

Cluster analysis of capitalization of ukrainian banks in the conditions of national economy globalization

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Abstract. The conducted analysis of activity of Ukrainian banks allowed to draw conclusion about the general tendencies of banks development within the limits of clusters and testified about the reduction of profitability of equity in direct ratio to the decline of index of cartoonist of equity of the bank. The crisis processes in national and world economy have an influence on the banks of the first cluster, because the structure of their capital is formed mainly by liabilities. The banks of the third cluster, predefined by low efficiency and considerable frequent problem debt, need a recommendation to take part in M&A processes. The banks of second cluster at sufficient profitability and insignificant statistics of problem credits have a sufficient provision of equity in case any unforeseeable circumstances arise. Thus, the optima of multiple capital index are 10-20, the proportion of equity to owned capital from 4 to 10.

Key words: bank, competition strategy, bank cluster, multiplier of bank stock, qualitative composition of the owned capital, profitability of the owned capital.

INTRODUCTION

The banking system is a set of business units that are characterized by various sizes, geographical locations, client bases and ranges of services. However, if the banks are grouped according to quality criteria, it will become apparent that they are closely connected and can be incorporated in a few stable groups with identical parameters of activity, and the difference between these groups is substantial. The application of such grouping is made by means of the cluster method.

The efficiency of activity of Ukrainian banks during 2007 - 2011 was analyzed by a cluster method. In order to strengthen competitive positions of banks at the international financial market it is necessary to conduct the analysis of capitalization of their activity, investigating reasons of problems and evaluating potential of development. To that end it is necessary to solve such tasks of scientific research:

- estimate the level of reliability and profitability of activity of banks during 2007-2011;
- analyze competition positions of Ukrainian banks after the changes in the level of capitalization;
- define the list of recommendations for the competitive strategies of development of banks within the limits of clusters.

MATERIALS AND METHODS

The term “cluster” (Eng.) implies a bunch, bouquet or group, accumulation, concentration. As a mathematical term, “cluster” suggests close location of some logically related objects within one area [4, 5, 6, 11, 14, 15, 16, 17, 18].

The logic of applying the cluster method to the analysis of the functioning of the banking system consists in selecting the institutions, for which it is possible to use similar methods of regulation and analysis, application of activity criteria and determination of priorities [1, 2, 3, 8, 19, 20].

Therefore, the conducted cluster analysis will enable estimating the quality of the banking system through the evaluation of the rating of the banks in certain groups and their relocation during defined period of time. For the central bank such groups will be the basis for making recommendations on the improvement of the quality of the banks' capital and its growth with the purpose of increasing the competitiveness of the system in general and of certain banks in particular.

In addition, the identification of the group of banks with the worst indices will be a criterion for keeping a closer watch over them and, possibly, taking the measures of administrative influence.

The revealing of its position in a corresponding cluster will enable the certain bank not only to identify the

institutions with similar advantages and disadvantages in the market, and, thus, to use their work experience for eliminating its own certain disproportions in activity, but also to strive for changing to another cluster, whose banks activity is more profitable and less risky.

The placing of a bank in a certain cluster is used as an additional source of information about the level of its capitalization for clients, as the choice of the bank must be based, first of all, on its reliability. Thus, choosing a certain group will determine not only the bank's provision with insurance funds (owned capital), but also a proper level of risk and profitability, that satisfies a potential contractor.

The grouping of banks must be carried out according to a logically grounded system of indices, as, depending on their choice, different combinations of banks are possible in different clusters. Certainly, within each of the basic clusters it is possible to determine smaller groups, depending on other factors. However, it does not change the closeness of connection in the group according to the top-priority criteria, but only determines additional characteristics.

For the analysis of the capitalization of the banking system we consider it necessary to use, first of all, the multiplier of bank stock (M_{bc}) [9, 10]:

$$M_{bc} = \frac{\text{balance sheet total}}{\text{authorized capital amount}}. \quad (1)$$

This index determines the level of bank provision with the authorized capital, therefore, the higher the multiplier index is, the higher the risk level of work and probability of losses. The balance sheet total or the amount of assets in the numerator determines the object of insurance for the capital, as the level of the bank's risk is determined by the volume of its active operations.

For a meaningful supplementing of the bank stock multiplier we shall calculate the index of the qualitative composition of the owned capital (Q_{oc}):

$$Q_{oc} = \frac{\text{authorized capital}}{\text{owned capital}}. \quad (2)$$

It is worth mentioning that the division of the authorized capital by the owned one determines the quality index of the bank's insurance buffer without taking into account possible manipulations and fictitiously grown constituents, on the use of which the National Bank imposes restrictions.

The next criterion of the division of banking institutions into clusters is the profitability of the owned capital (P_{oc}):

$$P_{oc} = \frac{\text{net profit/loss}}{\text{owned capital}}. \quad (3)$$

The use of this index is substantiated by the fact that every bank as a business establishment aims at receiving a profit, and this criterion is probably the most

important in an economic analysis. On the basis of the index of capital profitability, in case of making a loss, it is necessary to calculate its part that can be covered by the owned capital and the safety factor that remains in the bank.

The complex of the suggested indices enables discovering clear tendencies only in dynamics, therefore we consider it expedient to make an analysis of the years 2007-2011 [7]. While doing this, for description of indices in the clusters we have used the index of arithmetic mean for totality (\bar{x}), as the calculation of the averages will make it possible to estimate the reference-points of the group:

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2}, \quad (4)$$

where: N – the number of banks in the cluster;

x_i – index value for a certain bank.

For the uniting of banks into clusters a statistical package SPSS is used, which enables to discover distinct gaps between the groups of banks, and by means of determination between the indices of authorized capital correlation and the total of liabilities (the index of approximation reliability – R^2) of these groups to confirm the division made.

RESULTS AND DISCUSSION

Fig. 1 represents the division of Ukraine's banks into three clusters, the first of which will comprise the banks, the size of whose multiplier exceeds thirty, the second - exceeding ten, and the third one will comprise the rest. The number of banks in the formed clusters is as follows: the first cluster comprises four banks, the second cluster – sixty-nine, the third cluster consists of ninety-nine banks.

Verification of determination availability in each of the clusters is represented in Fig. 2-4. Additional criteria for confirmation of substantial differences between the formed clusters is the construction of different equations of dependences. For the symmetry of the received results a linear function has been used for each dependence.

From Fig. 2 - 4 it is obvious that there is a considerable reliability of connection in the clusters (more than 0.8), and the dependences are described by different equations (for the Ukrainian banks from the first cluster the increase variable at x is fifty-three, for the second – seventeen, for the third – seven).

By January 1, 2009 the tendency to the division into three clusters remained unchanged. The first of them includes six banks, the second - forty-nine, the third - one hundred and twenty-seven banks in Ukraine, which means that a redistribution of banks in favour of the third cluster took place (see Figure 5). We observe a redistribution of banks in favour of the third group, namely a return to the tendencies of the previous years in Ukraine.

High reliability of connection between the banks (0.9) in the distinguished clusters and similar values

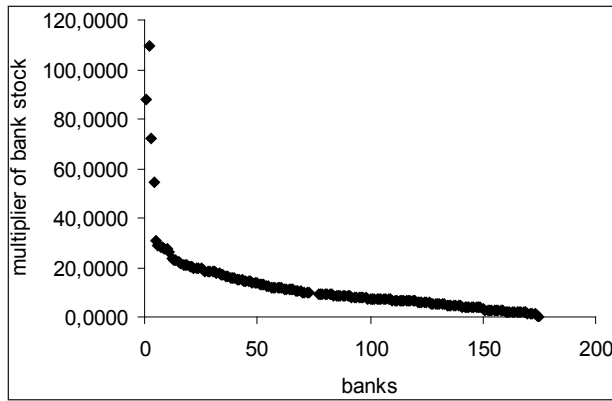


Fig 1. M_{bc} indexes (01.01.2008)

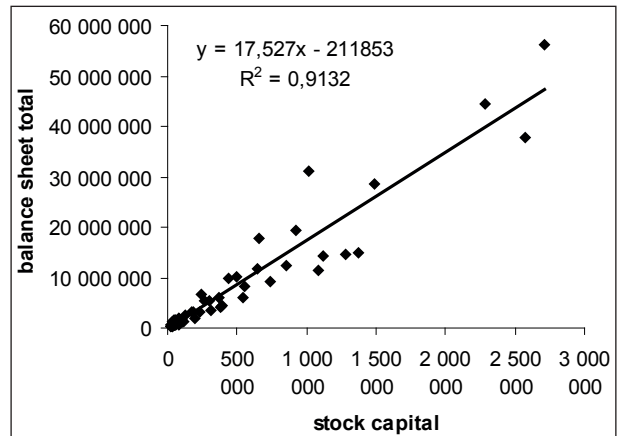


Fig. 2. Dependence between balance sheet total and stock capital of cluster 1 (01.01.2008)

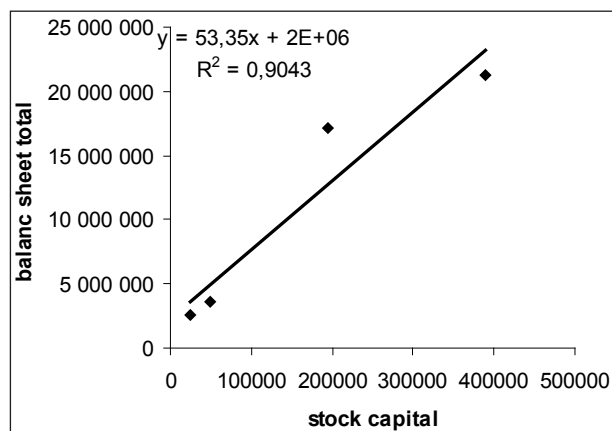


Fig. 3. Dependence between balance sheet

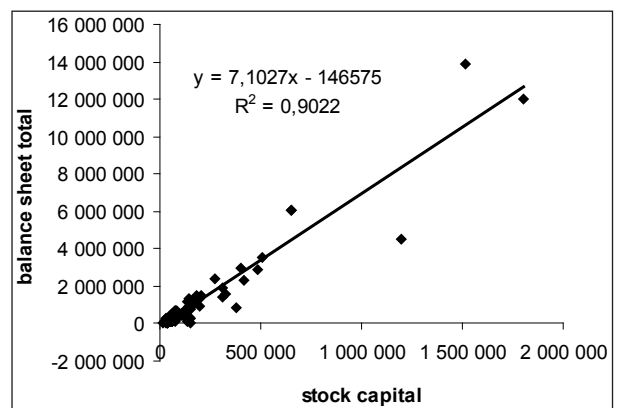


Fig. 4. Dependence between balance sheet total and stock capital of cluster 2 (01.01.2008) total and stock capital of cluster 3 (01.01.2008)

of increase variables are clearly exhibited by the linear equations of the first and second clusters, but in the third cluster the increase value diminished twice, which testifies to the convergence of characteristics of the banks in the cluster (Fig. 6 - 8).

We continue to observe the division into three clusters as of January 1, 2010. The first of them comprises eleven banks, the second - twenty-one banks, the third - one hundred and forty-one banks in Ukraine (Fig. 9). We notice the continuation of the tendencies toward changes

in the structure of the clusters in favour of the group that is lower in order, due to the greater influence of the financial crisis on the activity of the banks.

The high reliability of connection between the banks in the clusters and similar values of increase variables in the linear equations of the second and third clusters remained unchanged, while in the first cluster the value of increase diminished twice, which testifies to the increase in the closeness of connection within the cluster in Ukraine (Fig. 10 - 12).

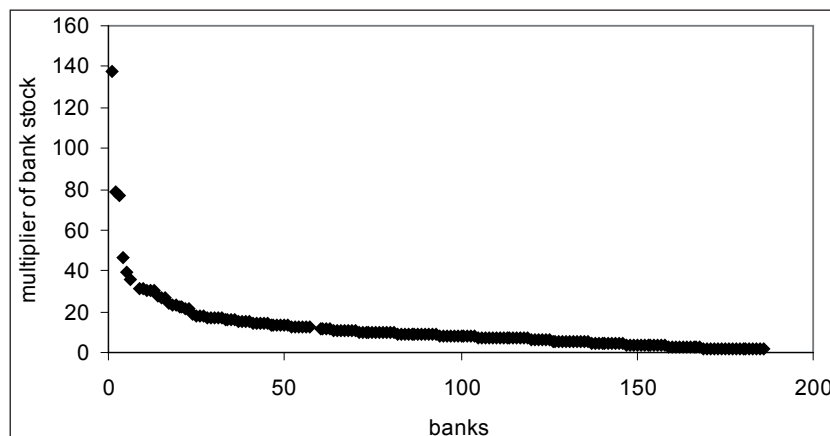


Fig. 5. M_{bc} indexes (01.01.2009)

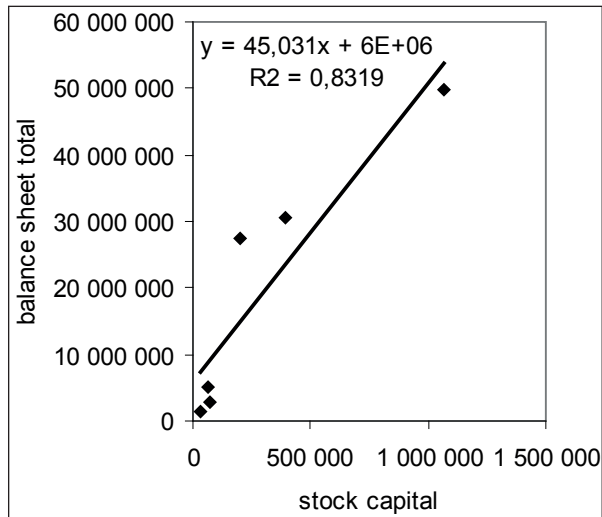


Fig. 6. Dependence between balance sheet total and stock capital of cluster 1 (01.01.2009)

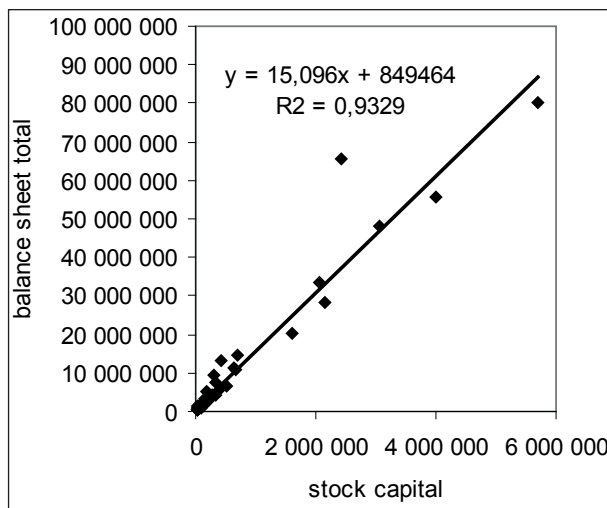


Fig. 7. Dependence between balance sheet

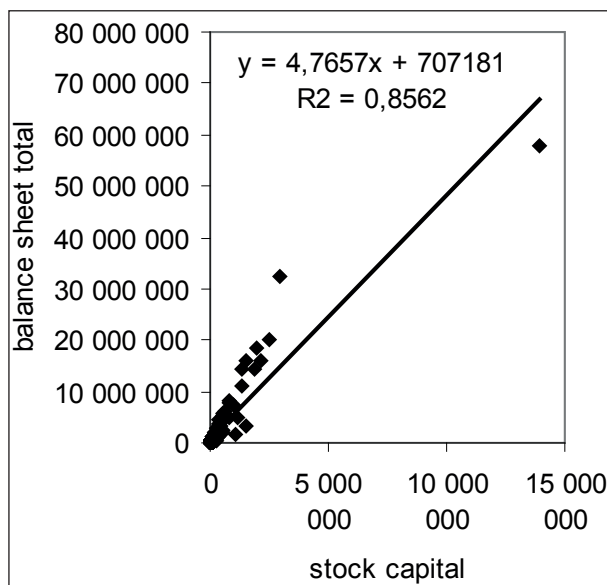


Fig. 8. Dependence between balance sheet total and stock capital of cluster 2 (01.01.2009) total and stock capital of cluster 3 (01.01.2009)

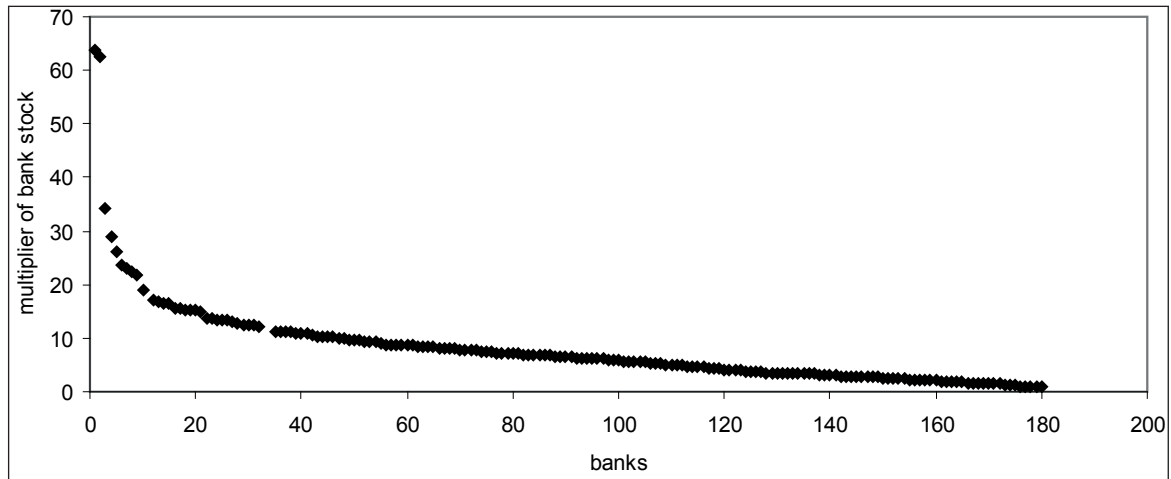


Fig. 9. M_{bc} indexes (01.01.2010)

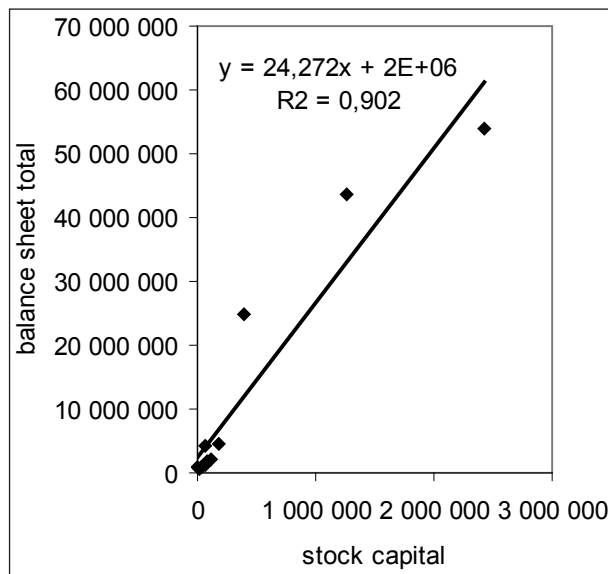


Fig. 10. Dependence between balance sheet total and stock capital of cluster 1(01.01.2010)

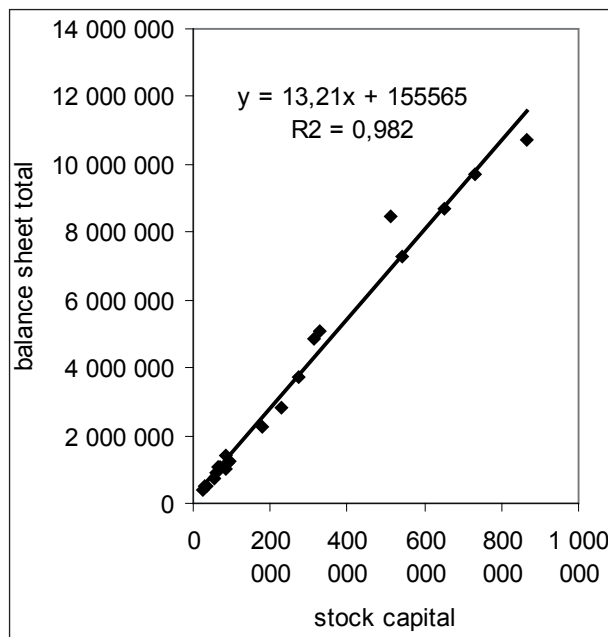


Fig. 11. Dependence between balance sheet

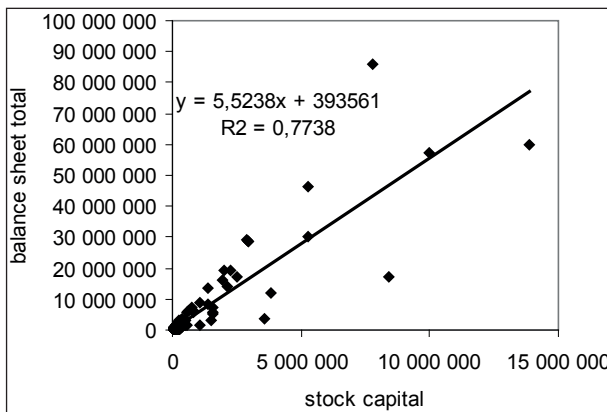


Fig. 12. Dependence between balance sheet total and stock capital of cluster 2 (01.01.2010) total and stock capital of cluster 3 (01.01.2010)

It is necessary to point out the reappearance of the former 10 - point gap between the multiplier indices of the first and the second clusters, which resulted from the additional changes in the characteristics of the clusters due to the crisis.

In Fig. 13 we can see a division into three clusters as of January 1, 2011, the first of which comprises seven banks, the second – twenty-seven, the third - one hundred and forty-one banks. We observe changes in the structure of the first cluster in favour of the second one, thus,

a decline in the possibilities of the banks to accumulate funds in Ukraine.

In the conditions of high reliability of connection between the banks in the clusters the capital increase index tends to grow in the first cluster (due to the diminishing of the gap between the clusters the first group includes again the banks with a rather wide range of the multiplier index values – 23 - 87), and similar values of increase variables in the linear equations of the banks from the second and third clusters are preserved (Fig. 14 - 16).

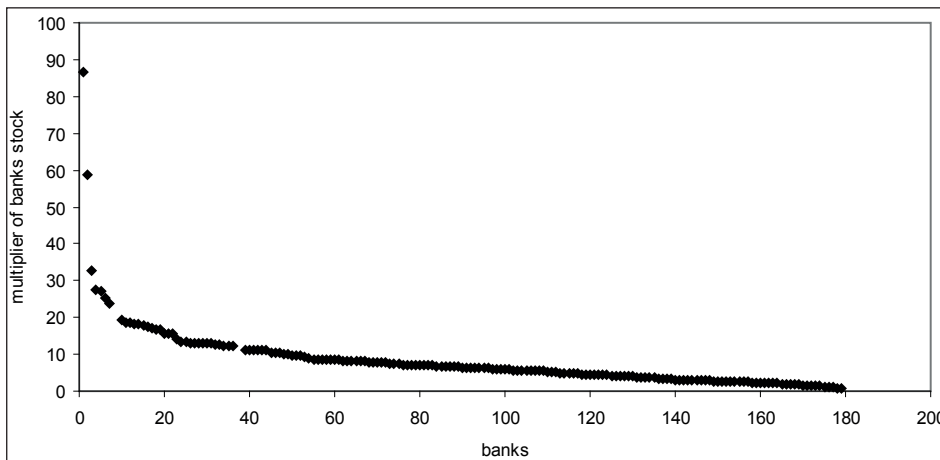


Fig. 13. M_{bc} indexes (01.01.2011)

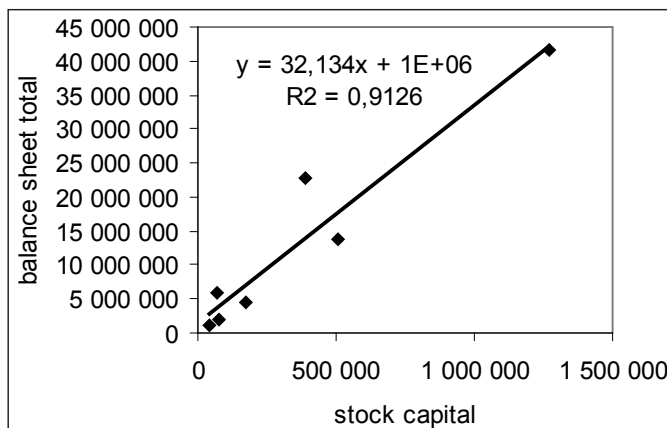


Fig. 14. Dependence between balance sheet total and stock capital of cluster 1 (01.01.2011)

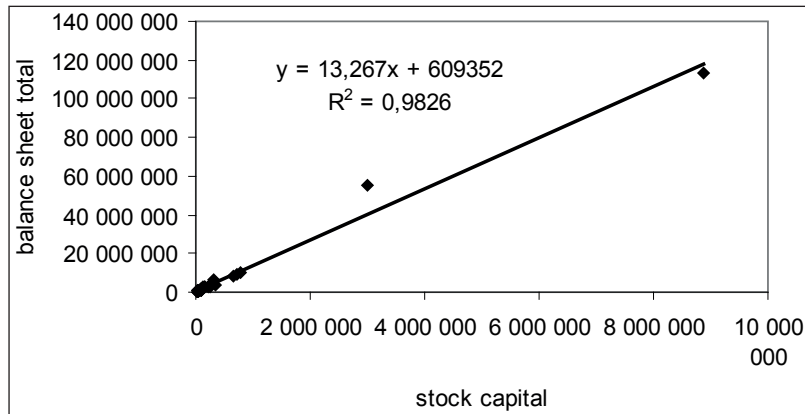


Fig. 15. Dependence between balance sheet

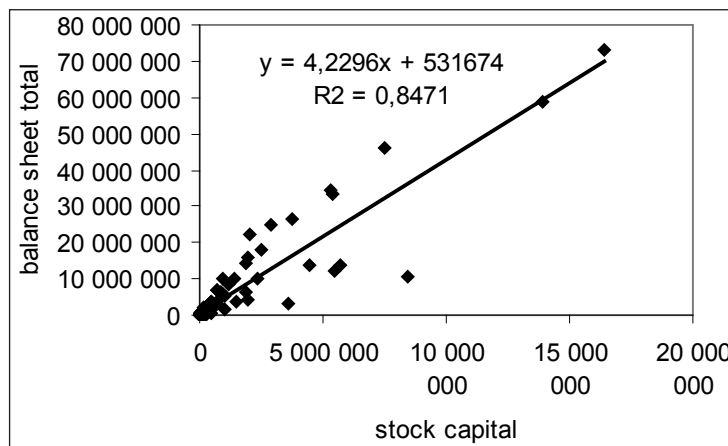


Fig. 16. Dependence between balance sheet total and stock capital of cluster 2 (01.01.2011) total and stock capital of cluster 3 (01.01.2011)

As of January 1, 2012 three clusters were distinguished in the banking system of Ukraine, the first of which included seven banks, the second – twenty-seven, the third - one hundred and forty-one banks (Fig. 17). The unchanging tendency of the structure of the clusters testifies to a certain stabilization in the Ukrainian banking system and gradual renewal of the pre-crisis parameters of the banks' activity.

The high reliability of connection between the banks inherent to the clusters and similar values of increase variables in the linear equations are preserved (only the linear increase coefficient of the banks from the second cluster rose insignificantly) in the banking systems of Ukraine (Fig. 18 - 20).

The conducted analysis enables us to make conclusions concerning the similar features that are observed

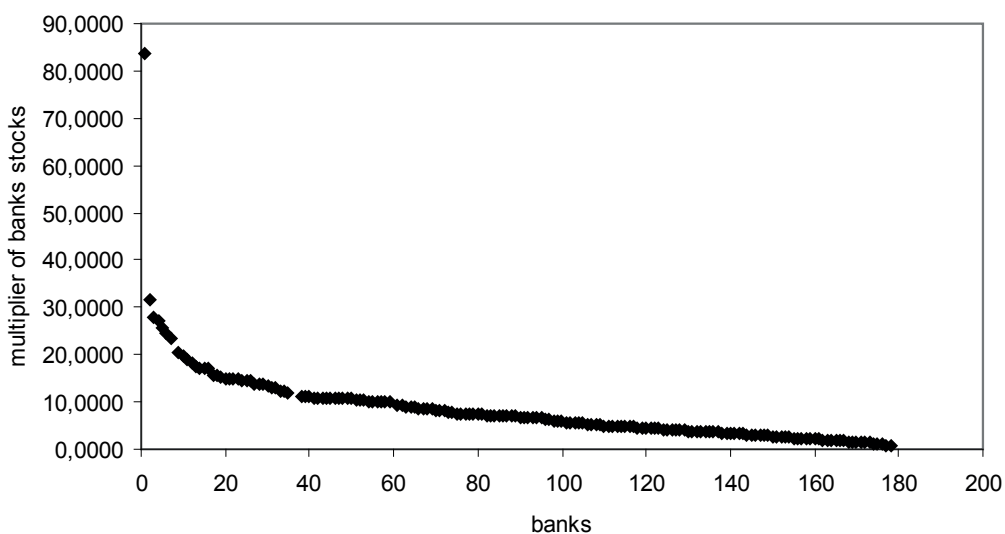


Fig. 17. M_{bc} indexes (01.01.2012)

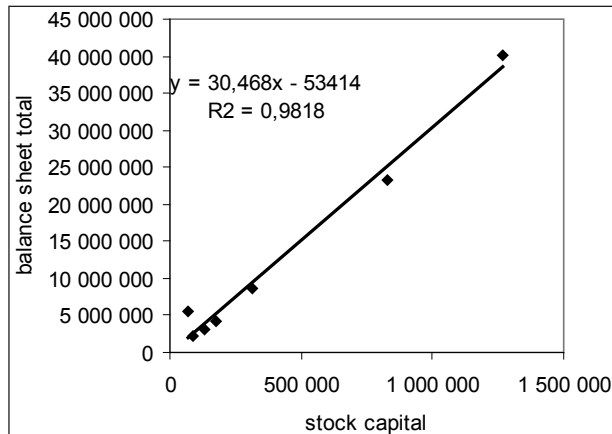


Fig. 18. Dependence between balance sheet total and stock capital of cluster 1 (01.01.2012)

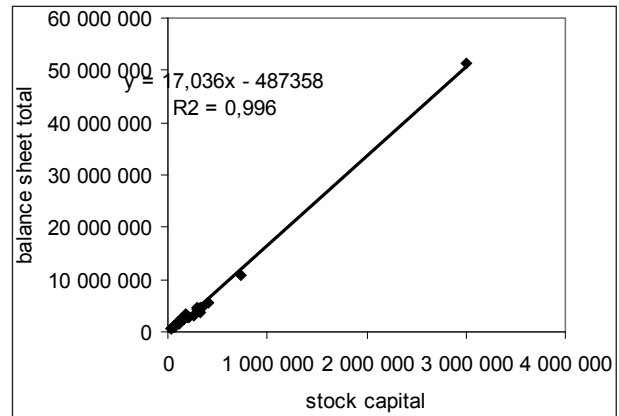


Fig. 19. Dependence between balance sheet

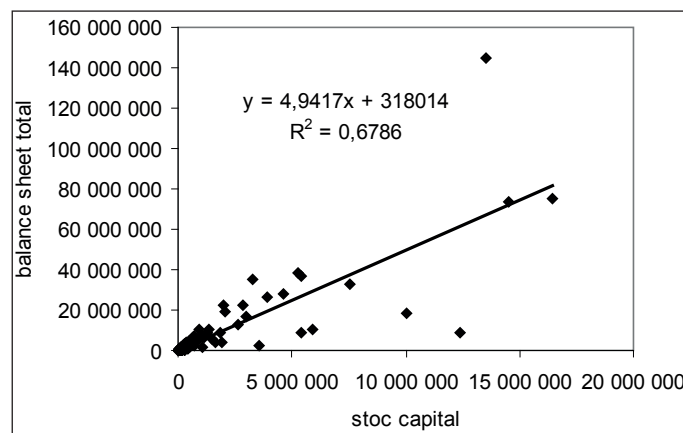


Fig. 20. Dependence between balance sheet total and stock capital of cluster 2 (01.01.2012) total and stock capital of cluster 3 (01.01.2012)

in the clusters of the Ukrainian banks (appendix 1). The first conclusion is that the number of banks in the first cluster is limited, while the number of banks in the third cluster is considerable (Fig. 21).

In our opinion, the limited number of banks in the first cluster is explained by the fact that leadership in the market depends not only on the work of management, which must be organized on a high level, but also on considerable expenses connected with achieving this kind of increase, that is why only a small number of banks can reach a high level and hold this position.

The analysis of the quality of the owned capital and the bank stock multiplier in dynamics makes it possible to understand that for banks with a small multiplier the share of authorized capital in the owned capital is low (Fig. 22). We consider that this is due to the “information” potential of banks – actively developing banks with tendencies to a profit increase successfully accomplish strategic work and use marketing developments.

With time these banks can attract a considerable part of their liabilities using deposits and resources of the European financial market, which will diminish the portion of their own assets in the structure of the resource base, and subordinated obligations, which will decrease the share of the authorized funds. At the same time,

the banks that do not use the publicity status, operate only in separate market segments and show low profitability, can grow mainly owing to additional payments of shareholders.

It stands to reason that a greater amount of resources and more effective activity enable getting a higher level of profit, that is why the index *Poc* is obviously higher in the first cluster. The tendency of five years proves the symmetry of the achieved results in the comparison of the clusters and speaks of a reduction of the owned capital profitability in direct proportion to the decline of the index of the bank stock multiplier (Fig. 23).

According to the logic of economic research, the profitability increase should have been accompanied by an increase in the non-standard debt quotient. However, there is a reverse tendency according to the received results. In the banks of the first group the risk level is lower, which can be explained by a high quality of work or by a cardinally opposite phenomenon – the mass character, in which inaccurate loans influence the quality of the combined credit portfolio to a lesser extent.

It should be pointed out that despite the best performance indices in the first group, the banks belonging to it are more susceptible to the crisis phenomena. This hypothesis is confirmed by the data of 2009, when the

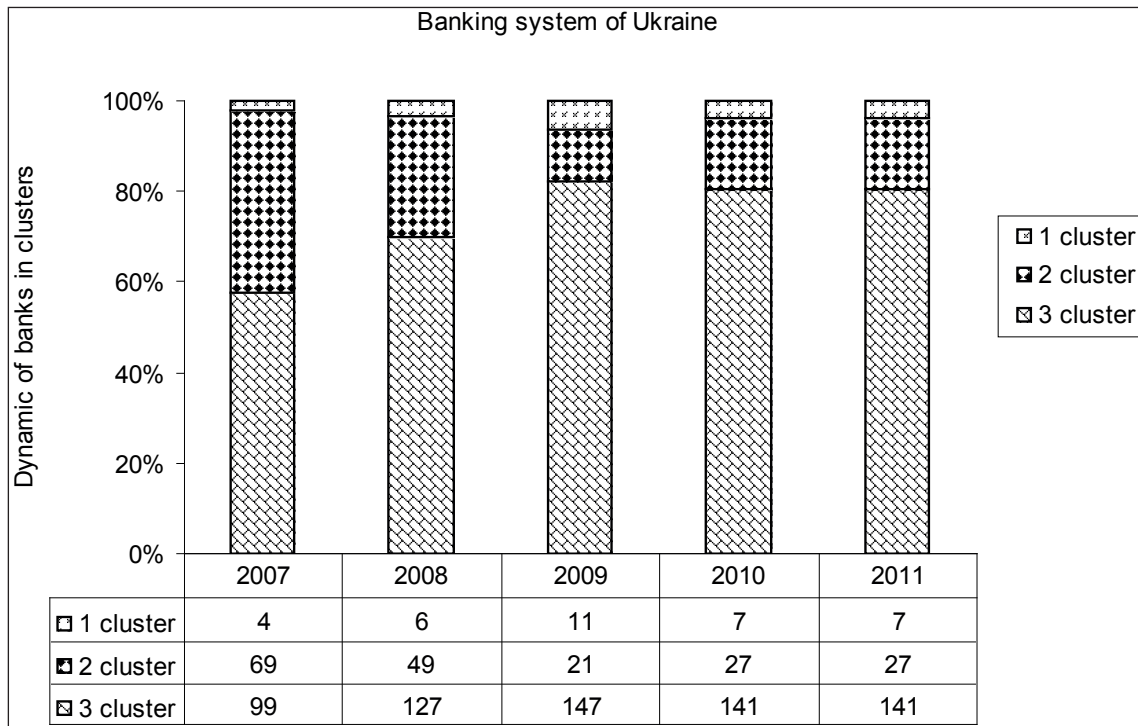


Fig. 21. Dynamics of quantity in clusters

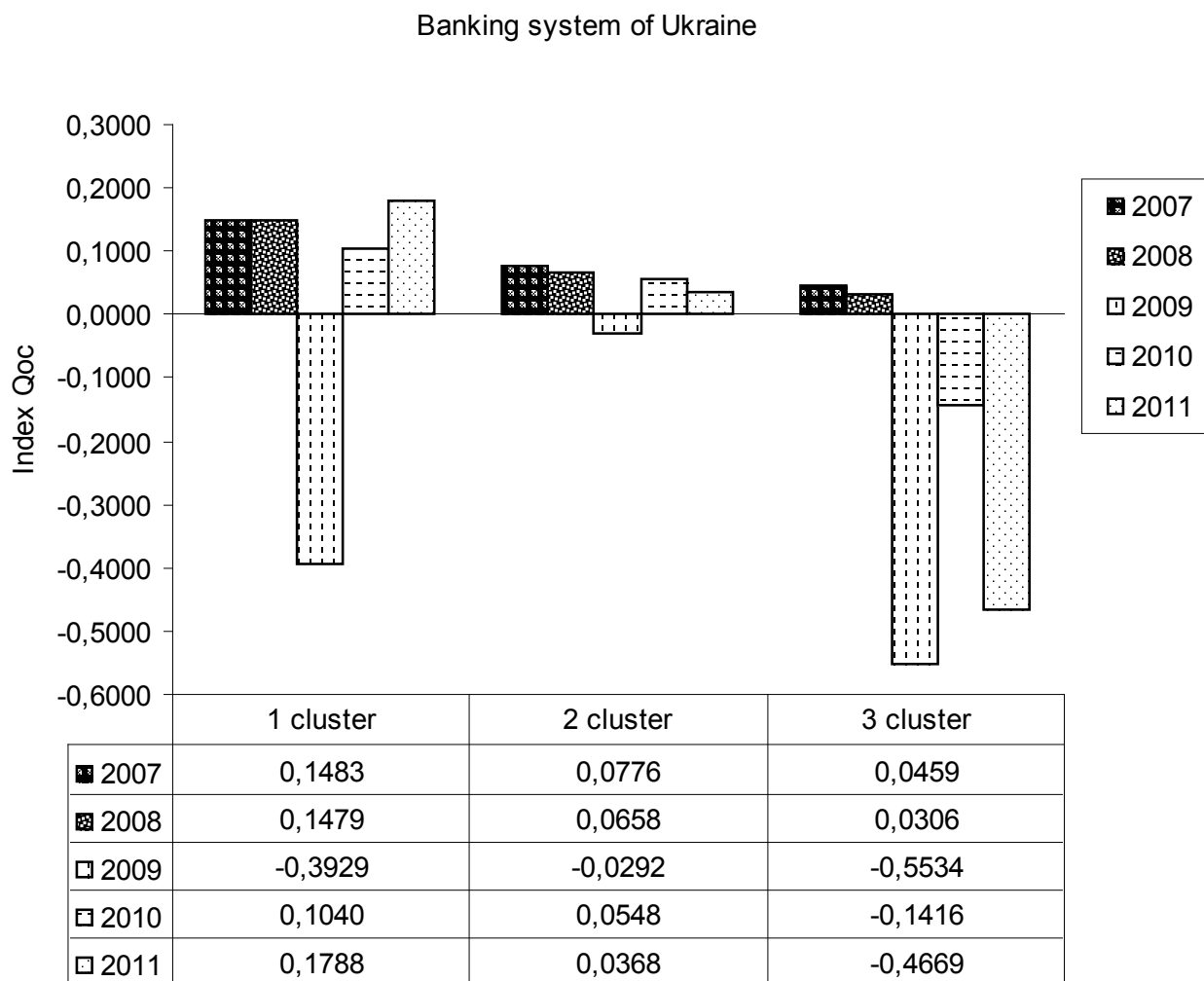


Fig. 22. Analysis of banks in clusters by index Qoc

Banking system of Ukraine

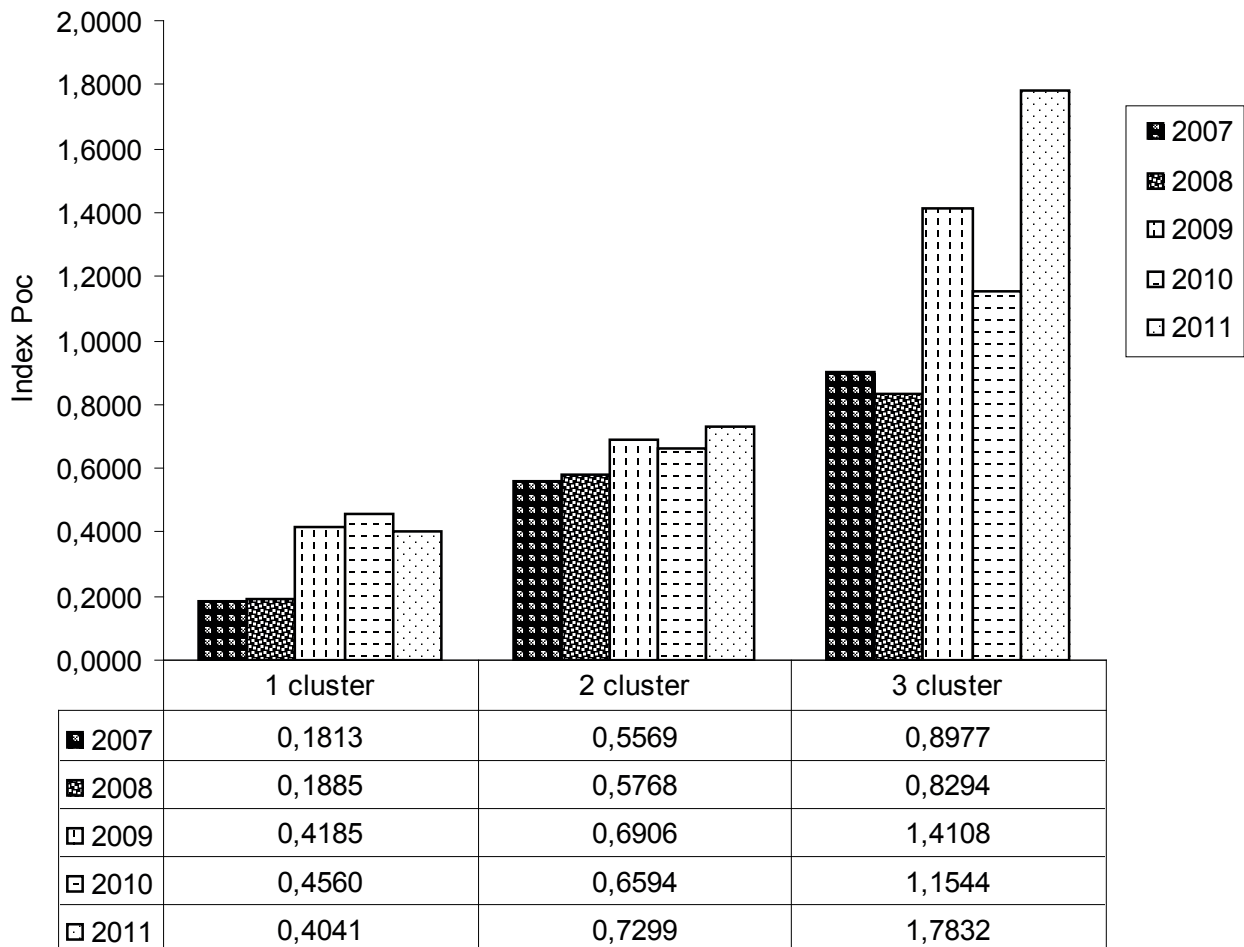


Fig. 23. Analysis of banks in clusters by index Poc

mass outflow of deposits put two of the four banks, that firmly belonged to the first cluster, - Prominvestbank and Nadra – in danger of bankruptcy.

The other two banks – Citibank (Ukraine) and Ukrsofsbank – belong to foreign owners, therefore they were supported by the financial resources of parent structures, although now they show a considerably greater part of problem loans than during the previous years.

The banks of the third group require recommendations of the central bank concerning mergers and acquisitions owing to their low efficiency and a considerable portion of problem debts. As a result of the crisis, the ratio of the authorized capital to the owned one exceeds 1, which indicates a significant amount of reserves that have not been sufficiently formed and a reduction in the amount of the owned capital due to the losses of the previous periods.

The character of activity of most banks belonging to the group is regional or aimed at serving a limited circle of clients, that is why with the increase of requirements for the amount of the owned capital the majority of these banks will have to search for variants of consolidation,

because a capital increase at the expense of shareholders or foreign market entry is improbable.

CONCLUSIONS

We must not think that the financial crisis did not affect the activity of the second cluster of banks. However, on the whole, it may be concluded that according to the criteria of stability used by the central bank the second group of banks, which at sufficient profitability and an insignificant portion of problem loans has sufficient provision of bank stock in case of contingency, remains optimal. Thus, we can recommend 10 – 27 as optimal limits of the multiplier index, that is a 4 to 10 per cent share of the authorized capital in the liabilities.

The received results confirm Michael Porter's theory of competitive advantages [12; 13]. The scientist distinguishes three types of strategies that are used by banks in certain clusters. The strategy of the least aggregate expenditures consists in reducing the expenditures on service and activity through gaining leadership in the

branch and using the scale effect. While working on the realization of this strategy, banks acquire considerable experience and substantially reduce expenditures to get greater profit than the other competitors, and good organization of work contributes to a decrease in general risk of activity (in this particular case, of the quotient of non-standard loans).

This strategy is adhered to by the banks of the first cluster, higher profitability is really characteristic of them. However, the use of this strategy requires from them considerable capital investments and access to a great amount of cheap resources, which is not possible for all banks.

The banks of the second cluster use the strategy of differentiation. It presupposes the diversification of services offered to clients in various directions for maximum satisfaction of their needs. Knowing that he can complete all required operations in one certain bank, the client will not search for another bank and he will be willing to pay the price that is not necessarily the lowest; moreover, he will be willing to pay a bonus for the economy of

his time and quality of service. This strategy requires paying constant attention to the range of services and qualifications of the personnel.

The use of the strategy of concentration by the banks of the third group makes it possible to satisfy a definite target group of the bank's own clients and to attain narrow specialization. This strategy does not presuppose either expenditure reduction or complete differentiation, as it is aimed at satisfying the limited needs of certain clients.

Thus, the conducted analysis has made it possible to reveal real market tendencies that confirm the theory of competitive advantages. In the course of determining the aims of its work and choosing one of the three strategies of their realization, every bank will probably find itself in a certain cluster and reach its standards. For the central bank, the belonging of a bank to the specific cluster will give the former an opportunity to formulate strategies necessary for the group of differentiated regulation and control over the indices that reveal risks in each particular case.

Table 1. Analysis of performance banks in clusters

Indexes		01.01.2008	01.01.2009	01.01.2010	01.01.2011	01.01.2012
1 cluster	Quantity banks in cluster	4	6	11	7	7
	Limits of the cluster by M_{BC}	54-130	35-137	19-64	24-87	23-83
	P_{oc}	0,1813	0,1885	0,418	0,456	0,4041
	Q_{oc}	0,148	0,1479	-0,393	0,104	0,1788
2 cluster	Quantity banks in cluster	69	49	21	27	27
	Limits of the cluster by M_{BC}	10-31	12-32	12-17	12-19	12-20
	P_{oc}	0,5569	0,5768	0,691	0,6594	0,7299
	Q_{oc}	0,077	0,066	-0,029	0,0548	0,0368
3 cluster	Quantity banks in cluster	99	127	147	141	142
	Limits of the cluster by M_{BC}	0-9	1-11	1-11	1-11	0-11
	P_{oc}	0,8977	0,8294	1,411	1,1544	1,7832
	Q_{oc}	0,046	0,031	-0,553	-0,1413	-0,669

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