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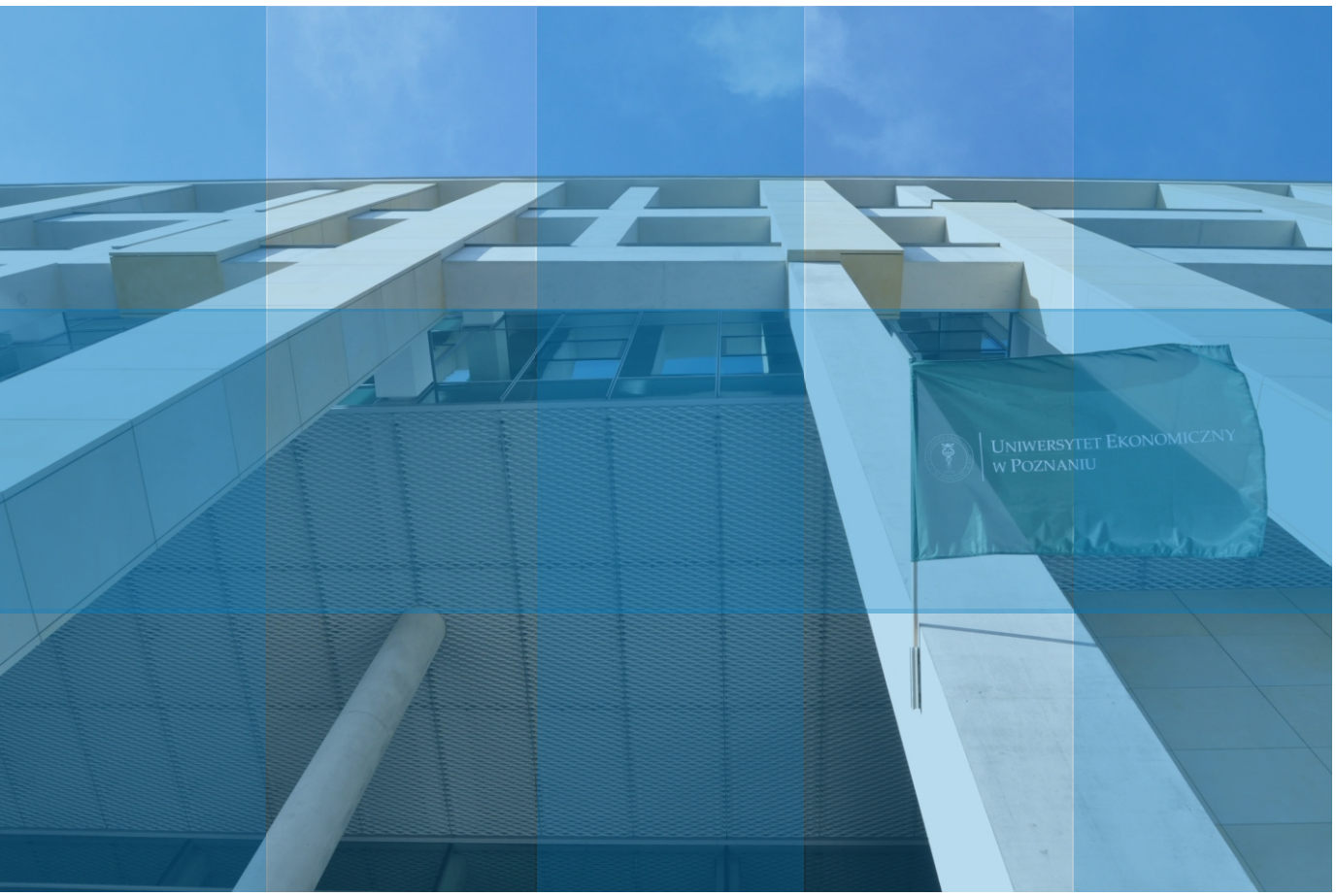

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PREFACE

Dear Readers,

We have the pleasure of presenting to you the second issue of our research journal entitled „Research Papers in Economics and Finance" (REF), published by the Faculty of Economics at the Poznań University of Economics and Business. Caring about the highest level of the content of our publications, we publish only the manuscripts which have received two reviews under the "peer review" procedure, after initial verification done by the Editorial Committee. The articles published within REF are available online in English and in an open mode.

REF is a quarterly journal, with the second issue containing six research articles. Two of the articles focus on the social and socio-economic aspects of development and business, one article looks at small family businesses and their path to growth; another paper dwells on the topic of sustainable agriculture, with two last research articles depicting financial subject matters such as currency rates and asset pricing. Let us bring you closer to the outcomes of the works presented in volume 2.

The article entitled *Proposal of alternative typology of social economy* by **A. Waligóra** presents an alternative proposal of division in social economy, focusing on the social functions of its entities – social enterprises. The proposed solution serves to fulfil the dominant discourse of the social economy in new ways of thinking about the reasons and motivations connected with creating social enterprises. The article's conclusions are considered in the light of Piotr Sztompka's social capital theory and the theory of social cost.

The article entitled *Investigation of the social factors of development of society in the territories with transforming environment* by **O. Kvilinskyi**, **A. Mieshkov** and **I. Bondaryeva** aims at identifying the main social factors that affect the vital activity of society at the present stage of development of territories which have unstable socio-economic and political environment. The authors have developed a methodology of an expert assessment of the importance of the factors of forming the system of vital social activity. A set of recommendations for the coordinated impact on the economic and social processes in the conditions of transforming the market system have been proposed as a result of the research.

The article entitled *Family Firms as a potential source of growth for the Warsaw Stock Exchange* by **S. Filipczak** discusses the possibility that family firms will step into the state's shoes and become a more meaningful source of new issuers for the Warsaw Stock Exchange. The paper identifies the reasons for a possible increase in family firms listings on the WSE as well as key elements for that to happen. The author notes that an increasing number of family firms are big enough to meet the WSE requirements, and thus a wave of succession in family enterprises is expected in the coming years.

The article entitled *Theoretical Framework for Stock Pricing Process based on Micro-Economic Decision Model* by **V. Kanagov** introduces a theoretical framework for a new model which aims at avoiding the problems of CAPM, the most common model for asset pricing, and keeping its advantages, therefore allowing universality of asset pricing. It is based on the micro-economic decision model, involving an expected value and dividing a stock price to objective and subjective prices. As a result, rational based individuals, just like individuals with non-rational factors, may use the model to calculate a future price stock in exactly the same way.

The article entitled *Analysis of the EUR/USD exchange rate in binary-temporal representation* by **M.D. Stasiak** deals with the topic of exchange rates by employing an algorithm that transforms the exchange rate represented by tick data into a binary string. Each course change equal to a given discretisation unit is assigned a binary value indicating the direction of the change. The main goal of the presented research is to verify the existence of any dependences between the duration of a change and the probability of future direction of the change. The EUR/USD analysis performed by statistical tests and presented in the article suggests relations between the direction and order of historical data and the direction of a future change.

The article entitled *The main priority of achieving resource safety of agricultural production* by **Y. Pushak**, **M. Orobchuk** and **O. Marchenko** touches upon the subject matter of resource safety in agriculture, in particular the maintenance of land resources through increased use of organic fertilizers, the optimization of croplands and strengthening legislation and ecological awareness. The authors conclude the paper with recommendations.

This issue of Research Papers would not have come to fruition if it had not been for the help, work, trust and support of the Reviewers, Authors, the members of the Editorial Committee and others who have been engaged in editing and publishing. Let this issue of our journal become an inspiration for scientific research and discovery in the field of contemporary finance and economics.

Yours faithfully,

dr Hanna Kołodziejczyk

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RESEARCH PAPERS
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Proposal of alternative typology of social economy

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ABSTRACT

Due to the growing interest in the field of social economy and the increasing popularity of social entrepreneurship, these areas of theoretical knowledge and economical practice are constantly a subject of new analyses. The dominant classification of social enterprises is the division into the old and new social economy. These propositions do not cover all existing forms of social enterprises in Poland. The aim of the article is to present an alternative proposal of division in social economy focused on the social functions of its entities – social enterprises. The proposed solution serves to fulfil the dominant discourse of the social economy in new ways of thinking about the reasons and motivations connected with creating social enterprises. The proposed Matrix of social enterprises creates a possibility to describe (and understand better) the manifestations of this social and economic phenomenon. The presented conclusions were considered in the light of Piotr Sztompka's social capital theory and the theory of social cost developed by Ronald Harry Coase..

Keywords: social economy, the matrix of social economy, social capital, social enterprises, social cooperatives.

1. Introduction

The aim of the article is to present an alternative proposal of division to the dominant one in the discourse of the social economy division into old and new entities of social economy, to understand and create a possibility to describe the manifestations of this social and economic phenomenon.

For the purposes of this paper, the following order of definitions was adopted. Social economy is understood here as an area of interdisciplinary, theoretical considerations, whereas social entrepreneurship is defined as types of organized business practices, also going beyond the existing legal framework for social responsibility, positively evaluated in relation to social and symbolic values, meeting the requirement of economic rationality[1]. Social enterprises are therefore both old and new social economy entities, and other types of entities in an open market that balance their economic and social goals. The article is a development of the considerations presented in the dissertation entitled *Determinants of diversity in social entrepreneurship types in Poland*.

2. Literature review

In the social economy, the most common division is defined as the old (19th century) and the new (20th and 21st century) social economy. This solution is primarily connected with the time of establishing social enterprises. The second important variable is the initiative and the purpose for which these companies were formed. The following table shows the main differences between traditional (old) and modern (new) social enterprises.

The presented division of social enterprises seems to be dominant for other categorization attempts in the area of social economy. This is due to several factors. The discussed division refers to the economics and legislation in force, which seems to provide binding and least debatable knowledge. This division seems to be disjointed - theoretically it allows for a distinct classification of social enterprises in which the possibility of non-social enterprises of mixed type does not (formally) exist[2]. In the above-mentioned division, attention is drawn to the fact that the creation of social enterprises can influence the development of social capital, not taking into account the fact that the existing social capital influences the emergence of new forms of social enterprises.

[1] The presented definition of social entrepreneurship was created by the author and first mentioned in her dissertation.

[2] The problem of the formation of social enterprises combining different perceptions as functionally detached features is currently being discussed in the Italian legislature.

Piotr Sztompka defines social capital as a moral space based on trust, loyalty, mutuality, solidarity, respect and justice [Sztompka 2016, p. 12]. The more developed the social capital is, the more civil the society becomes. These arrangements have particular importance in the context of the development of new forms of social entrepreneurship, demonstrating the densification of social capital in Poland.

Table 1: Comparison of old and new social economy

	OLD SOCIAL ECONOMY	NEW SOCIAL ECONOMY
RESPONSE TO PROBLEMS GENERATED BY THE ECONOMY	exploitation, alienation	exclusion, unemployment
PROFIT AND SOCIAL OBJECTIVES	profit at least as important as social goals	social goals are definitely more important than profits
NATURE OF SOCIAL GOALS	PRODUCT TYPE: not specific TYPE OF WORK: not specific POSITIVE EXTERNAL EFFECTS: eradication of exploitation and alienation as a result of management in collective forms of ownership	PRODUCT TYPE: goods (primarily services) which are not interested in the market and the public sector TYPE OF WORKERS: employment of people with the weakest position on the labour market POSITIVE EXTERNAL EFFECTS: development of social capital, local development
FORMS	cooperatives, associations, mutual assistance societies	various forms of social enterprises, social cooperatives and others
ROLE OF THE STATE	support (postulate)	support, subsidy, protection
MARKET RELATION	competition	operates in areas of market failure
MACROSTRUCTURAL EFFECTS	weakening class conflict	increase of social cohesion

Source: [Kaźmierczak 2007, p. 106].

Second, significant for the presented findings, is connected with the theory of social cost developed by Ronald Harry Coase. In his original works this author dealt, among others, with ecological problems caused by industry. Coase claimed that air pollution and other ecological damages are a kind of cost for factories which should be paid to the society because of using common good such as clean air. These propositions of understanding social costs were intended to avoid more serious harm [Coase 1960, p. 2]. Today, the theory of social costs is applicable in the sense of how to understand the social costs associated with running a social policy in the labour market. The theory of social costs makes it possible to understand long-term unemployment as a social cost, while its reduction as a social gain. Entities that are able to generate such profits for the society are, among others, social enterprises. This way of understanding the importance of social entrepreneurship allows to redefine the notion of the costs that the society has to bear in terms of the values of the society's recognition.

3. Methodology

The basis for the presented conclusions were the studies of subject literature and multi-faceted qualitative research. Literature studies were mainly focused on a chronological overview of the economic theory, social development, legislation and social enterprise organizations from the 17th century until now. These analyses had a multithreaded dimension and referred to the socio-political context of the formation of social enterprises, the influence of

culture, including the traditions and beliefs that stimulate the development of entrepreneurial attitudes, but also charitable among social entrepreneurs. Literature studies also referred to the characteristics of the entrepreneurs of social economy entities. This research activity has tracked legislative changes in the area of social entrepreneurship, which are understood here as a consequence of a social change resulting from the changes in the density of social capital. Literature studies also included in the results of the studies on the nature of social entrepreneurship development reports commissioned by government agencies, third sector actors focused on civil society, and market research.

In field research, participatory observations of open and closed nature were conducted, alongside individual in-depth interviews and expert interviews with leaders in the field of social economy in Wielkopolska. In the research process, the results of the research conducted by researchers such as Marek Rymsza, Jakub Wygnański and organizations such as the Institute of Public Affairs and the Association for Social Cooperatives were taken into consideration.

The research was conducted for 4 years. Literature studies covered Poland, Italy, Great Britain and the United States of America and other countries. Field studies covered Poland, and in particular social enterprises operating in Poznan. The study was completed by the observation of a social company operating in Italy.

4. Results and Discussion

The result of conducted theoretical and empirical research is the Matrix of social enterprises. The proposal that follows focuses both on the importance of social capital for these types of companies and how the effects of individual types of enterprises affect the reduction of social costs.

The matrix is divided into four parts, each of which presents an orientation for specific values. These values determine the legal form of social enterprises, specific characteristics of

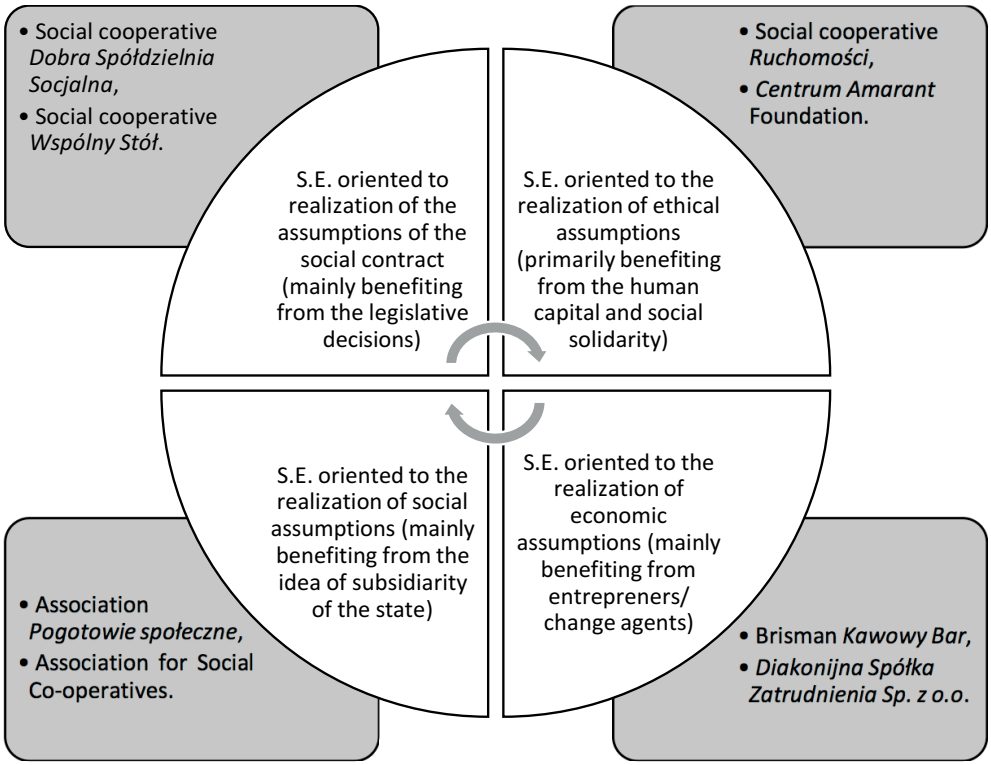

Figure 1: Matrix of social enterprises

the consumer and the services offered by the social enterprise, the source of funding for the business and the way in which the funds are redistributed. For all types, the assumption is that the more dominant values there are in them (the more social capital there is around them), the better they accomplish their goals. This factor also influences the sustainability of individual social economy entities and the expansiveness of their activities. Each quarter[3] was assigned examples of social enterprises that best[4] reflect the proposed understanding of the distribution of social enterprises.

The first quarter consists of social enterprises oriented to the realization of the assumptions of the social contract (mainly benefiting from the legislative decisions). Entities that dominate the implementation of the social contract assumptions are primarily benefited from legislative decisions resulting from the assumptions of the social economy adopted in Poland. Second, this category of social enterprises is characterized by entities whose activities are based on the accepted and constantly reconciling the diversity of both the members of the social enterprise and the recipients of their products and services. Diversity is linked to such factors as health and social conditioning that characterize individuals as members of social co-operatives.

One of the main goals of Cooperative Wspólny Stół and Cooperative Dobra is social activation of their members. Cooperative members are supposed to increase their competences and specialize in the gastronomic professions, thereby strengthening their social position and developing interpersonal relations. The social contract is understood here as a socially accepted strategy of involving excluded people (e.g. through long-term unemployment or lack of experience in the labour market, a difficult personal situation or disability) to the social world, including the "world" of the profession.

The second quarter consists of social enterprises oriented to the realization of ethical assumptions (primarily benefiting from the human capital and social solidarity). Entities that are predominant in ethical principles are primarily benefiting from human capital and social solidarity. The characteristic feature of these types of entities is the pursuit of sustainability of activities related to broadly understood socio-cultural animation with activities of economic nature. Service recipients of the entities with a dominant orientation towards ethical assumptions identify themselves with worldview beliefs manifested in actions undertaken by social entrepreneurs; this identification, in turn, is associated with consumer choices. These companies include in their offer the unpaid activities they benefit from, but also ones in which the beneficiaries are included in the offer. Entities that dominate the ethical orientation are characterized by the uniqueness of the goods and offered services.

Social cooperative Ruchomości was created in response to the specific needs of the social group organized around the anarchist movement, according to which social co-operatives are the most democratic of the available forms of economic activity. Centrum Amarant Foundation was created in response to the specific expectations of the local community that demanded a shared space where broadly understood social and cultural animation and artistic activities took place.

The third quarter consists of social enterprises oriented to the realization of social assumptions (mainly benefiting from the idea of subsidiarity of the state). Entities that dominate the implementation of social objectives are principally beneficiaries of the idea of state subsidiarity: they are oriented towards building jobs for people in socio-economic difficulties, and also for the self-employment of their dependents. These entities also mediate the acquisition of work by market-based workers or the acquisition and transfer of grants for their economic self-reliance.

Enterprises oriented to the realization of social assumptions carry out activities related to the animation of entrepreneurial attitudes among disadvantaged social groups. The activities of this type are subject to individual aid or assistance in creating social enterprises. From the other types of entities, they distinguish, among others, the fact that their activities are financed from various sources (including public and non-public and national and EU funds), which are meant to equalize the broadly understood social opportunities of citizens.

The fourth quarter consists of social enterprises oriented to the realization of economic assumptions (mainly benefiting from entrepreneurs / change agents). Entities that dominate the implementation of economic assumptions

[3] Descriptions and examples of social enterprises used in the paper are taken from the case studies presented in the dissertation.

[4] In the quadrant of social enterprises whose activity is oriented towards the realization of economic assumptions, Diakonijna Spółka Zatrudnienia Sp.o.o. replaced the originally assigned Brisman Coffee Bar. In the meaning of the author, Diakonijna Spółka Zatrudnienia Sp.o.o. is a more complex and thus more interesting example of a social enterprise of the analyzed type from the perspective of discussed considerations.

are used primarily by entrepreneurs and change agents – experienced individuals oriented towards the realization of specific assumptions that, through human and social capital, induce a social change. Companies run by such entities are demand-driven entities, both for specific products and services and for the way they are consumed. Another characteristics of entities dominating the economic assumptions is the constant readiness to learn – both, the market and the customer.

Described entities are best suited to the definition of a company operating on the open market. This quarter includes companies defined as social enterprises (e.g. Diakonijna Spółka Zatrudnienia Sp. z o.o.) and entities that go beyond these standardization (e.g. Makerspace). This type of social enterprise builds its position mainly on the basis of a free-market game by participating in public tenders and, above all, by carrying out business activities. Brisman Coffee Bar operates on the basis of direct trade rules. Diakonijna Spółka Zatrudnienia Sp. z o.o. carries out production and service activities, employing people who have experienced social exclusion (e.g. those who have returned from unpaid economic migration), and who are also involved in social rehabilitation.

It seems important to emphasize that the presented division is inseparable, and like the division of social economy into old and new, it is a proposal to organize thinking about what social economy is and what aims it is to achieve. The Matrix of social enterprises were also developed because it seems important to emphasize the interdisciplinary nature of considerations in this area of theoretical analyses. The examples of social enterprises referred to in the Matrix have been selected taking into account that at different stages of their development they can move between the quarters. In the presented division, the formal and legal accent of the division of social enterprises was transferred to social categories (e.g. using, creating and thickening social capital), which are treated here as a cause rather than a consequence (side effect) of the development of social enterprises in Poland. Social economy management is not (only) about supporting people who do not manage the labour market. It is also a conscious choice, which may result from changes in the value system of the economic activity of Poles. The presented understanding of divisions in the field of social entrepreneurship serves to crystallize the scientific discourse in the area of emerging disciplines (subdisciplines?) – social economy, which can be clearly and exclusively included in the fields of interest of economics, sociology or social policy.

5. Conclusions

Social economy is a developing discipline of knowledge, evidenced by numerous discussions about its sense, purpose, disciplines in the world of science, and on the interface of theoretical knowledge and practical experience. Social entrepreneurship is developing, as evidenced by the increasing number of entities in this area of the economy. The presented model reflects the current moment in the history of the development of the social economy discipline and there is no doubt that it will develop and change over time.

The presented abstractions and conclusions relate to social capital at a certain stage of its development (thickening). It seems important to emphasize that not only as it is adopted in the classical divisions does social capital liberate the potential of social entrepreneurship. Social entrepreneurship seems to have the ability to produce this specific kind of capital.

Assuming that it is possible to treat the development of social entrepreneurship as an economic activity (activation) of a society, it is possible to treat the promotion of this type of activity in order to reduce social costs, and to properly generate profits in this regard. This way of thinking could open up a new perspective in understanding and interpreting social economy in the scientific theory.

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Investigation of the social factors of development of society in the territories with transforming environment

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ABSTRACT

Constantly changing environmental conditions lead to the necessity of regular updates, enhancements and adaptation of the existing approaches to the investigation of the development of societies that live in different territories. As a result, the purpose of the paper is to identify the main social factors that affect the vital activity of society at the present stage of development of territories which have unstable socio-economic and political environment. Specific trends, reflecting the state of social and economic processes in the countries of the evolving political and legal systems are considered (on the example of the Donetsk region). The components of the social and cultural environment as factors of forming a system of vital activity of the society are determined: the level of development of education, medicine, social infrastructure facilities, the environmental aspects, the social hierarchy and relationships in the community, the criminal and military risks, the demographic trends, the level of unemployment and informal employment. The authors developed a methodology of an expert assessment of the importance of the factors of forming the system of vital activity of the society. A set of recommendations for the coordinated impact on the economic and social processes in the conditions of transforming market system was proposed as a result of the research.

Keywords: vital activity of society, the Donetsk region, the socio-cultural environment, economic and social development.

1. Introduction

A study of the current state and trends of many countries and regions in conditions of transforming the political, social and market environment leads to the conclusion that most of the territories and their populations are severely affected by negative factors, leading to the deterioration of living conditions, violation of rights and freedoms, reduction of opportunities and redistribution of desires to satisfy the most simple needs. In advanced economies, these processes reveal themselves in the form of declining trends in household incomes, violation of trade relations, diversion of capital from the sphere of economic development to the sphere of military spending, curtailing of social programs. Most vividly modern social and economic cataclysms show themselves in Eastern Europe and the Middle East.

2. Literature review and problem statement

The problem of management of the complex characteristics that are used to create an enabling environment for economic and social development was raised by many scientists [Amosha, Kharazishvili, Liashenko, Kvilinskyi 2016, pp.19-34; Babkin 2013, pp. 138-148; Baranovskyi, Girchenko, Serdiukova 2017, pp. 20-33; Blagodarnyi, Tolmachova, Kvilinskyi 2014, pp. 30-37; Bondaryeva, Kravchenko, Mieshkov 2015, pp. 236-244; Bukharova 2012, pp. 1843-1849; Dementiev, Vishnevskiy, 2010, pp. 81-95; Ivanov, Liashenko, Kamińska, Kvilinskyi, 2017, pp. 86-101; Ivanov, Lyashenko, Tolmachova, Kvilinskyi 2016, pp. 9-34; Khobta, Popova, Mieshkov 2005; Kvilinskyi, Kravchenko 2016, pp. 101-112; Kvilinskyi, Zwierzchlewski, Błaszczyk 2016, pp. 310-315; Lang, Melnychenko 2016, pp. 9-17; Lis 2016, pp. 56-61; Lyashenko, Kvi-

linskyi 2016, pp. 9-24; Lyashenko, Tolmachova, Kvilinskyi 2016, pp. 155-164; Meshkov, Bondaryeva, Kvilinskyi, 2016, pp.120-134; Pająk, Dahlke, Kvilinskyi 2016, pp. 109-122; Pająk, Kamińska, Kvilinskyi 2016, pp. 204-217; Pershin 2009, pp. 96-102; Polidi, Sichkar 2013, pp. 144-149; Sisoev 2014, pp. 76-84; Sorokina 2013, pp. 27-31; Todosiychuk 2010, pp. 15-27]. At the same time, constantly changing environmental conditions lead to the necessity of regular updates, enhancements and adaptation of existing approaches to the investigation of the development of societies that live in different territories. All this has led to the necessity of given research and formulation of the purpose of the article which focuses on identifying the main social factors that affect the vital activity of society at the present stage of development of territories, which have unstable socio-economic and political environment.

Development tendencies of a certain territory are influenced by a large variety of characteristics with different specifics and force of impact on economic agents. The study of these characteristics is relevant to all areas of functioning of the state, society and certain enterprises. This aspect makes it necessary to define the number of factors that have a decisive influence on the conditions of the vital activity of society within a particular territory.

General scientific principles of creating classifications are the selection of the constituent elements of a certain process, object or phenomenon, through the use of a specific defining characteristic which is called a criterion. Criteria may be different. Taking one feature, you can get one division of a whole object (process, phenomenon) into its component parts. Using other criteria, it is possible to create a completely different set of elements, which allows you to see the object under study from a different angle. All this is necessary for the formation of theoretical understanding of the object of research and better use of the acquired knowledge into practice in order to solve the problem of increasing the manageability of the object. The use of resulting characteristics is difficult because they are often subjective by reason of the frequent lack of clear boundaries in nature in general and in science in particular. This is why the classification is often quite subjective. At the same time, this drawback does not overlap the advantages noted above, and does not cancel the most important general scientific and practical value of making classifications.

Drawing up a list of characteristics that form the level of development of the society is also quite a time-consuming and subjective process because of the high level of interdependence of selectable items. For example, noting the legislative and regulatory documents as one of the factors forming the specifics of the vital activity of society, researchers have to understand that this aspect has a direct or indirect impact on most of the other characteristics. Thus, there is partial superimposition of a number of factors that must be considered when carrying out a deeper analysis.

Nevertheless, the team of authors attempted to highlight a broad range of factors that reflect the development of the territories. Also, the analysis of the peculiarities of forming the conditions of the market system functioning and the vital activity of the population of a crisis territory has been carried out (on the example of Donetsk region).

3. Research results

The entire list of various characteristics that have an influence on the development of the territory should be divided into three main categories: the state of the political and legal environment, the level of economic development of society as well as the features of the socio-cultural environment. Each group of factors requires a separate analysis. At the same time, it is necessary to take into account its specificity and the relationship with other characteristics. This study is very cumbersome, because it covers a very wide range of research areas. Therefore, its results cannot be reflected in a single article. In this regard, this paper briefly reveals a whole range of factors that influence the development of society and focuses on social and cultural factors within the formulated purpose of the article.

The main characteristics of the political and legal environment, ultimately merged into three major elements: the degree of political stability of the territory, the efficiency of the legislative and regulatory instruments, the reasonableness and sustainability of the concepts of territory development.

The principal characteristics that reflect the level of economic development of the society include: the degree of development of the tax system, the capacity and solvency of the internal market, the availability of raw materials, the rate of inflation, the stability of the national currency, the principles of formation of the national budget, the state of the stock market, the banking sector, the quality of investment infrastructure, the specifics of forming an integrated logistics infrastructure, the growth dynamics of the gross domestic product, the volume of production, logistics costs in the supply chain, capital investments. Each factor has its own peculiarities of influence on the processes of capi-

tal investment, which in different ways can manifest themselves in different circumstances.

Simultaneously with the political and economic factors socio-cultural factors of forming the system of the vital activity of society of certain territory clearly reveal themselves (fig. 1).

In spite of the lack of funding, the limitation of material resources and a high level of personnel outflow, the Donetsk region retains a sufficiently high level of training of professio-

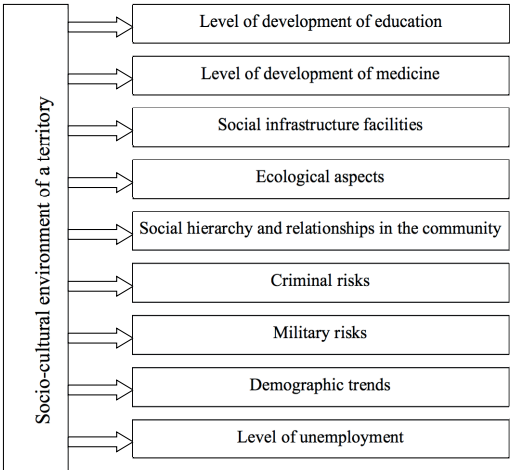

Figure 1. The components of the social and cultural environment as factors of forming a system of vital activity of the society
Source: own study

nals in technical research areas, engineers, economists, masters of innovation management [Bondaryeva, Kravchenko, Mieshkov, 2015, pp. 236–244]. However, this sphere can also come to a complete decline, without appropriate funding, creating conditions for the appearance and development of highly qualified personnel in education and industry, where the product of the educational system of the Donetsk region is mainly used.

The same trends and perspectives characterize the health sector in the region. The high level of Medicine was formed due to the development of industry (primarily: mining, metallurgical, machine-building and chemical industries). This is related to the fact that the highest levels of personal injuries and environmental pollution are the adverse effects of functioning of the industrial enterprises of the Donetsk region. We emphasize that the potential of powerful centres of the health care system, the intensity of investigations in the areas of advanced medical science have been seriously weakened by the change in current urgent needs of the region.

It should also be noted that many educational and medical facilities of Donetsk and the Donetsk region greatly suffered from military operations. In general, the social infrastructure of the region is largely outdated and preserved since the Soviet times. Mainly, it concerns the social and cultural facilities, housing and the utilities sector, health and education facilities, which have a high average level of physical deterioration and obsolescence, as well as a need for the creation of alternative facilities or reconstruction.

In view of the impossibility of qualitative monitoring of the functioning of enterprises, ecological risks have increased. Stopping of many enterprises, along with the negative economic and social consequences, has led to occasional positive side effects, which is to reduce the negative impact of these economic entities on the environment. At the same time, many experts point out a decrease in the requirements for environmental safety in the majority of functioning industrial enterprises throughout the Donetsk region. In addition, criminal risks become higher, as well as specific regional risks: first of all, the need to maintain a proper form of underground coal mines, which cover most of the territories of the cities in the region: the prevention of floods, landslides, etc. In recent years, the risks of destruction of infrastructure and damage of the health of employees as a result of hostilities were added. War risks have become greater than all the other negative characteristics. Two years ago, many experts, making an assessment of the level of development of the Donetsk region, did not even take this factor into account.

All post-Soviet states since the beginning of the 1990s up to the current period are characterized by an extremely high level of social inequality. The classical model of a developed society implies the existence of a layer of wealthy people, poor people and a massive layer of the middle class, which largely determines the level of economic development of society and its social and cultural priorities. In the Ukrainian society, the middle class was extremely insignificant: from the end of the 1990s to the beginning of the second half of the 2000s, with great effort, it was increased. However, the crisis of 2008 and the war that started in 2014 have led to critically negative changes in the structure of income and needs of the population, primarily in the Donetsk region.

The high level of migration has led to deterioration of demographic indicators. The

statistics that reflect the real dynamics of the current population of the region are missing. At the same time, it is evident that many qualified and able-bodied residents have found temporary or permanent employment and residence in the territory of Russia, Ukraine, Belarus and other countries. This led to a decrease in the average skill level of employees in the region and a significant decrease in the proportion of the working population.

In general, the related problems of unemployment and informal employment during the last twenty-five years were very urgent in Ukraine. The indicators of registered unemployed in the country as a percentage of the working age population in the pre-war period amounted to 1.8-2.1%. In the Donetsk region, they were even lower - 1.2-1.3%. However, the statistics in this case are not indicative because of widespread informal employment and understatement of declared wages of many employees of private companies. Thus, at present there is a significant number of citizens who have worked for many years without registering labour relations with their employer or getting a small part of their wages officially. As a result, a very serious social problem has appeared. Pensioners aspire to continue working as long as possible, in contrast to the Western model of behaviour of the age population, which is expressed in the postulate of „Retirement – Only the Beginning". In addition, some persons who have retired, have to put up with a multiple decrease in income and decline in living standards due to the lack of sufficient savings or loss of savings due to the financial crisis and in view of the lack of development of private pension insurance.

All these factors cause the serious condition of the system of vital activity of the Donetsk region society now. As a result, it is necessary to identify the most significant and urgent characteristics and search for the ways to improve them.

Further, the expert assessment of the importance of social factors that influence the development of the society was carried out. The research methodology assumed the use of a survey method with semi-closed questions to quantify the degree of influence. The selection of experts was carried out by random sampling without replacement sampling. Twenty representatives of the scientific school of investment and innovation theory and practice of Donetsk National Technical University (which was headed by Professor V.M. Khobta for twenty years) took part in the expert evaluation [Bondaryeva, Kravchenko, Mieshkov, 2015, pp. 236–244]. The scientific school of investment and innovation theory and practice had prepared about three and a half thousand graduates and currently about one hundred and fifty persons are administrative staff. Their activities are directly related to the analysis of investment processes in the economy (15% – random sampling). Currently, experts are leading specialists of educational institutions and enterprises, such as Donetsk National Technical University, Donetsk National University, Poznań University of Economics and Business, the "PricewaterhouseCoopers Ukraine" company, the "Metinvest" company, the "Ukrpodshipnik" group and others (survey date – April 2016).

A numerical system of evaluation has been used in conducting the expert assessment. Six basic levels were defined depending on the influence on society development (Table 1).

Table 1: The method of expert assessment of the significance of factors of forming the system of vital activity of society

Influence of the characteristics on the level of development of society	Points
Decisive (the highest possible) influence of the factor	5
High level of influence of the factor	4
Medium level of influence of the factor	3
Low level of influence of the factor	2
Episodic (very low) influence of the factor	1
Influence of the factor is not observed	0

Source: own study.

The result is a ranking of the characteristics depending on the importance of their impact on the level of development of the society. All the analyzed factors were identified as having a value from low to very high. (Table 2).

The methodology for analyzing the results of assessing the impact of factors on the investment climate formation includes statistical methods for assessing the consistency of expert actions and methods for assessing the degree of variation of expert opinions on each individual issue. The studies carried out are based on a sufficient degree of consistency of experts, which is confirmed by a concordance coefficient of 0.52 (ω=0,52>0,5). However, it was established that the opinions of experts on different issues vary not equally. The highest consistency of opinions of experts was obtained on two factors: the level of political stability (the degree of variation is 9.7%) and the quality of

investment infrastructure development (variability of expert opinions - 12.46%). The similarity of opinions in these cases is explained by the obviousness of the meaning and content of factors, as well as the relevance to modern conditions. The most numerous were the factors with variation of experts' estimates from 15% to 30%. Moreover, in this group a larger number of estimates are closer to the average value for the group, and only some experts expressed an opinion different from the majority. The other six characteristics of the investment climate (the principles of budgeting, the level of development of medicine, the quality and accessibility of social infrastructure, social hierarchy and relations in the society, criminal risks, the level of shadow employment), having a debatable nature, were assessed by experts heterogeneously. For example, the principles of budget formation as an investment climate factor received an average score of 2.5 with a range of variation from 0 to 4 points and a volatility of 41.9%, which is the maximum of the observed factors.

This study shows that of greatest importance are the military risks, which on closer examination, may also have political sources. The importance of the level of development of education, criminal risks, demographic (personnel) trends, ecological risks was estimated as above average.

Table 2: Expert assessment of the importance of factors of forming the system of vital activity of the society

Factors of formating the system of vital activity of the society	Average points
Military risks	4.33
Level of development of education	3.5
Criminal risks	3.44
Demographic trends	3.22
Ecological aspects	3.11
Level of unemployment	2.94
Level of informal employment	2.72
Level of development of medicine	2.61
Social hierarchy and relationships in the community	2.39
Social infrastructure facilities	2.22

Source: own study.

4. Conclusions

These aspects lead to the necessity to generate a sequence of interrelated actions which are aimed at overcoming the crisis and the gradual recovery and improvement in the level of development of the Donetsk region. The solution to current acute problems of stabilizing the functioning of the system of vital social activity in the Donetsk region is based on the implementation of three global phases: the achievement of peace; optimizing the quality of labour resources; involvement and effective use of financial resources from various sources.

The first basic socio-political stage is to establish sustainable peace in the Donbass due to strict observance by all participants of the conflict of conditions of the Minsk Agreement of February 11-12, 2015, as well as other international agreements aimed at de-escalating the military conflict.

The establishment of peace as well as loyal and friendly relations in the society should be the basic premise of restoring the personnel potential. First of all, it must be associated with the return of highly qualified employees who have left the region because of the fear for the life and health of their families, and also with the efficient use of existing potential and the ability to develop available staff. The responsibility of higher education institutions in solving the problems of strategic development of human resources is very high. Using the advanced experience of scientific schools of the Donetsk region in training professionals in the field of technical sciences, engineering and economic specialties, investment and innovation has the prospect of obtaining a high-quality human resource product that can be used in industry to increase its economic potential, as well as in other business spheres [Babkin, 2013, pp. 138-148; Bondaryeva, Kravchenko, Mieshkov, 2015, pp. 236–244].

Strengthening the capacity of human resources in the region is associated not only with an increase in the level of qualifications, but also with the decision of a number of problems in the field of mentality. These problems must be solved by raising the general cultural level, the level of spirituality, overcoming the high level of cynicism that has formed in the society. This feature is expressed in the high requirements for the other people, while the requirements of the individual to own characteristics are understated, and the main efforts are directed at creating the illusion of high morality to others. The solution to this problem requires deep understanding of one's own need to begin the transformations with oneself, which is

greatly facilitated by effective the state policy, especially in education, culture and upbringing of the youth. The implementation of the first two stages will provide the basis for financing economic development programs, providing a further increase in social welfare.

Summarizing all the above, it should be noted that the formation of favourable conditions for the development of society is an extremely difficult, complex problem. It repeatedly amplifies in the territories with unstable political, economic and social environment. Each of the selected characteristics is a separate sphere of research. Improving its current state requires more concrete recommendations, taking into account the specificities of different territories. This aspect determines the necessity of a large number of subsequent investigations.

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Family Firms as a potential source of growth for the Warsaw Stock Exchange

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ABSTRACT

The Warsaw Stock Exchange (WSE) has been growing rapidly since its establishment. The privatization program undergone via the public market was one of the crucial factors that contributed to this growth. Currently, very few state-owned companies that might go public have left. The main goal of this article is to discuss the possibility that family firms will step into the state's shoes and become a more meaningful source of new issuers for the WSE. This paper identifies the reasons for a possible increase in family firms listings on the WSE as well as key elements for that to happen.

Keywords: Family Firms, Capital Market, Warsaw Stock Exchange, IPO.

1. Introduction

The Warsaw Stock Exchange (WSE) has been growing rapidly for the last 25 years. This was possible due to some specific circumstances and actions that were taken. The first aim of this paper is to provide proposals for a set of key factors that most contributed to this development. Such a set could be used by other researchers as a base for further investigation of particular factors. One of these factors consists of the privatization program. The State Treasury provided a pipeline of new issuers that were able to attract a majority of domestic institutional investors, a large number of Poles (individual investors), as well as foreign funds. This process brought a lot of investor attention to the Warsaw market and allowed WSE to become a leading CEE stock exchange. Today, most of the large, well-performing state-owned businesses have already been privatized (through IPO), and there are not many that remain for the future. While the flow of new issuers is essential for the stock exchange, the lack of opportunities for privatization, accomplished through public equity offerings, might weaken further WSE development. On the other hand, there are more and more Polish family companies that are large enough to think about listing themselves on the WSE. The main aim of this paper is to examine whether families might step into the state's shoes and became a meaningful source of new public companies. It is an important field of research from the Polish capital market perspective. Future attractiveness and shape of the WSE create the basis for future research in the field of the Polish financial market. Additionally, it is important research from the perspective of family businesses as those companies are currently in a period of transition in Poland. Furthermore, it is worth mentioning that family firms have been identified by researchers relatively lately, and papers in that field in Poland concentrate rather not on capital markets, but mainly on such issues as succession, strategic management, managing types, innovativeness, financial management (financial analysis), mechanisms of control and supervision. The impact of family firms on the WSE future could be then perceived as an important and interesting from both a theoretical and practical point of view. The paper presents a qualitative approach and uses methods such as a scenario analysis.

2. Family Firms definition and role in capital markets

Family firms have only recently become a separate field of study. Researchers have found that these types of enterprises have some specific features that distinguish them from other types. Although there is a lack of consensus on the definition of a family firm (the European Commission (EU) [2009] even identified more than 90 definitions), researchers usually use criteria such as the family possession of a certain threshold of shares, family involvement in governance of the company (e.g. by having representation in management/supervisory boards) or succession, as well as some additional, soft characteristics such as the presence of family culture in the company. A review of family firm definitions was published e.g. by Gama and Galvão [2010].

As previously investigated by researchers, family firms usually have a longer-term approach to business, are less bureaucratized, and have higher levels of employment, but on the other hand, tend to employ family-members regardless of their qualifications, grow slower but more steadily than other firms, prefer lower levels of financial leverage and pay lower dividends [James 1999; Gallo, Tapies, and Cappuyns 2004; Instytut Badań nad Przedsiębiorczością i Rozwojem Ekonomicznym 2008; Stradomski 2010; Belenzon and Zarutskie 2012; PwC 2012]. Many consider family firms as a fundamental piece of modern economies. Research confirms this statement. The EU [2009] assessed that family firms comprise up to 60% of European companies. In Poland, their contribution is probably similar; therefore, their influence on the overall economy is significant and further research into this field is justified.

According to various studies, family firms account for a significant part of all listed companies on different stock exchanges. 35% of the Standard and Poor (S&P) 500 Industrials as well as 46% of S&P 1500 were family owned businesses [Anderson and Reeb, 2003; Chen et al., 2007]. In Germany, almost a half of all listed companies were family owned, excluding companies from financial sector [Achleitner et al., 2009], while in Spain it was almost 40% [Zulfiqar i Fayyaz 2014]. In Poland, Stradomski [2008, p. 71] investigated that family companies in 2006 accounted for ca. 35% of all listed companies. It is less than in western countries, however, the Polish market is relatively young. During the period of 2005-2014 family firms accounted for 48%[1] of all IPOs in Poland, which leads to the conclusion than their share in listed companies is growing [Filipczak 2016]. What is interesting, research confirms that family firms usually perform well or even outperform other companies on different stock exchanges based on the Q-Tobin indicator or total return for shareholders [Anderson and Reeb, 2003; Corstjens et al. 2006; Barontini and Caprio 2006; Sraer and Thesmar 2007].

3. Capital Market Developments in Poland

The Polish capital market has been developing rapidly since its re-establishment after the fall of communism. Amongst a group of a few institutions that are vital for this market and contribute the most, the Warsaw Stock Exchange plays a crucial role. The WSE concentrates financial instruments trading; therefore, its statistics might be used as a proxy for the overall development of the capital market. The number of companies listed on the main market of the WSE increased from 5 companies on the first day of listing in 1991 to 487 by the end of 2016 (out of which 53 were foreign). The market capitalization of the listed companies increased from PLN 161 mn in 1991 to over PLN 1.1 trillion 2016, while the turnover accounted for over PLN 189 bn in 2016 (vs. PLN 60 bn in 2004 or PLN 12 bn in 1994). This allowed the WSE to become a leading regional stock exchange, with market capitalization higher than other regional stock exchanges, such as those in Bratislava, Sofia, Ljubljana, Budapest, Bucharest, Prague and Vienna. Despite the WSE being a common academic research topic, there is lack of up-to--date and comprehensive reviews of the major factors influencing its development. Therefore, such a review is being proposed herein.

First of all, political changes and the transition from a centrally-planned economy to a market economy both allowed for the creation of a stock exchange at the beginning of the 1990s and for its further expansion. The importance of political regimes, as well as the economic model of capital market development, have been frequently investigated by researchers [e.g., Keefer 2007; Voghouei, Azali and Law 2011; Francis and Ofori 2015], and it is clear that in the Polish context, these items were crucial. What is more, politics drive regulations, governance standards, market practices, investment climate and the rules for those who run the businesses. Creating commercial laws that allowed for the expansion of entrepreneurship was one of the pillars of the development of the Polish capital market. Another political-driven factor was Polish accession into the European Union, bringing

[1] Results vary depending on the definition of a family firm. 48% in case of applying ownership and management criteria to define family firms.

its capital flows, set of market standards, and regulations to Poland. To some extent, it facilitated an increase in foreign investors' turnover on the main market of the WSE from PLN 17 bn in 2002 to PLN 203 bn in 2016[2].

Second of all, economic factors must be considered. Over the last two decades, the Polish economy has been developing rapidly. Some researchers have even called it the best 20 years in Polish economic history [Piątkowski 2013]. Between 1992 and 2003, the GDP per capita increased in Poland twice as fast as in the most developed EU countries, which resulted in a significant improvement in the country's wealth [Gomułka 2014]. Additionally, Polish economy performed very impressively (comparing to other European economies) during the recent global financial crisis. According to academic research, economic growth and financial market development (including capital markets) are interdependent [Jung 1986; Peia and Roszbach 2015]. Although a majority of the research concentrates on the influence of the financial market on economic growth, it might be assumed that in the Polish context, the economy's evolution allowed for an increase in savings (that were further allocated on the capital market) as well as the further development of companies (share issuers). Both issues had an impact on the WSE. Besides economic growth, other macro factors in general, such as a decrease in interest rates (from over 30% at the beginning of 1990s to stable, low single digits in recent years) or in the liquid currency exchange rate (allowing foreign investors to easily change their positions on the WSE) were important as well.

The third group of factors includes the introduction of proper law that facilitated the public trade of financial instruments and public offerings. The importance of proper law, with protection for investors, was highlighted in the research [Laeven 2014, p. 9; La Porta et al. 1997, 1998]. It is important to mention that together with the introduction of new laws, very important market institutions were established (e.g. Securities and Exchange Commission). Besides the laws and regulations themselves, market standards and corporate governance matter. These have evolved since the 1990s, and the EU accession placed an even stronger pressure on Poland to adopt corporate governance standards to compete for capital and investors with other EU members [Mortimer 2009, p. 383]. On top of that, there was also a lack of significant happenings that would undermine trust in the market.

The fourth group includes the technological development that allowed for electronic trade on a continuous basis, as well as stimulated turnover. In 2000, the WSE introduced the new WARSET trading system, which was replaced by the UTP (Universal Trading Platform) in 2013. This modern and efficient trading system allowed for the introduction of new financial instruments to trading, speeded up the execution of orders, attracted new foreign investors, and so on. It resulted in liquidity improvement on the market as well as continued the overall market development.

The next cornerstone for the Polish capital market was the pension system and introduction of Open Pension Funds (OPF). For many years, due to the stable inflow of money, OPF were active investors (their total yearly turnover on the WSE amounted to ca. PLN 30 bn in 2013) and participated in many equity offerings. Their assets increased from ca. PLN 30 bn in 2002 to ca. PLN 300 bn in 2013 (out of which ca. 50% was transferred to ZUS in 2014). As Bardziłowski [2015] stated, their contribution to the development of the WSE was crucial [Fundacja Forum Obywatelskiego Rozwoju 2010, p.16]; however, starting from the reduction of OPF contributions in 2011 and continuing further with significant changes introduced in 2015 (the immediate transfer of over 50% of assets from OPF to ZUS, the gradual transfer of money from OPF to ZUS in the future prior to retirement called a "slider", as well as the modification of investment limits), OPFs are being marginalized on the domestic capital market. The development of pension funds in Poland and recent reforms related therein have been analyzed in various different contexts [Chybalski 2009; Dybał 2013; Instytut Badań nad Gospodarką Rynkową 2009; Jakubowski 2014, 2015], but there is no doubt that pension funds fostered the development of the WSE. To some extent, a stable local investor base was likely to be a key factor for foreign issuers coming to Poland. What is important for this paper, contrary to past practice, is that the reformed pension funds have recently been investing more and more in equities abroad [Komisja Nadzoru Finansowego (KNF) 2015], which increases competition for this capital among stock issuers. From the other end, the mutual funds industry developed significantly with the growth in its assets under management, from ca. PLN 33 bn in 2003 to almost PLN 260 bn by the end of 2016.

[2] Data for both sides of transactions.

Finally, a very important factor in the capital market development was the privatization program. According to the WSE data, the State Treasury has in general decided to privatize over 70 companies via the WSE (including companies privatized via National Investment Funds). The value of these privatization IPOs amounted to almost a half of all IPOs on the WSE between 2005 and 2014. The transaction value of all of these IPOs was significant and above the average IPO value. The selling of shares in Poland's biggest companies via the public market attracted foreign investors (who are usually seeking bigger deals because of aftermarket liquidity, etc.) as well as large number of Poles. On the other hand, such transactions attracted international investment banks that were interested in their execution, therefore allowing them to implement standards from developed markets and share their know-how with local brokers. It allowed for the development of local brokers to the benefit of all market participants. In general, these transactions helped the WSE in building a proper scale for the market and becoming a regional leader.

Currently, there are only a few state-owned companies that might be floated on the WSE. A pipeline of new and attractive companies is required for the WSE to improve its competitive position. This gap might potentially be filled by family firms.

4. Why more Family Firms IPOs may take place ?

There are advantages (e.g. access to capital) and disadvantages (e.g. losing part of the control of the company, disclosure requirements) of being a public company. In every case, both should be deeply analyzed. The definition of family firm assumes a long-term approach to business and its maintenance by a family over generations [James 1999]. The capital market might boost business development and result in its longevity; however, it might limit family control over a company (and eventually its familiness). Should it be expected that family businesses in Poland will more often decide to go public? There are few factors that might imply that it is possible.

First of all, many family firms were established in the 1990s and in the years immediately following. Since this period, these companies have grown significantly. For the purposes of listing on the WSE, minimal market capitalization is required (in general EUR 17 mn or EUR 15 m depending on the market and with some exceptions for issuers whose shares were listed on another regulated market or on NewConnect for at least 6 months [Warsaw Stock Exchange 2015]). It might then be assumed that more family businesses will currently meet these criteria than in the past.

Along with bigger scale of business operations, capital requirements are growing. New funds might be used either to finance organic growth or for acquisitions. What is worth mentioning, more and more companies decide to expand abroad. Sometimes it requires significant capital expenditures. It is important to remember that family firms in general are reluctant to take on excessive debt. Equity raising through the stock exchange might therefore be a source of funding for business development.

A family life cycle may be another factor. Many of the entrepreneurs that founded their businesses after the political transformation in 1989 may be seeking succession. Assuming they were forming their businesses in their 20-30s, soon they will be approaching retirement age. An IPO might become a part of the succession process in several different scenarios.

Scenario 1: The founder would like to sell the whole company instead of passing it on to the next generation (e.g. because there is no next generation). In this case, listing on the WSE might be treated as a first step and a "shopping window" before a strategic or financial investor will acquire the company. On the other hand, the WSE might be treated as an ultimate exit route. The family may sell part of their shares in the IPO and further reduce their stake after some time. Usually, institutional investors on the public market expect that there is someone with a significant stake in the company on the board who will be engaged in the company's operations; this is why selling 100% of shares through the public market usually should be done gradually and requires two or more sell-downs.

Scenario 2: The founder does not want to lose control over the company and would like to pass it to next generation (which is interested in running the company). In this scenario, an IPO allows for a limited dilution in shareholding (which is rare in the case of the strategic investor path) and maintaining significant control over the company. During preparation for the offering, company needs to describe its business in details, formalize some of its internal processes as well as e.g. clearly determine and formalize its strategy. All those steps should be helpful in the succession process by facilitating the transfer of knowledge (additional benefits of choosing public path in that scenario are mentioned in the next scenario).

Scenario 3: The founder does not want to lose control over the company and would like

to pass it to next generation but the descendants are not interested in running the company. Going public and having shares of a public company instead of private one might be more practical from their perspective because:

1. A current valuation of the company is being provided;
2. It is only possible to sell a small stake in the public company very quickly;
3. Investors, sell-side analysts and the media will analyze the company on a continuous basis, therefore providing additional supervision;
4. Liquid shares of the public company may be used as a basis for a management option scheme for managers.

Together with successions more and more family members might become shareholders. It is natural that not all descendants would like to be involved in the company. Listing on the stock exchange may help in managing intra-family relations by e.g. offering shares of those family members that would like to exit the company while perceiving control over company by those members that are keen to be involved in the family business.

On top of the above scenarios it is worth mentioning that the successors with extensive academic background, and sometimes working experience in other companies, may be more familiar with public capital market rules than their predecessors, and therefore be more open to that source of capital.

Additionally, capital market might be helpful in managing the families' wealth, including diversification of it in a way of selling some of the shares in the company while still maintaining family control over it. It is important due to the fact that very often family companies constitute the majority of family assets.

Besides the above, the wealthy individuals that successfully founded businesses may look for additional challenges. Becoming a public company might be perceived as such, and additionally it is very prestigious to be a CEO/owner of a public company.

5. Limitation for increasing the number of family firms IPOs

As mentioned before, apart from the factors that could imply growing significance of family firms on the WSE there are some downsides that could limit WSE attractiveness for this group of companies[3]. First of all, families are not only economically driven. To preserve the family character of the company they may be unwilling to share control/ownership. Second of all, research shows [Filipczak 2016] that families decide to go public mainly to acquire new capital for organic development. Competition from other sources of capital could limit the IPO attractiveness. What is more, being a listed company requires fulfilling all obligations, such as issuing current and financial reports and disclosing a lot of information. Finally, it has to be mentioned that very often entrepreneurs are not familiar with financial markets, and therefore are not able to properly evaluate the IPO option.

6. Key elements for Family Firms' IPO accelerations

A family firm's IPO is a natural thing to consider only to a certain extent. To facilitate the growth of a number of family companies going public, several elements are crucial. Of course, some of these elements refer not only to family firms, but also to all potential issuers; nevertheless, this paper only concerns an analysis from the perspective of a family business.

First of all, it is the education of private entrepreneurs. To consider the public market as a source of capital or a place to sell some of the shares, families have to have knowledge about the public capital market. This is a task both for the institutions of the financial market (such as the WSE, KNF and others) as well as for the financial advisory industry as a whole. It includes knowledge about the benefits of being a public company, as well as its obligations.

Second of all, the development of advisers that are aware of family-firm specifics and are able to build trust and properly advise them. For example, as Filipczak writes [2015], the role of transaction advisors differs in the case of family firms. Such advisers should be perceived as a family transaction advisor, and should take into account not only the company's situation but the family's as well. This is also important for the transaction itself, because the family, on the one hand, might support the investment story, but on the other hand, could make the whole process more difficult.

Third, a stable base of investors is required to provide capital. In Poland, these mainly consist of pension funds and mutual funds. The amount under the management of mutual funds varies due to inflows and outflows; however, it is expected that Poles will shift more from bank deposits towards investment products. Mutual funds will benefit from this shift. On the other hand, a recent pension reform negatively influenced pension funds, and they will probably be facing net outflows in the upcoming years. Those funds used to be a long-term, stabile investor in Poland's equity offerings, but their future

[3] The review concentrates on factors that are specific for family firms.

role is not yet clear. On top of the existence of an investor base, investment managers should be aware of family-firm specifics to be able to assess their influence and properly valuate them.

Another important factor consists of regulations. Proper rules that regulate public equity offerings and information disclosures post-IPO are crucial for the market. Currently, the Polish law is being adjusted to the EU standards, but sometimes the implementation of the law is even more important than the law itself. The prospectus approval process might serve as a good example. Strong cooperation between the KNF and issuers might be very fruitful for the market.

On the other hand, family entrepreneurs should be willing to understand the public market and be ready to disclose information that will limit investors' concerns towards mutual relations between the family and business. For example, rules for employing family members might be disclosed or other such materials.

7. Conclusions

First of all, this paper provides proposals for a set of key factors that contributed most to the development of the Polish capital market. Such an up-to-date set has not been identified in the literature. One of the key factors was the stream of new issuers being state-owned companies that were privatized via the WSE. This paper discusses the future development of the Polish capital market in the light of the fact that not many such transactions are expected in the future. As analyzed in the paper, family firms may become a more meaningful source of new issuers. There are clear factors that may encourage these firms to go public in the upcoming years. First of all, more and more family firms are big enough to meet WSE requirements. What is more, many of them develop rapidly (domestically and abroad) through both acquisitions and organic means. To fund such growth, they may consider listing as a true alternative. Second of all, a wave of succession in family enterprises is expected. The public market might be a useful tool in this instance. Additionally, the public market might be helpful in diversifying the families' wealth or manage intra-family relations. On top of that, listing a company might be very prestigious for those successful entrepreneurs. These give credence to the expectation that there will be potential family issuers in Poland. Of course, on the other hand, the capital market should actively approach them so as to increase the number of family listings. In addition to other factors, what is crucial to this process is proper education and information about the capital market for private entrepreneurs, the development of an industry of family advisers, a stable base of investors and proper regulations with practical implementation.

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Theoretical Framework for Stock Pricing Process based on Micro-Economic Decision Model

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ABSTRACT

The most common model for asset pricing (CAPM) is problematic and does not match the reality. In this article, I introduce a theoretical framework for a new model which aims at avoiding the problems of CAPM and keeping its advantages, therefore allowing universality of asset pricing. The model is built on the economic principles, using a budget constraint and a Risk Appetite (RA) function. It is based on the micro-economic decision model, involving an expected value and dividing a stock price to objective and subjective prices. As a result, rational based individuals, just like individuals with non-rational factors, may use the model to calculate a future price stock in exactly the same way.

Keywords: Asset Pricing, CAPM, Risk Appetite, Economic Decision Model.

1. Introduction

For six decades CAPM has been a preferred model for asset pricing both by the academia and industry. It gives and shows a simple explanation of expected returns, which is based on the connection between risk and expected rates of return as compensation for the risk. However, it is far from being perfect due to its mismatches of the reality. Because of strong and non-realistic assumptions, the model has created econometric anomalies, which support the wrongness of the model.

Generally, there are two main approaches to asset pricing which bring solutions to the puzzles or anomalies associated with asset pricing. A traditional economic approach sees the solution to any problem only in the economic factors, such as a utility function and consumption or an income, based on the underlying assumption that the economic agents are rational. On the other hand, there is a behavioural economic approach that sees a human as a complicated organism whose decisions are influenced by psychological and sociological factors rather than by economic factors. The reason for such a view is the fact that human nature may be non-rational in the sense of homo economicus, as the traditional approach suggests.

Both approaches have strong evidence of their rightness, but so far both have failed to find a final and efficient solution for asset pricing. Rational behaviour, as non-rational, is observed on the markets, and the theory or models should count all the agents in order to match the reality as much as possible. Combining two main approaches has the potential to create a better explanation for the financial phenomena.

One of the main advantages of CAPM is the ability of a graphical presentation of the model. The visual explanation is easy and understandable even to a naive investor, but due to the model's failure to explain the reality, it is preferred to keep this advantage through finding a better alternative. Another advantage of CAPM is its simplicity and ease of use [Fama, French, 2004]. On the other hand, there are some problems and criticism of the model. The

most problematic is a market portfolio, which theoretically should contain all possible assets that in some part are immeasurable and beta coefficient, which is supposed to be a measure of systematic risk, but in fact fails to do it. Those problems create a distorted explanation of the reality on one hand, and challenge to find a better solution on the other hand.

The model suggested in this paper tries to tackle with the challenge. This is a theoretical framework for the asset pricing process in which I attempt to integrate normative and descriptive approaches into one pricing platform. This article is theoretical rather than empirical. The applied methodology is literature study with a combination of the findings and my own analyses.

Looking at the price nature from a different angle, the model introduces the price as an objective price with its dissonance and assumes a budget constraint. The price is adjusted to something that I call a Risk Appetite (RA). The higher the Risk Appetite, the higher the expected price of an asset. The proposed model should keep the advantages of CAPM and eliminate its disadvantages. The model is stepping forward to the universality relatively to an agent's nature. Both, the rational-based agents and agents using non-rational factors are able to accept it.

The second part of this paper discusses the limitations, advantages and criticism of CAPM. It shows why CAPM fails in general, but is still the most popular and preferred model for asset pricing. In the third section two main approaches to asset pricing and resolving the anomalies with the puzzles are introduced and discussed. In the fourth part I propose a new approach. I show the goals of a new model and explain how it is possible to eliminate the limitations of CAPM through keeping its advantages. Also, I show how the model may gain suitability with rational-based agents and agents using non-rational factors. Next, I show how the suggested model should work and what it contains. At the end of the paper I make necessary conclusions.

2. Theoretical framework

The failure of CAPM does not mean that it does not have any rational points, but it means that the model should be improved through keeping its advantages and eliminating its disadvantages. Consequently, I suggest the theoretical framework that has three main goals - directions:

1) Keeping the advantages of CAPM:
- Simplicity
- Ease of use
- Ability of the graphical explanation

2) Eliminating the disadvantages of CAPM:
- Problematic market portfolio
- Beta coefficient critics
- Better and closer explanation of the reality

3) Possibility for rational based agents and agents using non-rational factors to accept the model:
- Independent of classical economic rationality
- Possibly universal

2.1. Keeping the advantages of CAPM

A simple model means it is intuitively understandable and it looks similar from the past knowledge. Even before knowing or using the model, the agents may recognize its parts due to the analogy with other approaches. The proposed model imitates the microeconomic-decision model of an individual's choice between two different products due to the existing utility function. Hence, in the suggested model, the utility function is replaced with the so-called Risk Appetite, which originally comes from risk management.

When the model is familiar, it is acceptable by the agents as they may easily use it. Moreover, when the model contains fewer simple components, it will be more understandable and easy. Another important ease point is the ability of the model to create a very understandable product with a simple accessible input.

Additional advantage that CAPM has is an ability of graphical explanation. Due to imitating some known models, the proposed model has the same principles and can be represented by similar and familiar graphs. The visual explanation adds a lot to the mathematical explanation.

2.2. Eliminating the disadvantages of CAPM

CAPM has limitations through a clear point: risk and ROR have a very strong connection and only when an individual is ready to take a higher risk may he or she obtain a higher ROR. Those limitations are too problematic. It is possible to get rid of them by improving the CAPM, but it may make the CAPM more complicated and uncomfortable. It is also possible to avoid the limitations by creating a new model. This model is built on a different basis. It has no market portfolio or beta coefficient. It is based on the economic approach: the individual's choice is made by the integration of their Risk Appetite with their desirable ROR.

2.3. Universality

Two approaches, EMH and behavioral finance, which are based on rationality and on possible non-rationality respectively, try to deal with the issue of the econometric anomalies, but no

one gives an efficient solution to it. The issue of rationality is on top of economic sciences. The proposed model uses the so-called Risk Appetite instead of the utility function and universalizes the expectations of all individuals. Whatever the factors that an individual uses to make his or her decision are, it will not affect the proposed model. The fact that the model avoids the utility function makes it suitable with every possible individual.

3. The fundaments of CAPM and its criticism

The modern asset pricing theory started with the „Portfolio Selection: Efficient Diversification of Investments" [Markowitz, H. 1952]. It does not suggest any predictability; the main goal of Markowitz [1952] was to find a way to reduce the investment risk. In his work, he shows that by combining assets on different risk levels, there is a possibility to obtain the same Rate of Return (ROR) with lower risk or to obtain higher ROR at the same level of risk. Consequently, building a portfolio of assets with different risk levels allows reducing its overall risk. Another important point is that such diversification is not endless; it will stop at a best possible portfolio at a given risk level with a respective ROR. Hence, there are a lot of portfolios that could be counted as the best choice. The set of such portfolios is called an efficient frontier, which is a line that demonstrates the most efficient investments. Markowitz [1952] claims that an efficient investment should be done when the chosen portfolio is a part of the efficient frontier; otherwise, it is possible to improve the portfolio by adding more assets. In 1990, H. Markowitz was marked with the Nobel Prize award for his theory.

The idea of modern asset pricing theory lies in the basis of the Capital Asset Pricing Model (CAPM). CAPM was developed and introduced by Treynor [1961, 1962], Sharpe [1964], Lintner [1965] and Mossin [1966] separately. It turned out to be a fundamental asset pricing model for the upcoming econometrical models that test it.

CAPM is a one-factor model that shows how much an investor should be compensated for accepting risk when he or she buys a stock. The higher the risk he accepts, the higher the expected compensation above the risk-free rate. A stock should be chosen due to the Markowitz's efficient frontier in order to obtain a maximum ROR for a given risk level or minimum risk level for a given ROR.

CAPM is logical evolution of the portfolio theory. Its inventors emphasize that it is possible to create a market portfolio, which contains all of the possible assets, including human power, and is situated on the efficient frontier. Such portfolio should have the highest ROR with a given standard deviation. The only thing that should be figured out is a correlation of each asset with the market portfolio, which is represented by a beta coefficient in the model. The only problem is that such a portfolio is impossible to create.

CAPM has been a leading model of the asset pricing for the last six decades. It has been widely used by the academia and financial industry. The main advantages of the CAPM are the ability of graphical explanation and its easiness to use with a very clear output. Its simplicity, however, has two faces; first is the quick and understandable calculation of the expected ROR, when every regular investor may get the concept; the second reason is that the model simplifies the reality too much and totally ignores other important economic factors.

Despite the advantages that the model provides, it is still quite problematic due to some strong assumptions; ignoring specific risk, single-period transaction horizon or borrowing and lending at the risk-free return. Another controversial assumption is the perfect capital market. The assumptions are necessary to make the model work, but they are non-suitable with the reality. The tech testing of the model shared some problems which occurred due to mismatching of the real data to the theory. For example, Roll [1970] stresses the impossibility to observe a market portfolio; Basu [1977] argues that some financial ratios, like earnings–to–price (E/P), have a greater explanatory power; French [1980] observes the so–called weekend anomaly, where the average return on the S&P composite portfolio was reliably negative at weekends; DeBondt and Thaler [1985] show that stocks that had over-performed over long horizons tended to under-perform over subsequent years; Amihud and Mendelson [1986] discover the liquidity anomaly. The most prominent anomaly is the equity premium puzzle, which was discovered by Mehra and Prescott [1985]. They argued that the real stock prices are excessively higher than it should be at a given risk level relatively to the risk-free assets, as the asset pricing theory suggests. In order to match the data, an investor should be extremely risk averted, that is impossible both by the theory and the logic. In the late 1980s and later, many researchers were trying to resolve the puzzle, but no fully efficient solution was found [See: Mehra, 2006 and Große-Rüschkamp, 2012].

The largest criticism of the CAPM is mostly concentrated on the beta coefficient and its estimation methodology. At least three basic

econometric issues related to beta estimation problems are commonly known:
1. beta is estimated under rational expectations and there is no logical justification that an agent is rational only;
2. beta is estimated by a liner regression due to a normal distribution of returns that is not necessarily true in reality;
3. the known issue of problematic observability of a market portfolio which harms the estimation but suggests using a proxy that does not match the reality.

The systematic risk or beta coefficient, measuring it, has been in the limelight since its inception in the 1960s. For the last 60 years, academics and practitioners have been debating the merits of the CAPM, focusing on whether the beta is an appropriate measure of a risk. Moreover, the stability of the beta has always been a concern of empirical studies. The test of the CAPM is the observation of existence of a positive linear relationship between the beta and returns. Although the model postulates a positive trade-off between the beta and expected returns, researchers, in general, always find a weak, but positive beta-returns relationship over the sample period, as shown in Fama and Keneth [2004]. Hence, they claim that the results are inconsistent with the positive linear relationship between the beta and returns as prescribed by the CAPM.

4. Efficient Market Hypothesis and behavioral finance

Since J. M. Keynes introduced his "General Theory", all the economists have been divided in two mainstreams. The traditional school theory believes in the power of the market to regulate itself. It requires no interruptions in a market, because even a minimal interruption (taxation, subsidies etc.) affects the optimum. Keynesian school theory declines the perfectness of the market ability, therefore keeping a place to non-rational factors to influence an individual's decision. Keynesian school argues failure of a market to regulate itself in some areas like producing public goods or resisting the monopoly. From that point, every economic subject has two approaches or visions respectively to the mainstream. It is right to say about asset pricing also, when every mainstream has developed its own strong basis, depending on its vision.

4.1. Efficient market hypothesis (EMH)

This theory was developed by the traditional economy school. The main point is that a human is rational and his or her decisions depend directly on economic factors such as consumption, income, inflation, etc. This theory assumes that an individual has a very clear and understandable preference system that might be represented by the utility function. Another strong assumption is that an individual has access to all needed information and he or she knows exactly how to use it. In asset pricing, this concept is represented in the efficient market hypothesis by Fama [1965].

According to Fama [1965], all possible and relevant information that an investor may have is already reflected in a stock price. The price is a reflection of economic information, but also of possible future information, like an expected profit or a dividend payoff and economic implications of non-economic factors, like political or legal decisions. In his Nobel Prize Award lecture, Fama [2013] argued that such a thing as a bubble cannot exist. There is just an economic situation that is given for some time period. This concept does not decline the existence of investors using non-rational factors, but emphasizes that their influence is minor, and every mispricing created by them is closed by rational-based investors that use the situation as an opportunity to gain an extra profit.

Samuelson [1965] publishes a proof of prices random–walk behaviour if a market holds the EMH. This usually is the theoretical support of the theory of Fama [1965]. Fama [1970] publishes a review of both the theory and the empirical evidence for the EMH. His paper makes an extension and redefinition for the theory. Additionally, it includes the definitions for efficient–market forms. It also claims that the stock market holds the micro efficiency, but not the macro efficiency. Samuelson [1998] shared such an opinion and argued that the EMH is more suitable with individual stocks rather than with the aggregate stock market. Additional strong support of the random walk is issued by Malkiel [1973] in his influential book „A Random Walk Down Wall Street".

4.2. Behavioural finance

Since Kahneman and Tversky [1979] introduced their prospect theory, the second approach which is based on psychological aspects of an investor, known as behavioral finance, was developed. Kahneman and Tversky [1979] show that the human nature cannot be rational in the sense of homo economicus. Our economic decisions depend not only on economic rational factors, but also on emotions, traditions, sociological factors and personality that has its own heuristics.

This concept was widely investigated and put to a test by Shiller [1979, 1981]. He emphasizes that non-rational investing can be obvio-

usly observed by excess overpricing or mispricing of some securities. Shiller [2010] believes that overconfidence, followed by lack of confidence, causes economic volatility. He argues that being consistent with rational expectations means to miss the most important dynamics underlying economic crises –the animal spirit. He thinks that as a consequence, the animal spirit, which was introduced by Keynes, should be integrated into the macroeconomic theory for better understanding of how the economy really works. [Shiller 2010, p. 167-170].

Asymmetric information is able to affect the economic behaviour of an individual, as is shown by Akerlof [1970]. The lack of information keeps a place to beliefs and assumptions about future prices. Brunnermeier [2001] claims that information may be not only asymmetric, but the same public announcement may be understood differently by different individuals due to their different background. Such asymmetry will obviously harm the asset pricing process, both in the static point of time and in a given period with dynamic price changes.

Following the idea of Kahneman and Tversky [1979] that an individual may be psychologically biased, some behavioral models emerged to explain under / overprising. De Long, et al. (DSSW [1990]) demonstrate that investors' sentiments may constantly affect the prices; Barberis, Shleifer and Vishny (BSV [1998]) in their model of investors' sentiment demonstrate how non-rational expectation relatively to price trending wrap the whole prices in the market; Daniel, Hirshleifer and Subrahmanyam (DHS [1998]) demonstrate the price affection of the investors' overconfidence; Hong and Stein (HS [1999]) assume gradual distribution of information. With it Fama [1998] argues that those behavioural models do well on the anomalies they are designed to explain though they confuse a „big picture". In addition, he emphasizes that the models share the same success, as well as the same empirical failure.

4.3. Discussion

Tests of efficiency basically test whether the properties of expected returns implied by the assumed model of market equilibrium are observed in actual returns. If the tests are rejected, we don't know whether the problem is an inefficient market or a bad model of market equilibrium. This is the joint hypothesis problem emphasized in Fama [1970] and in the Nobel Prize lecture [Fama, 2013].

It is hard to believe in the perfectness of the market since nothing perfect was found in the reality. Even if it was, it might bring a market to an undesirable situation, where the market will be dominated by a small group of individuals abusing other individuals. Sometimes an economic phenomenon takes place, because it is driven by the interests of some groups on account of others. That was observed during 2008 in the sub-prime mortgage crisis. The efficient market hypothesis denies the existence of bubbles and crises. All the information is already included in a stock price and every individual understands it and uses it in the right way. This assumption intuitively feels to be strong, it makes all humans identical and equal, which is impossible in real life.

Behavioural finance tries to integrate non-economic factors into the general economic theory. It sees a human not only as a different preference system, but as different nature and background. It also highlights that a market contains heterogeneous individuals with or without rational conceptions. Some market trends exist against rational logic and others as a consequence of public spirit. It is possible to observe some non-economic behaviour on the stock market, like panic. Since the individuals are different, their perception of the same occurrence may be different. Psychology drives the personality and its decisions. However, through a prominent influence of the psychological factors, it is impossible to avoid the rationality of human beings, exactly as we cannot deny the limitations of human nature, which affects our economic decisions. That is why, it is so important to combine the best achievements of the findings of both schools.

5. Economical Approach to Stock Pricing

The proposed model concerns a theoretical framework to determine prices of stocks, but not bonds or the options prices. If necessary, it is possible to make it suitable with those two in addition. Since the model is theoretical with no empirical support at this stage, it turns to economic approach of the stock pricing process rather than to the econometric one. The model is built according to literature study and combining the findings with my own thinking. The basis for the model is whatever expectations for possible future stock prices are. First, an individual should decide what his or her desirable ROR is and then realize the risk level that they have to absorb. Furthermore, an individual sees two parts: his or her budget constraint due to the expected ROR and risk level, which is represented by their Risk Appetite.

Budget constraint: During the valuation of a firm it is often right that the market value of its stock varies from the value of its assets in the books. This dissonance refers to a so-called reputation of a firm and may be positive or nega-

tive. Such dissonance is priced by the investors only. This phenomenon allows representing a stock price (S) as a combination of two parts: a price of true value (*Po*) and its dissonance (*Ps*):

$$S = Po \pm Ps \quad (1)$$

Po is an objective price that arrives from a book data of a company. Since the data is written and measured in units of money, it is absolute. *Po* comes out of a firm's business activity. Probably, this is a practical result of such activity and has to be embodied in its stock price. Inasmuch as *Po* derives from accounting book data, we may call it true price. This price represents any risk that comes out from a firm. It is derived at micro level. One important assumption must be made about the *Po* – one dollar is one dollar. It means that the assets that are written in the books keep their value with no change even if the market gives an opportunity to gain profits from selling them.

Ps is a subjective price which is derived from traders'/investors' expectations. Due to uncertainty, traders/investors have some assumptions about the stock's future price. The expectations may be both, rational or non-rational as a consequence of lack of information or misinformation. Obviously, irrational investors have place to exist and their expectations affect the stock price as well. On other hand, there are possible changes in macroeconomic environment that does not necessarily affect a firm but have a wide influence on the traders. *Ps* is much more subjective. It complements the gap between the *S* and *Po*, so it is possible to call it the dissonance. In the stock price, the dissonance is the aggregation of all expectations of the agents. This price represents any risk that comes out from the aggregation of investors' decisions, for example due to the utility function, and it is derived on the macro level.

Investors mostly are risk averted. They ask for compensation for their investing in a form of ROR - rate of return. Higher risk requires higher compensation. However, when a shock happens, prices of all stocks fall down with no relation to risk. This way a panic twists the picture of the whole stock market. The expected rate of return is given by the following formula:

$$ROR = (S^1/ S^0) - 1 \quad (2)$$

or due to equation (1) it is possible to write as well:

$$ROR = ((Po^1 \pm Ps^1) / S^0) - 1 \Rightarrow 1+ROR = (Po^1/ S^0) \pm (Ps^1/ S^0) \quad (3)$$

where S^1 represents the future stock price and S^0 represents the present stock price and hence is known.

The distribution of the stock prices is lognormal. Therefore, equation (1) may be written as *ln(S) = ln(Po) ± ln(Ps)*. By running the regression of *ln(S)*, it is possible to obtain the coefficients: α is for (*Po*) and *β* is for (*Ps*). Since the present stock price and the future stock price are a part of the same regression, the coefficients must hold. It is possible to write the equation (3) as follow:

$$1+ ROR = (\alpha/ S^0)Po^1 \pm (\beta/ S^0)Ps^1 \quad (4)$$

The equation (4) depends on two variables. It looks like a budget constraint with constant SLOPE = α/β. Of course, the coefficients are close to being permanent for some firms, but they vary from a firm to a firm. This demonstrates how many Ps^1 will be changed with one point of change in Po^1 (reminder: S^0 is the present price). When an agent decides about his or her expected ROR, they mind the combination of the stock price.

Let's assume that there are no economic shocks or macroeconomic changes for some short period, e.g. a week. If so, *Po* will not change dramatically. In this case the changes in the stock price come only from *Ps*. *Ps* as a form of expectation is the real price maker. If some macroeconomic shock takes place; the prices will drop down the next day almost in every possible economic sector. However, by observing a firm's activity, there is no dramatic change for it in a very short run. Its *Po* will not be changed unless consumption retreat in some long run. The panic of the investors makes a market price fall even less than a firm's book value by making its *Ps* negative. Due to its flexibility, *Ps* is the real price maker.

In case of macroeconomic shocks the stock price for some period is equal to: S = Po - Ps, which means *Po* > *S*. This process creates a mispricing of a given stock, so in some long run the mispricing has to be fixed by adjusting one of two possible parts of the price. If a firm was ready or expected the shock and took care of it, its *Po* is not to be changed and, as the panic will pass through, its *Ps* will be adjusted to the same level before the start of the panic. If not, the panic will pull down all the prices and consequently *Po* has to be adjusted to a lower price.

Defining Risk Appetite (RA): Prasanna and Vause [2006] with Gonzalez-Hermosillo [2008] define the *Risk Appetite* as the willingness of investors to bear a risk. This risk is defined in the sense of Cochrane [2001] and the main assumptions are that the investors have rational expectations and the EMH occurs. We can raise a question: what if the expectations are non-rational and the possible utility function is not so comfortable for estimation in real life, as it is assumed by Prasanna and Vause [2006]. The answer is obvious – in order to define risks

and Risk Appetite, it is necessary to avoid the EMH. For this reason, let's turn to the fundamentals of asset pricing.

Let's assume that rational based and non-rational based investors take actions in the trade. The individuals of both groups are risk averted. They prefer a low, but sure ROR. Every group makes its decision by its belonging, e.g. rational traders use a utility function and non-rational ones use non-economic factors. The only way to avoid the differences of those two groups is creating a universal base. It means that every group may use the same instruments for their decision and it will not distort the market.

Johnson [2014] shows a binomial model in which the present stock price S^0 is the mean of two future possibilities when a future stock price may get the values of S^1 and S^2, relatively to the state of nature, where $S^1 > S^0 > S^2$ to avoid the arbitrage. It is given as follows:

$$S^0 = S^1\pi + S^2(1-\pi) \quad (5)$$

$$S^2 = (S^0 - S^1\pi) / (1-\pi) \quad (6)$$

where π is the subjective probability to obtain higher future price S^1. S^1 is the desirable price for an agent and its probability is positive for him or her. In this case, the risk is to obtain S^2 and its probability is negative in the agent's vision. Probably, the risk is not to obtain S^1.

S^2 is undesirable for an agent, but the willingness to apply this price opens to an agent an opportunity to obtain the desirable S^1. In other words, the willingness of an agent for a loss gives him or her a possibility to gain. When an agent is ready to lose more (i.e. lower S^2), they may gain more, and the equation (7) reflects this trend. An individual minds all possible risks that are relevant to him or her. After a calculation, he aggregates the risks into money gain or loss and the result of such calculation is a possible future stock price. In other words, an agent calculates a possibility to obtain a stock price S^1 in some subjective probability due to his own beliefs. Once an agent has a decision about his minimum S^2, all possible combinations of the subjective probability π and the S^1 are acceptable to him. It creates a kind of an indifference loss curve which represents the Risk Appetite of an agent:

$$RA = (S^0 - \pi (Po^1 + Ps^1)) / (1-\pi) \quad (7)$$

The *Risk Appetite* is the willingness of an agent to absorb a maximum loss level. It depends on a future stock price and hence is influenced by two variables which are Po^1 and Ps^1. Moreover, the subjective probability with future stock price is undependable from the EMH and still unique for every individual. The calculation of a set of π and S^1 is used to define the *RA* but every agent makes his own calculation, based on his own vision of the future. *RA* has its maximum. The maximum possible loss is the value of the stock price today and it holds when $S^2 = 0$. Also, there is no possibility of $RA < 0$.

The integration of a budget constraint and RA: The integration of *RA* and the budget constraint indicates the maximum risk level that individuals should bear with their ROR. The integration point indicates what the future stock price should be in order to obtain the ROR with his level of risk. Although this point should reflect the future objective price, which derives from a firm book data and the future subjective price which derives from an agent's expectations.

The desirable ROR^1 is the variable that an agent expects from holding a stock. From the budget constraint an agent's subjective price is dependent on the firm's activity and the possible information, as shown in equation (8), which is derived from equation (4):

$$Ps^1 = (So*(1+ ROR^1) - \alpha\, Po^1) /\beta \quad (8)$$

Combing equations (8) with (7) we have:

$$RA = (S^0(\beta + \pi + ROR^1) - \pi\, Po^1\, (\beta +\alpha)) / / \beta\, (1-\pi) \quad (9)$$

Equation (9) depends on Po^1, other variables are known for individuals since they decide about them. S^0 is observed on the market. *RA* is the willingness of an agent to bear a loss and according to the equation (9), it does not depend on the subjective price Ps^1, which is not directly observed. Po^1 is somehow predictable and hence the required level of *RA* may be figured out from the impact equation (9). Since *RA* is known, Ps^1 can be further figured out. After that, according to the equation (1), the future stock price can be found.

6. Conclusions

The main purpose of the article is to introduce a theoretical framework for asset pricing, based on the micro-economic decision model, through keeping advantages of the CAPM, avoiding its problems and making the model suitable for both rational and non-rational individuals. The framework for the stock pricing process presented above answers the proposition. It is built on another, more universal base and allows predictability about the future stock price for an individual.

On the micro level, an individual, based on the suggested framework, may predict a future price for a stock. Based on this prediction an individual will be ready to propose his or her own price for buying a stock, or to decide to avoid the transaction whether being rational-based or not. On the macro level, the aggregation of all the proposals is formatting the demand or

supply for a stock, depending on the expectations (optimistic or pessimistic). Subjective probabilities on the micro level are aggregated into an objective observable probability on the macro level.

Another important point of the article is that the model turns towards universality. It allows individuals based on rational and non-rational expectations to use the model and to generate the result in exactly the same way. The reason is that the model is based on the financial mathematics rather than on the personal factors determining the behaviour of an individual. All the individuals are driven by their personal factors that are known only to themselves. Those factors are reflected in their behaviour that is observable. That is why the model should avoid the personal factors, but still be consistent with the observable reality.

Such universality allows avoiding some problematic points of both traditional and behavioural approaches. The CAPM has several mismatches due to its strong assumptions on the one hand, and due to several controversial components, like the market portfolio, on the other hand. The behavioural approach leans on psychological factors that are difficult to observe or create an appropriate measure. The suggested framework considers an individual behaviour and uses a microeconomic model-like approach that is free from creation of the market portfolio. The risk compensation is due to the willingness of an individual to bear a risk. Within the suggested framework, more objective measures are taken into account.

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Analysis of the EUR/USD exchange rate in binary-temporal representation

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ABSTRACT

An exchange rate between two currencies can be described in a binary representation. The binarization algorithm transforms the exchange rate represented by tick data into a binary string. Each course change equal to a given discretization unit is assigned a binary value indicating the direction of the change. The performed statistical analysis confirms the existence of a correlation between previous course changes and the probability of future direction of the changes. In order to conduct a more detailed analysis of the exchange rate in a binary representation, each shift in the trajectory can be assigned a parameter representing the duration of the change. Depending on the current market dynamics, course trajectory changes may occur at different moments in time. The main goal of the presented research is to verify the existence of any dependences between the duration of a change and the probability of future direction of the change.

Keywords: foreign exchange market, high frequency econometrics, technical analysis, modeling of currency exchange rates.

1. Introduction

Currency exchange rates are characterized by a high variability in time (they can change even every few seconds). Therefore, their values are usually presented by broker platforms in the form of a candlestick chart. This representation depends on established time intervals, i.e. the time based on which a single candlestick is being constructed. Traditional intervals are usually 1, 5 or 30 minutes, 1 or 4 hours and 1 day [Schlossberg 2006]. Each candle is represented by four values: the maximal rate, minimal rate, opening rate and closing rate. This method of visualizing a course trajectory can also be applied in a technical analysis for appointing particular indicators [Murphy 1999; Schlossberg 2006; Yazdi & Lashkari 2013; Valcu 2004; Neely& Weller 2011]. Applying the candlestick representation, in which the candle parameters are dependent on a predetermined time interval, can lead to some significant interpretation difficulties. This kind of representation can lead to a loss of information about the order and number of changes "inside" the candle. In order to solve this problem, the author proposes a binary representation of the exchange rate course.

In this kind of representation, each exchange rate trajectory change equal to a given discretization unit is being assigned a binary value indicating the direction of the change. This approach allows for eliminating from the analysis intervals characterized by lack of variability, that is, for example, nights. On the other hand, the representation still encompasses key information, i.e. the direction and level of rate changes. The achieved course representation (in the form of a binary string) is dependent only on the assumed discretization unit. Yet, one may ask if the duration of a change equal to a given discretization unit in an exchange rate trajectory has a substantial impact on the probability of further change direction? This article answers the abovementioned question by presenting a new representation method for the course – a binary-temporal representation – in which each price change is described by both a binary variable and duration of a rate change, calculated in seconds. In the following chapters, an attempt to evaluate the prognostic value of time in proposed representation model was made. To realize this goal, time distributions for a given change type were analyzed using proper statistical tests.

The presented article is organized in the following way. In the second chapter we describe the general premises and advantages of a binary representation for a currency pair exchange rate. In the third chapter we propose the assumptions of a binary-temporal representation. The next chapter is dedicated to statistical analysis of the time parameter's impact on the direction of a future rate change. The last chapter presents the results of performed research.

2. Binary representation of an exchange rate

As was already mentioned before, currency exchange rates are characterized by high variability in time. It is common knowledge that significant rate changes can happen in an interval of a few or a dozen seconds. At the same time, the rate course can alternate in a highly dynamic way - with changes of a high amplitude – because of, for example, presenting significant macroeconomic information (central banks' decisions regarding the level of interest rates, price indicators, etc.). In some instances, the exchange rate shifts over a few minutes can be more dramatic than changes registered during some long periods of hours or even days. Moreover, some changes are characterized by different dynamics during the day (that is, when stock markets, banks and other financial institutions are actually open and macroeconomic date is being presented) and during the night [Cheung & Chinn 1999; Murphy 1999; Schlossberg 2006; Oberlechner 2005]. This kind of situation leads to high complexity of the models encompassing the time parameter in order to describe the exchange rate course. The second problematic issue lies in the volume of the data. Most of the broker platforms present the exchange rate in the form of a candlestick chart for a given time interval (typically within the range of 1 minute to 1 year). The processed data is then used to calculate the value of market indicators.

Course discretization was used for the first time in the early years of the 20th century in order to create and analyze data charts in the so-called Point and Figure method [De Villiers, 1933]. Even though this method is far more precise than others, it was soon replaced by the candlestick chart analysis and was never further developed. In works of [Stasiak 2016], a binary representation which allowed for the conversion of an exchange rate trajectory into a binary string was used. In this approach, the sole parameter is the discretization unit that describes the length of the trajectory change for which the change will actually be noted.

The discretization algorithm works in the following way: the algorithm assigns an upper and lower change limit for the initial exchange rate value. The limit is equal to a positive or negative value shift of one discretization unit. When the exchange rate falls below the lower change limit, the algorithm assigns a binary value of (0) to the respective change, and in a contrary situation, i.e. in the case of exchange rate increasing above the upper change limit, it assigns it the binary value (1). In the next steps, the algorithm calculates further limit values based on the current exchange rate course. As a result of this procedure, the exchange rate course trajectory is presented as a binary string (e.g. 10101……01111). In case of encountering any data gaps for prices, e.g. after weekends, the algorithm checks which value would have been reached and assigns a respective result. The general idea of the discretization algorithm's performance is presented in Figure 1.

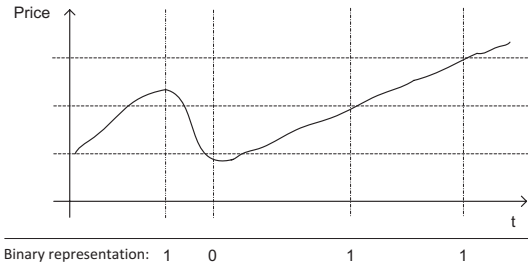

Figure 1: Binarization algorithm results for the considered exchange rate

2.1. Binary representation characteristics

Depending on the established value of the discretization unit, the achieved trajectory of exchange rate changes may have a different character. When appointing the discretization unit, it is crucial to include the characteristics and frequency of the changes for a considered currency pair as well as the spread offered by the brokers, etc. Choosing a high discretization unit can lead to such consequences as ‚losing' a part of significant information. In the case of using small (only a few pips) discretization units, the representation will register some random fluctuations of the so-called ‚noise'. The problem of the level of changes qualified as a noise was widely analyzed in existing literature, e.g. [Lo, Mamaysky & Wang 2000; Logue& Sweeney 1977, Menkhoff & Taylor 2007; Neely & Weller 2011]. Yet, it is difficult to indicate any specific recommendations for a binary analysis of a given currency pair. The minimal discretization unit can be described as optimal if it eliminates the influence of the noise.

In order to verify the achieved binary strings, a statistical analysis aiming to exclude ran-

domness was performed. In the case of any random changes in the exchange rate trajectory represented by the binary method, a further analysis would have been futile. In the performed research, four different statistical tests were used. Their general function is to verify the pseudo-random number generators [Soto 1999, Weigl & Anheier 2003] and they include a frequency test, runs test, non-overlapping template matching test and long run test. Because of the differences in notation and actual algorithms encountered in existing literature, in this article we use algorithms from SP800-22 packet [Rukhin et al. 2010]. The tests find if the analyzed data has a random character, i.e. if there are any occurrences of ensuing changes not correlated with previous trajectory. The simultaneous confirmation of the randomness hypothesis by all those tests allows to qualify the given data as random. In the presented research, this was confirmed for the cases of both high and low discretization units, that is, for the research performed for discretization units equal to 20, 25 and 30 pips respectively. Considering units smaller than 20 pips is not effective because of the level of spreads offered by brokers and because of random fluctuations. On the other hand, appointing discretization units higher than 35 pips can cause registering any small changes and thus, a decrease in the quality of information about the course trajectory. Only the first test (Frequency Test) confirmed the randomness hypothesis for the analyzed binary string. This result can be derived from the fact that in the long periods the summed numbers of zeros and ones in the binary strings were similar [Rukhin et al. 2010; Menezes, Oorschot & Vanstone 1996]. The three remaining tests reject the hypothesis of randomness. This means that there exists a possibility of some regularities connected with different frequencies in which zero-one sequences occur. To summarize, one can state that the statistical test results indicate the possibility of some correlation between the historical trajectory and the direction of future changes [Godbole & Papastavridis 1994; Chung, 2012; Rukhin et al. 2010; Menezes, Oorschot & Vanstone 1996, Weigl& Anheier 2003; Soto 1999].

In the presented research the tick historical data from Ducascopy was used, regarding the period of 5 years (01.01.2010-01.01.2015), for a EUR/USD currency pair. Relatively recently, the access to the currency market was restrained for professional investors. As a result of the development in telecommunication and informatics, in recent years the number of market participators highly increased (development of broker platforms, decrease of required deposit levels). Technological changes allowed for faster transactions, where time is actually measured in microseconds. Moreover, the implementation possibilities of HFT systems (which are becoming more and more popular) making hundreds or thousands of transactions, also have an influence on the market performance and characteristics. Taking into account all of the above premises, considering a five-year period for the analysis seems to be sensible. When using the statistical tests, the level of significance recommended by NIST was used, that is 0.05 [Ruthin et al. 2010]. The research results of the performed analysis suggest that the binary representation can be applied in constructing prediction models, yet, it lacks some information connected with the duration of a single exchange rate change. This raises the question if the knowledge about the duration time increases the prediction capabilities of the binary representation analysis.

2.2. A comparison of Binary and Candle representations of an exchange rate

Let us now consider exchange rate trajectory modelling in order to construct HFT systems. In HFT systems, the algorithm automatically performs hundreds of transactions of a few or a few dozen pips range. Investor's revenue is assured by a statistical majority of successful transactions. In the case of modelling such small changes, candlestick representation leads to a loss of information about the changes "inside" the candle, and in consequence, to unreliable modelling results. Even when using one-minute candlesticks (i.e. the most precise of candlestick charts offered by broker platforms), an investor still loses a lot of important information about respective changes occurring in the periods of high investors' activity shorter than one minute.

In Figure 2, a comparison between time- and binary representation of exchange rate changes is presented. Two exchange rate trajectories in a given time period are shown (Figure 2a and Figure 2b). Both of them can be represented by a candle of the same parameters. The example clearly depicts that, despite the same candle representation, the process of exchange rate trajectory changes can have an entirely different scenario and be actually characterized by different binary strings (101 in Figure 1a and 1 in Figure 1b). Moreover, the abovementioned example shows another disadvantage of the candlestick representation. Let us assume that the HFT system algorithm makes a sale transaction in which parameters SL and TP are placed one discretization unit above and below the price. In the case presented in Figure 2a the

investor achieves a profit; however, in the case presented in Figure 2b they will register a loss. It is impossible to differentiate the situations based only on historical candlestick charts.

Binary representation can be used in a simple way to create HFT systems. Let us consider a sale transaction with a TP parameter smaller than the current price by a discretization unit and with an SL parameter higher than the current price by the same discretization unit. The probability of a profit is equal to the probability of the occurrence of the value 0 in the binary representation, and the loss probability is equal to the probability of encountering a 1. An analogous situation takes place in the case of the purchase transaction.

To summarise, binary representation allows for more accurate modelling of the course trajectory as compared to candlestick representation and thus can be used in constructing HFT systems.

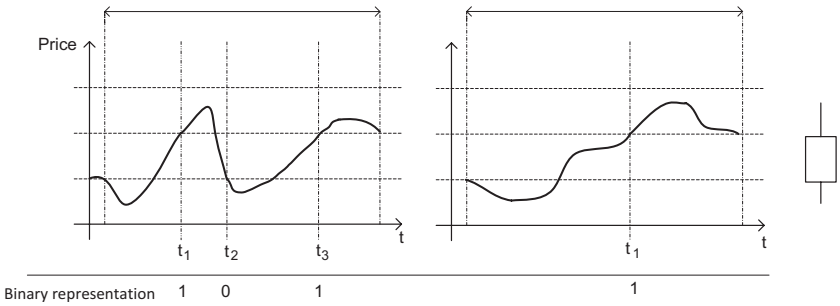

Figure 2: Two different trajectories of course changes given by the same candle but two different binary representations

3. Binary-temporal Representation

As indicated in the research results described in the previous chapter, in order to create a valid prediction model, binary representation can be applied to the data. In the case of small discretization units (a few or a few dozen pips), the duration of the change is not significant from the investor's (or HFT automaton's) point of view. On the other hand, the parameter can have an additional information value when used in the prediction of future exchange rate changes. For example, let us consider a discretization unit of 20 pips. If an increase in the exchange rate occurred in a short time, let us say, 5 seconds, then the probability of the further increase is higher than in the case of the same change lasting, for example, two hours.

In order to perceive the duration time of a change as a parameter of binary representation, in the presented article we propose binary-temporal representation. The main idea of this method's algorithm can be described as follows. The procedure indicates the upper and lower change limit for an initial exchange rate value. The limits are equal to the positive and negative shift in the exchange rate with a length of one discretization unit. The algorithm also registers the initial time of the change occurrence. If the exchange rate falls below the lower limit, the algorithm assigns two values to the registered change – a binary value of (0) and the duration of the change given in seconds (t). In the case of an increase in the price being higher than the upper limit, the algorithm assigns the binary value of (1), along with the change duration time (t). In the next steps, the algorithm indicates next limits calculated using the current exchange rate and the time when the previous course change ended. As a result of the algorithm operation, the exchange rate trajectory is presented by a string (e.g. 1(5), 0(450), 1(100), 0(345)). Figure 3 presents exemplary algorithm results for creating the binary-temporal exchange rate representation.

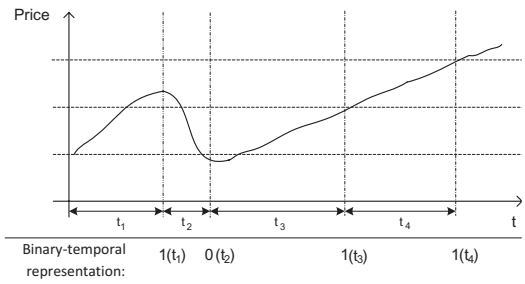

Figure 3: Binary-temporal exchange rate representation algorithm results

4. Statistical analysis of a EUR/USD exchange rate in binary-temporal representation

In order to confirm the possibility of using time as a parameter of binary representation, a statistical analysis was performed for the change duration distribution times, calculated for the given discretization unit of a currency

pair. Because of the difficulties in indicating potential correlations between the change duration and the direction of future changes, an analysis was performed in order to verify if the registered time distribution has a memory-loss character (that is, if there are no influences of previous events on the current event). The registered time distribution was then compared with an exponential distribution, which is characterized by a memory-loss. The main idea was to research the similarity exchange rate trajectory change duration time distribution to the exponential distribution. In order to do so, the Kołmogorow-Smirnow Test and Anderson--Darling were conducted.

4.1. Exponential distribution

Exponential distribution can be described in terms of its density function [Bobrowski 1986]:

$$f(t) = \begin{cases} 0 & for \quad t < 0 \\ \lambda e^{-\lambda t} & for \quad t \geq 0 \end{cases}, \tag{1}$$

where:
f(t) – a density function
λ – the intensity of events
The cumulative distribution function for exponential distribution is given by the s formula:

$$F(x) = 1 - e^{-\lambda t}, \qquad \text{for } t \geq 0 \tag{2}$$

By using the cumulative distribution of time between occurring events we can determine the unconditional probability value $P(T>t)$, i.e. the probability that the time between given events is longer than T:

$$P(T > t) = 1 - F_0(t) = e^{-\lambda t}. \tag{3}$$

Simultaneously, we can calculate the probability values $P(T>t+\tau)$, i.e. the probability of the time between events being at least $t+\tau$ long:

$$P(T > t) = e^{-\lambda(t+\tau)} \tag{4}$$

The above stated probability can be rewritten as:

$$P(T > t + \tau) = P(T > \tau | T > t) P(T > t), \tag{5}$$

where $P(T>\tau \mid T>t)$ is the conditional probability stating that the time between events will last for at least another period of τ. Based on (3)-(5) we can conclude that:

$$P(T > \tau | T > t) = P(T > \tau). \tag{6}$$

The conditional $P(T>\tau \mid T>t)$ and unconditional $P(T>\tau)$ probabilities are identical, which means that knowledge about the past does not have any influence over the variable characterized by exponential distribution [Stasiak et al. 2010]. In consequence, changes characterized by exponential distribution cannot be used in the analysis aiming to predict future events.

4.2. Distribution testing

In order to verify the similarity of the variable distribution to a given theoretical distribution we can use the statistical tests. The Kołmogorow-Smirnow Test (often called the Kołmogorow Test) verifies if the registered distribution of a variable differs from a given theoretical distribution, when only a finite number of variable observations is known to the researcher (i.e. statistical sample). The test compares the cumulative distributions of the theoretical distribution (F0) and the empirical distribution (Fn) obtained from the analyzed data [Bobrowski & Łybacka 2006; Gibbons & Chakraborti 2011;Górecki 2011]:

$$D = \sup_{x \epsilon R} |F_n(x) - F_0(x)|. \tag{7}$$

where D is the test's statistic.

The verification of the coincidence between the empirical and theoretical distribution can be also performed with the use of the Anderson-Darling Test [Anderson & Darling, 1952]. This test is characterized by stronger statistical power than the Kolmogorov-Smirnov test [Razali & Wah, 2011], yet it also compares the differences between the empirical and theoretical cumulative distribution. Statistic A of this test can be calculated based on the following formula:

$$A^2 = n \int_{-\infty}^{+\infty} \left[\frac{F_n(x) - F_0(x)}{F_0(x) - F_0(x)^2} \right] dF_0(x). \tag{8}$$

As a result of the applied tests, we can confirm or reject with a given statistical significance, the hypothesis of coincidence between the theoretical and empirical distribution.

4.3. Time parameter analysis of a EUR/USD exchange rate in binary-temporal representation

The distribution of change duration times was researched for a 5-year period (0.1.01.2010-01.01.2015) of tick data observations for EUR/USD exchange rates. The tick historical data was sampled from the Ducascopy broker. Based on the MQL4 software written by the author in order to perform described research, binary-temporal exchange rate represen-

tation using a 20-pips discretization unit was achieved for a given period. Taking into consideration such parameters as noise, the spread value and change dynamics, the author deemed the 20-pips discretization unit as ‚optimal' for application in HFT systems (that is, the value allows the representation not to include too much of random noise). Next, by using a statistical packet R with the implemented Kołmogorow-Smirnow and Anderson-Darling Test [Górecki 2011], the hypothesis of the coincidence between the duration distribution of falls or increases of an exchange rate with a theoretical (exponential) distribution was verified. The tests results confirm the lack of coincidence with the exponential distribution for the established 0.05 significance level. In Picture 3 cumulative empirical distribution achieved from the researched data and theoretical cumulative distribution of the exponential distribution for the duration of increases (Picture 3a) and the duration of falls (Picture 3b) are presented.

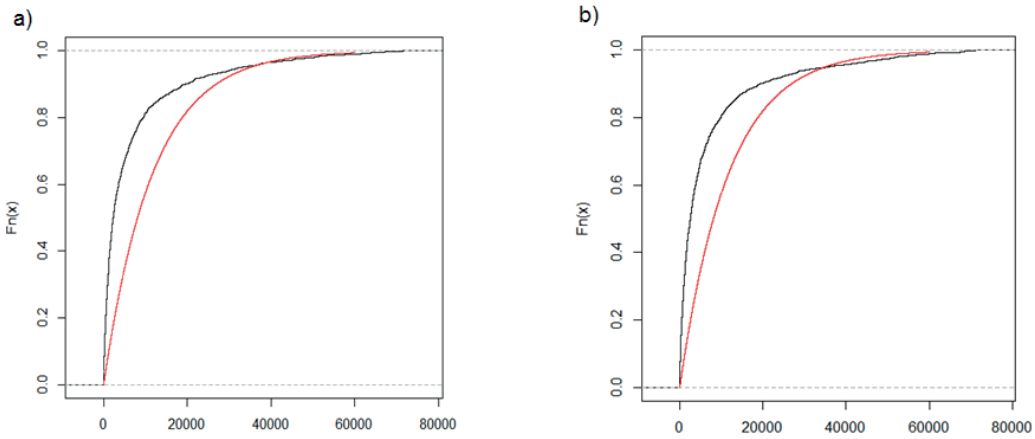

Figure 4: Theoretical cumulative distribution (black) and empirical cumulative distribution (red) of time distribution for a) falls and b) increases

The majority of changes lasted about 5000 seconds (the median is 2548 seconds for falls and 2277 seconds for increases). Thus, in further research it can be beneficial to focus on the classification of the changes in a few-minute-long intervals. An unexpectedly long change time, for example two hours, can be treated as an anomaly, which also has high forecast significance.

The statistical analysis mentioned above was performed for higher discretization units as well, that is, respectively 25, 30 and 35 pips. In all cases the results were analogous (the hypothesis of the empirical distribution being coincidental with the exponential distribution was rejected on the significance level of 0.05).

5. Summary

In the paper, a new binary-temporal representation of an exchange rate trajectory was presented. This kind of representation is an alternative to course trajectory visualization as compared to candlestick charts. Its main advantage lies in encompassing more information about the course variability. Binary-temporal representation can be used in creating HFT systems (the probability of the future direction of a change is equal to the probability of an investor's profit/loss). The EUR/USD analysis performed by statistical tests and presented in the article suggests relations between the direction and order of historical data and the direction of a future change. A statistical analysis of dependences between the duration of the previous changes and the direction of a future change was also performed by the means of the Kołmogorow-Smirnow and Anderson-Darling Test. The research results confirmed the existence of such relationships.

Research was conducted for different discretization units and based on the historical data of the EUR/USD course. All tests used a 0.05 statistical significance level and were applied to a few-thousand-element data set. Research results confirm the possibility of applying the binary-temporal representation to precise modelling of an exchange rate trajectory and for constructing prediction algorithms for HFT algorithms.

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The main priority of achieving resource safety of agricultural production

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ABSTRACT

Resource safety of agricultural production is investigated as the main condition. Its dominant registers are land resources and fertility of soil. The bearing-out of nutritives is analyzed from soil together with the harvest of agricultural cultures. It shall be underlined that for providing maintenance of areas and fertility, it is crucial to maintain a balance between the bearing-out of nutritives from soil with the harvest of agricultural cultures and compensative bringing. The major directions of maintenance of the resource providing agricultural production are the following: increase of bringing of organic fertilizers, optimization of the structure of croplands, strengthening the responsibility of land users, development of ecological culture.

Keywords: agricultural production, unsustainable agriculture, mineral and organic fertilizers, land safety legislation, ecological culture of land use.

1. Introduction

Safety from Greek means to own a situation, which means to know whether the situation is threatening or not [Kharazishvili, Liashenko, Zaloznova, Kvilinskyi 2016, p. 108-119]. In agricultural production it predetermines the sufficient provision of necessary resources: material, labour, financial [Pająk, Dahlke, Kvilinskyi 2016, p. 109-122]. A special place among material resources belongs to earth – to spatial basis and the main means of agricultural production. In fact, first of all, providing the agricultural production by near-term resources depends on the state of fertility of earth. Therefore, the basis for resource safety of agricultural production is proper (sufficient) provision of land resources. If soil is in an improper state, then it is necessary to attach (but sometimes it is impossible) considerable labour efforts and to spend corresponding material resources (mineral fertilizers, lime, etc.), to attain the minimum productivity. The improper state of lands is predefined by the influence of different factors on them, both natural (excessive moisture, acidity, alkalinity) and anthropogenic (water and wind erosion, bearing-out of nutritives from soil by cultural plants, machine degradation). Thus, there is a danger of a loss of fertility of areas and a decrease in the level of productivity of the processed earth. It is noted in the clause 7 Law of Ukraine concerning the bases of national safety of 19 June 2003. In particular, it is marked that the threats to the national interests in the ecological field are: the inefficient, exhausting use of raw mineral-material natural resources, both unrefurbishable and refurbishable. Notice that earth is a refurbishable resource – to renew 1 cm of soil nature needs not less than a hundred (!) years. In connection with the above facts, the resource safety of agricultural production, especially its main means – earth, is always actual.

2. State of research

The problem of rational use and protection of agricultural earth has been investigated by many scientists. Among them there are: O. Budziak, P. Vedienichev, A. Dankevych, M. Kropyvka, P. Marakulin, I. Mykhasiuk, B. Paskhaver, V. Tregobchuk, M. Khvesyk, D. Shyian and many other.

In our view, sufficient attention was not given to the main problem of the resource safety of agricultural production – the balance between the bearing-out of humus and nutriti-

ves (first of all to nitrogen, phosphorus, potassium) with the harvest of agricultural cultures and their compensative bringing of the users of earth. Thus, the aim of this article is to research the balance between the bearing-out of humus, nutritives with the harvest of agricultural cultures and their indemnification, as well as the ground of directions of improvement in the level of the resource providing agricultural production.

3. The main provisions

The most valuable organic substance and biologically active part of soil is humus. It is referred to as the immune system of soil, because due to it the ground structure is kept and gets better, main functions are supported and the health of the ground environment is provided. As V. Sofiichenko and L. Dotcenko underline, humus activates natural resistance to vegetable diseases and wreckers and prevents mass development of pathogens [Sofiichenko, Dotcenko 2012]. These authors mark that Ukraine owns enormous reserves of fat lands, from which black earth makes up 60 % of plough-land (6.7 % of world supplies). But, if 100 years ago there were 4-6 % of humus in soils of Ukraine, then presently there are only 3.2 % (when content of humus becomes less than 2.5 % it is not black earth anymore). The circumstance that after the calculations of "Centrfertility" the annual negative balance of humus amounts to 0.5-0.7 t/ha causes an enormous alarm. Each five years the soils of Ukraine loses 0.05 % of total supplies of humus [Sofiichenko, Docenko 2012]. Notice, on the face of it, it is not as terrible, because in black earth the supplies of humus arrive at 300 t/ha (and on sod-podzolic soils – in several times less than). In the opinion of some researchers, literally for 30 years we can remain without humus. Many scientists talk about it. For example, an academician of the National Academy of Agrarian Sciences of Ukraine, M. Khvesyk and Doctor (Candidate) of Economic Sciences, A. Stepanenko claim that "100 thousands ha of fertile soil degrade in Ukraine annually". Compared to the end of the 19th century, the amount of humus in soils went down 6 times and diminished annually 8 million t. [Khvesyk, Stepanenko, 2014, p. 82].

Table 1: The bearing-out of nitrogen with the harvest of agricultural cultures in Ukraine in 1995-2015 (thousand ton)

Types of agricultural cultures	1990	1995	2000	2010	2013	2014	2015
Winter wheat	971.0	511.0	312.8	518.9	693.9	751.9	830.0
Winter-annual rye	53.0	35.0	28.0	13.4	18.3	13.7	11.2
Winter-annual barley	41.0	20.7	12.7	67.6	60.5	70.3	68.9
Furious wheat	1.1	12.8	17.7	26.6	17.5	25.9	25.0
Furious barley	195.0	233.4	169.2	142.2	126.4	153.9	135.2
Oat	42.0	35.7	28.2	14.7	14.9	19.6	15.6
A corn on grain	142.0	101.8	115.4	358.6	978.5	854.9	699.8
Millet	11.0	8.8	14.1	3.9	3.4	5.9	7.0
Buckwheat	13.0	10.2	14.1	4.0	5.4	5.0	3.8
Rice	3.0	2.3	2.6	4.3	4.2	1.5	1.8
Grain-leguminous plants	21.6	103.6	43.0	39.1	24.6	31.7	33.1
Sugar beets(factory)	221.0	148.3	66.0	68.7	53.9	78.7	51.7
Sunflower	147.0	163.0	197.1	386.0	629.9	577.6	637.3
Rape	6.0	1.8	5.8	64.7	103.5	96.7	76.4
Soy	2.0	0.5	1.3	35.3	58.3	81.5	82.6
Long-fibred flax	1.4	2.3	0.4	0.0	0.1	0.1	0.1
Potato	84.0	73.6	99.2	93.5	111.3	118.5	104.2
Vegetables	22.0	19.4	19.2	26.8	32.6	31.8	30.4
Forage root crops	109.0	53.9	26.7	27.1	29.0	28.0	24.8
A corn on a silo and green feed	246.0	154.8	60.5	18.8	21.3	18.9	17.1
One-year herbares	19.0	13.1	11.0	16.2	16.2	17.1	16.6
Long-term herbares	94.0	74.3	43.7	55.1	58.2	66.7	53.1
Garden-stuffs and berries	15.0	9.5	7.3	8.7	11.5	10.0	10.8
Vine	1.4	0.8	0.9	0.7	1.0	0.8	0.7
Total	*2656.0*	*1790.6*	*1277.7*	*1994.9*	*3074.4*	*3060.7*	*2937.2*

Source: It is calculated on the basis of the data from: State service of statistics of Ukraine 2015, p. 134; State service of statistics of Ukraine 2016, p. 308; Reference book on the fertilizer of agriculture 1987, p.183.

D.Sc O. Budziak similarly asserts that "Presently the annual losses of humus are 600-700 kg on hectare of agricultural lands" [Budziak 2013, p.180]. Taking into account the minimum losses – of 0.6 t and the area of agricultural lands of Ukraine, then total losses will be within the limits of 25 million tons of humus a year.

M. Kyssil and N. Sprynchuk report that the average content of humus went down from 2.9 % in 1981-1985 to 2.7 % in 2006-2009 in the Vinnytsya region [Kyssil, Sprynchuk 2011, p. 67].

N. Solovianenko marks that middle (2-3 % and 3-4 %) contents of humus are on 16.4 millions of hectares (66.1 % of the inspected area) [Solovianenko 2012, p. 23]. The sandy and sandy-loam grain-size distribution, that is widespread mainly in the Polissya region, are with low and very low content of humus. The author underlines that much of them are located particularly in the regions of Volyn (87 %), Zhytomyr (61,4 %), Chernihiv (47,1 %) and Rivne (44,9 %). There are large areas with subzero content of humus also in the regions of Lviv, Chernivtsi, Donetsk, Zakarpattia, Kyiv [Solovianenko 2012, p. 23].

Unfortunately, these are a lot of such examples. We will try to give an explanation to such a state and analyse the bearing-out of nutritives with the harvest of agricultural cultures of all economies of population and bringing of corresponding fertilizers on its indemnification (tables 1-3).

The volumes of bearing-out of nitrogen by agricultural plants are calculated on the basis of corresponding norms and statistical data (table 1). Their general volume attained 2937.2 thousand t in 2015 (sunflowers make up for 22 % of this volume, corn – 23,8 %).

Thus, these two (!) agricultural cultures 'take' away from soil almost the half of total bearing-out. These phenomena arose up in recent years. In fact, although these two cultures are exported, they very exhausting for the soils of Ukraine.

Except for these two cultures, furious barley, soy, rape and potato have considerably taken away nutritives from soil, especially in the last few years. A similar situation takes place in the case of phosphoric and potassium fertilizers (table 2-3).

Table 2: The bearing-out of phosphorus with the harvest of agricultural cultures in Ukraine in 1995-2015 (thousand t.)

Types of agricultural cultures	1990	1995	2000	2010	2013	2014	2015
Winter wheat	334.0	175.6	107.5	178.4	240.5	258.5	285.3
Winter-annual rye	15.0	14.5	11.6	5.6	7.6	5.7	4.6
Winter-annual barley	33.0	16.8	10.3	54.7	49.0	56.9	55.8
Furious wheat	0.3	3.3	4.6	7.0	4.6	6.8	6.5
Furious barley	192.0	95.1	68.9	57.9	51.5	62.7	55.1
Oat	18.0	15.6	12.3	6.4	6.5	8.6	6.8
A corn on grain	47.0	33.9	38.5	119.5	309.5	285.0	233.3
Millet	3.0	2.4	3.8	1.1	0.9	1.6	1.9
Buckwheat	6.0	5.1	7.2	2.0	2.7	2.5	1.9
Rice	2.0	1.4	1.5	2.5	2.5	0.9	1.1
Grain-leguminous plants	49.0	23.6	9.8	8.9	5.6	7.2	7.5
Sugar beets(factory)	58.0	148.3	66.0	68.7	53.9	78.7	51.7
Sunflower	69.0	77.2	93.3	182.8	298.4	273.6	301.9
Rape	2.0	0.6	2.1	23.5	37.6	35.2	27.8
Soy	1.0	0.2	0.5	13.4	22.2	31.1	31.4
Long-fibred flax	0.4	0.9	0.1	0.0	0.02	0.02	0.02
Potato	37.0	32.4	43.6	41.1	49.0	52.1	45.8
Vegetables	9.0	7.6	7.6	10.6	12.8	12.5	12.0
Forage root crops	33.0	16.2	8.0	8.1	8.7	8.4	7.4
A corn on a silo and green feed	98.0	61.9	24.2	7.5	8.5	7.6	6.8
One-year herbares	10.0	7.0	5.8	8.6	8.6	9.0	8.8
Long-term herbares	28.0	21.8	12.3	16.1	17.1	19.6	15.6
Garden-stuffs and berries	9.0	5.7	4.4	1.2	6.9	6.0	6.5
Vine	1.4	0.8	0.9	0.7	1.0	0.7	0.7
Total	*1055.0*	*767.9*	*544.8*	*826.3*	*1205.6*	*1230.9*	*1176.2*

Source: It is calculated on the basis of the data from: State service of statistics of Ukraine 2015, p. 134; State service of statistics of Ukraine, 2016 p. 308; Reference book on the fertilizer of agriculture 1987, p.183.

As shown in Table 2, the most recipients of phosphorus is grain corn (233.3 thousand t in 2015) and sunflower (301.9 thousand t in 2015). These cultures together take away 45.5 % of phosphorus from soil. Winter wheat, furious barley also take away considerable volumes of phosphorus from soil.

A particular situation takes place when it comes to the bearing-out of potassium. Bearing-out of this feed element of sunflower attained 1274.6 thousand t in 2015. For comparison, in 1990 only 293.0 thousand t, that in 4.3 times less (table 3).

Table 3: The bearing-out of potassium with the harvest of agricultural cultures in Ukraine in 1995-2015 (thousand t)

Types of agricultural cultures	1990	1995	2000	2010	2013	2014	2015
Winter wheat	789.0	415.2	254.2	421.6	568.4	610.9	674.4
Winter-annual rye	35.0	33.8	27.1	13.0	17.7	13.2	10.8
Winter-annual barley	27.0	13.8	8.5	45.1	40.3	46.8	45.9
Furious wheat	0.3	7.6	10.6	15.9	10.4	15.4	14.9
Furious barley	192.0	224.8	162.9	136.9	121.7	148.2	130.2
Oat	35.0	31.2	24.7	12.9	13.1	17.2	13.7
A corn on grain	142.0	101.8	115.4	358.6	928.5	854.9	699.8
Millet	12.0	9.1	14.5	4.0	3.5	6.1	7.2
Buckwheat	16.0	13.3	18.8	5.2	7.0	6.5	5.0
Rice	0.7	0.5	0.5	0.9	0.9	0.3	0.4
Grain-leguminous plants	65.0	31.4	13.0	11.8	7.4	9.6	10.0
Sugar beets(factory)	221.0	148.3	66.0	68.7	53.9	78.7	51.7
Sunflower	293.0	326.0	394.1	772.0	1259.8	1155.3	1274.6
Rape	6.0	1.9	6.2	69.1	110.5	103.3	81.7
Soy	2.0	0.4	1.2	31.9	52.7	73.8	74.7
Long-fibred flax	0.6	1.0	0.2	0.0	0.02	0.02	0.02
Potato	134.0	117.8	158.7	149.6	178.1	189.5	166.7
Vegetables	29.0	25.9	25.6	35.7	43.4	42.4	40.5
Forage root crops	136.0	67.4	33.4	33.9	36.2	35.0	30.9
A corn on a silo and green feed	344.0	216.7	84.6	26.2	29.8	26.5	24.0
One-year herbares	10.0	7.0	5.8	8.6	8.6	9.0	8.8
Long-term herbares	83.0	65.5	38.6	48.6	51.4	58.9	46.9
Garden-stuffs and berries	17.0	11.4	8.7	10.5	13.8	12.0	12.9
Vine	1.8	1.0	1.1	0.9	1.3	1.0	0.8
Total	*2588.0*	*1872.8*	*1474.4*	*2281.6*	*3558.4*	*3514.5*	*3426.5*

Source: It is calculated on the basis of the data from: State service of statistics of Ukraine 2015, p. 134; State service of statistics of Ukraine, 2016 p. 308; Reference book on the fertilizer of agriculture 1987, p.183.

The considerable volumes of potassium are also 'taken' away by winter wheat and grain corn: 674.4 and 699.8 thousand t in 2015. They are also our 'export' cultures.

There arises a question after the analysis of tables 1-3: how to compensate the bearing-out of nutritives? There is a traditional answer – by bringing in minerals and organic fertilizers. However, the analysis of the corresponding data shows the deplorable state in this business. After our calculations, 18.7 % of the total bearing-out under harvest was compensated in all in 2015. Only 79 kg of nutritives are brought in on one hectare of sowing area. For comparison, it has to be noted that as early as in 2006 215.6 kg of nutritives were brought in on one hectare of plough-land in Greece, with 219.6 in Germany, 175.5 in Italy, 324.9 in Great Britain and 371.3 kg in Holland [Korchynska 2004, p. 33].

Bringing of organic fertilizers is a wrong idea. The part of the fertilized area amounted to only 2.5 % in 2015, and brought in only 0.5 t on one hectare of sowing area. In general, agricultural production became exhausting for us.

Even in 1990, when the volumes of bringing mineral fertilizers were three times more than the level in 2015, and organic in 26.8 times, their volumes were insufficient.

Obviously, there occurs a question after such an analysis – are there possibilities to improve this situation? In our view, there are.

First of all, it is an increase in bringing of organic fertilizers. A considerable reduction in the population of domestic animals took place. As early as in 1995 there were 17.5 million

heads of livestock in the country (that number included 7531 cows, 13.1 million heads of pigs, 4.1 million heads of sheep and goats), and in 2015 there were only 3750 thousand heads of livestock (that number included 2167 cows, 7079 thousand heads of pigs, 1325 thousand heads of sheep and goats). The only population that increased from 149.8 million heads in 1995 to 204 million heads in 2015 is the population of birds, mainly chickens (State service of statistics of Ukraine, 2016, p. 327).

If you calculate the coming out of dung from keeping the domestic animals [Reference book on the fertilizer of agriculture 1987, p. 51, 54, 57] and their amount (State service of statistics of Ukraine 2016, p. 327), then the charges of dung on all sowing areas in 2015 would make up 3 t. The most opportunities to increase the number of „potential" dung can be achieved by the growth of livestock in households.

The second way of indemnifying bearing-out of nutritives is the observance of proper organization of the use of land; in other words, optimal correlation of agricultural cultures in crop rotations. There are considerable violations without regard to the corresponding documents (Government of Ukraine 2010) – every fifth hectare of sowing areas is occupied with sunflower in last years (table 4).

Table 4: The structure of sowing areas of Ukraine in 1990-2015 (%)

Types of agricultural cultures	1990	1995	2000	2010	2013	2014	2015
Total sowing areas	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Grain crops	45.0	45.7	50.2	56.0	57.2	54.3	54.8
including winter wheat	23.4	17.2	19.6	22.7	23.0	21.7	24.9
furious barley	6.8	13.3	13.4	11.2	9.6	7.2	6.6
a corn on grain	3.8	3.8	5.0	10.1	17.3	17.2	15.3
Industrial crops	11.6	12.1	15.4	27.1	27.8	31.0	31.0
including sugar beets	5.0	4.8	3.2	1.9	1.0	1.2	0.9
sunflower	5.1	6.5	10.8	17.0	17.8	19.4	19.0
rape	0.3	0.2	0.8	3.4	3.6	3.2	2.5
soy	0.3	0.1	0.2	4.0	4.8	6.6	8.0
Potato, vegetables, melons and gourds	6.4	7.0	8.4	7.3	6.9	7.0	6.8
including potato	4.4	4.9	6.0	5.2	4.9	4.9	4.8
Forage crops	37.0	35.2	26.	9.6	8.1	7.7	7.4
including forage root crops	1.9	1.6	1.1	0.9	0.8	0.8	0.8
a corn on a silo and green feed	14.3	11.2	7.1	1.8	1.4	1.3	1.1
One-year herbares	8.0	9.3	6.5	2.2	1.7	1.5	1.5
Long-term herbares	12.3	12.6	11.0	4.6	4.1	4.1	3.8
Area of clean fallow land (% of all sowing area)	4.4	5.1	11.8	5.4	3.5	3.0	2.3

Source: It is calculated on the basis of the data from: State service of statistics of Ukraine 2015, p. 129; State service of statistics of Ukraine 2016, p. 313.

It is necessary to notice that scientists have emphasised that in steppe districts it can be almost one third of sowing areas.

Specific gravity of areas of one-year and long-term herbares diminished fourfold (from 20.3 % in 1990 to 5.3 % in 2015). The herbares satiate soil nitrogen-fixing bacteria, improving the structure of soil.

Also the negative phenomenon is an increase of areas of grain-crops from 45 % in 1990 to 54.8 %. There is no need to follow an extensive way, but the intensive one. For this purpose, a very important thing for soil is corn gross collections that make up for more than half of grain-growing. The areas of rape and soy increased sharply, which is exhausting for soil as well.

It is important for the balanced land-tenure that all land users observe the corresponding legislation. For example, clause 30 of the Law of Ukraine on the protection of earth from 19 June 2003 sets such norms in the industry of earth protection and recreation of fertility of soils: maximum possible contamination of soils; quality of soils; optimal correlation of agrarian lands; indexes of degradation of earth and soils. The norms of optimal correlation of agrarian lands are set in clause 33 for the prevention of an excessive anthropogenic influence on lands, including excessive plouphing up of agrarian lands. The norms of optimal correlation of agrarian lands include: optimal correlation of agricultural earth with natural reserve, nature protection, sanative, historic and cultural, re-

creational role, as well as earth, forest and water funds; optimal correlation of plough-land and long-term planting, hayfield, pastures, as well as lands under field-protecting forest belts in agrarian landscapes [Verkhovna Rada of Ukraine, 2003].

Summarizing, what shall be marked is the sharp necessity of keeping to lands protecting legislation, in particular, in part of optimising the organization of the use of land.

Large possibilities are opened in the field of recreating the fertility of soils at the use of green manure crops. In V. Grekov and PhD V. Dacko's opinion, green fertilizers accumulate nitrogen and humus, first of all. Nitrogen from the air is taken by legume bacteria. 150-250 kg/ha of general nitrogen come in soil at harvest of 350 cwt/ha, which may be compared to bringing 30-40 t/ha and leaving it to rot. In particular, the green mass of lupine leguminous culture achieves 150-200 cwt/ha in autumn, which may be compared to bringing to rot 20 t on hectare. One-year rape gives 80-160 cwt/ha of roots and nourishing bits and pieces with the humification coefficient of 0.15-0.25 [Grekov, Dacko 2008].

The global experience shows that turnip, cabbage, lupin, phacelia, mustard, buckwheat, long-term herbares (alfalfa, clover, melilot), leguminous (vetch, peas, forage bobs), cabbage (rape, radish oily), grain (rye, sudanese grass) and different mixtures (for example, vetch + oat, vetch + rye, peas + oat) are grown on a green fertilizer. In this connection, the scientific centers of Ukraine recommend to sow green manure crops. However, if the sowing area of our country occupies more than 27 million ha, then the areas of sowing green manure crops, based on our data – only a few hundreds thousand ha, and although charges for their sowing are 2 – 4 times less than ordinary manure fertilizer.

In this aspect the best situation is with ploughing nourishing leavings, in particular, stubble. As V. Sofijchenko and L. Dacko underline, in obedience to these regional centers of "Oblderzhrodiuchist", agrarians plough straw on an area of 5.5 millions annually, thus forming 2 million t of the same organic substances. There are possibilities to expand this area to 10 millions ha.

As regards the optimization of the structure of sowing areas, certain work is conducted. For example, from the data of round table, organized Volyn ODE and by corresponding scientific institutes table, Ltd "Pyatydni" (with the area of agricultural lands amounting to 16 thousands hectare) had the taken crop of winter wheat of 127 cwt /ha. A predecessor was peat (!). As may be seen, it is a persuasive argument for optimising the structure of sowing areas, with a sharp increase of areas under green manure crops.

An important element of Ukrainian fertility, main direction of smoothing the balance of bearing-out and bringing in mineral and organic substances are the reserves of peat and sapropel.

In Ukraine, there are 1512 deposits of peat, 503 of which are developed, with a general area covering 639.5 thousands ha. The supplies of peat are estimated to be 1853 million t, with the basic supplies amounting to 1160 million t (1056 deposits) in the regions of Volyn, Rivne, Chernihiv, Zhytomyr and Sumy. We obtain only 713 thousand t, and thus, only 19 % are spend on fertilizers. For comparison we will mark that the world does not have a considerable success in this regard: getting of peat is 26-28 million t, with 5.5 million t being obtained in Finland and Spain, and 4 million t in Germany [Peat and Sapropel of Ukraine].

Sapropel (rotten silt) is applied for a native improvement of earth, for its recultivation, readjustment and optimization of the ground processes. Bringing sapropel in soil improves its mechanical structure, moist absorptive and water-retaining capacity for airing, assists the development of useful microflora of soil and favourably operates on the water and air mode during 2-3 years, as well as increases the level of humus, nitrogen and microelements in soil. The action of sapropel may be observed even up to 14 (!) years.

There are 274 deposits of sapropel, the supplies of which are estimated at 97.2 million t, with 190 deposits located in the Volyn region, supplying 71.8 million t. The Volyn region obtains 200 thousand t of sapropel in 8 deposits [Peat and Sapropel of Ukraine].

In addition, for the receiption of organic fertilizers it is possible to use lacustrine and river silt. There are 63119 rivers (63028 of which are small rivers) and 8073 lakes in Ukraine. There are large backlogs of organic "production", moreover mineral fertilizers worsen soil without it.

In the light of the above facts, a question arises here – do the earth users have money and motivation to implement works on the "creation" of organic fertilizers? In our view, they do.

As PhD O. Pelenychak marks, from the data of the Educational scientific institute of economy and natural resources of ecology of land-tenure, Ukrainian agrarians get 79 % of their income due to natural fertility of earth, and only 21 % as a result of introduction of technologies

[Pelenychak 2012, p. 32]. Thus, there must be a proper attitude towards the protection of the main means of production. The analysis of the statistical data in 2015 shows that the level of profitability of the operating activity attained 43.1 %. For comparison: in 2010 – 24.5 % in 2011 – 24.7 %, in 2012 –22.8 % in 2013 – 11.7 %, in 2014 – 21.4 % [State service of statistics of Ukraine 2016, p. 327]. Thus, though small, yet there are financial possibilities to increase the volume of earth protection works.

It is especially necessary to mark the attitude of agrarians toward the protection of earth, especially agricultural holdings that concentrated large areas – 24 % of croplands, and assume predatory exploitation of the agrarian lands [Kvesyk, Stepanenko 2014, p.82].

A. Dankevych, a doctor of economic sciences, notices that the most widespread index in the agrarian sector is an analytical index of EBITDA - income to the contribution of charges on interest payment and taxes and accrued depreciation. As a comparative analysis of efficiency of work of the biggest 20 agroholdings in a plant-grower testify, with the index adopted on the average amounting to 300 USD.

And how much do the agricultural holdings spend on the protection of fertility? Scientists have already written about the necessity of revivals on landed arrays that lease agricultural holdings of the stock-raising sphere. It would be good, if there also appeared national and agroholding fight for organics, mastering of deposits, lakes with a sapropel, ponds with a silt.

Obviously it is urgently needed to grow green manure crops, as the present commercial course of agriculture is a way to complete the exhaustion of earth, and a correct way is the way of high ecological culture of land-tenure. It is needed to leave fertile, but not exhausted earth descendants.

4. Conclusions

On the basis of the above facts it is possible to recommend the following:

1. For the "production" of organic fertilizers it is needed to sow earth green manure crops, to use peat and sapropelic fertilizers, pond and river mules, take a maximum advantage of the possibilities of modern plant-grower. It will substantially decrease the negative balance to humus. Mineral fertilizers should be applied only with the organic ones.

2. To renew the optimal structure of sowing areas in crop rotations. It would be expedient at a grant of earth in a lease to assert the plan of organising the use of land,which means an optimal duty of agricultural cultures. It would allow to accumulate corresponding useful substances in soil, to barrier it from tiredness of soil which substantially promotes the provision of earth users with landed resources and improves the resource strength of agricultural producer safety.

3. To strengthen state control after keeping to land protective legislation. To apply the norms of responsibility for a failure to observe the rules of protection and rational use of agricultural earth.

4. To form the ecological culture of land-tenure,i.e. to search and apply the new forms of influence on the users of earth on soil fertility. To encourage this work in every way. To mark the fields of an exemplary and kind state. Expediently, on occasion, to disentitle land-tenure. It will allow to increase the resource strength of agricultural production safety.

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