

TECHNICAL EFFICIENCY, PURE TECHNICAL EFFICIENCY AND SCALE EFFICIENCY OF RUSSIAN COMMERCIAL BANKS: AN EMPIRICAL ANALYSIS (2007-2014)

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ABSTRACT

This study proposes to examine the technical efficiency of commercial banks in Russia in recent years. Many firms in the service industry face the problem of dissimilar results in terms of efficiency. In particular, the last decade has witnessed continuous changes in regulation, technology and competition in the global financial services industry, and Russian Banks are no exception to this change. The efficient operation of banks has become an important issue in Russia. Rising cost-income ratio and declining profitability reflect the enhanced competitive pressure. An efficient banking system contributes, in an extensive way, to higher economic growth in any country. Hence studies of banking efficiency are important for policy makers, industry leaders and many others. The Data Envelopment Analysis (DEA) Approach has been used to measure the relative technical efficiency. The Efficiency Scores of the banks are also decomposed into Pure Technical Efficiency (PTE) and Scale Efficiency (SE). It has been noticed that the observed technical inefficiency in the Russian commercial banks is due to poor input utilization (i.e., managerial inefficiency) rather than scale efficiency.

KEYWORDS: Commercial Banks, Technical efficiency; Pure technical efficiency; Scale efficiency; Data envelopment analysis.

1. INTRODUCTION

Banking sector inefficiency is often cited as one of the key determining factors of financial crisis in emerging markets. Financial crises in the South East Asian countries, Czech Republic, the Russian Federation, Turkey, and Argentina are marked with the failure of the banking sector as the key financial intermediation institution. After the disintegration of USSR, Russia made a transition from centrally planned economy towards market economy, by introducing various political, economic and structural reforms. Banks that essentially played a passive role during soviet era adopted a Law on Banks and Banking, which introduced a two-tier banking system, with the upper level represented by the Central Bank of Russia

(CBR) and the second layer by commercial banks, other lending institutions and the representative offices of foreign banks. Cheap credit and low capital requirements give rise to mushrooming growth of the banking institutions in Russia that rose from 850 in 1991 to 2400 in 1994 and 1080 in 2009. At present, the number of operating credit institutions in Russia is 923. With such a huge landscape of operating credit institutions in Russia, it becomes a pivotal aspect to measure the efficiency of those operating credit institutions.

In this study, we estimate the technical efficiency which is further decomposed into pure technical efficiency and scale efficiency of the Russian banking sector (selected commercial banks) using a non-parametric approach (data envelopment analysis).

2. LITERATURE REVIEW

There is a plethora of literature evaluating the performance of financial institutions particularly banking institutions. Financial ratio analysis; data envelopment analysis, and the stochastic frontier analysis are the few frequently and widely used approaches to analyze the financial performance of the banks. DEA, an approach led by Charnes et al. (1978), used by researchers as a methodology for performance evaluation (Gregoriou and Zhu, 2005). Applying DEA, Sherman and Gold (1985), Parkan (1987) analyzed the efficiency of branches of US and Canadian banks. Rangan et al. (1988) analyzed the pure technical inefficiency and Scale inefficiency of 215 US banks. Their results show that same amount of output could have been produced by banks with 70 per cent of the inputs and the cause of inefficiency was primarily technical. Yue's (1990) examined the efficiency of banks in Missouri, US (1984-1990), and found that the major source of overall technical inefficiency is Pure Technical Inefficiency. Efficiency of 143 Japanese banks was examined by Fukuyama (1993) by employing the DEA method. Findings show that the banks were more scale efficient compare to pure technical efficient (PTE). Study by Yudistria (2003) too applied DEA to examine the technical, pure technical, and scale efficiency of Islamic banks and found that there exists diseconomies of scale for small-to-medium Islamic banks therefore mergers to be encouraged.

Penikas (2013) in its research tried to measure the technical efficiency estimates under RAS and IFRS. Results show that estimates under RAS are in average greater than estimates under IFRS and result also show that state-owned banks in Russia are most efficient. Peresetsky (2010), estimated the cost efficiency of Russian and Kazakhstan banks from 2002-2006 and found that most banks in both countries are below

optimal level. Fedeeva (2010) in his master's thesis investigated the profit efficiency of Russian banks (200-2008) using stochastic frontier analysis and found that foreign capital banks are more profit efficient than local domestic banks due to better expertise and management; banks in central regions are not more profit efficient than their periphery counterparts mainly due to more fierce competition in Moscow and Saint Petersburg; average profit efficiency has definitely increased during 2000-2008 which can be explained by active growth, development and expansion of local market. Karas (2008) in its research tried to find out whether private banks are more efficient than public banks and results show that domestic public banks are more efficient than domestic private banks and that the efficiency gap between these two ownership types did not narrow after the introduction of deposit insurance in 2004. Caner (2004) in its research tried to do an international comparison of the efficiency of the banking sector in the Russian federation and found that the estimates for the years 1999-2003 show that Russian banks have very low efficiency scores compared to the banks in selected developed and developing markets. Ono (2002) used non-parametric approach to examine the technical and scale efficiency of Russian far-east banks and found that larger banks' overall inefficiency scores tended to be due to scale inefficiency, and many that smaller banks operate efficiently from both technical and scale aspects. Ono (2008) in its research of efficiency of the domestic and foreign banks in Russia found that foreign banks are more technically efficient, Moscow-based banks are less efficient than non-Moscow-based banks and banks with more assets have a tendency to use inputs with less waste, but they tended to be scale efficient.

Above mentioned few studies have focused on efficiency of Russian banking sector; proposed study is going to examine the

technical efficiency, pure technical efficiency and scale efficiency of Russia's commercial banks (sample of 131) using DEA, over a period of 2007-2014.

3. RUSSIAN BANKING SECTOR

Banking sector in former Soviet Union has experienced major transformations throughout the 1990s. In the pre and early transition periods, state policies generally distorted resource allocation, as credit was directed towards sustaining existing industries and maintaining living standards through explicit and implicit subsidies to enterprises and households. Since, the primary role of the banking system was to channel funds to the real sector; efficiency and profitability were not among the top priorities.

After the disintegration, Russian banking sector dynamics kept on progressing. Banking sector primarily dominates the financial system and the size of the transactions in the banking sector is significantly high. Percentage of financial assets owned by Russian banking industry rose from 89% in 2005 to 93% in 2013. Another important dynamic about Russian banking sector is the significant involvement of state banks in financial intermediation. In Russian banking market, two state-owned banks (Sberbank and VTB) have a common market share of about 50% comprising 50.4% of total banking sector assets and 48.2% of total banking sector capital followed by some 20 mid-sized banks, mainly privately held. Within these group, there are also the banks owned by Western European, like Unicredit (1.7% share), Raiffeisen (1.5%), or SocieteGénéralé (1.2%)¹. Table 1 clearly indicates that state owned banks still dominates the Russian banking industry

¹<https://bankinghub.de/banking/research-markets/russian-core-banking-market>

Table 1: INDICATORS OF CREDIT INSTITUTIONS GROUPS IN RUSSIA:

	2007	2008	2009	2010	2011	2012	2013
Number of credit institutions	1189	136	1108	1058	1012	978	956
Branches	3281	3455	3470	3183	2926	2807	2349
State controlled banks credit institutions	31	24	17	22	27	26	25
% share of total banking sector assets	37.8	39.2	40.5	43.9	45.8	50.2	50.4
% share of total banking sector capital;	32.4	40.8	47.1	48.9	47.3	50.8	48.2
Foreign controlled banks credit institutions	64	85	101	106	108	108	112
% share of total banking sector assets	12.1	17.2	18.7	18.3	18.0	16.9	17.8
% share of total banking sector capital;	12.7	15.7	17.2	16.9	19.1	17.6	19.2
Large Private banks credit institutions	152	147	136	139	131	132	128
% share of total banking sector assets	41.0	35.5	34.6	32.1	30.5	27.5	26.6
% share of total banking sector capital;	42.3	33.5	27.6	27.4	26.9	24.9	26.1
Non-bank credit institutions	46	44	50	51	57	56	59
% share of total banking sector assets	0.6	0.5	0.7	0.4	0.4	0.4	0.3
% share of total banking sector capital;	0.2	0.1	0.1	0.2	0.3	0.2	0.2

Source: Central Bank of Russia (Banking Supervision Reports)

Besides indicators of credit institution groups in Russia, it is quite interesting to look at the macroeconomic indicators of Russian banking sector. Table 2 shows the upward trend (52.4% in 2007 to 86% in 2014) of banking sector assets to % of GDP. Banking

sector capital also shows an upward trend (6.3% in 2007 to 10.6% in 2014) to % of GDP. Loans and deposits both banking sector dynamic show a sluggish trend as both loans and deposits % to GDP are rising but not at an impressive rate.

Table 2: RUSSIAN BANKING SECTOR MACROECONOMIC INDICATORS

	2007	2008	2009	2010	2011	2012	2013	2014
Banking sector assets(liabilities), Billions of rubles	14045.6	20,125.1	28,022.3	29,430	33,805	41,628	49,510	57,423
As % of GDP	52.4	60.5	67.9	75.8	73.0	74.4	79.6	86.0
Banking sector capital, billions of rubles	1692.7	2671.5	3811.1	4621	4732	5242	6113	7064
As % of GDP	6.3	8.0	9.2	11.9	10.2	9.4	9.9	10.6
As % of banking sector assets	12.1	13.3	13.6	15.7	14.0	12.6	12.3	12.3
Loans and other funds provided to non-financial organization and households, including overdue debt, billions of rubles	8031.4	12,287.1	16,526.9	16,115	18,148	23,266	27,708	32,456
As % of GDP	30.0	37.0	40.0	41.5	39.2	41.6	44.5	48.6
As % of banking sector assets	57.2	61.1	59.0	54.8	53.7	55.9	56.0	56.5
Securities acquired by banks, billions of rubles	1961.4	2250.6	2365.2	4309	5829	6212	7035	7822
As % of GDP	7.3	6.8	5.7	11.1	12.6	11.2	11.3	11.7
As % of banking sector assets	14.0	11.2	8.4	14.6	17.6	14.9	14.2	13.6
Household deposits, billions of rubles	3793.5	5159.2	5907.0	7485	9818	11871	14251	16958
As % of GDP	14.3	15.5	14.3	19.3	21.2	21.2	22.9	25.4
As % of banking sector assets	27.0	25.6	21.1	25.4	29.0	28.5	28.8	29.5
As % of household income	22.5	24.2	23.4	26.1	30.2	33.3	36.0	38.6
Funds raised from organization, billions of rubles	4570.9	7053.1	8774.6	9557	11127	13996	15648	17787
As % of GDP	17.1	21.2	21.3	24.6	24.0	25.0	25.2	26.6
As % of banking sector liabilities	32.5	35.0	31.3	32.5	32.9	33.6	31.6	31.0

Source: Central Bank of Russia (Banking Supervision Reports)

4. RESEARCH METHODOLOGY

Charnes et al. (1978), first introduced the Non-parametric DEA method, is used to measure the input-oriented technical efficiency of the DFIs of Malaysia. The CCR (Charnes, Cooper and Rhodes) model calculates an overall efficiency for the unit in which both its pure technical efficiency and scale efficiency are amassed into a single value assuming constant returns to scale (CRS) and CRS hypothesis is acceptable when all decision making units (DMUs) are functioning at an optimal scale. But, institutions like banks face either economies or diseconomies of scale. Thus, assuming Constant Returns to Scale the calculated measures of TE will be contaminated with scale efficiency (SE) when all DMUs are not functioning at an optimal scale. Beyond CCR, Banker et al. (1984)

introduced another model BCC (Banker, Charnes and Cooper) by relaxing the CRS assumption. Assumption of Variable Returns to Scale provides the measurement of PTE. An observable deviance among the Technical efficiency and Pure Technical Efficiency scores of DMUs shows the presence of Scale inefficiency, i.e., $\text{Technical Efficiency} = \text{Pure Technical Efficiency} \times \text{Scale efficiency}$. Pure Technical Efficiency is related to the capability of managers to use banks' given resources, and scale efficiency is related with exploiting scale economies by operating at constant returns to scale.

SPECIFICATIONS OF BANK'S INPUT, OUTPUT AND DATA

Approaches used to evaluate efficiency in banking are Production and the intermediation approach. Benston in 1965 introduced Production approach, which considers that banks provide services to customers whereas Intermediation approach accepts that financial firms act as an intermediary between savers and borrowers and posits total loans and securities as outputs, and deposits along with labor and physical capital are defined as inputs. Charnes *et al.* (1990), Bhattacharyya *et al.* (1997) and Sathye (2001) adopted intermediation approach. Berger and Humphrey (1997) proposed that the intermediation approach is best suited for

analyzing bank level efficiency, whereas the production approach is well suited for measuring branch level efficiency. The proposed study will use secondary data of 131 commercial banks annual reports for the period of 7 years (2007-2014). For the year 2007 and 2009, because of data unavailability, we were restricted to only 119 banks. This study is restricted to 131 commercial because of data unavailability. Under intermediation approach, 2 inputs and 2 outputs are chosen for each development financial institutions.

Input A (x_1) = Total deposits

Input B (x_2) = Total expenses

Output A (y_1) = Loans, financing and advance

Output B (y_2) = Net investments

EMPIRICAL FINDING

Table: 3 (RESULTS OF MEAN TECHNICAL EFFICIENCY, PURE TECHNICAL EFFICIENCY AND SCALE EFFICIENCY)

Years	No of Banks in the sample	Mean Technical efficiency	Mean Pure Technical Efficiency	Mean Scale Efficiency
2007	119	0.313	0.387	0.832
2008	131	0.421	0.497	0.859
2009	119	0.528	0.642	0.826
2010	131	0.394	0.627	0.629
2011	131	0.340	0.557	0.610
2012	131	0.055	0.451	0.104
2013	131	0.320	0.468	0.673
2014	131	0.453	0.624	0.733

Source: Authors own calculation

Table 3 clearly shows the empirical result of the analysis done on the sample of 131 commercial banks of Russia from 2008, 2010 to 2014 and a sample of 119 commercial banks for the year 2007 and 2009 because of data unavailability. Result shows that the mean technical efficiency for commercial banks ranges from 31% to 51%, except for the year 2012, in which almost all banks in sample suffered from lack of resource base and deposits due to global market turbulences and by a structural deficit. Only the largest

Russian banks had access to external funding sources during most of 2012. Pure technical efficiency scores of commercial banks ranges from 38% to 64% reflecting inefficiency ranges from 36% to 62% due to only managerial underperformance. Another dynamic that is important to note is that commercial banks in sample are not able to attract sufficient deposits, proportion of total expenses incurred by banks was quite significant and the return banks achieving from net investment is also not significant, giving rise to inefficiency in commercial

banks in the sample. Scale efficiency scores of commercial banks in Russia ranges from 61% to 85% except for year 2012 in which score is 10%. Scale inefficiency score ranges from 39% to 15% due to inappropriate bank size.

The scores of PTE during the period are higher than the scores of TE. These results are in line with Banker *et al.* (1984) stated that technical efficiency scores obtained under VRS (PTE) are higher than or equal to those obtained under CRS (TE). While scores of scale efficiency are higher than the pure technical efficiency, explains that the main reason for the inefficiency of commercial banks in Russia is due to managerial inefficiency.

CONCLUSION

Qualitative dynamics of Russian banking sector comprises of monopolization or concentration of assets of 5 largest banks increased from 43 to 50 percent. Nationalization or state participation exists in the capital of 8 of the 20 largest banks, their market share is growing beyond 50% private capital, federalizing or reducing the number of participants with a predominance of acquisitions, centralization (reduction of the branches) make clear that still the state-controlled banks play a major role in Russian banking industry. Banking sector respond to internal and external macroeconomic upheavals that clearly coincides with the trend of the efficiency and productivity of the Russian commercial banks. Russian economic growth experienced extreme volatility of negative 7.8% growth rate in 2009 to 1.3% in 2013 and further hit hard to 0.6% in 2014, resultantly industrial sector responded with negative growth rate during 2008-2009, grew approx 3.5% in 2010-12 and hit hard again in 2013-14. Efficiency and productivity of Russian commercial banks

largely reflect the general situation of the Russian economy.

Present study that tries to look at the efficiency for a sample of 131 commercial banks for the year 2008, 2010, 2011, 2012, 2013 and 2014 and 119 for the year 2007 and 2009. Technical efficiency is further decomposed to pure technical efficiency and scale efficiency, to evaluate whether inefficiency in banks are because of managerial inefficiency i.e., inputs are not managed properly or inefficiency is due to inappropriate bank's size. Scores of technical efficiency range from 31% to 51% which implies that banks need to reduce their inputs from 49% to 69% to be on efficiency frontier. Result also shows that commercial banks in the sample are by and large operating at decreasing returns to scale (if output increases by less than that proportional change in inputs). Operation of banks at decreasing returns to scale is attributed to the managerial inefficiency caused by rising (Input) total expenses and lack of adequate deposits with the banks. Result shows that banks underperform in the utilization of inputs (total expenses and deposits) to create optimum outputs (loans and net investment).

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