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THE IMPACT OF CORPORATE GOVERNANCE PRACTICES ON BANK EFFICIENCY: A CASE OF TURKEY

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ABSTRACT

This study investigates the relationship between corporate governance and the efficiency of Turkish banks. We use a sample of 10Turkish depository banks listed in Borsa Istanbul covering the ten year period 2005-2015.Data Envelopment Analysis (DEA) has been used in examining the efficiency levels of the sampled Turkish banks and panel regression analysis was used for finding out whether there is an effect of corporate governance on bank efficiency. The results have shown that free float rate and board independence have a negative and significant impact on the efficiency of the banks. As for the other variables; it is seen that major shareholder, number of committees and board size have positive and significant relationship with the bank efficiency. Finally the results have shown that there is no statistically significant relationship between institutional ownership and bank efficiency.

Keywords: *Bank Efficiency, Corporate Governance, Data Envelopment Analysis, Panel Data, Turkey.*

KURUMSAL YÖNETİM UYGULAMALARININ BANKA ETKİNLİĞİ ÜZERİNDEKİ ETKİSİ: TÜRKİYE ÖRNEĞİ

ÖZET

Bu çalışmada Türkiye'de faaliyet gösteren halka açık mevduat bankalarındaki kurumsal yönetim uygulamaları ile etkinlik arasındaki ilişki incelenmiştir. 2005-2015 dönem aralığında Borsa Istanbul 'da işlem gören on

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mevduat bankası değerlendirmeye alınmıştır. Ele alınan bankaların etkinlik skorlarını belirlemede Veri Zarflama Analizi (VZA) yönteminden yararlanılmış, etkinlik ile kurumsal yönetim arasındaki ilişkinin belirlenmesinde ise panel veri analizi yöntemi kullanılmıştır. Analiz sonucu elde edilen bulgular; halka açıklık oranı ve bağımsız yönetim kurulu üye sayısının bankaların etkinliği üzerinde negatif ve anlamlı bir etkiye sahip olduğunu gösterirken; en büyük hissedarın sermaye payı, komite sayısı ve yönetim kurulu büyüklüğü değişkenlerinin etkinlik üzerinde pozitif ve anlamlı bir etkiye sahip olduğunu göstermiştir. Son olarak ise; kurumsal yönetim değişkenlerinden kurumsal sermaye sahipliğinin banka etkinliği üzerinde herhangi bir etkiye sahip olmadığı sonucu elde edilmiştir.

***Anahtar Kelimeler**: Banka Etkinliği, Kurumsal Yönetim, Veri Zarflama Analizi, Panel Veri, Türkiye.*

1. INTRODUCTION

Several problems may be occurred if the banks cannot fulfil their duties as to applying corporate governance practices efficiently. Poor corporate governance practices may be resulted in a decrease in the ability of managing liabilities and assets and this situation gives rise to a bank run or a liquidity crisis. Because banks have a key role as an intermediary in the economy as a whole, any problem that may be taken place in the banking sector may cause several disadvantages across the country. So; banks should fulfil the required responsibilities as to applying the corporate governance practices efficiently. At this point it is possible to say that efficient corporate governance practises provide several advantages in setting corporate objectives, operating the bank's business on a day-to-day basis, meeting the obligation of accountability, providing confidence in banks' operations and protecting the interests of depositors[4].

The proper functioning of the banking sector and the economy as a whole is of great importance. At this point; corporate governance practices provide several opportunities in the operation of the economy. Corporate governance practices pave the way for setting the bank's strategy or objectives, protecting the interests of stakeholders, establishing the control functions and operating the bank's business on a day-to-day basis[5].

There is no single model of corporate governance for all the sectors. The corporate governance practices at banks become different from the non-

[4]Basel Committee on Banking Supervision. (2006). Enhancing Corporate Governance for Banking Organisations", Viewed on August 05, 2016 www.bis.org/publ/bcbs122.pdf.

[5] Bank for International Settlements Basel Committee on Banking Supervision (2015), Guidelines: Corporate Governance Principles for Banks, 2015, pp. 1-43.

financial firms because of various reasons. Because there are some differences as to corporate governance principles between financial institutions and unregulated-nonfinancial firms, considering uniformly designed proposals that do not take into account industry differences may be resulted in unexpected negative consequences. As it is understood from the statements; corporate governance is of great importance for both financial and non-financial firms. Especially; corporate governance in the banking sector and its impact on this sector have become like a challenging issue.

The rest of the paper proceeds as follows: Section 2 presents the relevant literature showing the studies made in the banking sector in both Turkey and foreign countries. In Section 3; the research methodologies (Data Envelopment Analysis and Panel Data Analysis), the variables and the sample are explained. Section 4 shows the empirical results of the analysis and the main findings are explicated.

2. LITERATURE REVIEW

Early studies dealing with the relationship between the corporate governance practices and the efficiency or performance levels date back to 1900s [6]. It is possible to encounter several studies examining such a relationship in the literature over the past decade. When considered the applications of Data Envelopment Analysis (DEA) in the banking sector, it is seen that there are several studies made in both Turkey and foreign countries. The studies examining the effects of corporate governance practices on financial performance or efficiency in banking sector are as shown chronologically in Table 1:

[6]R. H. Fosberg and M. R. Nelson, Leadership Structure and Firm Performance, International Review of Financial Analysis, Vol. 8, No. 1, 1999; D. Yermack, Higher Market Valuation of Companies with a Small Board of Directors, Journal of Financial Economics, Vol. 40, No. 2, 1996; T. Eisenberg, S. Sundgren, and M. T. Wells, Larger Board Size and Decreasing Firm Value in Small Firms; Journal of Financial Economics, Vol. 48, No. 1, 1998; S. W. Barnhart, and S. Roseinstein, Board Composition, Managerial Ownership, and Firm Performance: An Empirical Analysis, The Financial Review, Vol. 33, No. 4, 1998; B. D. Baysinger and H. N. Butler, Corporate Governance and the Board of Directors Performance Effects of Changes in Board Composition, Journal of Law, Economics and Organization, Vol. 1, No.1, 1985; X. Xu and Y. Wang, Ownership Structure and Corporate Governance in Chinese Stock Companies, China Economics Review, Vol. 10, No. 1, 1999.

Table 1: LiteratureReview

Authors	**Country and Period**	**Method**	**Bank Financial Performance Indicator**		**Corporate Governance Factors**	**Key Findings**
Salim et al. (2016)	Australia (1999-2013)	Data Envelopment Analysis andTruncated Regression Analysis	Inputs -Interest expenses –Non-interest expenses	Outputs -Interest income – Non-interest income	-Board size, -Board independence, -Number of board meetings, -Number of committee meetings, --Ownership concentration	Positive relationship with board size and number of committee meetings.
Al-Sahafi et al. (2015)	Saudi Arabia (2009-2012) (11 Banks)	Panel Regression Analysis	-Return on assets, -Return on equity, -Tobin Q		-Board size, -Board Independence -CEO Status, -Audit committee, -Ownership concentration	Positive relationship with board size and board independence. Negative relationship with ownership concentration.
Haider et al. (2015)	Pakistan (2008-2012)	Correlation and Linear Regression Analysis	-Return on assets, -Return on equity, -Earnings per share		-Board size,-Number of meetings, -Audit committee size	Positive relationship with all corporate governance variables.
Arouri et al. (2014)	GCC Countries (2010) (58 Banks)	Multivariate Regression Analysis	Tobin's Q		-Family ownership, -Institutional ownership, -Foreign ownership, -Government ownership, -Board size, -CEO duality,	Positive relationship with family, institutional and foreign ownership.
Al-Amarneh (2014)	Jordan (2000-2012) (13 Banks)	Panel Regression Analysis	- Return on assets, -Operating efficiency ratio		-Ownership concentration - Institutional ownership, - Foreign ownership, - Board size, -CEO duality,	Positive relationship with board size and ownership concentration. Not significant with institutional and foreign ownership.
Bokpin (2013)	Ghana (1999-2007) (25 Banks)	Panel Regression Analysis	-Loan/loss provision, - Return on assets,		-Ownership structure, -Board size,-Board independence, -Inside ownership	Positive relationship with board size and foreign ownership. Not significant with board independence
	Nepal (2005-2011) (29 Banks)	Panel Regression Analysis	-Non-performing loan/Total loan		- Board size, - Board Independence,	Positive relationship with board size, audit committee size and board independence.

Poudel & Hovey (2013)				-Number of board meetings, -Audit committee size, - Number of audit committee meetings, - Institutional ownership, - Foreign ownership	Negative relationship with institutional ownership.
Akpan & Riman (2012)	Nigeria (2005-2008) (11 Banks)	Correlation and Regression Analysis	- Return on assets, - Return on equity, -Non-performing loans	- Board size, -Number of shareholders	Positive relationship with all corporate governance variables.
Tomar & Bino (2012)	Jordan (1997-2006) (14 Banks)	Panel Regression Analysis	- Return on assets, - Return on equity	-Ownership structure, -Composition of board of directors, -Managerial ownership, -Outstanding shares owned by members of board of directors, -The number of directors appointed by the shareholders on the board.	Positive relationship with compositions of board of directors and institutional ownership.
Tanna et al. (2011)	England (2001-2006) (17 Banks)	Panel Regression Analysis	Inputs: -Fixed assets, - Deposits and short-term funding - Personnel expenses Outputs: -Net loans, -Other earning assets	- Board size, - Board Independence	Positive relationship with all corporate governance variables.
Aygun et al. (2010)	Turkey (2006-2008) (12 Banks)	Correlation and Regression Analysis	-Return on assets (ROS), -Tobin's Q (TQ)	-Board size , -Free float rate (FFR)	Negative relationship between BS and ROS Positive relationship between TQ and ROS. Positive relationship with FFR.
Praptiningsih (2009)	Asian Emerging Market	Panel Regression Analysis	-Return on assets	-Ownership concentration,	Not significant with board size, board independence,

	(2003-2007) (52 Banks)			-Government ownership, -Foreign ownership, -CEO duality, - Board size, - Board Independence, -Rating of banks by reputable rating agencies (Big 3) -Auditing by reputable external auditor (Big 4)	ownership concentration and Big3. Negative relationship with foreign ownership and CEO duality. Positive relationship with Big4.
Staikouras et al. (2007)	(2002-2004) (58 European Banks)	Panel Regression Analysis	-Return on assets, -Tobin's Q	- Board size, - Board Independence	Negative relationship with board size. Positive relationship with board independence.

3. DATA AND METHODOLOGY

Banking sector have a significant role in national economies likewise the several developing countries. So; enhancing the bank efficiency and determining the factors affecting efficiency levels is of great importance in terms of well-functioning of national economies. Especially corporate governance practices are of extremely important in terms of achieving high efficiency levels for banks because of their different characteristics and complex operations. At this point; we aim to contribute to the corporate governance literature by investigating the relationship bank efficiency and corporate governance practices in Turkey with a dataset including 2005-2015 period.Because there are limited studies examining the so-called relationship in banking sector in Turkey, this paper aims to bridges this gap in the literature.

3.1. DATA ENVELOPMENT ANALYSIS

Data Envelopment Analysis (DEA) provides a mathematical programming method of estimating the best practice production frontiers and evaluating the relative performance efficiency of different organizational units called as Decision-Making Units (DMUs)[7]. DEA has been applied to several DMUs such as banks, mutual funds, police stations, hospitals, tax offices, insurance companies, schools, libraries and university departments. The performance of a unit is evaluated by comparing its performance with the best performing units of the sample. Best performing unit forms the efficiency

[7]Peter Bogetoft - Lars Otto, Benchmarking with DEA, SFA and R, USA, Springer Publishing, 2011. p. 81.

frontier. If the unit is not on the efficiency frontier, it is considered to be inefficient[8].

The aim of this method is to determine how efficiently DMUs use their inputs in generating a set of outputs. The performance of DMUs is assessed by considering the ratio of total outputs to total inputs. The efficiency of commercial organizations may be evaluated easily by their yearly profits, their stock market indices or their other earning assets. It has been effectively adopted for evaluating the relative performance of a set of firms using a set of identical inputs for producing a set of identical outputs. It was originally developed for performance measurement and its principles date back to Farrel (1957). Thereafter; several studies as to this topic have been made by some authors such as Charnes et al. (1978), Norman and Stoker (1991) and Cooper et al.[9]. The essential feature of DEA model originally formulated by Charnes et al. (1978), called as CCR is the reduction of the multi-output, multi input situation for each DMU. There is a ranking of the different DMUs in the system in a scale of relative efficiency from the lowest to the highest, where the latter is 100% efficient[10].

The criteria of selection of inputs and outputs are quite subjective, because there is no specific rule in determining the procedure for the selection of inputs and outputs. Determining the inputs and outputs accurately is of great importance in measuring the relative efficiency of banks by DEA. For a meaningful study; it is important to restrict the total number of inputs and outputs to reasonable levels. The sample size should be at least 2 or 3 times larger than the sum of the number of inputs and outputs[11]. So in this study; we have determined the inputs and outputs by considering this principle. At this point, the input and output variables used in the previous studies made as to determining the banks' efficiencies by using DEA are considered in determining the inputs and outputs to be used in this study:

[8] Jibendu Kumar Mantri, Research Methodology on Data Envelopment Analysis (DEA), USA, Universal Publishers, 2008, p. 15.
[9] Ram Ramanathan, An Introduction to Data Envelopment Analysis: A Tool for Performance Measurement, New Delhi, Sage Publications, 2003, p. 26.
[10] K. Jati Sengupta, Dynamics of Data Envelopment Analysis: Theory of Systems Efficiency, Netherlands,Kluwer Academic Publications, 1995, p. 1.
[11] Ramanathan, 2003, p. 174.

Table 2: Input & Output Variables Used in Literature

Author (Year)	**Country**	**Inputs**	**Outputs**
Nigmonov (2010)	Uzbekistan (2004-2006) (23 Banks)	-Operational expenses, -Fixed assets, -Total deposits	-Total credits (Reserve for possible loan losses), -Total non-interest income, -Other non-interest income (excluding commission income)
Angelidis ve Lyroudi (2006)	Italy (2001-2002) (100 Banks)	-Personnel expenses, -Other operating expenses, -Total fixed assets	-Total other earning assets -Total customer loans -Total deposits
Liao (2009)	Taiwan (2002-2004) (48 Banks)	- Operation expense - Interest expense	-Loan and discount, -Interest income, -Investment
Drake (2001)	England (1984-1995) (9 Banks)	-Fixed Assets - No of Employees - Deposits	-Loans - Liquid Assets+Investments - Other Income
Chen et al. (2005)	China (1993-2000) (43 Banks)	- Interest expenses - Non-interest expenses - Price of deposits - Price of capital	- Loans - Deposits - Non-interest income
Isık ve Hassan (2003)	Turkey (1981-1990)	- Labor: The number of full-time employees on the payroll -Capital: The book value of premises and fixed assets, - Loanable funds: The sum of deposit and non-deposit funds	-Short-term loans -Long-term loans -Risk-adjusted off-balance sheet items -Other earning assets
Tahir et al.	Africa, The Far East, Central Asia, Europe and Middle East (2003-2008)	-Total deposits, -Overhead expenses	-Total loans, -Other earnings assets
Kucukaksoy and Onal	Turkey (2004-2011) (15 Banks)	-Total deposits, -Interest expenses, -Personnel expenses	-Total loans, -Interest income

When considered the relevant literature; we employed three inputs and two outputs in this study. The inputs are total deposits *(1)*, interest expenses *(2)* and personnel expenses *(3)*. As for outputs; total loans *(1)* and interest income *(2)* were used as outputs.

This study is composed of two stages. Firstly; the efficiency scores of the banks considered in this study have been assessed by DEA, and then the effect of corporate governance practices on the banks' efficiencies is tried to be determined by panel data analysis. The data belongs to 10 Turkish depository banks listed in Borsa Istanbul (BIST) were used for the period of 2005-2015 years and the balance sheets, income tables and annual reports of the listed depository banks have been considered in measuring the inputs and outputs. In determining the efficiency scores of DMUs, Excel's Solver add-in has been used. The DMUs considered in this study are presented in Table 3:

Table 3: Decision Making Units (DMUs) and Their Codes

Turkish Depository Banks listed in Borsa Istanbul		**Code**
1	Akbank A.Ş.	D1
2	Denizbank A.Ş.	D2
3	Garanti Bankası A.Ş.	D3
4	Türkiye Halk Bankası A.Ş.	D4
5	ICBC Turkey Bank A.Ş.	D5
6	Türkiye İş Bankası A.Ş.	D6
7	Şekerbank T.A.Ş.	D7
8	Türkiye Ekonomi Bankası A.Ş.	D8
9	Türkiye Vakıflar Bankası A.Ş.	D9
10	Yapı ve Kredi Bankası A.Ş.	D10

3.2.PANEL DATA ANALYSIS

Panel data involve two dimensions: a cross-sectional dimension N, and a time-series dimension T. It is expected that the computation of panel data estimators would be more complicated than the analysis of cross-section data alone (where T=1) or time series data alone (where N=1). However, in certain cases the availability of panel data can actually simplify the computation and inference[12].

There are several benefits of panel data. The first of these benefits is the fact that the use of panel date enables researchers to control for individual heterogeneity. Panel data suggest that individuals, firms, states or countries are heterogeneous. Time-series and cross-section data that do not control for such heterogeneity run the risk of obtaining biased results. Secondly; panels give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency. Thirdly; cross-sectional distributions that look relatively stable can hide a multitude of changes. As well as the spells of unemployment, job turnover or residential

[12] Cheng Hsiao, Analysis of Panel Data, 2nd edition, United Kingdom, Cambridge University Press, 2003, p. 7.

and income mobility; the duration of economic states may be well studied with panels. Fourthly; it is more suitable to identify and measure the effects that may not be detected in pure cross-section and time-series data with panels[13].

Determination of Regression Variables:

The dependent variable, independent variables and control variables that are determined according to the literature review are shownin Table 4:

Table 4:Measurement of the Variables

Variable Definition	**Name**	**Definition**
Dependent Variable		
DEA Efficiency Score	EFC	Efficiency Score
Independent Variables		
Board Size	BSZ	Number of Members on the Board
Board Independence	BI	Number of Independent Directors on the Board
Institutional Ownership	INO	Proportion of Institutional Ownership
Major Shareholder	MS	Proportion of Block Ownership
Number of Committees	NOC	Number of Committees Held During the Financial Year
Free Float Rate	FFR	Proportion of Outstanding Shares Available to the Public for Trade
Control Variables		
Firm Size	FS	Log of Total Assets
Leverage	LEV	Total Assets over Total Equity
Capital Adequacy Ratio	CAR	Percentage of Banks' Risk Weighted Credit Exposures

Three control variables determined as firm size, leverage and capital adequacy ratio are used in panel regression model in order to reduce the endogeneity problem.

Hypotheses Development:

The hypotheses as to the relationship between the banks' efficiency and corporate governance are as follows:

- Bank efficiency is positively related to board independence,
- Bank efficiency is positively related to board size,

[13]H. BadiBaltagi,Econometric Analysis of Panel Data, 5th edition, United Kingdom, John Wiley & Sons Ltd, pp. 6-8.

- Bank efficiency is negatively related to higher proportion of institutional ownership,
- Bank efficiency is positively related to higher proportion of major shareholder,
- Bank efficiency is positively related to higher number of committees,
- Bank efficiency is positively related to higher free float rate.

4. FINDINGS

In determining the effect of corporate governance on bank efficiency; a two-step procedure has been employed. Firstly; Data Envelopment Method (DEA) has been used in measuring the efficiency of Turkish listed deposit banks during 2005-2015. Secondly; a multiple regression model has been derived and analysed by the panel data analysis. In measuring the efficiency level of the banks; DEA-Solver-LV (Data Envelopment Analysis Solver), a special software and E-views 9.0 version has been used in analysing the panel data.

4.1. DEA RESULTS

The efficiency scores of the listed banks are shown at Table 5:

Table 5: Efficiency Scores Of Decision Making Units By The End Of Each Year

2005		**2006**		**2007**		**2008**		**2009**		**2010**	
DMU	Score	DMU	Score	DMU	Score	DMU	Score	DMU	Score	DMU	Score
D1	1	**D1**	1	**D1**	1	**D1**	1	**D1**	1	**D1**	1
D2	1	**D2**	1	**D2**	1	**D2**	1	**D2**	1	**D2**	1
D4	1	**D3**	1	**D3**	1	**D3**	1	**D3**	1	**D4**	1
D7	1	**D5**	1	**D5**	1	**D4**	1	**D4**	1	**D9**	1
D3	0.9649	**D7**	1	**D7**	1	**D5**	1	**D9**	1	**D10**	1
D6	0.9367	**D9**	1	**D8**	0.9291	**D7**	1	**D10**	0.9788	**D5**	0.9946
D9	0.9183	**D4**	0.9488	**D10**	0.9093	**D9**	1	**D5**	0.8925	**D3**	0.9931
D5	0.9089	**D8**	0.9371	**D9**	0.896	**D10**	0.9818	**D7**	0.8757	**D7**	0.8987
D10	0.9044	**D10**	0.9087	**D6**	0.8834	**D6**	0.9183	**D6**	0.8404	**D8**	0.8381
D8	0.8727	**D6**	0.899	**D4**	0.672	**D8**	0.8851	**D8**	0.7908	**D6**	0.8299

2011		**2012**		**2013**		**2014**		**2015**	
DMU	Score	DMU	Score	DMU	Score	DMU	Score	DMU	Score
D1	1	**D1**	1	**D1**	1	**D1**	1	**D1**	1
D2	1	**D2**	1	**D2**	1	**D3**	1	**D3**	1
D3	1	**D4**	1	**D3**	1	**D5**	1	**D5**	1
D4	1	**D10**	1	**D4**	1	**D10**	1	**D7**	1
D7	1	**D9**	0.9943	**D5**	1	**D9**	0.9861	**D8**	1

D8	1	**D7**	0.9627	**D6**	1	**D2**	0.9852	**D9**	1
D9	1	**D8**	0.9426	**D9**	1	**D8**	0.9751	**D10**	1
D10	1	**D6**	0.9331	**D10**	1	**D6**	0.9527	**D2**	0.9786
D5	0.9469	**D3**	0.9293	**D8**	0.997	**D4**	0.9355	**D6**	0.9766
D6	0.8699	**D5**	0.9223	**D7**	0.9918	**D7**	0.9285	**D4**	0.9513

4.2. DESCRIPTIVE STATISTICS

Table 6 presents the descriptive statistics of the variables that are used in this study. According to the findings; it is seen that the mean value of the board size is 9.61. When considered the principles of corporate governance in Turkey; the appropriate number of board members should be higher than five. At this point; it is possible to say that this value may be considered as an indicator of effectiveness. The mean value of free float rate is 27.91%. It is expected that the efficiency shows increase as the free float rate increases. But it is seen that this value remains low in Turkey. The average of number of committees held during each financial year is 9.12%. The means value for INO and MS is 0.73 and 15.3 respectively. This indicates that low portion of shares is owned by institutional investors and the significant portion of shares is owned by the largest shareholders. The average of banks' efficiency scores is 0.97. According to the used inputs and outputs used in DEA method; it is possible to say that this score may be considered as a high score for the banks analysed in this study. Finally; the means value for LEV, FS and CAR is 5.87%, 7.63% and 16.32 respectively.

Table 6: Summary of Results of Descriptive Statistics

Variables	**Mean**	**Median**	**Maximum**	**Minimum**	**Std.Dev.**	**Observation**
EFC	0.966969	1.000000	1.000000	0.672000	0.055377	110
MS	0.152914	0.174242	0.428574	0.000000	0.134518	110
FFR	27.90877	25.18480	51.10000	3.230000	11.64169	110
NOC	9.121208	8.832431	18.65749	4.556970	2.082633	110
INO	0.724568	0.747900	0.998526	0.436600	0.136488	110
BSZ	9.609091	10.00000	14.00000	6.000000	1.963406	110
BI	1.509091	2.00000	4.00000	0.00000	1.311526	110
LEV	5.872727	5.000000	21.00000	2.000000	3.514346	110
FS	7.626074	7.778408	8.440464	6.292012	0.569944	110
CAR	16.32009	15.18000	49.64000	7.200000	4.505839	110

A multiple regression model is carried out in order to investigate the impact of corporate governance on the bank efficiency. The regression model has been derived as follows:

$$EFC_{it} = \alpha_0 + \beta_1 MS_{it} + \beta_2 FFR_{it} + \beta_3 NOC_{it} + \beta_4 INO_{it} + \beta_5 BSZ_{it} + \beta_6 BI_{it} + \beta_5 LEV_{it} + \beta_6 FS_{it} + \beta_7 CAR_{it} + \varepsilon_{it} \quad (1)$$

The dependent variable is bank's efficiency (EFC_{it}) of the bank i at the time t. α_0 is the intercept and β_i is the coefficient of independent variables of the model. ε_{it} is a random error.

4.3. REGRESSION RESULTS

Table 7 shows the regression results of the study and presents the effect of corporate governance factors on bank efficiency:

Table 7- Summaryof Regression Results

Independent Variables	**Coefficient**	**t- statistics**	**P value**	
FFR	-0.001349	-4.186999	0.0001	
FS	0.091523	1.883392	0.0000	
INO	-0.030095	-0.938202	0.3506	
LEV	-0.003495	-6.070976	0.0000	
MS	0.003912	5.940837	0.0000	
NOC	0.003580	5.035491	0.0000	
CAR	0.001207	2.382577	0.0193	
BSZ	0.006698	4.455381	0.0000	
BI	-0.047250	-7.364736	0.0000	
R-squared	0.921178			
Adjusted R-squared	0.905586			
F-Statistics (P-value)	59.08302 (0.0000)			
Hausman Test	**Chi-Sq.Statistics Prob.**		40.674399	
			(0.0000)	
Likelihood Ratio Test	**Cross-section F Prob.**		4.519378	
			(0.0001)	
	Cross-section Chi-square Prob.		40.641997	
			(0.0000)	
Durbin-Watson Stat	2.196953			
Observation	110			

Table 7 presents the fixed effect regression model results for the ratio of EFC and corporate governance variables. Firstly; Hausman specification test was used in order to choose between fixed effects model and random effects model in panel data. According to Hausman test statistics results; it is

seen that there is no random effect in the regression model. So; fixed effects model was used because this model gives more consistent results in the model. Next, Likelihood ratio test wasperformed in predicting whether fixed effects model is better than pooled Ordinary Least Square (OLS) model. Test results have shown that fixed effects model is more feasible for the model. Lastly; in predicting the model results; Generalised Least Square (GLS) cross-section Seemingly Unrelated Regression (SUR) technique was performed by considering cross-section heteroscedasticity and contemporaneous correlation problems.

The regression model incorporating nine variables results in adjusted R^2 of 92 percent for the efficiency model. This means that nine variables are able to explain 92 percent of variation of efficiency of Turkish listed deposit banks that investigated in this study. Probability of f-statistics has shown that all variables are statistically significant at 1% level of significance.Separately, all of the variables except institutional ownership are statistically significant at 5% level of significance. The results have shown that free float rate and board independence have a negative and significant impact on the efficiency of the banks. As for the other variables; major shareholder, number of committees and board size have positive and significant relationship with the bank efficiency. There is no statistically significant relationship between institutional ownership and bank efficiency. Leverage which is one of the control variables is negatively related to efficiency. The other control variables that are firm size and capital adequacy ratio are positively related to efficiency at the 1 percent.

5. CONCLUSION

This paper aims to determine the impact of corporate governance on bank efficiency using panel data regression. The regression results have shown that board size has a positive impact on bank efficiency. This means that larger board size achieve a higher level of efficiency in terms the input and output ratios used in DEA method. Additionally, larger board size brings higher knowledge into supervisory process and the decision making mechanism. This evidence is consistent with the previous studies that find a positive relationship between board size and bank efficiency (Salim et al., 2016; Al-Sahafi et al., 2015; Haider et al., 2015; Al-Amameh, 2014; Bokpin, 2013; Poudel & Hovey, 2013; Akpan & Riman, 2012; Tanna et al., 2011). Additionally according to the regression results; it is seen that there is a significant positive relationship between major shareholder and bank efficiency. This result is in line with the findings of previous studies showing the same relationship (Al-Sahafi et al., 2015; Al-Amameh, 2014; Tomar & Bino, 2012, Adnan et al., 2011). On the other hand; this result is inconsistent with the finding of a study made by

Praptiningsih (2009) investigating 52 Asian banks which shows a negative relationship between ownership concentration and bank profitability.The results have also shown that the number of committees have a significant positive impact on bank efficiency. This result is supported by the study of Al-Smadi (2013) that finds a positive relationship between these two variables. From this finding; it is possible to say that the increase in the number of specialized committees in different areas provide directors with controlling the banking mechanism readily.

The study is limited to only listed banks in Turkey and based on the data for eleven year period from 2005-2015. At this point; diversifying the sample and expanding the observation period may be provide more consistent results for further studies. In addition further studies may consider the other emerging countries in order to be able to suggest more generalized results for corporate governance practices.

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