Journal of Business Economics and Management
ISSN 1611-1699 print / ISSN 2029-4433 online
2011 Volume 12(4): 629–654
doi:10.3846/16111699.2011.599411

PANEL STOCHASTIC FRONTIER ANALYSIS OF PROFITABILITY AND EFFICIENCY OF TURKISH BANKING SECTOR IN THE POST CRISIS ERA

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Received 31 January 2011; accepted 15 March 2011

Abstract. This paper examines the efficiency and its relation to profitability in Turkish banking sector by employing Panel Stochastic Frontier Approach. In the post crises period, extensive structural changes have taken place and a great number of new developments have occurred, affecting the efficiency of banking sector. This is the first study that employs panel stochastic frontier approach for banking efficiency in Turkey. In this research, both cost and profit efficiency measures are estimated for the panel data consisting of 32 banks between 2002–2007. Results suggest that there is cost efficiency gain and convergence in the efficiency levels of banks. As another interesting result, foreign banks are less efficient and state banks are more efficient. This paper also analyzes the relation between efficiency and profitability and finds no robust relation between them. However, the bank size matters more for profitability.

Keywords: panel stochastic frontier analysis, efficiency, profitability, Turkish commercial banks.

Reference to this paper should be made as follows: Aysan, A. F.; Karakaya, M. M.; Uyanik, M. 2011. Panel stochastic frontier analysis of profitability and efficiency of Turkish banking sector in the post crisis era, *Journal of Business Economics and Management* 12(4): 629–654.

JEL Classification: C23, C67, E44, G21, O11.

1. Introduction

November 2000 and Februar y 2001 crises adversely affected Turkish economy and particularly Turkish banking sector. In the post-crisis period, extensive structural changes have taken place in Turkish banking sector. Interest of foreign banks for the Turkish market increased. Some new foreign banks entered into Turkish banking sector through acquisition, while existing foreign banks increased their operations. Foreign banks are

expected to bring new practices and advance technology to the market and enhance competitive pressure in banking. Throughout 1990s Turkey experienced very high interest rates and accumulated huge debt stock surpassing Gross National Product. Consequently banks did not perceive any need to operate more efficiently given that they could earn enormous returns through financing government. In the post-crisis period, inflation, interest rates and debt stock started to decline. Eventually banks felt the need to rely more on essential banking activities to make more profit. Hence they had to operate more efficiently. As a result of these changes Turkish banks experienced profound transformations in their cost and profit efficiencies. These developments in cost and profit efficiencies shall have implications for the profitability of banks.

In this paper, we investigate the cost and profit efficiencies of Turkish banking sector in the post-crisis era by employing panel stochastic frontier approach. Our data set spans 2002–2007 period just before the global crisis. We further divided this period into 2 sub-periods as 2002–2005 (period of recovery and merger activities) and 2005–2007 (period of growth and acquisition by foreign banks). According to our knowledge there are studies that employ stochastic frontier approach, but this is the first study that employs panel stochastic frontier approach to analyze the efficiency of Turkish banking sector for this period. Panel data has various advantages which significantly improve efficiency analysis compared to previous studies. Moreover we explore the relation between efficiency, size and profitability. Finally state banks are quite dominant in the banking industry in Turkey. Therefore we conduct the same analysis by excluding the state banks to implement sensitivity analysis.

In this paper we address the following questions: How does efficiency change over time? Is there a substantial efficiency improvement? Does the foreign banks prefer to buy more efficient banks? Is there efficiency gain in the banks acquired by the foreign banks? Is there a relation between profitability, efficiency and size?

The rest of the paper progresses as follows: Section 2 reviews the efficiency literature in banking sector and provide an overview of Turkish case in the post crisis period. Section 3 defines the data and explains the methodology and advantages of our model. Section 4 discusses the empirical results of efficiency and its relationship with size and profitability. Lastly section 5 concludes.

2. Literature review and Turkish case in retrospect

During the crisis period in Turkey, the banks which did not employ risk management techniques effectively had maturity and currency mismatch problems in their assets and liabilities. As a result of crises, interest rates increased sharply and Turkish currency rapidly lost value against other currencies. Hike in the interest rates especially hits the banks that had maturity mismatch problem in their portfolios. As a result of the increase in the interest rates, the assets of these banks also rapidly lost value and maturity mismatch in their portfolios did not allow the value of their liabilities to decrease by the same amount. Interest rates in domestic currency was higher than the interest rates in foreign currency. Therefore most of the banks had short position in foreign currencies and long position in Turkish currency. In fact, before the crisis most of the Turkish banks had both cur-

rency and maturity mismatch problems in their portfolios. Furthermore contraction in economic activities engendered the rise in bad debt of banks.

In the aftermath of the devastating crises, Turkish banks were in a very uneasy situation. They made huge losses and some of them were on the edge of bankruptcy. As in many other developing countries, in Turkey banks are main financial intermediaries which channel saving into investment. This gives banks a major role in the capital accumulation and growth. Turkey urgently needed less fragile financial sector for consistent growth and economic prosperity. Hence Turkey initiated Banking Sector Reconstruction Program on May 15, 2001 to establish a competitive and healthy banking sector (see Al, Aysan 2006). In the scope of Banking Sector Reconstruction Program, capital structure of banks were strengthened, merger and acquisition activities encouraged. Furthermore Treasury helped the banks to close their short positions in foreign currencies while regulation and legislation were improved.

In 2001, Ulusal Bank, Sitebank, Iktisat Bankasi, Kentbank, Tarisbank, Bayindirbank, EGS Bank and Toprak Bank are all acquired by Saving Deposit Insurance Fund (TMSF). Seven banks were merged. Egebank, Turkbank, Yasarbank, Bank Kapital, Ulusal Bank merged under Sumerbank and Interbank, Esbank merged under Etibank. Moreover licenses of Etibank, Iktisat Bankasi and Kentbank are cancelled. Also in private sector several banks engaged in merger and acquisition activities. Bank Ekspres merged with Tekfen Yatirim ve Finansman and constitute Tekfen Bank. Demirbank was acquired by HSBC. Korfez Bank, Osmanli Bankasi, Sumerbank, Sinai Yatirim Bankasi were transferred to Osmanli Bankasi, Garanti Bankasi, Oyakbank and Turkiye Sinai Kalkinma Bankasi respectively.

In 2002, number of banks, branches and employees were reduced for financial and operational recovery. Number of banks decreased from 61 (end of 2001) to 54 (end of 2002). Number of branches decreased by 9.7 percent. Number of employees decreased by 10.8 percent (see Table 1).

Table 1. Number of Banks

	Dec 2000	**Dec 2001**	**Dec 2002**	**Dec 2003**	**Dec 2004**	**Dec 2005**	**Dec 2006**	**Sep 2007**
Commercial	61	46	40	36	35	34	33	33
State Owned	4	3	3	3	3	3	3	3
Privately-owned	28	22	20	18	18	17	14	12
Under SDIF*	11	6	2	2	1	1	1	1
Foreign	18	15	15	13	13	13	15	17
Development and Investment	18	15	14	14	13	13	13	13
Sector Total	**79**	**61**	**54**	**50**	**48**	**47**	**46**	**46**

Note: *Saving Deposit Insurance Fund (TMSF)
Source: The Banks Association of Turkey

In 2003, world economy and in particular Turkish Economy started to recover itself compared to stagnation period of 2001 and 2002. Especially after the general elections in November 2002 and Copenhagen Summit about Turkey's efforts for full membership to European Union[1] in December 2002, Turkey's economic and political recovery has accelerated while uncertainties ameliorating and expectations about Turkish economy improving. As a result of these changes and decrease in nominal interest rates, Turkish banking sector reach healthier asset-liability structure. Number of banks decreased from 54 (end of 2002) to 50 (end of 2003). In the same period, number of branches decreased by 2.2 percent and asset size per branch increased. On the other hand number of employees did not changed much (see Table 2).

Table 2. Number of Branches

	Dec 2000	**Dec 2001**	**Dec 2002**	**Dec 2003**	**Dec 2004**	**Dec 2005**	**Dec 2006**	**Sep 2007**
Commercial	7807	6889	6087	5949	6088	6228	6804	7318
State Owned	2834	2725	2019	1971	2149	2035	2149	2165
Privately-owned	3783	3523	3659	3594	3729	3799	3582	3868
Under SDIF*	1073	408	203	175	1	1	1	1
Foreign	117	233	206	209	209	393	1072	1284
Development and Investment	30	19	19	17	18	19	45	48
Sector Total	**7837**	**6908**	**6106**	**5966**	**6106**	**6247**	**6849**	**7366**

Note: *Saving Deposit Insurance Fund (TMSF)
Source: The Banks Association of Turkey

In 2004, the recovery in the world economy continued. The growth rate of the world economy increased and reached 5.1 percent compared to 4 percent in 2003. In the same year Turkey's performance was even better due to the political stability and successful structural transformation projects and macroeconomic policies. Turkey's GNP and GNP per capita in dollars grew by 9.3 percent and 23 percent respectively. Inflation rate of Turkey was 9.3 percent lowest since 1970. In December 2004 EU decided to initiate membership negotiations with Turkey, starting in September 2005. The number of banks in the sector declined to 48. Two foreign banks, Credit Lyonnais S. A. and Credit Agricole Indosuez Türk Bank merged. Two domestic banks, T. Halk Bankası and Pamukbank were also merged. Deutsche Bank A. G. changed its status from development and investment bank to foreign bank. Due to the growth in the sector, number of branches and employees increased as well (see Table 3).

[1] See Ginevičienė and Tvaronavičienė (2005) for an excellent evaluation of development level of new European Union members.

Table 3. Number of Employees

	Dec 2000	Dec 2001	Dec 2002	Dec 2003	Dec 2004	Dec 2005	Dec 2006	Sep 2007
Commercial	164845	132274	118329	118607	12263	127857	13857	149102
State Owned	70191	56108	40158	37994	39467	38046	39223	4014
Privately-owned	70954	6438	66869	70614	7688	78806	7322	78741
Under SDIF*	19895	6391	5886	4518	403	395	333	327
Foreign	3805	5395	5416	5481	588	1061	25794	29894
Development and Investment	5556	5221	4942	4642	4533	4401	4573	4681
Sector Total	**170401**	**137495**	**123271**	**123249**	**127163**	**132258**	**143143**	**153783**

Note: *Saving Deposit Insurance Fund (TMSF)
Source: The Banks Association of Turkey

In 2005, world economy was stable and grew by 4.3 percent. In Turkey, main macroeconomic indicators continue to improve. GNP increased by 7.6 percent and the inflation rate was 7.7 percent which was even lower than the inflation rate in 2004. Number of banks decreased by 1 to 47 due to the new mergers while number of employees and branches increased.

After 2005, Turkish banking sector is on a stable growth path. Overall, total assets, number of branches and number of employees of the banking sector keep increasing. Actually one can divide the post-crisis period into two sub-periods before 2005 and after 2005. Pre-2005 episode was the recovery and stabilization period. There was a lot of merger activities. On the other hand, post-2005 can be called as the growth period. The new period is shaped by acquisition activities done by foreign banks.

BNP Paribas (French) acquired Türk Ekonomi Bankasi in February 2005. Fortis (Holland-Belgium) acquired Dışbank on April 11, 2005. General Electric bought 25.5 percent of the Garanti Bankasi on August 24, 2005. Unicredit (Italian) and Koç Holding (Turkish) together acquired Yapi Kredi on September 28, 2005. Hapoalim (Israel) acquired C Bank and named Bank Pozitif on December 14, 2005. National Bank (Greece) bought 47 percent of Finans Bank on April 3, 2006. EFG Eurobank (Greece) acquired Tekfenbank on May 8, 2006. Dexia (French-Belgium) acquired Denizbank on May 30, 2006. Turan-Alem (Kazakhstan) bought 33 percent of Şekerbank on June 22, 2006. Merrill Lynch acquired Tat Yatirim Bankasi on August 31, 2006. Arab Bank (Jordan) and BankMed (Lebanon) acquired MNG Bank and changed its name as Turkland on September 4, 2006. Citibank bought 20 percent of Akbank on October 17, 2006. Anadolu Group and Alpha Bank (Greece) acquired Abank on November 24, 2006. ING (Holland) acquire Oyak Bank on June 19, 2007 (see Annual Reports 2001–2006 of Banking Regulation and Supervision Agency).

In a very short period of time, foreign share in the banking sector increased. According to the data of Central Bank of Turkey and Banking Regulation and Supervision Agency

foreign share in banking sector reached 25 percent. This ratio is much higher compared to 7.3 percent foreign share in March 2001.

There is a growing literature that investigates possible effects of foreign entry into the banking sector. Bonin *et al.* (2005) and Levine (2001) suggest that foreign banks increase efficiency of the banks by improving corporate governance. Moreover domestic banks acquired by foreign banks are upgraded by international rating agencies (Cardenas *et al.* 2003). Usually foreign banks bring new financial products and services, which enhance competition. Berger *et al.* (2000) show different results in the case of developed and developing countries about efficiency of foreign banks. Results suggest that foreign banks are more efficient in terms of cost and profit in developing countries and less efficient in developed countries compared to the domestic banks. Aysan and Ceyhan (2007) investigate the reasons for foreign bank entry in the light of push and pull factors. They suggest that Turkey's location (intersection of Europe and Middle East) increasing population and per capita income and EU accession process are the factors attracting foreign banks to invest in Turkey[2]. This literature reveals that foreign bank entry has effects on bank efficiency and structure. Hence it is quite interesting to analyze the period after the acceleration of foreign bank entry into Turkey.

There is also considerable literature on the relation between efficiency and profitability[3]. Turati (2003) analyzed this relation by examining correlation coefficient which he computed between efficiency scores and profitability. Abbasoglu *et al.* (2007) explore efficiency of Turkish banking sector and its relation with profitability. They found no robust relation between efficiency and profitability. There are also some studies that compares the efficiency of domestic and foreign banks. For example Isik and Hassan (2002a) analyzed efficiency of Turkish banking sector by Data Envelopment Analysis (DEA). They found that foreign banks are not more efficient than domestic banks.

3. Data and the empirical models

3.1. Data and definitions of variables

We use the quarterly panel data of the all commercial banks of Turkey for the period 2002Q4-2007Q2. The data are taken from the Banks Association of Turkey (BAT). There are 32 banks of which 3 are state banks, 13 are domestic banks, and 16 are foreign banks. We use two distinct dependent and seven independent variables consisting of four outputs and three inputs. Dependent variables are total cost (tc) and profit (p), or net income; and independent variables consist of outputs which are short term commercial loans (y1), long term commercial loans (y2), off balance sheet items (y3), and other earning assets (y4); and of inputs which are price of labor (p1), price of capital (p2), and

[2] See Kosekahyaoglu (2006); Bilgin *et al.* (2010); Dumlubag (2009) and Ucal *et al.* (2010) for detailed account of Turkish Economy.

[3] Also see Altunbas and Chakravarty (1998); Aysan and Ceyhan (2008); Berg *et al.* (1993); Berger *et al.* (1993); Berger, Mester (1997); Gong and Sickels (1992); Kumbhakar (1990); Kwan and Eisenbeis (1994); Lang (1996) and Maudos *et al.* (2002).

price of funds (p3). Price of labor is the total expenditures on personnel and services, price of capital is total expenditures on physical capital divided by the book value of fixed assets and price of funds is total interest expenses divided by total funds borrowed. These variables are commonly used in the cost and profit efficiency of the banking sector literature[4]. Hence, we choose these variables in our study. As a measure of profitability we use two different measures return on asset and return on equity (see Table A.4 and Table A.5). Book value is taken as a measure of size.

3.2. Measure of efficiency, profitability, size and methodology

We can calculate efficiency by using either non-parametric (originating from operations research) or parametric approaches (econometric approaches). In a nonparametric (non-stochastic) approach like Data Envelopment Analysis efficiency is calculated by linear mathematical programming techniques. Parametric (stochastic) efficiency is calculated via a cost or profit function in which variables are costs or profits determined by input prices, quantities of variable outputs, random error and inefficiency. In our study, we use parametric approaches because of its two main advantages. In parametric approaches inefficiency is separated from statistical noise and we can use standard statistical tests on the variables to test their significance (Farsi, Filippini 2004). On the other hand non-parametric approaches do not allow this kind of statistical inference (Isik, Hassan 2002b).

In this study we calculate cost and profit efficiency following the paper of Isik and Hassan (2002b). Cost inefficiency is caused by using sub-optimal input combinations on a given output level while profit efficiency stems from using sub-optimal output level given the input and output prices. In other words cost efficiency shows how far a bank's cost is away from the bank that shows best performance if they produce under same conditions and same level of output. Profit efficiency shows how much bank is close to the highest amount of profit for its given level of output.

In this research we estimate both cost and profit frontier by time invariant panel stochastic frontier approach. We discuss the benefits of this approach over regular stochastic frontier models after introducing the model as follows:

Cost Frontier Model

$$\ln tc_{it} = f\left(y_{lit},\ p_{kit}\right) + \mu_{1i} + v_{1it},\ \ \mu_{1i} \geq 0.$$

Profit Frontier Model

$$\ln\left(\alpha + \pi_{it}\right) = f\left(y_{lit},\ p_{kit}\right) + \mu_{2i} + v_{2it},\ \ \mu_{2i} \geq 0,$$

$$i = 1, 2, \ldots, N \text{ and } t = 1, 2, \ldots, T,$$

$$l = 1, 2, 3, 4 \text{ and } k = 1, 2, 3.$$

[4] Isik and Hassan (2002b); Abbasoglu *et al*. (2007); Demir *et al*. (2005); Carvallo and Kasman (2004); Akin *et al.* (2010) employ these variables in their models.

In these equations tc_{it} stands for total cost, π_{it} stands for profit, γ_{fit} stands for output, ρ_{kit} stands for input, i indicates the bank, t indicates the time, l indicates the output, k indicates the input and υ_{it} is a classical error term that follows a symmetric normal distribution. It is assumed that μ_{ji} follows truncated half normal distribution and υ_{jit} is independent of μ_i, for $j = 1, 2$. Translog specification is employed in modeling both cost and profit function. In the empirical literature on bank efficiency translog specification is widely used. This functional form has various advantages, one of them is its flexible form which allows us to use Cobb-Douglas specification. Resulting 4 output, 3 input models for a given i[th] firm are as follows.

$$\ln tc_{it} = \lambda + \sum_{l=1}^{4} \psi_{lit} \ln \sigma_{lit} + \sum_{k=1}^{3} \beta_{kit} \ln \gamma_{kit} + \mu_{1i} + \upsilon_{1it}, \quad \mu_{1i} \geq 0.$$

$$\ln(\alpha + \pi_{it}) = \alpha + \sum_{l=1}^{4} \phi_{lit} \ln \delta_{lit} + \sum_{k=1}^{3} \rho_{kit} \ln \xi_{kit} + \mu_{2i} + \upsilon_{2it}, \quad \mu_{2i} \geq 0.$$

Lastly we look at the advantages of panel data over cross sectional data in efficiency estimation. Schmidt and Sickles (1984) discuss the main advantages of panel data. Firstly there is no need to impose distributional specification on the efficiency term for consistent estimations. Secondly one can relax the assumption that inefficiency and input levels are independent. Moreover technical efficiency can not be consistently estimated in a single cross section, because its results heavily rely on distributional assumption on inefficiency[5].

4. Empirical results

4.1. Cost and profit efficiency change

There are two important observations. There is a clear cost efficiency gain in Turkish banking sector in this period. Mean of efficiency scores increased from 0.74 to 0.91. One can also observe convergence in terms of cost efficiency. Standard deviation of cost efficiency scores declines from 0.06 to 0.04 (see Table 4 and Table A.1).

Apparently, profit efficiency roughly declines. However this can be attributed to the increased standard deviation between these two periods. Hence, in terms of profit efficiency divergence instead of convergence is the pattern. Recent developments in Turkey increased competition in the banking sector. Competition lowers the excess profits, which can affect profit efficiency.

When we look at the cost efficiencies of the banks for the period 2002–2005, the most cost efficient bank is AKB, whereas the least one is HBB. Among the highest ten cost efficient banks, all three of the state bank are included, only one of them is foreign banks, and the remaining six are domestic banks. Beside the banks that have the worst cost efficiency appear as follows: three are domestic banks, and the remaining seven are foreign banks. Hence, the overall cost efficiency of foreign banks is poorer in the period 2002–2005, whereas the state banks and domestic banks have better cost efficiencies.

[5] Also see Aigner *et al.* (1997); Battese and Coelli (1988, 1995); Greene (2001, 2002, 2004); Schmidt (1988) and Sickles (2005).

Table 4. Descriptive Statistics

	Cost Efficiency 2002–2007	Cost Efficiency 2002–2005	Cost Efficiency 2005–2007	Profit Efficiency 2002–2007	Profit Efficiency 2002–2005	Profit Efficiency 2005–2007
Mean	0.75	0.74	0.91	0.81	0.60	0.36
Median	0.73	0.73	0.92	0.82	0.59	0.30
Maximum	0.90	0.87	0.95	0.85	0.62	0.62
Minimum	0.65	0.65	0.84	0.76	0.58	0.16
Std. Dev.	0.08	0.06	0.04	0.03	0.01	0.17
Skewness	0.43	0.39	–0.58	–0.75	0.53	0.38
Observations	32	32	32	32	32	32

Source: Authors' calculation

Looking at the period 2005–2007, the highest ten cost efficient banks consist of two state banks, five domestic banks and three foreign banks. Lowest cost efficient banks that have least cost efficiency consist of two domestic banks, and eight foreign banks. In this period, again, foreign banks did worse in terms of cost efficiency, but they are better than their rankings in the former period. The efficiency of state banks remains almost same given that efficiency of TCZB declines whereas efficiency of THB increases almost the same amount. Furthermore the ranking of the overall cost efficiency of the domestic banks converges to median since the share of the domestic banks in least ten and highest ten declines.

For the overall cost efficiency ranking, in the 2002–2007 period, the state banks and the domestic banks are the most efficient, and foreign banks did the worst. All state banks are among the highest ten cost efficient banks, whereas nine of the least ten cost efficient banks are foreign banks. Beside domestic banks are almost above the median. Profit efficiency rankings of the groups of the banks are more homogeneous than the cost efficiency ranking. In the first period, 2002–2005, foreign banks were dominant among the highest ten profit efficient banks: five foreign banks, four domestic banks and only one state bank. On the other hand, in the second period the domination of the foreign banks is more apparent: eight foreign banks, and two domestic banks. State banks did worse in terms of profit efficiency compared to their cost efficiency ranking. In both periods their rankings are about the median.

Our results do not indicate any evidence supporting the idea that international investors look for higher efficiency in their acquisition decisions. There are examples of banks that are inefficient but acquired. Banks that are acquired by foreign banks experienced efficiency increase. However in this period overall efficiency score of banking industry increases as well. In retrospect some of foreign banks experienced efficiency decline relative to other banks suggesting no clear-cut evidence in favor of efficiency improvement for the banks acquired by foreign banks (see Table 5).

Table 5. Cost-Profit Efficiency Scores

	Cost Efficiency 2002–2007	Cost Efficiency 2002–2005	Cost Efficiency 2005–2007	Profit Efficiency 2002–2007	Profit Efficiency 2002–2005	Profit Efficiency 2005–2007
ABN	0.66	0.67	0.88	0.80	0.60	0.45
AKB	0.89	0.87	0.92	0.84	0.61	0.38
ALTR	0.73	0.77	0.93	0.83	0.59	0.20
ANDL	0.69	0.68	0.94	0.83	0.60	0.16
ARTB	0.68	0.71	0.94	0.83	0.60	0.19
BDR	0.65	0.67	0.92	0.82	0.60	0.18
BNKM	0.67	0.73	0.84	0.77	0.61	0.62
BFB	0.78	0.68	0.91	0.80	0.61	0.60
CTB	0.70	0.70	0.88	0.80	0.59	0.48
DNZB	0.86	0.80	0.94	0.84	0.58	0.23
DTCB	0.65	0.65	0.84	0.76	0.62	0.62
FNB	0.75	0.77	0.88	0.80	0.59	0.47
FRB	0.83	0.80	0.94	0.84	0.58	0.21
HBB	0.65	0.65	0.84	0.76	0.62	0.62
HSBC	0.77	0.75	0.91	0.82	0.58	0.31
KCB	0.67	0.67	0.86	0.77	0.61	0.55
MLB	0.68	0.74	0.84	0.78	0.60	0.62
OYK	0.80	0.74	0.94	0.83	0.58	0.19
SCG	0.65	0.66	0.84	0.78	0.60	0.62
SKRB	0.73	0.68	0.94	0.81	0.61	0.20
TKF	0.69	0.68	0.94	0.84	0.58	0.16
TKS	0.70	0.70	0.88	0.80	0.59	0.44
TRKS	0.75	0.81	0.91	0.82	0.59	0.30
TRKL	0.66	0.65	0.93	0.83	0.58	0.18
TEB	0.77	0.75	0.94	0.84	0.58	0.18
TCZB	0.87	0.83	0.93	0.83	0.61	0.42
TGB	0.79	0.72	0.95	0.85	0.58	0.23
THB	0.84	0.79	0.95	0.84	0.60	0.27
TİS	0.85	0.81	0.92	0.83	0.59	0.38
TVB	0.90	0.84	0.95	0.84	0.59	0.26
WLB	0.70	0.73	0.88	0.80	0.59	0.53
YKR	0.89	0.82	0.84	0.76	0.59	0.27

Source: Authors' calculation

Lastly according to our results profit efficiency and cost efficiency are not related. Cost efficient bank can be profit inefficient and profit efficient bank can be cost inefficient. However we observe in general that in the first and second period profit and cost efficiency are negatively related (see Table 5, Table 6 and Table A.3).

Table 6. Efficiency Ranks of the Banks

Rank	Cost Efficiency 2002–2007 rank	Cost Efficiency 2002–2005 rank	Cost Efficiency 2005–2007 rank	Profit Efficiency 2002–2007 rank	Profit Efficiency 2002–2005 rank	Profit Efficiency 2005–2007 rank
1	**TVB**	AKB	**THB**	TGB	*DTCB*	*BNKM*
2	YKR	**TVB**	**TVB**	**TVB**	*HBB*	*DTCB*
3	AKB	**TCZB**	TGB	AKB	AKB	*HBB*
4	**TCZB**	YKR	*ARTB*	**THB**	KCB	*MLB*
5	DNZB	TİS	ANDL	*TKF*	*BNKM*	*SCG*
6	TİS	TRKS	*TKF*	*FRB*	BFB	BFB
7	**THB**	DNZB	SKRB	DNZB	SKRB	KCB
8	*FRB*	FRB	*FRB*	TEB	**TCZB**	*WLB*
9	OYK	**THB**	OYK	*TRKL*	*SCG*	*CTB*
10	TGB	ALTR	DNZB	OYK	*BDR*	*FNB*
11	BFB	FNB	TEB	**TCZB**	*ARTB*	*ABN*
12	TEB	TEB	**TCZB**	TİS	**THB**	TKS
13	*HSBC*	*HSBC*	ALTR	ALTR	*MLB*	**TCZB**
14	TRKS	*MLB*	*TRKL*	*ARTB*	ANDL	AKB
15	*FNB*	OYK	*BDR*	ANDL	*ABN*	TİS
16	SKRB	*BNKM*	AKB	*HSBC*	*WLB*	*HSBC*
17	ALTR	*WLB*	TİS	TRKS	TKS	TRKS
18	*WLB*	TGB	TRKS	*BDR*	TRKS	YKR
19	*CTB*	*ARTB*	*HSBC*	SKRB	*CTB*	**THB**
20	TKS	TKS	BFB	*FNB*	TİS	**TVB**
21	ANDL	*CTB*	*FNB*	*CTB*	FNB	DNZB
22	*TKF*	BFB	TKS	TKS	**TVB**	TGB
23	*ARTB*	TKF	*WLB*	BFB	YKR	*FRB*
24	*MLB*	ANDL	*CTB*	*ABN*	ALTR	SKRB
25	*BNKM*	SKRB	*ABN*	*WLB*	TKF	ALTR
26	KCB	*BDR*	KCB	*MLB*	TRKL	OYK
27	*TRKL*	*ABN*	*BNKM*	*SCG*	TGB	*ARTB*
28	*ABN*	KCB	*DTCB*	*BNKM*	DNZB	*BDR*
29	*BDR*	*SCG*	*HBB*	KCB	FRB	*TRKL*
30	*SCG*	TRKL	*MLB*	*DTCB*	TEB	TEB
31	*DTCB*	*DTCB*	*SCG*	*HBB*	OYK	ANDL
32	*HBB*	*HBB*	YKR	YKR	*HSBC*	*TKF*

Notes: Bold: State banks, Italic: Foreign banks, Other: Domestic Private banks
Source: The Banks Association of Turkey

4.2. Efficiency, size and profitability

We use book value of banks as measure of size and return on asset (ROA) and return on equity (ROE) as measures of profitability. We run fixed effect regression with panel data of 64 observations to examine the relationship between efficiency and profitability[6]. Our results do not suggest that there is a significant relation between cost efficiency, profit efficiency measures and profitability. We find however significant relationship between size and return on equity and return on asset suggesting that the size matters more for profitability in Turkey (see Table 7, Table 8 and Table A.2).

Table 7. Cost Efficiency

Fixed Effect Regression		Dependent Variable			
		Return on Asset		Retun on Equity	
		Coef.	t-value	Coef.	t-value
Explanatory variable	Cost Efficiency	0.221534	1	–0.03198	–0.43
	Size	2.81E-07	1.79	1.56E-07	2.95
	Constant	–0.04848	–0.25	0.002128	0.03

Source: Authors' calculation

Table 8. Profit Efficiency

Fixed Effect Regression		Dependent Variable			
		Return on Asset		Retun on Equity	
		Coef.	t-value	Coef.	t-value
Explanatory variable	Profit Efficiency	–0.20271	–1.48	0.012627	0.27
	Size	2.82E-07	1.84	1,55E-07	2.93
	Constant	0.22948	1.95	–0.02942	–0.72

Source: Authors' calculation

We also run random effect regression with the same panel data and add dummy for foreign banks and state banks. Generally these dummies are insignificant while other results are very similar. Goodness of fit of our regressions are quite good considering that most of actual observations are in the confidence interval of our regression fit (see Figs. 1–4).

[6] See Sufian and Habibullah (2009) for determinants of bank profitability in developing countries.

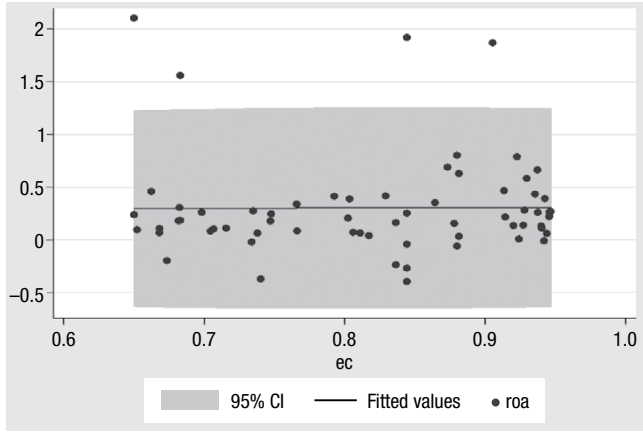

Fig. 1. ROA and Cost Efficiency

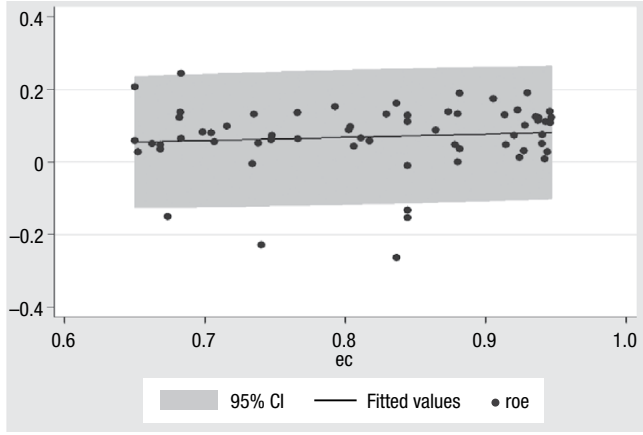

Fig. 2. ROE and Cost Efficiency

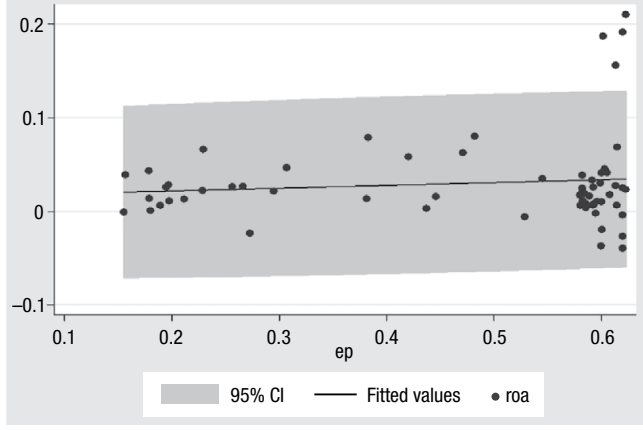

Fig. 3. ROA and Profit Efficiency

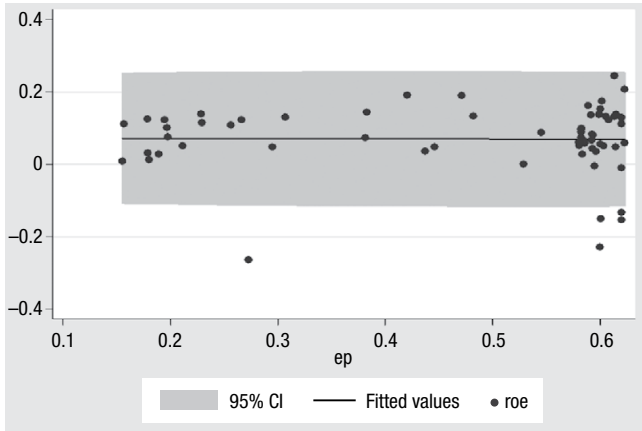

Fig. 4. ROE and Profit Efficiency

4.3. Sensitivity analysis

Turkish banking sector is known as state dominated sector. Although there are few state banks, their size is large. We conduct the same analysis to see the sensitivity of our results to the state owned banks. The findings show that our results are insensitive to the exclusion of state banks. Correlation between efficiency scores from the results of the analysis with the state banks and without the state banks are all more than 99 percent (see Table 9, Table A.6, Table A.7 and Table A.8). Furthermore we do not find a significant relation between efficiency and profitability which confirms our earlier results.

Table 9. Correlation Matrix

			Without State Banks			
	Cost Efficiency 2002–2007	**Profit Efficiency 2002–2007**	**Cost Efficiency 2002–2005**	**Profit Efficiency 2002–2005**	**Cost Efficiency 2005–2007**	**Profit Efficiency 2005–2007**
Cost Efficiency 2002–2007	**0.9997**	0.4201	0.8726	–0.3665	0.3655	–0.3275
Profit Efficiency 2002–2007	0.4155	**0.9951**	0.3856	–0.6052	0.9419	–0.7748
Cost Efficiency 2002–2005	0.8444	0.3524	**0.9944**	–0.3287	0.2194	–0.2146
Profit Efficiency 2002–2005	–0.4113	–0.5934	–0.41	**0.9959**	–0.4981	0.6626
Cost Efficiency 2005–2007	0.3622	0.9354	0.248	–0.4878	**0.9952**	–0.8448
Profit Efficiency 2005–2007	–0.3499	–0.741	–0.2747	0.6514	–0.8327	**0.9999**

Source: Authors' calculation

5. Conclusions

In this paper, we analyze cost and profit efficiency of Turkish banking sector in the post crisis era (2002–2007) by employing Panel Stochastic Frontier Approach for the first time in Turkish banking efficiency literature. Moreover we investigate the relation between efficiency, size and profitability. In our analysis we further divide the period 2002–2007 into 2 sub-periods as 2002–2005 and 2005–2007. 2002–2005 period characterized by contraction, recovery and merger in the banking sector. On the other hand 2005–2007 is the period of growth and acquisition by foreign banks.

The results of our study reveal that there is an increase in the cost efficiency in addition to convergence in the cost efficiency of banks. This finding shows that banks in Turkish market easily adopt new practices which enhance efficiency. When one bank discovers ways to increase its efficiency or a new more efficient bank enters into Turkish market other banks quickly imitate better technology. We also find that foreign banks including new entrants are less efficient. Our results also show that state banks are more efficient. The results about state banks and foreign banks are quite interesting for the literature while they are in congruent with prior studies in Turkish banking sector.

We can not necessarily claim that banks acquired by foreign banks are more efficient banks. In the sample of banks acquired by foreign banks, there are efficient and inefficient banks. Efficiency of the banks acquired by foreigners increased. However there is an overall efficiency increase in this period anyway suggesting that these banks have relatively not performed better. We also analyze the relation between cost-profit efficiency, size and profitability by both fixed effect and random effect regressions. According to our results there is no significant relation between efficiency and profitability. However there is a positive relationship between efficiency and size. However we find significant relationship between size and profitability. Lastly we examine the sensitivity of our results for the exclusion of state owned banks. We conduct the same analysis by excluding the state owned banks. The findings confirm that our results are not sensitive to the exclusion of state owned banks.

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APPENDIX

Table A.1. Descriptive Statistics

	Mean	Median	Max	Min	Std. Dev.	Observation
Cost Efficiency 2002–2007	0.7470	0.7347	0.8954	0.6458	0.0827	32
Cost Efficiency 2002–2005	0.7353	0.7343	0.8734	0.6502	0.0634	32
Cost Efficiency 2005–2007	0.9053	0.9217	0.9468	0.8367	0.0383	32
Profit Efficiency 2002–2007	0.8128	0.8237	0.8467	0.7575	0.0275	32
Profit Efficiency 2002–2005	0.5965	0.5941	0.6226	0.5800	0.0126	32
Profit Efficiency 2005–2007	0.3591	0.3010	0.6198	0.1552	0.1690	32
ROA 2002–2005	0.2775	0.1778	2.1017	–0.3718	0.4556	32
ROA 2005–2007	0.3253	0.2365	1.9175	–0.3967	0.4995	32
ROA 2002–2007	0.2985	0.1654	2.0211	–0.3827	0.4610	32
ROE 2002–2005	0.0741	0.0694	0.2442	–0.2291	0.0877	32
ROE 2005–2007	0.0647	0.0938	0.1900	–0.2641	0.0989	32
ROE 2002–2007	0.0691	0.0863	0.2147	–0.1893	0.0854	32
SIZE 2002–2007	601617.4	117219.0	4949542.0	2202.10	1151396.0	32
SIZE 2002–2005	596088.2	92929.1	5140583.0	2198.90	1209261.0	32
SIZE 2005–2007	601071.5	115624.8	4703918,0	2206.10	1086974.0	32

Source: Authors' calculation

Table A.2. The Correlation Matrix

	Cost efficiency 2002–2007	Cost efficiency 2002–2005	Cost efficiency 2005–2007	Profit efficiency 2002–2007	Profit efficiency 2002–2005	Profit efficiency 2005–2007	ROA 2002–2005	ROA 2005–2007	ROA 2002–2007	ROE 2002–2005	ROE 2005–2007	ROE 2002–2007	SIZE 2002–2007	SIZE 2002–2005	SIZE 2005–2007
Cost Efficiency 2002–2007	1	0.88	0.44	0.49	–0.34	–0.34	0.02	0.12	0.07	0.36	0.21	0.31	0.63	0.58	0.65
Cost Efficiency 2002–2005	0.88	1	0.3	0.42	–0.3	–0.23	–0.14	–0.04	–0.1	0.15	0.12	0.14	0.51	0.47	0.53
Cost Efficiency 2005–2007	0.44	0.3	1	0.95	–0.47	–0.83	–0.14	0.03	–0.06	0.2	0.49	0.39	0.04	–0.01	0.08
Profit Efficiency 2002–2007	0.49	0.42	0.95	1	–0.58	–0.76	–0.23	–0.03	–0.14	0.11	0.48	0.33	0.08	0.02	0.12
Profit Efficiency 2002–2005	–0.34	–0.3	–0.47	–0.58	1	0.66	0.49	0.34	0.43	0.2	0.06	0.15	–0.18	–0.15	–0.17
Profit Efficiency 2005-2007	–0.34	–0.23	–0.83	–0.76	0.66	1	0.36	0.24	0.31	0.02	–0.1	–0.04	–0.11	–0.09	–0.12
ROA 2002–2005	0.02	–0.14	–0.14	–0.23	0.49	0.36	1	0.88	0.98	0.69	0.38	0.6	–0.11	–0.13	–0.11
ROA 2005–2007	0.12	–0.04	0.03	–0.03	0.34	0.24	0.88	1	0.97	0.66	0.65	0.74	–0.14	–0.17	–0.12
ROA 2002–2007	0.07	–0.1	–0.06	–0.14	0.43	0.31	0.98	0.97	1	0.7	0.52	0.68	–0.13	–0.15	–0.12
ROE 2002–2005	0.36	0.15	0.2	0.11	0.2	0.02	0.69	0.66	0.7	1	0.59	0.87	0.1	0.06	0.13
ROE 2005–2007	0.21	0.12	0.49	0.48	0.06	–0.1	0.38	0.65	0.52	0.59	1	0.91	–0.17	–0.24	–0.12
ROE 2002–2007	0.31	0.14	0.39	0.33	0.15	–0.04	0.6	0.74	0.68	0.87	0.91	1	–0.06	–0.13	–0.02
SIZE 2002–2007	0.63	0.51	0.04	0.08	–0.18	–0.11	–0.11	–0.14	–0.13	0.1	–0.17	–0.06	1	0.99	1
SIZE 2002–2005	0.58	0.47	-0.01	0.02	–0.15	–0.09	–0.13	–0.17	–0.15	0.06	–0.24	–0.13	0.99	1	0.98
SIZE 2005–2007	0.65	0.53	0.08	0.12	–0.17	–0.12	–0.11	–0.12	–0.12	0.13	–0.12	–0.02	1	0.98	1

Source: Authors' calculation

Table A.3. Banks

Banks	Code	Ownership
ABN AMRO Bank NV	ABN	foreign
Akbank TAŞ	AKB	domestic
Alternatif Bank AŞ	ALTR	domestic
Anadolubank AŞ	ANDL	domestic
Arap Türk Bankası AŞ	ARTB	foreign
Banca di Roma SPA	BDR	foreign
Bank Mellat	BNKM	foreign
Birleşik Fon Bankası AŞ	BFB	domestic
Citibank AŞ	CTB	foreign
Denizbank AŞ	DNZB	domestic
Deutsche Bank AŞ	DTCB	foreign
Finans Bank AŞ	FNB	foreign
Fortis Bank AŞ	FRB	foreign
Habib Bank Limited	HBB	foreign
HSBC Bank AŞ	HSBC	foreign
Koçbank AŞ	KCB	domestic
Millennium Bank AŞ	MLB	foreign
Oyak Bank AŞ	OYK	domestic
Société Générale (SA)	SCG	foreign
Şekerbank TAŞ	SKRB	domestic
Tekfenbank AŞ	TKF	foreign
Tekstil Bankası AŞ	TKS	domestic
Turkish Bank AŞ	TRKS	domestic
Turkland Bank AŞ	TRKL	foreign
Türk Ekonomi Bankası AŞ	TEB	domestic
Türkiye Cumhuriyeti Ziraat Bankası AŞ	TCZB	state
Türkiye Garanti Bankası AŞ	TGB	domestic
Türkiye Halk Bankası AŞ	THB	state
Türkiye İş Bankası AŞ	TİS	domestic
Türkiye Vakıflar Bankası TAO	TVB	state
WestLB AG	WLB	foreign
Yapı ve Kredi Bankası AŞ	YKR	domestic

Source: The Banks Association of Turkey

Table A.4. Profitability of the Banks

	ROA 2002–2007	ROA 2002–2005	ROA 2005–2007	ROE 2002–2007	ROE 2002–2005	ROE 2005–2007
ABN	0.13	0.11	0.16	0.04	0.04	0.05
AKB	0.73	0.69	0.79	0.14	0.14	0.14
ALTR	0.17	0.09	0.28	0.08	0.06	0.1
ANDL	0.34	0.3	0.39	0.12	0.14	0.11
ARTB	0.09	0.1	0.06	0.04	0.06	0.03
BDR	–0.11	–0.2	0.01	–0.07	–0.15	0.01
BNKM	0.26	0.27	0.25	0.13	0.13	0.11
BFB	1.69	1.56	1.87	0.21	0.24	0.17
CTB	0.5	0.26	0.8	0.11	0.08	0.13
DNZB	0.51	0.39	0.66	0.1	0.1	0.11
DTCB	2.02	2.1	1.92	0.17	0.21	0.13
FNB	0.46	0.34	0.63	0.16	0.14	0.19
FRB	0.17	0.21	0.13	0.07	0.09	0.05
HBB	0.11	0.24	–0.04	0.02	0.06	–0.01
HSBC	0.3	0.18	0.47	0.1	0.06	0.13
KCB	0.19	0.07	0.35	0.06	0.05	0.09
MLB	–0.38	–0.37	–0.4	–0.19	–0.23	–0.15
OYK	0.15	0.06	0.26	0.09	0.05	0.12
SCG	0.14	0.46	–0.27	–0.05	0.05	–0.13
SKRB	0.15	0.18	0.11	0.12	0.12	0.07
TKF	0.1	0.19	–0.01	0.03	0.06	0.01
TKS	0.06	0.08	0.03	0.06	0.08	0.04
TRKS	0.14	0.07	0.22	0.04	0.04	0.05
TRKL	0.11	0.1	0.14	0.03	0.03	0.03
TEB	0.33	0.25	0.43	0.1	0.07	0.12
TCZB	0.49	0.41	0.58	0.16	0.13	0.19
TGB	0.16	0.11	0.22	0.11	0.1	0.14
THB	0.35	0.41	0.27	0.13	0.15	0.12
TİS	0.1	0.07	0.14	0.06	0.07	0.07
TVB	0.21	0.16	0.26	0.14	0.16	0.11
WLB	–0.04	–0.02	–0.06	–0.01	–0.01	0
YKR	–0.08	0.04	–0.24	–0.11	0.06	–0.26

Source: Authors' calculation

Table A.5. Profitability Ranks of the Banks

Rank	ROA 2002–2007 rank	ROA 2002–2005 rank	ROA 2005–2007 rank	ROE 2002–2007 rank	ROE 2002–2005 rank	ROE 2005–2007 rank
1	*DTCB*	*DTCB*	*DTCB*	BFB	BFB	**TCZB**
2	BFB	BFB	BFB	*DTCB*	*DTCB*	*FNB*
3	AKB	AKB	*CTB*	*FNB*	**TVB**	BFB
4	DNZB	*SCG*	AKB	**TCZB**	**THB**	AKB
5	*CTB*	**TCZB**	DNZB	AKB	AKB	TGB
6	**TCZB**	**THB**	*FNB*	**TVB**	ANDL	*CTB*
7	*FNB*	DNZB	**TCZB**	**THB**	FNB	*HSBC*
8	**THB**	FNB	*HSBC*	*BNKM*	**TCZB**	*DTCB*
9	ANDL	ANDL	TEB	ANDL	*BNKM*	TEB
10	TEB	*BNKM*	ANDL	SKRB	SKRB	OYK
11	*HSBC*	*CTB*	KCB	TGB	TGB	**THB**
12	*BNKM*	TEB	ALTR	*CTB*	DNZB	DNZB
13	**TVB**	*HBB*	**THB**	DNZB	FRB	*BNKM*
14	KCB	FRB	**TVB**	TEB	*CTB*	ANDL
15	*FRB*	TKF	OYK	*HSBC*	TKS	**TVB**
16	ALTR	SKRB	*BNKM*	OYK	TEB	ALTR
17	TGB	*HSBC*	TGB	ALTR	TİS	KCB
18	SKRB	**TVB**	TRKS	*FRB*	TKF	SKRB
19	OYK	TGB	*ABN*	TİS	ALTR	TİS
20	*SCG*	*ABN*	*TRKL*	TKS	*HSBC*	*FRB*
21	TRKS	*ARTB*	TİS	KCB	*HBB*	TRKS
22	*ABN*	TRKL	*FRB*	TRKS	YKR	*ABN*
23	*HBB*	ALTR	SKRB	*ABN*	*ARTB*	TKS
24	*TRKL*	TKS	*ARTB*	*ARTB*	OYK	*TRKL*
25	*TKF*	TRKS	TKS	*TKF*	*SCG*	*ARTB*
26	TİS	KCB	*BDR*	*TRKL*	KCB	*BDR*
27	*ARTB*	TİS	*TKF*	*HBB*	TRKS	*TKF*
28	TKS	OYK	*HBB*	*WLB*	*ABN*	*WLB*
29	*WLB*	YKR	*WLB*	*SCG*	TRKL	*HBB*
30	YKR	*WLB*	YKR	*BDR*	*WLB*	*SCG*
31	*BDR*	*BDR*	*SCG*	YKR	*BDR*	*MLB*
32	*MLB*	*MLB*	*MLB*	*MLB*	*MLB*	*YKR*

Notes: Bold: State banks, Italic: Foreign banks, Other: Domestic Private banks
Source: Authors' calculation

Table A.6. Efficiency Scores of the Banks Excluding State Banks

Banks	Cost Efficiency 2002–2007 without state banks	Cost Efficiency 2002–2005 without state banks	Cost Efficiency 2005–2007 without state banks	Profit Efficiency 2002–2007 without state banks	Profit Efficiency 2002–2005 without state banks	Profit Efficiency 2005–2007 without state banks
ABN	0.66	0.68	0.87	0.78	0.6	0.45
AKB	0.89	0.89	0.91	0.82	0.62	0.39
ALTR	0.74	0.78	0.91	0.81	0.58	0.2
ANDL	0.7	0.69	0.93	0.81	0.6	0.16
ARTB	0.69	0.71	0.93	0.81	0.6	0.19
BDR	0.65	0.68	0.9	0.8	0.6	0.18
BNKM	0.67	0.73	0.85	0.76	0.61	0.62
BFB	0.78	0.69	0.89	0.78	0.61	0.6
CTB	0.7	0.71	0.87	0.79	0.59	0.49
DNZB	0.86	0.82	0.92	0.82	0.58	0.24
DTCB	0.65	0.65	0.85	0.75	0.62	0.62
FNB	0.76	0.78	0.88	0.79	0.59	0.48
FRB	0.84	0.82	0.92	0.82	0.58	0.22
HBB	0.65	0.65	0.85	0.75	0.62	0.62
HSBC	0.78	0.76	0.9	0.81	0.58	0.31
KCB	0.67	0.67	0.86	0.77	0.62	0.55
MLB	0.68	0.74	0.85	0.77	0.6	0.62
OYK	0.81	0.76	0.92	0.81	0.58	0.2
SCG	0.65	0.67	0.85	0.77	0.6	0.62
SKRB	0.74	0.69	0.93	0.8	0.61	0.2
TKF	0.69	0.7	0.93	0.82	0.59	0.16
TKS	0.71	0.72	0.88	0.79	0.59	0.44
TRKS	0.75	0.82	0.9	0.8	0.59	0.3
TRKL	0.66	0.66	0.91	0.81	0.58	0.18
TEB	0.78	0.77	0.92	0.81	0.58	0.18
TGB	0.8	0.75	0.93	0.83	0.59	0.24
TİS	0.86	0.84	0.91	0.82	0.59	0.39
WLB	0.71	0.75	0.88	0.78	0.59	0.53
YKR	0.9	0.84	0.84	0.74	0.59	0.28

Source: Authors' calculation

Table A.7. Efficiency Ranks of the Banks Excluding State Banks

Rank	Cost Efficiency 2002–2007 rank	Cost Efficiency 2002–2005 rank	Cost Efficiency 2005–2007 rank	Profit Efficiency 2002–2007 rank	Profit Efficiency 2002–2005 rank	Profit Efficiency 2005–2007 rank
1	YKR	AKB	TGB	TGB	*DTCB*	*BNKM*
2	AKB	YKR	*ARTB*	AKB	*HBB*	*DTCB*
3	DNZB	TİS	ANDL	*FRB*	AKB	*HBB*
4	TİS	DNZB	SKRB	*TKF*	KCB	*MLB*
5	*FRB*	FRB	*TKF*	TİS	*BNKM*	*SCG*
6	OYK	TRKS	*FRB*	DNZB	BFB	BFB
7	TGB	ALTR	OYK	OYK	SKRB	KCB
8	BFB	FNB	DNZB	TEB	*SCG*	*WLB*
9	*HSBC*	TEB	TEB	*TRKL*	*ARTB*	*CTB*
10	TEB	*HSBC*	TİS	ALTR	ANDL	*FNB*
11	*FNB*	OYK	ALTR	*ARTB*	*MLB*	*ABN*
12	TRKS	*WLB*	AKB	ANDL	*BDR*	*TKS*
13	SKRB	TGB	*TRKL*	*HSBC*	*ABN*	AKB
14	ALTR	*MLB*	*BDR*	TRKS	*WLB*	TİS
15	*WLB*	*BNKM*	*HSBC*	SKRB	FNB	*HSBC*
16	*TKS*	*TKS*	*TRKS*	*BDR*	TİS	TRKS
17	*CTB*	*ARTB*	BFB	*FNB*	*CTB*	YKR
18	ANDL	*CTB*	*WLB*	*CTB*	TKS	TGB
19	*TKF*	TKF	*FNB*	TKS	TRKS	DNZB
20	*ARTB*	ANDL	*TKS*	*ABN*	TGB	*FRB*
21	*MLB*	SKRB	*CTB*	*WLB*	YKR	*SKRB*
22	*BNKM*	BFB	*ABN*	BFB	TKF	ALTR
23	KCB	*ABN*	KCB	*MLB*	ALTR	OYK
24	*TRKL*	*BDR*	*BNKM*	*SCG*	TEB	*ARTB*
25	*ABN*	KCB	*DTCB*	KCB	DNZB	TEB
26	*BDR*	*SCG*	*HBB*	*BNKM*	FRB	*TRKL*
27	*SCG*	TRKL	*MLB*	*DTCB*	OYK	*BDR*
28	*DTCB*	*DTCB*	*SCG*	*HBB*	*HSBC*	ANDL
29	*HBB*	*HBB*	YKR	YKR	TRKL	*TKF*

Notes: Decreasing ranking, highest value is at the top and the lowest is at the bottom
Italic: Foreign banks, Other: Domestic Private banks
Source: Authors' calculation

Table A.8. Profitability Ranks of the Banks Excluding State Banks

Rank	ROA 2002–2007 rank	ROA 2002–2005 rank	ROA 2005–2007 rank	ROE 2002–2007 rank	ROE 2002–2005 rank	ROE 2005–2007 rank
1	*DTCB*	*DTCB*	*DTCB*	BFB	BFB	*FNB*
2	BFB	BFB	BFB	*DTCB*	*DTCB*	BFB
3	AKB	AKB	*CTB*	*FNB*	AKB	AKB
4	DNZB	*SCG*	AKB	AKB	ANDL	TGB
5	*CTB*	DNZB	DNZB	*BNKM*	FNB	*CTB*
6	*FNB*	FNB	*FNB*	ANDL	*BNKM*	*HSBC*
7	*ANDL*	ANDL	*HSBC*	SKRB	SKRB	*DTCB*
8	TEB	*BNKM*	TEB	TGB	TGB	TEB
9	*HSBC*	*CTB*	ANDL	*CTB*	DNZB	OYK
10	*BNKM*	TEB	KCB	DNZB	FRB	DNZB
11	KCB	*HBB*	ALTR	TEB	*CTB*	*BNKM*
12	*FRB*	FRB	OYK	*HSBC*	TKS	ANDL
13	ALTR	TKF	*BNKM*	OYK	TEB	ALTR
14	TGB	SKRB	TGB	ALTR	TİS	KCB
15	SKRB	*HSBC*	TRKS	*FRB*	TKF	SKRB
16	OYK	TGB	*ABN*	TİS	ALTR	TİS
17	*SCG*	*ABN*	*TRKL*	TKS	*HSBC*	*FRB*
18	TRKS	*ARTB*	TİS	KCB	*HBB*	TRKS
19	*ABN*	TRKL	*FRB*	TRKS	YKR	*ABN*
20	*HBB*	ALTR	SKRB	*ABN*	*ARTB*	TKS
21	*TRKL*	TKS	*ARTB*	*ARTB*	OYK	*TRKL*
22	*TKF*	TRKS	TKS	*TKF*	*SCG*	*ARTB*
23	TİS	KCB	*BDR*	*TRKL*	KCB	*BDR*
24	*ARTB*	TİS	*TKF*	*HBB*	TRKS	*TKF*
25	TKS	OYK	*HBB*	*WLB*	*ABN*	*WLB*
26	*WLB*	YKR	*WLB*	*SCG*	TRKL	*HBB*
27	YKR	*WLB*	YKR	*BDR*	*WLB*	*SCG*
28	*BDR*	*BDR*	*SCG*	YKR	*BDR*	*MLB*
29	*MLB*	*MLB*	*MLB*	*MLB*	*MLB*	YKR

Notes: Decreasing ranking, highest value is at the top and the lowest is at the bottom
Italic: Foreign banks, Other: Domestic Private banks
Source: Authors' calculation

TURKIJOS BANKŲ SEKTORIAUS VEIKLOS PELNINGUMO IR EFEKTYVUMO ANALIZĖ POKRIZINIU LAIKOTARPIU

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Santrauka

Autoriai nagrinėja Turkijos bankų veiklą, t. y. jų pelningumą bei efektyvumą pokriziniu laikotarpiu. Šis laikotarpis buvo pasirinktas todėl, kad atsirado daug įvairių struktūrinių pokyčių, kurie turėjo įtakos bankininkystės sektoriaus efektyvumui. Tyrimui buvo pasirinkti 32 Turkijoje veikiantys bankai (jų veiklos rodikliai prieš ekonominę krizę ir po jos). Rezultatai rodo, kad Turkijoje veikiančių užsienio komercinių bankų veikla yra mažiau efektyvesnė nei valstybinių. Taip pat autoriai analizuoja bankų veiklos efektyvumo ir pelningumo santykį, tačiau, kaip rodo gauti rezultatai, stipraus ryšio tarp jų nėra.

Reikšminiai žodžiai: efektyvumas, pelningumas, komerciniai bankai, nacionaliniai bankai, Turkija.

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