Comparative Analysis of Efficiency Measurement of Banks in the Turkish Banking System

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Abstract

The global developments at the beginning of 21st century raised different issues about the banking sector. International banks are being effective since 2001 in emerging markets while U.S. banking sector is dealing with the consequences of the crisis in 2008. Furthermore the flow of funds from developed countries to emerging markets had an increasing trend due to the globalization of the capital markets. Banks have a major role in Turkish financial system. The aim of this study is to measure and compare the efficiency of banks in Turkish banking industry. The first part of the study reports a descriptive summary about the general appearance of the Turkish banking system. The second part of the study discusses the theoretical aspects in measuring the efficiency of banks. In the third part of the study, a non-parametric method, data envelopment analysis is used to analyze the efficiency of foreign banks, private banks and participation banks. As a result the average efficiency score of foreign banks in 2008-2012 is slightly higher than the average efficiency of participation banks. Although there isn't a very large difference, foreign banks and participation banks are more efficient than private banks.

1 Introduction

In the last decade both emerging markets and developed countries were exposed to financial crisis. For instance in countries like Turkey and United States supporting financial liberalization with incompetent regulation and supervision provided the ground for crisis. Banking sector one of the key players of financial markets is going through a rapid change due to the global effects of crisis. In February 2001 a banking crisis broke out in Turkish economy due to structural problems like unsustainable amount of internal debt stock, high inflation rate, fragilities in Turkish banking sector and ambiguities in political environment. As a result 22 banks were transferred to Savings Deposit Insurance Fund (SDIF) with a restructuring cost of USD 53.6 billion (BRSA, 2010). After the crisis structural reforms were put into action to maintain economic and financial stability. The financial reforms covered; (i) solving the financial problems of banks under SDIF control, (ii) restructuring the state owned banks, (iii) strengthening the capital of private banks through mergers and share transfers and (iv) adopting legislative measures (BAT, 2009b). Following the crisis and the financial reforms, the total assets rose from USD 130 billion to nearly USD 800 billion during the period of 2002-2014 (BRSA, 2014c).

United States was exposed to financial crisis started in December 2007 due to massive growth, increased complexity and leverage in credit securities and credit derivatives (FSA, 2009). Risky mortgages worth trillions of dollars were circulated throughout the financial system while mortgage related derivatives were traded around the world. Dramatic failures in accountability, transparency, ethics, corporate governance, risk management, credit rating mechanisms combined with poor financial regulation and supervision caused excessive borrowing and risky investments resulting in a global financial crisis (FCIC, 2011). The immediate effect of the crisis was the collapse of a globally known two institutions; an investment bank Lehman Brothers and an insurance company American International Group (AIG). The impact of the crisis was felt by households and business in U.S and in all around the world. The cost of crisis is assumed to be an output loss of USD 6 trillion to USD 14 trillion which amounts to a loss of between USD 50,000 to USD 120.000 for every U.S. household (Lutterall et al., 2013).

The purpose of this study is to measure the efficiency trend of different bank groups in Turkish banking sector after the local and global crisis occurred in 2001 and 2008. The contribution of this paper for scholars and practitioners is that it provides an efficiency analysis of banks for post-crisis period. The research is an initial in analyzing and comparing the efficiency of participation banks with other bank groups. Data is gathered for the period of 2008-2012 and examined using the method of data envelopment analysis (DEA) model.

2 General Appearance of Turkish Banking Sector

In Turkey financial system is operating with small scales and at the growth stage when compared with developed countries (BAT, 2009b). Banking sector has a leading role in terms of asset size, number of employees, branches, transactions and customers (BRSA, 2013) The growing trend of banking sector is continuing in the recent years. Due to the developments in information and communication technologies the volume of financial transactions provided by internet banking and mobile banking has increased. The number of ATM and POS machines has expanded due to the

Table 2.1 presents the number of banks in Turkish banking sector according to the ownership structure of different bank groups. The three functional groups in Turkish banking sector are; deposit banks, development & investment banks and participation banks according to the Banking Law No. 5411. There are totally 49 banks by September 2013. The structural reforms after 2001 crisis required improvements in the capital adequacy levels in banking sector. Therefore banks strengthened capital through mergers and share transfers. 16 mergers and acquisitions occurred during the period of 2001 – 2011 (BRSA, 2010). As a result there are 17 foreign deposit banks. Foreign shares in private deposit banks are %20,5 whereas foreign shares in participation banks are %54. The total foreign contribution in terms of the weighted paid-in capital shares is approximately %30.

The organic growth of Turkish banking sector is continuing despite the local banking crisis in 2002 and global financial crisis in 2008. Thus the growth of selected indicators for the period of 2002 – 2102 is presented in Table 2. For instance in 2012 the assets have increased by 5.8 times reaching to an amount of TL 1.237 billion. Loans were the main item in speedy asset growth which has increased by 15 times, from TL 49 billion to TL 737 billion. The increase in loans is evidence that banks are performing intermediary activities. There is a significant growth in the amount of off-balance sheet items due to expanding rate of derivative transactions and revocable unused credit lines in recent years. Even though the loss from capital market transactions and growth of operational expenses had a negative effect, the income creation capacity of the sector has increased in 2012.

Bank Group	Number	Ownership Structure (%)		
		Trading in BIST	Other Resident	Other Non-Resident
Deposit Banks	32	19,8	42,7	37,4
State-Owned	3	19,9	80,1	0,0
Private	12	29,5	50,0	20,5
Foreign	17	0,1	1,9	98
SDIF	1	0	100	0
Development & Investment Banks	13	4	93,3	2,7
Participation Banks	4	19	27	54

Table 1: *Ownership Structure (In terms of paid-in capital, as of September 2013, perc.)* ***Source:*** *BAT, 2013b & TKBB, 2013*

TL Billion	2002	2004	2006	2008	2009	2010	2011	Jun 2012
Loans	49	99,3	219,0	367,4	392,6	525,9	682,9	737,2
Deposits	132	191,1	307,6	454,6	514,6	617,0	695,5	718,8
Total Assets	212,7	306,4	499,7	732,5	834	1.000,7	1.217,7	1.237,7
Off-Bal. Sheet	154,6	277,4	476,0	579,8	1.038,1	1.664,3	1.709,4	1.767,9
Total Int. Income	44,4	40,3	55,8	85,8	85,3	77,4	39,9	54,8
Total Int. Expense	31,6	22,7	34,6	54,8	43,5	38,7	21,8	30,2
Net Profit	2,9	6,5	11,4	13,4	20,2	22,1	10,4	11,6

Table 2: *Selected Indicators for Turkish Banking Sector 2002 - 2012* ***Source:*** *BRSA, 2012*

TL Million	State-Owned Banks	Private Banks	Foreign Banks	Participation Banks	Investment & Development Banks	SDIF Bank	Banking Sector Total
Number of Employees	54.466	94.747	42.746	16.800	5.244	260	214.810
Number of Branches	3.397	5.411	2.171	965	40	2	11.986
TotalAssets	483.378	842.002	239.948	96.086	70.137	869	1.732.420
Loans	277.040	518.913	143.819	62.042	45.614	1	1.047.428
Deposits	300.536	456.834	127.068	61.313	-	19,7	945.770
Own Funds	45.204	95.060	25.097	8.851	18.938	658	193.807
CAR	13,5	14,8	15,5	14,0	32,7	38,4	15,3
Net Period Profit	7.741	13.288	1.456	1.071	1.171	-	24.733
ROA	1,8	1,7	0,7	1,3	1,9	-	1,6
ROE	19,8	15,4	6,4	14,0	6,6	-	14,2

Table 3: *Selected Indicators for Different Bank Groups in Turkish Banking Sector for December 2013* ***Source:*** *BRSA, 2013*

As illustrated in Table 3, net period profit of banking sector has reached to TL 24 billion by the end of 2013. There are 49 banks operating with 11,986 branches and 214,810 employees in Turkish banking sector. Private

banks have a leading role in a number of items such as number of employees, number of branches, total assets, loans, deposits, own funds and net period profit. State-owned banks have the highest ROE with 19,8 while foreign banks have the highest capital adequacy ratio (CAR) which is 15,5.

Deposit banks have a significant dominance in Turkish banking sector while a decrease in the asset size and number of branches is observed during the period of 2002 – 2103. As presented in Table 4 the asset size of participation banks has increased by % 130 and the growth rate for number of branches is % 321 since 2002. The loan size and number of branches for development and investment banks have a declining trend whereas the mentioned banks have the highest return on asset ratio in the sector.

%	**2002**	**2004**	**2006**	**2008**	**2009**	**2010**	**2013**
Total Asset Size (%)							
Deposit Banks	94,4	94,2	93,9	93,4	92,7	92,6	90,5
Dev.&Inv. Banks	3,2	3,2	3,1	3,1	3,2	3,1	4
Participation Banks	2,4	2,6	3,1	3,5	4,0	4,3	5,5
Total	100	100	100	100	100	100	100
Loans (%)							
Deposit Banks	87,6	90,2	92,5	92	90,5	91,1	89,7
Dev.&Inv. Banks	8,3	5,1	3,3	3,2	3,5	3,0	4,4
Participation Banks	4,1	4,7	4,3	4,8	6,0	5,9	5,9
Total	100	100	100	100	100	100	100
Number of Branches (%)							
Deposit Banks	97,6	95,6	94,5	93,8	93,6	93,6	91,7
Dev.&Inv. Banks	0,6	0,5	0,6	0,5	0,5	0,4	0,3
Participation Banks	1,9	3,9	4,9	5,8	5,9	6,0	8,0
Total	100	100	100	100	100	100	100
ROA / ROE							
Deposit Banks	1,2 /10,7	2,1 / 15,0	2,2 / 20,3	1,7 / 16,4	2,4 / 19,7	2,2 / 17,8	1,53/ 14,92
Dev.&Inv. Banks	4,9 / 15,5	2,8 / 6,1	4,8 / 9,7	4,0 / 8,7	3,7 / 7,8	2,7 / 6,0	1,9 / 6,6
Participation Banks	0,4 / 4,4	1,4 / 10,7	2,8 / 25,1	2,5 / 17,4	2,1 / 16,0	1,8 / 13,9	1,3 / 14,0

Table 4: *Market Share and Profitability Analysis of Bank Groups in Turkish Banking Sector 2002 – 2013*
Source: *BRSA, 2010*

3 Efficiency Measurements in Banking Sector

A significant amount of research explored efficiency of banks in Turkey and in other countries. The most used technique for efficiency analysis in studies identifying banking efficiency is Data Envelopment Analysis (DEA), originally proposed by Farrell (1957). Since then a number of papers extended and applied DEA methodology. For instance Charnes, Cooper, Rhodes (1978) developed a model which had an input oriented constant returns to scale (CRS) and Banker, Charnes, Cooper (1984) proposed variable returns to scale (VRS) model (Coelli, 1996). In light of the developments about DEA methodology it has been widely used in studies about efficiency measurements in banking sector.

Behdioglu and Ozcan (2009) concluded that foreign banks were the most efficient groups in Turkey during 1999-2005 in their study using DEA application. A different result was assessed by Kok and Ay (2013) about the period of 2007-2009. They observed that state-owned banks were the most efficient group with DEA. Celik and Kaplan (2010) investigated efficiency and competition relationship while Seyrek and Ata (2010) predicted financial performance indicators using efficiency scores of banks in Turkey. Similarly Halkos and Salamouris (2004) proposes that DEA can be used as an alternative or complement to ratio analysis in their study measuring the performance of the Greek banking sector.

Staub et. al. examined cost, technical and allocative efficiencies for Brazilian banks using Data DEA for the period of 2000-2007. The results indicate that Brazilian banks have low levels of economic efficiency when compared with banks operating in Europe and U.S. Athanassopoulos and Giokas (2000) applied DEA approach in their case study, for measuring performance, productive and market efficiency of branches in the Commercial Bank of Greece.

A brief summary of the inputs and outputs proposed by past studies is presented in Table 5. Accordingly interest expenses, non-interest expenses, number of branches, number of employees, total deposits are the frequently used input parameters while interest income, total loans and net profit are the commonly used output parameters by scholars. The previous studies cover efficiency measurements in either pre-crisis or the crisis period of 2007-2008. The aim of this study is to fill the gap for post-crisis period in efficiency measurements of banking sector.

Year	Author(s)	Period of Analysis	Inputs	Outputs
2004	Halkos & Salamouris	1997 - 1999	Interest Expenses Total Assets Number of Employees Operating Expenses	Interest Income Net Profit
2009	Behidoglu & Ozcan	1999 - 2005	Number of Employees Non-Interest Expenses Interest Expenses Number of Branches	Total Deposits Total Loans Net Profit
2010	Seyrek & Ata	2003 - 2008	Total Deposits Interest Expenses Non-Interest Expenses	Total Loans Interest Income Non-Interest Income
2013	Kok & Ay	2007 - 2009	Number of Employees Number of Branches Interest Expenses Total Assets	Total Loans Total Deposits

Table 5*: Inputs and Outputs Proposed by Past Studies in Efficiency Measurements of Banks*

4 Methodology and Data

The aim of the study is to measure the comparative effectiveness of different bank groups operating in Turkey after the global financial crises occurred in 2008. In this respect data from three bank groups; private banks, foreign banks and participation banks is collected for the period of 2008-2012. Investment and development banks are not included in the analysis because they don't collect deposits. The research is an initial in analyzing and comparing the efficiency of participation banks with other bank groups. Because there are four participation banks operating with either medium or small scales, four banks with similar scales are chosen for private and foreign bank groups using. Banks with asset size shares more than 5% in the sector are classified as large scale, between 1% - 5% are medium scale and between 0,20% and 1% are small scale banks. Large scale banks are not included in the study.

Data issued annually in "Banks in Turkey" by BAT (2009a, 2010, 2011, 2012, 2013a) and statistical reports disclosed by Turkish Participation Banks Association (TKBB, 2013) in the website is used for the selection and information gathering process. For instance, in this part, comparative information about the selected indicators of the analyzed banks is presented. Changes in paid-in capital, number of branches and employees for the analyzed banks are reported in Table 6. Accordingly, increases are observed for paid-in capital, number of branches and employees of private and participation banks during 2008-2012. Paid-in capital is constant for foreign banks

	Banks	Paid-in Capital (TL Million)			Number of Branches			Number of Employees			Number of Employees Per Branch		
	Years	2008	2012	%	2008	2012	%	2008	2012	%	2008	2012	%
Private Banks	Şekerbank	400	1.000	150	250	272	8,8	4.089	3.565	12,8	16	13	(18,5)
	TEB	1.100	2.204	100	336	509	51,5	6.400	9.288	45,1	19	18	(5,2)
	Anadolubank	410	600	47,5	77	91	18,2	1.718	2.024	17,8	22	22	0
	Alternatifbank	300	420	40	46	63	37	1.006	1.230	22,2	21	19	(9,5)
Foreign Banks	ING Bank	1.324	2.786	110	366	319	(12,8)	6.357	5.319	(19,1)	17	16	(5,8)
	Citibank	34	34	0	56	37	(33,9)	2.315	2.123	(8,29)	41	57	39,0
	Denizbank	716	716	0	400	610	52,5	7.376	10.280	39,3	18	16	(11,1)
	HSBC Bank	652	652	0	335	338	0,089	6.853	6.170	9,9	20	18	(10)
Participation Banks	AlbarakaTürk	269,5	900	234	100	137	37	1.799	2.758	53,3	17	20	17,6
	Asya Finans	900	900	0	149	251	68,5	3.806	5.064	33,1	15	20	33,3
	Kuveyt Türk	500	1.100	120	113	221	95,6	2.246	3.939	75,3	19	17	(10.5)
	TürkiyeFinans	800	1.650	106	174	220	26,4	3.185	3.595	12,8	18	16	(11,1)

Table 6: *Changes in Paid-in Capital, Number of Branches and Employees for the Analyzed Banks* ***Source:*** *BAT; 2009a, 2012; TKBB, 2013*

Changes in selected balance sheet items for banks under analysis are disclosed in Table 7. In this respect, a significant growth in total assets, total loans and deposits of all bank groups is observed while participation banks have the highest rate. There are negative changes in net profit of period for some of the foreign and participation banks whereas the profitability trend is upwards for all private banks.

Banks		Total Assets (TL Million)			Total Loans, Receivables and Funds Allocated (TL Million)			Total Deposit and Funds Collected (TL Million)			Net Profit of Period (TL Million)		
Years		2008	2012	%	2008	2012	%	2008	2012	%	2008	2012	%
Private Banks	Şekerbank	8.041	14.518	80,5	4.800	9.974	107	6.508	10.887	67,2	144	240	66,6
	TEB	14.736	43.532	195	8.505	29.686	249	11.717	33.906	189	164	486	196
	Anadolubank	3.384	6.291	85,9	1.958	4.176	113	2.529	4.148	64	87	166	90,8
	Alternatifbank	3.745	7.969	112	2.371	5.201	119	3.187	5.203	63	53	68	28,3
Foreign Banks	ING Bank	16.503	25.115	52,1	11.044	18.842	70,6	12.898	20.366	57	140	252	80
	Citibank	5.451	7.420	36,1	2.513	2.678	65,6	4.274	6.158	44	81	89	9,8
	Denizbank	19.225	44.198	129	12.759	28.191	120,1	14.579	25.464	74	278	813	192
	HSBC Bank	14.696	25.299	72,1	9.724	15.422	58,5	11.554	19.903	72	250	181	(27,6)
Participation Banks	Albaraka Türk	4.789	12.327	157	3.616	10.270	184	3.985	10.562	165	136	191	40,4
	Asya Finans	8.108	21.390	163	8.153	15.803	93,8	6.299	15.667	148	246	190	(22,7)
	Kuveyt Türk	5.768	18.910	227	4.134	11.664	182	4.869	15.667	221	104	250	140
	Türkiye Finans	7.104	17.616	147	5.393	12.666	134	5.573	12.012	115	160	283	76,8

Table 7: *Changes in Selected Balance Sheet Items for Analyzed Banks* ***Source:*** *BAT; 2009a, 2012; TKBB, 2013*

Table 8 reports changes in selected income statement items for analyzed banks. For instance, in all bank groups the growth rate of interest / profit share income is greater than the growth of interest / profit share expenses. Profit share income and profit share expenses are the terminology used in income statement of participation banks. Even though, all banks have net profits in 2008 and 2012, some of them have a declining trend in profit growth. To illustrate, net operating profits for Alternatifbank, HSBC Bank and Asya Finans have decreased in 2012 when compared with 2008.

Banks		Interest / Profit Share Income (TL Million)			Interest / Profit Share Expenses (TL Million)			Net Operating Profit (TL Million)		
Years		2008	2012	%	2008	2012	%	2008	2012	%
Private Banks	Şekerbank	1.322	1.731	30,9	695	896	28,9	182	311	70,8
	TEB	1.966	3.938	100	1.262	2.094	65,9	197	641	225
	Anadolubank	473	759	60,4	258	349	35,2	109	211	93,5
	Alternatifbank	449	857	90,8	252	440	74,6	67	42	(37,3)
Foreign Banks	ING Bank	2.209	2.403	8,7	1.400	1.058	(24,4)	185	353	90,8
	Citibank	757	732	(3,3)	336	276	(17,8)	102	113	107
	Denizbank	2.363	4.095	73	1.528	3.071	100	328	993	202
	HSBC Bank	2.235	2.473	106	1.063	1.130	6,3	306	240	(21,5)
Participation Banks	Albaraka Türk	534	965	80,7	295	509	72,5	171	293	71,3
	Asya Finans	963	1.586	64,6	1.109	787	(29,0)	311	245	(21,2)
	Kuveyt Türk	523	1.296	147	298	584	95,9	263	309	17,4
	Türkiye Finans	710	1.350	90,1	423	617	45,8	202	293	45,0

Table 8: *Changes in Selected Income Statement Items for Analyzed Banks* ***Source:*** *BAT; 2009a, 2012; TKBB, 2013*

To measure and compare the efficiency of banks in different bank groups, a non-parametric method, Data Envelopment Analysis is used. Data Envelopment Analysis Program developed by Coelli (1996) is applied under the assumption of constant returns to scale (CRS). Data Envelopment Analysis is a non-parametric method.

Input-oriented technical efficiency measurement is used. Due to the intermediary function of deposit and participation banks, funds borrowed, interest/profit share expenses, deposits are used as inputs while interest/profit share income, loans, net operating profit are used as outputs.

5 Results

The results of the input oriented CRS model for analyzed banks are presented in Table 9. Accordingly, foreign banks have the highest average efficiency score of 0,9918 for the period of 2008 – 2012. HSBC, with an efficiency score 1, is the most efficient Bank in the group. Foreign banks are closely followed by participation banks which have an average efficiency score of 0,9878. Türkiye Finans is the most efficient bank in the group with a score of 1. Private deposit banks have the lowest average efficiency score which is 0,9504.

	Years	2008	2009	2010	2011	2012	Average
Private Deposit Banks	Şekerbank	1	1	0,8791	1	0,9052	**0,9568**
	Türk Ekonomi Bankası	0,8711	0,8698	0,8121	0,9450	0,8598	**0,8716**
	Anadolubank	1	1	1	1	1	**1**
	Alternatifbank	0,8919	0,9766	1	1	1	**0,9737**
	Average	0,9403	0,9616	0,9228	0,9862	0,9412	**0,9504**
Foreign Banks	ING Bank	0,9530	1	1	1	1	**0,9906**
	Citibank	1	0,9714	1	1	1	**0,9942**
	Denizbank	1	1	1	0,9156	1	**0,9831**
	HSBC Bank	1	1	1	1	0,9958	**0,9991**
	Average	0,9882	0,9928	1	0,9789	0,9989	**0,9918**
Participation Banks	Albaraka Türk	1	1	0,9189	1	1	**0,9837**
	Asya Finans Kurumu	1	1	0,9127	1	1	**0,9825**
	Kuveyt Türk	1	1	1	0,9260	1	**0,9852**
	Türkiye Finans	1	1	1	1	1	**1**
	Average	1	1	0,9579	0,9815	1	**0,9878**

Table 9: *Efficiency Scores of the Analyzed Banks*

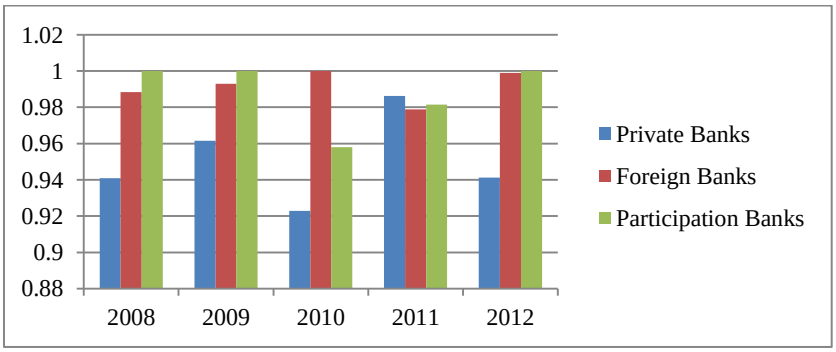

Figure 1: *Comparative Analysis for Efficiency Scores of Bank Groups in 2008-2012*

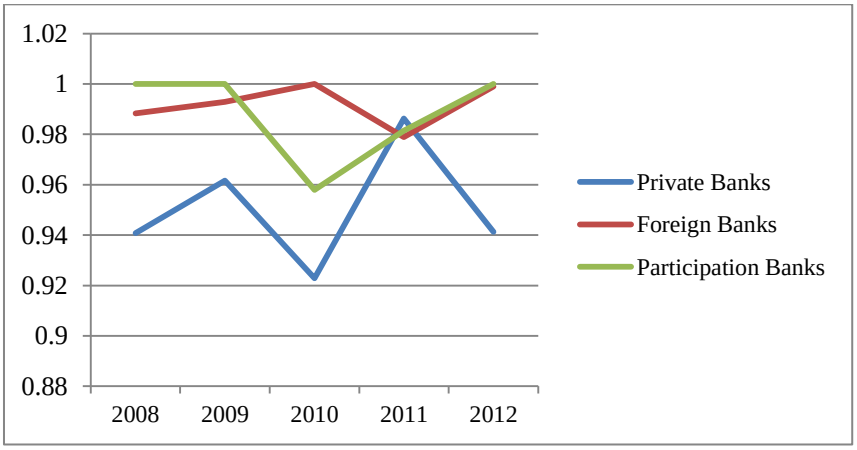

Figure 2: *Trend Analysis for Efficiency Scores of Bank Groups in 2008-2012*

Comparative analysis for efficiency scores of bank groups are presented in Figure 1. In 2008 and 2009 participation banks were fully efficient and they were followed by foreign banks. In 2010, foreign banks were the most efficient while private banks had the lowest average efficiency scores among the other groups. 2011 was the only year when the private banks were the most efficient. In 2012 the efficiency scores of participation and foreign banks were very close where participation banks were slightly ahead. Private banks' success in 2011 didn't continue in 2012. Yet, they had the lowest efficiency scores.

Figure 2 illustrates the trend analysis for efficiency scores of bank groups during the period of 2008 and 2012. In 2008, 2009 and 2012 participation banks have the highest efficiency score of 1. In 2010 foreign banks and in 2011 private banks have the highest efficiency scores. The overall performance of foreign banks is the highest while participation banks have an increasing trend in efficiency scores since 2010. In 2011 and 2012 participation banks are little far efficient than foreign banks. Private banks had unsteady efficiency scores in five years. Even though they recovered from 2010 and performed an efficient year in 2011, the improvement didn't continue in 2012. Foreign banks and participation banks had an upward trend of efficiency scores whereas private banks had a downward trend of efficiency scores in 2012. However the difference is not very large. In fact the average efficiency scores of the three bank groups for the period of 2008-2012 are close to each other.

6 Conclusion

The growing trend of Turkish banking sector is continuing in the recent years despite the local banking crisis in 2001 and global financial crisis in 2008. Total assets rose from USD 130 billion to nearly USD 800 billion during the period of 2001-2013. Foreign banks and participation banks had increased their effectiveness since 2001 in the banking system. This paper examined the comparative efficiency of private banks, foreign banks and participation banks during the post-global crisis period of 2008-2012. Because there are four banks with medium and small scales operating in participation banks group, four banks with similar scales are chosen from foreign and private banks groups. Data Envelopment Analysis, a non-parametric method frequently applied by scholars measuring bank performance, is used for efficiency evaluation. The inputs of the efficiency model are funds borrowed, interest/profit expenses, deposits and the outputs are interest/profit share income, loans, net operating profit. The results show that average efficiency score of foreign banks is the highest for the mentioned 5 year period. Participation banks' average efficiency score is very close to performance of foreign banks. Further, in 2008, 2009 and 2012 participation banks were fully efficient. The findings of the study are consistent with the evaluation of BRSA in the report about Structural Developments in Banking (2010): *"…Numeric data show that the participation banks are presenting a performance above the sector for all capacity indicators and that they are in a fast development process.*" This study is an initial in comparing the performance of participation banks with other bank groups. In addition, the efficiency performance of private banks is lower than the efficiency performance of foreign banks and participation banks.

References

- Athanassopoulos, A. D., Giokas D., 2000. "The Use of Data Envelopment Analysis in Banking Institutions: Evidence from the "Commercial Bank of Greece" Interfaces, Vol. 30, No. 2, pp. 81-95
- BAT - The Banks Association of Turkey, 2009a. "Banks in Turkey 2008". http://www.tbb.org.tr/en/Content /Upload/Dokuman/44/Turkish_Banking_System_2008.pdf
- BAT - The Banks Association of Turkey, 2009b. "The Financial System and Banking Sector in Turkey" http://www.tbb.org.tr/en/Content/Upload/Dokuman/38/The_Financial_System_and_Banking_Sector_in _Turkey.pdf
- BAT - The Banks Association of Turkey, 2010. "Banks in Turkey 2009" http://www.tbb.org.tr/en/Content/ Upload/Dokuman/43/2Bankalarimiz2009ING.pdf.
- BAT - The Banks Association of Turkey, 2011. "Banks in Turkey 2010" http://www.tbb.org.tr/en/Content/ Upload/Dokuman/42/Bankalarimiz2010ingesas.pdf
- BAT - The Banks Association of Turkey, 2012. "Banks in Turkey 2011" http://www.tbb.org.tr/en/Content/ Upload/Dokuman/41/Banks2011.pdf
- BAT - The Banks Association of Turkey, 2013a. "Banks in Turkey 2012" http://www.tbb.org.tr/en/Content/ Upload/Dokuman/126/Bankalarimiz_kompING-basim.pdf
- BAT - The Banks Association of Turkey, 2013b. "The Banking Sector in Turkey 2009 – 2013" http://www.tbb.org.tr/en/Content/Upload/Dokuman/127/The_Banking_Sector_in_Turkey_2009-2013_ December.pdf
- Banker, R. D., Charnes, A., Cooper, W. W, 1984. "Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis", Management science, 30(9), pp. 1078-1092

- Behdioglu, S., Ozcan, G., 2009. "Data Envelopment Analysis and an Application in Banking Sector", Süleyman Demirel University, Journal of Faculty of Economics and Administrative Sciences, Vol.14, No.3, pp.301-326
- Ben S. Bernanke, 2009. "Financial Regulation and Supervision after the Crisis: The Role of the Federal Reserve" At the Federal Reserve Bank of Boston 54th Economic Conference, Chatham, Massachusetts, http://www.federalreserve.gov/newsevents/speech/bernanke20091023a.htm
- BRSA - Banking Regulation and Supervision Agency, 2010. "Structural Developments in Banking", http://www.bddk.org.tr/WebSitesi/english/Reports/Structural_Developments/10132byg5_eng_final_230911.pdf
- BRSA - Banking Regulation and Supervision Agency, 2012. "Financial Markets Report" http://www.bddk.org.tr/WebSitesi/english/Reports/Financial_Markets_Report/11588financial_markets_report_june_2012.pdf
- BRSA - Banking Regulation and Supervision Agency, 2013. "Turkish Financial System: The Review of 2012 and Trends" https://www.bddk.org.tr/WebSitesi/english/Reports/Financial_Markets_Report/11899fmr_dec2012 _eng_0504131700.pdf
- BRSA - Banking Regulation and Supervision Agency, 2014a. "Türk Bankacılık Sektörü Genel Görünümü" http://www.bddk.org.tr/WebSitesi/turkce/Raporlar/TBSGG/12779tbs_genel_gorunumu_aralik_2013.pdf
- BRSA - Banking Regulation and Supervision Agency, 2014b. http://www.bddk.org.tr/WebSitesi/turkce/Kuruluslar/Bankalar/Bankalar.aspx
- BRSA - Banking Regulation and Supervision Agency, 2014c. http://ebulten.bddk.org.tr/ABMVC/en#.
- Charnes, A., Cooper, W. W., Rhodes, E., 1978. "Measuring the Efficiency of Decision Making Units", European Journal of Operational Research, 2(6), pp. 429-444.
- Celik, T., Kaplan, M., 2010. "Efficiency and Competition in Turkish Banking Sector: 2007-2009", Sosyoekonomi, Vol.6, Issue 2, pp 7-28
- Coelli, T. A. 1996. "Guide to DEAP, Version 2.1: A Data Envelopment Analysis (Computer) Program", Center for Efficiency and Productivity Analysis. University of New England. Working paper, 96(08) pp1-50
- Farrell, M. J., 1957. "The Measurement of Productive Efficiency", Journal of Royal Statistical Society, 120(3), pp. 253-290
- FSA - Financial Services Authority, 2009. "The Turner Review A Regulatory Response" http://www.fsa.gov.uk/pubs/other/turner_review.pdf
- FCIC - The Financial Crisis Inquiry Commission, 2011. "The Financial Crisis Inquiry Report" http://www.gpo.gov/fdsys/pkg/GPO-FCIC/pdf/GPO-FCIC.pdf
- Halkos, G. E., & Salamouris, D. S. 2004. "Efficiency measurement of the Greek commercial banks with the use of financial ratios: a data envelopment analysis approach." Management Accounting Research, 15(2), 201-224
- Kok, D., Ay, O. E, 2013. "A Research on the Reflection of 2008 Global Financial Crisis on the Efficiency Level of Turkish Banking Sector in the Period of 2007-2009", International Journal of Economic and Administrative Sciences, Vol.5 No.10, pp.155-170
- Lutterell, D., Atkinson, T., Rosenblum, H., 2013. "Assessing the Costs and Consequences of 2007-2009 Financial Crisis and Its Aftermath" DallasFed Economic Letter Vol. 8, No. 7 http://www.dallasfed.org/assets/documents/research/eclett/2013/el1307.pdf
- Seyrek İ.H., Ata H.A, 2010. "Efficiency Measurement in Deposit Banks Using Data Envelopment Analysis and Data Mining", BRSA, Journal of Banking and Financial Markets, Vol. 4, Issue 2, pp. 67-84.
- TKBB – Turkish Participation Banks Association, 2012. "Participation Banks in The Financial System of Turkey" http://tkbb.org.tr/general-presentation.aspx?pageID=178
- TKBB - Turkish Participation Banks Association, 2013. Statistical Reports, http://tkbb.org.tr/auditing-reports-of-member-banks.aspx?pageID=192