measure the level of market volatility and to anticipate the evolution of the prices of some financial assets related to some companies (Visual Fan S.A., Arobs Transilvania Software S.A. and Agroland Business System S.A.) using the following indicators: „Bollinger Bands”, „Double Bollinger Band” and „Moving Average Convergence Divergence”. Following the realization of the first application, the following general conclusions can be formulated, namely that companies that have more and more debts, in order to succeed in growing in the future, must look for possible future financing options and possible future investors in order not to and loses the money to be invested, he should invest in companies whose profit is increasing and whose net situation exceeds the total value of the sums invested by the shareholders. It can also be concluded that, always, the market values of the existing financial assets of all three companies (Microsoft Corp., Tesla Inc. and Apple Inc) are overvalued

because they are always higher than the amounts that should be spent to replace these assets. Within these companies, the sale offer of these financial assets increases while their purchase demand decreases. This application is an example of good practice for all shareholders and investors who want to know the financial situation of a company. As a result of the realization of the second application, it was found that the price of a product (financial asset) always influences both the demand and the offer for that product (financial asset), as well as the choice of the moment to invest in the respective product (financial asset). Following the realization of the third application, it was found that investors can always know the volatility of the market and the favorable moment when they can buy or sell a financial asset.

Original contributions

In this paper, the main personal contributions are:

- creating an application focused on economic-financial analyzes to deepen some useful details from the accounting documents of some technological companies. As part of these analyses, the following indicators are calculated, interpreted and graphically represented: asset structure, liability structure (general solvency and general debt ratio), liquidity (general liquidity), profitability (economic profitability and financial profitability), as well as the company's net situation. All these indicators are calculated taking into account the inflation rate. Also, within this application, the financial indicator Q Tobin is graphically represented and interpreted, useful for determining whether the market values of the existing financial assets of companies are undervalued or overvalued in relation to the amounts that should be spent to replace those financial assets. This application is made as an example of good practices for all shareholders and investors who want to know the economic-financial situation of a company (chap. 1, point 1.5.);
- creating an application that addresses the problem of balancing supply and demand on the capital market (www.bvb.ro) using: „the Kaldor model”, „the Kaldor model with rational anticipations” and „the Kaldor model with Goodwin-type price anticipation”. Within this application, the graphical trajectory of prices is established for each individual model. Then, the trajectory of the price of any financial asset in any company can be compared with the trajectory of the prices related to the three models (chap. 2, point 2.6.);
- creating an application focused on technical analysis to measure the level of market volatility and to anticipate the evolution of the prices of some financial assets related to some companies using the following indicators: „Bollinger Bands”, „Double Bollinger Band” and „Moving Average Convergence Divergence”. Also, investors will be able to anticipate the favorable moment when they can buy or sell financial assets (chap. 2, point 2.7.);
- carrying out three quantitative researches (chapter 4) among investment fund participants (investors), entrepreneurs and investment fund managers in Romania with the following themes:
 - the attitudes, opinions and behaviors of investment fund participants (investors) regarding the investment solutions offered on the Romanian market;
 - the attitudes, opinions and behaviors of entrepreneurs regarding the financing solutions they use;
 - the attitudes, opinions and behaviors of Romanian investment fund managers regarding the financing solutions they recommend to entrepreneurs;

- carrying out a Brainstorming session with the aim of analyzing the results of the three quantitative researches dedicated to investment fund participants (investors), entrepreneurs and investment fund managers in Romania, as the case may be, in order to be able to choose an advantageous financing option for SMEs on the basis of which to build a successful strategy in the context of Industry 4.0 (chap. 5, point 5.1.);
- carrying out a multi-criteria analysis of the solutions proposed following the Brainstorming session, in order to be able to choose an advantageous financing option for SMEs on the basis of which to build a successful strategy in the context of Industry 4.0 (chapter 5, point 5.2);
- determining the elements that entrepreneurial firms in the context of Industry 4.0 should pay particular attention to when they want to formulate a successful entrepreneurial strategy, respectively: access to financing, the place where the company is positioned-repositioned on the market, as well as of its products and services within the company, forecasting the expected yield of a financial asset, the opportune moment to make an investment and last but not least the current technological context (chap. 5, point 5.3.);
- dissemination of the results obtained as a result of the research activity carried out during doctoral school by participating in various international conferences and by publishing various articles (chap. 6, point 6.3.).

Dissemination of results

The results of my research during doctoral school were disseminated by attending conferences and publishing papers.

Thus, I participated in:

- „The 27th International Conference Knowledge-Based Organization KBO, Organized by Nicolae Bălcescu - Land Forces Academy in Sibiu” - June 10-12, 2021 Romania, presenting two papers, entitled:
 - „Aspects regarding a new methodology for active portfolio management of alternative hedge funds in emerging markets - the case of Romanian capital market in the current context of post-crisis recovery”;
 - „Applications of game - theory in asset strategic portfolio management - the case of hedge - funds adaptation for the real constraints in the Romanian capital market”;
- „The 23 Edition of the International Conference Scientific Research and Education in the Air Force (AFASES 2022), Digitalization in the Military High Education” - May 26-28, 2022, Braşov, Romania, presenting the paper entitled:
 - „Military blockchain in healthcare to support clinical data”;
- „8th International Management Conference – Review of Management and Economic Engineering”– September 22-24, 2022, Cluj-Napoca, Romania, presenting the following two papers entitled:
 - „Dynamic Capabilities and High Quality Standards in S.C. Jungheinrich Romania S.R.L. ”;
 - „Electric Forklift Trucks Refurbishment at S.C. Jungheinrich Reconditionare Romania S.R.L.”;

• „10th edition of STRATEGICA International Conference” - October 20-21, 2022, Bucharest, Romania presenting the following two papers entitled:

- „Strategic Ideas for Improving the Format of FIFA and UEFA International Competitions”;
- „Towards a Holistic Optimization of the European Inter-club Football Competition System”;

I have also published the following scientific papers (as first author / co-author) as follows:

• „Aspects regarding a new methodology for active portfolio management of alternative hedge funds in emerging markets - the case of Romanian capital market in the actual context of post-crisis recovery” - Published in „International conference - THE KNOWLEDGE-BASED ORGANIZATION - KBO”; (2021); Volume 27, Issue 2, <https://doi.org/10.2478/kbo-2021-0054>;

• „Applications of game - theory in active strategic portfolio management - the case of hedge - funds adaptation for the real constraints in Romanian capital market” - Published in „International conference - THE KNOWLEDGE-BASED ORGANIZATION - KBO”; (2021); Volume 27, Issue 2, <https://doi.org/10.2478/kbo-2021-0055>;

• „Aligning complementary funding opportunities - through TAS (triple alternative synergy) - the smart answer to the challenges of Industry 4.0 transformation” - Published in the Magazine - „Recent” 63 (BDI) - number 1/2021, volume (22), <https://doi.org/10.31926/RECENT.2021.63.050>;

• „Procurement in automotive industry” - Published in the Magazine - „Recent” 64 (BDI) - number 2/2021, volume (22), <https://doi.org/10.31926/RECENT.2021.64.069>;

• „Security Challenges from the Integration of AI with Blockchain” - Published in the Magazine - „Recent” 69 (BDI) - number 1/2023, volume (24), <https://doi.org/10.31926/RECENT.2023.69.020>;

• „Military blockchain in healthcare to support clinical data” - Published in „Scientific research and education in the air force - AFASES 2022”, (BDI), [DOI:10.19062/2247-3173.2022.23.17](https://doi.org/10.19062/2247-3173.2022.23.17);

• „Dynamic Capabilities and High Quality Standards in S.C. Jungheinrich Romania S.R.L.” - in the Management and Economic Engineering magazine entitled „Proceedings of the Review of the Review of Management and Economic Engineering 8th International Management Conference”, Todesco Publishing House, 2022, http://conference.rmee.org/wp-content/uploads/2022/10/RMEE2022_Proceedings.pdf;

• „Electric Forklift Trucks Refurbishment at S.C. Jungheinrich Reconditionare Romania S.R.L.”, - in the Management and Economic Engineering magazine entitled „Proceedings of the Review of the Review of Management and Economic Engineering 8th International Management Conference”, Todesco Publishing House, 2022, http://conference.rmee.org/wp-content/uploads/2022/10/RMEE2022_Proceedings.pdf;

• „Strategic Ideas for Improving the Format of FIFA and UEFA International Competitions” (in print);

• „Towards a Holistic Optimization of the European Inter-club Football Competition System” (in print).

I would also like to point out that, as a doctoral student with a scholarship, in the amount of the doctoral scholarship I carried out 7 hours/week in the 1st semester, respectively 5 hours/week in the 2nd semester of didactic activity of seminars, laboratories and projects based on the approved State of Functions for academic year 2021 – 2022 in the following subjects: E-commerce, Production Management, Accounting Project, Sustainable Development, Management Information Systems and Public Policies and 9 hours/week in the 1st semester, respectively 2 hours/week in the 2nd semester

didactic activity seminars, laboratories and projects based on the approved State of Functions for the academic year 2022 – 2023 in the following disciplines: E-commerce, Production Management, Accounting Project, Sustainable Development and Public Policies. During these classes, I told the students about my research results during doctoral school.

Future research directions

While approaching each chapter of this paper, various ideas emerged that could represent important starting points as well as future research directions.

These possible future research directions are:

- designing an architecture for mezzanine financing adapted to liquidity problems for the use of alternative strategies and responding to aspects related to inflationary problems and restrictive monetary policies;
- building an active strategy that can anticipate the critical movements of different markets based on the performance of a portfolio made from mezzanine financing based on the rotation of sub-portfolios;
- building an architecture for mezzanine financing with rotating sub-portfolios to capture the advantages of pure mezzanine financing in the context of adverse market inefficiencies;
- developing an active strategy that can anticipate critical movements of different markets based on the performance of a portfolio made from private equity financing based on the rotation of sub-portfolios;
- designing and building a hedge fund architecture for active portfolio management (in the case of Romanian alternative investment funds). This is important for understanding the dynamics of all types of alternative investment portfolios and adapting these portfolios to market liquidity issues and other issues arising from market imperfections in emerging markets. Also, this is important for understanding the process of selection and rotation of sub-portfolios in accordance with the real dynamics of global capital markets;
- analyzing the possibility of developing and actively managing, in a dynamic way, through multiple rotating satellites, a portfolio of speculative funds with sub-portfolios;
- easily anticipating critical movements of different markets, taking into account the performance of a portfolio of speculative funds based on the rotation of sub-portfolios;
- the association of alternative assets, formed by alternative instruments (venture capital or private equity), with alternative strategies (hedge funds) and with alternative partnerships to connect in the shortest possible time to the major funding programs (NRFF, H2020, NGD) having as main themes projects related to energy, infrastructure, entrepreneurship, ESG;
- the development of an appropriate complementary financing process, taking into account the reduced functionality and the dynamics of the emerging market in Romania;
- carrying out new quantitative researches similar to those carried out in this work, in which to test whether there are significant differences within the sample between:
 - rural and urban investors in appreciating the importance of past historical performance of fund units, when choosing to buy them?
 - rural and urban investors in the assessment of the importance of the fund manager's brand, when they choose to be bought?

- between the percentage of rural investors and the percentage of urban investors who prefer investment products offered by top banks?
- between rural and urban entrepreneurs in assessing their level of importance regarding the problems arising from short-term financing when it is desired to make an investment?
- between rural and urban entrepreneurs in assessing their level of importance regarding the cost of capital when an investment is desired?
- between the percentage of rural entrepreneurs and the percentage of urban entrepreneurs who understood the harmonization between long-term financing and short-term financing;
- between the percentage of entrepreneurs from the rural environment and the percentage of entrepreneurs from the urban environment who want to access financing funds through PNRR projects?.

The realization of these future research directions would certainly develop this work, helping both entrepreneurs and investors to accumulate new information related to the investment field with applicability to both industrial and other sectors.

Bibliography (selective)

Books and articles

- [1] Achelis B.S. – Technical analysis from A to Z; Mc Graw Hill (2nd Edition); 2013;
- [3] Ahlers K.C.G., Cumming D., Günther C., Schweizer D. – Signaling in equity crowdfunding; Entrepreneurship Theory and Practice; (vol. 39, no. 4); pp. 955-980; SAGE Publications; 2015;
- [6] Andreja R. – Industry 4.0 concept: background and overview; International Journal of Interactive Mobile Technologies; (vol. 11, no. 5); pp. 77-90; EBSCO; 2017;
- [8] Ansoff H.J., Leontiadis J.G. – Strategic portfolio management; Journal of General Management; (vol. 4, no. 1); pp. 13-29; 2017;
- [13] Audretsch D., Caiazza R. – Technology transfer and entrepreneurship: cross-national analysis; Journal of Technology Transfer; (vol. 41); pp. 1247-1259; Springer; 2015;
- [19] Benson D., Ziedonis R.H. – Corporate venture capital as a window on new technologies: implications for the performance of corporate investors when acquiring startups; Organization Science; (vol. 20, no. 2); pp. 329-351; Informs; 2009;
- [20] Berk J. B., Binsbergen J. H. – Mutual funds in equilibrium; Annual Review of Financial Economics; (vol. 9); pp. 147-167; 2017;
- [23] Brach M.A. – Real options in practice, Wiley, 2003;
- [26] Cañas H., Mula J., Díaz-Madroñero M., Campuzano-Bolarín F. – Implementing Industry 4.0 principles; Computers & Industrial Engineering; (vol. 158); Elsevier; 2021;
- [30] Constantin, C., Tecău, A. S. – Introducere în cercetarea de marketing; Editura Universitară; 2013;
- [40] Davies R. – Industry 4.0 digitalisation for productivity and growth; Policy Commons; 2015;
- [41] Davila A., Foster G., Gupta M. – Venture capital financing and the growth of startup firms; Journal of Business Venturing; (vol. 18, no. 6); pp. 689-708; Elsevier; 2003;
- [45] Duguleană L., Petcu N. – Metode cantitative în analiza datelor; Editura Infomarket; 2005;
- [47] Elias G., Carayannis E.G., Campbell D.F.J. – Triple Helix, Quadruple Helix and Quintuple Helix and how do knowledge, innovation and the environment relate to each other?; International Journal of Social Ecology and Sustainable Development; (vol. 1, no. 1); pp. 41-69; IGI Publishing; 2010;
- [48] Elton E.J., Gruber M.J. – Mutual funds; Handbook of the Economics of Finance; (vol. 2, part. B), pp. 1011-1061; Elsevier, 2013;
- [51] Fama, E.F., French, K.R. – Luck versus skill in the cross-section of mutual fund returns; The Journal of Finance; (vol. 65, no. 5); pp. 1915-1947; Wiley; 2010;
- [57] Gans J., Ryall M.D. – Value capture theory: a strategic management review; Strategic Management Journal; (vol. 38, no.1); pp. 17-41; Wiley; 2016;
- [61] Grinold R.C., Kahn R.N. – Active portfolio management. A quantitative approach for providing superior returns and controlling risk; 2000;
- [64] Guthrie G. – Real options in theory and practice; Oxford University Press; 2009;

- [66] Hon T., Y. – The behaviour of small investors in the Hong Kong derivatives markets: a factor analysis; *Journal of Risk and Financial Management*; (vol.5, no. 1); pp. 59-77; MDPI; 2012;
- [73] Kumar K., Zindani D., Davim J.P. – *Industry 4.0: developments towards the fourth industrial revolution*; Springer; 2019;
- [75] Lefter C., Brătucu G., Bălășescu M., Chițu I., Răuță C. – *Marketing*; ESR; 2000;
- [76] Lefter, C. – *Cercetarea de marketing. Teorie și aplicații*; Informarket; 2004;
- [79] Markowitz H. – Portfolio selection; *The journal of finance*; (vol. 7, no. 1); pp. 77-91; Wiley; 1952;
- [88] Nijs L. – *Mezzanine financing. Tools, applications and total performance*; Wiley Finance; 2014;
- [89] Olsen T.L, Tomlin B. – *Industry 4.0: opportunities and challenges for operations management*; *Manufacturing & Service Operations Management*; (vol. 22, no. 1); pp. 113-122; Informs; 2019;
- [96] Puiu R., Boșcoianu M., **Vrăjitoru E.S.**, Boșcoianu C.E. – *Procurement in automotive industry*; Recent; (vol 22, no. 64); pp.69-73; 2021;
- [100] Robinson A., Fert I., Webb D., Thacher S., LLP B. – *Mezzanine finance: overview*; Practical Law Company; pp. 1-7; 2013;
- [107] Sharpe, F.W. – A simplified model for portfolio analysis, *Management Science*; (vol. 9, no. 2), pp. 171-349; Informs; 1963;
- [108] Sharpe, F.W. – The arithmetic of active management; *Financial Analysts Journal*; (vol. 47, no. 1); pp.7-9; Taylor&Francis 1991;
- [109] Singh P., Singh-Bedi H. – Investors behaviour in secondary market; *International Journal of Research in Finance & Marketing*; (vol. 1, no. 4); pp. 96-114; SSRN; 2011;
- [115] Sumedrea S. – *Management și strategii financiare*; Universitatea Transilvania; 2006;
- [116] Sumedrea S. – *Managementul financiar. Teorie și aplicații practice*; Universitatea Transilvania; 2007;
- [117] Svedik J. – Mezzanine financing instruments in comparison to the classic financing sources; *Business, Management and Education*; (vol. 16, no. 1); pp. 133-146; 2018;
- [121] Toth Z., Puiu I.R., Wang S.S., **Vrăjitoru E.S.**, Boșcoianu M. – Dynamic capabilities and high-quality standards in S.C. Jungheinrich Romania S.R.L; *Proceedings of the Review of Management and Economic Engineering 8th International Management Conference. Management challenges and oportunities in the post-pandemic reality*; pp. 44-49; Toderesco Publishing House; 2022;
- [122] Toth Z., Puiu I.R., Wang S.S., **Vrăjitoru E.S.**, Boșcoianu M. – Electric forklift trucks refurbishment at S.C. Jungheinrich Romania S.R.L; *Proceedings of the Review of Management and Economic Engineering 8th International Management Conference. Management challenges and oportunities in the post-pandemic reality*; pp. 50-56; Toderesco Publishing House; 2022;
- [127] **Vrăjitoru, E.S.**, Boșcoianu M, Boșcoianu E.C – Aspects regarding a new methodology for active portfolio management of hedge funds alternative in emerging markets – the case of

- romanian capital market in the actual context of post-crisis recovery; Knowledge-Based Organization; (vol. 27, no. 2); pp.94-99; Sciendo; 2021;
- [128] **Vrăjitoru, E.S.**, Boşcoianu M, Boşcoianu E.C. – Aligning complementary funding opportunities – through TAS – the smart answer to the challenges of Industry 4.0 transformation; Recent Journal; (vol. 22 no. 1(63)); pp. 50-54; 2021;
- [129] **Vrăjitoru, E.S.**, Boşcoianu M., Boşcoianu E.C. – Applications of game – theory in active strategic portfolio management – the case of hedge - funds adaptation for the real constraints in romanian capital market; Knowledge-Based Organization; (vol. 27, no. 2); pp. 100-104; Sciendo; 2021;
- [131] Wang S.S., Puiu I.R., **Vrăjitoru E.S.**, Stafie M. – Military blockchain in healthcare to support clinical data; Scientific research and education in the air force; pp. 113-118; AFASES; 2022;
- [132] Wang S.S., Toth Z., **Vrăjitoru E.S.**, Puiu R.I., Boşcoianu M., – Security Challenges from the Integration of AI with Blockchain, Recent Journal; (vol. 24 no. 1(69)); pp. 20-28; 2023;
- [133] Wolfe J., Sauaia A.C.A. – The Tobin Q as a company performance indicator; Developments in Business Simulation and Experiential Learning; (vol. 30); pp. 155-159; 2003;
- [136] Zezulka F., Marcon P., Vesely I., Sajdl O. – Industry 4.0 - an introduction in the phenomenon; IFAC; (vol. 49, no. 25); pp. 8-12; Elsevier; 2016.

Websites

- [1*] <http://www.aaf.ro/ghidul-investitorului/#faq-1>; accessed in 26.12.2022;
- [5*] <https://bvb.ro/FinancialInstruments/Details/FinancialInstrumentsDetails.aspx?s=ALW>; accesat în 12.05.2022;
- [12*] <https://insse.ro/cms/ro/content/ipc%E2%80%93serie-de-date-anuala>; accessed in 14.09.2022;
- [15*] <https://mfinante.gov.ro/ro/web/site/info-pj-selectie-nume-si-judet>; accessed in 14.09.2022;
- [30*] <https://tradeville.ro/analiza-tehnica/indicatori-analiza-tehnica/medie-mobila>; accessed in 23.01.2023;
- [45*] <https://www.tradingview.com/>; accessed in 21.01.2023; 31.01.2023; 22.02.2023;
- [49*] <https://www.xtb.com/ro/educatie/ce-sunt-etf-urile>; accessed in 26.12.2022;