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PERFORMANCE OF BANKS IN UKRAINE (2005-2008)

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The paper is devoted to the analysis of functioning of Ukrainian banks in recent years, using the non-parametric DEA methodology. The analysis concerns several aspects of characteristics of bank functioning and is illustrated with rich empirical material.

1. Introduction

The banking system in Ukraine has been recently dynamically developing: both capitalization and loan and deposit portfolios have been growing. The global financial crisis that stirred up the world in 2008 modified the activity of the Ukrainian banks. In the situation of abrupt worsening of macroeconomics (high level of inflation, devaluation of Ukrainian currency, the UAH, falling real GDP, etc.), the crisis phenomena became more visible in the banking sphere as well.

Bank crisis in Ukraine is caused by a range of macro- and microeconomic factors. Along with the world tendencies, it is also connected with peculiarities of transition economy (in details about the causes of bank crises, see, e.g. Latter, 1997). In such a situation it is especially important to pay attention to measurement of efficiency and productivity of the Ukrainian banks.

In this paper the non-parametric DEA method (Charnes, Cooper and Rhodes, 1978; Banker, Charnes and Cooper, 1984) is used for two aims. First, we measure efficiency of Ukrainian banks with DEA. Second, we use DEA to measure and decompose the Malmquist index in the analysis of productivity changes in Ukrainian banks (Malmquist, 1953; Fare et al., 1991, 1992). We assess efficiency and productivity changes of Ukrainian banks for the years 2005-2008. Note that as of late papers that apply this method to efficiency analysis and productivity changes of both branches of a bank (Pilyavskyy, Matsiv and Khoma, 2008, 2009), and the Ukrainian banks on the whole (Mertens and Urga, 2001; Kyj and Isik, 2008) have appeared.

The paper is organized as follows. In Section 2, the DEA method, the technique of forming and decomposing the Malmquist index is considered. In Section 3 the data and the model used for calculations are presented. In Section 4 the main results of the research are discussed, and in section 5 we present our conclusions.

2. Methodology of research

We use the output distance function, proposed by Shephard (1970), for the analysis of efficiency and productivity changes in the Ukrainian banks. The function allows for measuring technical efficiency of a bank with respect to the production frontier and allows for answering the question: to what extent output quantities can be proportionally expanded without changing input quantities. We evaluate the output distance functions on the basis of a non-parametric method of frontier analysis – Data Envelopment Analysis (DEA). We use these functions for efficiency measurement and for creating the Malmquist index that is used for productivity comparison.

Let us consider *N* banks, each of them uses *n* inputs for producing *m* outputs. Then, let $x_i \in \Re_+^n$ and $y_i \in \Re_+^m$ denote input and output vectors for the *i*-th bank. We consider each bank in two periods of time $t = 0$ and $t = 1$. Production technology, transforming inputs into outputs, can be represented by the set $S^t \subset \Re_+^n \times \Re_+^m$:

$$S^t = \{(x^t, y^t) \mid x^t \; can \quad produce \quad y^t\}. \tag{1}$$

The set of outputs $P^t(x)$ is defined as:

$$P^t(x^t) = \{y^t \mid (x^t, y^t) \in S^t\}. \tag{2}$$

Note that the set S^t can represent a certain production technology only when it meets some properties (for more details, see Fare and Primont, 1995).

Shephard's output distance function $D_i(x_i, y_i)$ (Shephard, 1970) for bank *i* in peroid *t* is defined on the output set $P^t(x)$ as:

$$D_i^t(x_i^t, y_i^t) = \inf\{\theta \mid \theta > 0, y_i^t / \theta \in P^t(x^t)\}. \tag{3}$$

In practice, function (3) for bank *i* can be calculated with the help of DEA, by solving the following linear programming (LP) problem:

$$[D_i^t(x_i^t, y_i^t)]^{-1} = \max\{\varphi_i \mid -\varphi_i y_i^t + Y^t\lambda \geq 0, x_i^t - X^t\lambda \geq 0, \vec{1}\lambda = 1, \lambda \geq 0\}. \tag{4}$$

The LP problem (4) makes it possible to obtain a value of parameter φ_i, measuring bank efficiency, if a technology is characterized by variable returns to scale (VRS). In case the technology is characterized by constant returns to scale (CRS), the problem (4) must be solved without the constraint: $\vec{1}\lambda = 1$.

Production technology under assumption of CRS ($\hat{S}^t$) can be defined from the set S^t:

$$\hat{S}^t = \{(\lambda x^t, \lambda y^t) \mid (x^t, y^t) \in S^t, \lambda > 0\}. \tag{5}$$

Technology (5) is also called cone technology. For this set, analogously as for the set S^t the following notions are introduced: a set of outputs $\hat{P}^t$ and output distance functions $\hat{D}^t$.

Scale efficiency (SE) of bank *i* in period *t* is calculated as ratio of technical efficiency (TE) and pure technical efficiency (PTE) of bank *i* in period *t* as follows:

$$SE_i^t = \frac{TE_i^t}{PTE_i^t}. \tag{6}$$

Here, TE is measured under assumption of CRS ($TE_i = \left(\hat{D}_i^t(x^t, y^t)\right)^{-1}$), and PTE is measured under the assumption of VRS ($PTE_i = \left(D_i^t(x^t, y^t)\right)^{-1}$).

If there are data on bank activity for two periods of time, $t = 0$ and $t = 1$, output distance function for bank i in the period $t = 0$, $D_i^1(x_i^0, y_i^0)$, can be defined with respect to the technology of the period $t = 1$:

$$D_i^1(x_i^0, y_i^0) = \inf\{\theta \mid \theta > 0,\ y_i^0 / \theta \in P^1(x^1)\} \tag{7}$$

The distance function $D_i^0(x_i^1, y_i^1)$ is built analogously.

Construction of such functions allows us to use the concept of Malmquist's (1953) in the analysis of bank productivity. In Fare et al. (1991, 1992) the following Malmquist-type index (Total Factor Productivity (TFP) index) was suggested:

$$TFP^{0,1} = \left(\frac{D^0(x^1, y^1)}{D^0(x^0, y^0)} \cdot \frac{D^1(x^1, y^1)}{D^1(x^0, y^0)} \right)^{1/2} \tag{8}$$

A value of the index (8) greater than 1 indicates productivity increase, and the value below 1 – a decrease.

Decomposition of index (8) is a significant aspect of analysis of productivity changes meant to uncover the potential sources of increasing total factor productivity. In Fare et al. (1991, 1992), decomposition of TFP into two components – efficiency change and technological change was performed. Technical efficiency change (EC) is measured in the following way:

$$EC^{0,1} = \frac{D^1(x^1, y^1)}{D^0(x^0, y^0)} \tag{9}$$

Technological (technical) change (TC) is measured as follows:

$$TC^{0,1} = \left(\frac{D^0(x^1, y^1)}{D^1(x^1, y^1)} \cdot \frac{D^0(x^0, y^0)}{D^1(x^0, y^0)} \right)^{1/2} \tag{10}$$

Based on the above,

$$TFP^{0,1} = EC^{0,1} \cdot TC^{0,1}. \tag{11}$$

Decomposition of the index (8) in the form (11) can be supplemented with scale efficiency changes and thus we obtain one more source of the total factor of productivity increase. One of the first decompositions of the index (8) taking into consideration all the scale changes, the one we make use of, is considered in Fare et al. (1994). Among other approaches let us mention those of Rey and Desli (1997), Zofio and Lovell (1999), Griffell-Tatje and Lovell (1999) and Balk (2001).

In the approach of Fare et al. (1994), that we consider here, technological change is measured with the help of the formula (10), but certainly under assump-

tion of CRS. Two more sources of increase are pure technical efficiency change and scale efficiency change. Pure technical efficiency change (PEC) is measured as:

$$PEC = \frac{D^1(x^1, y^1)}{D^0(x^0, y^0)} \tag{12}$$

Scale efficiency change (SEC) is then calculated as follows:

$$SEC = \left[\frac{D^1(x^1, y^1) / \hat{D}^1(x^1, y^1)}{D^1(x^0, y^0) / \hat{D}^1(x^0, y^0)} \cdot \frac{D^0(x^1, y^1) / \hat{D}^0(x^1, y^1)}{D^0(x^0, y^0) / \hat{D}^0(x^0, y^0)} \right]^{1/2} \tag{13}$$

Hence, the TFP index takes the following form:

$$TFP^{0,1} = TC^{0,1} \cdot PEC^{0,1} \cdot SEC^{0,1} = \left(\frac{\hat{D}^0(x^1, y^1)}{\hat{D}^0(x^0, y^0)} \cdot \frac{\hat{D}^1(x^1, y^1)}{\hat{D}^1(x^0, y^0)} \right)^{1/2} \tag{14}$$

3. Data

In this paper we use quarterly data on the activity of Ukrainian banks over 2005-2008 that were published in the official publication of the National Bank of Ukraine (NBU) "Visnyk of the National Bank of Ukraine". The information about locations of head offices of the banks was obtained from the official site of the Association of the Ukrainian banks and *finance.ua* portal. Our data set contains 2 723 observations. Two banks (Ukreximbank and Oshchadnyy) have been removed from the data set as far as they function under different conditions from the commercial ones. Banks that had in the period of time considered here at least one input or output equal to zero have been also excluded from the data set. So, the final data set for measuring efficiency of the Ukrainian banks contains 2 671 observations, while data set for productivity measurement – 2 480[1]. Let us note that since we use financial data, they were adjusted to prices as of 01.04.2005 using quarterly price index[2].

Specification of inputs and outputs is one of the major problems for measurement of bank efficiency and productivity changes. To determine inputs and outputs, we made use of the assets approach (Sealey and Lindley, 1977), treating banks as classical intermediaries between depositors and borrowers. We assumed three inputs (personnel, physical capital, purchased funds) and two outputs: net loans, securities and other earning assets.[3] All the data are in 1 000 UAH. All the data, except for personnel are measured by the sum at the end of the quarter. Personnel

[1] For measurement of productivity changes bank data must be accessible for two periods and this is impossible for banks that had not yet existed in the previous period. That is why there are less observations in the data set for measurement of productivity changes than for efficiency measurement.

[2] As far as Shephard's output function does not depend upon the unit of measurement, there is no need to adjust the data to the prices of the base period.

[3] We are aware that our model does not fully cover operations of the banks and this can lead to biased measures when estimating TFP. However, we picked inputs and outputs that are the most characteristic of the activity of Ukrainian banks and cover a considerable part of their operations. Note that there is no free access to some data concerning the activity of the Ukrainian banks at all. The problem of bias in the Malmquist index is considered in detail in Lozano-Vivas and Humphrey (2002).

can be calculated, in the absence of data on the number of employees, from the quarterly payroll expenses. Physical capital can be measured by the book value of tangible and intangible assets. Purchased funds consist of loanable funds, including all the kinds of bank deposits, funds of other banks and securities issued by a bank. Net loans of a bank contain all the kinds of loans (either to legal entities or individuals) reduced by the sum of reserves. Securities and other earning assets consist of public and private funds in other banks. These items, along with loans, are reduced by the sum of reserves. Descriptive statistics of inputs and outputs are given in Appendix 1.

4. Results of the study

4.1 Analysis of efficiency

The essential goal of the study is to measure the efficiency and productivity changes in the Ukrainian banking sector on the whole. That is why we focus on the average indices and uncovering of tendencies that make it easier to understand the way the banking system of Ukraine functions from the point of view of efficiency and productivity changes. Thus, assessment of separate banks is not considered in this study[4].

The mean values of efficiency of the Ukrainian banks are given in Table 1.

Table 1: *Mean values of efficiency of the Ukrainian banks*

Period (month/year)	Number of banks	TE (CRS model)	PTE (VRS model)	SE	Number of efficient banks (CRS model)	Number of efficient banks (VRS model)
04/05	157	0.533	0.771	0.683	11	27
07/05	159	0.482	0.738	0.647	10	24
10/05	161	0.444	0.737	0.604	11	24
01/06	160	0.533	0.749	0.713	13	30
04/06	161	0.582	0.741	0.795	10	26
07/06	163	0.556	0.771	0.725	10	27
10/06	161	0.587	0.804	0.727	13	33
01/07	166	0.395	0.747	0.539	6	24
04/07	170	0.319	0.719	0.438	8	22
07/07	170	0.481	0.684	0.703	11	22
10/07	169	0.367	0.640	0.585	3	18
01/08	170	0.292	0.719	0.401	6	26
04/08	173	0.301	0.748	0.405	7	23
07/08	174	0.426	0.735	0.588	8	29
10/08	178	0.387	0.744	0.520	8	29
01/09	179	0.600	0.792	0.761	12	39

Source: authors' own calculations

[4] Banks having problems due to the global financial crisis are the exception and, according to the NBU's resolution, had a temporary management assigned. The efficiency of such banks is considered in details.

As shown in Table 1, mean technical efficiency of the Ukrainian banks during the period considered varied from 0.292 to 0.600. Such a low technical efficiency is first of all connected with scale inefficiency. In recent years, the Ukrainian banking sector has been dynamically developing; banks have actively won the market and expanded their branch networks. Let us notice that this expansion was not always justifiable. During the study period, 88% to 96% of banks were working in the zone of decreasing returns to scale (see Table 2). Considerable scale inefficiency of the Ukrainian banks somehow explains why during the study period the global financial crisis injured the bank system of Ukraine so deeply. It is rather peculiar that scale efficiency grew to the level of 0.761 at the end of 2008, when in the fourth quarter of 2008 the Ukrainian banks started to reduce the number of employees and close their inefficient branch offices.

Table 2. *Returns to scale of the Ukrainian banks*
(IRS: number of banks working in the zone of Increasing Returns to Scale, *DRS*: number of banks working in the zone of Decreasing Returns to Scale*)*

Period	Number of banks	IRS	DRS
04/05	157	0	146
07/05	159	5	144
10/05	161	2	148
01/06	160	1	146
04/06	161	5	145
07/06	163	8	143
10/06	161	6	142
01/07	166	9	151
04/07	170	1	161
07/07	170	3	155
10/07	169	5	160
01/08	169	1	162
04/08	173	0	166
07/08	174	4	162
10/08	178	4	166
01/09	179	8	159

Source: authors' own calculations

As to the pure scale efficiency, it does not vary so much as the technical efficiency.

The share of efficient banks under the assumption of CRS ranges from 2% to 8% in different periods, whereas under for VRS – from 11% to 22%. To sum up, we must say that increase of efficiency is a rather burning question for the Ukrainian banks, it concerns first of all the scale efficiency. It looks like the global financial crisis has become rather a good stimulus for solving this problem.

Let us now consider the efficiency of Ukrainian banks depending on their size. We use the classification of banks according to the NBU's methodology. In this methodology, a bank is assigned to one of four groups depending on its size and capital. The results from this analysis are given in Table 3.

Table 3. *Mean values of bank efficiency depending on bank size (Minimum-Maximum)*

Group	Number of banks	TE (CRS model)	PTE (VRS model)	SE
I (the largest)	8-16	0.214-0.589	0.964-0.985	0.217-0.603
II (large)	14-20	0.310-0.591	0.816-0.930	0.334-0.643
III (medium)	24-34	0.264-0.577	0.617-0.838	0.314-0.685
IV (small)	104-119	0.301-0.608	0.579-0.764	0.453-0.879

Source: authors' own calculations

During the 16 quarters of the year, accessible for us, distinct tendency has been traced that can be formulated as follows (here, mean pure technical efficiency of group x is denoted $PTE(x)$ and mean scale efficiency of the group x – $SE(x)$):

1. *within every period (except one, where PTE(III)<PTE(IV)) inequality PTE(I)> PTE(II)> PTE(III)> PTE(IV) holds;*
2. *within every period (but for three, where SE(III)<SE(II)) inequality SE(I)<SE(II)<SE(III)<SE(IV) holds.*

This means that the larger the banks in a group, the higher their mean pure efficiency and the lower their scale efficiency, and vice versa. Thus, for the group of the largest banks mean pure efficiency for the study period was not lower than 0.964, while the scale efficiency varied quite a lot, with a minimum value of 0.217. The above results can be easily interpreted, if we consider the fact that large banks possess considerable resources for attracting highly qualified staff and new technologies and so they have greater opportunities for an effective bank management (the result – high pure efficiency). On the other hand, not always justifiable expansion of the market leads to low scale efficiency. For the smaller banks the situation, of course, is directly opposite. Limited resources do not allow for an effective management of a bank, but ensure higher scale efficiency. It is necessary to note that the situation with low scale efficiency has been slowly improving in 2008. The differences between the first three groups are negligible. So, as of January 1st, 2009, *SE(I)*=0.603, *SE(II)*=0.643, *SE(III)*=0.685, with the fourth group as a clear leader, according to this factor, with *SE(IV)*=0.817. Taking into consideration such tendencies, we can suppose that the Ukrainian banks will come out of the crisis with considerably higher scale efficiency on the whole.

Besides the size of a bank, its location is also an important factor, influencing bank efficiency. In our case, we determined bank location through the place, where its head office was situated. We conducted a comparative analysis of efficiency of the banks, whose head offices are located in the capital, Kyiv, and in other regions. On the whole, nearly 60% of the Ukrainian banks are located in Kyiv. We found out

a marginal superiority in the mean pure efficiency of the banks situated in the capital in comparison with the rest. On the contrary, mean scale efficiency of both groups was practically equal. Our analysis showed that location of the head office in Kyiv is not essential for an effective functioning and that scale inefficiency is an inherent problem of the bank sector of Ukraine, not depending on bank location. On the other hand, a lot of non-Kyiv banks have their regional offices in Kyiv with wide authority and can perform some functions of the head offices. The analysis made is sensitive to such situations and the question of location is open. For a more correct analysis, we need other methodological approaches to notion of 'bank location'.

Let us now consider the efficiency of banks, having problems that appeared because of the recent crisis. There are 14 banks classified in this group; in 10 of them as of March 17th, 2008, a temporary management functioned (Rodovid, Big Enerhiya, Ukrprombank, Natsional'nyy Kredyt, Prychornomor'ya, Kyiv, Nadra, Zahidinkombank, Odesa-Bank, Transbank); one bank, where temporary management operated, but was recalled a year later (Prominvestbank); three banks, in which curators of the NBU sit on the board (Ukrhazbank, Sotskombank, Bank Rehional'noho Rozvytku). During the study period mean pure efficiency of such banks was higher than the mean pure efficiency of all the banks, while scale efficiency of the problematic banks was lower than the mean scale efficiency of the Ukrainian banks in general. All of these banks work in the zone of decreasing returns to scale. Given that the efficiency measures for these banks are quite typical, and correlated with mean measures for the entire bank sector in all the periods, in Table 4 we show the data only as of January 1st, 2009.

Table 4. *Efficiency measurement of banks with problems as of 01.01.2009.*

	TE (CRS model)	**PTE (VRS model)**	**SE**
Rodovid	0.563	0.913	0.617
Big Enerhiya	0.538	0.681	0.789
Ukrprombank	0.537	0.875	0.614
Natsional'nyy Kredyt	0.459	0.803	0.572
Prychornomor'ya	0.687	0.861	0.798
Kyiv	0.536	0.742	0.723
Nadra	0.550	0.901	0.610
Zahidinkombank	0.638	0.818	0.780
Odesa-Bank	0.539	0.785	0.687
Transbank	0.472	0.710	0.665
Prominvestbank	0.568	0.963	0.590
Ukrhazbank	0.472	1.000	0.472
Sotskombank	0.747	0.878	0.850
Bank Rehional'noho Rozvytku	0.490	0.713	0.687
Mean value (banks with problems)	**0.557**	**0.832**	**0.675**
Total mean	**0.600**	**0.792**	**0.761**

Source: authors' own calculations

Let us notice that among the banks with problems there are banks of all the four size groups, banks with the head offices in Kyiv and in the regions (from the East, South and West of the country), but there is none with foreign capital.

4.2 Analysis of productivity changes

The analysis of productivity changes of the Ukrainian banks is connected with certain technical difficulties and peculiarities that should be discussed before we start considering the results. The first problem is the fact that a lot of the Ukrainian banks during the study period changed their names, some of them even more than once. The second problem is closing of the banks, and the third one are their mergers. So long as neither 'Visnyk NBU', nor any other official source does not make it possible to trace such changes in time, to search for the data on the internet independently is the only way to solve the problem. Certainly, this could have influenced the quality of the data in our data set. That is why, when disputable moments arose, we had to remove the data about some banks from the data set, because of lack of information, on the basis of which conclusions about a name change or closing of a bank could be made.

In Table 5 the results of analysis of productivity changes of the Ukrainian banks are presented. Taking into consideration the fact that the Malmquist index is not transitive, an index that characterizes productivity change between 01.04.2005 and 01.01.2009 has been additionally calculated.

Table 5. *Results of the analysis of productivity changes of the Ukrainian banks (mean values)*[5]

Period	Number of banks	TFP	TEC	EC	PEC	SEC
04/05-07/05	157	0.981	1.061	0.925	1.000	0.924
07/05-10/05	159	1.019	1.090	0.934	1.002	0.933
10/05-01/06	160	0.970	0.790	1.229	1.018	1.207
01/06-04/06	158	1.020	0.892	1.144	1.022	1.119
04/06-07/06	160	0.998	0.962	1.038	1.059	0.979
07/06-10/06	160	0.992	1.028	0.965	1.035	0.932
10/06-01/07	161	0.956	0.982	0.973	1.013	0.961
01/07-04/07	165	1.005	0.773	1.299	1.000	1.299
04/07-07/07	170	0.978	0.580	1.688	0.951	1.774
07/07-10/07	168	0.974	1.291	0.754	0.931	0.810
10/07-01/08	168	0.953	1.303	0.731	0.912	0.802
01/08-04/08	169	0.973	0.823	1.182	1.055	1.121
04/08-07/08	173	0.972	0.633	1.535	0.979	1.568
07/08-10/08	174	0.993	0.788	1.260	1.043	1.208
10/08-01/09	178	1.001	1.000	1.001	1.000	1.001
04/05-01/09	148	0.969	0.727	1.332	1.100	1.211

Source: authors' own calculations

During the study period, except for some sub-periods, productivity of the Ukrainian banks was decreasing (*TFP* < 1). The greatest changes took place in the technology and scale efficiency, while changes in pure technical efficiency were negligible. Let us note that technological changes stand in a reciprocal relation to scale efficiency changes (Pearson correlation coefficient for these factors is 0.92).

[5] Note that all the mean values in Table 5 are geometric means

This tendency is vividly shown in Fig. 1. As we can see, technique and scale efficiency changes were constantly in such a correlation, resulting in a rather small deviation of *TFP* from 1. It looks like all the positive changes in the technique the Ukrainian banks tried to use for expansion, not taking care of effective management.

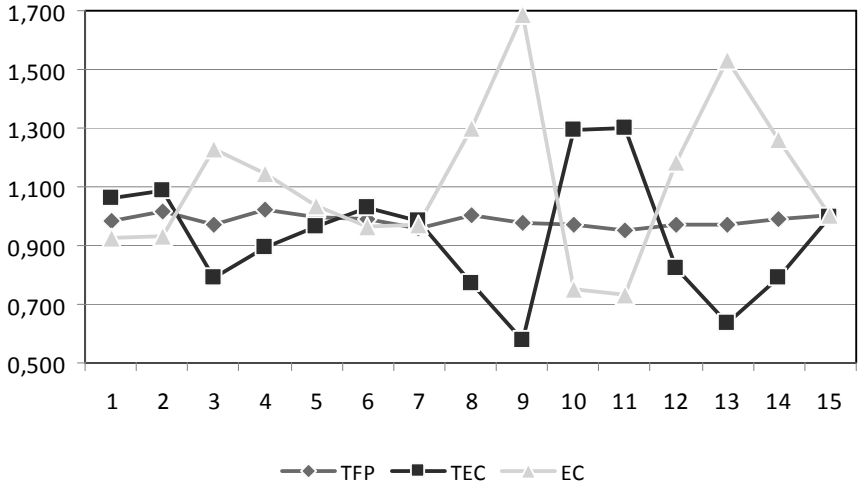

Figure 1. Changes of *TFP and its components*
Source: authors' own calculations

It should be said that on the whole during the study period (April 1st, 2005 – January 1st, 2009), productivity of the Ukrainian banks fell by 3%. This is the consequence of considerable negative change in technology (drop by 27%), and increase of pure technical efficiency (by 10%) and of scale efficiency (by 21%).

5. Summary

Shortly, the main results of our research can be summarized in two propositions, of which the first one ascertains a fact and the second one frames a hypothesis:

1. *along with a rather insignificant deviation of X-efficiency during all the periods of our study a considerable mean scale inefficiency was observed;*
2. *there are reasons to suppose that owing to optimization of the activity, the Ukrainian banks will come out of the crisis with considerably higher scale efficiency.*

The second thesis may seem somewhat paradoxical, as one can come to the conclusion that crises, besides negative aspects, also have some positive ones. Financial crises stimulate banks to make decisions that are necessary for their prosperity, yet in the situation of financial stability any bank would never make them.

During the study period we came across some problems that are very urgent and ought to be discussed more widely. One of the problems is connected with a rather difficult access to the data concerning the activity of the Ukrainian banks. As a matter of fact, such data are published in the form and content proper for research only in 'Visnyk NBU'. Lack of electronic data sets at least as informative as those published by NBU is an obstacle to the use of frontier analysis for efficiency measurement of the Ukrainian banks. Concerning the analysis of productivity changes of the Ukrainian banks, we do not know any papers devoted to this problem. We consider that creation of an official electronic database of the detailed data on the activity of the Ukrainian banks would doubtlessly make the research on efficiency and productivity changes with the use of advanced methodologies more promising.

We would like to make a special remark on the method of Malmquist index decomposition, presented in our paper. It is the most widely used method for differentiation of scale efficiency changes. It is quite often criticized. And, definitely, not in vain. Namely, technological change is calculated with such decomposition of the Malmquist index under the assumption of CRS, while the scale changes and changes of pure technical efficiency are calculated the under assumption of VRS. Overcoming of this fault is possible only by using other methods of Malmquist index decomposition. Balk's (2001) approach seems to provide such a perspective, as having positive references in the literature (see Coelli et al., 2005, pp. 74-81).

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APPENDIX A[i]

Table A1. Descriptive statistics for *personnel*

	N	Min	Max	Mean	StD
04/05	157	90	115 262	5 428	15 401
07/05	159	100	134 136	5 922	17 151
10/05	161	101	147 100	6 429	18 731
01/06	160	110	160 061	7 163	20 404
04/06	161	175	168 757	7 235	20 469
07/06	163	172	173 639	7 977	21 616
10/06	161	152	195 982	8 654	23 590
01/07	166	43	200 384	9 566	25 617
04/07	170	62	234 139	10 117	26 791
07/07	170	120	214 641	11 149	27 690
10/07	169	113	270 959	12 349	31 227
01/08	170	99	313 296	14 127	36 003
04/08	173	107	275 887	13 215	32 043
07/08	174	143	307 329	14 625	35 580
10/08	178	143	353 554	15 223	38 795
01/09	179	165	323 898	13 922	33 570

Source: authors' own calculations

Table A2. Descriptive statistics for *physical capital*

	N	Min	Max	Mean	StD
04/05	157	314	913 253	51 526	134 206
07/05	159	292	885 168	53 078	136 171
10/05	161	63	914 197	55 017	143 021
01/06	160	160	1 024 141	63 129	156 914
04/06	161	189	1 056 690	62 779	156 155
07/06	163	173	1 089 015	63 914	159 202
10/06	161	259	1 094 843	66 673	160 687
01/07	166	24	1 419 267	80 918	198 358
04/07	170	190	1 402 042	80 679	196 747
07/07	170	240	1 588 550	90 529	225 486
10/07	169	249	1 537 752	95 303	223 612
01/08	170	218	1 491 765	108 441	240 559
04/08	173	191	1 366 351	101 997	222 855
07/08	174	174	1 315 943	100 772	217 010
10/08	178	66	1 864 795	107 172	246 322
01/09	179	141	1 873 749	116 900	270 382

Source: authors' own calculations

Table A3 Descriptive statistics for *loanable funds*

	N	Min	Max	Mean	StD
04/05	157	30	14 145 624	737 566	1 858 342
07/05	159	668	15 257 366	782 147	2 009 703
10/05	161	557	16 995 379	852 697	2 200 563
01/06	160	4 222	18 110 012	971 821	2 407 926
04/06	161	988	19 175 425	987 587	2 413 930
07/06	163	45	20 843 937	1 098 510	2 690 806
10/06	161	404	22 297 088	1 215 497	2 993 535
01/07	166	85	24 564 158	1 330 620	3 247 655
04/07	170	879	29 128 862	1 422 134	3 618 878
07/07	170	1 633	30 669 962	1 610 028	3 992 797
10/07	169	11 712	32 772 212	1 803 263	4 353 974
01/08	170	12 283	34 273 792	1 990 059	4 643 982
04/08	173	83	34 087 952	1 912 165	4 521 933
07/08	174	3 557	36 538 628	1 932 796	4 579 037
10/08	178	2 001	39 692 127	2 028 515	4 832 805
01/09	179	9 194	40 771 196	2 275 479	5 486 865

Source: authors' own calculations

Table A4 Descriptive statistics for *net loans*

	N	Min	Max	Mean	StD
04/05	157	2 082	9 518 430	529 440	1 304 433
07/05	159	12 692	10 545 542	587 212	1 501 133
10/05	161	3 874	13 092 966	670 774	1 718 856
01/06	160	6 557	13 506 508	743 506	1 833 860
04/06	161	5 497	14 266 864	788 388	1 937 737
07/06	163	4 176	16 108 234	891 500	2 238 218
10/06	161	20 478	19 214 939	1 016 458	2 606 838
01/07	166	1	21 781 373	1 104 184	2 834 649
04/07	170	620	22 901 220	1 185 447	3 041 224
07/07	170	7 145	26 043 837	1 339 615	3 473 820
10/07	169	4 760	28 167 608	1 508 735	3 827 633
01/08	170	10 589	27 580 714	1 635 273	4 007 309
04/08	173	15	31 404 906	1 656 955	4 134 286
07/08	174	1 336	29 291 695	1 675 889	4 056 441
10/08	178	13 347	33 269 878	1 781 755	4 343 997
01/09	179	15 179	38 275 204	2 085 356	5 213 165

Source: authors' own calculations

Table A5 Descriptive statistics for *securities and other earning assets*

	N	Min	Max	Mean	StD
04/05	157	19	3 450 208	163 981	395 129
07/05	159	29	3 585 497	176 936	395 689
10/05	161	58	3 094 199	172 534	380 968
01/06	160	36	2 998 676	186 168	381 870
04/06	161	33	4 729 108	207 892	484 102
07/06	163	39	4 077 619	229 855	479 380
10/06	161	404	3 193 532	242 490	463 265
01/07	166	87	2 911 034	244 440	434 929
04/07	170	653	6 272 185	283 974	646 663
07/07	170	1 363	4 100 785	315 669	620 204
10/07	169	119	4 813 866	357 559	712 683
01/08	170	932	6 771 843	411 876	824 528
04/08	173	594	4 223 199	354 055	651 198
07/08	174	114	7 556 454	367 551	788 229
10/08	178	109	6 854 325	363 273	763 128
01/09	179	87	5 079 088	342 496	659 673

Source: author`s own calculation

[i] All the data are in 1000 UAH and furnished to the prices of the end of the first quarter of 2005 using the quarter price index.