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METHODS OF COMPARATIVE ANALYSIS OF BANKS FUNCTIONING: CLASSIC AND NEW APPROACHES

Alexander Kuzemin, Vyacheslav Lyashenko

Abstract: *General aspects of carrying out of the comparative analysis of functioning and development of banks are considered. Classical interpretation of an estimation of efficient control by bank from the point of view of interrelation of its liquidity and profitableness is considered. Questions of existential dynamics in a system of comparative analysis of difficult economic processes and objects are generalised.*

Keywords: *bank, analysis, microsituation, statistical conclusion, nonlinear dynamics, Wilcoxon criterion.*

ACM Classification Keywords*: H.4.2. Information system Applications: Types of Systems Decision Support*

Introduction

When considering directions of solving different aspects of analysis of the market economy objects spatial-temporal dynamics the necessity arises, in any event, to carry out the comparison between the characteristics of the subjects being studied. The performance of such analysis is related, first of all, to elucidation of the arisen situation in the estimation of the economic entity functioning being studied and comparison of such object development with other similar market objects development. As a whole, this contributes not only to revealing of the reasonable approaches to the arising problems solution, but to the possibility to justify look-ahead actions in decision-making relating to the stable functioning and development of the economic entity being studied.

In this work the banks are chosen as an example of the specific economic entities. This is motivated by the fact that the stable and systematic development of the banking sector has a profound impact on the reproduction structure of economy, as through the banking the flow and reallocation of monetary resources and capital funds are organized. At the same time, the analysis of the finance flows both of the banking system, as a whole, and individual banks, in particular, is one of the key components of building of the adequate economic security system of the economic entity operating in the market economy [1, 2]. Eventually, it is precisely this that defines the urgency of the given direction of the investigation, the importance and utility of its consideration as far as the banks is concerned.

Primary Purpose of Research

The basis for performance of the banks functioning comparative analysis involves, as a rule:

- the models based on generalization and consideration of the normative indices, coefficients of economic agents activity standards with the subsequent estimation of their rating [3, 4];

- the methods of statistical conclusion based on econometric models and methods having in their origin the game theory approaches [5, 6];

- the methods of the fuzzy sets theory [1, 7].

By widespread approaches, comparative analysis, as a rule, is:

- either relative generalization of dynamics of the corresponding activity indices of the economic entity being analyzed [8],

- or construction of cluster models which allow to rank the degree of development of the objects being compared [9, 10].

But in any case the mathematical basis of investigations consists, mainly, of the probabilistic methods for data analysis. In this case the solution key aspect consists in determination of the analyzed data distribution parameters with a view to obtain an adequate model, often this is connected with violation of the distribution normality law of the data sampling involving such objects. At the same time, the main problem, arising when constructing an adequate model of the banking comparative analysis, is connected with that the economic development laws assume the presence of such interaction between different subject of the market and account for the action on these interactions of various surroundings manifestations, not having a definite statistical nature in the classical meaning. Solution of the given problem is reached, in a way, through introduction of different aspects of information saturation, banking indices being considered, into the problem treatment. But in the given case another problem arises associated with the necessity to consider the procedure of various manifestations ranking of information saturation of one or other banking indices.

Thus, the openness of a question of construction or a choice of model of the comparative analysis of functioning and development of banks induces not only to carrying out of new researches directed on its decision, but also consideration of the reached results on the basis of construction of a generalised conceptual model.

Classical Interpretation of the Estimate of the Bank Management Efficient with Respect to Interaction of its Liquidity and Profitability.

One of approaches for carrying out of a comparative estimation of development, both bank system, and separate banks is comparison of their levels of liquidity and profitableness. A basis of such comparison reflects the interrelation between liquidity and profitableness of the bank activity which essence reveals that more risky bank operations can bring even higher incomes. Thus, when considering the probabilistic interpretation of banking activity management starting from a definite liquidity level one should take into account the fact that the bank tends to support the liquid assets volume at the level sufficient to ensure meeting previously taken commitments. At the same time the bank defines the probability of the need for loan resources to meet its commitments. Then, for example, the interpretation of the banking system development based on the liquidity analysis can be considered as a probability for a random two-dimensional value to penetrate into some specified field where acceptable and admissible liquidity and profitability levels parameters manifest themselves as boundaries of such a field.

At the same time the classical interpretation of the bank management efficiency can be considered in terms of the fuzzy sets theory. The given approach becomes possible through introduction into consideration of the ownership function of some set of the bank liquidity and profitability indices corresponding to a subset of efficient managing actions of the given indices.

Then, for example, the fuzzy interpretation of the bank management efficiency in the specified phase space is limited to building and estimation of the corresponding ownership functions characterizing the degree of reaching the bank efficient management in the specified variation intervals of the banking activity being analyzed. In this case it is expedient to choose a fuzzy interpretation of the intended parameters variations in the limits of the admissible values of liquidity and profitability indices presented in the probabilistic model by the corresponding probabilistic curve as a formal description of such functions. The advisability of such a transition is motivated by that the fuzzy formalization of the corresponding probabilistic curve is possible on the basis of the concept of the fuzzy number of L-R type, which in the given case can be regarded as a trapezoidal fuzzy number. Such an

interpretation of the ownership function makes it possible not only to describe the processes under investigation formally but to take into account existing economical aspects in their development.

Nevertheless, a prominent aspect of carrying out of the comparative analysis of functioning of banks is the account of dynamics of investigated processes that allows speaking about possibility of use of a method of space-time analysis in comparison of development of banks [2].

Space-time Dynamics in System of the Comparative Analysis of Difficult Economic Processes and Objects

The most simple and abundant example of the spatial-temporal dynamics in the economic systems may be considered a set of the data characterizing development of some process (phenomenon) in time having regard to variety of available economic managing subjects. By description of such processes (phenomena), in particular, is meant dynamics of different indices of the socioeconomic development of the country in connection of its separate regions or development of some sector of the economy taking into account functioning of its separate economic components. Dynamics of the banking sector of economy development both taking into account regional features of separate administrative territorial units of the country and presence of a definite number of economic managing subjects defining the corresponding activity in this or that region can exemplify such a description.

The spatial-temporal dynamics analysis in the economic systems amounts either to the cross-section regression, or to the temporal series regression. The first type of regression makes it possible to estimate the interconnection between different data being analyzed at a definite moment of time; the second type is the interconnection between the data of one (or several) parameter during some interval of time. In this case application of the first type of regression, as a rule, doesn't take into account the dynamics of data being analyzed, application of the second type of regression doesn't take into account the presence of interdependent influence between the studied parameters with respect to different economic managing subjects. In the total the generalized model of analysis can assume the structured form [2]:

$$Y = F(X_1, X_2, ..., X_n) \Leftrightarrow \begin{cases} y^1 = f^1(X_1), \\ y^2 = f^1(X_2), \\ \quad ... \\ y^n = f^n(X_n), \end{cases} \tag{1}$$

or

$$Y = F(X_1, X_2, ..., X_n) \Leftrightarrow \begin{cases} y^1 = f^1(x_1^1, x_2^1, ..., x_n^1), \\ y^2 = f^2(x_1^2, x_2^2, ..., x_n^2), \\ \quad ... \\ y^i = f^i(x_1^i, x_2^i, ..., x_n^i), \end{cases} \tag{2}$$

where

Y – dependent variable characterizing some generalized its value;

$\{X_n\}$ – set of independent variables characterizing some generalized their values;

$F(...)$ – function representing the kind of regression dependence between the generalized values of variables being investigated;

y^n and y^i – dependent variables with regard to the analysis of the action of one independent variable X_n on the whole interval of time being investigated or taking into account analysis of the action of all independent variables $\left\{x_n^i\right\}$ for some definite interval of time;

$f^n(...)$ and $f^i(...)$ – function representing the kind of regression dependence between the dependent and independent variables represented with non-generalized values.

Such a representation of spatial-temporal dynamics in the form of the regression dependence makes it possible to present the interconnections existing between the data being analyzed in the combined-structured form and to investigate them in greater detail.

Nevertheless, it should be noticed that the basis of a method of analysis of space-time dynamics of difficult economic processes and phenomena builds the concept of a financial stream dominating in a number of approaches for carrying out of the comparative analysis of functioning of banks.

Analysis of Financial Streams as Basis of Conducting of Comparative Analysis of Functioning of Banks

As be marked before, for conducting of comparative analysis of functioning of banks an important instrument is the use of the finance flows, which makes it possible to give the most complete description of the banking on the basis of multiple presentation of the initial data (separate indices of activity) x_t^γ of their sets of γ at a certain temporal interval t in terms of the finance flows – $\left\{x_t^\gamma\right\}$.

This is associated with that the basis of the flow approach comprises the possibility to realize the structuring of data for complex dynamic systems; it is precisely the structuring that opens different directions for carrying out the necessary analysis [11].

At the same time, the flow processes involve all spheres of the market economy, this is rather important as far as the banks is concerned as the centers of redistribution of monetary and reallocation of capital. This also allows taking into account the degree of various environment factors action, governing thereby the information saturation of the indices being considered.

It should be noted in this case that the flow approach can serve not only as the set of instruments for the banks functioning and development, but also act as the combining center of various approaches applications for carrying such analysis.

At the same time one of the shortages of the flow approach consists in performance of the banks generalizing comparative analysis as the financial flow concept assumes only consideration of some sets of such flows while their structuring is also significant. Therefore, the following part of the given investigation is just devoted to the processes of more precise bank finance flows structuring.

Visualisation of Processes of the Comparative Analysis of Functioning of Banks

However, before to pass to consideration of the questions, concerning direct carrying out of the comparative analysis of functioning of banks, we will stop on a problem, concerning visualisation of the investigated facts and received results. Validity of such consideration is connected by that decision-making in area, a task in view of the given research, are connected with necessity of carrying out of the analysis and interpretation of the multidimensional data for a time scale approached to the real. Thus the purpose of such visualisation is, including identification of a current condition of investigated object (bank) during its life cycle on the basis of the intellectual

analysis of the data. Therefore, on a number with classical approaches about representation of the statistical data about investigated economic object (bank) in the form of diagrams and schedules, also it is necessary to use more difficult models of interpretation of the received data.

In particular one of perspective directions of research, concerning visualisation of carrying out of the comparative analysis of functioning of banks is the representation of results of such analysis in a kind of equal-distance points from the beginning used systems of co-ordinates in various metrics. The offered approach gives the chance to interpret results of the comparative analysis, as in the form of various geometrical figures, as well as various lines which reflect dynamics of the investigated data and change of such dynamics.

Thus the task of the beginning of co-ordinates (by means of a choice of the certain metrics) for equal-distance points with the subsequent transformation of the received curve (or figures) by means of group of affine transformations allows to carry out comparative analysis for the investigated objects forming one economic cluster. For example, if in two-dimensional space of signs of an income-expense scheme display an arrangement of various banks they form a curve which reminds one of ellipse quarters (fig. 1).

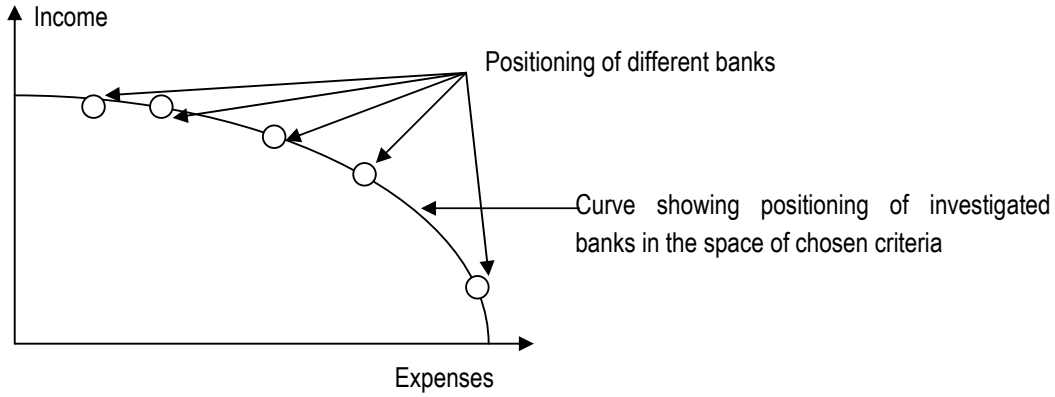

Fig. 1 shows the investigated objects (banks) as a curve in the space of chosen criteria (income – expenses)

In particular such representation (see fig. 1) allows not only to compare initial data (the received income and the realized expenses), but also to predict dynamics of change of probable profit in the framework of one model. The general toolkit for carrying out of the comparative analysis of functioning of various subjects of managing thus extends. On the other hand decomposition of the income and profit of each of banks allows to speak about certain situations in their development and therefore to apply concept of a microsituation to research of the chosen subjects of managing.

Microsituation Concept as the Foundation for Performance of the Banks Functioning Comparative Analysis and Development

Some problems of finance flows structuring for carrying out of the economical processes dynamics comparative analysis were considered in [1]. Nevertheless, the problematic aspects concerning comparison of special and general finance flows for their further structuring and analysis remain beyond the scope of investigations. First and foremost, such a generalization concerns, first of all, the problems of description of the situation of functioning of the banks as a complex system and the banks taken individually.

One of the specified problem solution directions can be the use of the microsituation concept which found the proper application when solving a number of problems arising in emergency situations [12].

In the given aspect, to perform the comparative analysis of the banks functioning and development based on the flow approach, by the microsituation, variety of the banking description with the help of the corresponding parameters and indices should be meant. In this case the concrete microsituation S^L can be described in the form of a separate finance flow or some set of them being defined with a set of data $\gamma,(\gamma=\overline{1,m})$, characterizing the banking of some bank $L,(L=\overline{1,n})$:

$$S^L=(\{x_t^{k1}\}^L,\ k1\in\gamma, \tag{3}$$

$$S^L=(\{x_t^{k1}\},\{x_t^{k2}\},\{x_t^{k2}\})^L,\ k1,k2.k3\in\gamma. \tag{4}$$

Thus, comparing banks between themselves we, first of all, compare the micro situations which in the given case describe the state of the banks functioning and development in terms of some parameter or their totality:

$$S^1=(\{x_t^{k1}\},\{x_t^{k2}\},\{x_t^{k3}\})^1\approx S^2=(\{x_t^{k1}\},\{x_t^{k2}\},\{x_t^{k3}\})^2,\ 1,2\in L, \tag{5}$$

where S^1 – is the microsituation describing the first of the banks being analyzed,

S^2 – is the microsituation describing the second of the banks being analyzed.

At the same time it is possible to carry out comparison of the banks development and functioning as a whole fixing parameter t. Then, in the given case, variation of some of the banking parameters being analyzed x_{tp}^{γ} for a fixed date tp in terms of the whole variety of banks – $\{x_{tp}^{\gamma}\}^L$, $L,(L=\overline{1,n})$ is considered as a finance flow.

In this case the concrete microsituation can be presented in the following form:

$$S_{tp}^L=(\{x_{tp}^{\gamma}\}^L,\ tp\in t,\ \gamma,(\gamma=\overline{1,m}), \tag{6}$$

or

$$S_{tp}^L=(\{x_{tp}^{\gamma}\},\{x_{tp}^{\gamma}\},\{x_{tp}^{\gamma}\})^L,\ tp\in t,\ \gamma,(\gamma=\overline{1,m}). \tag{7}$$

Then the comparison consists in performance of the analysis between the microsituations describing the state of the banking system functioning as a whole at some fixed dates of time:

$$S_{tp1}^L=(\{x_{tp1}^{\gamma}\},\{x_{tp1}^{\gamma}\},\{x_{tp1}^{\gamma}\})^L\approx S_{tp2}^L=(\{x_{tp2}^{\gamma}\},\{x_{tp2}^{\gamma}\},\{x_{tp2}^{\gamma}\})^L,\ tp1,tp2\in t. \tag{8}$$

Ultimately, we receive some set of microsituations $\Omega=\{S^L,S_{tp}^S\}$, completely describing functioning and development of the banking system. Since, as mentioned above, not all microsituations can have the normal distribution, then we shall consider nonparametric tests to verify the hypothesis for coincidence of the microsituations being investigated. In the given case it is expedient to use the test Wilcoxon for bound samplings [13], which answers the question: whether some event essentially changing the microstructure hierarchy took place in the analyzed data which characterize different samplings.

In other words, when carrying out the comparative analysis of banks functioning and development the analyzed microsituations distinguishability is studied. Then the value of the Wilcoxon test can be used as the measure of distinction (agreement) of the microsituations being considered. The greater is the value of the test being considered, the more distinguishable as a whole are the microsituations being considered and vice versa, the less is the value of the test being considered the closer are the microsituations being considered.

The Initial Data and Results of the Comparative Analysis of Banks Functioning in Ukraine

The foregoing approach is being considered as an example of the banking in Ukraine in terms of such index as a share of the granted credits in the overall totality of bank assets. The paramount importance of consideration of such banking values is associated with that just the credits

- on the one hand, constitute a considerable part of bank operations and, respectively, operating profits in total gains of a bank from such operations,

- on the other hand, the granted credits growth results in credit risks and, consequently, in the banks development destabilization.

Thus the problem associated with the succession of the development dynamics of relation between the granted credits and total volume of banks assets both for the banking system as a whole, and in terms of separate banks functioning is rather significant. The more so the generalized dynamics of the relation between the granted credits and total volume of banks assets as a whole is indicative of the rise in the banks preferred weight with the increased part of the granted credits in their assets volume (Fig.2, generalized using the site www.finance.ua).

Hence the essence of the first question as to carrying out the comparative analysis of the banking activity consists in estimation of the succession in variation of the granted credits preferred weight in their assets volume during each year of the period being investigated. To analyze such a succession is possible on the basis of investigation of the microsituations each of them describes the state of the banking system functioning as a whole for the fixed date of time tp in terms of the banking activity index x_{tp}^{γ} – the credits preferred weight in the banks assets (see Eq. 8). The results of such investigation obtained within the periods of 2004, 2005, 2006 and 2007 years in section of each month represent a separate microsituation shown in Figs.3-6 (generalized on the basis of the above approach and data of the site www.finance.ua). In this case the black circles mark the microsituations the most consistent between themselves, the microsituations less consistent are not shown at all.

As can be seen from the data in Fig. 3 the corresponding consistency between microsituations in the banking system development of Ukraine by the results of 2004 in terms of the credits specific weight in the banks assets is the least one.

At the same time the analysis of data from Fig.3-Fig.6 testifies that year after year the consistency between the microsituations becomes stronger. This is apparent both from the increase in the microsituations number and from the increase in such consistency, the decrease in the circles dimensions demonstrates this. Hence a dangerous situation forms in the banking system development in Ukraine as a whole, which is marked by the rise in the credits specific weight in the banks assets structure, this can cause the rise in credits risk level. Moreover, continuity in such development is observed.

In other hand the analysis performed according to the above methods of consistency in development of separate banks is not less interesting in the considered aspect. To perform such an analysis let us consider a group of 12 banks representing those representing and operating in the same region that makes it possible to consider indirectly the action of various factors on their functioning and development. For the microsituations, their comparison will represent consistency of separate banks development, generalization of their finance flows appears, this represents the specific weight of credits in the structure of such banks assets. Further comparison is carried out on the basis of Wilcoxon criterion accordion to Eq.5. Fig.7 shows results of such consistency.

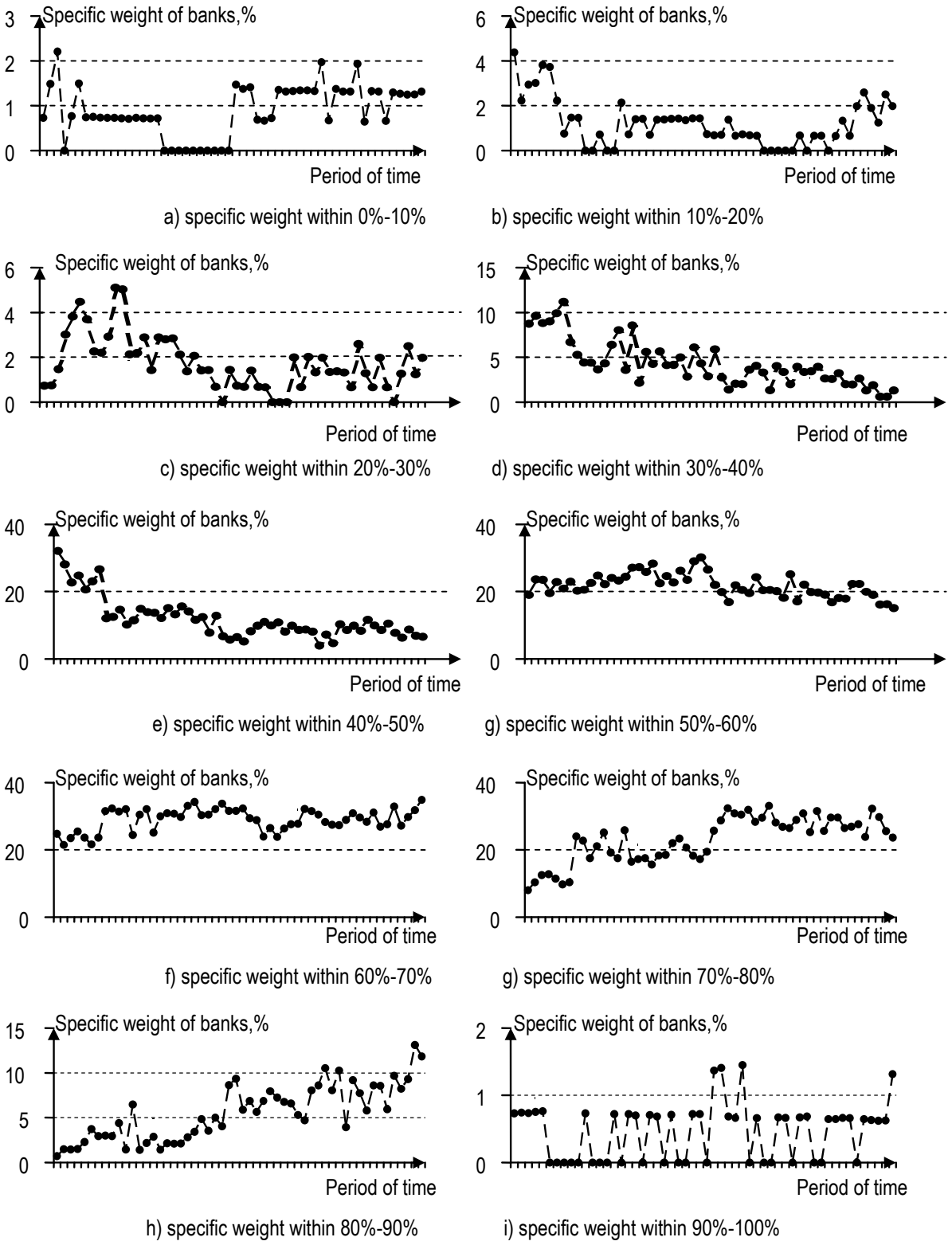

Fig.2 The specific weight dynamics of the granted credits to the total assets volume in the banking system as a whole during the period from 01.01.2004 till 01.05.2008

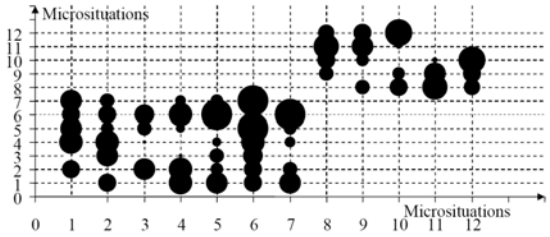

Fig.3 Consistency of microsituations representing variation of the credits specific weight in the banks assets volume according to the results of the banking system work in 2004.

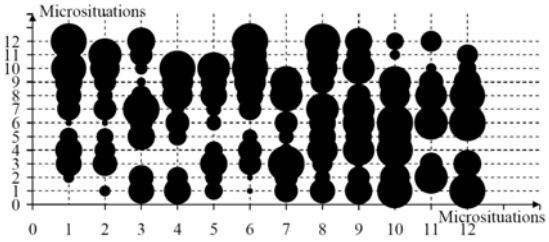

Fig.4 Consistency of microsituations representing variation of the credits specific weight in the banks assets volume according to the results of the banking system work in 2005.

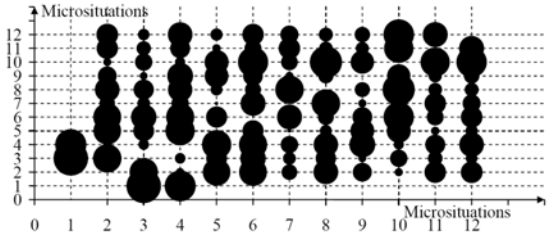

Fig.5 Consistency of microsituations representing variation of the credits specific weight in the banks assets volume according to the results of the banking system work in 2006.

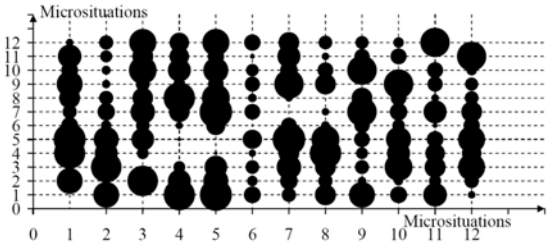

Fig.6 Consistency of microsituations representing variation of the credits specific weight in the banks assets volume according to the results of the banking system work in 2007.

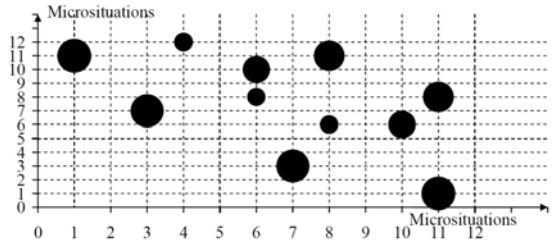

Fig.7 Consistency of microsituations representing variation of the credits specific weight in the banks assets volume according to separate banks of the group being studied by the results of their work within the period from 01.01.2004 till 01.05.2008

As evident from the data in Fig.7 the microsituations consistency in the considered aspect is not bserved for the group of banks under study. Thus it may be concluded that each of the banks chooses its own strategy of increase of the credits being granted. Nevertheless, according to the data from Figs.3-6 such a strategy as a whole is aimed at increasing the credits specific weight in the banks assets structure. Consequently, the problem of the credit risk rise remains an urgent one.

If we speak about direct visualisation of results of the comparative analysis of functioning of banks it is possible to take advantage also of their representation in the form of some curve that has been described in subsection visualisation of processes of the comparative analysis of functioning of banks of the given work. In particular useful ist the consideration of difference between the received coordination of considered microsituations according to fig. 3 – fig. 6 where such distance is considered for various metrics from the point of view of change of degree of the coordination considered microsituations (in this case the size of each circle reflects conformity

degree (a coordination) of investigated microsituations). In the formalized expression it can be written down as follows:

$$R = M(S_n^m, S_{n+1}^{m+1}) . \quad (9)$$

where R is distance of coincidence between investigated microsituations in the framework of some metrics M; S_n^m is dimension of certain circle characterising microsituation nm in the former period of analysis of the whole set of microsituations, describing the actions of investigated economic subjects; S_{n+1}^{m+1} is size of a certain circle characterising a microsituation during the subsequent period of the analysis of a cumulative set of microsituations, describing investigated subjects of managing activities.

The received curve by means of the formula 9 will reflect dynamics of change of a coordination of microsituations of the investigated subject of managing and may be used as some profile of its dynamics. On the other hand you may use methods of nonlinear dynamics for consideration of such dynamics which also find wide application for carrying out of the comparative analysis of functioning of objects in economic researches.

Methods of Nonlinear Dynamics are in the Estimation of Development of Banks

Methods of nonlinear dynamics are widely used in analysis and forecasting of parameters showing the development of stock exchange market, insurance market, dynamics of investment handling. Simultaneously analyses of bank segements of finance market based on methods of nonlinear dynamics are not sufficient explored in scientific publications. One of boundaries of such approach to such type of markets is the necessary amount of sample data collected, which may characterise the development of bank sector. Even for such markets the investigation of discontinuities of economic processes is quite important for taking into account existing dynamics and the possibility of weakening regarding to further development of banks.

Phase portrait of statistical data series is the key term of nonlinear dynamics, characterising main parameters of bank's processing and their time induced changes. Such series are e.g.

KI – data series, defining dynamics of bank's loan-investment portfolio;

KR – data series defining dynamics of loans handed over;

MK – data series, defining bank's activity on the markets of interbank loans;

ZP – data series, characterising dynamics of amount of bank's securities;

D – data series, defining the general amount of resources, acquired as deposits;

DF – data series, generalizing amount of resources acquired as deposits of physical persons;

DY – time series generalizing amount of resources acquired as deposits of legal persons;

In this way, bank's activity may be described as an amount of data series mentioned above, which can be generalised as follows:

Data series, defining dynamics of bank's loan-investment portfolio as:

$$KI(x_1, x_2, ..., x_t) = KR(y_1, y_2, ..., y_t) + MK(z_1, z_2, ..., z_t) + ZP(d_1, d_2, ..., d_t) , \quad (10)$$

and data series, defining the overall amount of resources, acquired as deposites:

$$D(e_1, e_2, ..., e_t) = DF(ef_1, ef_2, ..., ef_t) + DY(ey_1, ey_2, ..., ey_t) , \quad (11)$$

Where $x_t, y_t, z_t, d_t, e_t, ef_t, ey_t$ are values of according series at a fixed time moment t.

Then, in a phase space of dimension 2 using cartesian coordinates the phase portrait of statistical data series may be defined as a set of points:

$$\Phi(CHR) = \{(r_i, r_{i+1})\}, i = \overline{1, t-1}, \quad (12)$$

where CHR – one of series shown above according to equ. 10 and 11.

r_i, r_{i+1} – are the values of series shown, in defined time intervals.

According to the fundamentals of rating of bank's development with methods of nonlinear dynamics in pic. 8 are shown phase portraits of data series, reflecting dynamics of interbank loans, taking into account the specifics of activities of different Ukrainian banks (values are taken from www.finance.ua).

As seen from fig. 8 generally for banks are characteristic different phase portraits of investigated data series. Simultaneously you may see that the dynamics of phase portraits of Basis and Grant banks are most correlated compared with the dynamics of phase portraits of investigated series for Big Energy and Nadra. This fact may be first of all explained by existing bank's strategy to act on market of interbank loans.

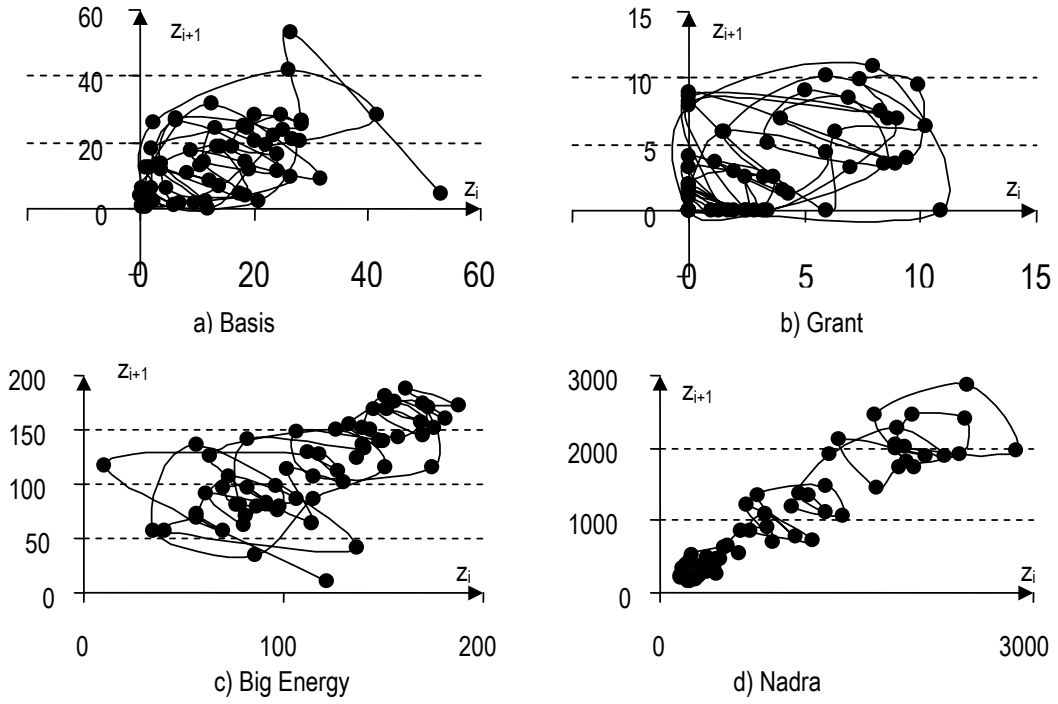

Fig. 8. Phase portraits of data series defining bank's activities on the market of interbank loans for 2004–2008 (monthly)

Such strategy, however, will be defined based on existing conditions and factors, influencing bank's activities. This fact is reflected in the phase portraits of investigated data series shown above. So the Basis bank and the Grant bank are related to the same group of banks, which are additional administrated by intermediate management. Big Energy and Nadra banks also are administrated by intermediate management (www.bank.gov.ua). Therefore, one may state, that phase portraits of data series, shown above, reflect existing conditions of functioning, belonging to different banks. With other words, methods of nonlinear dynamics may be used on equal rights for investigation and analysis of development processes of complex economic systems, banks belonging to.

Conclusions

Thus, in the given work a number of methods developed by authors throughout last four years for carrying out of the comparative analysis of functioning of banks which it is represented perspective is considered. In particular such methods are:

- Formalisation of management efficiency by bank from the point of view of interrelation of its liquidity and profitableness on the basis of the theory of indistinct sets;
- Representation of space-time dynamics of the investigated phenomena and processes as conjoint-structured ones;
- Technique of carrying out of the comparative analysis of functioning and development both bank system as a whole, and separate banks in particular, on the basis of the generalised concept of a set of microsituations, each of which characterises such activity proceeding from certain financial streams which in turn reflect those or other indicators of activity of separate banks. Thus for comparison of microsituations nonparametric tests on the basis of Wilcoxon's criterion are used;
- Carrying out of the comparative analysis of functioning of banks byf nonlinear dynamics which is defined by concept of a phase portrait, the presence of cyclic changes in time series of the data from the point of view of different indicators of activity of banks is shown, that allows to note features of development of the investigated time series of data.

In the given aspect work presents a general concept of carrying out of comparative analysis of functioning of banks where prevailing focus is given the concept of microsituation, and also the use of approaches of nonlinear dynamics.

Adequacy and working capacity of the offered approaches is approved on the real data, concerning various directions of bank activity. It allows applying the offered approaches to carrying out of the expanded comparative analysis of various directions of activity, both separate banks, and bank systems.

Bibliography

1. Kuzemin A., Lyashenko V. Fuzzy set theory approach as the basis of analysis of financial flows in the economical security system // International Journal "INFORMATION THEORIES & APPLICATIONS" – 2006. – Vol. 13, Num. 1. – P. 45–51.
2. Kuzemin A., Lyashenko V. Analysis of Spatial-temporal Dynamics in the System of Economic Security of Different Subjects of Economic Management // International Journal "Information Technologies and Knowledge" – 2008. – Vol. 2, Num. 3. – P. 234–238.
3. Kuzmenko E.S. Methods for banks safety rating estimation// Urgent problems of economics. – 2007. – № 1. – P. 164-175.
4. Indicators of financial stability. Instruction manual. – Washington, Columbia District, USA: International Monetary Fund, 2007. – 326 p.
5. Azarenkova G.M. Models and methods for financial flows analysis. – KharkovX: ВКФ “Grif”, 2005. – 119 p.
6. Watshem T.G., Parramaw K. Quantitative methods in finances. – M.: Finances, ЮНИТИ, 1999. – 527 p.
7. Nedosekin A.O. Application of fuzzy models to banks finances management // http://sedok.narod.ru.
8. E.V. Comparative analysis of the banking systems of Russia and Czech Republic under condition of the transitional period in economics // Materials of the V International scientific-practical conference “Countries with transitional economy under conditions of globalization”. – M.: РУДН, 2006.
9. Golovan’ S.V., Karminsky A.M., Kopylov A.V., Peresetsky A.A. Models of the Russian banks default probability. Preliminary banks partitioning into clusters // Preprint # 2003 XXX. – M.: РЭШ, 2003. – 49 p.

10. Snityuk V. Evolutionary clusteraization of complex objects and processes // XI-th International Conference «Knowledge-Dialogue-Solution» – Varna, 2005. – Vol. 1. – P. 232–237.
11. Kuzemin A., Lyashenko V., Bulavina E., Torojev A. Analysis of movement of financial flows of economical agents as the basis for designing the system of economical security (general conception) // Third international conference «Information research, applications, and education». 27-30 June. Varna, Bulgaria. – Sofia: FOI-COMMERCE – 2005. – P. 204–209.
12. Kuzemin A., Lyashenko V. Conceptual Foundations of Construction of the Models and Procedures for Prediction of the Avalanche-dangerous Situations Initiation // International Journal INFORMATION THEORIES & APPLICATIONS. – 2008. – Volume 15. – №2. – P. 153–158.
13. General theory of statistics: Manual// T.V. Ryabushkin, M.R. Efimova, I.M. Ipatova, N.I. Yakovleva. — M.: Finance and statistics, 1981.

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