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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

THE ESSENCE AND IMPLICATIONS OF INTEGRATED LOCAL DEVELOPMENT PLANNING

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Abstract: *Local development planning (i.e. development planning of municipalities and cities) in all countries has always played an important social role. For this reason, in the last couple of decades, this area is regulated by adequate national laws, which differ in many ways due to insufficiently developed scientifically based local development theory. According to this, in the presently constituted first vision of the theory, two local planning systems were identified. The first system with a long tradition is called a partial system since the state with its development interests is exclusively responsible for all local and overall social development in a certain country. The second, new system, is called an integrated system and in it, both state and the most influential social forces, which have fought hard for such a role, participate together as partners. The integrated system has numerous advantages when compared to the partial system of local planning and is therefore, especially in developed countries, the reason for switching from partial to integrated system.*

This scientific paper has been created to support this, especially because of the insufficiently developed local planning theory, with the goal to contribute to the development of the local integrated development systems and the projection of its general implications on the local government, its nation state as well as the international community. In this paper, adequate research methods, primarily integrated, were used and the obtained results imply that when using this system, positive fundamental social changes are caused, which, especially in the less developed countries, facilitate faster and more efficient catching up with the developed countries.

Key words: *local development, integrated planning, planned partnership, planned implications, trends, effects.*

The JEL classification: *R11, R58.*

INTRODUCTION

When compared to the other areas of social studies, the local and overall social development study developed significantly slower, mostly because of the traditional state monopoly over that field. That is the reason why the local planning system which is more and more ineffective in use, in the newly constituted theory is called partial (state – with narrow interests). On the other hand, with the influence of science and consequently increased level of highly educated population mostly in developed countries, those counties have started to apply the so-called integrated local planning system, which is vital and more efficient than the previously mentioned partial system. Its comparative advantages are based on the fact that it uses the integrated principles and that planning is done by competent state authorities together with a high number of social (democratic) forces (scientific, educational, political, economic, ecological, security etc.) as their partners.

When speaking of integrated local planning system, which is surpassing the partial system and will most likely eliminate it, it must be emphasized that, as a new system, it is not theoretically and practically developed enough. This mainly refers to the insufficiently defined intergrativeness of this system, its structure which is insufficiently elaborated (principles, methods, models, computerization and so on), and the underreasearched implications of its use on the local and overall society both in a nation state and on the international level. In the current state, especially in developed countries, the term integrated is used more and more in local and overall development planning systems however, it is not completely clear what kind of integrativeness is discussed[1]. That is the reason why we decided to write this theoretical scientific paper with the main goal of filling all the theoretical "gaps", and as such enable the integrated local and overall social planning theory to become scientific and efficiently used. In this paper, we try, for the first time, to identify the influence of such local and overall social planning on the local social community, national state as well as the overall international community.

In favor of the necessity for this scientific paper speaks the range of chosen and used bibliographic works in this field, and some additional facts must be mentioned. When compared to the other fields of social studies, the published literature in the field of local and global social planning is modest. That is, as previously mentioned in this paper, the consequence of the long use of partial planning system and

[1] The term „integrated" in social planning appeared at the beginning of XX century. However, the authors who used it did not explain in details what that term actually comprises.

the monopoly of the state, which is why the constitution of a scientifically based overall social planning theory was delayed. The proof of this is the low number of published scientific books and a slightly larger number of published scientific articles in this field[2]. Choosing the appropriate literature that should be consulted during the preparation of this scientific paper was a significant obstacle. Additional obstacle was the author's request that literature should scientifically deal with the most important segments of integrated local planning theory comprising of principles, technology, planners and implications of that planning since those segments are the subject of the research in this scientific paper. Therefore, according to the author's main request, a small number of published scientific works in this field was chosen and consulted and their range relative to the goals of this paper was rated – this will be further elaborated in this paper.

As far as the principles and integrated local planning technology in the sense of defining structures of local plans (long-term, middle-term and short-term) and the process of their creation, the authors of the consulted scientific literature discuss it, but in an expert, not in a scientific way. Because of that, their articles are heterogeneous and without a general answer concerning the structure of these plans. The same applies for the offered educational logistics of the main plan makers and their expert associates (Vukonjanski, I, 2019: 184-204). Similar applies for the treatment of areas of main integrated local plan makers since the consulted articles in that field, imply that the partner relationship between the state authorities and recruited social (democratic) forces is not described in detail concerning the making and critical rating of those plans by the public. According to all this, in consulted articles, the cohesion of those partners and the development of their partnership was not emphasized and described in detail.

Finally, when considering the implications of integrated local development and its spreading into the state and social partnership in all the fields of social politics and practice (science, education, economy, ecology, culture and security) the chosen authors in their works emphasize this but without significant synthesis on how the state and social partnership will influence the future life of mankind on the local, national and international level.

However, we should mention a number of scientifically based works where the authors analyzed three main local planning factors in detail (technological, performative and implicational side of this planning).

[2] Low number of the published monographic scientific articles in the field of social planning is the consequence of the long lasting traditional, monopoly role of the state in that planning.

All this implies that in the used scientific literature the mentioned basic integrated local planning factors were not theoretically analyzed in detail and because of that in this scientific paper, we want this important theoretical gap to be filled for the sake of effective future politics and practice in development of local governments and more (state and the whole international community). At the same time, this opens a problem of redefining the treatment of the current globalization, new relations among countries, constituting new general integrated philosophy and similar things. Important philosophers, political scientists, sociologists etc. should consider these factors.

THE APPLIED RESEARCH METHODOLOGY

For the purpose of this scientific paper, based on the recommendation of the modern scientific research methodology, the adequate internal research project was created, which in practice allowed the collection of relevant theoretical data. By their interpretation, certain research results were obtained and they allow for better understanding of the local and global integrated system and in such way social practices in this field shall be improved. This research project had the following structure (Radovanović, T, 2019: 49-56):

- The research problem in this paper was based on the formulation of the basic question which should be answered during the research and the question was: What is the essence of integrated local and overall social planning and what are the general implications of its use? The research problem formulated this way was the basis for defining all other factors in this research project;
- The subject of this research was the intention to research the essence of integrated local planning in more detail and to identify the influence of such planning on the future movement of the society in the local, national and international social community;
- The goals of this research were to broaden the scientific knowledge in the field of the new integrated local planning system, then to research the implications of such an improved planning system and thus improve the practical effectiveness of the most important kind of the social planning;
- Hypotheses in this research were considered as guidelines for solving the given research problem. In this context, the main hypothesis in this research is the following: While on purpose broadening the theory of integrated planning, the components of the integrativeness will be identified in detail and that shall be the basis used to determine the influence of such planning on further development of local, national and international social community;
- Scientific methods used in this research paper are comprised of a dialectical

method as general, study method as a distinctive and integral method as an individual method. Based on this, adequate techniques were defined for the collection of important research data, which were then interpreted by using logical procedures of induction and deduction.

In such way, necessary theoretical material was collected for creation of this scientific paper and the material was used in its following parts:

- Introductory, central, part which deals with the structure and fundamentals of the integrated social planning, where using the appropriate argumentation, the new planning system was analyzed in more detail together with the general social implications which will be caused by its use;
- In the second part, the urgency of using this integrated local planning system was dealt with, where it is suggested that the results of this research should be used by developed countries to improve this planning system while the less developed countries should start using this planning system as soon as possible to catch up with the developed countries in the most effective way;
- The next part of this paper refers to the identification and discussion of the collected new scientific knowledges and the declaration of their practical use;
- In the final part of this paper, the general findings of this research were described (definitions and statements), with the possible solutions to this research problem and verification of the given research hypotheses.

The list of the used scientific literature in this research is displayed at the end, and the list is modest in quantity due to the fact that the theory of local planning has just been constituted.

THE PROFILE OF THE INTEGRATED LOCAL PLANNING

Starting from the given research problem and defined goals of this research as well as from the theoretical range of the consulted scientific literature, the first thing that should be done is to determine the essence of integrated local planning, and then to identify and explain the basic social implications of such planning. All this must be done to try to complete the just constituted theory of this planning and in such a way raise the practical effectiveness in this field.

Concerning the essence of integrated local planning which is being introduced into the developed countries without scientific basis, the first thing that should be done is to explain the term "integrated" used for this kind of planning, then to identify the representative structures of the basic types of those plans (long-

term, middle-term and short-term) and after that explain the character of the partnership between the state and social forces in such a planning system[3]. When explaining the essence of integrated local planning some other factors can be analyzed as well; however the three already listed factors are the most important. They are characterized by the following (Mersal, A, 2016: 56-59):

- In integrated local planning, as scientifically based and the most effective, the term "integrated" is used and this term has several complementary meanings (Radovanović, T, 2019:36-45). The first meaning has internal character and it includes planned relationships and relations among all the factors in a local community (Wigley, M & Petruney, T., 2015: 36-39). The other meaning includes externally planned connection between the factors of local community and its environment (other local communities, its state and relevant international community). Finally, the third meaning of this term includes the fact that the parties responsible for planning are the adequate state authorities and different complementary social organizations (scientific and educational, political parties, different associations etc.), while the other segments of the society can criticize the prepared local plans and give suggestions on how they can be improved. For the given reasons, the parties responsible for planning with the local organizations and population in certain aspects can participate in the preparation and evaluation of finished local plans and this has the full integrative character (Arimavciute, M, 2011:124-127);
- In order to be successful, the integrated local planning should be based on the appropriate scientific theory. This is especially important for projecting the structures of basic local plans (long-term, middle-term, short-term). However, due to the late creation of this theory, the initiated local planning in developed countries was based on the recommendations given by UNCTAD, then European Commission, The World Bank and other international organizations that did not have the necessary scientific base for development planning. That is the reason why the applied plan structures are different in many ways which in turn reduces their quality. The necessary structures of all basic integrated local plans, according to the results of the previous scientific works in this field, will be described briefly. The basic structure of the long-term (strategic) local development plan (for the period from 10 to 15 years) should be comprised of the following segments: the general profile of the community, the reached development potential, the vision and the mission of the development, the goals and directions of integrated development,

[3] The obstacles in interpreting the essence of the integrated local planning in this paper are due to the fact that the scientific works published so far dealt with this topic superficially.

the integrated development projects, the effects of the projected development as well as the management of the development realization (Molebatsi, C, 2012:11-13). The structure of the middle-term local development plan (from 3 to 4 years) should contain the following segments: the frames and sources of planning, the selection of the development projects for comparison, the comparison of the chosen projects, the final selection of projects, the preparation of the project documentation, the effects of the project realization, the financiers of the development projects, the management of the project realization (Rasoolimanesh, S, 2016:290). Finally, the structure of short-term (one year) plans should be comprised of: the order of project implementation, the activities of project implementation, the activities in project implementation, the activities in project evaluation, and the management of project realization. All this can be computerized and appropriate software can be used; in such a way special tool for collecting and usage of relevant information for creation of local plans is obtained;

- The partnership between the state and society in integrated local planning, which was recently introduced into the developed countries, is theoretically complex. It is the consequence of the large social force comprised of a society with the high level of education that pressures the state and in such a way actively participates in the management of the society, which then leads to the decentralization of the public policy and practices in a certain country. This especially applies to the field of local and overall social development planning as the most important segment in the management of the society and it is consequently spread onto the complete society and in such way it becomes democratic and efficient. This partnership, as far as the integrated local development is concerned, is related to official and organizational participation of the most powerful and most competent social forces of the state in designing of all integrated local development plans as well as their realization. Such a new reality has huge (even epochal) consequences on each country and on the whole world (Frank, D, 2011: 135-138).
- It can be concluded that the creation of state and social partnership in integrated local planning represents the key cause for the democratic management of the society in local governments and in the whole country, which leads to the decentralization in the management in such a country and regulating the relations in the world as whole. However, it is a long process which is spreading and its spreading depends on the educational level of population in a certain country. This process is not strictly time determined and it can happen slowly or quickly depending on the strength of the democratic forces in each country (Green, L.N, 2016: 13-16);

Noticeable implications of the use of integrated local planning in any country can be numerous and complementary. They can influence the following: how the country is being run, the development of science, educational dynamics, national economy, environmental protection, social care, development of culture and security[4]. All these things need to be described further:

- When using the integrated local and overall social development, due to the mentioned partnership between the state and society, the process of decentralization will obviously be accelerated in the certain countries and the people responsible for that will be the most competent representatives of the country and society, so the running of the society will approach the Plato's concept of the state and the experience of the Nordic countries in this field according to which the country should be run by the cleverest individuals, and that can enable the general partnership between the state and the society in the integrated local and overall social development. The summary of the results of such social changes can facilitate the new epoch in the development of mankind and it should be dealt with by the famous philosophers, political scientists and sociologists (Hamdouch, A, 2016: 21-22);
- In such an expected reality, the most important role will have the further development of science. With its content, it should lead to the adequate development of integrated local and overall social development theory in all fields (planning etc.). Particularly, social science should gain new knowledge and in such a way as to create a foundation for further integrated and overall social planning from the aspect of further decentralization in running of the country and partnership between the country and society in this process while pointing out the fundamental influence of education in the society (local, national and international) (Harrison, P, 2001: 178-180);
- According to this, further development of the educational level in a certain society has an important role in further decentralization and democratization of the public policy partner leadership in each country, which should be expected in the integrated local and overall social development as well. It should be emphasized that the level of education in each social community is directly related to its democratic power which is implicitly shown in the partnership between the state and social forces in running of a certain country (Bassand, M, 2001: 7-8). This key social rule should always be taken into consideration by leading state and social forces in each country and they should insist on the higher level of education of their population (Hanson, R, 2017: 8-10);

[4] Due to not enough described essence of integrated local planning, in the literature written so far, the implications of such a planning were not mentioned in details.

The use of such an integrated local and overall social planning system will, in the future, have the positive impact on all the aspects of work and social development, especially economy, ecology, standard of living, culture, life safety etc. (Mehanović & Palić, 2019:302) and in regards to that the following need to be added:

- Such an expected future development of countries in the world will influence the development of their national economy. It will be represented in the constructive relation between national economy and unstoppable breach of international business and overall globalization in each country. Such a construct is related to the usage of the positive characteristics of international business (growth of gross domestic product and the level of employment), and on the other hand it is related to the diminishing of its negative characteristics (inclination to use natural resources recklessly, to suppress national business and similar). Such a future development of national economy should be followed by adequate international trade, whose further development will lead to organized general trade freedom which represses accompanying barriers (customs, protectionist and others) (Hirt, S, Stanilov, K, 2009: 11-14);
- Similar should be expected in the further development of ecology, which must ensure sustainability and survival, so it should improve the protection of all social communities from the polluters of soil, air and water that are causing negative consequences on local, national and international social community as a whole. Most certainly, all these dangers harm the countries and the world as a whole and there is no alternative but to fight together and to protect the healthy environment and work space in each country and in the whole world;
- With such expected changes in the world, nation states and international community must work together to take care of narrowing the huge international differences in the standard of life and protection of the most vulnerable members of the society in certain national communities (UN Habitat, 2009: 117-120). This is important not only for humane reasons but because it also facilitates the economic and social growth of each nation state. It is clear that the further development of the whole social protection will be the constant process which will be changed and improved constantly;
- Further development of the entire culture, which will be caused by the expected decentralization of countries and their integrated planning and development, will be comprehensive and complex. It will be moved in the direction of multiculturalism which will affirm collective general culture in all fields as the combination of the most valuable examples of national cultures. It means introduction of national and international care of the whole culture as the heritage of the former life and artistic expression and creation of certain parts and mankind as a whole (Kourliours, E, 2013: 4-7);

- Considering the previously mentioned expectations in partner leadership of the national communities by both state authorities and democratic forces, in the field of their security there will be major changes. Although since The Peace of Westphalia (1648) the security focus was mainly on the country, there were some noticeable attempts to transfer the focus to the individuals and their prosperity. A proof of this is the Report of UN Development Program from 1994 where the concept of human security is presented and the central place is given to the care of every single individual (UNDP, 1994). On the other hand, in the given conditions there are scientists who think that the country is a guarantee of safety of its people and that this fact should not be changed (Buzan, B, 2000). Such attitudes and many challenges in the present leadership of countries, certainly hinder the use of the previously mentioned concept of the UN about human security. However, the expected use of the scientifically based system of integrated local and overall social development eliminates all obstacles in affirming the concept of human security which will make the lives of future generations safer and of better quality.

Previously described essence of the integrated local planning with all its accompanying implications indicates that this planning system is based on participation of reinforced democratic forces and it is caused by the increased level of education of people in the leading the whole social policy, while in the previous period it was done autonomously by the state. It is the first and the most important victory of the democratic forces which influences all other areas of life and the development of all countries and at the same time causes the decentralization of authorities in each nation state. It is the epochal change in the further development of each national country and mankind as a whole. That is the reason why in this paper, in the form of short concept, we described the expected outline of the changes in the most important areas of life and development of each country. It is clear that this description should point out the huge changes that will be caused by the partnership between the state and democratic forces in the decentralized leadership of each country – and it has the epochal character which should be explored in further detail by the leading philosophers, political scientists and sociologists (Matarrita, D, Brannan, M, 2012: 8-11).

THE URGENCY OF APPLYING INTEGRATED PLANNING

The new theory of integrated local planning which relies on the adequate social science and partnership between the state and society represents the revolutionary change not only in planning but also in all other areas of leading a certain

country. This planning system is definitely more efficient than the one used so far that is referred to as partial (elitist and of narrow interest) which is purely state planning. Recently, because of reinforced democratic forces, it has been applied in the developed countries while in other countries there are still forms of the partial local planning. Since the new scientifically based theory of integrated local planning has just been constituted, in this paper we try to contribute to its full shaping and we think that all the countries should organize themselves and start using this new system. In application of this system huge differences can been seen between developed and underdeveloped countries.

As far as developed countries are concerned, they should, taking into the consideration the requirements of the new local planning theory, adequately innovate their law regulation in the planning area, then adjust their regulation in the area of planning improvement of adequate individuals from local governments and their plans for local development should be done by adequate expert organizations in that area – which means the following:

- Innovation of law regulation in the area of local planning means that it should be adjusted to the requirements of newly formed integrated local planning theory especially when using the projected structures of the basic local development plans (long-term, middle-term and staffing) and the accompanying computerization and the usage of the appropriate software for relevant planning information. In such a way, according to this theory, the appropriate law regulation will be provided for all kinds of plans and their structure
- Improvement of the law regulation for the planned training of people from the local governments regarding their expert education from the area of integrated local planning theory with the accompanying computerization and the usage of the appropriate software for relevant planning information. In such a way, those educated people become internal associates in the design of all integrated development of the local government basic plans. After that, there should be an obligation for the previously mentioned people to innovate their knowledge and skills periodically considering the theoretical and legal changes in that area of planning;
- According to the integrated local planning theory, the design of those plans should be done by expert teams formed by the hired external expert organizations in this area and the selected and educated internal planners. External experts should have the role of leaders in the plan design in methodological and integrated sense while internal planers should cooperate in development off specific projects in the economic, communal and social sense. In such way, necessary expert conditions for designing basic quality local development plans are met.

On the other hand, when taking into consideration the underdeveloped countries, their law regulation in the area of local planning is much weaker when compared to the same regulation in the developed countries. That is the reason why, for their accelerated switching to integrated local planning, it is necessary to urgently create the adequate program of implementing the integrated local development in those countries (especially African and others as well). Such implementation should be done by competent expert organizations experienced in the matter[5]. The program should consist of projecting of the law regulations for integrated local planning, the design of action plan for the use of such regulation, i.e. the necessary education of leading experts in those countries for the successful performance of such a huge endeavor – and it includes the following:

- Projecting the law regulation for integrated local planning should be based on the theory of this planning which means the revision of the existing (if there is any) or the preparation of the new law regulation – especially in the area of social planning and expert training of the employees in the local governments;
- Based on this, the action plan for the use of this regulation should be prepared and the leaders and the manner of use of this regulation should be mentioned in such a way that the system of local planning will be successfully introduced in a specific country;
- Finally, according to all this, for the leading experts from a specific country, education about the mentioned topics should be organized so that they can become the emissaries of the practical introduction of the integrated local development in a specific country.

It is clear that all these activities in developed and underdeveloped countries should be organized urgently, since they have strong influence onto the dynamic and quality of the further local government development as well as the development of the countries to which those governments belong.

RESEARCH RESULTS AND THEIR DISCUSSION

After interpretation of the whole research, based on the methods of induction and deduction, it is possible to gain new scientific knowledge in the area of local and

[5] Such organizations that work internationally have recently appeared in some countries. One of them is, for example, College of Economics and Administration from Belgrade, Serbia (www.rafin.edu, rs; office@rafin.edu.rs), which is state accredited for such work and gathers the well known authors in the area of integrated local planning and provides services to the interested countries for implementing integrated local planning based on its own scientific publications in this area (now based on the publication „Integrated local planning“). Similar applies to the other organizations that deal with this.

overall social development planning. This newly gained knowledge includes the following discoveries: local and overall social development planning in each country directly depends on the level of education of the population; partial (state) system of development is more suitable for underdeveloped countries while the integrated system is suitable for developed countries; the integrated system of development is clearly more effective a has future potential, while the partial system is ineffective and will not be used any more in the future; head-on use of the integrated local and overall social development planning in the world will consequently introduce a partnership between state and society in all aspects of the country leadership and bring huge and positive changes to the country (Radovanović, T., 2019: 22-27).

These four new scientific discoveries need a short discussion:

- Planning of local and overall social development definitely depends on the level of education of population since in the underdeveloped countries with the modest education it is convenient to use purely state system while in the developed countries it is convenient to use the partnership between state and social system;
- Due to the differences in the level of education, partial (state) system is convenient for less educated societies while integrated (state-democratic) system is convenient for the societies with higher levels of education;
- Based on the expectation that the level of education around the world will rise and because of its high efficiency, integrated social development system has a future perspective while the partial system, because of its failing efficiency, must be eliminated soon;
- Finally, the partnership between state and social (democratic) forces in an integrated social planning system will logically spread onto all the areas and aspects of leadership in each country which will eventually cause many huge positive changes in certain countries and around the world.

This and similar scientific knowledge contribute to the completion of the local and overall social development planning theory and in such a way it will become scientific and efficient. The only obstacle is the positive verification of this knowledge by the relevant scientific public and social practice itself – which is highly expected by the authors of this paper.

CONCLUSION

The description of theoretical and practical discussions of the new integrated local planning in this paper make it possible to write a conclusion based on the short mentioning of the most important discoveries concerning this theory.

In the introduction, it was stated that around the world the theory of local planning, as the basic part of the social planning, was constituted very late. The delay was caused by the wish of each country to maintain its monopoly in this area and refuse changes. However, especially in the developed countries, due to the higher level of education, in recent years, the democratic forces are reinforced so they are able to fight for their partner participation together with the state in local planning and consequently in the leading of those countries. That was the reason for constituting the scientifically based integrated local planning, as a system which is indisputably more efficient than long lasting traditional (elitist and narrow interested) partial planning system. All this caused heterogeneous changes in theory and practice of this planning, so we decided to write this paper with the goal to improve all this based on its results.

For the needs of this paper, the adequate research project was created and applied where the starting point was to define the problem of this research by asking the question: what is the essence of integrated local and overall social planning and what are the general implications of its use? In such a context all other research factors were determined (subject, goals, hypotheses and methods), and they were the leading points in realizing this theoretical research.

According to that, in the introduction, the range of consulted scientific literature was mentioned, and it was concluded that the literature showed the recommendations given by the international organizations how to prepare local development plans while the smaller part of literature mentioned scientific reinforcement of this theory. Based on that fact, the subject of this paper is the essence of this planning and its accompanying and general implications.

By analyzing the essence of integrated local planning in this paper, we defined the term *integrativeness* of such planning, modeling of all basic types and internal structure of those plans, as well as provided the explanation that the partnership between state and democratic forces in designing the plans, their implementation and their evaluation is necessary. All this is concluded with an important recommendation that in this planning system, an adequate model for collecting information (register and software) should be used because the preparation is easier and the quality of such plans is better.

According to the observed essence of the planning system in this paper, and especially due to implied consequences of a partnership between state and democratic forces, the adequate implications of such local and overall social develop-

ment were projected. It is concluded that the mentioned partnership started in the integrated local planning consequently very quickly enters all areas of social leadership and it causes decentralization of the country and general and epochal positive changes in the further development of each country and the whole mankind. Such implications, caused by the use of the integrated local and overall social planning, represent tectonic changes that should be dealt by philosophers and certain segments of social sciences.

Considering the positive importance of the partnership between state and democratic forces in the running of each country, in this paper, the adequate programs are suggested for innovation of the already started integrated local planning in developed countries and for the accelerated implementation of this planning system in other countries which do not have experience with it.

After the research, the important new scientific knowledge considering the essence of integrated local planning was identified in this paper; the knowledge about the partnership between state and democratic forces in running the country as well as knowledge about revolutionary positive changes caused by all these things. Additionally, in this paper expert models of local development basic plans were created together with the accompanying tools (register and software) for collecting the information.

According to all this, it can be concluded that the given problem in this research was successfully solved and that the given hypotheses were verified by that.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

METRIJSKE KARAKTERISTIKE UPITNIKA PRIMIJENJENOG U PROCJENI KVALITETA USLUGA VISOKOŠKOLSKIH INSTITUCIJA U REPUBLICI SRPSKOJ

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Sažetak: *U cilju validacije istraživačkog instrumenta koji je primijenjen radi identifikacije studentske percepcije kvaliteta usluga visokoškolskih ustanova na području Republike Srpske (u okviru šire empirijske studije) izvršeno je utvrđivanje njegovih metrijskih karakteristika. Upitnik, čiju je osnovu sačinjavala HEDUQUAL skala, podvrgnut je testiranju primjenom dva postupka: (1) faktorskom analizom (analiza glavnih komponenti – Principal Components Analysis, sa metodom kose rotacije - Direct Oblimin) i (2) provjerom unutrašnje saglasnosti skale (Scale Reliability Analysis - zasnovane na Kronbahovom alfa koeficijentu). Uzorak ispitanika činila je populacija studenata koji pohađaju neku od visokoškolskih ustanova na području Republike Srpske, ukupno 863 studenta (M=265; Ž=598) prosječne starosti 21,5 godina. Dobijeni rezultati potvrđuju dobru metriku skale, kako u pogledu validnosti (KMO = 0,972; Bartlett's Test of Sphericity = 14292,613; Sig.=0,000), tako i u kontekstu njene relijabilnosti (Cronbach's Alpha = 0,966). Sva statistička zaključivanja sprovedena su na nivou značajnosti od 0,05 (Sig. < ,05). Dobre metrijske karakteristike instrumenta definisale su kvalitetnu osnovu za dalje analitičke opservacije rezultata studije.*

Ključne reči: *kvalitet usluga; skala procjene, metrijske karakteristike,*

JEL klasifikacija: *C83, I23*

UVOD

Evropski prostor visokog obrazovanja (kojem pripada i akademski prostor Republike Srpske, od uvođenja Bolonjskog sistema studiranja) podrazumijeva da se sistem obezbjeđivanja kvaliteta usluga visokoškolskih ustanova zasniva na: (1)

autonomiji svake visokoobrazovne institucije i (2) na njenoj odgovornosti za kvalitet usluga vezanih u sistemu ukupnih aktivnosti i studijskih programa koje pruža svojim klijentima/studentima. U tom smislu aktivnosti na punoj standarizaciji i realizaciji obezbjeđivanja kvaliteta usluga determinisani su načelima evropskog prostora visokog obrazovanja (Glanville, 2006). To se, u prvom redu, odnosi na kvalitet studijskih programa, a potom i na odgovornost konkretnih fakulteta/visokih škola za primjenu definisanih standarda kvaliteta.

Sistem kvaliteta u visokom obrazovanju, te njegovo adekvatno obezbjeđivanje, predstavlja sveobuhvatnu aktivnost menadžmenta visokoškolskih ustanova. Podrazumijeva kompleksne aktivnosti u kontinuiranom procesu ostvarivanja poslovne politike kojom se ustanovljava, održava i razvija kvalitet visokog obrazovanja. Odnosno, obezbjeđuje jasno i precizno ispunjavanje postavljenih standarda. U tom kontekstu fakulteti i visoke škole su odgovorne prema svim stejkholderima u sistemu visokog obrazovanja – prvenstveno studentima (koji ulažu dio svog života u obrazovanje), zatim roditeljima (koji se sa svoje strane snose i značajan dio finansijskog tereta školovanja), ali i potencijalnim poslodavcima (Ivković, 2009).

Pojam kvaliteta u visokoškolskim ustanovama predstavlja višedimenzionalni sistem koji je, u osnovi, obuhvaćen kroz nekoliko međusobno povezanih dijelova: (a) nastavni proces (kvalitetan nastavni plan i program prilagođen tržištu), (b) nastavni kadar (kompetentan da pruži odgovarajuća znanja studentima), (c) uslovi rada (savremeni materijalni resursi) i (d) kvalifikovano administrativno i drugo nenastavno osoblje. Osnovni ciljevi kvaliteta usluga visokoškolske ustanove se mogu sagledati kroz sljedeće: (1) spremnost za ispunjenje obrazovne i istraživačke funkcije, (2) kvalitet kao jedan od strateških ciljeva ustanove, (3) zadovoljstvo korisnika usluga (studenti i društvena zajednica), (4) težnja ka izvrsnosti, (5) veća vrijednost za uložene finansijske inpute, (6) transformacija ustanove i (7) kvalitet usluga kao instrument unaprijeđenja efikasnosti (Puška, Stanišić & Maksimović, 2015:16). Drugim riječima, sam kvalitet usluga visokoškolske ustanove determinisan je zadovoljstvom studenata koje se zasniva na pozitivnom iskustvu i ispunjenim prethodnim očekivanjima na konkretne uslužne aspekte koje "obećava"/nudi ustanova.

Procjena kvaliteta usluga u visokoškolskim institucijama sve više zaokuplja pažnju, kako ukupne akademske zajednice, tako i samih institucionalnih subjekata visokog obrazovanja (fakulteta i visokih škola), ali i šire društvene zajednice. Pored eksterne valorizacije kvaliteta rada od strane osnivača, finansijera, pa i naj-

šire društvene javnosti, sve intenzivnije se u prvi plan postavljaju studenti kao neposredni korisnici usluga (Vranješ, Gašević & Drinić, 2014). Od toga kako studenti (kao osnovni stejkholderi u sistemu visokog obrazovanja) percepiraju kvalitet ukupnog sistema usluga ustanove, zavisi vrijednosni status i tržišna pozicioniranost konkretnog fakulteta/visoke škole (Nešić i sar., 2017). Zbog toga je veoma značajno da se poslovna strategija ustanove determiniše kroz suštinsko razumijevanje potreba korisnika (Milosavljević, Maričić & Gligorijević, 2009). Njihova očekivanja, a potom i percepcija konzumirane usluge, međusobno su u korelaciji u kontekstu kvaliteta (Douglas, J., Douglas, A., & Barnes, 2006), tako da se identifikovano zadovoljstvo ili nezadovoljstvo uslugom u cjelini, ili nekim njenim dijelom, trebaju tretirati u kontekstu satisfakcije i zadovoljstva korisnika (Nešić i sar., 2017: 887). Ovakvo stanovište je potvrđeno i u jednom broju dosadašnjih istraživanja (Clewes, 2003; Hill, Lomas & MacGregor, 2003; Gajić, 2011; Kolev & Jakupović, 2014).

Mjerenje kvaliteta obrazovanja u cjelini, a time i kvaliteta usluga visokoškolskih ustanova, suočava se sa sličnim problemima koje se u ekonomiji pojavljuju kod mjerenja korisnosti dobara i usluga (Paszek, 2102). Zbog toga je u praksi mjerenje kvaliteta u obrazovanju najcjelishodnije vršiti putem procjene, što u kontekstu vrednovanja kvaliteta usluga fakulteta/visoke škole od strane studenata pažnju usmjerava ka primjeni skala procjene.

U svjetlu ovih akademskih stavova nametnula se potreba realizacije jedne šire empirijske studije sa ciljem identifikacije studentske percepcije kvaliteta usluga visokoškolskih ustanova na području Republike Srpske. Odnosno svojevrsne valorizacije rada fakulteta i visokih škola od strane njihovih glavnih stejkholdera – studenata. U tom pogledu bilo je neophodno odabrati i odgovarajući istraživački instrument, te izvršiti njegovu validaciju putem utvrđivanja metrijskih karakteristika, što predstavlja glavni predmet ovog rada.

METOD

U okviru šire empirijske studije, realizovano je anketno istraživanje koje je obuhvatilo pet visokoškolskih institucija na području Republike Srpske (Panevropski univerzitet Apeiron u Banjoj Luci, Univerzitet u Banjoj Luci, Univerzitet u Istočnom Sarajevu, Visoka medicinska škola u Prijedoru i Univerzitet za poslovne studije Banja Luka), sa ciljem provjere metrijskih karakteristika primijenjenog instrumenta za procjenu kvaliteta usluga visokoškolskih ustanova od strane studenata.

Empirijski podaci su prikupljeni putem upitnika čiji je centralni dio sačinjavala HEDUQUAL skala, primijenjena u jednom broju prethodnih istraživanja i koja je pokazala dobra metrijska svojstva (Klarić & Kulišam, 2011; Nešić i sar., 2017). Originalna verzija HEDUQUAL skale (Klarić & Kulišan, 2011) je prvi put primijenjena za ispitivanje percepcije kvaliteta usluga visokog obrazovanja u BiH. Kreirana kao multiajtemska skala sa ukupno 30 pitanja bila je segmentirana u pet subskala (*opipljvost* usluge/6 ajtema, *pouzdanost* usluge/7 ajtema, *odgovornost* uslužnog subjekta/5 ajtema, *povjerenje/*7 ajtema i *empatija/*5 ajtema) čiju je osnovu činila struktura SERVQUAL upitnika (Parasuraman, Zeithaml & Berry, 1988). U jednom od prethodnih istraživanja (Nešić, Ahmetović, Srdić & Badrić, 2017) izvršena je validacija HEDUQUAL skale na uzorku studentske populacije u AP Vojvodini gdje je identifikovano jednofaktorsko rješenje skale (generalni faktor kvaliteta usluga) i preporučena za primjenu kao jedinstveni multiajtemski uputnik kojim se identifikuje studentska percepcija u smislu kvaliteta usluga visokoškolske ustanove. U našem istraživanju prihvatili smo ovaj pristup.

U oba prethodna istraživanja, kao i u našoj studiji, ispitanici su svoju procjenu iskazivali izborom jedne od pozicija na petostepenoj Likertovoj skali. Numeričke vrijednosti ovako uređene ordinalne skale odgovarale su intenzitetu procjene trideset indikatora usluge i to: **1** (*mnogo manje od mojih očekivanja*); **2** (*manje od mojih očekivanja*); **3** (*prema mojim očekivanjima*); **4** (*više od mojih očekivanja*); **5** (*znatno više od mojih očekivanja*). Vrijednosna procjena odgovora se interpretira u skladu sa pravilom: (a) percepcija kvaliteta usluge "*u skladu sa o**č**ekivanjima*" (ako je skalarni prosjek blizak kvantitativnoj vrijednosti tri), (b) percepcija kvaliteta usluge "*ispod očekivanja*" (kada je skalarni prosjek znatno ispod kvantitativne vrijednosti tri), (c) percepcija kvaliteta usluge "*iznad očekivanja*" (ako se radi o skalarnom prosjeku znatno iznad kvantitativne vrijednosti tri) (Klarić & Kulišan, 2011). Takođe, za rangiranje značaja indikatora, u manifestnom prostoru, u interpretaciji se koriste vrijednosti skalarnih prosjeka (*Mean*) (Nešić i sar., 2017).

Uzorak ispitanika je bio stratifikovan i uzet iz populacije studenata koji pohađaju neku od visokoškolskih ustanova na području Republike Srpske, ukupno 863 studenta (M=265; Ž=598). Prosječna starost ispitanika je bila 21,5 godina.

Metrika skale za procjenu kvaliteta usluga visokoškolskih ustanova od strane studenata, u našem istraživanju, testirana je primjenom dva postupka: (1) faktorskom analizom (analiza glavnih komponenti – *Principal Components Analysis*) sa metodom kose rotacije (*Direct Oblimin*) i (2) provjerom unutrašnje saglasnosti (*Scale Reliability Analysis* - zasnovane na Kronbahovom alfa ko-

eficijentu). Izbor navedenih statističkih procedura bio je uslovljen, u prvom redu, karakterom istraživanja i konkretnim istraživačkim instrumentom. Kako se radi o upitniku čije su metrijske karakteristike provjerene u samo dva istraživanja (sa različitim pristupom eksplikacije unutrašnjih elemenata kao ishodišta tumačenja empirijskih podataka i u različitim entitetskim okruženjima), to se kao logičan odabir metode analize podataka namentnuo PCA pristup (prema Tabachnick & Fidell, 2007: 635, ovo je znatno superiornije rješenje kada je reč o uobičajenom empirijskom sažimanju skupa podataka, u odnosu na CFA postupak - *common factor analysis*). Takođe i opšte istraživačke preporuke za provjeru svakog instrumenta u formi skale (Pallant, 2009) bili su opredjeljujući i u našem istraživanju za izbor statističke procedure kojom se utvrđuje pouzdanost (na konkretnom uzorku) ka primjeni *Scale Reliability Analysis* zasnovane na Kronbahovom alfa koeficijentu.

Sva statistička zaključivanja sprovedena su na nivou značajnosti od 0,05 (*Sig.* < ,05).

REZULTATI I DISKUSIJA

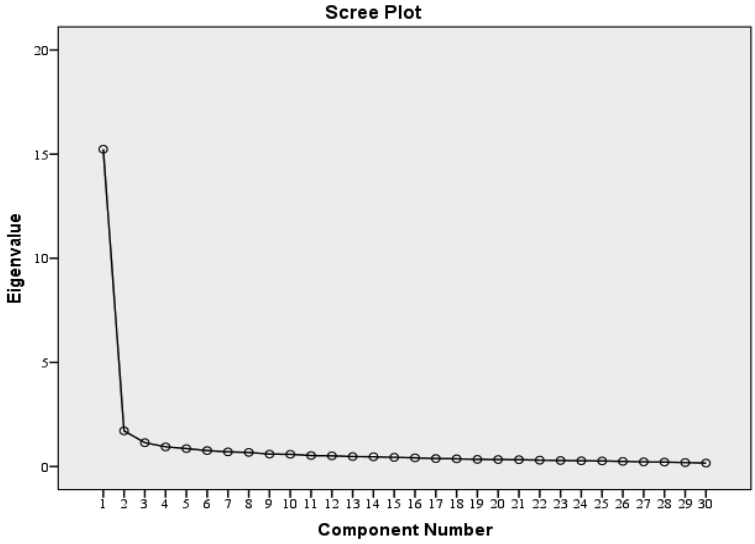
Prvi nivo provjere metrijskih karakteristika primijenjenog upitnika realizovan je statističkom procedurom faktorske analize, metoda glavnih komponenti. Cilj je bio utvrđivanje validnosti tridesetajtemske skale (*Principal components analysis* - PCA). Uz uvažavanje preporuka o adekvatnim statističkim procedurama za skalarne konstrukte (Pallant, 2009), prethodnim postupkom ocijenjena je prikladnost podataka za faktorsku analizu, a rezultati su pokazali punu opravdanost njene primjene *(KMO = 0,972; Bartlett's Test of Sphericity = 14292,613; Sig.=0,000)* (Tabela 1). Analiza glavnih komponenti, otkrila je prisustvo ukupno tri sa karakterističnim vrednostima (*Eigenvalues*) preko jedan, koje objašnjavaju 50,78%, 5,70% i 3,81% varijanse. S obzirom da su rezultati izdvojenih komponenti nakon provjere sa rotacijom u obje projekcije (*Varimax* i *Direct Oblimon*) bili veoma slični, a struktura korelacije veoma jasna (sa svim vrijednostima koeficijenta korelacije iznad 0,3), zadržana je solucija sa kosom rotacijom, što je u skladu sa preporukama o vrednovanjima mjernih skala (Tabachnick & Fidell, 2007; Pallant, 2009). Međutim, dobijeni dijagram prevoja (*Scree plot*) pokazao je postojanje jasne tačke preloma već iza prve komponente (Slika 1), te je na osnovu Kattel-ovog kriterijuma (1966) odlučeno da se zadrži samo prva komponenta, koje objašnjava značajan procenat ukupne varijanse (50,78%), što je korespodentno sa preporučenim procedurama tumačenja rezultata faktorske analize (Pallant, 2009).

Tabela 1: Faktorska struktura skale procjene kvaliteta usluga

Br.	Indikator	Sv	Faktor	Komunaliteti
O1	Fakultet posjeduje savremenu opremu	3,02	,660	,435
O2	Oprema fakulteta je vizuelno dopadljiva	3,04	,621	,386
O3	Zaposleni na fakultetu su uredni i profesionalnog izgleda	3,81	,633	,400
O4	Na fakultetu se maksimalno pruža obećana usluga	3,27	,765	,586
O5	Bibliotečki resursi na fakultetu su dobri	3,00	,546	,298
O6	U nastavi se značajno koriste savremene tehnologije	3,15	,717	,514
P7	Usluge koje fakultet pruža uvijek su konstantno dobre	3,17	,795	,632
P8	Nastavnici se pridržavaju utvrđenog rasporeda nastave	3,47	,666	,444
P9	Administrativni radnici se pridržavaju radnog vremena službi	3,64	,705	,350
P10	Na fakultetu se vodi evidencija o žalbama studenata	3,07	,704	,496
P11	Problemi studenata se efikasno rješavaju	3,11	,795	,633
P12	Nastavni plan fakulteta je savremen	3,43	,771	,595
P13	Radno vrijeme servisa podrške (studentske službe, biblioteke...) je maksimalno prilagođen studentima	3,26	,599	,359
OD14	Studenti se blagovremeno informišu kada će određena usluga biti realizovana (raspored nastave, ispitni rokovi...)	3,51	,644	,415
OD15	Administrativna usluga na fakultetu je ažurna	3,41	,592	,496
OD16	Zaposleni na fakultetu su uvijek spremni da pruže pomoć studentima	3,65	,744	,554
OD17	Svojim odnosom, zaposleni pobuđuju povjerenje studenata	3,37	,651	,659
OD18	Nastavnici primjenjuju dosljedne kriterijume prilikom ocjenjivanja	3,39	,696	,484
PO19	Studenti osjećaju sigurnost pri uslužnim transakcijama servisa podrške (izdavanje uvjerenja, prijava ispita, korištenje biblioteke...)	3,68	,812	,424
PO20	Studenti osjećaju sigurnost pri uslužnim transakcijama nastavnog osoblja (konsultacije, ispiti...)	3,52	,781	,610
PO21	Zaposleni na fakultetu su uvek ljubazni	3,28	,708	,501
PO22	Zaposleni na fakultetu imaju kompetencije kojima mogu uspješno odgovoriti na sve potrebe studenata	3,45	,780	,608
PO23	U nastavi, profesori povezuju teoriju i praksu	3,35	,704	,495
PO24	Sa nastavnicima je moguća *online* komunikacija	3,59	,617	,381
PO25	Nastavnici se periodično ocjenjuju od strane studenata	3,17	,693	,480
E26	Studentima se pruža individualna pažnja	2,96	,782	,612

E27	Zaposleni na fakultetu se odnose brižno prema studentima	3,22	,814	,663
E28	Zaposleni na fakultetu se iskreno zalažu za ostvarivanje interesa studenata	3,21	,824	,678
E29	Zaposleni na fakulteta imaju puno razumijevanje za specifične/ posebne potrebe studenata	3,24	,765	,586
E30	Raspored nastave prilagođen je studentima	3,15	,679	,462
Pokazatelj adekvatnosti uzorka (KMO) = ,972 Bartletov test sferičnosti = 14292,613 Sig.= ,000				

Izvor: autori



Slika 1: *Dijagram preloma (Screeplot) za indikatore skale procjene*

Izvor: autori

Drugi nivo provjere metrike primijenjenog upitnika obuhvatio je identifikaciju unutrašnje saglasnosti skale procjene. Vrijednost Kronbahov koeficijenta alfa (*Cronbach's Alpha* = 0,966) pokazuje da skala u cjelini ima dobru unutrašnju saglasnost, s obzirom da znantno premašuje preporučenu teorijsku vrijednost od 0,7 (De Vellis, 2003) (Tabela 2). Stoga se može konstatovati da su rezultati drugog nivoa provjere metrike pokazali da korišteni instrument, primijenjen i na studentima visokoškolskih ustanova u Republici Srpskoj, u pogledu svoje unutrašnje saglasnosti pokazuje dobre metrijske karakteristike.

Tabela 2: Elementi unutrašnje saglasnosti skale procjene

Br.	Indikator	Sv	Cronbach's Alpha if Item Deleted
O1	Fakultet posjeduje savremenu opremu	3,02	,964
O2	Oprema fakulteta je vizuelno dopadljiva	3,04	,965
O3	Zaposleni na fakultetu su uredni i profesionalnog izgleda	3,81	,965
O4	Na fakultetu se maksimalno pruža obećana usluga	3,27	,964
O5	Bibliotečki resursi na fakultetu su dobri	3,00	,965
O6	U nastavi se značajno koriste savremene tehnologije	3,15	,964
P7	Usluge koje fakultet pruža uvijek su konstantno dobre	3,17	,964
P8	Nastavnici se pridržavaju utvrđenog rasporeda nastave	3,47	,964
P9	Administrativni radnici se pridržavaju radnog vremena službi	3,64	,965
P10	Na fakultetu se vodi evidencija o žalbama studenata	3,07	,964
P11	Problemi studenata se efikasno rješavaju	3,11	,963
P12	Nastavni plan fakulteta je savremen	3,43	,964
P13	Radno vrijeme servisa podrške (studentske službe, biblioteke...) je maksimalno prilagođen studentima	3,26	,965
OD14	Studenti se blagovremeno informišu kada će određena usluga biti realizovana (raspored nastave, ispitni rokovi...)	3,51	,965
OD15	Administrativna usluga na fakultetu je ažurna	3,41	,964
OD16	Zaposleni na fakultetu su uvijek spremni da pruže pomoć studentima	3,65	,964
OD17	Svojim odnosom, zaposleni pobuđuju povjerenje studenata	3,37	,963
OD18	Nastavnici primjenjuju dosljedne kriterijume prilikom ocjenjivanja	3,39	,964
PO19	Studenti osjećaju sigurnost pri uslužnim transakcijama servisa podrške (izdavanje uvjerenja, prijava ispita, korištenje biblioteke...)	3,68	,964
PO20	Studenti osjećaju sigurnost pri uslužnim transakcijama nastavnog osoblja (konsultacije, ispiti...)	3,52	,964
PO21	Zaposleni na fakultetu su uvek ljubazni	3,28	,964
PO22	Zaposleni na fakultetu imaju kompetencije kojima mogu uspješno odgovoriti na sve potrebe studenata	3,45	,964
PO23	U nastavi, profesori povezuju teoriju i praksu	3,35	,964
PO24	Sa nastavnicima je moguća *online* komunikacija	3,59	,965
PO25	Nastavnici se periodično ocjenjuju od strane studenata	3,17	,964
E26	Studentima se pruža individualna pažnja	2,96	,964
E27	Zaposleni na fakultetu se odnose brižno prema studentima	3,22	,963
E28	Zaposleni na fakultetu se iskreno zalažu za ostvarivanje interesa studenata	3,21	,963
E29	Zaposleni na fakulteta imaju puno razumijevanje za specifične/posebne potrebe studenata	3,24	,964
E30	Raspored nastave prilagođen je studentima	3,15	,964
	Kronbahov alfa koeficijent:		,966

Izvor: autori

Dakle, provjera metrijskih svojstava primijenjenog upitnika je pokazala da skala procjene, u cjelini, ima odgovarajuću validnost. Takođe se i u našem istraživanju jasno prikazalo kao svrsishodno jednofaktorsko rješenje skale, te je preporuka iz prethodnog istraživanja (Nešić i sar., 2017) ovom prilikom nedvosmisleno potvrđena i prihvaćena. Na ovaj način se stvara validna osnova za moguća poređenja rezultata istraživanja različitih entitetskih okruženja u budućnosti.

Neophodnost utvrđivanja metrijskih karakteristika instrumenata namijenjenih empirijskim istraživanjima proizilazi iz uobičajenih akademskih determinanti koje definišu da skup unaprijed planiranih istraživačkih indikatora treba prethodno da ispuni jasne metodološke kriterijume: validnost i relijabilnost (Perić, 2013). Zbog toga je u našem istraživanju za utvrđivanje validnosti skale procjene primenjena faktorska analiza, uz uvažavanje vladajućih stavova u naučnoj literaturi o izboru odgovarajućih pristupa/tehnika vezanih za ovu statističku proceduru (Pallant, 2000; Pallant, 2009; De Vaus, 2002; Cooper & Schindler, 2003; Stangor, 2006). Posebno u pogledu izbora načina sprovođenja gdje smo se, u skladu sa tipom empirijskih podataka i karakteristikama istraživačkog prostora (psiho-socijalni), opredijelili za analizu glavnih komponenti (*principal components analysis*). Podrška za ovakvo rješenje utemeljena je na stavu Stivensa (Stevens, 1996) da je PCA postupak daleko prikladniji za psihološka i sociološka istraživanja, s obzirom na to da se njome izbjegavaju neki od potencijalnih problema sa "neodređenošću faktora". Takođe, analiza glavnih komponenti je superiornija procedura za uobičajeno empirijsko sažimanje skupa podataka (Tabacnhnik & Fidell, 2007; Palant, 2009: 182) kakvo je bilo i u našem slučaju.

Pored faktorske analize kao logična statistička procedura za utvrđivanje unutrašnje saglasnosti (relijabilnosti) skale nametnula se identifikacija nivoa Kronbahovog alfa koeficijenta, što je najčešće primjenjivani postupak u istraživanjima sličnog tipa (istraživačke operacionalizacije pomoću ordinalnih skala) (Macuka, 2007; Macuka & Burić, 2013; Nešić, 2016; Nešić, Srdić, & Jezdimirović, 2016; Perić, Nešić, Dačić, Ahmetović, Srdić, & Milosavljević, 2017; Nešić, Ahmetović, Srdić, & Badrić, 2017; Nešić, Romanov, Jezdimirović, Lepeš, & Andrašić, 2018).

ZAKLJUČAK

Prezentovani deo empirijske studije je prikazao konstrukt i provjeru metrijskih karakteristika primijenjene skale procjene, namijenjene utvrđivanju percepcije kvaliteta usluga ustanova visokog obrazovanja od strane studenata u Republici Srpskoj, baziranog na instrumentu HEDUQUAL. Ovaj instrument primijenjen

je u jednom od prethodnih istraživanja na studentskoj populaciji u AP Vojvodini (akademskom prostoru koji u kontekstu paralelnih i posebnih veza Republike Srpske i Republike Srbije ima status kompatibilnog visokoškolskog ambijenta).

Metrika ove multiajstemske skale (sa trideset indikatora kvaliteta) u našem istraživanju je testirana primjenom dva postupka: (1) faktorskom analizom (analiza glavnih komponenti – *Principal Components Analysis*) sa metodom kose rotacije (*Direct Oblimin*) i (2) provjerom unutrašnje saglasnosti (*Scale Reliability Analysis* - zasnovane na Kronbahovom alfa koeficijentu).

U cilju utvrđivanja validnosti ajtem konstrukta skale, primjenom postupka faktorske analize, dobijeni su interpretabilni korektni podaci koji potvrđuju validnost odabranog istraživačkog instrumenta. Visoke vrijednosti Bartletovog testa sferičnosti (*Bartlett's Test of Sphericity* = 14292,613) i Kajzer-Majer-Oklinovog pokazatelja adekvatnosti uzorka (*KMO* = 0,972), kao i nivo statističke značajnosti (*Sig.*=0,000) ukazuju na: (a) opravdanost primjene faktorske analize i (b) visoku validnost skale za procjenu kvaliteta usluga visokoškolske ustanove. Analizom glavnih komponenti postignuta je statistički prihvatljiva parsimonija i potvrđena ranije preporučena jednofaktorska struktura, što upućuje na intencije da je HEDUQUAL upitnik i nadalje preporučljivo koristiti kao multiajtemsku jednofaktorsku skalu koja identifikuje (procenjuje) generalni faktor zadovoljstva studenata kvalitetom usluga visokoškolske institucije.

Takođe su i u kontekstu primene procedure za identifikaciju unutrašnje saglasnosti skale (*Scale Reliability Analysis*) dobijene visoke vrijednosti alfa koeficijenta (*Cronbach's Alpha* = 0,966), što dodatno potvrđuje odgovarajuću pouzdanost ovog instrumenta.

Polazeći od dobrih metrijskih karakteristika dobijenih u ovom dijelu studije (čiji se zadatak odnosio na validaciju instraživačkog upitnika) realno je za očekivati da se, u nastavku analitičkog sagledavanja empirijskih rezultata studije, istraživačka zaključivanja mogu kvalifikovano utemeljiti na tačnim i akademski korektnim statističkim podlogama. Što je preduslov za valjano osperviranje dobijenih informacija i, u skladu sa tim, naučno korektnoj interpretaciji ukupnih rezultata studije.

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METRICAL CHARACTERISTICS OF THE QUESTIONNAIRE APPLIED TO THE QUALITY ASSESSMENT OF THE SERVICES OF HIGHER EDUCATION IN THE REPUBLIC OF SRPSKA

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Abstract: *In order to validate the research instrument used to identify student perceptions of the quality of service provided by higher education institutions in the Republika Srpska- (Pan-European Apeiron University in Banja Luka, University of Banja Luka, University of East Sarajevo, Prijedor College of Medicine and University of Business Studies Banja Luka) (within a broader empirical study), its metric characteristics were determined. In our study, respondents expressed their estimation by choosing one of the positions on a five-point Likert scale. The numerical values of the ordinal scale arranged in this way corresponded to the intensity of the assessment of thirty service indicators, namely: 1 (much less than my*

expectations); 2 (less than my expectations); 3 (according to my expectations); 4 (more than my expectations); 5 (significantly more than my expectations). The value evaluation of the response is interpreted in accordance with the rule: (a) the perception of the quality of service "as expected" (if the scalar average is close to the quantitative value of three), (b) the perception of the quality of the service "below expectations" (when the scalar average is well below quantitative values of three), (c) perception of service quality "above expectations" (if it is a scalar average well above quantitative value of three) (Klarić & Kulišan, 2011). Also, in order to rank the importance of indicators, in manifest space, values of scalar averages (Mean) are used in interpretation (Nešić et al., 2017). The questionnaire, based on the HEDUQUAL scale, was tested using two procedures: (1) factor analysis (Principal Components Analysis, Direct Oblimin) and (2) Scale Reliability Analysis - based on Cronbach's alpha coefficient). The sample of respondents consisted of a population of students attending one of the higher education institutions in the Republika Srpska, a total of 863 students (M = 265; F = 598) with an average age of 21.5 years. The results obtained confirm the good metric of the scale, both in terms of validity (KMO = 0.972; Bartlett's Test of Sphericity = 14292.613; Sig. = 0.000) and in the context of its reliability (Cronbach's Alpha = 0.966). All statistical inferences were conducted at a significance level of 0.05 (Sig. <, 05). The good metric characteristics of the instrument defined the quality basis for further analytical observations of the study results.

Based on good metric characteristics obtained in this part of the study (whose task was to validate the survey questionnaire), it is reasonable to expect that, in continuing the analytical examination of the empirical results of the study, the research conclusions can be reasonably based on accurate and academically correct statistical background. Which is a prerequisite for the correct dissemination of the information obtained and, accordingly, a scientifically correct interpretation of the overall results of the study.

Keywords: *quality of services; rating scale, metric characteristics.*

JEL Classification: *C83, I23*

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str. 277-297

ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

PROCJENA VRIJEDNOSTI PREDUZEĆA KOJA POSLUJU S GUBITKOM

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Sažetak: *Većina literature iz oblasti procjene vrijednosti, polazi od teoretske pretpostavke da preduzeća posluju po principu trajnosti poslovanja i ostvaruju dobitak u dugom roku, s izuzetkom likvidacione metode. Kada su ove pretpostavke ispunjene, nije isuviše teško izvršiti projekcije novčanih tokova i procijeniti vrijednost preduzeća. Međutim, kod preduzeća koja posluju s gubitkom, problemi i nedoumice u procjeni višestruko se usložnjavaju. Cilj istraživanja je ukazati na specifičnosti preduzeća koja posluju s gubicima, kao i moguće načine prevazilaženja prepreka pri procjeni ovakvih preduzeća. Za kvantifikovanje i obradu podatka korištene su metode: korelacione analize, deskriptivne statistike i statističkog zaključivanja. Rezultati pokazuju da se u praksi većinom primjenjuju tri ili četiri metode procjene. Ispitujući uticajne faktore koji utiču na rješavanje operativnih problema, identifikovane su četiri grupe faktora, od kojih su kao najznačajnije ocijenjene priroda neefikasnosti i kvalitet top menadžmenta. U procjenama preduzeća čiji je uzrok gubitaka prezaduženost, a operativno su zdrava, najviše se koristi modifikacija racija duga (76,9%). Procjena preduzeća kod kojih je stečaj gotovo neizbježan vrši se likvidacionom metodom (98.7%). Zaključujemo da je u procjenama vrijednosti preduzeća koja posluju s gubicima od presudne važnosti utvrđivanje uzroka problema i mogućnosti otklanjanja istih, uvažavajući mogućnost da preduzeća nastave poslovanje i uslove na neaktivnom tržištu kapitala u BiH.*

Ključne riječi: *procjena vrijednosti, gubitak, privremeni problemi, dugoročni problemi, likvidaciona vrijednost*

JEL klasifikacija: *G12, G32, G33*

UVOD

Pojedine teorije vrijednosti različito shvataju pojam vrijednosti i u zavisnosti od toga razlikuje se pristup postupku procjene vrijednosti. Ono što je zajedničko svima jeste stav da je visoka vrijednost preduzeća, ne samo pokazatelj uspješnog poslovanja u prethodnom periodu, već i indikator dobrih poslovnih rezultata preduzeća u budućnosti (Eugene F. Brigham i Michael C. Ehrhardt, 2009).

Nadalje, većina literature koja se bavi procjenom vrijednosti, polazi od teoretske pretpostavke da preduzeća posluju po principu trajnosti poslovanja (going-concern) i ostvaruju dobitak u dugom roku, s izuzetkom likvidacione metode. Ovaj problem je naročito izražen kod prinosnih metoda procjene kod kojih se pretpostavlja da preduzeća posluju s dobitkom što je uslov za projekciju stope rasta i budućih novčanih tokova. Kada su pretpostavke o trajnosti poslovanja i ostvarivanju dobitka ispunjene, nije teško izvršiti projekcije novčanih tokova. Međutim, šta se dešava kod preduzeća koja posluju s gubitkom?

U ovakvim slučajevima uvijek treba poći od uzroka problema i razloga zbog kojih je uopšte došlo do gubitaka. Naime, preduzeća koja posluju s gubicima onemogućavaju procjenu vrijednosti prinosnim metodama i korišćenje stope rasta zarada koja bi se primijenila u projektovanju novčanih tokova. Stopa rasta primijenjena na navedena preduzeća gubitke bi učinila još negativnijim. Nadalje, ni projekcije analitičara niti fundamentalna izračunavanja ne dovode do značajnih i upotrebljivih stopa rasta (Aswath Damodaran, 2012). Poteškoće se javljaju i kod obračuna poreskih obaveza, a ozbiljno se dovodi u pitanje pretpostavka o trajnosti poslovanja. Razlozi zbog kojih preduzeća posluju s gubitkom su složeni i višestruki. Kod procjene ovakvih preduzeća razmatraju se alternative u zavisnosti od uzroka gubitaka.

Cilj rada je ukazati na specifičnosti preduzeća koja posluju s gubicima, kao i moguće načine prevazilaženja prepreka pri procjeni ovakvih preduzeća. Rezultati analize ukazuju da veliki procenat preduzeća u privredi Republike Srpske koja posluju s gubicima diktiraju pristupe i metode koje se primjenjuju u praksi procjene vrijednosti preduzeća u Bosni i Hercegovini. U svrhu donošenja zaključaka i dokazivanja tvrdnji, daćemo pregled teorija vrijednosti i kapitala, te se osvrnuti na prethodna istraživanja na datu temu. Zatim ćemo analizirati grupe preduzeća koja posluju s gubitkom i načine njihovog procjenjivanja, u zavisnosti od uzroka problema i mogućnosti rješavanja istih: preduzeća s privremenim problemima, preduzeća s dugoročnim problemima te preduzeća koja ostvaruju gubitke zbog faze životnog ciklusa. U posljednjem dijelu rada prezentovano je empirijsko istraživanje vezano za temu procjene vrijednosti u našoj zemlji i data su zaključna razmatranja.

Svrha istraživanja je naglasiti važnost utvrđivanja uzroka problema u preduzećima s koji posluju s gubitkom, uvažavajući mogućnost da nastave poslovanje po going-concern principu i pretpostavke koje se vežu za neaktivno tržište kapitala u Bosni i Hercegovini, te pružiti konkretne odgovore na pitanja procjene vrijednosti ovakvih preduzeća.

PROCJENA VRIJEDNOSTI PREDUZEĆA S PRIVREMENIM PROBLEMIMA

Za preduzeća s privremenim problemima pretpostavlja se da će u kratkom roku ponovo poslovati s dobitkom, te će umjesto gubitaka (negativnih zarada) ostvarivati stabilizovane zarade. Ako su gubici rezultat specifičnog događaja (recimo, štrajka ili parnice), zarade, novčani tokovi i stopa povrata procjenjuju se prije nastanka istog (Sorin V. Stan, 2014). S druge strane, kada gubitke nije moguće povezati sa specifičnim događajem i trošak događaja nije odvojen od ostalih troškova, vrši se poređenje stavki iz godine u kojoj se izvodi procjena sa stavkama iz prethodnih godina (Damodaran, 2012). Kod neuobičajeno visokih iznosa, treba da se izvrši normalizacija stavki, pri čemu se može koristiti profitna marža iz prethodne godine.

Privremeni problemi mogu da proističu iz privredne grane ili da budu tržišno derivirani. Prihodi cikličnih preduzeća su volatilni i zavisni od stanja privrede. Metode diskontovanja novčanog toka za baznu godinu uzimaju tekuću, međutim, kod cikličnih preduzeća tekuće zarade mogu biti preniske ili previsoke da bi se koristile kao osnova za projekciju. Jedno od rješenja je prilagoditi očekivanu stopu rasta u bliskom periodu tako da reflektuje ciklične promjene, a drugo pretpostavlja procjenu zasnovanu na stabilizovanim, a ne tekućim zaradama.

Prilagođavanje stope rasta

Ciklične firme ostvaruju niske zarade kada je ekonomija u recesiji, i obrnuto. Ako preduzeće ostvaruje gubitke uz stanje recesije u ekonomiji, a očekuje se brz oporavak, može se projektovati stopa rasta u sljedećoj godini (ili dvije) koja bi bila viša od tekuće stope rasta. Obrnuta strategija se primjenjuje ako su dobici naduvani zbog ekonomije u uzletu, te se u narednom periodu očekuje pad aktivnosti. Nedostatak ovog pristupa je u tome što se tačnost procjene vezuje za preciznost makroekonomskih prognoza, ali s druge strane, to je neizbježno kod cikličnih preduzeća (Pablo Fernández, 2011). Mogu se razmotriti ponašanje i iskustva preduzeća u prijašnjim cikusima da bi se izvukli određeni zaključci. Za procjenu dugoročne stope rasta uzima se prosječna stopa rasta iz prethodnih godina.

Primjer 1: Prilagođavanje stope rasta u recesiji kod cikličnih preduzeća (prema: Damodaran, 2002; 2012). Preduzeće „Anna" koja se bavi proizvodnjom celuloznog papira u 2018. godini (bazna godina) ima tekuću zaradu po akciji od $0.63.

Tekuće obezvređenje po akciji iznosi $2,93. Tekuća kapitalna ulaganja po akciji iznose $3.63. Racio duga za finansiranje kapitalnih ulaganja je 45%. Beta preduzeća je 1, bezrizična stopa na državne obveznice 8.5%, a tržišna premija rizika 4%. Pretpostavljena dugoročna stopa rasta je 6%.
Trošak sopstvenog kapitala = 8,5% + 1 × 4% = 12,5%

Ako bi se procjenjivala vrijednost akcija preko tekuće zarade i uz pretpostavljenu dugoročnu stopu rasta od 6%, vrijednost po akciji iznosila bi tek $4.0:
Slobodni novčani tok = $0,63 - (1-0,45) × ($3,63 - $2,93) = $0,245
Vrijednost po akciji = ($0,245 × 1,06) / (0,125 - 0,06) = $4,00

U poređenju s tim, tržišna cijena akcije je $20,00. Pretpostavimo da će se ekonomija naredne godine oporavljati sporije, a potom brže.

Tabela 1: Očekivana stopa rasta zarade po akciji po godinama

Godina	Očekivana stopa rasta po akciji	Vrijednost akcije u $
2019.	5%	0,66
2020.	100%	1,32
2021.	50%	1,98
Poslije 2022.	6%	

Izvor: Prema Damodaran, 2012.

Za kapitalna ulaganja i obezvređenje očekuje se da budu na nivou od 6%. Slobodni novčani tok prema sopstvenom kapitalu (FCFE) iznosi:

Tabela 2: Izračunavanje slobodnog novčanog toka prema sopstvenom kapitalu

	2019.	2020.	2021.	2022.
EPS (zarada po akciji) u $	0,66	1,32	1,98	2,10
Minus (Kapitalni troškovi – obezvređenje) x (1-racio duga) u $	0,41	0,43	0,46	0,49
FCFE u $	0,25	0,89	1,53	1,62

Izvor: Damodaran, 2002.

$$\text{Rezidualna vrijednost (na kraju 2021.)} = \$1{,}62 \,/\, (0{,}125 - 0{,}06) = \$24{,}88$$

$$\text{Sadašnja vrijednost po akciji} = \frac{0{,}25}{1{,}125} + \frac{0{,}89}{1{,}125^2} + \frac{1{,}53 + 24{,}88}{1{,}125^3} = \$19{,}47$$

Dakle, ovako procijenjena vrijednost po akciji je mnogo realnija i približno jednaka tržišnoj cijeni akcije preduzeća.

Stabilizovane zarade

Za ciklična preduzeća najjednostavnije rješenje za problem volatilnosti zarada i negativne zarade u baznom periodu jeste stabilizovanje zarada. Osnovni zadatak je utvrditi približan iznos zarade u stabilizovanoj godini, uz pretpostavku da će se preduzeće ubrzo vratiti na uobičajen nivo poslovanja. Stabilizovanje se može izvesti na jedan od sljedećih načina (Damodaran, 2012):

- uprosječiti zarade (u novčanim jedinicama) preduzeća tokom prethodnih perioda (između 5-10 godina) – pogodno za preduzeća koja nisu mijenjala veličinu i obim poslovanja;
- uprosječiti povrat na investicije ili profitnu maržu tokom prethodnih perioda (uprosječuju se relativne zarade, a ne one u novčanim jedinicama) – pristup reflektuje veličinu firme;
- procjena prosječne ili operativne neto marže u prethodnim periodima (stabilizovanje marže) i primjena na tekuće prihode da bi se dobio stabilizovan poslovni ili neto dobitak. Ova varijanta je manje osjetljiva na računovodstvene manipulacije.

Pri zamjeni tekućih zarada stabilizovanim pretpostavlja se da će se stabilizovanje zarada odmah desiti, što najčešće nije slučaj. Ako se stvarna stabilizacija zarada odigra tokom sljedećih par godina, stabilizovane zarade utvrđene za potrebe procjene biće visoke. Ovaj nedostatak se može popraviti diskontovanjem vrijednosti stabilizovanih zarada za onaj broj perioda unazad koliko je potrebno da se u preduzeću stabilizuju zarade (Fernández, 2011).

Primjer 2: Slučaj iz prakse - tok procjene korišćenjem stabilizovanih marži u kompaniji Volvo (prema: Damodaran, 2002). Treba da se procijeni vrijednost sopstvenog kapitala kompanije Volvo u 1993. godini koja je 1992. godine ostvarila gubitak od 2.249 miliona švedskih kruna (SK) zbog velike recesije koja je pogodila Evropu i SAD. Prosječna operativna marža za prethodne četiri godine prije recesije iznosila je 4,1%, a prihod iz 1992. godine 83.002 miliona SK. Prosječni povrat na kapital u prethodne 4 godine je 12,2%. Očekivana stopa rasta u automobilskoj industriji je procijenjena na 4%, a očekivana poreska stopa na 35%.

Trošak kapitala je 7,36%. Novac i utržive HOV iz bilansa stanja iznose 20.760 miliona SK, a obaveze 42.641 milion SK.

Kao prvo, izračunava se stabilizovani operativni dobitak, kao zbir prihoda iz prethodne godine (prije ostvarivanja gubitka) i stabilizovane marže (prosječna neto marža).

Stabilizovani operativni dobitak = 83.002 mil.SK × 4,1% = 3.403 mil.SK

Stopa reinvestiranja u stabilan rast = g / ROC = 4% / 12,2% = 32,8%

Očekivani slobodni novčani tok
= stabilizovani operativni dobitak x (1 + očekivana stopa rasta) x (1 − očekivana poreska stopa) x (1 − stopa reinvestiranja)
= 3.403 mil.SK x 1,04 x (1 − 0,35) x (1 − 0,328) = 1.546 mil.SK

Vrijednost operativne aktive = očekivani slobodni novčani tok /(trošak kapitala − stopa rasta)
= 1.546 mil.SK /(0,0736 − 0,04) = 45.977 mil.SK

Vrijednost sopstvenog kapitala = vrijednost operativne aktive + novac i utržive HOV − obaveze
= 45.977 mil. SK + 20.760 mil.SK − 42.641mil. SK = 24.096 mil. SK

Međutim, pošto se oporavak neće odmah desiti nego pretpostavljamo da za to treba dvije godine, izvršićemo diskontovanje za te dvije godine:

Vrijednost operativne aktive ako za oporavak treba 2 godine = 45.977 / $1{,}0736^2$	= 39.889
+ novac i utržive HOV	+ 20.760
- preostale obaveze	- 42.641
= vrijednost sopstvenog kapitala	= 18.008

Procijenjena vrijednost sopstvenog kapitala kompanije Volvo u 1993. iznosi 18.008 mil. SK.

Preduzeća s cikličnom djelatnošću mogu da inkorporiraju efekte kretanja budućih recesija i uspona u novčane tokove, ali ovo treba uzeti s rezervom, jer su greške mogu da budu veoma velike. Takođe, komplikovano je za uočiti koliko ukupna vrijednost preduzeća (potcijenjenost/precijenjenost) proističe iz pogrešne procjene, a koliko iz pesimizma/optimizma procjenjivača. Procjenjivači mogu da kod cikličnih preduzeća u diskontnu stopu inkorporiraju varijabilnost zarada (ciklična preduzeća imaju više diskontne stope, kao i više neponderisane bete) (Fernández, 2011).

Kod preduzeća koje se bave poljoprivrednom proizvodnjom i proizvodnjom prirodnih resursa aktivnost varira ne samo po proizvodnim ciklusima, već i po periodima godine (sezonski). Dugi su periodi kako visokih, tako i niskih cijena proizvoda, zbog čega mnoga od poljoprivrednih preduzeća koriste opcije u cilju

zaštite od rasta/pada cijena. Mogući načini procjene ovih preduzeća uključuju (Damodaran, 2002):

- predviđanje budućih cijena i ugradnja istih u očekivane buduće prihode;
- korišćenje stabilizovanih cijena, procjenom prosječne cijene tokom ciklusa;
- procjena preduzeća preko tekuće proizvodnje i tekuće cijene plus uvećanje za vrijednost opcija preduzeća (što znači više proizvodnje ako cijene rastu i obrnuto).

Razvojne faza preduzeća takođe utiče na visinu zarada, npr. preduzeća iz infrastrukturne djelatnosti u početnim fazama životnog ciklusa imaju visoke gubitke i visok leveridž zbog velikih investicija (Pratt, 2008). Međutim, te investicije će u narednim godinama odbacivati dobit, tako da se u godinama projekcije koristi stopa rasta u skladu s fazama životnog ciklusa. Stope rasta su fazi osnivanja preduzeća niske, zatim u fazi rasta visoke, da bi s dostizanjem zrelosti opale na nivo stope stabilnog rasta.

Ako se za procjenu koristi tržišni pristup, prilagođavanja takođe treba načiniti (čak i kada se ne vrše prilagođavanja, pretpostavlja se stabilizacija novčanih tokova). Kod poređenja racija stabilizacija je potrebna jer su pokazatelji zasnovani na stabilizovanim iznosima pouzdanija mjera vrijednosti.

PROCJENA VRIJEDNOSTI PREDUZEĆA S DUGOROČNIM PROBLEMIMA

Kod nekih preduzeća gubici su manifestacija većih i ozbiljnijih problema u preduzeću te treba da se procijeni da li će problemi biti prevaziđeni, i ako je tako, kada će se to desiti. Uzroci dugoročnih problema u preduzeću, su loše strateške odluke, poslovna neefikasnosti i prezaduženost (Ruben Enikolopov, Maria Petrova i Sergey Stepanov, 2014).

Strateški problemi. Mogu se javiti kod proizvodnog miksa, marketinških strategija i greške kod izbora ciljnih tržišta. To dovodi do znatnih troškova izraženih preko gubitaka i nižih zarada, te mogućeg trajnog gubitka tržišnog udjela. Kod strateških problema utvrđuje se da li je problem trajan: ako jeste, preduzeće se procjenjuje po likvidacionoj vrijednosti; ako nije, pretpostavlja se da će preduzeće u doglednom roku stabilizovati zarade (Pratt, 2008).

Operativni problemi - operativna neefikasnost (npr. manja efikasnost u dostavi dobara zbog zastarjelosti tehnologije). Operativna efikasnost najbolje se mjeri

preko operativne marže - kod preduzeća s operativnim problemima ove marže su znatno niže nego kod konkurencije. Efekti operativnih proboljšanja mogu da se ugrađuju tokom vremena kroz povećanje marže u odnosu na prosjek privredne grane. Na brzinu prilagođavanja marže utiču (Damodaran, 2012):

- Veličina preduzeća – što je veće, više vremena treba da se otklone neefikasnosti;
- Priroda neefikasnosti – zamjena zastarjele opreme biće brža nego obuka radne snage;
- Eksterna ograničenja – ugovorne obaveze i socijalni pritisak;
- Kvalitet menadžementa – zamjena top menadžera u cilju rješenja operativnih problema.

Ovdje se pretpostavlja da će prihodi rasti po istoj stopi kao i visina kapitalnih ulaganja i obrtnih sredstava. Na osnovu stopa rasta, projektuju se prihodi, poslovni dobitak i novčani tokovi u narednim godinama.

Prezaduženost ili finansijski leveridž. Jedan od uzroka problema i gubitaka u preduzećima je preveliko zaduživanje. Zarada po akciji u ovom slučaju će biti negativna, uz istovremeno ostvarivanje poslovnog dobitka. Postupak zavisi od dubine krize (Enikolopov, Petrova & Stepanov, 2014).

1) *Ako zaduženje nije toliko da preduzeću prijeti stečaj*. Kada postoji vrijedna poslovna aktiva i značajni operativni novčani tokovi preduzeće se može zadužiti više od optimuma. Troškovi duga su preveliko izlaganje riziku, a viša beta i trošak duga povećavaju trošak kapitala i smanjuju vrijednost preduzeća. Stoga je najbolje smanjiti racio dug/sopstveni kapital u razumnom vremenskom periodu. Kod procjene postoje dva pristupa:

(a) Ako je preduzeće operativno zdravo i uporedivo s konkurentnim preduzećima po poslovnom dobitku, vrši se modifikacija racija duga tokom godina projekcije. U projekciji svake godine sve više reinvestiranja treba da bude finansirano iz akcijskog kapitala. Potom se izračunavaju troškovi kapitala koji se mijenjaju s promjenom racija duga. S druge strane, ako je ugrožen poslovni dobitak, treba prilagoditi poslovni dobitak tokom vremena prema prosjeku industrije (Damodaran, 2002; 2012).

(b) Može se koristiti APV[1] pristup i procijeniti preduzeće kao da nema leveridža te od ove vrijednosti oduzeti troškove (stečaja) i dodati poreske pred-

[1] APV (Adjusted Present Value) – prilagođena neto sadašnja vrijednost

nosti duga. Vrijednost akcije ne može biti negativna, ako se koriste tržišne vrijednosti za sopstveni kapital i dug. Ako je procijenjena vrijednost duga u DCF metodi manja od njegove tržišne vrijednosti, razlozi mogu biti: potcijenjena vrijednost preduzeća u procjeni ili precijenjena tržišna vrijednost duga (Damodaran, 2012). S druge strane, ako je procjena vrijednosti preduzeća (i duga) tačna i imajući u vidu da tržišna vrijednost sopstvenog kapitala ne može biti manja od nule, akcije ne vrijede ništa (mogu da sadrži vrijednost ako se ako se koristi model call opcija) (Fernández, 2002).

2) *Ako su finansijski problemi zaista ozbiljni i preduzeću prijeti stečaj*, koristi se:

(a) likvidaciona vrijednost za procjenu vrijednost preduzeća ili

(b) aktiva se tretira kao opcija pod going-concern pretpostavkom. Akcije u prezaduženim preduzećima gdje je dug prevazišao i likvidacionu vrijednost aktive tretiraju se kao call opcije (out-of-the-money) i tako se i procjenjuju (Fernández, 2002).

Klasifikacija preduzeća u pojedine kategorije nije jednostavna i zahtijeva veliku umješnost i stručnost procjenjivača, jer od toga zavisi način na koji će se pristupiti procjeni. Potrebno je poznavati stanje u preduzeću, privrednoj grani i na tržištu da bi se procijenilo da li se radi o preduzećima s privremenim ili dugoročnoim problemima, pri čemu su procjenjivaču od naročite koristi sljedeće informacije: kredibilitet menadžmenta, raspoloživost podataka o preduzeću i njegovim aktivnostima, stanje u privrednoj grani, te konzistentnost datog problema u preduzeću.

PREDUZEĆA KOJA POSLUJU S GUBITKOM ZBOG FAZE ŽIVOTNOG CIKLUSA

Pored preduzeća koja imaju privremene i dugoročne probleme, postoje i preduzeća kod kojih gubici nisu prouzrokovani problemima, nego fazom životnog ciklusa u kojoj se trenutno nalaze. Tu ubrajamo (Damodaran, 2012):

- Preduzeća iz industrijskih grana koje zahtijevaju velika infrastrukturna ulaganja obično ostvaruju gubitke dok se ne završi implementacija ovakvih projekata;
- Farmaceutske kompanije i mala biotehnološka preduzeća ulažu mnogo novca u istraživanja i patente, ali često moraju da prođu godine dok investicije ne počnu da donose prinos;

- Mlada i nova preduzeća ostvaruju gubitke dok njihov posao ne zaživi, a ideje ne počnu da donose profit. Procjena ovakvih preduzeća predstavlja veliki izazov zbog nedostatka podataka i kratke istorije preduzeća.

Za procjenu ovakvih preduzeća i donošenje zaključaka procjenjivači koriste sve dostupne informacije o preduzeću, upravi, konkurenciji, okruženju, tržištu, podatke iz finansijskih i drugih izvještaja, te svoj profesionalni sud. U većini slučajeva, metode diskontovanja novčanih tokova smatraju se dovoljno fleksibilnim za procjenu vrijednosti preduzeća koja ostvaruju gubitke zbog faze životnog ciklusa.

METODOLOŠKI OKVIR ISTRAŽIVANJA

Procjena vrijednosti kapitala i preduzeća je u žiži interesovanja nauke i prakse već veoma dugo, međutim, kada se radi o preduzećima koje posluju s gubitkom, multiplikuju se nedoumice, pitanja i komplikuje sam proces procjene. Jedno od najopširnijih istraživanja vrijednosti i procjene iste kod preduzeća koja posluju s gubicima dao je Damodaran (2002; 2009; 2012). Dalje analize i ispitivanja procjene vrijednosti prezentovane u radovima značajnih savremenih autora iz oblasti finansija: Edward I. Altman i Edith Hotchkiss (1993), Fernández, 2011, Raymond M. Brooks, 2010, Damodaran, 2012, Robert C. Higgins, 2009, Pratt, 2008.

Pored toga interesantno je istraživanje Yenpao Chen, Chien-Hsun Chen i Shiau-Lan Huang (2010) koji su analizirali veliku grupu kompanija u teškoćama, listiranih na kineskom finansijskom tržištu u periodu od 4 godine, s posebnim fokusom na način na koji su one upravljale svojim zaradama. Michael Crystal i Riz Mokal (2006) bavili su se procjenom preduzeća u poteškoćama na tržištu Velike Britanije, ali sa njihovo posmatranje je sa pretežno pravnog aspekta. Od novijih istraživanja, Fabio Buttignon (2015) je proučavao procjenu vrijednosti preduzeća u poteškoćama prinosnim odnosno DFC metodama i modelima vrednovanja opcija. Matteo Pozzoli i Francesco Paolone (2017) analizirali su kompanije u finansijskim teškoćama i mogućnost predviđanja njihovog oporavka na bazi studije sprovedene u italijanskoj proizvođačkoj industriji.

Radovi novijeg datuma daju određene prijedloge i rješenja vezano za procjenu vrijednosti preduzeća koja posluju s gubitkom, međutim još uvijek postoje mnogobrojne nedoumice u pogledu procesa procjene, izbora metoda i relevantnosti procijenjene vrijednosti. Suprotstavljeni stavovi teoretičara su naročito izraženi kad je u pitanju uspješnost pojedinih modela da na adekvatan način izraze vri-

jednost preduzeća koja posluju s gubitkom. Uočava se da, iako se radi o veoma komplikovanom i interesantnom pitanju koje traži odgovore, malo je radova na ovu temu, pogotovo onih koji se bave konkretnom analizom, te svaka dodatno istraživanje predstavlja važan korak u razumijevanju problematike procjene.

Prvi dio istraživanja odnosi se na komparativnu analizu procjena vrijednosti 20 preduzeća iz Republike Srpske. U uzorku procjene je 10 malih, 6 srednjih i 4 velika preduzeća, kategorisana prema Zakonu o računovodstvu i reviziji Republike Srpske („Sl. glasnik RS", br. 94/15, čl. 5). Strukturu procjenjivanih preduzeća prema pravnoj formi čini 19 akcionarskih društava koja su u trenutku procjene kotirala na Banjalučkoj berzi, te jedno društvo s ograničenom odgovornošću. Djelatnosti preduzeća pripadaju različitim granama. Samo jedno preduzeće iz uzorka je završilo stečajem, dok sva ostala i dalje posluju. U izradi procjena vrijednosti kumulativno je učestvovalo 7 preduzeća za reviziju, procjenu, računovodstveni i finansijski konsalting, te više od 20 ovlašćenih procjenjivača i vještaka ekonomske, finansijske i građevinske struke. Cilj analize jeste analizirati i uporediti procijenjene vrijednosti i pojedine korišćene metode, i utvrditi da li postoji razlika u učestalosti korišćenja istih.

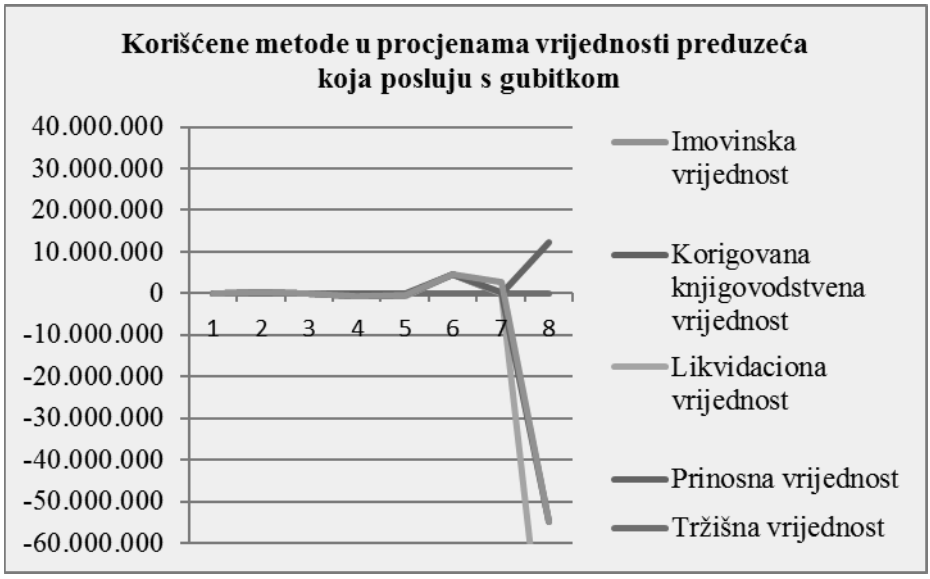
Drugi dio istraživanja podaci su prikupljani na osnovu slučajnog uzorka, metodom anketnog upitnika s karakteristikama kvantitativnog i kvalitatitivnog istraživanja. Bazu za istraživanje i izvođenje zaključaka čini uzorak od 78 procjenjivača koji posjeduju sertifikat i licencu ovlašćenog procjenjivača. Prvo slično anketiranje rađeno je krajem 2014. godine, a zatim je osvježeno novim podacima i pitanjima 2018. godine. Odziv ispitanika je dobar , odnosno iznosio je bio 78%. Stavovi iz velikog broja pitanja analiziraju se korišćenjem instrumenta skala: Likertove skale, grafičkih, numeričkih i deskriptivnih skala.

Za kvantifikovanje i obradu podatka te izračunavanje kvalitativnih pokazatelja koristile su se metode iz domena: korelacione analize, deskriptivne statistike (proporcije i grafičko prikazivanje podataka) i statističkog zaključivanja (hi-kvadrat test). Takođe, u obzir su uzete karakteristike finansijskog tržišta u BiH koje je nerazvijeno i bankocentrično (Ismet Kumalić, 2013) i čiji aspekti neaktivnosti veoma bitno određuju proces procjene vrijednosti. U toku istraživanja korišćeni su podaci sa Banjalučke berze, Sarajevske berze, Agencije za statistiku BiH, kao i iz studija Svjetske banke, MMF-a, i Savjeta za Međunarodne standarde vrednovanja (IVSC).

REZULTATI ISTRAŽIVANJA

U analizi uporednih procijenjenih vrijednosti preduzeća razmatrane su: knjigovodstvena, korigovana knjigovodstvena, prinosna (vrijednost utvrđena DCF metodom), tržišna, imovinska i likvidaciona vrijednost. U najvećem broju slučajeva, u procjenama su korišćene tri ili četiri metode procjene. Radi relevantnosti poređenja, svrhe procjene preduzeća iz uzorka odnose se na utvrđivanje objektivne vrijednosti kapitala za potrebe akcionara ili zbog pravnih razloga.

Grafikon 1: Primjena metoda u procjenama vrijednosti preduzeća koja posluju s gubitkom u BiH



Izvor: Istraživanje autora

Rezultati pokazuju da je kod preduzeća koja posluju s gubitkom, korigovana knjigovodstvena vrijednost utvrđivana u 100% slučajeva (kao i knjigovodstvena vrijednost koja je već dostupna u finansijskim izvještajima preduzeća). Likvidaciona vrijednost se utvrđivala u 87,5% procjena preduzeća koja posluju s gubitkom, što je i logično. Jedno preduzeće iz uzorka je procjenjivano za potrebe stečaja, međutim, druga su usprkos gubicima, nastavila da posluju, što znači da problemi ovih preduzeća nisu bili strateški odnosno trajnog karaktera. Likvidaciona vrijednost se koristila za preduzeća u smislu određivanje donje granice vrijednosti preduzeća.

Imovinska vrijednost (odnosno vrijednosti utvrđena troškovnim ili imovinskim metodama) utvrđena je u 25% slučajeva. Imovinska vrijednost, iako je finansijsko tržište u BiH neaktivno, u uzorku nije primjenjivana u većem procentu iz dva razloga. Kao prvo, imovinske ili troškovne metode spadaju u najkomplikovanije i najteže metode za primjenu koje zahtijevaju dugotrajan rad i stručna znanja vještaka više struka. Drugo, većina procjenjivača se u okviru imovinskog pristupa, između imovinske vrijednosti i korigovane knjigovodstvene vrijednosti odlučila za posljednju te nije smatrala da je neophodno utvrđivati obe vrijednosti.

Vrijednost utvrđenu metodom diskontovanja novčanih tokova odnosno prinosnu vrijednost utvrđivalo je tek 25% procjenjivača. Ovaj podatak je bitan jer se upravo zbog problema koji se javljaju kod procjene preduzeća s gubitkom, prinosne metode ne koriste u većem procentu. Ovdje se uočava značaj jasne prethodne analize i razgraničenja uzroka problema u preduzećima koja posluju s gubitkom, kako bi se došlo do što objektivnije vrijednosti istih.

Naposljetku, tržišna vrijednost se kod preduzeća koja posluju s gubitkom uopšte nije utvrđivala. Razlog za ovakav rezultat jeste u nemogućnosti utvrđivanja tržišne cijene kapitala zbog neaktivnog i nelikvidnog tržišta kapitala i neredovnosti transakcija.

Kada je u pitanju trend kretanja korišćenih metoda u odnosu na visinu procijenjene vrijednosti, sa rastom visine procijenjene vrijednosti, sve više se koristi prinosna vrijednost, svakako znajući da je prinosna vrijednost najadekvatnija za preduzeća koja pozitivno posluju. Sličan trend pokazuje i korigovana knjigovodstvena vrijednost, koja je date svrhe kod procjenjivača izjednačena s fer vrijednošću. Tržišna vrijednost takođe se koristi kod preduzeća čija je procijenjena vrijednost veća od nule. S opadanjem procijenjene vrijednosti, tj. sve lošijom situacijom u preduzeću, sve više se koristi likvidaciona vrijednost i imovinska vrijednost. Imovinska vrijednost pretpostavlja da troškovi zamjene ili reprodukcije određene imovine umanjeni za amortizaciju izražavaju vrijednost te imovine, a kod presuzeća koja su u krizi vrijednost se često svodi upravo na vrijednost materijalne imovine. Likvidaciona vrijednost je logičan izbor kod preduzeća koja posluju s velikim gubicima. Iako likvidaciona vrijednost kapitala u konačnici može da bude samo nula jer akcionari odgovaraju za imovinu društva do visine svog uloga, radi reprezentativnosti uzorka u analizi smo naveli i negativne vrijednosti.

Kada se radi o procijenjenoj vrijednosti koju su procjenjivači naveli kao objektivnu vrijednost preduzeća, između svih utvrđenih, najviše ih se odlučivalo za korigovanu knjigovodstvenu (62,5%), a potom prinosnu vrijednost (25%).

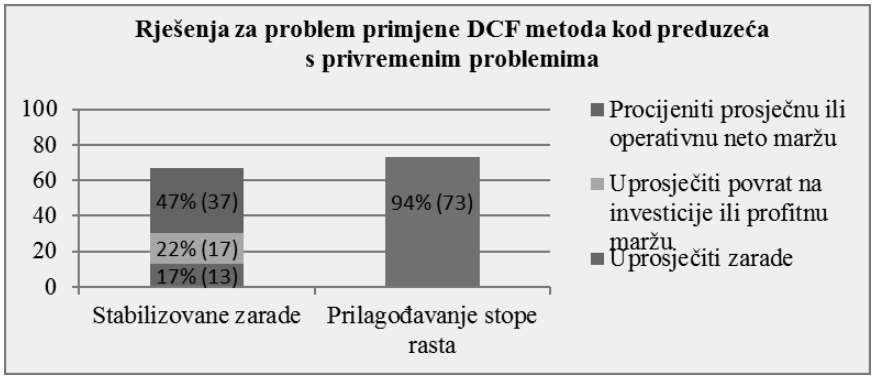
Likvidaciona vrijednost kao relevantna vrijednost kapitala preduzeća navodi u 12,5% slučajeva. Imovinska vrijednost nije se navela kao objektivna niti u jednom slučaju, a tržišna se nije ni procjenjivala.

U drugom dijelu istraživanja, kod procjena preduzeća s privremenim problemima, razmatrano je kojim se metodama procjenjivači najviše služe. Utvrđeno je da 94% (73) preferiraju prilagođavanje stope rasta kod u primjeni prinosnih metoda kod preduzeća koja posluju s gubitkom. Stabilizovanje ili normalizovanje zarada preferira 86% (67) procjenjivača. Očigledno je da postoji razumijevanje da je problem procjene preduzeća s gubicima komplikovan posao.

U okviru grupe procjenjivača koji su koristili stabilizovanje zarada, izbor određenih načina za stabilizovanje bio je sljedeći:
- uprosječiti zarade preduzeća tokom prethodnih perioda – 17%,
- uprosječiti povrat na investicije ili profitnu maržu tokom prethodnih perioda – 22%
- procijeniti prosječnu ili operativnu neto marže u prethodnim periodima i primijeniti istu na tekuće prihode da bi se dobio stabilizovan poslovni ili neto dobitak – 47%.

Najviše procjenjivača preferira posljednju metodu, jer je najpraktičnije izračunati jednu prosječnu maržu koja će se poslije primjenjivati na prihode. Hi-kvadrat test viši je od granične vrijednosti uz p = ,01: $\chi 2 = 14{,}8 > \chi 2\ (2;\ ,01) = 9{,}2$, odnosno postoji statistički značajna razlika između učestalosti korišćenja pojedinih metoda za stabilizovanje zarada.

Grafikon 2: Izbor rješenja za probleme u primjeni metoda DNT kod preduzeća s privremenim problemima

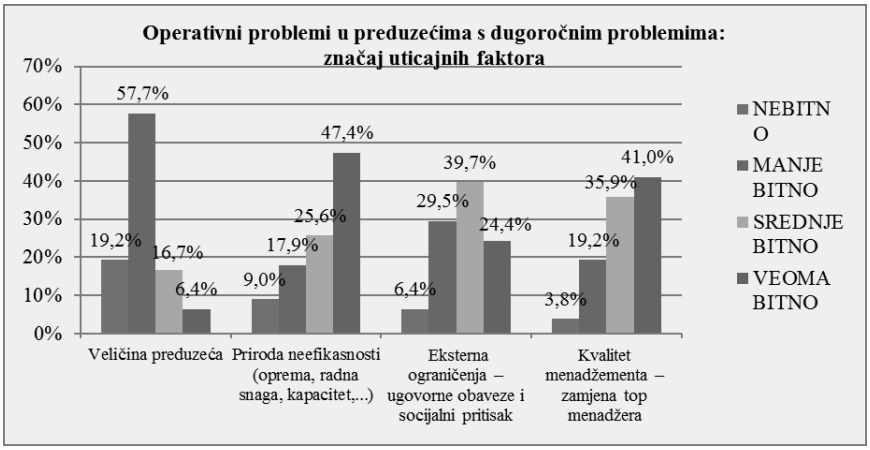


Izvor: istraživanje autora

Kod procjene preduzeća sa strateškim problemima procjenjivači su se mahom opredjeljivali za likvidacionu vrijednost, odnosno njih 96,2% je navelo da bi kao objektivnu vrijednost kod ove grupe preduzeća uzeli likvidacionu vrijednost.

Naredni grafikon pokazuje uticajne faktore koji mogu da utiču na rješavanje operativnih neefikasnosti u preduzećima s dugoročnim problemima.

Grafikon 3: Operativni problemi i uticajni faktori u preduzećima s dugoročnim problemima



Izvor: Istraživanje autora

$\chi^2 = 71{,}883, \quad df = 9, \quad \chi^2/df = 7{,}99, \quad p(\chi^2 > 71{,}883) = {,}0000$

Ispitujući uticajne faktore koji mogu da utiču na rješavanje operativnih problema i brzinu prilagođavanja marže, identifikovane su četiri grupe faktora. Procjenjivači su ocijenili svaku grupu faktora na skali od 1 do 4, gdje je 1 nebitno, a 4 veoma bitno. Najviše ispitanika je veličinu preduzeća smatralo manje bitnim faktorom za brzinu rješavanja problema (57,7%), dok je otprilike podjednak procenat ovom faktoru dodijelilo oznaku nebitno i srednje bitno. Za prirodu neefikasnosti većina ispitanika je smatrala da je ovo veoma bitan uticajni faktor na rješavanje operativnih problema sa 47,4%. Takođe, kvalitet top menadžmenta i mogućnost smjene je 41% ispitanih smatralo za veoma bitan faktor. Sljedeća najbrojnija grupa odgovora odnosi se na kvalitet menadžmenta kao na srednje bitan faktor (35,9%). Eksterna ograničenja kao što su ugovorne obaveze i socijalni pritisak posmatrane su kao srednje bitan faktor sa najvećom frekvencijom odgovora (39,7%). Manje bitnim eksterna ograničenja smatra 29,55 ispitanih, a srednje bitnim 24,4%. Naredna tabela pokazuje aritmetičke sredine odgovora

ispitanika (1 - 4) po pojedinim kategorijama uticaja, gdje osim veličine preduzeća, ostali faktori gravitiraju ka maksimumu skale vrijednosti. χ^2 test pokazuje da postoji veoma značajna statistička razlika između pojedinih uticajnih faktora.

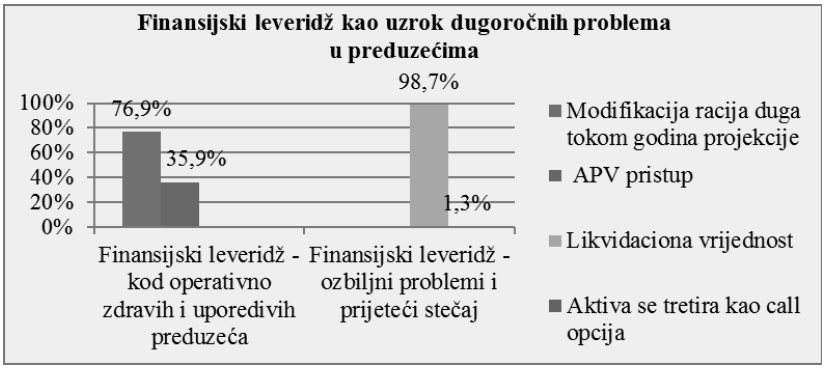
Tabela 3: Operativni problemi: aritmetička sredina izabranih odgovora

Operativni problemi i uticajni faktori	Arit. sredina
Veličina preduzeća	2,1
Priroda neefikasnosti	3,1
Eksterna ograničenja – ugovorne obaveze i socijalni pritisak	2,8
Kvalitet menadžementa – zamjena top menadžera	3,1

Izvor: Istraživanje autora

Kod preduzeća kod kojih je uzrok problema u prevelikom zaduživanju, odnosno finansijskom leveridžu, podjela se može izvršit, (1) na preduzeća koja su operativno zdrava i uporediva s konkurencijom i (2) na ona koja se nalaze u ozbiljnim problemima i pred prijetećim stečajem. Procjena obe grupe preduzeća u gubitku može da se vrši na više načina, a procjenjivači su se o korišćenju istih izjasnili na sljedeći način (grafikon 4).

Grafikon 4: Način procjene preduzeća kod kojih je finansijski leveridž uzrok dugoročnih problema



Izvor: Istraživanje autora

$\chi^2 = 26{,}742, \quad df = 1, \quad \chi^2/df = 26{,}74, \quad p(\chi^2 > 26{,}742) = {,}0000$

Kod operativno zdravih preduzeća, najviše se koristi modifikacija racija duga tokom perioda projekcije, u 76,9% procjena preduzeća. APV metode se nešto

manje koristi, u 35,9% slučajeva. APV ovdje podrazumijeva procjenu preduzeća kao da nema duga, te se od ove procijenjene vrijednosti oduzmu troškovi (mogućeg stečaja) i dodaju poreske olakšice koja potiču od duga.

Kod preduzeća koja su ozbiljno ugrožena i kod kojih je stečaj gotovo izvjesan opcija, procjena se može vršiti likvidacionom metodom kao je slučaj kod nas, u čak 98,7% procjena. Druga opcija je tretiranje akcijskog kapitala kao call opcije, što se rijetko primjenjuje, kako pokazuju rezultati istraživanja. Razlog ovome je u činjenici da navedena metoda zahtijeva i druge uslove, koji nisu karakteristični za neaktivno tržište kapitala u BiH, a čega su i procjenjivači svjesni. Kod obe grupe preduzeća kod kojih je razmatran finansijski leveridž kao uzrok problema, postoji statistički značajna razlika između korišćenih metoda i načina za procjenu vrijednosti.

Naposljetku, dajemo pregled osnovnih metoda procjene sa značajem njihove upotrebe u procjenama u Bosni i Hercegovini, prema izjašnjavanju ispitanih procjenjivača. Navedene se odnose na sve procjene, a ne samo na preduzeća koja posluju s gubicima. Skala značaj pojedinih metoda je označena od 1 do 5, gdje je 1- ne koristimo, a 5 – veoma bitno.

Tabela 4: Primjenjivane metode procjene u Bosni i Hercegovini

	Primjenjivane metode procjene	**Arit. sredina**
Prinosne metode	Metoda kapitalizacije stabilizovanog dobitka	2,7
	Metoda kapitalizacije neto novčanog toka	4,1
	Metoda diskontovanja očekivanog dobitka	3,9
	Metoda diskontovanja neto novčanog toka	4,8
Tržišne metode	Metoda multiplikatora vrijednosti - na osnovu uporedivih preduzeća	3,6
	Metoda multiplikatora vrijednosti – uporedive kupoprodajne transakcije	4,0
Imovinske (troškovne) metode	Metoda vrijednost neto imovine	4,6
	Metoda kapitalizovanja viška dobiti	2,9
	Likvidaciona vrijednost	4,2

Izvor: Istraživanje autora

Zanimljiva je činjenica da se usprkos problemima koji mogu da se jave kod prinosnih metoda sa projekcijom novčanih tokova i diskontne stope, zbog neaktivnog tržišta kapitala, prinosne metode ipak najviše koriste, naročito metoda diskontovanja novčanog toka (4,8). Pored metode diskontovanja novčanih tokova kao najznačajnije od svih metoda, ističe se metoda vrijednosti neto imovine

(4,6), kojoj se poklanja mnogo povjerenja u praksi. Potom, veoma je značajna likvidaciona metoda (4,2). Interesantno je da je jedna od veoma korišćenih i tržišna metoda, metoda multiplikatora vrijednosti na osnovu uporedivih kupoprodajnih transakcija (4,0), koja dijeli približan značaj sa metodom kapitalizacije neto novčanog toka (4,1) i metodom diskontovanja očekivanog dobitka (3,9). Može se izvući zaključak da se sve osnovne metode procjene koriste u praksi u da im procjenjivači pridaju mnogo pažnje u svojim studijama, uzevši u obzir aritmetičku sredinu dodijeljenog značaja pojedinim metodama.

ZAKLJUČAK

Sa razvojem nauke, uočava se pojava određenih teorija, prijedloga i rješenja u oblasti procjene preduzeća koja posluju s gubitkom, međutim, još uvijek postoje mnogobrojne nedoumice u pogledu procesa procjene i relevantnosti procijenjene vrijednosti. Problemi se posebno uočavaju kod prinosnih metoda kod kojih se pretpostavlja da preduzeća posluju s dobitkom, što je uslov za projekciju stope rasta i novčanih tokova. U slučajevima preduzeća koja posluju s gubitkom, uvijek treba poći od uzroka problema i razloga zbog kojih je uopšte došlo do gubitaka. U skladu s tim, preduzeća možemo da podijelimo na preduzeća sa privremenim, ona sa dugoročnim problemima i preduzeća koja ostvaruju gubitke zbog faze životnog ciklusa u kojoj se nalaze.

Za *preduzeća s privremenim problemima* pretpostavlja se da će u kratkom roku ponovo poslovati s dobitkom, te se umjesto gubitaka, ostvarivati stabilizovane zarade. Jedno od mogućih rješenja je prilagođavanje očekivane stopu rasta u budućem periodu, a drugo pretpostavlja procjenu zasnovanu na stabilizovanim, a ne tekućim zaradama.

Uzroci *dugoročnih problema* u preduzeću mogu da budu loše strateške odluke, operativna neefikasnost i prezaduženost. U preduzećima sa strateškim problemima ispituje se da li je problem trajan: ako jeste, preduzeće se procjenjuje po likvidacionoj vrijednosti, a ukoliko nije, pretpostavlja se da će preduzeće u doglednom roku stabilizovati zarade. Kod preduzeća s operativnim problemima utvrđuje se operativna efikasnost, te se analiziraju faktori koji utiču na brzinu rasta operativne marže. Naposljetku, ukoliko je uzrok dugoročnih problema i gubitaka prezaduženost, postupak procjene zavisi od dubine krize: kod operativno zdravih preduzeća procjena se vrši modifikacijom racija duga ili APV pristupom, a kod onih koje su u ozbiljnim problemima likvidacionom metodom ili tretiranjem likvidacione vrijednosti aktive kao opcije.

Kod preduzeća koja ostvaruju gubitke zbog faze životnog ciklusa, metode diskontovanja novčanih tokova obično smatraju se dovoljno fleksibilnim za procjenu njihove vrijednosti.

Rezultati empirijskog istraživanja pokazuju da se u praksi u procjenama u BiH, u najvećem broju slučajeva, primjenjuju su tri ili četiri metode procjene. Kod preduzeća koja posluju s gubitkom, korigovana knjigovodstvena vrijednost utvrđivana u 100%, a likvidaciona vrijednost u 87,5% procjena, što je logično rješenje. S opadanjem procijenjene vrijednosti, tj. sve lošijom situacijom u preduzeću, sve više se koristi likvidaciona vrijednost i imovinska vrijednost. Utvrđeno je da 94% procjenjivača preferiraju prilagođavanje stope rasta, a 86% stabilizovanje zarada u primjeni prinosnih metoda kod preduzeća s privremenim problemima.

Ispitujući faktore od uticaja za rješavanje operativnih problema i brzinu prilagođavanja marže kod preduzeća s dugoročnim problemima, identifikovane su četiri grupe faktora: veličina preduzeća, priroda neefikasnosti, eksterna ograničenja i kvalitet menadžmenta. Najbitni faktor po ocijenjenoj važnosti je priroda neefikasanosti (47,4%), a potom slijedi kvalitet menadžmenta i mogućnost smjene istog u cilju rješavanja problema (41%).

Kod preduzeća čiji je uzrok gubitaka prezaduženost, a operativno su zdrava, najviše se koristi modifikacija racija duga tokom perioda projekcije, sa 76,9%. Procjena preduzeća koja su ozbiljno ugrožena i kod kojih je stečaj gotovo izvjesna opcija, vrši se likvidacionom metodom u čak 98,7% procjena. Druga opcija je tretiranje akcijskog kapitala kao call opcije, što se rijetko primjenjuje. Zaključujemo da je u procesu procjene preduzeća koja posluju s gubicima od presudne važnosti utvrđivanje uzroka problema i mogućnosti otklanjanja istih, uvažavajući mogućnost da preduzeća nastave poslovanje i uslove na neaktivnom tržištu kapitala u BiH.

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THE APPRAISAL OF THE COMPANIES WITH NEGATIVE EARNINGS

Tajana Serdar Raković

Abstract: *A large body of valuation literature comes from the theoretical assumption that businesses operate on a going-concern principle and earn profit in the long-term, except for the liquidation method. When assumptions about going-concern principle and profit-earning are met, it is not too difficult to make cash flow projections and determine the entity's*

estimated value. However, for businesses with negative earnings, the problems and concerns of valuation are multiplied. The research aims to point out the specificities of companies with negative earnings and possible ways of overcoming the barriers in valuing such businesses. For companies with temporary problems, it is assumed they will earn profits again in the short term, and instead of losses, stabilized earnings will be generated. One possible solution is in adjusting the expected growth rate in the future period and the other assumes the estimation based on stabilized earnings. In the other group of companies, losses are a manifestation of larger and more serious problems, and it is necessary to estimate whether the problems will be overcome and, if so, when that will occur. Poor strategic decisions, business inefficiencies and over-indebtedness can be the causes of long-term problems in companies. According to the depth of crisis: the liquidation method should be applied if the problems are permanent and serious, and other valuation methods in opposite cases. The first part of the empirical research relates to the comparative analysis of 20 companies' valuations in Republic of Srpska, and the second part to the analysis of the data collected by the questionnaire method, on a sample of 78 appraisers who hold the license of the certified appraiser. Methods from the domains of correlation analysis, descriptive statistics and statistical inference are used to quantify and process the data and to calculate the qualitative indicators. The results show that in practice, in most cases, three or four valuation methods are applied. For companies with negative earnings, the adjusted book value was determined in 100% and the liquidation value in 87.5% of appraisals. For firms with temporary problems, 94% of appraisers prefer adjusting growth rates and 86% stabilizing earnings when applying income approach methods. Examining influential factors that can affect solving of operational problems in companies with long-term problems, four groups of factors were identified, the most significant being the nature of inefficiencies and the quality of top management. In the valuation of companies where over-indebtedness is the cause of problems, and which are operationally sound, the most used method is a modification of debt ratios, in 76.9% of cases. APV method is used in 35.9% of these companies' valuations. Valuation of companies whose bankruptcy is almost a certain option is done by liquidation method in almost 98.7% of appraisals. We conclude that in the appraisal of companies with negative earnings, it is crucial to identify the causes of problems and the possibilities of eliminating them, recognizing the ability of entities to continue operating on a going-concern principle and assumptions related to the inactive capital market in BiH.

Keywords: *appraisal, negative earnings, temporary problems, long-term problems, liquidation value*

JEL Classification: *G12, G32, G33*

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

NONLINEAR ADJUSTMENTS IN THE EXPORT-LED GROWTH HYPOTHESIS: RE-EXAMINING THE HUNGARIAN CASE

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Abstract: *This paper aims to examine the non-linear adjustments between exports and gross domestic product (GDP) in Hungary. In order to test the export-led growth hypothesis in the Hungarian economy this research analyses data from 1996Q1-2016Q4. Applying relatively novel approach to export-led growth hypothesis likely nonlinear asymmetric effect of exports and GDP toward their long-run equilibrium is tested. The results disclose a threshold cointegrating connection between the selected variables providing more insights into export led growth hypothesis. Unlike previous studies, research results reveal unidirectional and bidirectional causality in the long-run Hungarian exports-growth nexus which depends on the regime process with significantly different error correction adjustments in normal and stress regimes. Exports is found to be an engine of economic growth in Hungary for entire period but in times of stress when domestic demand contracts the role of exports in economic growth becomes more prominent and takes the basic form of export led growth hypothesis. Empirical results in this paper clearly points that threshold cointegration approach offers deeper insights than the linear error-correction model and might be the proper model specification to examine export led growth hypothesis.*

Keywords: *export-led growth, Hungary, time series analysis, threshold vector error correction*

JEL Classifcation: *C01; C34; F1; F4*

INTRODUCTION

Exporting performance of the country and its effects on the economic wellbeing has been in the focus of scholars since the age of mercantilism. Importance of export as one of the key factors in stimulating economic growth is based in the foundations of classical trade theories (Franc, 2017). Since exporting has been recognized as an important driver of growth many countries already included various incentives in their national strategies (Bilas, Šupuković, 2017).

Development of quantitative methods resulted in numerous empirical evidence from many countries, emphasizing country specific differences and conditioned interconnections between exports and economic growth making this topic interesting and challenging. Additionally, globalization process and other changes in the economic environment of the country make this issue evergreen. Literature examining export-led growth hypothesis mostly relies on the linear models. On the other hand economic theory points that the assumption of linearity may not hold. The reason behind might be the transaction costs, interventions in macroeconomic policy after the economy reach some point being considered as a critical or just the asymmetric pattern behavior of the variables under concern. Example of nonlinear models application can be found in Chevallier (2011). Furthermore, nonlinearities might be speciously prominent in examining the relationship between small open economy and rest of the world like the case presented in this paper. Therefore, this research moves ahead in this direction and also provides the case of the export-led growth in Hungary.

This paper is divided in six sections. Second section of the paper offers systemic overview of the existing literature on the export-led growth hypothesis. Third section of the paper explains research data and empirical strategy. Fourth section of the paper presents matching methodology. Fifth section of the paper describes research results enclosing short discussion. The final section delivers an overview of the main conclusions of the following research.

BRIEF RELATED LITERATURE OVERVIEW

Trošt and Bojnec (2016) using Johansen cointegration test and Granger causality test were used to explore the export-led growth hypothesis in two candidates, open and export-oriented economies: Estonia and Slovenia. The results indicated arguments to support the export-led growth hypothesis in Estonia and Slovenia both. Relationship between export growth and economic (GDP) was confirmed for both countries. Sampathkumar and Rajeshkumar (2016) examined the relationship between export and economic growth on the South Asian Association-for Regional Cooperation (SAARC) member countries. The results out of linear cointegration and Granger Causality tests revealed that there is unidirectional causation from the economic growth to export for Bangladesh and India while bidirectional causation was found for Afghanistan and Sri Lanka and no causation was obtained for Bhutan, Maldives, Nepal and Pakistan. Bilas et al. (2015) applied Granger Causality tests and using Engle Granger linear error correction

established and confirmed unidirectional causality from exports to growth in Croatia. Chia (2016) applied generation panel data approach such as panel unit root, panel cointegration, Fully Modified OLS (FMOLS) and Dynamic Ordinary Least Square (DOLS) to test the export-led growth hypothesis in selected Sub-Saharan African (SSA) countries for the period from 1985-2014 and results proved that export-oriented growth strategy is valid in the SSA countries. Zahonogo (2016) by means of pooled mean group estimates for 42 sub-Saharan African countries suggests that trade openness may positively impact growth in the long run but the effect is not linear and the trade openness has a positive and significant effect on economic growth only up to a certain level of trade openness (threshold effect), above which the effect declines. Pop-Silaghi (2009) has found growth led exports but no export led growth pattern in Hungary. Dreger and Herzer (2013) applied cross-sectional regressions for a sample of 45 developing countries and found that cross-country differences in the long-run effect of exports on the non-export GDP are significantly negatively related to cross-country differences in primary export dependence and business and labor market regulation. Furthermore, they found no significant association between the growth effect of exports and the capacity of a country to absorb new knowledge. Al-Assaf and Al-Abdulrazag (2015) applied the autoregressive distributed lag model (ARDL) to cointegration approach and confirmed the export led growth pattern for Jordan. Empirical literature directed towards examining export-led growth hypothesis that relies on varieties of linear model specifications is extremely large and ongoing (Narayan, 2007; Tsegaye, 2015; Malhotra and Kumari, 2016; Gatawa and Dalhatu, 2017). Ongan and Demiroz (2005) examined the relationship between tourism and growth. Nevertheless some papers were found to tackle nonlinear effects in a variable. Foster (2007) accommodates the threshold regression analysis on African economies and claimed that reaching either certain level of development or exporting is not a prerequisite for export-led hypothesis to hold. Nevertheless the connection is more intense for countries with higher export growth. Leyaro (2015) tested for a threshold in inequality for the effect of exports on growth on a panel data of 100 countries (including Hungary) over 30 years (1980 to 2010) and applied standard econometric techniques and the Hansen (2000) endogenous threshold regression technique that located the thresholds in income inequality. Leyaro (2015) found that, though trade openness supports economic growth, the relatively high income inequality reduces economic growth. Seabra and Galimberti (2012) accommodated threshold regression technique on a panel data, covering sample of 72 countries and two sub-samples over the period from 1974 to 2003, focusing on conditioning effects from countries initial level of GDP per worker, human capital stock,

and exports share in GDP. Seabra and Galimberti (2012) confirm the export-led growth hypothesis pointing out that the relationship between exports and growth was found to be not as trivial as linear specifications would indicate. Bošnjak et al. (2018) examined the nonlinearity regarding the adjustment of exports and GDP in Croatia. Results revealed threshold cointegrating relationship with regime dependence. Export-led growth was confirmed only for extreme regime reflecting the influence of tourism and its seasonal effect.

EMPIRICAL STRATEGY AND DATA SELECTION

Testing of the research hypothesis is based on the quarterly data of exports and gross domestic product in the period 1996Q1 – 2016Q2 gathered from the Hungarian Bureau of Statistics. Time series of the original data is shown in the appendix (Table 6). In order to avoid the problem of seasonality data is adjusted by X-13-ARIMA and provided in natural logarithm values (see Appendix, Figure 1).

First step in any time series analysis is a stationarity diagnostics since economic time series often exhibit non-stationarity properties. Stationarity of time series is tested by traditional unit root diagnostics (ADF, PP, KPSS). Additionally in order to avoid spurious regression results time series are tested by unit root test provided by Zivot and Andrews (1992). According to linear Johansen (1995) cointegration test results confirm the bivariate long-term relationship for exports and gross domestic product. Furthermore following Johansen (1988, 1991) and Johansen and Juselius (1990) vector error correction model (VECM) is being estimated. Linear VECM modelling assumes that the speed of correction to equilibrium level is independent of time. Nevertheless it is possible for the adjustment to happen only when a certain threshold is reached and therefore linearity relationship does not hold (Balke and Fomby, 1997). With the same premise for export-led growth hypothesis calculations use test robust for threshold and non-stationarity relying on the error correction dependent on threshold. Finally, estimates are calculated for threshold cointegration of exports and GDP in Hungarian economy with regime switching properties dependent on error correction size (Hansen & Seo, 2002).

METHODOLOGY

Procedure is adjusted according to study by Bosnjak (2018). In the case of two or more underlying time series having a long-run stochastic trend first step is to estimate VECM. VECM model with two time series of which both are integrated of the same order is noted by the expression (1):

$$\Delta x_t = Z' X_{t-1}(\beta) + u_t \quad (1)$$

Where:

$x_t - n$ - dimensional I(1) cointegrated time series with n x 1 cointegrating vector β

Z - coefficient matrix m x n | m = n + 2

$(X_{t-1}(\beta))$ - regressor and a m x 1 matrix given by the expression (2):

$$X_{t-1}(\beta) = [1 \quad w_{t-1}(\beta)\, \Delta x_{t-1} \cdots \Delta x_{t-l}]' \quad (2)$$

$w_{t-1}(\beta) = \beta' x_{t-1}$ - stationary error correction term

u_t - vector martingale difference sequence with finite covariance matrix

as presented in following expression (3):

$$\sum = E(u_t u_t') \quad (3)$$

Hansen and Seo (2002) threshold cointegration model is presented by expression (4):

$$\Delta x_t = \begin{cases} Z_1' x_{t-1}(\beta) + u_t, w_{t-1}(\beta) \leq \gamma \\ Z_2' x_{t-1}(\beta) + u_t, w_{t-1}(\beta) > \gamma \end{cases} \quad (4)$$

Where:

Z_1 and Z_2 – coefficient matrices for different regimes

x_t - n - dimensional I(1) cointegrated time series with n x 1 cointegrating vector β

$w_{t-1}(\beta) = \beta' x_{t-1}$ - stationary error correction term

γ – threshold parameter

This research examines bivariate ($n = 2$) relationship of exports and gross domestic product in Hungary $\Delta x_t = [\Delta \log(\text{EXP}) \quad \Delta \log(\text{GDP})]$

Coefficients in expression (4) except β are allowed to alternate between the regimes. If condition of $0 < P(w_{t-1}(\beta) \leq \gamma) < 1$ is satisfied threshold effect has content and if not there is linear cointegration. Assumption is that $\pi_0 < P(w_{t-1}(\beta) \leq \gamma) < 1 - \pi_0$ where π_0 is triming parameter set to 0.05. To maintain the assumption that the residuals are independent and identically distributed maximum likelihood (ML) is applied to obtain the model estimation. Using Hansen and Seo (2002) exports and gross domestic product are tested for the presence of linear against threshold cointegration

$$SupLM = \sup_{\gamma_L < \gamma < \gamma_U} LM(\tilde{\beta}, \gamma) \quad (5)$$

While $[\gamma_L, \gamma_U]$ present the search region where γ_L is the π_0 percentile of $\tilde{w}_{t-1}$ and γ_U is the $(1 - \pi_0)$ percentile. According to Hansen and Seo (2002) threshold cointegration $SupLM$ test is used with 73 grid points and p-values are calculated by the parametric bootstrapping. Using the AIC and BIC criteria applied to VECM

suggested two lags. Model estimates for threshold cointegration are calculated by the following Hansen and Seo (2002) procedure. Aiming to provide maximum likelihood estimation (MLE($\tilde{\beta}, \tilde{\gamma}$)) best fit is the model with the lowest value of $log|\Sigma(\beta, \gamma)|$ provided by the grid-search algorithm. Considering $\tilde{A}_1 = \tilde{A}_1(\tilde{\beta}, \tilde{\gamma})$ and $\tilde{Z}_2 = \tilde{Z}_2(\tilde{\beta}, \tilde{\gamma})$, with MLE($\tilde{Z}_1, \tilde{Z}_2$) from the grid-search algorithm parameter calculations are obtained and the results are summarized in Table 5.

RESEARCH RESULTS AND DISCUSSION

Following the empirical strategy described in the previous section traditional unit root test (ADF, PP, KPSS) are summarized in Table 1.

Table 1. Unit root test results for Hungarian exports and GDP

Name of the variable and test	Level test		First difference test	
	Constant	**Constant & trend**	**Constant**	**Constant & trend**
ADF test	**t-stat.**			
log(EXP)	-2.586351	-3.239683	-4.412924	-5.098763
log(GDP)	-2.301680	-3.159780	-3.517847	-4.816661
PP test	**Adj. t-stat.**			
log(EXP)	-2.586103	-3.325069	-4.412924	-5.098763
log(GDP)	-2.953172	-3.159780	-4.769077	-7.274089
KPSS test	**LM-stat.**			
log(EXP)	1.199359	0.281107	0.714196	0.136562
log(GDP)	1.177870	0.312661	0.709029	0.132050

Source: Author' calculation

The results in Table 1 show that Hungarian exports and GDP are difference stationary. Zivot Andrews (1992) unit root test results are shown in Table2.

Table 2. Zivot Andrews (1992) unit root test results for Hungarian exports nad GDP

Alternative	Variable	Test statistic
Slope of the trend	log(GDP)	-5.5338
	log(EXP)	-5.6119
Level and the slope of the trend	log(GDP)	-4.4391
	log(EXP)	-4.2806
Level and the slope of the trend	Δlog(GDP)	-9.4413
	Δlog(EXP)	-6.0128

Source: Author' calculation

Following Zivot Andrews (1992) unit root test results in Table 2, Hunagrian exports and GDP are both trend stationary process with a break in the trend (detected break in the first quarter of 2008 for both series) or difference stationary series (if the alternative is break in level and slope of the trend). But nonetheless both series show similar results for each test. So, weather the both series are trend stationary with break or differenced stationary next step is the cointegration tests and results are given in Table 3.

Table 3. Johansen test for non cointegration (trace and maxmum eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	p –value
None	0.250892	29.65684	15.49471	0.0002
At most 1	0.082893	6.835919	3.841466	0.0089
		Max-Eigen Statistic		
None	0.250892	22.82092	14.26460	0.0018
At most 1	0.082893	6.835919	3.841466	0.0089

Source: Author' calculation

Since the results in Table 3 indicate cointegration relationship between exports and GDP in Hungary VECM is estimated and tested. The linear VECM estimates are summarizes in Table 3

Table 4. Linear VECM estimates

Variables	$\Delta\log(\mathrm{EXP})_t$	$\Delta\log(\mathrm{GDP})_t$
Intercept	0.4327*** (0.1858)	0.4808*** (0.0967)
w_{t-1}	-0.0010*** (0.0004)	-0.0011*** (0.0002)
$\Delta\log(\mathrm{EXP})_{t-1}$	0.4010*** (0.1238)	-0.0174 (0.0644)
$\Delta\log(\mathrm{EXP})_{t-2}$	0.0747 (0.1214)	0.0481 (0.0632)
$\Delta\log(\mathrm{GDP})_{t-1}$	0.1372 (0.2327)	0.0371 (0.1212)
$\Delta\log(\mathrm{GDP})_{t-2}$	-0.3199 (0.2305)	-0.0477 (0.1200)
AIC: -1226.932	BIC: -1196.129	SSR: 0.07396039

Notes: Estimations are done by Maximum Likelihood (ML); standard errors are given in brackets; *** reflects 1%, ** reflect 5% significance

Source: Author' calculation

The results in Table 3 indicate that there is a significant error-correction term in both (exports and GDP) expressions. Slightly higher error-correction coefficient is found in the GDP expression indicating faster GDP adjustment towards the exports in the long-run equilibrium than the other way around. According to the AIC, BIC and HQ appropriate number of lag is two ($l = 2$). Diagnostics from ARCH, Ljung–Box and Jarque–Bera test indicate estimates of the model to be valid. Furthermore to test the nonlinearity in the relationship of Hungarian exports and growth, occurrence of threshold in the error correction term is tested and estimates of threshold error correction model are given below in Table 4.

Table 5. Threshold VECMs exports –growth estimates

	1st regime - (83.5% obs) $w_{t-1}(\beta) \leq \gamma = 0.1691934$		**2nd regime - (16.5% obs)** $w_{t-1}(\beta) > \gamma = 0.1691934$	
Variables	$\Delta\log(\mathrm{EXP})_t$	$\Delta\log(\mathrm{GDP})_t$	$\Delta\log(\mathrm{EXP})_t$	$\Delta\log(\mathrm{GDP})_t$
Intercept	0.0178*** (0.0042)	0.0133*** (0.0002)	0.1289 (0.1363)	0.1202*** (0.0132)
w_{t-1}	-0.1048*** (0.0003)	-0.0711*** (1.3e-05)	-0.2980 (0.4085)	-0.3855** (0.0557)
$\Delta\log(\mathrm{EXP})_{t-1}$	0.4597*** (0.0003)	-0.0015 (0.9823)	-0.2802 (0.6179)	0.2334 (0.4526)
$\Delta\log(\mathrm{GDP})_{t-1}$	-0.0418 (0.8534)	0.0469 (0.7073)	-1.2711 (0.4504)	-1.2617 0.1772)

$\Delta\log(\mathrm{EXP})_{t-2}$	0.1073 (0.3654)	0.0945 (0.1510)	-0.3480 (0.5281)	0.1420 (0.6412)
$\Delta\log(\mathrm{GDP})_{t-2}$	-0.5138*** (0.0254)	-0.0576 (0.6444)	-0.7725 (0.6987)	-0.9223 (0.4039)
SSR: 0.06212902		AIC : -1220.365	BIC: -1161.129	

Threshold Value (γ): 0.1691934

Cointegrating vector: (1, - 0.9812477)

Test of linear versus threshold cointegration of Hansen and Seo (2002):
Test Statistic: 15.39995 (Maximized for threshold value: 427.6866)
P-Value: 0 (Fixed regressor bootstrap)

Notes: Estimations are done by Maximum Likelihood (ML); standard errors are given in brackets; *** reflects 1%, ** reflect 5% significance.

Source: Author' calculation

Table 5 gives linear versus threshold cointegration test results and threshold vector error correction model estimates. The multivariate LM test with a test statistic equal to 15.39 leads to the conclusion of threshold cointegration between $\log(\mathrm{GDP})$ or $\log(\mathrm{EXP})$. This result provides a strong rejection of the null hypothesis of linear cointegration in favor of threshold cointegration at the 1% significance level. The threshold model in the expression (4) has two regimes, resulted from the value of the error-correction term in regards to estimated threshold $\tilde{\gamma}$ amounting 0.1691934. The error-correction term could be described by the expression (6):

$$w_t = \log(EXP)_t - 0.9812477 \cdot \log(GDP)_t \tag{6}$$

The first regime expression explains 83.5% of the observations and it is valid when expression holds (7):

$$\log(EXP)_t \leq 0.9812477 \cdot \log(GDP)_t + 0.1691934 \tag{7}$$

The second regime expression (here referred as the stress regime) explains 16.5% of the observations and is valid when expression holds (8):

$$\log(EXP)_t > 0.9812477 \cdot \log(GDP)_t + 0.1691934 \tag{8}$$

It is reasonable that the error-correction may occur in one regime only or that the error-correction occurs in both regimes but at different speeds of adjustment on the $\log(\mathrm{GDP})$ side or on the side of the $\log(\mathrm{EXP})$. Following the results in Table 5, exports governs the most of the adjustment from the short-run to the long-run equilibrium in the model explaining the first regime since the absolute value of error correction term in exports expression is higher than error correction term in GDP expression ($|w_{t-1}|_{EXP} = 0.1048) > (|w_{t-1}|_{GDP} = 0.0711$). Regarding second regime the results lead in the oposite direction and the adjustment is governed by GDP, while error correction term in exports expression is not significant with usually accepted significance level. The magnitude of the GDP adjustment in regime two is sizable and amounts 0.3855 indicating that 38.55% of disequilibrium occurred in being adjusted in a preceding quarter. Therefore the complete disequilibrium is expected to be adjusted in less than three quarter. To get deeper in-

sight and enable putting the results in context and enrich the conclusions, occurrence of regime one and two is detected and illustrated. Figure 2 in the appendix illustrates regime change and visual inspection of these data series in Figure 2 suggests that irregular or stress conditions in Hungary occurred during and after recent global financial crises. So exporting performance of the Hungary might be speciously important in times of crises. The empirical results found in this paper are quite intuitive and can be summarized as follow: exports is found to be an engine of economic growth in Hungary during the whole sample period, but in times when domestic demand records contractions the role of exports in economic growth become more prominent and takes the basic form of export led growth hypothesis. Empirical results in this paper clearly points that threshold cointegration approach offers deeper insights than the linear error-correction model and might be the proper model specification to examine export led growth hypothesis speciously for the small and open economy like the Hungarian one.

CONCLUSION

Several important deductions could be made as the result of this research. Nonlinear threshold cointegrating model shows occurrence of nonlinear adjustments between exports and GDP in Hungarian economy. Empirical literature dealing with export-led growth hypothesis relies on linear vector error-correction model that might be miss-specified. Nonlinear threshold cointegrating model approach provides richer insights into export led growth hypothesis. Furthermore unlike previous studies, research results reveal unidirectional and bidirectional causality in the long-run Hungarian exports-growth nexus which depends on the regime process. The proposed model identified the speed of exports adjustment by 10.48% of disequilibrium correction quarterly for reaching long run equilibrium steady state, while the speed of GDP adjustment to steady state amounts 7.11% of disequilibrium correction quarterly. However, the results explain the regular conditions or 83.5% of the observed period. Model estimates for the irregular or stress conditions (identified as 16.5% of the observed period) points on the unidirectional causality from exports to GDP with the sizable speed of GDP adjustment amounting 38.55%. So the results clearly points - the bigger disequilibrium occurred the higher speed of adjustment in the afterwards. Conclusively, nonlinear threshold cointegration model might be proper specification to examine exports-growth nexus or export led growth hypothesis in the small and open economy like the Hungarian.

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APPENDIX

Table 6. Descriptive statistics of the original variables –exports (EXP) and gross domestic product (GDP)

	EXP	GDP
Min.	10342	27909
1st Qu.	17670	46087
Median	25395	70369
Mean	24029	62984
3rd Qu.	28693	81273
Max.	36937	91656

Source: Author' calculation

Figure 1. X-13-ARIMA seasonally adjusted series in (natural) log values

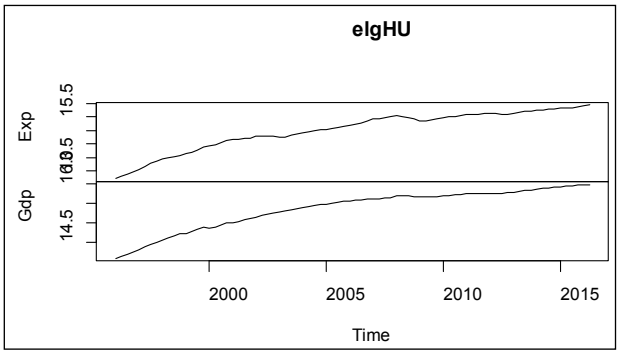
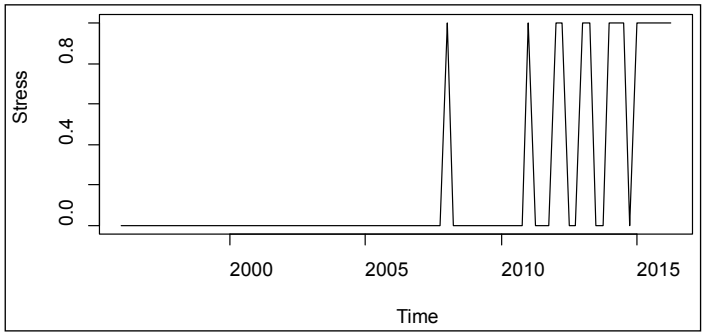


Figure 2. Regime change



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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

ISTRAŽIVANJE UTICAJA TEHNIČKE I FUNKCIONALNE DIMENZIJE NA PERCEPCIJU UKUPNOG KVALITETA USLUGA U ZDRAVSTVU

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Sažetak: *Predmet istraživanja ovog rada je ispitivanje i mjerenje razlike u nivou percepcije i očekivanja tehničke i funkcionalne dimenzije kvaliteta usluga različitih grupa pacijenata s ciljem utvrđivanja značaja percipiranog nivoa kvaliteta zdravstvenih usluga i uticaja očekivanja na nivo percipiranog kvaliteta. Istraživanje je provedeno u Univerzitetsko kliničkom centru Tuzla uz primijenjeni uzorak koji posjeduje karakteristiku prigodnog, jer su odabirani dostupni pacijenti na aktivnom liječenju.*

U radu se prezentiraju rezultati istraživanja provedenih među korisnicima zdravstvenih usluga i mjerenje uticaja njihovih prethodnih očekivanja na percepciju ukupnog kvaliteta koristeći ponderisani SERVQUAL model na bazi razlike percipiranog i očekivanog kvaliteta. Sam izbor modela je posljedica činjenice da je ponderisani SERVQUAL model korišten u ranijim istraživanjima nivoa kvaliteta i percepcija, gdje se u više studija pokazalo da postoje razlike u nivoima očekivanja pacijenata.

Rezultati testiranja potvrđuju da postoji razlika u nivou percepcija i očekivanja pacijenata u pogledu funkcionalne dimenzije usluga između usluga rehabilitacije i hirurgije što djelimično potvrđuje našu tvrdnju da se očekivanja i percepcije pacijenata razlikuju u zavisnosti od vrste usluge i činjenice da li su usluge pružene u okviru rehabilitacijskih i hirurških grana. Istovremeno, rezultati testiranja upućuju na zaključak da pacijenti nemaju znanja da procijene pojedine poddimenzije tehničke dimenzije kvaliteta usluge te formiraju mišljenje o kvalitetu procesa zdravstvene usluge bazirano na poddimenzijama funkcionalne dimenzije kvaliteta, odnosno ne-tehničkim dimenzijama kvaliteta.

Ključne riječi: *tehnički i funkcionalni kvalitet, percepcije i očekivanja pacijenata*

JEL klasifikacija: *M53*

UVOD

Kada je riječ o mjerenju, postoje dva ključna elementa u mjerenju kvaliteta usluga: identifikovanje potrošačkih zahtjeva i očekivanja o kvalitetu usluga (Brown i Swartz, 1989). Općepoznato je da kupci ocjenjuju usluge koja ima je pružena i da su njihova očekivanja od kritičnog značaja u određivanju nivoa zadovoljstva i percepcija kupaca. Percipirani kvalitet odražava mišljenje kupaca o superiornosti ili globalnoj izvrsnosti usluga (Zeithaml, 1987).

Kao što se može vidjeti iz prethodnog izlaganja ne postoji saglasnost među autorima oko opravdanosti mjerenja nivoa očekivanja u pogledu kvaliteta usluga, njegovog objektiviziranja ali i definisanja. I sami zagovornici teorije mjerenja kvaliteta usluga na bazi teorije diskonfirmacije definišu očekivanja na različit način: kao želje, zahtjeve, koje pružaoc treba da ispuni, kao normativna očekivanja, idealne standarde, ono što se kupci nadaju da će dobiti, te kao adekvatnu uslugu (Teas, 1993). Pri tome, Parasuraman, Zeithaml i Berry (1985) prave razliku između očekivanja koja se odnose na zadovoljstvo i očekivanja koja su vezana za kvalitet, ali to nije do kraja na odgovarajući način inkorporirano u model mjerenja kvaliteta usluga, nego je više stvar definisanja i koncipiranja samog značenja pojma i kategorije očekivanja. Neki autori očekivanja definišu kao vrijeme provedeno u čekanju, stil ljekara, znanje o porodici i tehničkom kvalitetu usluge (Roos, 1981).

Dimenzija očekivanja osim različitog definisanja izaziva i probleme, zbog činjenice da model nepotvrđivanja – diskonfirmacije implicira da je neophodno da nivo percipirane performanse, odnosno nivo pružene usluge uvijek mora nadmašiti očekivanja da bi klijenti percipirali visok kvalitet. Ovakvo stanje nije primjereno klasičnom shvatanju idealne tačke određene performanse, koja odražava želje korisnika usluge. Prema tome, model nepotvrđivanja neće moći odraziti opadanje kvaliteta onda kad nivo performanse premaši idealnu tačku (Carman, 1990). Stoga je u teoriji kreiran veliki broj modela (ServQual, ServPerf, Kano model, Grönroosov model) za mjerenje kvaliteta usluga usmjerenih na identifikovanje očekivanja korisnika i mjerenje performansi pruženih usluga (Babić-Hodović, 2012). Takođe, kvalitet usluga ima uticaj na zadovoljstvo i lojalnost korisnika (Lewis, 1993, Rousseau et al., 1998) i predstavlja preduslov zadovoljsva korisnika (Anderson et al., 1994).

Važno je naglasiti da je zadovoljstvo pacijenata rezultat ukupne percepcije kvaliteta zdravstvenih usluga zato što se dešava samo kada su potvrđena njihova očekivanja u vezi sa tehničkim i funkcionalnim kvalitetom. Naime, zadovoljstvo i

ukupno percipirani kvalitet nisu identične kategorije, nego se radi o međusobno uvjetovanim faktorima (Huseinspahić, N., 2011).

Rezultat ovog istraživanja treba da pokaže koje dimenzije pacijenti smatraju značajnim u ocjeni kvaliteta pruženih usluga, te u kojoj mjeri nivo njihovih prethodnih očekivanja utiče na percipirani kvalitet kao krajnje pretpostavke za zadovoljstvo istih.

METODOLOGIJA ISTRAŽIVANJA

Provedeno je istraživanje o nivou tehničke i funkcionalne dimenzije kvaliteta usluga u Univerzitetsko kliničkom centru Tuzla i uticaju očekivanja pacijenata na percipirani nivo kvaliteta usluga pojedinih vrsta usluga. Ukupno 84 upitnika za mjerenje očekivanja i percepcija distribuirana su učesnicima u toku diskusije vođene u fokus-grupama. Primijenjeni uzorak ispitanika odabranih za testiranje posjeduje karakteristiku prigodnog uzorka, jer su za uzorak odabrani pacijenti s obzirom na njihovu trenutačnu dostupnost (zatečeni na liječenju). Od ukupnoga broja ispitanika 28,95% je muškaraca i 71,05% žena, životne dobi od 25 godina do 76 godina. Njih 58 ili 69,00% je sa završenom srednjom školom, 14 ili 16,70% sa završenom visokom školom i 12 ili 14,34% sa završenom osnovnom školom.

Predmet istraživanja je ispitivanje i mjerenje nivoa očekivanja i percepcije tehničkih i funkcionalnih dimenzija kvaliteta usluga kod dva različita segmenata pacijenata te analiza dobivenih rezultata, s ciljem utvrđivanja značaja percipiranog nivoa kvaliteta zdravstvenih usluga i uticaja očekivanja na nivo percipiranoga kvaliteta u vezi s tehničkim i funkcionalnim dimenzijama kvaliteta usluga u Univerzitetsko kliničkom centru Tuzla.

Cilj je bio mjerenje nivoa očekivanog i percipiranog nivoa kvaliteta zdravstvenih usluga, korištenjem ponderisanog SERVQUAL modela. Ponderisani SERVQUAL modela je odabran za mjerenja stavova pacijenata jer logika korištenog modela počiva na pretpostavci da će negativna reakcija pacijenata pratiti neispunjavanje očekivanja u onim poddimenzijama koje su za korisnike najznačajnije. Izbor modela je posljedica činjenice da je korišten u ranijim istraživanjima nivoa kvaliteta i percepcija, te se u više studija pokazalo da postoje razlike u nivoima očekivanja pacijenata. Model mjeri pet originalnih SERVQUAL dimenzija kvaliteta: opipljivost, pouzdanost, susretljivost, sigurnost i empatija, a korišten je za mjere očekivanja i percepcija pacijenata u toku liječenja pacijenata.

Za mjerenje funkcionalne dimenzije kvaliteta usluga, koristili smo se adaptiranim upitnikom SERVQUAL mjerne skale. Naime, Babakus i Mangold (1992) su originalnu SERVQUAL mjernu skalu od 22 izjave adaptirali za potrebe mjerenja kvaliteta usluga u zdravstvu. Adaptirani upitnik sadrži 15 izjava u vezi s očekivanjima pacijenata i 15 odgovarajućih izjava u vezi s njihovim percepcijama koje identifikuju funkcionalne poddimenzije kvaliteta pruženih usluga. Jedina devijacija u odnosu na ovu adaptiranu SERVQUAL mjernu skalu je u promjeni termina "bolnica" u "Klinički centar".

Ocijenili smo da je adaptirana skala u cijelosti prihvatljiva za mjerenje nivoa funkcionalnih poddimenzija kvaliteta u zdravstvu, bez predtestiranja s obzirom na validnost i pouzdanost ove skale, koju su Babakus i Mangold (1992) već testirali za mjerenje percipiranog i očekivanog kvaliteta usluga u zdravstvu.

Upitnik za tehničku dimenziju kvaliteta je koncipiran na osnovu razrade pacijentove mogućnosti ocjenjivanja rezultata pružene usluge. Za mjerenje tehničke dimenzije kvaliteta usluga u zdravstvu, koristili smo se mjernom skalom koja sadrži 12 izjava u vezi s očekivanjima pacijenata i 12 odgovarajućih izjava u vezi s njihovim percepcijama kvaliteta usluga.

Nakon ove faze, od ispitanika je traženo da iznos od 100 poena podijele na tri poddimenzije. Nakon ove faze, od ispitanika je traženo da iznos od 100 poena podijele na pet poddimenzija. Traženo je od pacijenata da ocijene percepcije funkcionalnih dimenzija kvaliteta zdravstvenih usluga, koristeći se Likert skalom od 7 tačaka. Rezultati su mjereni u rasponu od "jako neslaganje" (1) do "jako slaganje" (7). Da bi se udovoljilo zadacima u istraživanju, korištena su dva različita tipa mjerenja i upoređivanja performansi i očekivanja: (1) originalni tip koji polazi od mjerenja razlika između percepcija i očekivanja pacijenata i njihovoga ponderisanja te (2) mjerenja odnosa između percepcija i očekivanja pacijenata i njihovoga ponderisanja, dovodeći u vezu veličine izračunatih gapova sa značajem svake od posmatranih poddimenzija funkcionalnog kvaliteta usluga - opipljivost, pouzdanost, susretljivost, sigurnost i empatija.

U toku istraživanja formirane su dvije grupa ispitanika u koje su bili uključeni pacijenti:
1. kojima se pružaju usluge medicinske rehabilitacije,
2. koji su imali neki hirurški zahvat.

U skladu s metodologijom SERVQUAL modela, svaka grupa ispitanika je u toku diskusije o specifičnostima i karakteristikama zdravstvenih usluga, dobila uputstvo

kako popuniti upitnik u dijelu koji se odnosi na ocjenu pojedinih dimenzija i karakteristika koje moraju odlikovati "Klinički centar koji pruža izvanredne usluge".

Također, ispitanici su u ovom dijelu bili obavezni ocijeniti značaj pojedinih od poddimenzija tehničkog i funkcionalnog kvaliteta, iz svoje perspektive, za percepciju kvalitetne usluge.

Prema metodologiji ponderisanog SERVQUAL modela od ispitanika smo tražili da identifikuju nivo pojedinih karakteristika (u dimenzijama SERVQUAL-a) koje bi trebalo da osigura hipotetička "izvanredna" zdravstvena ustanova, a nakon toga da ocjene važnosti pojedinih uslužnih dimenzija iz vlastite perspektive.

Na osnovu postavljenih ciljeva istraživanja, testirana je sljedeća radna hipoteza:
$\mathbf{H}_{1(r)}$ Nivo prethodnih očekivanja, koji se značajno razlikuje kod različitih segmenata pacijenata, ima značajan uticaj na percipiranje funkcionalnih dimenzija kvaliteta usluga, kao pretpostavke za građenje krajnjeg zadovoljstva i lojalnosti pacijenata kao korisnika usluga, a tehničke dimenzije kvaliteta usluga imaju presudan (direktni i indirektni) uticaj na ukupnu percepciju ukupnog kvaliteta usluga i zadovoljstvo korisnika.

Iz radne hipoteze izvedene se sljedeće pomoćne hipoteze:
$\mathbf{H}_{2(p)}$ Postoji razlika u nivou očekivanja i percepcije pacijenata u pogledu tehničke i funkconalne dimenzije kvaliteta usluga, u zavisnosti od vrste usluge i činjenice jesu li usluge pružene u okviru rehabilitacijskih ili hirurških grana.
$\mathbf{H}_{3(p)}$ Nivo percepcije ukupnoga kvaliteta usluga nije uspostavljen samo nivoom dimenzija tehničkog i funkcionalnoga kvaliteta usluga nego, prije svega, razlikom (gapom) između percipiranog i očekivanog kvaliteta usluga u zdravstvu.

REZULTATI ISTRAŽIVANJA

U tabelama od 3.1. do 3.2. dat je prikaz prosječne ocjene za percepcije i očekivanja pojedinih funkcionalnih dimenzija usluga te neponderisana i ponderisana ocjena kvaliteta. U tabelama su date srednje vrijednosti očekivanja i percepcije prikupljene prema pet originalnih servqual dimenzija: opipljivost, pouzdanost, susretljivost, sigurnost i empatija.

Iz rezultata prikazanih u tabelama od 3.1. do 3.2., za funkcionalnu dimenziju kvaliteta možemo uočiti da ne postoje razlike u rangiranju prve i druge dimenzije po važnosti između korisnika zdravstvenih usluga rehabilitacije, usluga hirurgije.

Tabela 3.1. Ocjena nivoa funkcionalne dimenzije kvaliteta za usluge rehabilitacije

F-dimenzije	E	P	$SQ_{(P-E)}$	R	W %	$SQ_{(P-E)}W$	$SQ_{(P-E)}WR$
Opipljivost	6,84	6,11	-0,73	1	11,67	-0,086	4
Pouzdanost	6,98	6,56	-0,42	5	19,67	-0,083	5
Susretljivost	6,93	6,44	-0,49	4	26,67	-0,130	2
Sigurnost	7,00	6,43	-0,57	3	25,33	-0,144	1
Empatija	6,87	6,30	-0,57	2	16,67	-0,094	3
			-0,556		100	-0,537	

Izvor: Autori rada

Legenda: E = očekivanja, P = percepcije, SQ (P-E) = neponderisana razlika između percepcipiranih i očekivanih usluga, R = rang dimenzije, W% = značaj dimenzije, SQ(P-E)W = ponderisana razlika između percepcipiranih i očekivanih usluga,SQ (P-E)WR = rang za ponderisane vrijednosti.

Najveći negativni gap SQ (P-E) i SWQ (P-E), po pojedinim dimenzijama, kao i ukupni gap, zabilježen je kod **usluga rehabilitacije**. Najveći negativni gap kod usluga rehabilitacije zabilježen je kod poddimenzije "opipljivost", a najniži kod poddimenzije "pouzdanost". Drugi po veličini negativni gap SQ (P-E) i SWQ (P-E), po pojedinim dimenzijama, kao i ukupni gap, zabilježen je kod usluga hirurgije.

Tabela 3.2. Ocjena nivoa kvaliteta funkcionalne dimenzije kvaliteta za usluge hirurgije

F-dimenzije	E	P	$SQ_{(P-E)}$	R	W %	$SQ_{(P-E)}W$	$SQ_{(P-E)}WR$
Opipljivost	6,20	5,37	-0,83	1	15,00	-0,125	1
Pouzdanost	6,00	5,73	-0,27	2	21,50	-0,057	3
Susretljivost	6,20	5,97	-0,23	3	26,00	-0,061	2
Sigurnost	6,23	6,15	-0,07	4	23,00	-0,017	4
Empatija	5,10	5,50	0,40	5	14,50	0,058	5
			-0,202		100,00	-0,202	

Izvor: Autori rada

Legenda: značenje simbola kao iz zaglavlja Tebele 3.1.

Najveći negativni gap kod usluga hirurgije zabilježen je kod poddimenzije "opipljivost", a najniži kod poddimenzije "sigurnost". Pozitivan gap zabilježen je kod poddimenzije "empatija". Druga po važnosti je dimenzija "pouzdanost". To implicira da je zapravo i nivo njihovih očekivanja vrlo visok, te da vjerovatno i sama ocjena ostvarene dimenzije kvaliteta može biti pod ovim uticajem.

U tabelama od 3.3. do 3.5. dat je prikaz ocjene nivoa kvaliteta za tehničku i funkcionalnih dimenzija te neponderisana i ponderisana ocjena kvaliteta. U ta-

belama su date srednje vrijednosti očekivanja i percepcije prikupljene prema pet originalnih SERVQUAL dimenzija: opipljivost, pouzdanost, susretljivost, sigurnost i empatija.

Iz rezultata prikazanih u tabelama od 3.3. do 3.5., za tehničku i funkcionalnu dimenziju kvaliteta možemo uočiti da ne postoje razlike u rangiranju prve i druge dimenzije po važnosti između korisnika zdravstvenih usluga rehabilitacije ili usluga hirurgije.

Kako je prikazano u Tabeli 3.3. percepcije su manje od očekivanja za poddimenzije "ozdravljenje / liječenje", "kvalitet života oboljeloga" te "izgradnja svijesti i odgovornosti oboljeloga". Poddimenzije "ozdravljenje/liječenje", "kvalitet života oboljeloga" i "izgradnja svijesti i odgovornosti oboljeloga" pokazuju negativne gapove.

Tabela 3.3. Ocjena nivoa kvaliteta za tehničku dimenziju za usluge rehabilitacije

T-dimenzije	E	P	$SQ_{(P-E)}$	R	W %	$SQ_{(P-E)}W$	$SQ_{(P-E)}WR$	$SQ_{(P/E)}$	$SQ_{(P/E)}R$	$SQ_{(P/E)}W$	$SQ_{(P/E)}WR$
Ozdravljenje / liječenje	6,37	6,08	-0,29	2	41,33	-0,121	2	0,954	2	0,394	1
Kvalitet života oboljeloga	6,44	6,04	-0,40	1	34,67	-0,139	1	0,938	3	0,325	2
Izgradnja svijesti i odgovornosti oboljeloga	6,30	6,02	-0,28	3	24,00	-0,068	3	0,955	1	0,229	3
			-0,326		100	-0,328		0,949		0,949	

Izvor: Autori rada

Legenda: značenje simbola kao iz zaglavlja Tabele 3.1.

Analizirajući gapove između percepcija i očekivanja usluga rehabilitacije, može se zaključiti da "kvalitet života oboljeloga" pokazuje najveći negativni gap (-0,40), dok je drugi po udaljenosti "ozdravljenje / liječenje" (-0,29), slijedi "izgradnja svijesti i odgovornosti oboljeloga" (-0,28).

Tabela 3.4. Vrijednosti očekivanja i percepcija za usluge hirurgije

T-dimenzije	E	P	$SQ_{(P-E)}$	R	W %	$SQ_{(P-E)}W$	$SQ_{(P-E)}WR$	$SQ_{(P/E)}$	$SQ_{(P/E)}R$	$SQ_{(P/E)}W$	$SQ_{(P/E)}WR$
Ozdravljenje / liječenje	6,44	5,98	-0,46	2	51,00	-0,235	1	0,929	2	0,474	1
Kvalitet života oboljeloga	6,30	5,73	-0,57	1	28,50	-0,162	2	0,910	3	0,259	2
Izgradnja svijesti i odgovornosti oboljeloga	5,93	5,83	-0,10	3	20,50	-0,020	3	0,983	1	0,202	3
			-0,376		100	-0,417		0,941		0,934	

Izvor: Autori rada

Legenda: značenje simbola kao iz zaglavlja Tebele 3.3.

Tabela 3.4. prikazuje srednje ocjene percepcije i očekivanja kvaliteta za svaku tehničku poddimenziju usluga hirurgije. Najveći negativni gap zabilježen je kod poddimenzije "kvalitet života oboljeloga" (-0,57), dok je najmanji negativni gap zabilježen kod poddimenzije "izgradnja svijesti i odgovornosti oboljeloga" (-0,10). Ukupni gap za usluge biohemije je negativan (-0,376).

U tabelama od 3.5. do 3.8. dat je prikaz ocjene razlike u nivou percepcije i očekivanja pacijenata zavisno o vrsti usluge te neponderisana i ponderisana ocjena kvaliteta. U tabelama su date srednje vrijednosti očekivanja i percepcije prikupljene prema pet originalnih SERVQUAL dimenzija: opipljivost, pouzdanost, susretljivost, sigurnost i empatija.

Tabela 3.5. Ocjena razlika u nivou percepcija pacijenata zavisno od vrste usluge

DIMENZIJE	Rehabilitacija		Hirurgija		t-vrijednost	p-vrijednost
	M[a]	SD	M	SD		
Opipljivost	6,1111	1,0131	5,3667	0,8233	1,3330	0,0660
Pouzdanost	6,5556	0,7418	5,7333	0,7825	2,6570	0,0140
Susretljivost	6,4444	1,1245	5,9667	0,7609	1,1720	0,2630
Sigurnost	6,4333	0,8938	6,1500	0,4734	0,9160	0,3690
Empatija	6,3000	1,3732	5,5000	0,8165	1,6510	0,1120
Percipirani kvalitet	6,3778	0,9298	5,7867	0,5248	1,8180	0,0820

Izvor: Autori rada

Legenda: [a]M = srednja vrijednost, [b]SD = standardna devijacija

Rezultati t-testa, prikazani u Tabeli 3.5., upućuju na zaključak da ne postoji statistički značajna razlika (p > 0,05) u nivou percepcija pacijenata korisnika usluga rehabilitacije i hirurgije kod poddimenzije "pouzdanost" (t = 2,6570; p = 0,0140).

U ocjeni razlika u nivou percepcija pacijenata korisnika usluga hirurgije i rehabilitacije nije utvrđena statistički značajna razlika kod poddimenzija "opipljivost" (t = 1,3330; p = 0,0660), "susretljivost" (t = 1,1720; p = 0,2630), "sigurnost" (t = 0,9160; p = 0,369) i "empatija" (t = 1,6510; p = 0,1120) te percipiranoga kvaliteta usluga (t = 1,8180; p = 0,0820).

Tabela 3.6. Ocjena razlika u nivou očekivanja pacijenata zavisno od vrste usluge

DIMENZIJE	Rehabilitacija		Hirurgija		t-vrijednost	p-vrijednost
	M	SD	M	SD		
Opipljivost	6,8444	0,3052	6,2000	0,7888	2,4640	0,0320
Pouzdanost	6,9778	0,0861	6,0000	0,7370	4,1760	0,0020
Susretljivost	6,9333	0,1869	6,2000	0,3913	5,5520	0,0000
Sigurnost	7,0000	0,0000	6,2250	0,7308	3,3540	0,0080
Empatija	6,8667	0,3519	5,1000	1,3703	3,9900	0,0030
Očekivani kvalitet	6,9333	0,1309	6,0200	0,5306	5,3360	0,0000

Izvor: Autori rada

Legenda: kao u zaglavlju tabele 3.1.

Rezultati t-testa, prikazani u Tabeli 3.6., upućuju na zaključak da postoji statistički značajna razlika (p < 0,05) u nivou očekivanja pacijenata korisnika usluga rehabilitacije i hirurgije kod poddimenzija "opipljivost" (t = 2,4640; p = 0,0320), "pouzdanost" (t = 4,1760; p = 0,0020), "susretljivost" (t = 5,5520; p = 0,0000), "sigurnost" (t = 3,3540; p = 0,0080) i "empatija" (t = 3,9900; p = 0,0030) te očekivanog kvaliteta usluga (t = 5,3360; p = 0,0000).

Tabela 3.7. Ocjena razlika u nivou percepcija pacijenata zavisno o vrsti usluga

DIMENZIJE	Rehabilitacija		Hirurgija		t-vrijednost	p-vrijednost
	M	SD	M	SD		
Ozdravljenje / liječenje	6,0800	1,0304	5,9800	0,5996	0,2760	0,7850
Kvalitet života oboljeloga	6,0444	1,0902	5,7333	0,6441	0,8100	0,4260
Izgradnja svijesti i odgovornosti oboljeloga	6,0167	1,1199	5,8250	0,5658	0,4980	0,6230
Percipirani kvalitet	6,0500	0,9954	5,8667	0,5599	0,5270	0,6030

Izvor: Autori rada

Legenda: kao u zaglavlju tabele 3.5.

Iz rezultata t-testa, prikazanih u Tabeli 3.7., možemo uočiti da ne postoji statistički značajna razlika ($p > 0,05$) u nivou percepcija pacijenata korisnika usluga rehabilitacije i hirurgije kod poddimenzija "ozdravljenje / liječenje" ($t = 0,2760$; $p = 0,7850$), "kvalitet života oboljeloga" ($t = 0,8100$; $p = 0,4260$), "izgradnja svijesti i odgovornosti oboljeloga" ($t = 0,4980$; $p = 0,6230$) te percipiranoga kvaliteta usluga ($t = 0,5270$; $p = 0,6030$).

Tabela 3.8. Ocjena razlika u nivou očekivanja pacijenata zavisno od vrste usluge

DIMENZIJE	Rehabilitacija		Hirurgija		t-vrijednost	p-vrijednost
	M	SD	M	SD		
Ozdravljenje / liječenje	6,3733	0,7046	6,4400	0,4560	-2,2630	0,7950
Kvalitet života oboljeloga	6,4444	0,7201	6,3000	0,3991	0,5670	0,5710
Izgradnja svijesti i odgovornosti oboljeloga	6,3000	0,7974	5,9250	0,5658	1,2830	0,2120
Očekivani kvalitet	6,3944	0,6868	6,2083	0,3198	0,7970	0,4340

Izvor: Autori rada

Legenda: kao u zaglavlju tabele 3.1.

Rezultati t-testa, prikazani u Tabeli 3.8., upućuju na zaključak da **ne postoji** statistički značajna razlika ($p > 0,05$) u nivou očekivanja kod poddimenzija "ozdravljenje / liječenje" ($t = -2,2630$; $p = 0,7950$), "kvalitet života oboljeloga" ($t = 0,5670$; $p = 0,5710$), "izgradnja svijesti i odgovornosti oboljeloga" ($t = 1,2830$; $p = 0,2120$) te očekivanog kvaliteta ($t = 0,7970$; $p = 0,4340$).

Poređenjem nivoa percepcija i očekivanja, po pojedinim dimenzijama kvaliteta hirurških i rehabilitacijskih usluga, uočavamo da ne postoji statistički značajna razlika između očekivanja i percepcija pacijenata korisnika usluga rehabilitacije i

hirurgije. Najviši nivo očekivanja zabilježen je kod poddimenzije "kvalitet života oboljeloga" za usluge rehabilitacije, a najviši nivo percepcije je zabilježen kod poddimenzije "ozdravljenje/liječenje" za usluge rehabilitacije.

U Tabeli 3.9., dat je prikaz poređenja ocjene uticaja percipiranih funkcionalnih i tehničkih dimenzija kvaliteta na ukupno percipirani kvalitet usluga.

Iz rezultata t-testa prezentiranih u Tabeli 3.9., može se uočiti da postoji razlika u nivou uticaja poddimenzija tehničke i funkcionalne dimenzije kvaliteta. Možemo uočiti da ne postoji statistički značajna razlika ($p > 0,05$) u nivou uticaja percepcija tehničke dimenzija kvaliteta na percepciju ukupnoga kvaliteta hirurških usluga kod poddimenzija "ozdravljenje / liječenje" ($t = 1,5060$; $p = 0,1660$), "kvalitet života oboljeloga" ($t = -1,5260$; $p = 0,1610$) i "izgradnja svijesti i odgovornosti oboljeloga" ($t = -0,1080$; $p = 0,916$).

Tabela 3.9. Ocjena uticaja percipiranih funkcionalnih i tehničkih dimenzija kvaliteta na percepciju ukupnoga kvaliteta usluga

Dimenzije	M	SD	SG	df	t-vrijednost	p-vrijednost
Funkcionalna dimenzija						
Opipljivost	-0,21190	0,51641	0,05635	83	-3,7610	0,0000
Pouzdanost	0,06190	0,40291	0,04396	83	1,4080	0,1630
Susretljivost	0,06984	0,40623	0,04432	83	1,5760	0,1190
Sigurnost	0,15119	0,30211	0,03296	83	4,5870	0,0000
Empatija	-0,18214	0,62214	0,06788	83	-2,6830	0,0090
Tehnička dimenzija						
Ozdravljenje / liječenje	0,04226	0,34649	0,03781	83	1,1180	0,2670
Kvalitet života oboljeloga	-0,12202	0,41079	0,04482	83	-2,7220	0,0080
Izgradnja svijesti i odgovornosti oboljeloga	0,03869	0,40813	0,04453	83	0,8690	0,3870

Izvor: Autori rada

Legenda: kao u zaglavlju tabele 3.1.

Konačno, korisnici zdravstvenih usluga imaju znanje i prethodno stečeno iskustvo u vezi s funkcionalnim poddimenzijama "opipljivost", "sigurnost" i "empatija" te tehničkoj dimenziji "kvalitet života oboljeloga". Zbog navedene činjenice i jeste bilo zanimljivo provjeriti da li postoji stečeno iskustvo po osnovu tehničke dimenzije kvaliteta kada su u pitanju usluge rehabilitacije.

ZAKLJUČAK

Postoje razlike u nivou očekivanja između pacijenata korisnika rehabilitacijskih i hirurških usluga. Dakle, potvrđuju se naše hipoteze da postoji razlika u nivou očekivanja i percepcija pacijenata u pogledu funkcionalne dimenzije usluga, u zavisnosti od vrste usluge i činjenice da li su usluge pružene u okviru hirurških ili rehabilitacijskih grana. Istovremeno, rezultati testiranja upućuju na zaključak da pacijenti nemaju znanja da procijene pojedine poddimenzije tehničke dimenzije kvaliteta usluge i, zbog toga, formiraju mišljenje o kvalitetu procesa zdravstvene usluge bazirano na poddimenzijama funkcionalne dimenzije kvaliteta, odnosno ne-tehničkim dimenzijama kvaliteta. Naime, funkcionalni kvalitet se nudi kao podloga tehničkom kvalitetu zdravstvene usluge tako da i direktno i indirektno, preko tehničke dimenzije, utiče na percipirani kvalitet usluge i generira ne/zadovoljstvo pacijenata. Percipirane tehničke dimenzije kvaliteta usluga nemaju veći uticaj na percepciju ukupnoga kvaliteta u poređenju s funkcionalnim dimenzijama kvaliteta usluga, obzirom da korisnik usluga nema dovoljno znanja i iskustva da ih procijeni. Rezultati testiranja djelimično potvrđuju da nivo percipirane funkcionalne dimenzije kvaliteta usluga imaju veći uticaj na percepciju ukupnoga kvaliteta u poređenju s tehničkom dimenzijama kvaliteta usluga kod onih vrsta usluga kod kojih korisnik nije u mogućnosti (ne posjeduje znanja i iskustva) procijeniti nivo kvaliteta outputa usluga.

Poređenjem nivoa percepcija, po pojedinim dimenzijama kvaliteta rehabilitacijskih i hirurških usluga, uočavamo da ne postoji statistički značajna razlika između nivoa percepcija pacijenata korisnika usluga rehabilitacije i hirurgije. Suprotno navedenom, poređenjem nivoa očekivanja, po pojedinim dimenzijama kvaliteta rehabilitacijskih i hirurških usluga, uočavamo da postoji statistički značajna razlika između nivoa očekivanja ove dvije grupe pacijenata. Najviši nivo očekivanja zabilježen je kod poddimenzije "opipljivost" za hirurške usluge, a najviši nivo percepcija zabilježen je kod poddimenzije "pouzdanost" za usluge rehabilitacije. Poređenjem nivoa percepcija, po pojedinim dimenzijama kvaliteta rehabilitacijskih i radioloških usluga, uočavamo da ne postoji statistički značajna razlika između nivoa percepcija pacijenata korisnika usluga hirurgije i rehabilitacije. Na bazi razlike između percipirane i očekivane usluge pokazuje da je ukupan gap funkcionalnog kvaliteta usluga manji pri računanju ponderisane razlike, što rezultira nižim odstupanjima kada je u pitanju korištenje podataka o značaju pojedinih dimenzija kod rehabilitacijskih usluga. Pri tome se može uočiti da ne postoji razlika između percipiranog i očekivanog kvaliteta usluga pri računanju ponderisane i neponderisane razlike kod usluga hirurgije.

Nasuprot ovim rezultatima, rezultati upoređivanje na bazi razlike između percipirane i očekivane usluge pokazuju da je ukupan gap funkcionalnog kvaliteta usluga veći pri računanju ponderisane razlike. Obe grupe pacijenata daju najveću značaj poddimenziji "susretljivost". Poddimenzija "susretljivost" najznačajnija je dimenzija usluge, što je konzistentno s dosadašnjim istraživanjima koja su pokazala da ispitanici u različitim vrstama usluga najznačajnijim smatraju "pouzdanost", "susretljivost" i "sigurnost". Stoga je situacija u ukupnoj analizi gapova povoljnija nakon uključivanja pondera. To znači da su neusklađenosti između percepcije i očekivanja uglavnom daleko veće u onim poddimenzijama usluga kojima pacijenti pridaju najveći značaj. Ovo potvrđuje činjenicu da su u analizu percepcije kvaliteta poddimenzija moraju, osim percepcije pojedinih dimenzija, uključiti i korisnički prioriteti. Visoki negativni gapovi kod usluga rehabilitacije rezultat su visokih očekivanja pacijenata uzrokovanih njihovim poznavanjem funkcionalnoga kvaliteta usluga, a visoki nivo percepcija uzrokovan je profesionalnim odnosom pružaoca usluga.

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RESEARCH OF THE TECHNICAL AND FUNCTIONAL DIMENSION TO THE PERCEPTION OF TOTAL QUALITY OF SERVICES IN HEALTH

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Abstract: *The study subject of this paper is to examine and measure the difference in the level of perception and expectation of the technical and functional dimension of the quality of services of different groups of patients in order to determine the importance of the perceived level of quality of health services and the impact of expectations on the level of perceived quality. The study was conducted at the University Clinical Center Tuzla with the applied sample, which has the characteristic of a suitable sample, since the selected patients are on active treatment. Of the total number of respondents, 28.95% were men and 71.05% were women, aged 25 to 76 years, 58 or 69.00% are with high school graduation, 14 or 16.70% with high school graduation and 12 or 14.34% with primary school education.*

The paper presents the results of research conducted among health care users and the measurement of the impact of their previous expectations on the perception of the overall quality of different types of services using a weighted SERVQUAL model based on the difference between perceived and expected quality. It should be emphasized that the selected model measures five standard and original SERVQUAL dimensions: tangibility, reliability, friendliness, security and empathy. The choice of model is due to the fact that the weighted SERVQUAL model has been used in previous studies of quality and perception levels, where multiple studies have shown that there are differences in patient expectation levels.

Test results confirm that there is a difference in patients' perceptions and expectations regarding the functional dimension of services between rehabilitation and surgery services, which partly confirms our claim that patients' expectations and perceptions differ depending on the type of service and the fact that services are provided within rehabilitation and/or surgical branches. At the same time, the test results indicate that patients do not have the knowledge to evaluate the individual sub-dimensions of the technical dimension of service quality and form an opinion on the quality of the health care process based on the sub-dimensions of the functional dimension of quality, that is, non-technical dimensions of quality.

However, the situation in the overall gap analysis is more favorable after the inclusion of weights, which means that the mismatches between perception and expectations are generally far greater in those sub-dimensions of the services to which patients attach the greatest importance. This confirms the fact that, in addition to the perception of individual dimensions, sub-dimensions must include user priorities in the analysis of the perception of quality.

Key words: *technical and functional quality, perceptions and expectations of patients*

JEL classification: *M53*

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PREGLEDNI NAUČNI RAD / OVERVIEW SCIENTIFIC PAPER

STANJE I PERSPEKTIVE FORENZIČKOG RAČUNOVODSTVA U REPUBLICI SRPSKOJ

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Sažetak: *Vještačenje je jedna od osnovnih aktivnosti prikupljanja dokaza u privrednom kriminalu. Ova aktivnost je ujedno i najviše kritikovana jer može znatno usporiti sudski postupak, naročito u složenim vještačenjima, kao što su to predmeti iz finanijsko-ekonomske oblasti. U novije vrijeme se za potrebe vještačenja, na tim predmetima, angažuju ekspeti iz oblasti forenzičkog računovodstva - forenzičke računovođe. Republika Srpska je na vrijeme prepoznala potrebu za ovom profesijom, te joj dala zakonski legimitet. Međutim, mali su pomaci učinjeni u njenoj inplementaciji u praksi. Rad se bavi analizom potreba i stanja forenzičkog računovodstva u Republici Srpskoj, te na osnovu toga daje preporuke za njegov efikasniji rad, odnosno prikupljanje kvalitenijih informacija koje bi bile od pomoći u finansijskim istragama i dokazivanju određenih krivičnih djela. S obzirom da je profesija fornzičkog računovođe interdisciplinarna i da obuhvata cijeli spektar različitih usluga, potrebno je izvršiti određenu unifikaciju kriterija na globalnom nivou. Za sada takvi kriteriji ne postoje, niti ima naznaka za njihovim usaglašavanjem. U svijetu postoje razne institucije za sertifikaciju, a kao standard za potrebna znanja vještine i sposobnosti se uzimaju kriteriji utvrđeni od strane američkog Međunarodnog udruženja za certifikaciju istražitelja prevara (ACFE - Association of Certified Fraud Examiners), koje vrši sertifikaciju za ovlaštene finansijske forenzičare, namjenjene računovođama specijalizovanim za forenzičko računovodstvo. Uspostavljeni kriteriji nude solidnu osnovu za detekciju, prikupljanje i prezentovanje dokaza u postupku vještačenja kod finansijskih prevara. Za sada ostaje nejasno da li forenzički računovođa djeluje samostalno ili u sklopu interdisciplinarnog tima.*

Opšta znanja koja trenutno nude edukatori u Republici Srpskoj ne mogu donijeti određeni kvalitet u specifičnim vrstama usluga, koje prevashodno zahtijevaju specijalistička znanja. Za svaku vrstu usluga je potrebno definisati osobine, karakteristike i potrebna znanja i vještine koje mora posjedovati forenzički računovođa. U skladu sa takvim zahtjevima trebalo bi modifikovati i obrazovne programe za forenzičko računovodstvo kroz davanje smjernica za njihovu

homogenizaciju. Obrazovni programi moraju biti usklađeni sa djelovanjem ostalih sudionika u implementaciji forenzičkog računovodstva, poput korisnika, pružaoca usluga, edukatora i sl. Takvim sinergijskim djelovanjem moguće je podići profesionalnu osposobljenost forenzičkog računovođe i uskladiti je sa zahtjevima tržišta. Krajnji obrazovni ishod je edukovati forenzičkog računovođu tako da posjeduje specijalistička znanja iz oblasti računovodstva, prava i revizije, kao i vještine u efikasnom pružanju usluga forenzičkog računovodstva. Vještačenja forenzičkog računovodstva nalažu stalno usavršavanje znanja i sticanje vještina prema smjernicama iz međunarodnih standarda i preporuka, kao i dobrim praksama iz okruženja.

Cilj rada je da se afirmiše profesija forenzičkog računovodstva i zanimanje forenzičkog računovođe, kao eksperta sa specijalističim znanjima i vještinama

Budući fokus treba biti na poboljšanju profesionalnog integriteta forenzičkog računovođe za složenije predmete privrednog kriminala, ubrzavanje izrade nalaza i mišljenja, pojačanje nadzora nad njihovim radom, te sankcionisanje neprofesionalnih ponašanja.

Ključne riječi: *forenzičko računovodstvo, finansijski kriminal, finansijske istrage, dokaz u finansijskoj istrazi.*

JEL: *M41 - Računovodstvo*

YALE University: *M41 - Accounting*

UVOD

Analiza stanja i perspektive forenzičkog računovodstva u Republici Srpskoj sa ciljem razumijevanja problema sa kojima se susreću tužilaštva i policija prilikom prikupljanja dokaza za procesuiranje složenih slučajeva finansijskog kriminala. Važna oblast u kojoj je moguće narušiti integritet pravosuđa je oblast prikupljanja dokaza u istragama. U prikupljanju dokaza značajnu ulogu imaju vještaci, koji kroz kvalitet dokaza mogu doprinijeti snazi optužnice. Međutim, iskustva tužilaštva govore da vještaci često nisu osposobljeni za sačinjavanje upotrebljivih nalaza, posebno u rokovima koji se od njih očekuju. Krajnji rezultat je usporavanje procesa istrage i podizanja optužnica, posebno u predmetima finansijskog kriminala. Analiza koja je provedena u BiH, tokom 2017. godine od strane Pravosuđa BiH, ukazala je na osnovne probleme sa kojima se susreće tužilaštvo u slučajevima angažovanja vještaka:

1. "Rapoloživost kvalifikovanih i iskusnih vještaka koji mogu izraditi kvalitetan nalaz i mišljenje u složenim predmetima privrednog kriminala i korupcije;
2. Odbijanje vještaka da uzmu predmete u rad, i dugi periodi podnošenja nalaza i mišljenja;

3. Nedostatak finansijskih resursa za sudove i tužilaštva za angažovanje vještaka i nepostojanje sistemskog pristupa utvrđivanju iznosa naknade i nagrade za rad vještaka;
4. Nedostatak integriteta kod nekih vještaka koje često koriste sudovi i tužilaštva, i problemi sa nadzorom vještaka i njihovim radom" (Pravosuđe BiH, 2017: XIII).

Učesnici istraživanja su, isto tako, došli do spoznaje da nedostaje vještaka koji imaju odgovarajuća znanja i iskustva na vještačenju u složenim predmetima finansijskog kriminala, posebno u oblasti bankarstva, berze, fodova, pranja novca, finansijskog izvještavanja i sl. Drugim riječima, izražen je nedostatak forenzičkog pristupa vještačenju u ovim oblastima. Cilj ovog rada je da spozna potrebu i dostignuti stepen razvoja forenzičkog računovodstva u Republici Srpskoj, te na osnovu toga odrede njegove perspektive.

POJAM I OBUHVAT FORENZIČKOG RAČUNOVODSTVA

U protekloj deceniji jača uloga i značaj forenzike, kao nauke koja se kroz interdisciplinarni pristup bavi utvrđivanjem činjenica za potrebe sudskih i upravnih postupaka. Rast potražnje za forenzičkim uslugama doveo je do okretanja forenzike uskim specijalnostima, od kojih se posebno ističe forenzičko računovodstvo. Forenzičko računovodstvo podrazumijeva "primjenu računovodstvenih, revizorskih i svih drugih finansijskih vještina i znanja u rješavanju finansijskih odnosa, činjenica i transakcija koje mogu biti ili su već predmet sudskog spora, ili pak, utvrđivanju da li se pogrešno radi, pogrešno prikazuje ili izvještava, postoji li korupcija, postoji li prevara ili krađa, iskrivljavanje informacija, krivotvorenje i sl." (SRR RS, 2013: 1).

U skladu sa utvrđenim zadacima forenzičkog računovodstva porasla je potražnja za osobama koje imaju dovoljno znanja iz oblasti ekonomije, da bi mogli tragati za dokazima ekonomsko-finansijske prirode, koji su potrebni policiji i javnom tužilaštvu za potrebe podizanja optužnice, a to su forenzičke računovođe.

Forenzički računovođa je "osoba koja svoja znanja i vještine iz računovodstva, revizije i finansija primjenjuje u razrješavanju finansijskih odnosa, činjenica i transakcija ali i utvrđivanja grešaka, korupcije, krađa, nezakonitih poslova, krivotvorenja i sl." (SRR RS, 2013: 1).

Navedeno govori da je forenzički računovođa angažovan u istragama finansijskog kriminala. Često se pojam finansijski kriminal poistovjećuje sa pojmom

privrednog kriminala, zbog čega je potrebno definisati ove pojmove. U definisanju privrednog kriminala najčešće se koristi definicija Edvina Saterlanda, predsjednika Američkog sociološkog udruženja, prema kojem je privredni kriminal "kriminal koji se javlja u oblasti privrednog poslovanja čije su forme ispoljavanja najčešće u mahinacijama u vezi sa kupoprodajom raznih akcija, lažnim reklamiranjem robe, lažnim iskazivanjem finansijskog stanja i poslovanja pojedinih korporacija, podmićivanjem poslovnih partnera, neposrednim i posrednim podmićivanjem državnih službenika, a u cilju obezbjeđenja povoljnih poslovnih aranžmana, pronevjerama, nenamjenskim trošenjem sredstava, poreskim utajama i sl" (Bijelić, 2016: 9).

Pojam finansijskog kriminala je usko vezan za finansijske istrage koje možemo posmatrati dvojako, u užem i širem smislu.

U užem smislu finansijska istraga podrazumijeva praćenje tokova novca, koje se provodi skupa sa krivičnom istragom, a u cilju da se otkrije prihod i imovina proistekla izvršenjem krivičnog djela (Zakon o oduzimanju imovine, 2018: član 9).

U širem smislu pojam istrage finansijskog kriminala obuhvata "istragu finansijskih poslova povezanih s kriminalnom aktivnošću, radi: otkrivanja razmera kriminalnih mreža odnosno razmera kriminala; otkrivanja imovinske koristi od krivičnih dela, terorističkih sredstava ili bilo koje druge imovine koja jeste ili koja bi mogla da postane predmet oduzimanja, kao i radi otkrivanja te imovine; pribavljanja dokaza koji se mogu koristiti u krivičnim postupcima" (Strategije istraga finansijskog kriminala, 2015: 1).

Navedene definicije govore da je finansijski kriminal uža kategorija od privrednog kriminala. Finansijki kriminal je više vezan za istrage tokova novca i finansijskih transakcija u cilju krivičnog gonjenja, dok privredni kriminal obuhvata i nefinansijske tokove, kao što su npr. otuđenje imovine, lažno reklamiranje i sl.

POTREBNI KRITERIJI ZA STICANJE ZVANJA FORENZIČKOG RAČUNOVOĐE

Porast zanimanja za forenzičko računovodstvo javio se usljed velikih šteta u privredi uzrokavanih raznim oblicima prevara[1] i lažnim finansijskim izvještavanji-

[1] "Prevara se može definisati kao svaka aktivnost čiji je primarni cilj sticanje finansijske koristi na nezakonit način. Pod pojmom prevara podrazumijevamo korupciju, protivpravno prisvajanje imovine i prevarno finansijsko izvještavanje" , Tomaš, D. i dr., (2017). COSO okvir i organizovanje interne revizije za borbu protiv prevara, Emc Review, Vol. VII, No.II., Apeiron, Banjaluka.

ma. Broj i složenost sudskih sporova u oblasti finansijskog kriminala se povećava, što zahtijeva specifična znanja i vještine iz oblasti ekonomije. Forenzičko računovodstvo obuhvata posebnu vrstu finansijskog znanja čiji je cilj otkriti i spiječiti (Koletnik, 2008: 120-121).

Znanja koja treba da posjeduje računovođa forenzičar nisu obuhvaćena standardizacijom, ali je sigurno da ona moraju biti interdisciplinarna, dopunjena adekvatnim vještinama iz određenih oblasti. Iako u svijetu postoje razne institucije koje vrše sertifikaciju, kao standard možemo uzeti međunarodnu organizaciju ACFE (sa sjedištem u SAD) koja vrši sertifikaciju za ovlaštene finansijske forenzičare, namjenjene računovođama specijalizovanim za forenzičko računovodstvo. Potrebna znanja, vještine i sposobnosti za sticanje sertifikata u ovoj instituciji prikazani su u tabeli1:

Tabela 1. Kriteriji za sticanje sertifikata finansijskog forenzičara, namjenjene računovođama specijalizovanim za forenzičko računovodstvo, u međunarodnom udruženju za certifikaciju (ACFE)

Znanja	Vještine	Sposobnosti
Kriminal bijelog okovratnika	Pisanje izvještaja	Međuljudska komunikacija
Pranje novca	Svjedočenje kao vještak	Verbalna komunikacija
Kršenja GAAP-a ili GAAS-a[1]		Pismena komunikacija
Prevare (u: telemarketingu, ugovorima,		Fokusiranost na detalje
hartijama od vrijednosti, fin.izvještajima,		Analitičnost
stečaju, kreditnim karticama, otuđenju		Integritet
imovine) i pronevjere		Objektivnost
Analiza finansijskih podataka		Nezavisnost
Analiza integriteta dokaza		Kredibilitet
Dizajn kompjuterskih aplikacija		
Procjena štete		
Traženje nelegalnih sredstava		
Pronalaženje skrivene imovine		
Pregledi dubinske analize		
Prikupljanje forenzičkih dokaza		
Računovodstveni postupci		
Pravni sistem i njegovi postupci		
Regresiona analiza		
Kompjuterske aplikacije		

Izvor: Association of Certified Fraud Examiners (ACFE), Forencic Accountant – Education (Knowledge, Skills and Abilities, https://www.acfe.com/career-path-forensic-accountant.aspx%20

U Republici Srpskoj je, krajem 2012. godine, uvedeno profesionalno-stručno zvanje sertifikovanog forenzičkog računovođe. Sertifikaciju vrši Savez računovođa i revizora RS. Predhodno se provodi instruktivna nastava i provjera znanja iz

sljedećih oblasti: 1) Uvod u forenzičko računovodstvo, 2) Forenzičko računovodstvo složenih transakcija, 3) Forenzika PDV-a, 4) Forenzika gotovinskih tokova, 5) Kreativno računovodstvo bilansa, 6) Sudska vještačenja i stečajevi, 7) Zaštita konkurencije, 8) Forenzička revizija, 9) Procjena vrijednosti preduzeća, 10) Forenzičko računovodstvo u IT okruženju, 11) Forenzika finansijskih instrumenata i 12) Korporativna bezbjednost i javne nabavke" (SRR RS, 2013: član 4).

Uslovi za polaganje su određeni stepenom obrazovanja, uz prihvatanje Kodeksa etike za profesionalne računovodstvene eksperte, kao i obaveze kontinuiranog profesionalno-stručnog usavršavanja, koje se obavlja u formi individualnog i formalizovanog angažmana. Individualna edukacija se valorizuje kroz proučavanje stručne literature u izdanju Saveza računovođa i revizora RS ili društava koja on ovlasti. Formalizovanu edukaciju provodi Savez i ona se kvantifikuje bodovanjem učešća kandidata u pojedinim organizacionim formama, poput kongresa, simpozijuma, jednodnevnih seminara, seminara iz oblasti forenzičkog računovodstva, kao i pretplata na časopis. Licenca za izdati sertifikat se obnavlja svake dvije godine, uz dokaz da je kandidat ostvario 40 časova profesionalne edukacije, od čega 50% kroz seminare iz forenzičkog računovodstva.

NADLEŽNOST ZA FINANSIJSKE ISTRAGE U REPUBLICI SRPSKOJ

Finansijske istrage u Republici Srpskoj pokreće i sa njima rukovodi javni tužilac. U okviru Republičkog javnog tužilaštva Republike Srpske formirano je posebno odjeljenje za suzbijanje korupcije organizovanog i najtežih oblika privrednog kriminala. Prema Zakonu o suzbijanju korupcije, organizovanog i najtežih oblika privrednog kriminala, sa kojim je regulisano formiranje tog odjeljenja, predviđena je i mogućnost organizovanjea finansijske forenzike. "U Tužilaštvu za organizovani kriminal i posebnim odeljenjima viših javnih tužilaštava iz ovog zakona može se obrazovati služba finansijske forenzike. Poslove službe finansijske forenzike obavljaju finansijski forenzičari. Finansijski forenzičar je lice koje pomaže javnom tužiocu u analizi tokova novca i finansijskih transakcija u cilju krivičnog gonjenja. Finansijski forenzičar je državni službenik koji poseduje posebna stručna znanja iz oblasti finansija, računovodstva, revizije, bankarskog, berzanskog i privrednog poslovanja, a koji je završio i specijalizovanu obuku u Pravosudnoj akademiji iz oblasti krivičnog prava" (Zakon o org. nadležnosti, 2018: član 19).

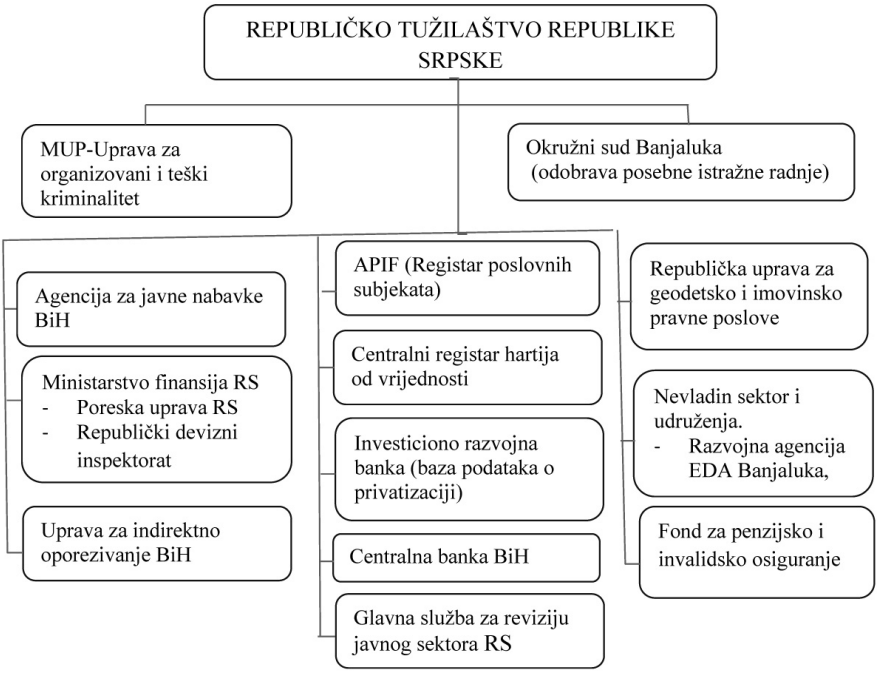
U otkrivanju krivičnih djela finansijskog kriminala u Republici Srpskoj, pored tužilaštva, ključnu ulogu ima i policija. U okviru Ministarstva unutrašnjih poslova Republike Srpske djeluju dvije organizacione jedinice: 1) Uprava za organizo-

vani i teški kriminalitet i 2) Uprava kriminalističke policije, koja u svom sastavu ima Odjeljenje za privredni kriminalitet i korupciju, Odjeljenje za finansijske istrage i pranje novca i Odjeljenje za visokotehnološki kriminalitet.

Nesporna uloga u istragama finansijskog kriminala u Republici Srpskoj pripada i sljedećim institucijama i organima: Poreskoj upravi, Upravi za indirektno oporezivanje, Registru privrednih subjekata (pri Agenciji za posredničke i informatičke usluge), Centralnom registru hartija od vrijednosti, Centralnoj banci BiH, Investiciono razvojnoj banci Republike Srpske, Glavnoj službi za reviziju javnog sektora, Republičkoj upravi za geodetske i imovinsko pravne poslove, te svim organima vlasti i institucija, kao i nevladinom sektoru i udruženjima.

Za obezbjeđenje dokaza finansijske prirode, pored entitetskih institucija, uključene su republičke i međunarodne državne institucije, kao i čitava mreža privatnih i nevladinih institucija. Navedeni represivni organi su dužni, u okvirima svoje nadležnosti, konstatno razmjenjivati informacije u cilju obezbjeđenja što kvalitetnijih dokaza u različitim finansijskim istragama.

Slika 1. Ograni represije uključeni u finansijske istrage u Republici Srpskoj



Izvor: Autor

Ako se ima u vidu da je BiH složena država od 2 entiteta i jednog distrikta, onda je razumljivo da se javljaju poteškoće u koordinaciji rada više institucija, a posebno zbog različitosti zakonskog okvira koji reguliše njihove nadležnosti. U svim strategijama vezanim za suzbijanju korupcije, organizovanog i najtežih oblika privrednog kriminala naglašava se potreba saradnje svih subjekata u borbi protiv organizovanog kriminala, sa mogućnošću bolje razmjene podataka, rada u zajedničkim istragama, te kreiranju efikasnijeg informacionog sistema u skladu sa nadležnostima.

Nadležnost na poslovima suzbijanja organizovanog kriminala na nivou BiH imaju Državna agencija za istarge i zaštitu (SIPA) i Granična policija BiH, koje djeluju pri Ministarstvu sigurnosti BiH. Takođe, u okviru Direkcije za koordinaciju policijskih tijela BiH postoji sektor za međunarodnu operativnu policijsku saradnju, koji je zadužen za razmjenu informacija u međunarodnoj policijskoj saradnji, kroz saradnju sa INTERPOL-om, EUROPOL-om i SELEC-om, kao i putem akreditovanih policijskih oficira za vezu u BiH. U okviru svoje nadležnosti na poslovima suzbijanja privrednog kriminala uključen je i Sud BiH i Tužilaštvo BiH putem formiranog odjela u svom sastavu – Poseban odjel za organizovani kriminal, ekonomski kriminal i korupciju. U okviru nevladinog sektora i udruženja, na poslovima suzbijanja privrednog kriminala djeluju „Transparency International“ u BiH, i Antikorupcijska mreža u BiH - „Account“.

Navedeno govori o složenosti institucionalnog okvira, koji u slučaju neadekvatne koordinacije može umanjiti efikasnost finansijskih istraga. U Strategiji za borbu protiv korupcije 2015. - 2019. godine i Akcionom planu za provođenje Strategije (Strategija za borbu protiv korupcije, 2014: 38), ukazuje se na nedostatak saradnje između policije i javnog tužilaštva s jedne strane i državnih organa koji posjeduju činjenice bitne za tok istrage s druge strane, što se negativno odražava na uspješnost otkrivanja počinilaca krivičnih djela finansijskog kriminala. Osim toga, postoje slabosti u saradnji u dijelu razmjene informacija, koje su u većini slučajeva loše obrađene, sa izraženim zakašnjenjem i kao takve neupotrebljive za tok istrage. Finansijske transakcije su često složene i zahtijevaju specijalistička znanja, koja tužioci nemaju. Zbog toga se potencira važnost finansijskog forenzičara (u tužilaštvu) koji u ovakvim slučajevima može doprinijeti efikasnijoj finansijskoj istrazi.

PROBLEMI OCJENE DOKAZA U REPUBLICI SRPSKOJ

Kao dokazno sredstvo u sprovođenju sudskog postupka koristi se vještačenje.

Ocjena vještaka se koristi kada sud ne može samostalno rasvijetliti okolnosti i adekvatno ocijeniti dokaz. Vještačenje mora biti objektivno uz validne iskaze i stručne nalaze koji se ne mogu oboriti na sudu. U istražnim radnjama značajno mjesto pripada računovodstvu i zbog toga je izražena njegova funkcija u rješavanju slučajeva privrednog kriminala. Prema Analizi sistema angažovanja vještaka u predmetima korupcije i organizovanog privrednog kriminala koja je izvršena u sklopu USAID-ovog projekta pravosuđa BiH, u decembru 2017.godine, "85% anketiranih tužilaca navodi da se u praksi iskazuje potreba za dodatnim obrazloženjem nalaza i mišljenja vještaka, dok 47% anketiranih tužilaca navodi da se u praksi dešavaju slučajevi da dostavljeni nalaz i mišljenje nisu ispunjavali upute iz naredbe" (Pravosuđe BiH, 2017: 63).

Dodatne naredbe za vještačenje su doprinijele povećanju troškova i odugovlačenju krivičnog postupka pri čemu su neka od tužilaštava čekala na izradu nalaza i mišljenja vještaka u prosjeku od 207 dana. U istoj analizi se navodi da su "neki od tužilaca prenijeli svoja iskustva koja ukazuju na to da su određena vještačenja finansijsko-ekonomske struke u tolikoj mjeri nekvalitetna da ne mogu poslužiti kao dokaz pred sudom" (Pravosuđe BiH, 2017: 64).

Dalje se u analizi navodi da su "učesnici u istraživanju posebno naveli da razvoj sofisticiranih metoda zloupotrebe napretka u finansijskom poslovanju multiplicira probleme zbog nedostatka vještaka sa iskustvom u sljedećim specifičnim oblastima: bankarsko-finansijsko poslovanje, hedge fondovi, pranje novca, korporativno upravljanje, berzansko poslovanje, te oduzimanje imovine stečene krivičnim djelom u smislu dokazivanja obima nezakonito stečene imovine koja je u nesrazmjeri sa zakonitim prihodima. Posebno je ukazano na nedostatak forenzičkih vještaka, odnosno nedostatak forenzičkog pristupa vještačenju u ovoj oblasti" (Pravosuđe BiH, 2017: 65). Jedan od uočenih trendova je da vještaci finansijsko-ekonomske struke izbjegavaju angažovanje na predmetima u krivičnom postupku, i usmjeravaju se na vještačenja u privrednim i parničnim predmentima zbog primamljivije zarade.

Prema članu 44. Zakona o vještacima Republike Srpske predviđene su novčane kazne za odbijanje vještačenja i to: od 2000 KM - 5000 KM za pravno lice, a za odgovorno lice u pravnom licu od 200 KM -1000 KM, osim u slučajevima ako je drugačije predviđeno pravilima postupka.

Zakon o vještacima Republike Srpske nije u dovoljnoj mjeri regulisao nadzor nad radom i kvalitetom nalaza i mišljenja vještaka. Ovaj Zakon je stavio fokus

na uslove i postupak imenovanja vještaka, njegova prava i dužnosti i druga pitanja od značaja za njihov rad. Nadzor vještaka vrši organ koji vodi postupak ili druga lica, mada oni ne mogu spriječiti prepisivanje nalaza sa sličnuh predmeta. Za povrede dužnosti vještaka, mjere izriče Ministar pravde na prijedlog stručne komisije koju čine jedan član iz Ministarstva pravde RS i 2 člana iz reda vodećih stručnjaka iz određene oblasti.

Prema analizi Pravosuđa BiH u Republici Srpskoj je tokom 2015. godine bilo ukupno 53 finansijsko-ekonomska vještačenja, uz angažovanje 15 vještaka (tabela 2).

Tabela 2. Pregled finansijsko-ekonomskog vještačenja u RS u 2015 god.

Okružno javno tužilaštvo	Broj angažovanih vještaka	Broj vještačenja
Banjaluka	3	6
Istočno Sarajevo	3	20
Trebinje	1	7
Doboj	2	6
Bijeljina	6	14

Izvor: Pravosuđe BiH, Analizi sistema angažovanja vještaka u predmetima korupcije i organizovanog privrednog kriminala, Sarajevo, 2017., str. 44.

Navedena finansijsko-ekonomska vještačenja su se odnosila na sumnje da je izvršeno krivično djelo "zloupotrebe položaja i ovlaštenja" ili "pronevjera u službi". Inače, najčešći razlog za ova vještačenja su "određivanje visine pribavljene protupravne imovinske koristi, ili visina prouzrokovane štete" (Pravosuđe BiH, 2017: 61).

PERSPEKTIVE EKONOMSKO FINANSIJSKE FORENZIKE U RS

Sve komplikovaniji načini izvršenja kriminalnih radnji i njihov stalni porast zahtijevaju proaktivnije vođenje finansijskih istraga. U tom smislu nameće se potreba formiranje stručnih timova osoba različitih profila, koji svojim djelovanjem mogu pomoći u pribavljanju dokaza za učinjena krivična djela i tako doprinijeti podizanju kvaliteta istrage na viši nivo. Ovdje se prevashodno misli da su, pored uključivanja policije i tužilaštva, neophodna znanja i vještine računovodstvenih i finansijskih forenzičara, posebno u dijelu finansijskih istraga.

Za veću prepoznatljivost forenzike potrebno je na fakultetima ekonomskog usmjerenja uvoditi više predmeta koji se tiču forenzičkog računovodstva, te povećati istraživački rad iz ove oblasti. Takođe, neophodna je transparentnost podataka o društvima protiv kojih je pokrenut postupak vezan za privredni kriminal

i lažno finansijsko izvještavanje, kako bi se povratilo povjerenje javnosti da će počinioci krivičnih dijela biti i sankcionisani, a ujedno podaci mogu poslužiti kao primjer za izučavanje oblasti ekonomsko-finansijske forenzike.

Iako je relativno mlada nauka, forenzika bi mogla biti u narednom periodu jedna od važnijih oblasti, zbog čega je razumljivo njeno dalje unapređenje, i u oblasti teorije, i u oblasti prakse. Doprinos boljem stanju ekonomsko finansijske forenzike u RS se može postići kroz:

- Uvođenje predmeta finansijske forenzike, odnosno forenzičkog računovodstva na fakultetima ekonomskog usmjerenja,
- Uvođenje stručnog profesionalnog zvanja ovlašteni forenzički računovođa,
- Stalno usavršavanje kroz kontinuiranu saradnju akademskih zajednica sa tržištem rada (Hunjet, 2014: 187),
- Uređivanje pitanje naknade za rad vještaka kako bi se povećao interes za vještačenjem na složenim predmetima iz oblasti finansijskog kriminala,
- Utvrđivanje kriterije i procedure za izbor i pozivanje vještaka, te za praćenje njihovog rada,
- Provođenje kontinuirane edukacije vještaka u saradnji sa tužilaštvom i
- Uspostavljanje kontinuiranog nadzora nad radom vještaka i kvalitetom njihovim nalaza.

ZAKLJUČAK

Forenzičko računovodstvo je prilično mlada naučna disciplina koja je našla svoju praktičnu primjenu u otkrivanju i sprečavanju svih vidova prevara i pronevjera. Jedan od važnih dijelova forenzičkog računovodstva je ekonomsko-finansijsko vještačenje koje se koristi u ocjeni činjenica validnih za sud. Predmet našeg istraživanja je bila validnost dokaza u oblasti finansijskog kriminala, te neophodnost razvijanja profesije forenzičkog računovođe. Analiza sistema angažovanja vještaka u predmetima korupcije i organizovanog privrednog kriminala, provedena od strane Pravosuđa BiH u 2017. godini, upućuje na osnovne probleme sa kojima se susreće tužilaštvo u slučajevima angažovanja vještaka, a to su nedostatak kvalifikovanih i iskusnih vještaka za složenije predmete privrednog kriminala, odbijanje predmeta od strane vještaka, nedostatak integriteta kod nekih vještaka, odugovlačenja izrade nalaza i mišljenja, te problemi sa nadzorom vještaka i njihovim radom. Navedeno upućuje na potrebu angažovanja eksperata koji mogu doprinijeti kvalitetu vještačenja, odnosno sastavljanja upotrebljivih nalaza i mišljenja u razumnim rokovima, a što se uklapa u profil forenzičkog računovođe. Forenzički računovođa treba da da svoj doprinos na poslovima vještačenja

u oblasti bankarstva, berze, fodova, pranja novca, finansijskog izvještavanja i sl. Sistem vještačenja, sa posebnim fokusom na finansijsko-ekonomska vještačenja u Republici Srpskoj, mora biti podvrgunut stalnom unapređenju prema odrednicama međunarodnih standarda i preporuka, te dobrim praksama iz regije. Preporuke se odnose uglavnom na otklanjanje već navedenih problema sa kojima se susreće tužilaštvo u slučajevima angažovanja vještaka, te sankcionisanje neprofesionalnog ponašanja. To je ujedno i način da se ojačaju kapaciteti tužilaštva vezani za istrage i procesuiranje predmeta finansijskog kriminala.

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STATUS AND PERSPECTIVE OF FORENSIC ACCOUNTING IN REPUBLIKA SRPSKA

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Abstract: *Expert testimony is becoming one of the main validation activities in financial crime. It is also amongst the most criticized ones because it can significantly slowdown court proceedings, especially in complex expert assessments, which is often the case with economic and financial subjects. Forensic accounting experts, which are also known as forensic accountants, are increasingly being hired to provide expert evaluation on these subjects. Republika Srpska recognized the need for this profession timely by granting it legal legitimacy.*

However, little progress has been made in its implementation in practice. This paper analyzes requirements and state of forensic accounting in Republika Srpska, and accordingly makes recommendations for further improvements such as gathering information of better quality that would help in financial investigations. Profession of forensic accountant is interdisciplinary and covers full range of different services, which signals the necessity to unify the criteria globally. So far, no such criteria exist nor are there any indications harmonization. Standard for required knowledge has been set by the American Association of Certified Fraud Examiners (ACFE), which certifies financial forensic professionals with certificate in forensic accounting. The established criteria offer a solid basis for the detection, collection and presentation of evidence in the financial fraud expert process. Currently it remains unclear whether the forensic accountant acts alone or as part of an interdisciplinary team.

The knowledge currently offered by educators in Republika Srpska cannot bring quality in specific types of services, which primarily require specialist knowledge. For each type of service, it is necessary to define the characteristics, required knowledge and skills that a forensic accountant must possess. In accordance with such requirements, educational programs for forensic accounting need to be modified by providing guidance on their homogenization. Educational programs must be consistent with the actions of other participants in the implementation of forensic accounting, such as users, providers, educators, etc. With synergistic action, it is possible to raise the professional competence of the forensic accountant and align it with the requirements of the market. The ultimate educational outcome is to educate a forensic accountant so that he or she has specialist knowledge in accounting, law and auditing, as well as skills in the effective forensic accounting. Forensic accounting requires continuous learning and skills acquisition in accordance with the guidelines of international standards and recommendations, as well as good practical application.

The aim of this paper is to promote forensic accounting and the profession of forensic accountant as an expert with specialist knowledge and skills.

The future focus should be on improving the professional integrity of expert witnesses relating to more complex economic crimes, accelerating final report preparation, enhancing supervision of expert witnesses and their work, and sanctioning unprofessional behaviors.

Keywords: *forensic accounting, financial crime, financial investigations, evidence in financial investigation.*

JEL: *M41 - Accounting*

YALE University: *M41 – Accounting*

(Footnotes)

1 GAAP (engl. Generally Accepted Accounting Principles) - Opšte prihvaćena računovodstvena načela; GAAS (engl. Generally Accepted Auditing Standard) - Opšte prihvaćeni revizorski standardi

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PREGLEDNI NAUČNI RAD / OVERVIEW SCIENTIFIC PAPER

FOREIGN DIRECT INVESTMENT TRENDS

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Abstract: *The beginning of this century is characterized by deepening globalization and one of the main features of this process is global foreign direct investment flows. The relevance of foreign direct investment as a source of economic growth is inevitable and it has sound theoretical foundation. Despite this fact, many forces shaping the global economy receive a significant amount of attention, but foreign direct investment is often overlooked. Technological progress, trade and foreign direct investment are interrelated. Namely, foreign direct investment has greatly accelerated the spread of innovation and technology, while the technological advances especially in the era of Industry 4.0 have been driving the dynamics of foreign direct investment. Due to expected positive impacts, many countries are continuing policy efforts aimed at attracting foreign direct investment. However, foreign direct investment is experiencing new trends. Over the last few decades the global map of inward and outward foreign direct investment has changed significantly. There are new players with increasing roles in the global foreign direct investment area which are reshaping the world economy. Global foreign direct investment is undergoing a shift as emerging markets countries both inflows and outflows rise dramatically. For example, China's outbound foreign direct investment has been growing dramatically in recent years, and impacted significant shifts in the global economy. Motives for foreign direct investment, as well as the type are changing due to globalization and new trends, especially high liberalization of trade. The proliferation of global value chains also influenced foreign direct investment trends. One of the examples is necessity of rethinking the framework on motives of foreign direct investment when analyzing emerging market multinational enterprises and their interdependent relationships within global value chains. The contribution of the paper is three-fold. Firstly, the paper gives an overview of key global and regional foreign direct investment trends. Secondly, key factors, as well as potential impacts of these changes are explored. Thirdly, paper offers recommendations for new investment policies.*

Key words: *foreign direct investment, global trends, global value chains, Industry 4.0*

JEL classification: *F2*

INTRODUCTION

According to John H. Dunning (1998) there are four types of foreign direct investment (FDI), depending on the motive for investment: (1) resource seeking, (2) market seeking, (3) efficiency seeking and (4) strategic asset seeking. Also, there are three main determinants of international involvement: (1) ownership advantages, (2) location advantages and (3) internalization advantages (Dunning, 1980). However, Chiara Franco et al. (2010) distinguished three main motives for foreign direct investment: (1) resource seeking, (2) market seeking and (3) non-marketable asset seeking. Maria – Ramona Sârbu and Iuliana Mazur Gavrea (2014) conclude their study on motive for foreign direct investment with the conclusion that the decision to invest in particular location is based on the analysis of various economic, political and social factors and the weight of each factor depends upon the motivation of foreign investor.

Industry 4.0 term, although has its origins in Germany, is commonly used to refer to the Fourth industrial revolution. Industry 4.0 refers to new technologies such as Internet of Things (IoT), big data, robotics, additive manufacturing, artificial intelligence, 3D printing, blockchain, etc.

The Fourth industrial revolution differs in speed, scale, complexity and transformative power in comparison to previous revolutions (Min Xu, et al., 2018).

By the development of Industry 4.0 policy focus changes from specialisation and increase of productivity to the industrial ecosystem development. Key elements of the industrial policies in the Fourth industrial revolution are considered to be technical capabilities development, innovation in production, learning economy, focus on sustainable development goals, public-private collaboration and transfer of knowledge and enabling entrepreneurship environment (A.T. Kearney, 2018).

Impacts of Industry 4.0 range from the way that individual organizations are organized over macro-economic challenges to private life and shouldn't be underestimated (Filip de Beule and Ysabel Nauwelaerts, 2018). The Fourth industrial revolution have obstacles such as income inequality, cybersecurity and ethical dilemmas (Min et al., 2018) that should be tackled by relevant policies. Of special importance is digital economy which can be defined as the application of internet-based technologies to the production and trade of goods and services (Bruno Casella and Lorenzo Formenti, 2018).

The paper consists of four parts. After the introduction follows the literature view on the issues of the Industry 4.0 and global value chains with special emphasis on the impact on foreign direct investment, while the third part gives an overview and discusses the global foreign direct investments flows. The fourth part of the paper is the conclusion.

ERA OF THE INDUSTRY 4.0 AND GLOBAL VALUE CHAINS

The Fourth industrial revolution could improve the lives of people, but at the same time generates challenges and risks, that may harm inclusive growth (Lilla Sarolta Balogh, 2017).

Min et al. (2018) define main opportunities that the Fourth industrial revolution brings: lower barriers between inventors and markets; more active role for the artificial intelligence; integration of different technics and domains; improved quality of our lives, for example using robotics and more connected life via Internet.

The Fourth industrial revolution will disrupt global value chains, meaning the transformation of production, distribution, design, consumption, reuse, etc. (A.T. Kearney, 2018). Industry 4.0 is definitely changing business landscape and will impact on the location as well as the extent of FDI as the need for global flows of FDI (de Beule and Nauwelaerts, 2018). Min et al. (2018) claim that changes introduced by the Fourth industrial revolution will influence also shifts in power, wealth and knowledge.

According to de Beule and Nauwelaerts (2018), other indicators for investment decisions will become more relevant and the level of labour costs might become less important compared to the openness of the economy, stimulation for innovation, availability of adequate infrastructure, etc. For example, advantages of less developed countries gained through cheaper labour can vanish due to artificial intelligence exploitation in more developed countries and substation of labour. Also, digital aspect became extremely important. However, these changes will influence in less demand for lower-skilled labour, but increase in demand for higher-skilled labour who can also monitor and drive further innovation and development. Consequently, low labour cost may become less important from an FDI perspective. Since the great potential of technological improvements to cut costs, FDI may increase in locations with higher technological and agglomeration capabilities (de Beule and Nauwelaerts, 2018).

Digital economy has important implications for foreign direct investment (Casella and Formenti, 2018). Study conducted by Casella and Formenti (2018) showed that multinational companies in highly digitalized industries tend to invest less than traditional multinational companies. According to their findings, these companies concentrate their operations in a few highly developed countries. Not of less importance, this study showed that investment patterns of multinational companies in highly digitalized industries are determined by fiscal and financial motives than those of traditional multinational companies.

One of the most interesting findings of A.T. Kearney (2019) is that investors do not consider country level any more for their potential investment, but regional, or even city level. So, investors changed their focus of evaluation of possible investment destination. A.T. Kearney (2019) explains it is because of the multi-localism. According to A.T. Kearney (2018) multi-localism is characterized by the preference for local cultures, communities, goods, services, customs, etc. So, one-size-fits all business model is not applicable any more, companies need to locally integrate. A.T. Kearney (2019) showed that the five most important factors for investment decision are: (1) tax rates and ease of tax payment, (2) technological and innovation capabilities, (3) general security environment, (4) regulatory transparency and lack of corruption and (5) strength of investor and property rights. Following are factors like labour costs, ease of moving capital, government incentives for investors, quality of digital infrastructure, etc.

Global value chains have sharpened the interdependencies between trade and FDI (Andrea Andrenelli et al., 2019). As OECD states, foreign direct investment are, with international trade, the main defining feature and key driver of global value chains (GVCs). Federico Carril-Caccia and Elena Pavlova (2018) provided evidence that GVCs play a relevant role for explaining FDI. They found that following factors are important for explaining bilateral mergers and acquisitions: exports (imports) in intermediate and final goods destinations countries heterogeneity; domestic value added embedded in exports and global value chains position and participation. Also, study conducted by Christian Buelens and Marcel Tirpák (2017) showed that policies that attract FDI would constitute an indirect way to deepen a GVC participation. It is due to the fact that foreign investors play an active role in shaping host economies' export structure and their participation in GVCs. Pavida Pananond (2015) claims that emerging multinational companies do not take independently decisions in the global value chain, but, on the contrary, these decisions are dependent on the relationship with the lead company. The main goal of emerging multinational companies is to climb over

the global value chain, while it may not be of the interest of the lead company. So, FDI decisions will be highly dependable on these relationships. Vito Amendolagine et al. (2017) found that more intense GVC participation and upstream specialization are associated to a higher share of inputs sourced locally by foreign investors which in fact, according to their findings, represents the main channel for FDI spillovers. Roger Strange and Antonella Zucchella (2017) concluded also that new digital technologies have considerable potential to disrupt how and where activities are located and organized within GVCs.

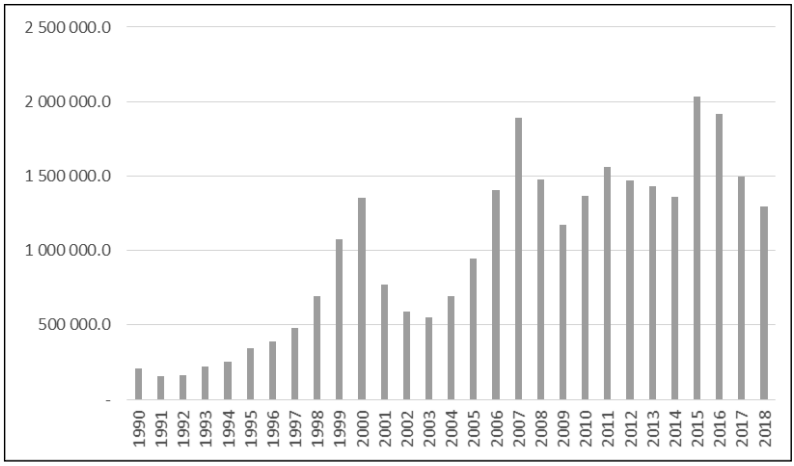
GLOBAL FOREIGN DIRECT INVESTMENTS FLOWS

The relevance of foreign direct investment as a source of economic growth is inevitable and it has sound theoretical foundation. Eduardo Borensztein et al. (1995) proved that FDI represents important way for the transfer of technology and it contributes to the economic growth more than domestic investment. Also, according to the results of their study, these effects will occur only in host countries which have necessary human capital to absorb the benefits and attract FDI. James R. Markusen and Anthony J. Venables (1997) state that effects of the FDI on the host country can operate through different channels and proved that FDI can serve as a catalyst, leading to the development of local industry. Sasi Iamsiraroj and Mehmet Ali Ulubaşoğlu (2015) on a sample of 140 countries in the period 1970-2009 proved that FDI positively affects economic growth. This finding holds globally, not only for developing countries. As many researchers prior, they stressed the importance of absorptive capacity and identified trade openness and financial development to be appropriate indicators of absorptive capacity.

According to the United Nations Conference on Trade and Development (UNCTAD) (2019) data, global foreign direct investment decreased by 13% in 2018 (estimated to 1.3 trillion USD), compared to 2017 (Figure 1). On the contrary, the projection was that global FDI flows are going to increase by about 5% in 2018 (UNCTAD, 2018). Very interesting are the facts that this decrease was mainly in developed countries, where foreign direct investment inflows decreased for 27% and that decrease in Europe was 55%. Explanation provided by the United Nations Conference on Trade and Development (2019) is in repatriation of accumulated foreign earnings by the United States of America. On the other side, according to World Investment Report 2019, developing countries experienced increase in the FDI inflow for 2% in 2018, compared to 2017. Analysing regionally, only Africa (11%) and developing Asia (4%) experienced

increase in the FDI inflow in 2018, compared to 2017.

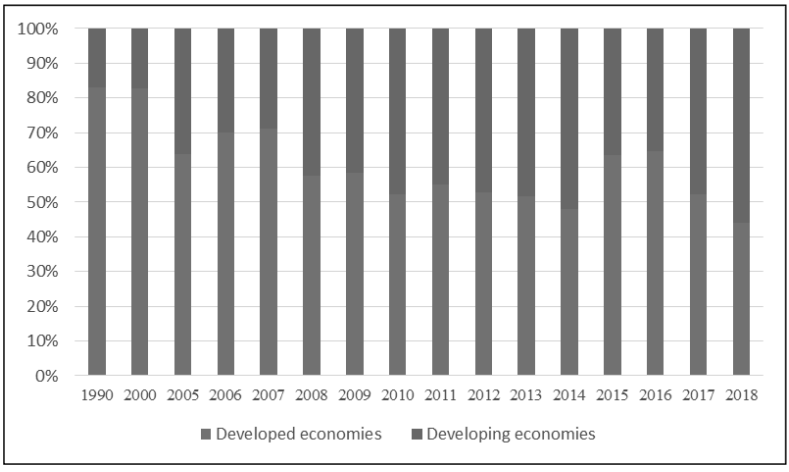
Figure 1. World FDI inflows 1990-2018 (millions USD)



Source: UNCTAD, FDI/MNE database.

Analysis of the data in the period 1990-2018 showed that shares of developed and developing economies in world FDI inflow changed over the period (Figure 2). For example, in 1990 83% of world FDI inflow went to developed economies, and 13% in developing economies. In year 2000 these shares remained similar. However in next years, shares changed. The latest available data, for 2018, show that most of the world FDI inflow went to developing countries.

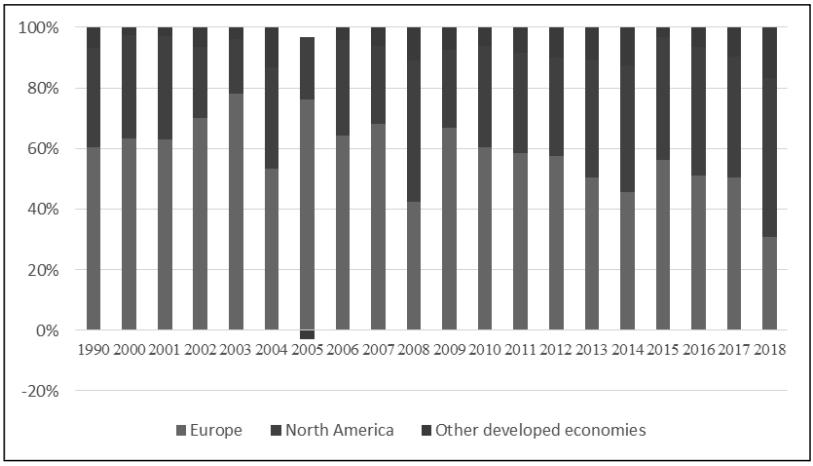
Figure 2. Shares of developed and developing economies in world FDI inflow 1990-2018 (%)



Source: UNCTAD, FDI/MNE database, authors calculation.

Analysis of the distribution of FDI inflow among developed countries by regions in the same period, 1990-2018, showed also changes in the distribution (Figure 3). In 1990 more than 60% of FDI inflow in developed countries went to Europe. The share of Europe was highest in 2005 when it exceeded 80%. However, after 2005 decreasing trend of Europe's share is visible. The smallest share is achieved in 2018, only 31%, while North America reached 52% at the same time.

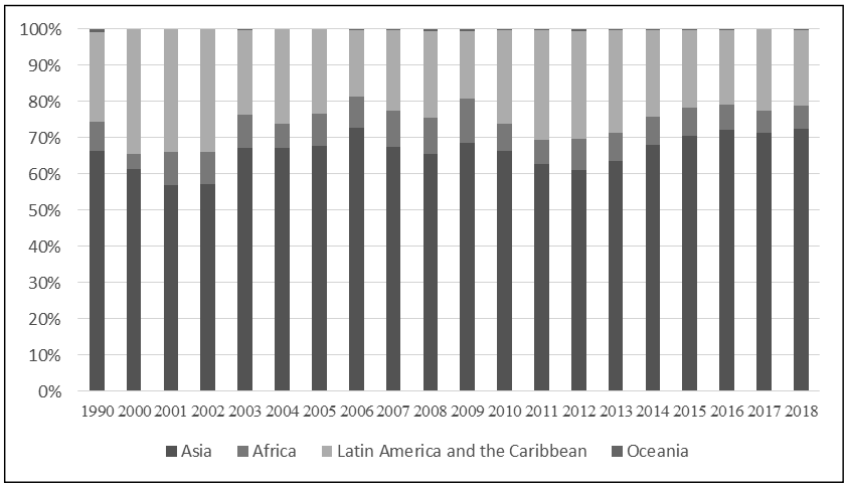
Figure 3. Shares of developed countries in world FDI inflow 1990-2018 by region (%)



Source: UNCTAD, FDI/MNE database, authors calculation.

However, analysis of the distribution of FDI inflow among developing countries by regions in the same period, 1990-2018, showed no changes in region rankings, only shares (Figure 4). For the whole observed period Asia had the highest share in world FDI inflow. It was 66% in 1990, while in 2019 it reached the highest share in the observed period of 73%. On the other side, shares of Africa and Latin America and the Caribbean in the FDI inflow decreased in the observed period.

Figure 4. Shares of developing countries in world FDI inflow 1990-2018 by region (%)



Source: UNCTAD, FDI/MNE database, authors calculation.

Share of the developed countries in global FDI outflow decreased on 55%, which is the lowest ever recorded (UNCTAD, 2019). Also, World Investment Report 2019 revealed that in 2018, the values of net cross-border mergers and acquisitions (M&As) increased for 18%, after the 22% fall in 2017. Also, the value of announced greenfield projects increased for 41%. However, investment activity measured by the number of projects increased by only 7%.

In top ten FDI host and home countries in 2018, the best positioned is China, second in both rankings (Table 1). Over 10% of world total FDI inflow in 2018 went to China which experienced growth of 4% in 2018, compared to 2017. On the other side, China reduced its outflows for the second year in a row (decrease of 18%). Balogh (2017) concluded that China is already world leader in industries based on consumer-focused, efficiency-driven innovation, and that it is only the matter of time when will it emerge as world leader in high-tech sectors, based upon the trends. Peter J. Buckley et al. (2007) found that Chinese FDI outflow was natural resources seeking FDI, and associated with high levels of political risk in, and cultural proximity to, host countries throughout, and with host market size and geographic proximity.

Also, in both rankings, countries all over the world are represented.

Table 1. Top ten FDI host and home countries 2018

	FDI inflows	FDI outflows
1	United States of America	Japan
2	China	China
3	Hong Kong, China	France
4	Singapore	Hong Kong, China
5	Netherlands	Germany
6	United Kingdom	Netherlands
7	Brazil	Canada
8	Australia	United Kingdom
9	Spain	Republic of Korea
10	India	Singapore

Source: United Nations Conference on Trade and Development (2019).

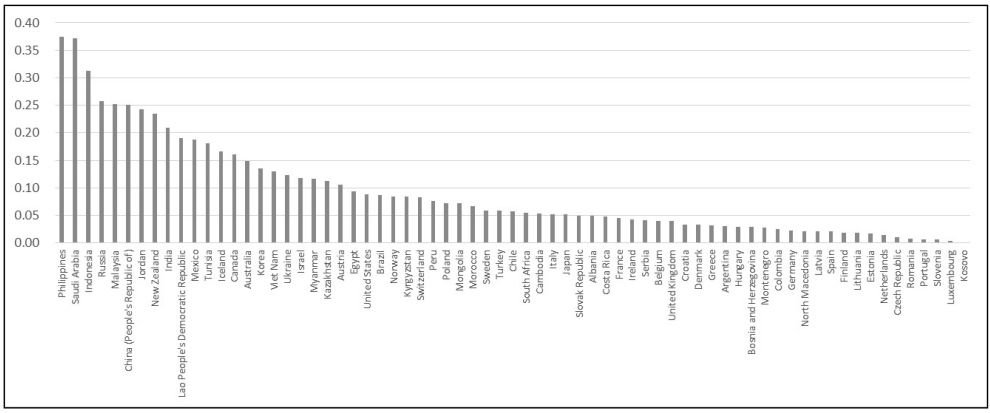
According to the World Bank (2019) data, the world share of net FDI inflows in GDP in the period 1970-2018 increased from 0.48% in 1970 to 1.39% in 2018. However, the highest value in the observed period was achieved in 2007 (5.27%). In 2017 the world share of net FDI inflows in GDP was 2.56%, so the value in 2018 represents the decrease of 1.17 percentage points.

FDI Confidence Index, developed by A.T. Kearney (2019) and calculated for 2019 from a survey of 500 senior executives of world's leading companies, showed that top ten (out of 25 countries in the survey) likely destinations for FDI in 2019 are mostly developed countries: (1) United States of America, (2) Germany, (3) Canada, (4) United Kingdom, (5) France, (6) Japan, (7) China, (8) Italy, (9) Australia and (10) Singapore. The results of this study showed that potential investors are planning to increase the level of FDI are surprising, having in mind, that global FDI decreased, like previously explained. Also, the results are contradictory with the UNCTADs data (2019) due to the fact that highest ranks of the FDI Confidence Index have developed countries, but these countries experienced decrease of FDI inflow, while developing countries experienced increase.

The extent of FDI restrictiveness is measured by FDI Restrictiveness Index. This index is developed by OECD (Blanka Kalinova et al., 2010) and it is consisted of four groups of measures for each of 22 covered sectors: (1) foreign equity restrictions, (2) screening and prior approval requirements, (3) rules for key personnel

and (4) other restrictions on the operation of foreign enterprises. The highest score for any measure in any sector is 1 (closed) and the lowest is 0 (open). Average score of all sectors makes a country score (Kalinova et al., 2010). The average score for all 67 countries included in the OECD database is 0.09 in 2018 (Figure 5). 63% countries are below this average, while 37% of countries are at the average or higher.

Figure 5. FDI Regulatory Restrictiveness Index 2018, by country



Source: OECD.Stat, FDI Regulatory Restrictiveness Index database available at: https://stats.oecd.org/Index.aspx?datasetcode=FDIINDEX# (29.8.2019).

Countries in the Asia and the Pacific region tend to remain relatively more restrictive than others. However, countries like India, Indonesia, China and Viet Nam have undertaken considerable efforts to liberalise FDI further (Fernando Mistura and Caroline Roulet, 2019). Still, Asia has the highest share in FDI inflow in developing countries. Analysis of the FDI Restrictiveness Index in the period 1997-2018 showed that countries have liberalised environments for FDI. Interestingly, Mistura and Roulet (2019) in their study covering 60 advanced and emerging economies in the period 1997-2016 found that liberalising FDI restrictions by about 10% as measured by the FDI Restrictiveness Index could increase bilateral FDI in stocks by 2.1% on average. They also found that effects are higher in the service sector.

CONCLUSION

The Fourth industrial revolution has potential to make greater improvements on every aspect of private and business lives than the first three industrial revolu-

tions. Nevertheless, the great challenge would be to ensure that advances reached by this industrial revolution benefit all and distribute evenly.

Foreign direct investment is inevitably important for each economy. Global FDI decreased by 13% in 2018 compared to 2017, although projections were opposite. Interesting are the facts that this decrease was mainly in developed countries, where FDI inflow decreased for 27% and that decrease in Europe was 55%. On the other side, developing countries experienced increase in the FDI inflow for 2%. Analysing regionally, only Africa (11%) and developing Asia (4%) experienced increase in the FDI inflow in 2018, compared to 2017. Countries in the Asia and the Pacific region tend to remain relatively more restrictive than others in terms of FDI Regulatory Restrictiveness Index. Still, Asia has the highest share in FDI inflow in developing countries.

Analysis of the data in the period 1990-2018 showed that shares of developed and developing economies in world FDI inflow changed over the period. At the beginning of the period, 83% of world FDI inflow went to developed economies, and 13% in developing economies. The latest available data, for 2018, show that most of the world FDI inflow went to developing countries. Analysis of the distribution of FDI inflow among developed countries by regions in the same period, 1990-2018, showed also changes in the distribution. In 1990 more than 60% of FDI inflow in developed countries went to Europe. However, after 2005 decreasing trend of Europe's share is visible. The smallest share is achieved in 2018, only 31%, while North America reached 52%. On the other side, analysis of the distribution of FDI inflow among developing countries by regions in the same period, showed no changes in region rankings, only shares. For the whole observed period Asia had the highest share in world FDI inflow. It was 66% in 1990, while in 2019 it reached the highest share in the observed period of 73%. On the other side, shares of Africa and Latin America and the Caribbean in the FDI inflow decreased in the observed period. In top ten FDI host and home countries in 2018, the best positioned is China, second in both rankings. Over 10% of world total FDI inflow in 2018 went to China which experienced growth of 4% in 2018, compared to 2017.

However, the emergence of the Fourth industrial revolution clearly raised issues regarding to foreign direct investment. First of all, the occurrence of Industry 4.0 and related technologies changes motives and basis of foreign direct investment and bringing decisions upon international business. Greater use of these technologies, like robotics, artificial intelligence, etc., will minimize the advantages

of low labour-cost countries. So, we could say that prior the eras of the Industry 4.0 one of the most recognized motive for the FDI were labour costs. However, in the era of Industry 4.0 factors of importance become multi-localism, growing demand for local and personalized products, localized production; eco-system development; focus on social impact, as well as sustainability.

Understanding new technologies brought by the Industry 4.0 and their disruption potential is critical for all countries and their relevant policies. Without that governments won't be able to ensure reaching all potential accomplishments of this industry revolution, and what is of same importance, reaching equal distribution of these benefits.

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PREGLEDNI NAUČNI RAD / OVERVIEW SCIENTIFIC PAPER

THE VIENNA INITIATIVE AS AN EXAMPLE OF CROSS-BORDER POLICY COORDINATION – CASE OF BOSNIA AND HERZEGOVINA[1]

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Abstract: *At the very beginning of global economic and financial crisis, foreign capital started to withdraw from banking sector of Bosnia and Herzegovina. There was a huge danger that the domestic banking sector would suffer great instability due to high exposure to foreign investors. The big part of foreign funds was in the form of hot money, and the European banks highly exposed to Central and Southeast Europe had to act. EBRD and IMF launched a rescue plan aimed to slow down the deleveraging process and to preserve financial stability. The foreign banks promised that the pace of funds withdrawal would be accommodated to the preserving of home countries financial stability. The meeting about this issue was held in Vienna, which is an international banking hub for part of Central and especially for Southeast Europe. According to the meeting's place, rescue plan got the name Vienna Initiative (VI). VI was a cross-border activity with the final aim to reduce systematic risks appeared because of the withdraw of foreign capital from BH banking sector. In this view, VI was specific m macroprudential tool for keeping financial stability. In addition, in a broader view, it was cross-border macroprudential policy coordination plan. For Bosnia and Herzegovina, the Vienna Initiative came in the right moment. Without VI it would be very hard or maybe even impossible for Bosnia and Herzegovina to preserve financial stability and to prevent the balance of payment crisis, and even currency crisis and banking crisis. Thus, in the case of BH, VI was very successful cross-border policy coordination due to the large exposure of domestic banking sector to the foreign investors. At the pick of crisis foreign liabilities of BH banking sector were 6 billion BAM (12/2008) i.e. 32,5% of total liabilities or 29% of total asset. All developed models show that foreign liabilities have a great influence on loans, deposits, and industrial production. The unexpected fall in foreign liabilities would have adverse and very strong effects on deposits, loans, and industrial production. All models show that foreign liabilities significantly affect economic and financial activity in Bosnia and Herzegovina. We used different techniques to show influences of foreign liabilities on domestic variables; Vector autoregression in level and in differences, Vector error correction model, Conditional VAR, and multiple regression models. All models show that in case of disorderly withdrawal of for-*

[1] The views expressed are those of the author and do not represent the views of the institution in which he is employed

eign funds, fall in industrial production, deposits, and loans would be much higher than in the case when VI is applied. The main conclusion of the article is that VI helped BH to avoid huge and long negative credit growth i.e. credit crunch, and to avoid deeper economic crisis.

Key words: *Vienna Initiative, cross-border macroprudential policy coordination, Bosnia and Herzegovina, VAR.*

INTRODUCTION

As almost in all countries in *SEE* (South East Europe) the credit growth in Bosnia was also driven by the foreign inflow of money and capital. Bosnian banking sector owned to foreign investors 6 billions BAM which was around 25% of GDP. From December 2002 to December 2008 exposure to foreign investors rose for 3,34 times. Such structure of banking liabilities made domestic banking sector highly vulnerable to unexpected withdraw of foreign funds. The outbreak of financial crisis, especially Lehman Brother bankruptcy, increased liquidity risk, and also solvency in some domestic banks.

At the initiative of European banks (highly exposed to Central and South East Europe worried for not only for their investment but also for financial stability in home countries) EBRD and IMF launched some kind of rescue plan/program aimed to slowdown deleveraging process and keep financial stability. It got name according to the place of meeting, Vienna Initiative. Five countries participated at the very beginning of this program; Bosnia and Herzegovina was among them. In short, foreign banks promised that they would keep their exposure to these countries, or in other words they promised that the pace of withdrawal of fund will be accommodated to the preserving of home countries financial stability. In this sense, *VI* was some kind of cross-border macroprudential policy coordination plan.

Foreign banks have been present in banking sector of Bosnia and Herzegovina through so-called foreign liabilities of banking sector of Bosnia and Herzegovina (BSBH), which are our major variable of interest. These foreign liabilities are composed from foreign deposit and foreign credits provided to BSBH and these funds are claims of foreign banks on BSBH. This research tries to answer the question if *VI* in the case of BH was successful or what would happen without *VI*. The central point of this research is estimating banks' foreign liabilities influence on major BH banking and macroeconomic variables. Our working thesis is that *VI* helped Bosnia to preserve financial stability and to avoid credit crunch.

In the first part of research we give short literal review, followed by explanation in methodology. After that, we present the central part of research – results and discussion. Conclusion and references are at the end of the research.

LITERARY REVIEW

We did not find any article regarding *VI* by Bosnian authors. Obviously, this topic was not interesting for domestic authors. There is one article (Jović & Jandrić, 2016) which analyzed the determinants of credit growth in Bosnia but it did not include foreign liabilities. Main findings of this article are as follows: 1) NPL and deposits on bank level, nominal GDP growth and inflation have biggest impact on credit growth 2) Credit growth is under direct and strong influence of global crisis and ECB monetary policy, and the influence of these variables comes with time lag. Authors, also, found that increase in capital ratio had positive impact on credit growth, and vice versa. The most comprehensive research of this kind of cross border policy coordination (De Haas, Korniyenko, Loukoianova, & Pivovarsky, 2012) was devoted to two issues and one of them was Vienna Initiative (*VI*). Authors analyzed how bank and *VI* affected credit growth during the 2008-2009 crisis. Main findings of this research is that foreign banks like domestic banks immediately reduced credit during the crisis but foreign banks that signed *VI* were on average stable lenders.

Many articles research determinants of credit growth or credit but *VI* is missing because this was a mainly European regional plan. Some of the articles of this type (Plekhanov & Skzypinska, 2018) have investigated the connection between non-performing loans (NPL) and cross-border spillovers, and influence of NPL on credit growth (Alihodžić & Halil Eksi, 2018). One research (Lane, Philip R, 2012) found that financial globalization had a different impact on different countries. In some countries, it provided a buffer against the crisis, and in another, it amplified the crisis. One author ((Wosko, 2015) used panel data to forecast credit growth, while another (Kochler, 2012) showed that banks with high rates of credit growth are riskier. For Philippines and Asia is proved (Tan, 2012) that there is no strong direct connection between deposit growth and credit growth, and using VECM methodology two authors (Shijaku & Kalluci, 2013) found the cointegrating relationship between real bank credit growth to the private sector on one side and real GDP, net wages, financial liberalization indicators, exchange rate and NPL on another side (for Albania).

METHODOLOGY AND DATA

In order to estimate the impact of *VI* on Bosnian banking sector and financial stability we used several (four) different methodologies, taking into account the interdependence between all key variables influenced by *VI*. All models are multivariate time series models. The first used model is VAR or unrestricted VAR which is used for the unconditional forecast. We have chosen VAR in level despite the fact that variables are nonstationary. Some authors[2] recommend performing VAR with nonstationary variables. This kind of approach is supported by the fact that information are lost by doing transformation (for example VAR in difference). Due to nonstationarity we checked for cointegration and used VEC. In both cases (VAR in level and VEC) for purpose of identification we have used Cholesky decomposition in order to construct impulse response function. All models we developed are stable[3].

Also, two regression models are developed in order to estimate impact of foreign liabilities on loans. At the very end of the research we constructed Bayesian VAR in order to make conditional forecast and to answer question what would happen with loans, deposits and industrial production in 2010 in the case of extremely adverse scenario in which foreign liabilities fall for 20%, 30% and 40% i.e. in the case that *VI* was absent. The methodology of conditional forecast has been explained in details in Alistair Dieppe, Romain Legrand and Björn van Roye (2016).

Quarterly data (nonperforming loans, capital ratio) are transformed in monthly data by applying linear transformation. Our VAR models are composed from five or six endogenous variables, and/or theirs log transformation: foreign liabilities (*fl*), foreign asset (*fa*), loans, deposits and nonperforming loans (*npl*). Exogenous variables in VAR were constant, linear trend. Two kinds of dummies are used, one to mark Lehman Brothers bankruptcy (9/2008), and second one for change in foreign investor sentiment i.e. the start of withdrawal of foreign deposits and loans from domestic banking sector (01/2009).

In all models estimation sample is from 02/2006 to 12/2017 except in BVAR with estimation sample from 02/2006 – 12/2009. The list of used abbreviations is given below.

2 Enders, Walter. 2009. Applied Econometric Time Series. John Wiley & Sons, Inc.

3 The roots of the company matrix (Inverse Roots of AR Characteristic Polynomial) are eigenvalues. In order for the VAR model to be stable, the eigenvalues must lie within the unit circle. VEC model like VAR model should satisfy this condition.

Table 1. List of abbreviations

Abbreviation	Full name	Unit of measurement
fl	foreign liabilities	in BAM
fa	foreign assets	in BAM
loan	loans	in BAM
deposit	deposits (owned by residents)	in BAM
ip	industrial production (2010 = 100)	index
capital ratio	tier 1/risk weighted asset	%
lfl	natural logarithm of foreign liabilities	-
lfa	natural logarithm of foreign asset	-
lloan	natural logarithm of loan	-
ldeposit	natural logarithm of deposit	-
npl	nonperforming loans	
lip	natural logarithm of industrial production	-
c	constant	-
dumc	dummy for crisis, from 9/2008=1	-
dumcs	dummy for changing sentiment i.e. start withdrawing of foreign liabilities of BSBH (01/2009)	-
trend	linear trend	-
*d_*	in front of variables denotes the first difference	-

Source: Author

SOME FACTS ABOUT BOSNIAN BANKING SECTOR

As in all other countries, the financial crisis hit Bosnian economy and banking sector very hard. Until 12/2008 the average annual credit growth was 22% (2003 – 2008) and in 2007 and 2008 it was 30,4% and 23% respectively. For the first time, after seven years, the annual credit growth was negative in 2009. Over time, the loan growth has become stronger, but it has not recovered at all comparing to pre-crisis level. The annual growth rate in eight year period (2010 – 2017) were much below the growth in 2008, 3,8% and in 2017 it was 7,1%. At the pick foreign liabilities were 6 billions BAM or 29% of GDP. At the end of 2017 foreign liabilities were 2,58 billions BAM, which is only 43% comparing to all times high (12/2008). The average annual growth rate of decline was 8,7% (2009-2017).

RESULTS AND DISCUSSION

The first model that we developed was VAR in level. This model has six endogenous variables (*fl, fa, loan deposit, ip, npl*) and three exogenous variables (constant and trend, dummy for crisis). To select lag order we use the Schwarz criterion (model with one lag is chosen). The overall fit of model (see Table 2), measured by the coefficient of determination, is very good; R^2 is in range 0.65 - 0.99.

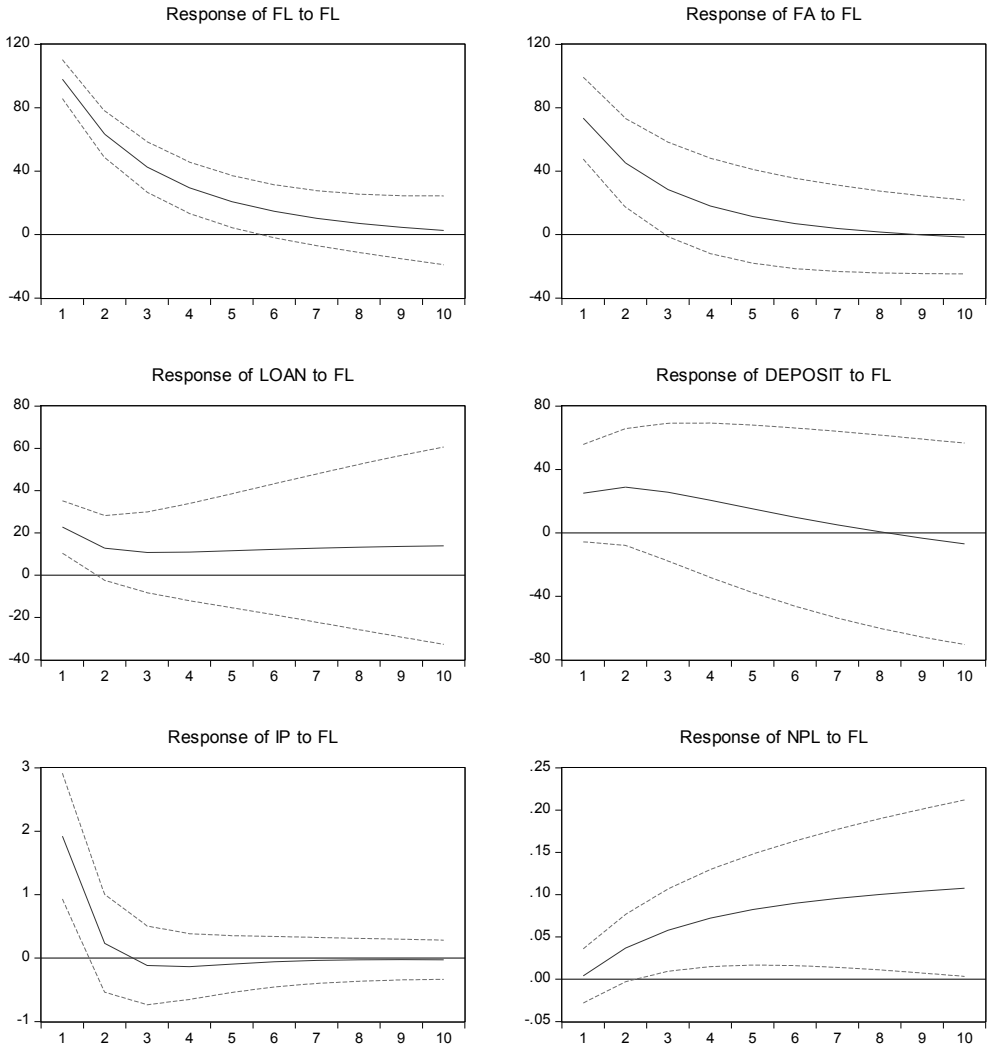
Table 2. Unrestricted VAR

Vector Autoregression Estimates
Date: 07/09/18 Time: 09:50
Sample: 2006M02 2017M12
Included observations: 143
Standard errors in ( ) & t-statistics in [ ]

	FL	FA	LOAN	DEPOSIT	IP	NPL
FL(-1)	0.664031	-0.064716	-0.068818	0.132784	-0.003961	0.000203
	(0.06513)	(0.10334)	(0.04703)	(0.10385)	(0.00375)	(0.00012)
	[10.1958]	[-0.62627]	[-1.46337]	[1.27856]	[-1.05540]	[1.72105]
FA(-1)	-0.004114	0.822096	0.010798	0.074206	-0.001667	0.000204
	(0.04884)	(0.07750)	(0.03527)	(0.07789)	(0.00281)	(8.8E-05)
	[-0.08423]	[10.6083]	[0.30616]	[0.95277]	[-0.59233]	[2.31283]
LOAN(-1)	0.151147	0.044291	1.013410	0.008069	0.001331	-9.55E-05
	(0.03571)	(0.05666)	(0.02579)	(0.05694)	(0.00206)	(6.5E-05)
	[4.23269]	[0.78172]	[39.3021]	[0.14170]	[0.64701]	[-1.47716]
DEPOSIT(-1)	0.046731	-0.011966	0.077411	0.770645	0.003510	-6.72E-05
	(0.03244)	(0.05147)	(0.02342)	(0.05173)	(0.00187)	(5.9E-05)
	[1.44058]	[-0.23250]	[3.30482]	[14.8979]	[1.87732]	[-1.14451]
IP(-1)	-0.587328	1.163506	-3.608137	2.794555	0.317170	0.000147
	(1.42280)	(2.25749)	(1.02737)	(2.26883)	(0.08199)	(0.00257)
	[-0.41280]	[0.51540]	[-3.51200]	[1.23171]	[3.86821]	[0.05700]
NPL(-1)	-32.62018	-26.76632	8.654255	-31.75829	-0.288859	1.030665
	(9.74119)	(15.4559)	(7.03391)	(15.5336)	(0.56137)	(0.01763)
	[-3.34868]	[-1.73178]	[1.23036]	[-2.04449]	[-0.51456]	[58.4631]
C	167.0564	516.7079	71.53082	842.6093	45.80109	-0.263392
	(156.773)	(248.745)	(113.203)	(249.995)	(9.03462)	(0.28372)
	[1.06559]	[2.07726]	[0.63188]	[3.37051]	[5.06951]	[-0.92834]
TREND	-17.47574	-1.982522	-7.710767	24.55223	-0.294732	0.010229
	(3.19090)	(5.06287)	(2.30409)	(5.08830)	(0.18389)	(0.00577)
	[-5.47674]	[-0.39158]	[-3.34656]	[4.82523]	[-1.60278]	[1.77136]
DUMC	171.8864	44.22414	-75.32860	-705.3482	5.941770	0.130054
	(78.9570)	(125.278)	(57.0133)	(125.907)	(4.55019)	(0.14289)
	[2.17696]	[0.35301]	[-1.32125]	[-5.60213]	[1.30583]	[0.91015]
R-squared	0.992592	0.851250	0.999351	0.996944	0.656019	0.998502

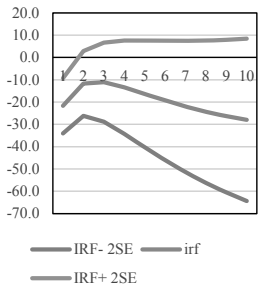
Impulse response functions (*IRF*) i.e. response to Cholesky one standard innovation in foreign liabilities (positive shock, i.e. increase) shows the expected and economically logical movement in all variables (Graphs 1-6). The exemption could be *NPL*, which is positively influenced by positive shock in foreign liabilities. Such a movement can be explained by the fact that with rise in foreign loans credit activity expands which leads to the rise in *NPL*. So, immediately after positive shock in foreign liabilities all variables, as expected, go up.

Graphs 1-6. Impulse response functions for VAR model (One S.D. positive shock)
Response to Cholesky One S.D. Innovations ± 2 S.E.

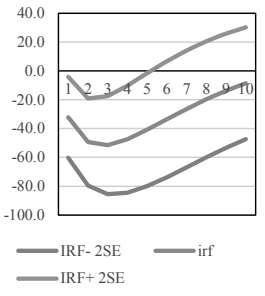


IRF for negative shock is symmetric with IRF for positive shock, so we constructed this kind of IRF (response to negative shock) in order to examine response of the key variables to the unexpected movement in foreign liabilities (Graphs 7-9). In the case of loans and deposits the IRF is very persistent and it is statistically significant 1 or 3 periods after shock. One impact one standard deviation shock in foreign liability decreases loans and deposits for 22.8 millions BAM and 25.0 millions BAM respectively. IRF for industrial production (IP) is not so persistent and on impact it reduces value of IP for 1.9 index points.

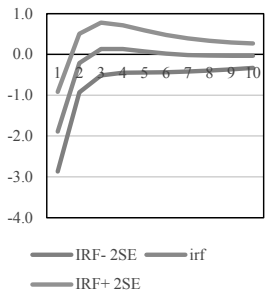
Graph 7. Response of LOANS to FL One S.D. negative shock (VAR model)



Graph 8. Response of DEPOSITS to FL One S.D. negative shock (VAR model)



Graph 9. Response of IP to FL One S.D. negative shock (VAR model)



From VAR in level we may conclude that absence of *VI,* which is similar to the unexpected shock, would have adverse effects on the value of loans and deposit, and generally on financial stability. Thus, *VI* helped to prevent the adverse scenario, and it also helped to stabilize banking sector through preserving financial stability and through transforming the unexpected shock in the expected one.

We checked this conclusion by using different kind of VAR's procedure. With respect to the fact that all variables are nonstationary (Table 3) we have tested for cointegration. By applying Johansen test (Table 4) we found that there are two cointegrated equations in line with the visual inspection of four endogenous variables, where we can see co-movement in two cases (Graph 10).

Table 3. Unit root test for endogenous variables

FL	FA	LOAN	DEPOSIT	IP	NPL
-1,367	-2,7870	-3,752	-0,698	-0,544	-1,96
(0,5965)	(0,0626)	(0,0043)	(0,8427)	(0,878)	(0,3016)

Note: Critical test values for 1%, 5%, and 10% are -3,47, -2,88 and -2,57 respectively.

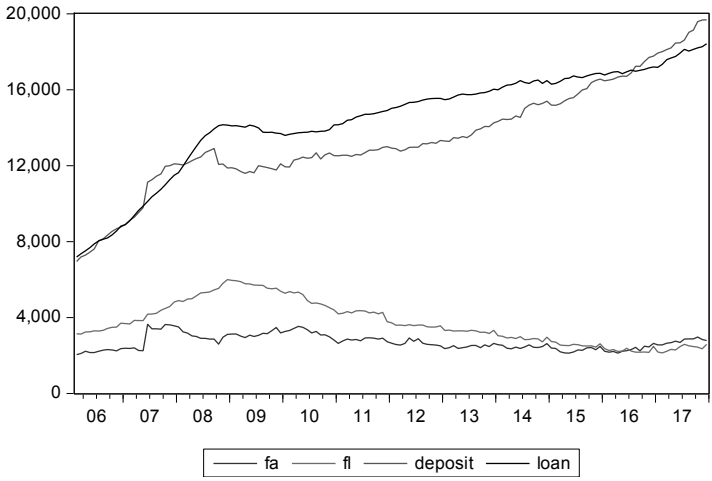
Table 4. Johansson test

Series: FL FA LOAN DEPOSIT IP NPL, Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

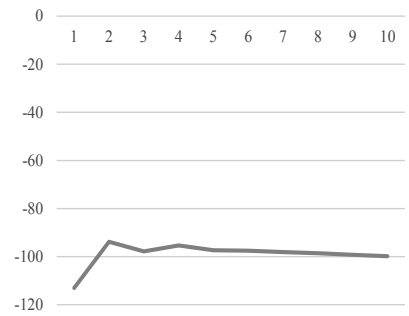
Hypothesized		Trace	0.05	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.268840	121.6577	95.75366	0.0003
At most 1 *	0.220307	76.88106	69.81889	0.0122
At most 2	**0.104534**	**41.29471**	**47.85613**	**0.1795**
At most 3	0.097213	25.50589	29.79707	0.1441
At most 4	0.056239	10.88146	15.49471	0.2189
At most 5	0.018047	2.604280	3.841466	0.1066

Graph 10. Cointegration between variables

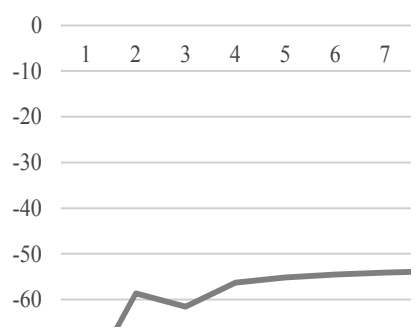


VEC model with two lags, two error correction equations, five endogenous variables (*fl fa loan deposit ip npl*) and one exogenous variable (constant) give similar results like *VAR* in levels. The negative shock of one standard deviation in foreign liabilities (i.e. decrease in foreign liabilities) affects other endogenous variables in line with expectations (Graphs 11 - 16). On impact almost all variables, except *NPL*, go down. Among three key variables (loans, deposits and industrial production), foreign liabilities influence loans the most. On impact the fall in loans is 25 millions and *IRF* is very persistent. The fall in deposits is temporary caused by the fact that deposits and foreign liabilities are substitutes. *VEC* gives one more evidence how foreign liabilities would influence key macrovariables in the case of unexpected shocks which is equivalent to the disorderly withdraw of foreign deposits and foreign loans previously provided to the banking sector of BH.

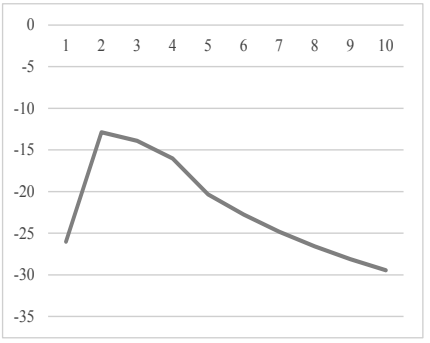
Graph 11. Response of FL to FL
(One S.D. **negative** shock (VEC model))



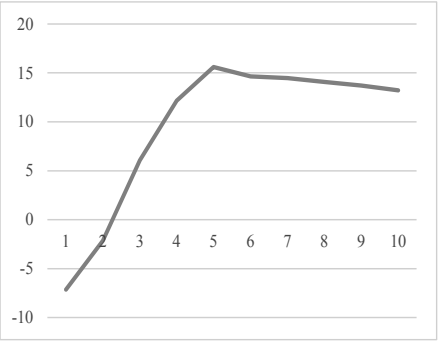
Graph 12. Response of FA to FL
(One S.D. **negative** shock (VEC model))



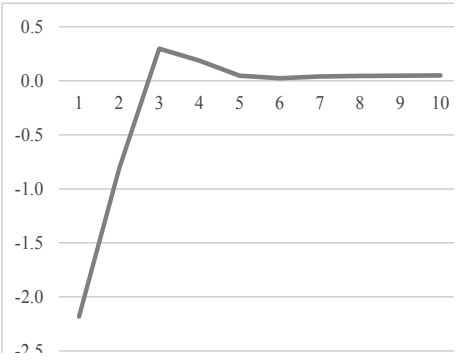
Graph 13. Response of LOAN to FL
(One S.D. **negative** shock (VEC model))



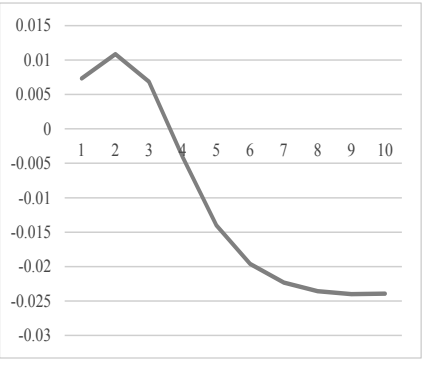
Graph 14. Response of DEPOSIT to FL
(One S.D. **negative** shock (VEC model))



Graph 15. Response of IP to FL
(One S.D. **negative** shock (VEC model))



Graph 16. Response of NPL to FL
(One S.D. **negative** shock (VEC model))



Fit of regression models is good (Table 5), and on average around 60% of variation in loans (i.e. in loan difference) is explained by independent variables.

Diagnostics of models is satisfactory. There is no evidence of heteroscedasticity and autocorrelation, and the mean of residuals converge to zero. All variables have expected sign in line with economic logic. The rise in deposits, industrial production, CPI and capital ratio move up loans. On the other hand, rise in foreign asset decreases loans because it reduces liquidity which is a base for credit growth. The most influence variable in specifications are dummy (marked cells) for the financial crisis (dumc), i.e. for changes in sentiment (dumcs) which capture a huge share of changes in loans. Other things being equal, crisis decrease difference in loans for 145 millions BAM (EQ1).

Of course, the behavior of foreign liabilities is the most important for this research. The sign in front of foreign liability, as expected, is positive. It means the positive relation between movement in *fl* and loans. So, according to specifications, if *fl* goes up loans will also go up because the rise in *fl* provides liquidity for banking sector and the fall in foreign liability absorbs liquidity. If difference in *fl* goes down for 100 millions BAM, the difference in loans will go down for 24 millions BAM.

To conclude, leaving *fl* without any control i.e. at the discretion of foreign owned bank would leave banking sector to a big exposure to liquidity risk. *VI* helped to preserve enough amount of liquidity through the negotiation of orderly withdrawal of foreign asset.

Table 5. Evaluation and diagnostics of regression models, dependent variable first difference in loan (*d_loan), 02/2006-12/2017*

	EQ1	***EQ2***
D_LOAN(-1)	0.170 (2.35)*	0.231 (2.97)***
D_DEPOSIT(-2)	0.040 (1.24)	0.073 (2.19)*
D_FL	**0.242** **(3.97)*** **	**0.230** **(3.46)*** **
D_FA	-0.103 (-2.58)***	-0.102 (-2.41)**
D_IP	3.208 (3.69)***	3.073 (3.343)***
Capital ratio	66.6 (1.86)*	57.6 (1.52)
DUMC	-145.73 (-6.41)***	

DUMCS		-110.70 (-4.69)***
CPI	1.753 (7.52)***	1.377 (5.86)***
Diagnostics		
R^2	0.631	0.586
Mean value of residuals	-0.41	-0.16
DW test	1.88	1.87
Jarque Bera test	4,05 (0.13)	6.86 (0.03)
Breusch-Pagan -Godfrey test	1.088 (0.37)	1.67 (0.109)
LM test (first lag)	1.28 (0.258)	2.18 (0.1419)
LM test (second lag)	0.641 (0.528)	1.11 (0.33)
LM test (third lag)	0.825 (0.482)	1.18 (0.316)

Source: Authors. Note: *** significant at the level of 1%, ** significant at the level of 5%, significant at the level of around 10%. In diagnostic tests, the first number denotes the value of the test statistics and the second is the probability. For the parameters of the models t statistics are in the brackets. For diagnostics in parenthesis is p-value.

CONDITIONAL BVAR

We estimated BVAR for the period 02/2006-12/2009. Endogenous variables are *lfl lfa lloan ldeposit lip* and exogenous variables are *constant, trend* and *dumc*. We applied Cholesky decomposition, and Normal Wishart with default setting for Normal-Wishart parameters.

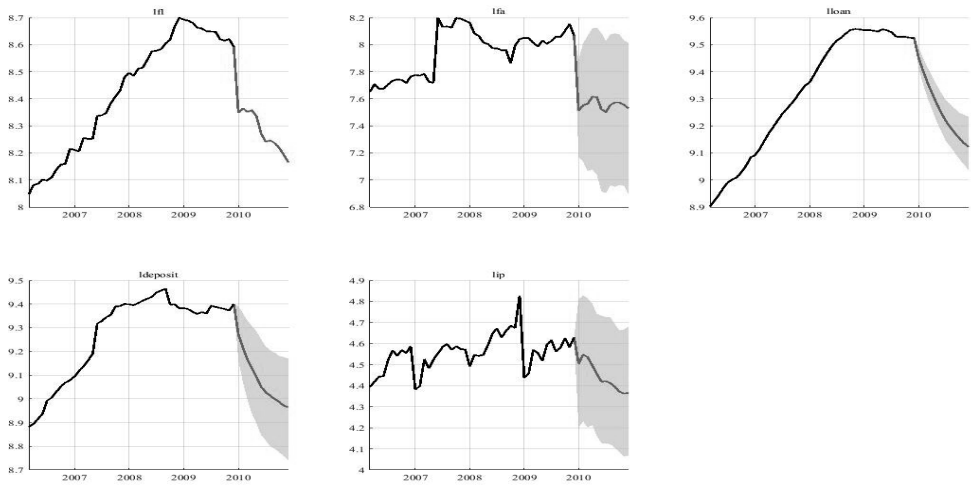
Table 6. Default values for hyperparameters - *Normal-Wishart priors*

auto-regressive coefficient:	0.8
overall tightness λ_1:	0.1
lag decay λ_3:	1
exogenous variable tightness λ_4:	100

Dieppe at el. 2016. The Bayesian Estimation, Analysis and Regression (BEAR) Toolbox, Technical Guide.ECB. p. 18.

In this part of research, the question is what would happen with foreign liabilities in the absence of *VI*. Or, in other words, what would happen if foreign banks had full discretion in withdrawing their assets from Bosnian banking sector. We make several scenarios for movements in foreign liabilities in 2010. As previously stressed, the annual foreign liabilities' growth in 2010 was on average -14%, so we wanted to see movement in endogenous variables, especially in loans in scenarios with unexpected fall in foreign liabilities of 20% (Graph 17), 30% and 40% per year, all other equal.

Graph 17. Conditional forecast, 20% unexpected fall/shock in foreign liabilities



Source: Author. Notes: Graphs from the left to the right are *lfl, lfa lloan (first row), ldeposit, lip (second row).*

In all three adverse scenarios, the fall in loans, deposits and industrial production is, comparing to the actual fall, huge (Tables 7-9). One possible explanation could be banking panic due to large, unexpected and unprecedented fall in foreign liabilities. All information about *VI* where transparent and available. Because of this very fact between mainly expected actual fall of 14% in foreign liabilities under *VI* agreement and 20% or more of unexpected fall in foreign liabilities must be huge difference in the quality of fall and its impact on loans, deposits, and industrial production. The drop in loans would be, on average, from -24,8% to -38,8% (2010/2009). If foreign banks in Bosnian banking sector had decided to withdraw asset at pace of 40% yearly the fall in deposits and industrial production would be 40,3% and 16,3% respectively. According to this last methodology, like in the all previous methodologies, the influence of sudden und

uncoordinated withdraw of foreign deposits and loans from Bosnian banking sector would have highly negative impact on Bosnian banking sector. Due to the policy coordination, i.e. *VI*, such a scenario was avoided.

Table 7. Average annual fall in **loans** in 2010 comparing to 2009 under different conditional forecasts (*CFORECAST*) of foreign liabilities (FL)

	CFORECAST LOANS (2010/2009)		
Actual Fall in *fl* -14%	Fall in *fl* -20%	Fall in *fl* -30%	Fall in *fl* -40%
-1.0%	-24.8%	-31.6%	-38.8%

Source: Author.

Table 8. Average annual fall in **deposits** in 2010 comparing to 2009 under different conditional forecasts (CFORECAST) of foreign liabilities (FL)

	CFORECAST DEPOSITS (2010/2009)		
Actual Fall in *fl* -14%	Fall in *fl* -20%	Fall in *fl* -30%	Fall in *fl* -40%
4.7%	-25.1%	-32.3%	-40.3%

Source: Author.

Table 9. Average annual fall in **industrial production** in 2010 comparing to 2009 under different conditional forecasts (CFORECAST) of foreign liabilities (FL)

	CFORECAST INDEX OF INDUSTRIAL PRODUCTION (2010/2009)		
Actual Fall in *fl* -14%	Fall in *fl* -20%	Fall in *fl* -30%	Fall in *fl* -40%
4.3%	-11.5%	-13.8%	-16.3%

Source: Author.

CONCLUSION

The banking sector of Bosnia and Herzegovina (BASH) has been highly dependent on foreign funds since 2002. At the pick (12/2008) foreign funds or foreign liabilities of BASH were 6 billions EUR and subsidiaries of foreign banks held more then 90% of total banking assets. Bosnia and Herzegovina, like other SEE countries, was not able on its own to cope with deleveraging process started after Lehman Brothers' bankruptcy. There was a huge danger that the uncoordinated withdraw of foreign funds could harm financial stability. The Vienna Initiative

(*VI*) came in that moment. The *VI* was policy coordination plan undertaken by EBRD, IMF and European banks with the large exposure to emerging Europe, during the first half of 2009 with the aim to keep financial stability in countries highly exposed to foreign funding. As it was expected, Bosnia and Herzegovina participated in this unique policy coordination plan, which had elements of macroprudential policy coordination.

The aim of this research was to answer the question whether the *VI* was necessary in the case of Bosnia and Herzegovina. In order to answer this question we developed a few models: VAR, VEC, multiple linear regressions, and BVAR. Our variable of interest was foreign liabilities of BSBH and their influence on loans, deposits, and industrial production. With VAR and VEC we showed that an unexpected fall in foreign liabilities would have a negative influence on all main banking and macro variables. With BVAR, i.e. with conditional forecast, we have proved what would happen in the case of extreme uncoordinated withdraw of foreign funds. Multiple linear regression models showed linear positive relation between foreign liabilities of BSBH on one hand and loans on the other hand.

The overall conclusion we draw from this research is that without *VI* it would not only be very hard, but even impossible to keep financial stability. *VI* was very successful policy coordination plan and it acted as some kind of macroprudential coordination. *VI* helped to preserve the financial stability in Bosnia and Herzegovina and to overcome the credit crunch.

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PREGLEDNI NAUČNI RAD / OVERVIEW SCIENTIFIC PAPER

EVALUATION OF UNCONSTRAINING METHODS IN AIRLINES' REVENUE MANAGEMENT SYSTEMS

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Abstract: *Airline revenue management systems are used to calculate booking limits on each fare class to maximize expected revenue for all future flight departures. Their performance depends critically on the forecasting module that uses historical data to project future quantities of demand. Those data are censored or constrained by the imposed booking limits and do not represent true demand since rejected requests are not recorded. Eight unconstraining methods that transform the censored data into more accurate estimates of actual historical demand ranging from naive methods such as discarding all censored observation, to complex, such as Expectation Maximization Algorithm and Projection Detruncation Algorithm, are analyzed and their accuracy is compared. Those methods are evaluated and tested on simulated data sets generated by ICE V2.0 software: first, the data sets that represent true demand were produced, then the aircraft capacity was reduced and EMSRb booking limits for every booking class were calculated. These limits constrained the original demand data at various points of the booking process and the corresponding censored data sets were obtained. The unconstrained methods were applied to the censored observations and the resulting unconstrained data were compared to the actual demand data and their performance was evaluated.*

Key words*: airline revenue management, demand forecasting, data censoring, unconstraining methods, Expectation Maximization Algorithm, Projection Detruncation Algorithm*

JEL*: C34, L93*

INTRODUCTION

Today's airline industry is facing many challenges while struggling to maintain marginal profits and continue the trend recorded in the last four years with a return on invested capital exceeding the industry's average cost of capital (Škurla

Babić, Ozmec-Ban, Bajić, 2018). The industry has made great efforts to develop sophisticated revenue management systems which would adequately respond to new requirements for forecasting demand and managing the availability of available seats in a competitive business environment.

Airline revenue management comprises a set of scientifically grounded strategic methods used by airlines to forecast fluctuating air travel demand and allocate seats in various fare classes with the aim of maximizing total flight revenue. A range of mathematical methods have been devised to calculate the booking limits of fare classes. With the development of information technologies, the computing power of processors and memory capacity no longer dictate the permitted degree of complexity and robustness of these methods. The focus of the problems of modern airline revenue management systems has, therefore, shifted to demand forecasting.

Based on the analysis of historical demand data, a demand-forecasting module generates the input data of the optimization module, that is, the forecasted demand parameters for each fare class. It is of vital significance to project the total (true) demand, which also includes rejected booking requests. Unconstraining methods use the recorded data of the realized demand to estimate the true demand for each fare class on different flights.

PREVIOUS RESEARCH

The first doctoral dissertation (Peter P. Belobaba, 1987) dealing with airline revenue management was published in 1987. Its research results are still used today in their original and author-modified form (EMSRa and EMSRb heuristic methods[1]). Several dissertations thereafter dealt with optimal leg-based and network seat inventory control policy in case of two, and later more, fare classes (Larry R. Weatherford, 1991; Dirk P. Günther, 1998; Darius Walczak, 2002). The issue of demand forecasting in the context of airline revenue management became the focus somewhat later and the first significant dissertation in the field which specified the issue of demand disaggregation and described passenger arrivals using the non-homogeneous Poisson model was published in 1990 (Anthony O. Lee, 1990). Later works shed more light on demand forecasting and emphasized its key role in the efficiency of airline revenue management systems and flight revenue maximization.

[1] EMSR (engl. Expected Marginal Seat Revenue) – EMSR models: EMSRa and EMSRb

William M. Swan (2002) and Richard Klophaus (2006) examined the methods of assessing true demand, the issue of describing demand using various probability distributions, and the problem of managing aircraft available seats under the terms of simplified tariff policy, respectively. It was noted that the normal probability distribution was not the best solution for describing demand probability in all cases, particularly in highest fare classes. Several AGIFORS[2] authors have dealt with the application of these methods in the context of airline revenue management (e.g., Stefan Pölt, 2000; Richard M. Ratliff et al., 2006; Catalina Stefanescu, 2009).

Weatherford and Pölt (2002) were the first to consider the Expectation–Maximization method in airline revenue management. They analyzed six unconstraining methods and concluded that the more the censoring exceeded 20 per cent, the poorer estimation results these naive methods would yield. At the same time, Expectation Maximization Method (EM Method) and Projection Detruncation Method (PD Method) proved to be the most efficient. In addition, they showed that the improvement of true demand forecast – switching from one of the naive methods to the EM or PD – leads to an increase in total flight revenue by 2–12 per cent. Zeni's PhD thesis evaluated several unconstraining methods which are used in practice. The possibility of using the EM algorithm was proposed in case a part of demand data does not exist (Richard H. Zeni, 2004).

In his later work, Weatherford tested the effect of using four unconstraining methods on total flight revenue. He concluded that a kind of optimization algorithm dictates various results when switching from one unconstraining method to another. His simulation results confirmed the importance of true demand forecasting and showed that upgrading the unconstraining process can lead to revenue gains of 2–15 per cent (Weatherford, 2012).

Alireza Nikseresht and Koorush Ziarati (2017) proposed unconstraining method that used Multinomial Logit model to model the customer choice behaviour. A simple algorithm was proposed to estimate the parameters (customers' preference) of the model by using historical sales data, product availability info and the market share. The proposed method was evaluated using different simulated datasets and the results showed that proposed method outperformed the others in terms of execution time and accuracy.

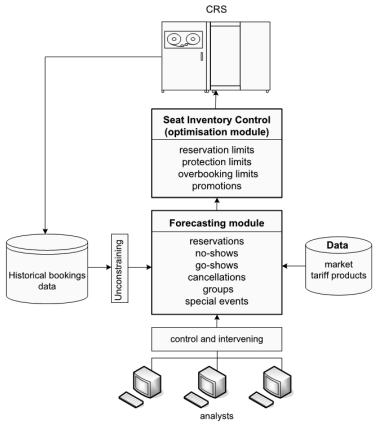
[2] AGIFORS – Airline Group of the International Federation of Operational Research Societies, a professional association dedicated to applying operational research in solving air transport problems

Kourentzes et al. studied the frequently encountered situation of observing only a few sales events at the individual product level and proposed variants of small demand forecasting methods to be used for unconstraining (Nikolaos Kourentzes, Dong Li & Arne K. Strauss, 2019). Price et al. proposed an unconstraining method that used Gaussian process (GP) regression. They developed a novel GP model by constructing and implementing a new non-stationary covariance function for the GP which enabled it to learn and extrapolate the underlying demand trend. Their results indicate that GPs outperform existing single-class unconstraining methods (Ilan Price, Jaroslav Fowkes & Daniel Hopman, 2019).

THE ISSUE OF DEMAND CENSORING

The core of the airline revenue management system is seat inventory control module which distributes seats into fare classes by optimizing the expected flight revenue based on true demand parameters. They must be calculated using available historical data on realized demand, the demand that is frequently far away from actual demand. If a fare class demand or flight demand reaches the booking limit, the booking data will not represent the true demand but only a part of it. The number of requests rejected due to the closing of the fare class or flight is not recorded in airline reservation systems and cannot therefore be used as input for optimal seat allocation. Unconstraining methods are used to forecast total demand – the demand without capacity limitations. Figure 1 illustrates the process of a typical airline revenue management system.

Figure 1: Demand forecasting module in airline revenue management system



Source: Prepared by authors according to Kalyan T. Talluri & Garrett J. van Ryzin, 2005:19

The reservation system is used to continuously fill the database with historical bookings data. Unconstraining methods are used to truncate the data and obtain uncensored demand data. From those data, future demand parameters are estimated (mean μ and standard deviation σ) being simultaneously the output of forecasting module and the input of optimization module.

UNCONSTRAINING METHODS

Unconstraining methods are used to unconstrain, that is, increase the number of recorded requests by the number of requests which have been rejected due to capacity limitations and which have not been recorded in the airline's reservation system.

The aim of unconstraining truncated data is to use the recorded data (some of which are censored) to estimate the cumulative demand curve for each fare class. The demand is estimated at checkpoints[3] before the scheduled departure date, based on the information on the current number of confirmed bookings. For each checkpoint, the confirmed booking data are archived within the airline revenue management system, comprising thereby a historical database used for forecasting future flight demands. If all requests are accepted, that means no data were censored and the true demand corresponds to the recorded demand, that is, the number of bookings at a checkpoint. If some requests have been rejected, true demand data are truncated, and such censored data represent booking limits at certain checkpoints and not the true demand.

The following sections describe various unconstraining methods and assess their robustness and efficiency.

METHODS THAT USE ONLY AVAILABLE DATA

The methods that only use the available data do not attempt to replace the censored data with new values. There are two such methods. One ignores censoring (hereinafter I1 method) by simply disregarding the fact that part of the available recorded demand data does not represent true demand. The method uses all available data which also includes the ones archived in the system after a fare class has closed. The method that rejects censored values (I2) limits the set of available recorded demand data to the values which have not been censored.

[3] Syn. snapshot, review point, reading day.

Regardless of the simplicity and ease of implementation of these methods, their application in the demand-forecasting module in the airline revenue management system can only be justified if the quantity of censored data is extremely low.

METHODS THAT REPLACE CENSORED DATA WITH NEW VALUES

Methods that replace censored data with new values replace all the data on bookings in cases when fare classes were closed due to reached reservation limit with new values. The methods work in the following manner:

- if the seat availability indicator shows that at a checkpoint the fare class was "open", the recorded number of bookings represents true demand;
- if the seat availability indicator shows that at a checkpoint the fare class was "closed", the recorded number of bookings represents censored demand and is then replaced with the average uncensored value (RWA method), the median (RWM method), the upper quartile (RWP75) or any other percentile, as long as these values are higher than the ones recorded.

STATISTICAL UNCONSTRAINING METHODS

The statistical methods used for true demand forecasting require more complex calculations which often comprise several iterations and demand more time for estimation and a powerful computer support.

The Booking Profile method (hereinafter BP method) determines true demand based on the booking profile curve and starts from the assumption that for similar flights[4], the booking profile curve of a fare class does not depend on demand intensity – the increase between adjacent checkpoints is constant for a set of similar flights. This means that for similar flights, the booking profile curve for fare classes can be accurately estimated by averaging the demand at every checkpoint. Uncensored booking data, which probably represent flights with lower demand, are averaged at every checkpoint and increase coefficients are calculated for every two adjacent checkpoints. The censored data are then unconstrained so that the last uncensored item of data at a previous checkpoint is increased by multiplying the calculated increase coefficients.

The EM algorithm (Expectation Maximization algorithm) is a general-purpose algorithm used for estimating maximum likelihood of parameters of truncated

[4] In the context of airline revenue management, a set of similar flights includes flights for which the number of bookings does not considerably exceed the average booking number for other flights in the same set.

data distribution. It is used for calculating the set of parameters that describe the hidden probability distribution when only a part of data is available. Its use is justified by the fact that in many statistical applications that deal with censored data the estimation of the maximum likelihood parameters is made difficult by the structure of the corresponding (log) likelihood function and the direct optimization over the incomplete-data (log) likelihood function tends to be a difficult-to-solve maximization problem (Tudor Bodea & Mark Ferguson, 2014).

It is assumed that there are $M + N$ booking data for a fare class, where M are censored data and N values represent true demand. In the iterative algorithm, the EM method uses the highest probability function L (μ, σ, $M + N$) so the E-step (estimation) and M-step (maximization) alternate with each other. All the censored values in the E-step are replaced with their estimated values (conditional estimation) by using the current hypothesis parameters on normal distribution, μ and σ. Then, in the M-step, the highest probability function lnL (μ, σ, $M + N$) is maximized based on the corrected values and new values are estimated for μ and σ. These steps alternate with each other until μ and σ obtained through iterations start to converge.

The Projection Detrunction Method (PD) is essentially similar to the EM algorithm. It is used in the PODS simulator and was developed at Boeing thanks to C. Hopperstad. The algorithm starts from the assumption of normal demand distribution and first calculates the average value of the number of requests for "open" flights. The algorithm then uses the arbitrary value τ for estimating demand on "closed flights". The true demand on a closed flight is replaced by the new value so that the ratio between the area below the normal distribution curve to the right of the new value and the area right to the original value equals τ (Craig H. Hopperstad, 1997). The process is repeated for the "closed" flights until the forecast values (both the mean and standard deviation) begin to converge. The τ constant impacts the unconstraining aggression, and for lower τ values, the PD algorithm will generate higher values of estimated demand.

UNCONSTRAINING METHODS COMPARISON

The comparison of various unconstraining methods performance assumes the availability of true, uncensored demand. Without the possibility of comparing the parameters of forecasted demand and the parameters of true demand it is impossible to assess the efficiency of an unconstraining method.

In his doctoral dissertation, Richard H. Zeni carried out a simulation of a situation without any rejected requests because the aircraft capacity was sufficient enough. He then analyzed what would have happened had the capacity been smaller that it was (Zeni, 2001). Data censoring simulations used in this paper are the closest to the ones described by Zeni's approach. Apart from generating demand and input data for a program which calculates in estimation errors and compares the accuracy of certain methods, the underlying difference in this paper is the fact that the optimization model used for calculating booking limits is EMSRb, which is the industry standard, whereas Zeni had used EMSRa.

DEMAND DATA CENSORING SIMULATION

To generate comparable sets of true and censored demand, which will be used for the comparison of unconstraining methods, a situation was simulated in which the aircraft capacity is much higher than true demand and in which there can be no rejected booking requests in any of the fare classes. Afterwards, the aircraft capacity was reduced, which led to requests being rejected due to booking limits. True demand data were compared to the recorded demand data in case of the reduced capacity in order to establish cases in which data are censored.

ICE V.20, a software developed by *The Boeing Company*, was used in this paper to generate demand data. Four basic true demand scenarios were simulated, each comprising 771 iterations (flights), with set simulation parameters which also included aircraft capacity, defined so as not to reject requests at any given moment. Since a special optimization is carried out for every part of the cabin, five economy classes were defined with tariffs ranging from 770 to 340 and with the average demand of 10, 20, 30, 40, 50 and 80 for classes 1 to 5.

Eleven checkpoints were used in all simulation sets. Demand set simulations used two combinations of cumulative booking curves. The first combination (hereinafter, T reservation curves) assumes characteristic (theoretical) booking curves which are concave for lower fare classes and convex for higher ones. The second combination (hereinafter CA booking curve) was made based on the analysis of bookings on 36 similar Croatia Airlines domestic flights. The original data was distributed in fourteen price ranges for 24 sub-intervals and grouped to obtain booking curves with 10 sub-intervals and 5 fare classes. The result of the data processing was relatively unexpected: the booking curves were not particularly concave for higher fare classes nor were they convex for lower classes. The

CA booking curves were only slightly concave or convex and all the curves were close to the provisionally homogeneous curve.

The average K-factor or variation coefficient is the ratio of the standard deviation to the mean, reflecting the imminent demand variability. The simulation sets were modeled so as to differentiate between high and low K-factors. In the simulation, in the sets marked with H (high K-factor) the total K-factor was 0.35, ranging from 0.5 for the first class to 0.4 for the lowest fare class. In the simulation sets marked L (low K-factor), the total K-factor was 0.2, ranging from 0.4 for the first class to 0.25 for the lowest fare class.

For each of the four basic demand sets obtained (CA_H, CA_L, T_H, and T_L), four simulation sets of aircraft cabin loading were performed (with 771 iterations) so the capacities were limited to 132, 164, 196, and 228 seats. This produced 16 sets of cabin loading, in which requests were rejected and demand censored. However, each of these sets had its own corresponding loading set without censoring. Therefore, 16 pairs of simulation sets were modeled, with each pair including a set which had rejected requests and censoring and a set in which all the requests had been accepted and whose data represented true demand. The number of accepted and rejected requests for 16 simulation sets with limited aircraft capacity is shown in Table 1.

Table 1: Accepted and rejected requests in simulated data sets

Simulated data set	requests (average)	Class 1	Class 2	Class 3	Class 4	Class 5	Total	Average flight revenue
CA_H_132	accepted	9,26	19,09	27,34	43,40	26,41	125,50	61 041,40
	rejected	0,91	1,22	3,26	7,53	54,74	67,65	
CA_H_164	accepted	9,51	19,40	28,17	46,68	45,73	149,48	69 826,47
	rejected	0,66	0,91	2,43	4,25	35,43	43,67	
CA_H_196	accepted	9,70	19,67	28,91	48,38	61,37	168,03	76 576,41
	rejected	0,46	0,64	1,69	2,55	19,79	25,12	
CA_H_228	accepted	9,90	19,92	29,54	49,63	71,56	180,55	81 210,17
	rejected	0,26	0,39	1,06	1,30	9,59	12,60	
CA_L_132	accepted	8,92	19,04	27,39	44,31	30,93	130,60	62 705,07
	rejected	0,99	1,21	2,88	5,54	48,78	59,40	
CA_L_164	accepted	9,17	19,36	28,25	46,62	55,03	158,43	72718,88
	rejected	0,75	0,89	2,02	3,23	24,69	31,58	

CA_L_196	accepted	9,52	19,81	29,21	48,47	70,61	177,62	79855,94
	rejected	0,40	0,45	1,06	1,37	9,11	12,39	
CA_L_196	accepted	9,77	20,09	29,90	49,48	77,45	186,69	83342,44
	rejected	0,15	0,17	0,37	0,36	2,27	3,31	
T_H_132	accepted	8,84	17,91	27,82	43,02	26,88	124,46	60172,55
	rejected	1,17	1,73	2,68	7,15	54,82	67,54	
T_H_164	accepted	9,10	18,24	28,44	46,22	45,86	147,87	68736,71
	rejected	0,91	1,40	2,06	3,94	35,83	44,14	
T_H_196	accepted	9,37	18,66	29,12	47,78	63,10	168,02	75361,73
	rejected	0,64	0,98	1,38	2,38	18,60	23,98	
T_H_228	accepted	9,59	20,00	29,59	48,72	72,05	178,94	80162,11
	rejected	0,42	0,64	0,91	1,45	9,65	13,07	
T_L_132	accepted	8,55	17,97	27,41	44,57	31,69	130,19	62086,28
	rejected	1,32	1,80	2,46	5,21	47,98	58,77	
T_L_164	accepted	8,88	18,36	28,07	46,42	56,01	157,74	71991,56
	rejected	0,99	1,41	1,80	3,36	23,66	31,22	
T_L_196	accepted	9,31	18,98	28,96	48,31	71,20	176,76	79158,42
	rejected	0,55	0,80	0,91	1,47	8,47	12,19	
T_L_228	accepted	9,66	19,52	29,58	49,38	77,41	185,55	82662,65
	rejected	0,21	0,26	0,29	0,39	2,26	3,41	

Source: Authors

The parameters of set simulations of the same pair differ only in aircraft capacity. All other indicators of demand, tariffs, cabin configuration and seat allocation policy, which must be defined in order to generate the simulation set, were identical. The censored values in 16 data sets were truncated by using eight unconstraining methods described earlier. Their precision was established by comparing unconstrained and actual demand parameters, which were calculated using the unconstrained values and true demand values.

Airline revenue management systems forecast future flight demand based on a number of similar flights. This paper defined future demand by looking at 26 historical flights. The number was chosen because it reflects a half-year period under the assumption that a day of the week is a relevant determinant in defining similar flights. In each of the 16 scenarios, a set of 771 iterations includes 150 groups of 26 iterations which comprise iterations from $1 + k \cdot 5$ to $26 + k \cdot 5$, $k = 0.....149$. Therefore, the groups include iterations 1–26, 6–31, 11–36, …, 746–771. For the 150 groups, unconstrained demand parameters were estimated (mean and stan-

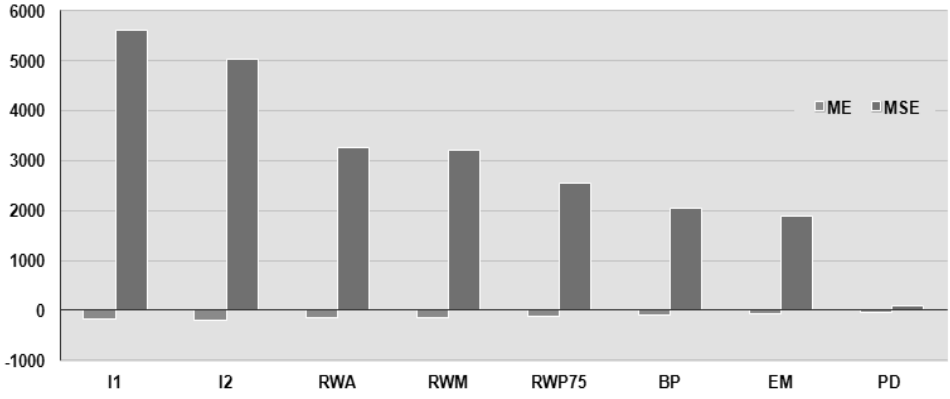
dard deviation) based on the unconstrained demand data using unconstraining methods. Analogous thereto, for each of the 16 scenarios, true demand parameters were calculated from the 771 samples of true demand for the 150 groups.

After that, it was possible to compare unconstrained demand parameters (calculated using various unconstraining methods) and true demand parameters. To carry out the comparison of unconstraining methods an application was developed using Visual Basic. The input data of the application were values of true demand parameters, i.e. output values of the ICE simulation software, as well as unconstrained demand parameters for 16 pairs of simulation sets. The Mean Error (ME) and Mean Square Error (MSE) were calculated for each method and each scenario of demand.

THE ANALYSIS AND COMPARISON OF ACCURACY OF UNCONSTRAINING METHODS

Based on the results of the simulations of aircraft loading and the unconstraining of censored demand data for the defined sets of data, this section compares the accuracy of eight unconstraining methods described in chapter 3. Illustrated in Figure 2 are mean errors (ME) and mean square errors (MSE) of mean estimates for 8 unconstrained methods that were tested. Table 2 lists the MSE values of mean estimates for all unconstraining methods at all checkpoints.

Figure 1: Total ME and MSE of mean estimates for all unconstraining methods



Source: Authors

The I1 method ignores censoring and does not take any actions so as to unconstrain the demand data. The application of the I2 method enlarges the error compared to the I1 method because the estimated mean value is – in case of rejecting censored values – lower that the estimated mean value based on the set which also comprises the censored data (I1 method).

The methods that unconstrain the censored values by replacing the maximum between the values and the average, the median, or the 75th percentile of uncensored set values yield similar results. Their use is simple and requires only a fraction of the time that statistical methods require.

Statistical methods ensure the best results meaning that they produce the smallest ME and MSE errors which were used to measure the accuracy of unconstraining methods. Such a result is consistent with the previous scientific research. In fact, these methods are regularly used in complex airline revenue management systems by leading world airlines.

Table 2: MSE of mean estimates for each unconstraining method at all review points

method	r_1	r_2	r_3	r_4	r_5	r_6	r_7	r_8	r_9	r_{10}	total
I1	7,5	55,4	127,2	234,1	317,4	454,5	594,7	746,2	1 017,5	1 026,9	**5 612,5**
I2	5,4	31,5	76,9	149,9	213,0	346,9	474,8	657,9	964,2	1 044,5	**5 035,9**
RWA	3,4	23,9	58,9	113,5	156,4	243,6	328,1	435,0	622,7	630,7	**3 249,1**
RWM	3,6	24,3	58,6	112,5	153,6	241,8	323,5	430,1	615,6	623,5	**3 213,2**
RWP75	2,0	15,0	40,2	79,7	110,9	181,2	250,6	343,3	503,3	510,0	**2 548,0**
BP	3,4	44,3	84,1	132,9	152,9	202,4	240,8	265,9	308,6	309,6	**2 055,1**
EM	1,6	13,6	34,7	66,3	90,9	137,4	188,8	247,2	358,5	372,0	**1 892,2**
PD	1,2	9,7	24,9	47,5	65,4	99,0	138,1	186,6	282,7	310,6	**1 492,5**

Source: Authors

Using the BP method to unconstrain data ensures that the estimated value is higher than the maximum value in the group of historical bookings, which is also its advantage. On the other hand, estimated values are sometimes very high and can lead to true demand overestimation. The EM algorithm and PD method yield the best results, as expected. The advantage of the PD method is its ability to adjust unconstraining levels by changing the τ constant.

Table 3 lists the ME and MSE values of mean estimates for all unconstraining methods with regard to the booking curves and K-factor. On the whole, the

larger the demand K-factor, the more inaccurate the mean estimation, that is, the higher the forecast errors. Furthermore, the data sets with theoretical booking curves recorded higher values of forecasting errors compared to the CA booking curves, which can be simply explained by the larger number of censored values for the same demand level and the earlier closing of lower fare classes.

Table 3: ME and MSE of mean estimates for various K-factors and booking curves

data set	CA_H		CA_L		T_H		T_L	
method	ME	MSE	ME	MSE	ME	MSE	ME	MSE
I1	-181,33	5705,70	-116,60	3329,08	-259,70	8555,59	-168,38	4859,69
I2	-199,03	4738,46	-118,33	2871,79	-307,87	7735,74	-182,01	4797,50
RWA	-139,50	3284,57	-84,45	1808,38	-207,12	5188,26	-124,92	2715,21
RWM	-138,33	3228,39	-84,16	1802,81	-205,52	5104,04	-124,67	2717,67
RWP75	-112,79	2388,85	-70,15	1546,80	-171,19	3878,96	-105,62	2377,45
BP	-89,19	461,44	-70,19	993,00	-153,73	2482,85	-60,38	4283,15
EM	-70,04	1930,48	-45,47	1110,25	-96,86	2976,19	-63,17	1551,91
PD	-50,98	1502,78	-33,63	910,24	-69,79	2321,87	-46,06	1235,04

Source: Authors

Table 4 shows forecasting errors of mean estimates for various aircraft capacities, that is, for different censoring levels.

Table 4: ME and MSE of mean estimates for various aircraft capacities

data set	C=132		C=164		C=196		C=228	
method	ME	MSE	ME	MSE	ME	MSE	ME	MSE
I1	-392,51	15761,92	-205,78	5113,98	-91,73	1293,34	-35,99	280,82
I2	-360,63	12324,24	-230,41	4863,76	-140,64	2152,63	-75,56	802,85
RWA	-278,86	8489,72	-162,12	3232,85	-81,25	1023,89	-33,76	249,96
RWM	-277,73	8415,65	-160,79	3180,69	-80,57	1009,90	-33,58	246,68
RWP75	-238,38	7016,61	-128,64	2281,63	-64,60	711,13	-28,13	182,69
BP	-237,73	7526,22	-78,63	518,02	-43,79	138,12	-13,35	38,09
EM	-172,80	5520,47	-74,45	1660,68	-22,88	327,78	-5,41	59,90
PD	-129,08	4367,37	-52,01	1283,92	-15,63	264,96	-3,73	53,68

Source: Authors

Forecasting error values are higher for lower aircraft capacity, i.e. for higher percentage of censored values in data sets used for true demand forecasting.

Although all previous tables have listed and taken into consideration errors in the lowest fare class, it is important to notice that the airline revenue management system that uses the EMSRb model in the optimization module does not at all require any demand estimation data for the lowest fare class. Therefore, the forecasting error values for the lowest fare class can be omitted when comparing the results of various methods because these estimations are ultimately not used. As in lower fare classes, due to the nested booking limits in revenue management systems, the most intensive censoring occurs, that can significantly affect the overall result and the accuracy of certain methods. So, it is justified to completely disregard forecasting errors in the lowest fare class. Table 4 lists the forecasting errors for the two most robust unconstraining methods, which have shown to be most accurate in estimating true demand values.

Table 4: ME and MSE of mean estimates for the EM and PD methods

metoda \ klasa		1	2	3	4	5	U
EM	ME	0,81	2,04	4,10	10,58	-86,42	-68,88
	MSE	0,74	4,20	12,75	53,22	1 821,29	1 892,21
PD	ME	1,02	2,44	5,04	14,20	-72,82	-50,11
	MSE	1,18	6,23	20,96	103,47	1 360,65	1 492,48

Source: Authors

The PD method (τ = 0.4) yields the lowest forecasting errors if the data on recorded demand for all fare classes are taken into consideration. However, if the lowest fare class data are eliminated, that ceases to be the case, so the EM method is more accurate and ensures a higher quality of censored data unconstraining. The reason for that is the use of the unique aggression constant τ for all data groups within a simulation set, which corresponds to the practice among airlines.

CONCLUSION

As the true demand data are an essential input parameter for the optimization module of the airline revenue management system, censored demand data must be unconstrained to forecast total demand – the demand if there were no booking limits. For that purpose, several methods have been devised to unconstrain demand, in which the truncated demand data are at all checkpoints increased by the number of requests that have, due to the booking limits, initially been rejected. This paper has specified eight known unconstraining methods, from the simplest

ones which use only available data to the complex statistical methods which use an algorithm to estimate maximum probability distribution of truncated data.

Unconstraining methods were analyzed using the data obtained by simulating 16 demand scenarios and 32 aircraft loading scenarios (each with 771 iterations). In the first 16 simulation sets the aircraft capacity was significantly bigger than the true demand which did not lead to requests being rejected in any fare class. For each of such flights generated in the first 16 data sets, the corresponding flights in the next 16 simulation sets were generated. They had the same demand scenario, but aircraft capacity was reduced and that led to closing of some fare classes and rejecting passengers, thus censoring demand. The censored values were unconstrained by using eight unconstraining methods and the obtained results were compared to the corresponding data on true demand.

Simulating the process of true demand data censoring has yielded credible data sets for testing unconstraining methods. For quantifying the results of some methods, a program was created using Visual Basic. For the eight unconstraining methods, the values of estimated demand parameters and values of true demand parameters were compared and relevant forecasting errors were calculated. The expectation maximisation and projection detruncation methods produced the most accurate forecasts and the advantage of the former method is its ability to adjust the degree of unconstraining by using the τ constant.

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PREGLEDNI NAUČNI RAD / OVERVIEW SCIENTIFIC PAPER

THE FINANCIAL ASPECT OF IOT PROCESS AUTOMATION IN CREATING NEW VALUE FOR THE ECONOMY

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Abstract: *In today's world, devices with possibility to communicate, are emerging and growing daily. This advanced technology is bringing ideas of how to use these devices, in order to gain financial benefits for enterprises, business and economy in general. Purpose of research in this scientific paper is to discover, what are the trends in connecting these devices, called internet of things (IoT), what are financial aspects of implementing IoT solutions and how leaders in area of cloud computing and IoT, are implementing additional advanced technologies such as machine learning and artificial intelligence, to improve processes and gain increase in revenue, while bringing automation in place for the end users. Development of informational society is not only bringing innovation to everyday life, but is also providing effect on the economy. This effect reflects on various business platforms, companies and organizations while increasing the quality of the end product or service that is being provided.*

Keywords*: internet of things, machine learning, predictive maintenance*

JEL classification: *O31*

INTRODUCTION

IoT – Internet of things is the new technology that has one main role, to connect various things together. This connection is being done by usage of internet, which means that all these devices are visible in some sort of network. When it comes to the devices and their definition, there is wide range of home appliances such as kitchen devices (fridge, stove, microwave, etc.), smartphones, sensors for various use, like in agriculture, car industries and so on. What is important by IoT that it has wide broad of usage and it can be applied in any industry and in everyday life.

To know what is the financial aspect of the IoT and connectivity of different systems in general, there should be more explanation of the term called digital economy. Digital economy sometimes is mistaken only for transactions in the internet and it is being foreseen the complexity of the connectivity of the society in general. For example, today if someone wants to make additional financial income next to their every day job, they can scale from standard sources of income such as renting a house or an apartment to providing their skills and knowledge in digital form or even provide an applications to perform various tasks. These applications could be intended from streaming of content, everyday task planner to social platforms applications. This can create a source of bigger income that could transfer this initial side job into the company, which has possibility to grow and develop. Just by this example, it is quite easy to see how this process can transfer an initial idea to a financial value for the society in general. IoT implementation can be reflected in the similar process, as this is also considered to be part of digital economy.

In this paper, focus will be on how the connecting of various items or systems, could create a heterogeneous environment, that will create various benefits, from saving time resources to increase of financial revenue for the organizations or the institutions.

FINANCIAL ASPECT OF IOT

They are approximately around more than 8 billion (Knud Lasse Lueth, 2018) connected devices and company Ericsson has predicted that it will grow 29 billion of devices, that 80% from it, will be related to the IoT area. One of prediction regarding car industry alone, is that approximately 60 million cars (Sanel Jakupović and Vesna Novaković, 2017) will be able to communicate with each other or with other devices within the commination infrastructure. Benefit of having so wide range of implementation cases, is also making harder on forecasting the revenue that IoT will bring. Depending on industry IoT will be implemented, the revenue and market share will differ.

Table 1. Number of connected devices in millions from 2014 to 2020 depending on categories

Year	TV	Tablets	Smartphones	PCs	IoT devices
2014	-	-	4100	3200	5400
2020	3300	5500	6000	5000	30000

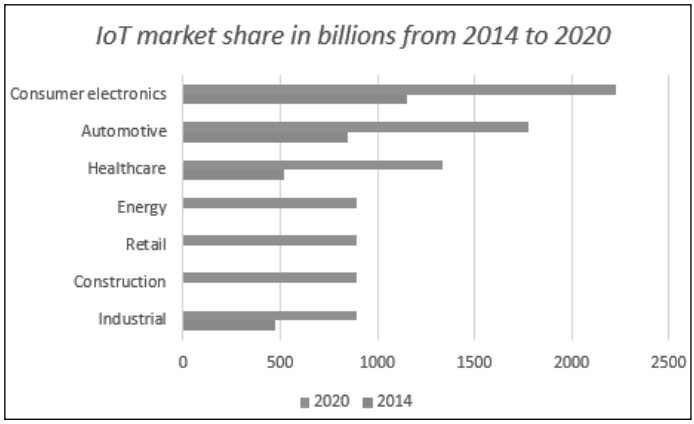
Source: Research results

Table 2. Prediction (in billion) of devices production 2016 to 2022 depending on categories

Year	Wide-area IoT	Short-range IoT	PC/Laptop	Mobile	Fixed phones	Total (billion)
2016	0,4	5,2	1,6	7,3	1,4	16
2022	2,1	16	1,7	8,6	1,3	29

Source: Research results

Figure 1. Chart comparing increase in IoT market share from 2014 to 2020



Source: Research results

For example, industry that is focused on semiconductors, has alone in year 2014 sales with 336 billion US dollars. By 2019 it will reach the 432 billion US dollars. Fastest growing component in semiconductors are sensors, achieving around 10% of share along with memory components with share of 18%, which are crucial for implementation of IoT solutions. Also, semiconductors revenue in wearable category, is from 2013 year where revenue was 15 million US dollars, elevated to 7 billion US dollars, as stated in PricewaterhouseCoopers report for 2015. This has led the semiconductors in also increasing development of other components such as batteries, to support durability and increasing computation components, to support processing of security requirements, which is beneficial for IoT solutions.

Internet of Things is capturing two major trends from product and service-oriented economy to an outcome economy (Bruce Sinclair, 2017). IoT monetizes combining various technologies by selling outcomes.

TOP SOLUTION PROVIDERS OF IOT SOLUTIONS

Market share of IoT as shown above, is getting bigger and bigger. That is the reason why top companies in cloud services are also looking for the way, on how implement solutions for IoT, to be applicable in various industries. Here will be described three companies such as Amazon, Microsoft and Google, in the financial term, how they impact IoT applications market including cloud data storage and data visualization.

Amazon AWS

Amazon AWS is cloud platform, developed by Amazon, which has made in 2018 year a 25,7 billion US dollars. Comparing with 2017 year, this was increase of 47%. It has a market share of 32% worldwide.

Microsoft Azure

Azure is Microsoft cloud platform that are fastest growing cloud services platform. It had revenue in 2018 7.4 billion US dollars, as stated Microsoft in their annual report for 2018. This is compared to 2017 fiscal year an increase of 12%. However according to Microsoft cloud report for 2019, Azure alone, has an increase of 73% in 2019 fiscal year for the Q3 quartal.

Google Cloud

Google Cloud platform is estimated to have revenue of 6.8 billion of US dollars, which puts the Google in third place on the market share, as Canalys has published in their cloud report for 2018.

Benchmark of revenue of the solution providers

To better understand what the market share is, here is the table provided that analyzes the market share and revenue of the top solution providers.

Table 3. Annual cloud revenue and growth comparing quartal Q4 for 2017 and 2018

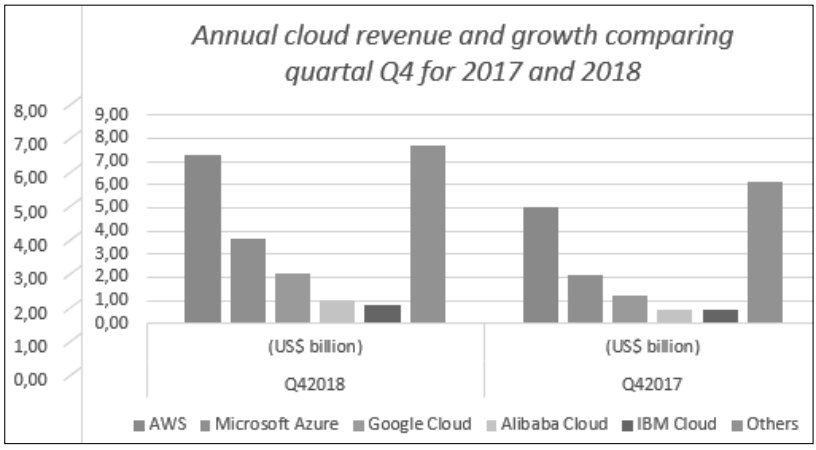
Vendor	Q42018	Q4018	Q42017	Q42017	Annual growth
	(US$ billion)	Market share	(US$ billion)	Market share	
AWS	7.3	32.3%	5.0	32.2%	+43.6%
Microsoft Azure	3.7	16.5%	2.1	13.7%	+75.9%
Google Cloud	2.2	9.5%	1.2	7.6%	+81.7%
Alibaba Cloud	1.0	4.2%	0.6	3.5%	+73.8%
IBM Cloud	0.8	3.6%	0.6	4.2%	+27.6%
Others	7.7	33.8%	6.1	38.9%	+26.7%
Total	22.7	100.0%	15.6	100.0%	+45.6%

Source: https://www.canalys.com/newsroom/cloud-market-share-q4-2018-and-full-year-2018

All solution providers are not so eager on representing their financial data into detailed categories, but they rather group other sections that are not specifically related to IoT and cloud, but they include other products, such as their commercial online products and social jobs platforms. This makes it bit difficult to have specific data, but what is clear, that growth of IoT and cloud platform will continue to spread in fast paced tempo.

However, as it can be seen from the table above, as market is getting bigger there is a linear growth of the revenue from the top solution providers. If this continues for the 2019 fiscal year, this projects a growth for all of the providers, with a minimum increase of quarter of the value of their current growth. Of course, it all depends on how innovative, scalable and beneficial their solutions for the end clients and customers will be.

Figure 2. Charts comparing Q4 for 2017 and 2018



Source: Research results

IMPLEMENTATION OF IOT ARCHITECTURE WITH MACHINE LEARNING – RECOMMENDED SOLUTION

Having announced Microsoft to spend 5 billion US dollars on IoT by 2022 year, it makes pretty much clear of where the future of IoT relays (Julia White, 2018). Here is shown a case study of recommended implementation of an IoT in company and what are the benefits and disadvantages. This case study recommendation will be based on Azure IoT platform as one of the strongest growing IoT platforms in the world.

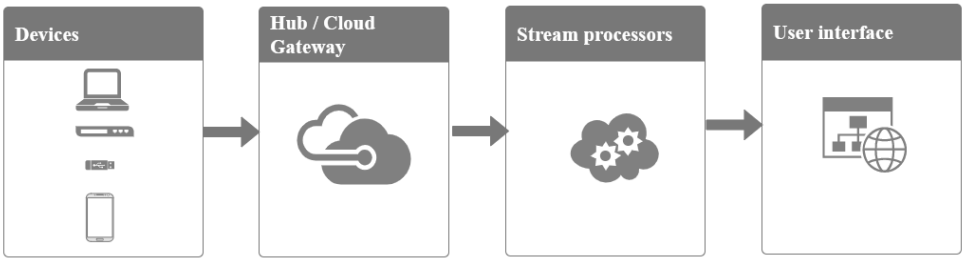
The company called Rockwell wants to have their devices connected from all over the world, they need to have two-way communication, easily to add new devices to IoT network, to have real time analytics and ability to have data visualization. Focus is on this case study not only to get devices to be connected and have overall preview, but also to implement predictive maintenance, that has huge impact on finance and people's safety.

Structure of IoT solution follows, according the reference IoT architecture from the Microsoft:
- Devices
- Hub / Cloud gateway
- Stream processors
- User interface

Devices to be considered an IoT device must be able to send or receive data from the cloud. Hub oversees sending and receiving data to devices and controlling access to them. Stream processors are responsible for processing of data and storing the data. User interface is the end system for users being able to explore and visualize the data.

For all these elements in IoT architecture, Microsoft has implemented a set of communications rules and algorithms. Each device has an API (Application Programming Interface) supported for various programming languages to communicate with. For Hub it has implemented secured communication with several various protocols and implementation of device connections to the cloud. For stream processing there is stream analytics service, for quickly processing data and providing data to pass on to the end users. This end user service is called time series insights and it is responsible for representing data to the user in meaningful manner.

Figure 3. Architecture of IoT solution



Source: Research results

To implement predictive maintenance solution, it must be clear that this belongs to the term of predicting future events. To predict a future event, it should be looked at the past data. It is important to find patterns in huge amount of data, that could help us in determine the outcome based on the new data that is coming in to our system. This is where machine learning comes in place.

Here are the six process that help us in building a machine learning model:
- Determine the outcome we want to achieve
- Identify potential sources of data
- Centralize, normalize and process data
- Model, test and iterate
- Validate model against the live data
- Integrate the model into daily operations

Our first step is to know what the end result that is being looked for is and what is the achievable outcome. In our case, goal is to prevent failures of specific sensors or machines, that could cause money and time costs.

Second process is to know what data sources are available for disposal. This phase is crucial because it is necessary to build predictive maintenance model based of data that is required to be processed. These data can be log data, sensors data, environment data etc. This is where is needed to identify all relevant data from with our enterprise or our business domain.

Third phase is the phase where our data will be connected into one data set, so it will be able to process it. All different data source can have various data type formats such as JSON from IoT device, text data format from log files, etc. Here the processing must be implementing like cleanse, normalize and combine our data, or in short, data preparation. This can be the lengthiest process, based on types of data that must be transformed into single data type format.

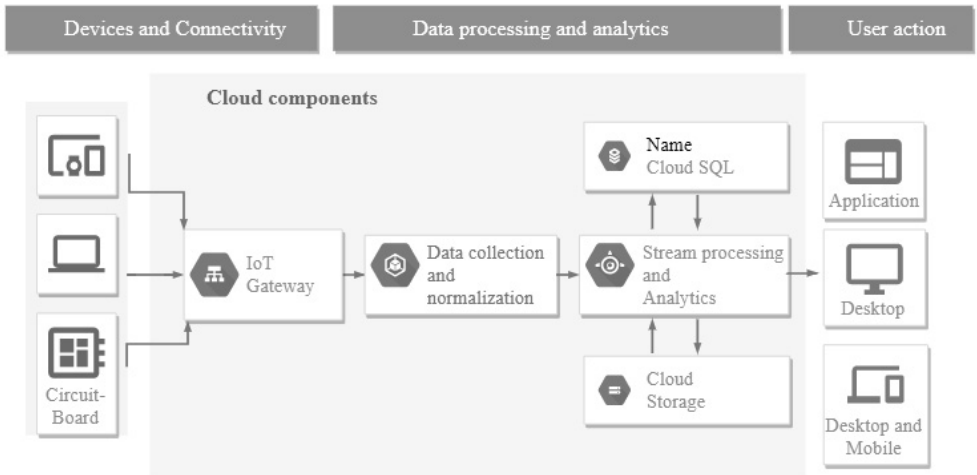
In the fourth phase, we are identifying patterns in data, by using statistical models to determine which analytics technique is best to implement. This is where model is being developed, by using test data and going through iteration until "fine tune" of the expected results is finished.

For the fifth phase, model for predictive maintenance is ready, and ready to test real data, data from production. Our model is still not released into the produc-

tion, as this is only meant for validation if our model is performing well, within controlled environment that has a production-like conditions.

The final phase, the sixth phase is for releasing predictive maintenance model into the production. This is the phase where model can also be in semi-phase released. When it is released, it will automatically create work logs in the customer relationship management tool, so technicians can inspect and repair the devices, and then later to create auto-scheduled maintenance, to replace the devices, etc. This helps in improving processes in general, with stocking the less parts, ordering on time right parts or devices, etc.

Figure 4. Diagram of implementation of machine learning in IoT, based on architecture



Source: Research results

What is also important in stream processing part, that Microsoft has his own data storage, based on SQL Server, which has huge power in processing data needed for building models for machine learning, including predictive maintenance model.

Benefit of using Azure platform (Sanel Jakupović and Hrnjica Bahrudin, 2016) is, that is so easily scalable, providing three category types:

- Infrastructure as A Service, IAAS
- Platform as A Service, PAAS
- Software as A Service, SAAS

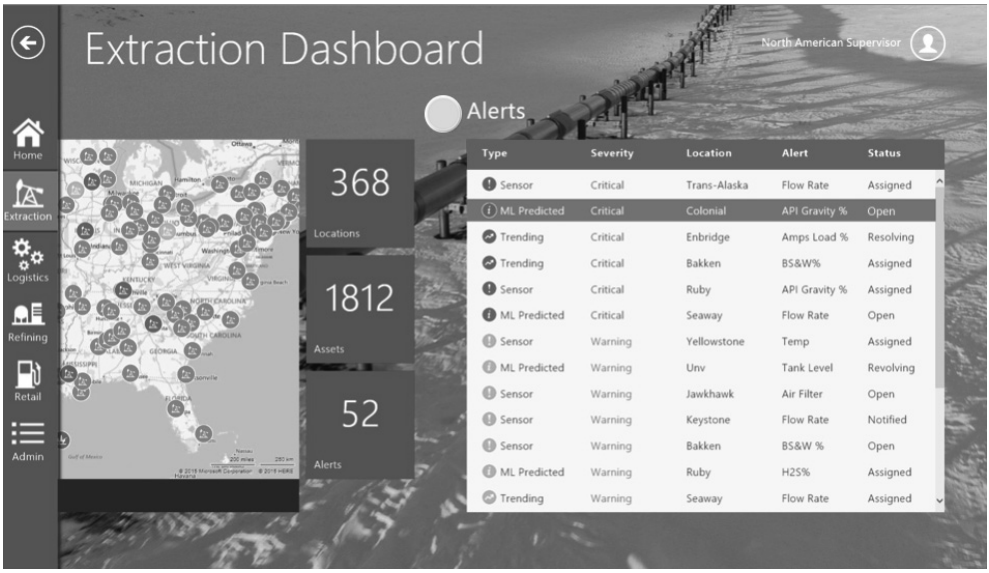
Infrastructure as A Service, IAAS, is mostly used for deployment of virtual machines, or using advantage of rented hardware infrastructure.

Platform as A Service, PAAS, is widely used platform as here is provided not only the virtual machine and infrastructure, but also preinstalled software or large range of software applications in general, required by the end user. This is including wide range of applications, also including database engines such as Microsoft SQL Server.

Software as A Service, SAAS, as its names implies is offering software hosted in the cloud. Here end users have their credentials where they simply use software as it is, and all data is stored on the cloud. Best example for SAAS is Office365, Outlook, Skype, etc.

Within our case study recommendation, we can use all of three, depending on how custom or general solution is needed to be implemented. PAAS implementation is the most general one, as all software is already built in and provided for building predictive maintenance.

Figure 5. Interactive dashboard for end users, showing IoT device statuses



Source: https://demos.azureiotsolutions.com/demos/predictivemaintenance

BENEFITS OF IMPLEMENTATION OF PREDICTIVE MAINTENANCE

Based on improvements when implementing predictive maintenance, as Microsoft has published in their solution accelerators report, it has come to the following results:

- 5% improvements in machine life time, based on reducing and anticipating machine breakdowns, with emphasis on keeping optimum work performance
- 50% reduced downtime based on preventing possible failures. Hour of machine not working can be calculated on delay in production, not to mention other indirect processes being blocked by downtime
- 40% reduction in maintenance cost when performing schedule maintenance that is not needed. By receiving data coming from the devices, system will be able to calculate and predict the results, notify the supervisors based on data processed, what is needed to be inspected and eventually changed or repaired
- 25% reduction in employee's safety, by predicting breakdowns that could result in harming the employees working with this equipment and minimize the danger occurring as end effect from these malfunctions
- 20% saving in operations. This means that when machines are not performing well, there will be energy costs occurring, material if being used by machine that is not used optimally, etc.
- Improved data analytics, by collecting all data from devices and machines, there can be planned and implemented solutions that will improve processes in our organization
- Improved quality of product, which will lead to improve satisfaction by end users and clients.
- Increased performance in the future processes, as predictive maintenance will create knowledge base that can be used guidance for recognition of possible failure and how to resolve these issues in best possible manner

APPLICABLE INDUSTRIES FOR PREDICTIVE MAINTENANCE

Predictive maintenance can be used pretty much everywhere where we have IoT and machine learning together implemented. From food industry to automotive industry, including pharma industry and oil industry, it will be great help in improving production and safety. Some of the industry that is already implementing IoT with predictive maintenance:

- Gas and oil industry are one the richest industries with great risk of impacting quality of life and environment. NASA together with US Navy had made survey where they have found out that 82% are random machine failures,

which could be prevented with implementation of predictive maintenance.
- Automotive industry is the first industry that has developed just in time methodology for manufacturing, since late sixties and early seventies years. They have implemented robots and various sensors to increase production and supply chain. One of great examples in automotive industry is cooperation of IBM with their Watson IoT and Jaguar Land Rover auto brand.
- Airlines is one of the most sensitive industries that requires accurate data integration, in order to preserve safety and punctuality in their everyday business. This where predictive maintenance with IoT can contribute to provide higher level of security including economic growth in aviation industry in general. One of good example is Delta Air Lines, where they had almost 5200 flight cancelations due to maintenance. They successfully improved predictive maintenance including Big Data for gathering and analyzing data, which has helped them to bring flight cancelation to zero. This company had 14.8% increase in operating margin in 2017 as result of implementing all these changes and had made 3.6 billion US dollars of net profit (Kevin Michaels, 2018).

CONCLUSION

By analyzing the economic aspect of IoT systems, it is concluded that bright future is ahead of IoT. Also, in addition to the financial point of view, here is presented an architecture of IoT proposed by one of the key market players, and how it can be scalable and productive at the same time. What is important, that combination of new technologies such as Machine Learning and Artificial Intelligence, easily can be implemented in the overall solutions of IoT, making IoT even more efficient in automatization of processes, creating new value for the businesses and producing an increase in financial revenue.

The area of implementation of IoT is practically unlimited, starting from health care, agriculture, logistic, transportation to banking and homes. Another important factor of IoT is the safety where it resembles in saving of people lives and various assets. This benefit alone creates a huge value for the society.

What is important to know, that IoT opens up the whole new dimension in economy, where increase of business opportunities are helping companies and organizations generate new stream of income. Just by implementing new models and services in IoT, end users and customers are getting more efficient and automated processes, cost savings and above all, increased safety and security.

Future of IoT is bright and it will definitely continue to develop and grow. Network connectivity is improving fast i.e. 5G wireless network, artificial intelligence implementation is growing fast, different platforms are being developed for synchronization and orchestration of various systems, which all of these create factors that helps IoT to become a standard way of our society development. With this in mind, IoT is definitely creating a financial value in our economy, and this is just a part of its limitless functionality.

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UPUTSTVA ZA AUTORE

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Časopis izlazi dva puta godišnje, u junu i decembru. Radovi se dostavljaju na jezicima naroda BiH, latinici, ili engleskom jeziku, isključivo elektronski, na mail redakcije, i to: **redakcija@emc-review.com** do kraja aprila za junski, i kraja septembra, za decembarski broj. Zajedno sa radom treba dostaviti adresu za slanje autorskog primjerak časopisa nakon objavljivanja. Autor po potrebi može zahtevati izdavanje potvrde u vidu dokaza da će rad biti objavljen nakon recenzije.

Redakcija će rukopis dostaviti recenzentima kompetentnim za odgovarajuću oblast. Recenzentima se ne otkriva identitet autora, kao i obrnuto. Tokom cijele godine časopis je otvoren za saradnju sa svim zainteresovanim domaćim i inostranim autorima.

Na osnovu recenzija, uredništvo donosi odluku o objavljivanju rada i o tome obaveštava autora u roku od 3 mjeseca od prijema rada. Radovi treba da budu pripremljeni u skladu sa Uputstvima za autore za EMC Review.

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Radovi treba da budu dostavljeni elektronski, u prilogu – kao otvoreni dokument (Word format), na mail redakcije časopisa na sljedeću adresu: **redakcija@emc-review.com**. Ukoliko radovi ne budu ispunjavali preporuke date u Uputstvu, neće biti predati na recenziju i neće biti štampani.

Rad mora biti sačinjen u *Microsoft Word-u*, fontom Times New Roman (12), razmak (1). **Format stranice**: veličina A4. Margine: vrh 2,5 cm, donja 2,5 cm, lijevo 2,5 cm, desno 2,5 cm.

U gornjem lijevom uglu navodi se ime i prezime autora (TNR, 12). Tri proreda niže **NASLOV RADA** na engleskom jeziku – ukoliko je rad pisan na jezicima BiH. **Naslov rada -** VELIKIM SLOVIMA, centrirano, (Times New Roman, 14, **bold**). Ispod naslova treba da stoji prezime, titula i ime autora (Times New Roman, 12). Primer: Prezime dr (mr) ime ili prezime ime, dipl ecc. U fusnoti na prvoj stranici se navodi naučno zvanje autora, naziv i adresa ustanove u kojoj je autor zaposlen i e-mail adresa autora, (Times New Roman, 11).

Sažetak, odnosno apstrakt članka je kratak informativan prikaz sadržaja članka koji čitaocu omogućava da brzo i tačno ocijeni njegovu relevantnost i koji sadrži termine koji se često koriste za indeksiranje i pretragu članaka. Sastavni dijelovi sažetka članka su: cilj istraživanja, metodi, rezultati i zaključak.

Ključne riječi su termini kojih u pravilu ima do deset.To su reči koje najbolje opisuju sadržaj članka za potrebe indeksiranja i pretraživanja i koje se dodjeljuju s osloncem na neki međunarodni izvor, koji je najšire prihvaćen unutar date naučne oblasti.

SADRŽAJ RADA

Radove pisati jezgrovito, razumljivim stilom i logičkim redom koji, po pravilu, uključuje: uvodni dio, cilj i metode istraživanja, razradu teme i zaključak. U radu mogu biti najviše tri autora.

Naslovi i podnaslovi rada

a) UVOD (TNR, 12, bold), bez tekst TNR 12, dva proreda poslije ključnih riječi, bez obilježavanja brojem.

b) Glavni naslovi u radu trebaju biti TNR 12, velikim slovima, bold, poravnato prema lijevoj margini. Između naslova u radu jedan prazan red. Glavne naslove označiti rednim brojem 1.; 2., itd.

c) Podnaslovi, drugi nivo, TNR 12, bold, poravnato prema lijevoj margini.

d) Podnaslovi, treći nivo, TNR 12, poravnato prema lijevoj margini.

e) ZAKLJUČAK (TNR, 12, bold), tekst TNR 12. bez obilježavana brojem.

f) Summary (TNR 12, bold), pa tekst (TNR 11, italic). Poslije teksta, jedan prored niže.

Summary se daje u proširenom obliku, čija dužina treba da bude od 400-500 riječi. Navodi se na kraju rada, poslije literature. Ukoliko je rad pisan na engleskom jeziku nije potrebno pisati Summary.

Pozivanje na pojedince u tekstu treba da sadrži ime, srednje slovo i prezime pri prvom navođenju. U naknadnim navođenjima se navodi samo prezime. Ne treba koristiti titule kao što su gospodin, doktor, profesor, itd. Na primjer: Alan S. Blinder (2006) [Prvo navođenje], Blinder (2006) [daljnja navođenja].

Organizacije ili vladine agencije u tekstu: Pri prvom pominjanju navesti puno ime sa skraćenicom u zagradi. Za ostala navođenja koristi se samo skraćenica.

Na primjer: Social Science Research Council (SSRC) [prvo navođenje], SSRC [ostala navođenja].

Pozivanje na članke i knjige u tekstu. Navedite ime i prezime (ime, srednje slovo i prezime, autora i godinu izdanja u prvom navođenju, sa brojevima stranica), gdje je to potrebno. Na primjer: Glen Firebaugh (1999) [prvo navođenje];

Firebaugh (1999) [daljnja navođenja]; Andrea Boltho i Gianni Toniolo (1999) [prvo navođenje], Boltho i Toniolo (1999) [daljnja navođenja]; Albert Berry, Francois Bourguignon, i Christian Morrisson (1983) [prvo navođenje], Berry, Bourguignon, i Morrisson (1983) [daljnja navođenja]. Kada se citira više djela jednog istog autora, treba dati prezime autora i godinu izdanja u zagradi, prilikom svakog daljnjeg navođenja. Navođenje autora u tekstu mora biti identično navođenju u dijelu rada, koji se odnosi na Bibliografiju.

Prijedlog za pozivanje u tekstu: (Lukacs, 2005)

Citati. Svaki citat, bez obzira na dužinu, mora biti naveden, kao i broj stranice. Za svaki citat duži od 350 znakova, autor mora imati pismeno odobrenje vlasnika autorskih prava, koji treba priložiti uz rad.

Tabele, grafikoni i slike. Tabele i grafikoni treba da budu u *Word-u* ili nekom formati koji je kompatibilan sa *Word-om*. Tabele i grafikone iz programa za statistiku treba prebaciti u format *Word-a*. Isti podaci ne mogu biti predstavljeni i u tabelama i u grafikonima. Svaka tabela, grafikon, ili slika, treba da budu označeni brojem i da imaju odgovarajući naslov, npr.: Tabela 2: Pouzdanost varijabli. Naziv tabele, grafikona ili slike se stavlja iznad, TNR 11, normal, dva slobodna reda između **naslova** tabela i teksta. Slike se moraju slati u elektronskoj formi. Ako se koristi ilustracija iz štampanih izvora, potrebno je pismeno odobrenje vlasnika autorskih prava. Izvor treba navesti ispod tabele, grafikona i slike. **Font izvora: TNR 11, italic.** Citiranja u okviru navedenog Izvora se rade na isti način kao u tekstu. Ukoliko su tabele, grafikoni i cifre plod proračuna, pregleda ili procjena autora, onda to takođe treba naglasiti.

Statistički podaci. Rezultati statističkih testova treba da budu dati u sljedećem obliku: F (1,9) = 25,35; p <001 ili slično. Niže brojeve konvencionalnih nivoa P treba isto tako navesti (na primjer: ,05, ,01, ,001).

Bibliografija. Korištena literatura treba da je u skladu sa sadržajem rada i da ima najmanje 10 izvora za sve radove, dok za pregledne najmanji broj je 15 izvora. Preporučuje se da se autori pozivaju na izvore radova do sada objavljene u časopisu EMC Review, *Journal of Economics and Market Communication. Pri pisanju rada* koristiti APA stil (http://www.apastyle.org/) za oblikovanje referenci u tekstu i u popisu literature. Bibliografija treba biti novijeg datuma. Dio koji se odnosi na bibliografi ju mora biti kucan proredom 1, mora početi na novoj stranici iza teksta i pružiti potpune informacije. Treba koristiti puna imena autora ili urednika, koristeći inicijale samo ako ih tako upotrebljava određeni autor/urednik. Navedite sve autore/urednike do/uključujući 10 imena. Autori članaka, knjiga i materijala, bez navedenih autora ili urednika, kao što su državna dokumenta, bilteni, ili novine, navode se po abecednom redu. Većina jedinki navedenih u dijelu Bibliografija treba da bude navedena (uključena) u samom tekstu.

Dodatak. U dodatku treba staviti samo one opise materijala, koji bi bili korisni čitaocima za razumijevanje, procjenu ili pregled istraživanja.

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Recenzije i objavljivanje. Svi radovi se anonimno recenziraju od strane dva anonimna recenzenta. Na osnovu recenzija redakcija donosi odluku o objavljivanju rada i obavještava autora.

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EMC Review, *Journal of Economics and Market Communication* publishes original scientific papers, descriptive and professional papers, scientific discussions, critics and reviews. With its thematic scope of scientific discoveries with applications in business and economy, the journal reflects the multidisciplinary of studies at the Apeiron University. The goal of the journal is to publish papers in the field of global economy, regional economy, economic politics, market and competition, consumers, media and business communication, new technologies, management, marketing.

The journal is published twice a year, in June and December. Papers should be submitted in the languages of B&H, Latin or English, exclusively electronically, to the redaction mail address: redakcija@emc-review.com by the end of April for June, and the end of September for December issue. The address for sending the author copy of the journal after it is published should be sent together with the paper.

Author, if necessary, may require issuance of a certificate as a proof that the paper will be published after it has been reviewed.

Editorial board will submit manuscript to editors competent for a respective area. Author's identity will not be revealed to the editors, and vice versa. Throughout the whole year, the journal is open for communication with all interested inland and foreign authors.

Based on the reviews, editorial board decides on paper publishing and informs the author within 3 months from paper receipt. Papers should be prepared in accordance with the Instructions for Authors for EMC review.

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Papers should be submitted electronically, attached as an open document (Word and PDF format), to redaction mail address: redakcija@emc-review.com. Submissions that do not meet the recommendations in the Instructions will not be submitted for review and will not be published. A paper must be written in text processor Microsoft Word, using font Times New Roman (size 12), in Latin alphabet, spacing (1). **Page setup:** A4, Margins: top 2,5 cm; bottom 2,5 cm; left 2,5 cm; right 2,5 cm. Paper needs to have the length of up to 30,000 characters (16 pages). The exception from this are reviews which may be up to 50,000 characters long. A paper needs to be proof read.

Paper title. CAPITAL LETTERS, centered, (Times New Roman, 16, **bold**). Author's

last name, title and first name should be written below the title (Times 172 New Roman, 14). Example: Last name Dr., (Mr.) name or last name. In the footnote on the first page, author's scientific occupation, name, author's address, author's e-mail address, and the name of the institution at which the author works is given, (Times New Roman, 11).

An abstract or summary of the article is a brief informative overview of the content of the article that enables the reader to assess its relevance quickly and accurately, which also contains terms that are often used to index and search articles. The constituent parts of the article abstract are: the aim of the research, the methods, the results and the conclusion.

There are typically up to ten keywords. These are the words that best describe the content of the article for indexing and search purposes, which are assigned with a reference to an international source that is most widely accepted within the given scientific field.

CONTENT OF WORK

Articles should be written in a concise manner, understandable style and logical order, which, as a rule, includes: the introductory part, the goal and methods of research, the topic development and

the conclusion. There are maximum three authors per article.

Headings and subheadings.

a) Introduction (TNR, 12, bold), text TNR 12, two spaces after keywords, without numbering.

b) Paper headings should be TNR 12, capital letters, bold, aligned to the left margin, among the titles in the paper, single space.

c) Subtitles, second level, TNR 12, bold, left margin alignment.

d) Subtitles, third level, TNR 12, left margin alignment.

e) Conclusion (TNR, 12, bold), text TNR 12, without numbering.

f) Abstract (TNR 12, bold), and text (TNR 11, italic). There is a single line spacing after the text.

The summary is given in an extended form, the length of which should be 400-500 words. It is written at the end of the article, after the references. If the article is written in English, it is not necessary to include a summary.

Summary is given in an expanded form, which length can be up to one tenth of the paper length. It should be written at the end of the paper, after bibliography. In the top left corner the name and surname of the author should be written (TNR, 12). Three spaces below Title in English - if the paper is written in Serbian, Croatian or Bosnian or in one of these languages if the paper is written in English (TNR, 14, bold). Then, two spaces below Summary follows (TNR 12, bold), followed by the text (TNR 11, italic). After the text, single space below Key words (TNR 12, bold): Key word 1, key word 2,… key word 5 (TNR 11, italic). And space below JEL classification (TNR 12, bold): E04, B12 (TNR 11, italic).

Reference to individuals in the text should include the first name, middle initial and last name on the first reference. Subsequent references should include last name only. Do NOT use titles such as Mister, Doctor, Professor, etc. For example: Alan S. Blinder (2006) [first reference], Blinder (2006) [subsequently].

Organizations or governmental agencies in the text. On the first references use the full name followed by the abbreviation in parentheses. Subsequent references should use abbreviation only. For example: Social Science Research Council (SSRC) [first reference], SSRC [subsequently].

Reference to articles and books in the text. Give full name (first name, middle initial and last name) of author(s) and year of publication in the first citation, with page numbers where appropriate. For example: Glenn Firebaugh (1999) [first reference]; Firebaugh (1999) [subsequently]; Andrea Boltho and Gianni Toniolo (1999) [first reference], Boltho and Toniolo (1999) [subsequently]; Albert Berry, Francois Bourguignon, and Chris titan Morrison (1983) [first reference], Berry, Bourguignon, and Morrison (1983) [subset quaintly]. When citing more than one work by the same author, give the last name of author and year of publication in parentheses for each subsequent citation. When listing a list of references within the text, arrange them first in chronological order, then alphabetically according to years. If there are four or more authors, refer to the first author, followed by et al. and the year; for example: Stefan Folster et al. (1998). If there is more than one publication referred to in the same year by the author(s), use the year and letters a, b, etc.

(example: 1997a, b). References to authors in the text must match exactly those in the Reference section.

Proposal for references to the authors in the text: (Lukacs, 2005)

Quotations. Any quotation, regardless of its length, needs to include reference and page number. For any quotation longer than 350 characters, the author must have written approval by copy rights owner that needs to be enclosed.

Tables, charts, and pictures. Tables and graphs need to be made in Word or some oth er Word compatible format. Tables and graphs from statistical programs should be trans ferred into Word format. Same data must not be presented both in tables and charts. Every table, chart, or picture should be marked with a number and adequate name, e.g.: Table 2: Variables Reliability. Name of tables, graphics or picture is placed above, TNR 11, normal, two spaces between table and text. If illustration from printing source is used, written authorization by copy rights owner is necessary. Source should be placed below tables, charts, and pic tures. **Source font: TNR 11, italic.** References in the Source are used in the same way as in the text. If the tables, charts, and figures are author'(s') calculations, reviews or estimations, that should also be emphasized.

Statistics. The results of statistical tests need to be provided in the following form: F (1.9) =25.35; p<001 or similar. Lower number of conventional P levels should be stated (e.g.: .05, .01, .001).

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