



A DEA-MALMQUIST Index Application to Analyze Inefficiency Reasons of BIST Corporate Governance Index Companies

Ender BAYKUT*, Fatih ECER**, Ismail KARA***

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ABSTRACT

Corporate governance applications and firms' ability level in putting these applications taken into considerations have started to be influential in making investment decisions. In addition to financial performances of the firms, corporate governance application levels also getting important day by day. The objective of this study is to determine inefficiency reasons of the firms constituting the Corporate Governance Index of Turkey. To this end, in the first stage of the study, annual data of the 21 companies trading on Borsa Istanbul (BIST) XKURY have been analyzed with Data Envelopment Analysis (DEA). In the second stage, the Malmquist Total Factor Productivity (MTFP) Index of the firms has been calculated. According to the results, none of the index firms in the financial sector was able to show full operational efficiency between 2010 and 2013. Additionally, the findings indicate that the firms were not managed efficiently, operated in unfitting scales and could have produced products with less input. Moreover, this study has revealed that one fourth of the firms experienced technological decline.

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1. Introduction

Corporate governance concept entered the literature in 1700s with first management scandal of "South Sea Bubble". Corporate governance has started to use with the although current literally the actual output has made after 1990. Starting with the Asian crisis in 2002, such as giant corporations WorldCom, Tyco and Enron financial scandals that resulted in the bankruptcy from a serious lack of confidence problem has emerged in the capital markets in the world. Experienced in the 2000s and the whole world felt the impact of these financial scandals and crises that cause inadequate corporate governance practices is a fact accepted by all authorities. That's why; during the 2000s, financial performance of firms and the level of implementation of corporate governance practices have become one of the most important variables for investment decisions.

Parallel with financial developments thriving enterprise management concepts separated from advisory for both firms and investors started to become an obligation. Corporate governance principles are not only prepared for financial crisis and scandals but also these principles provide guidance to their shareholders. From this point for the company's corporate governance practices; regaining the confidence of investors in the company in improving the performance of both financial and managerial. Also these principles obtain a competitive advantage against competitors and firms with continuity plays an important role in longevity.

When reviewing the literature, there is no a single definition of corporate governance is seen. Cadbury Report, published in 1992 (1992:1) corporate governance; is defined as "Firms with controlling and monitoring systems that need to be managed community". According to the Millstein Report (1998:27); corporate governance is; the purpose of distributing profits to profit-making rights of stakeholders in addition to the classical structure, taking into account that is a management approach.

Commissioned by the OECD and under the chairmanship of Columbia Law School professor from Ira Millstein committee had prepared the report on corporate governance meeting were approved on 16-27 May in 1999 the OECD Ministerial Council, and was announced to the public on 22th of June, 1999. OECD Principles of Corporate Governance (Corporate Governance Principles) which takes its name, and then revised in 2003. This report consists of 5 main sections. These sections are; shareholders' rights to fair treatment of shareholders, the role of stakeholders in corporate governance directly, without explanation and transparency to the public, are the responsibility of the board of directors.

*, **Afyon Kocatepe University, Afyonkarahisar, Turkey, *** Uşak University, Uşak, Turkey. E-mail address: ebaykut@aku.edu.tr (Baykut E.).

In this study, it was used Data Envelopment Analysis (DEA) in order to determine efficiency level of corporate governance index companies. Data Envelopment Analyze (DEA) is concerned a large number of inputs and outputs in cases where, as a relative makes measuring of efficiency of decision making units (Ali et al., 1995). This method is especially are being implemented in public sector organizations with non-profit expectations (Doyle and Green, 1994). In addition, consistent with an extension of the same techniques and businesses over the years, Total Factor Productivity (TFP) is used to determine the Malmquist Index.

In the literature on corporate governance index and the DEA with many uses works have been found (Grigorian and Manole, 2006; Zelenyuk and Zheka, 2006; Huang et al., 2007; Wanga et al., 2007; Feroz et al., 2008; Wanga et al., 2011). Referring to the literature in Turkey when dealing with corporate governance index and the DEA has not been obtained.

Financial performance of 21 firms traded in Borsa Istanbul (BIST) XKURY were analyzed by DEA. The data set covers the years of 2010-2013. All financial ratios were calculated based on annual financial statements of companies. Variables of Corporate governance ratings, sectorial differences, and market value was used firstly in this study. Therefore, the present study provides advances to the original literature.

In the following section of the study, development of corporate governance in Turkey and corporate governance literature has been given. In the third part of the study, data, methodology and findings will be given respectively. The study ends with finding reviews and conclusion with the fourth section.

2. Corporate Governance in Turkey

In 1999, following the publication of the OECD Principles of Corporate Governance, Turkey has started to work regarding corporate governance. The first study in Turkey related corporate governance was done by Banks Association in September 1999. Named of "Corporate Governance in Banks" is a report prepared by operating under the Basel Committee on Banking Supervision. The main purpose of this report is to highlight the importance of OECD Corporate Governance Principles for banks. Another purposes of this report is; draw attention to corporate governance issues for banks and supervisory authorities and transfer some new headlines. But the actual beginning of the concept of corporate governance in Turkey dated back to 2002. Turkish Industry and Business Association (TUSIAD) created a group of "Corporate Governance Working Group" in 2002 for preparing "Corporate Governance: Best Practices Code. The members of the Study Group in 2003, lays the foundation for Corporate Governance Association of Turkey, subject to the leadership to bring together the relevant environment and have aimed at to the development of corporate governance in the country (TKYD and Deloitte, 2007:1).

After the report of TUSIAD, Turkey's capital markets, representing the public authorities; CMB, the CMB Corporate Governance Principles published in 2003, was issued. These principles emerged later after international developments in 2005 and 2010 has been revised and final phase as today. "Apply or explain" approach based on the CMB Corporate Governance Principles announced in a statement of compliance with the obligation was entered into the lives of Turkish firms in 2004. In 2005, the Corporate Governance Compliance Statement included in the annual report has been made compulsory to give (TKYD, 2011:21-22).

Corporate governance developments in 2007 has continued with the establishment of the Corporate Governance Index. BIST Corporate Governance Index (XKURY) which enforces the listed firms in order to promote, BIST Board of Directors 18.03.2004, in its meeting decided but the CMB Board of Directors 07.02.2005 date and 4/99 in the meeting approved enacted and decisions are established pursuant to the index. When the numbers of firm reach to 5 in August of 2007, BIST XKURY index has started to be calculated. Corporate Governance Index was started to calculate 31 August 2007 with the index value of 48,082.17 and 5 firms (BIST, 2013). As of May 2014 BIST number of firms within 426, while the traded firms traded on Corporate Governance Index number is 47.

3. Literature review

There is a significant body of theoretical and empirical literature in corporate governance that considers the relationship between corporate governance and financial performance. Review of extant literature reveals several studies of general nature exploring the links between corporate governance mechanisms and financial performances using samples covering a wide variety of sectors including corporate governance indexes. The most common research on corporate governance index done by Gompers et.al. in 2003. Also, there are many variables were used in analysis to determine financial performances. In the following table, you will able to find literature regarding corporate governance and used variables.

Table no .1. Previous Studies Related Corporate Governance and Selected Variables

Authors	Data	Variables	Results
Ball and Brown (1968)	Standard and Poors Index Firms' data between 1946-1966.	Market Value and Net Profit	There is a positive significant relationship between market value and net profit.
Barbee et al. (1996)	13 years data of non-financial firms listed in New York Stock Exchange from 1991-2004	Equity/ Assets and market value	There is a positive relationship between equity/assets and market value of company.
Pagano et al. (1998)	139 IPO firms in Italy Stock Exchange between 1982-1992.	Equity and market value	There is a significant negative relationship between equity/asset and market value.
Demir (2001)	16 financial sector firms listed in BIST in 1991.	Net Profit and market value	There is no significant relationship between net profit and market value.
Gompers et al. (2003)	1500 firms listed on AMEX.	Corporate governance rating	Investors can get more return if they sell stocks which has low rating and then buy stock with high ratings.
Black et al. (2003)	515 firms listed on Korean Stock Exchange in 2011.	Corporate governance rating and market value	There is positive significant relationship between market value and corporate governance ratings.
Drobtetz et al. (2003)	93 financial sector firms listed in German Stock Exchange between 1998-2002.	Market value	There is positive significant relationship between market value and corporate governance ratings.
Moore and Porter (2007)	392 firms listed in S&P 500 Index in 2004.	Assets and market to book value	There is a significant negative relationship between corporate governance applications, assets and market to book value.
Cheung et al. (2007)	168 firms listed in Hong Kong Stock Exchange.	Market value and market to book value	There is positive significant relationship between market value corporate governance applications and market to book value.
Epps and Cereola (2008)	888 American firms listed on AMEX between 2002-2004.	Market value and market to book value	There is no significant relationship between market value, corporate governance applications and market to book value.
Morey et al. (2009)	Data from 21 different countries with a five year period.	Corporate governance rating and market value	There is a positive significant relationship between market value and corporate governance ratings.
Gupta et al. (2009)	Data of 200 Canadian firms between the years of 2002-2005	Corporate governance rating and market value	There is no significant relationship between market value and corporate governance ratings.
Dimitropoulos (2009)	105 firms listed on Atina Stock Exchange between 1994-2004.	Net profit and market value	There is a positive significant relationship between market value and net profit.
Karamustafa et al. (2009)	Data of 8 firms listed in BIST XKURY in 2009.	Current ratio, debt ratio, return on equity, return on assets and net profit.	All ratios increased significantly after entering to XKURY.
Karayel and Gök (2009)	Data of 9 firms listed in BIST XKURY in 2009.	Earning per share, return on assets and price earning ratio.	There is no significant relationship between financial ratios and corporate governance applications.
Bayrakdaroğlu (2010)	Data of 72 firms listed in BIST-100 between 2005-2009.	Market value	There is a positive significant relationship between market value and ownership structure.
Bozcuk (2010)	Data of firms listed in BIST XKURY between 2006-2009.	Corporate governance ratings and share prices	There is no significant relationship between share prices and corporate governance ratings.
Peni and Vahamaa (2010)	Data of 62 publicly held American commercial banks in 2008.	Price earnings ratio	There is positive significant relationship between price earnings ratio and corporate governance ratings.
Şengür and Püskül (2011)	Data of 24 firms listed in BIST XKURY in 2009.	Earnings per share, return on assets and price earnings ratio and return on equity.	Existence of independent manager will affect firms in terms of financial performance positively in XKURY.
Dağar and Çelik (2011)	Data of firms listed in BIST XKURY-Production Index between 2006-2009.	Return on assets and return on equity.	All ratios increased significantly after entering to XKURY.
Sakarya (2011)	Data of 11 firms listed in BIST XKURY in 2009.	Corporate governance ratings and earning per share.	There is positive significant relationship between earning per share and corporate governance ratings.
Gökçen et al. (2012)	29 firms listed in BIST-50 and data of 24 firms listed in BIST XKURY in 2010.	Market value	There is positive significant relationship between market value and corporate governance ratings.
Ficici and Aybar (2012)	55 firms data from 9 developing countries.	Corporate governance ratings and market value.	There is positive significant relationship between market value and corporate governance ratings.

Authors	Data	Variables	Results
Vintila and Gherghina (2012)	Data of 126 American firms.	Earnings per share and market to book value	There is positive significant relationship between earning per share and corporate governance applications while negative significant relationship between market to book.
Yener and Karakuş (2012)	Data of 63 firms listed in BIST-100 between 2004-2009.	Equity/assets and market value	Negative significant relationship between equity/assets and market value.
Kar et al. (2012)	Data of 4 football team firms listed in BIST between 2005-2010.	Price of shares and return assets, return on equity	There is positive significant relationship price of shares, return on assets and return on equities.
Yenice and Dölen (2013)	Data of 37 firms listed in BIST XKURY between 2007 -2011.	Corporate governance ratings and market value.	There is positive significant relationship between market value and corporate governance ratings.
Ege et al. (2013)	Data of 18 firms listed in BIST XKURY between 2009 -2011.	Corporate governance ratings	There is negative significant relationship between market value and corporate governance ratings.
Dinçer et al Dinçer (2013)	Data of banks listed in BIST between 2003-2009.	Corporate governance ratings and market value.	There is negative significant relationship between market value and corporate governance ratings.
Acar et al. (2013)	Data of 40 firms listed in BIST XKURY.	Earning per share, return on assets and price earning ratio, debt ratio, market to book value, assets.	There is no relationship between financial performances and entering to index.

4. Method

Data Envelopment Analysis (DEA) is a method used to determine effectiveness (Charnes, Cooper and Rhodes, 1978). DEA is a non-parametric approach to efficiency measurement that was originally established by Farrell (1957). DEA, first produce Charnes, Cooper and Rhodes (CCR) (1978). They produce goods or services similar to each other in terms of the relative effectiveness of economic decision making units which have been developed with the aim of measuring. The efficiency of any decision making units (DMUs) is obtained as the maximum of a ratio of weighted outputs to weighted inputs subject to the condition that the similar ratios for every DMUs be less than or equal to unity. Charnes, Cooper and Rhodes (1978) (CCR) linear model,

Objective Function:

$$Maxq_o = \sum_{r=1}^s \mu_r y_{ro} \quad (1)$$

Restrictive Conditions:

$$\sum_{r=1}^s \mu_r y_{rj} - \sum_{i=1}^m \omega_i x_{ij} \leq 0 \quad j = 1, 2, \dots, n \quad (2)$$

$$\sum_{i=1}^m \omega_i x_{io} = 1 \quad (3)$$

$$\omega_i \geq 0 \quad i = 1, 2, \dots, m \quad (4)$$

$$\mu_r \geq 0 \quad r = 1, 2, \dots, s \quad (5)$$

Here the y_{rj}, x_{ij} (all positive) are the known outputs and inputs of the j th DMUs and the $\lambda_r, \omega_i \geq 0$ are the variable weights to be determined by the solution of this problem. The models depicted above s output, m inputs and n specifies the number of decision makers (Basso and Funari, 2001). Dual output models aimed at decision makers about the maximum weighted average. The weighted average of the input decision makers are first synchronized. In addition, each output-weighted averages for decision makers, weighted averages, it is essential to be a little other input. This efficiency value must be calculated according to the desired output weighted average number of decision makers is a maximum of 1. Thus, the efficiency value of 1 for an active decision makers, an inactive decision making must be less than this value is 1.

This represents a production limit of CCR model in economic terms, a piece can be seen that achieve linear production surface: In fact, from another point of view from view, given the level of the input of a decision gives the maximum output obtained experimentally, that gives the minimum amount of input required to achieve a certain output levels (Basso and Funari, 2001).

DEA model (1) and (2) the first is the simplest and most widely used DEA techniques. However, while the extension and its derivatives have been proposed in the literature to deal with a number of more specific purposes (Charnes et al., 1994).

4.1. Malmquist Total Factor Productivity (MTFP) Index

Caves, Christensen and Diewert (1982) developed Malmquist total factor productivity (MTFP) index which is a technique for the measurement of DEA-based total factor productivity (TFP) index. MTFP index measures the change in total factor productivity by calculating the rate differences between two data points.

Fare et al. (1994) study the underlying t according to the output between the period and the subsequent t+1 era Malmquist TFV change index,

$$M_o(x^t, y^t, x^{t+1}, y^{t+1}) = \sqrt{\left[\frac{D_o^t(x^{t+1}, y^{t+1})}{D_o^t(x^t, y^t)} \times \frac{D_o^{t+1}(x^{t+1}, y^{t+1})}{D_o^{t+1}(x^t, y^t)} \right]} \quad (6)$$

This equation may also be expressed in the following form:

$$M_o(x^t, y^t, x^{t+1}, y^{t+1}) = \frac{D_o^{t+1}(x^{t+1}, y^{t+1})}{D_o^t(x^t, y^t)} \times \sqrt{\left[\frac{D_o^t(x^{t+1}, y^{t+1})}{D_o^{t+1}(x^{t+1}, y^{t+1})} \times \frac{D_o^t(x^t, y^t)}{D_o^{t+1}(x^t, y^t)} \right]} \quad (7)$$

The first term on the right side of Eq. 7 evaluates the difference in input based technical efficiency between the year t and the year t+1. The ratio of efficiency in period t+1 in proportion to period t shows the change in efficiency. The change of technology between two periods is symbolized by the geometric means of these two ratios in square brackets. It means that the geometric mean of Malmquist productivity indexes measure the changes in total factor productivity and components (Fare et al. 1994: 253).

The change in technical efficiency and technological change can be thought as the two components of The Malmquist total productivity index. Therefore, the change in efficiency and technology can be measured separately by dividing the Eq. 7 into two.

$$\text{Technical change in efficiency (Effch)} = \frac{D_o^{t+1}(x^{t+1}, y^{t+1})}{D_o^t(x^t, y^t)} \quad (8)$$

$$\text{Technological change (Techch)} = \sqrt{\left[\frac{D_o^t(x^{t+1}, y^{t+1})}{D_o^{t+1}(x^{t+1}, y^{t+1})} \times \frac{D_o^t(x^t, y^t)}{D_o^{t+1}(x^t, y^t)} \right]} \quad (9)$$

The definition of change in technical efficiency is the efficiency in approximating to the production limit, and the change in technology is defined as the shift in the curve in productivity limit (Mahadevan, 2002:590). Moreover, when we multiply the change in technical efficiency and technological change, this yields the change in total factor productivity. Total factor productivity index which is over 1 shows an increase in total factor productivity during the period between t and t+1, and the index which is lower than 1 indicates a decrease (Coelli 1996a:28).

Data

In this study, it was used DEAP 2.1 (Data Envelopment Analysis), for data analysis. The data set covers a 4-year period from 2010 to 2013, with a sample of 21 firms listed on BIST Corporate Governance Index (BIST XKURY). The data were taken from the annual reports and financial statements of these firms. All financial data are nominated in terms of the Turkish Lira (millions). Variables and description of them are shown in Table 2.

Table no.2. Variables used in the study

Variable Name	Description of the variable
Market Value	Market value measures the current value of assets and liabilities. It is the price at which a security is trading and could presumably be purchased or sold. Calculated by multiplying the number of shares outstanding by the current market price of the firm's shares. (Breadey et al. 2001: 115; Financial Dictionary, 2014).
Corporate Governance Score	The rating which is getting from responsible institution.
Growth of Net Profit	The net increase percentage in net operating income.
Earning per Share	The portion of a company's profit allocated to each outstanding share of common stock. Earnings per share serves as an indicator of a company's profitability.
Price to Earnings Ratio	Price to earnings ratio indicates how many times the market price of a share is vis-a-vis its earning. It is calculated as the ratio between the market price of the share and the earnings per share (Vintila and Gherghina, 2012:51).
Market to Book Value	The Market to book ratio is commonly defined as the market value of a firm's equity divided by the book value of equity. (McNichols et al., 2010:2).
Equity/Asset	The ratio shows the percent of owners share in total assets.
Return on Asset (ROA)	The ROA ratio, which shows the amount of earnings have generated from an invested capital asset and how profitable a company is relative to its total assets (Epps and Cereola, 2008). It is calculated by dividing a company's annual earnings by its total assets.

Variable Name	Description of the variable
Return on Equity	Return on Equity measures the rate of return on the ownership interest of the common stock owners. It measures a firm's efficiency at generating profits from every unit of shareholders' equity (also known as net assets or assets minus liabilities). ROE is equal to a fiscal year's net income (after preferred stock dividends but before common stock dividends) divided by total equity (excluding preferred shares), expressed as a percentage (Vintilă and Gherghina, 2012:180).
Sector Breakdown	In order to detect differences within sectors, we divided our sample into two sub-groups. These are non-financial sector and financial sector. The value of non-financial sector is "0" while value of financial sector "1" in the study.

5. Results

In the first phase of the study, which aims at determining the causes of inefficiency of corporate governance index firms, the input oriented CCR-DEA method has been employed to construct the analysis. In the second phase, however, the Malmquist TFP index has been calculated to enable the comparison in the period of 2010-2013, and to compare the changes in factors determining the efficiency. To calculate the technical efficiency index, linear programming techniques have been used, and by using input-output values (financial ratios) of the firms, the efficiency frontiers have been constructed. Later, the firms have been compared with these efficiency frontiers. When the calculated technical value is equal to 1 this means that that particular company is fully efficient; and when it is less than 1, the company is not efficient. The technical efficiency also reflects the utilization performance of the production factors. Having this index less than 1 therefore shows that with the existing technologies and inputs optimal outputs cannot be produced or actual outputs could be produced with relatively less inputs, hence, production factors remain relatively idle. Consequently, having the production factors idle means lower performance for that firm.

For each year between 2010 and 2013, Table 3 represents the results of input oriented DEA, which was applied in a cross-sectional way to the 21 firms under consideration. In order to enable more meaningful analyses, the firms have been grouped as financial firms and non-financial firms. 6 firms out of 21, are in the finance sector while the remaining 15 firms continue their operations in non-financial sectors. According to the results, 10 firms in 2010, 13 firms in 2011, 18 firms in 2012 and 5 firms in 2013 efficiently operated. The findings put forward that starting from 2010 onwards each year more and more firms operated efficiently. Presumably, the reason of this can be caused by the diminishing effect of the global financial crisis of 2007, and, beginning with 2010, firms started to perform in an increasingly efficient way. Whilst the technical efficiency index average of firms in finance sector is 0.967, the average of firms in non-finance sector has been calculated as 0.975. This result shows that the global financial crisis had a greater impact on the finance sector than the non-finance sectors. Furthermore, none of the finance sector firms was able to operate at full efficiency between 2010 and 2013. According to Taskin et al. (2013), after the global crisis, firms were less successful in producing outputs than in the pre-crisis period and the failures stemming from this situation led the firms to full inefficiency. In another study, Leaven and Valencia (2012) claim that although the global financial crisis started in late 2007 and early 2008, its striking effect on the finance sector started in 2010 and continued until the beginning of 2012. Besides, the financial institutions (Bear Stearns, Fannie Mae, Freddie Mac, Lehman Brothers etc.) failed during this period and due to the downgrading of rating firms the financial institutions with high volumes of funds started to take a more cautious stance. In light of all these developments, it is not surprising that the finance sector firms did not operate at full efficiency.

Table no.3. Effectiveness scores of firms

	Firms	Effectiveness coefficients				Mean
		2010	2011	2012	2013	
Financial	Bank Asya	1.000	0.821	0.991	1.000	0.953
	İş Yatırım	1.000	0.915	0.926	0.932	0.943
	Şekerbank	0.977	1.000	1.000	0.919	0.974
	TSKB	0.925	1.000	1.000	0.955	0.970
	Y&Y Yatırım	1.000	1.000	0.909	0.991	0.975
	Yapı Kredi	1.000	0.953	1.000	1.000	0.988
Non-financial	Anadolu Efes	1.000	1.000	1.000	0.989	0.997
	Arçelik	0.976	1.000	1.000	0.966	0.986
	Aygaz	0.999	1.000	1.000	0.948	0.987
	Coca Cola	0.982	1.000	1.000	0.958	0.985
	Yazıcılar	1.000	0.916	1.000	1.000	0.979
	OTOKAR	0.901	0.992	1.000	0.827	0.930
	Park Elektrik	0.966	1.000	1.000	0.891	0.964
	PETKİM	0.868	0.988	1.000	0.915	0.943
Prysmain	1.000	0.988	1.000	1.000	0.997	

	Firms	Effectiveness coefficients				Mean
	Türk Traktör	1.000	0.922	1.000	0.976	0.975
	TAV Airport	0.911	1.000	1.000	0.942	0.963
	Tofaş	0.960	1.000	1.000	0.933	0.973
	TÜPRAS	1.000	1.000	1.000	1.000	1.000
	TURKAS	0.927	1.000	1.000	0.919	0.962
	Türk Telekom	1.000	1.000	1.000	0.968	0.992
	<i>Mean</i>	<i>0.971</i>	<i>0.976</i>	<i>0.992</i>	<i>0.954</i>	<i>0.973</i>

In 2013, only 5 of the 21 firms under analysis are found to operate at full efficiency. Developments, both inside and outside the country, could be an effect on the markets. Moreover, the future-oriented bond purchase and selling decisions of the FED and interest rate increase decisions of the Central Bank of Turkey have indirect effects on the stock exchange. The stock index level of 93,400 in May 2013 dropped to 74,064 in December, and has been one of the indicators of adverse developments. This decline in the stock exchange has reflected on the corporate governance index as well. These occurrences may explain why only 5 firms are able to achieve full efficiency in 2013.

Due to these adversities experienced after the global financial crisis, none of the 6 firms in finance sector under analysis is able to reach full efficiency during the 2010-2013 period. Despite this, only TUPRAS has turned out to be the firm operating in full efficiency during the this period. It can be claimed that the reason for TUPRAS' being full efficient firm during all four years in the analysis period is it is a monopoly firm. From among the finance sector firms Yapi Kredi Bank has the highest efficiency (0.988) as Is Invest has the lowest efficiency (0.943) in the 2010-2013 period.

Among the non-finance firms, TUPRAS has the highest efficiency (1.000) as OTOKAR has the lowest efficiency (0.930). The fact that the other 20 firms are unable to operate at full efficiency. It also means that these firms need to take some measures to increase their market values. The low equity/assets ratio which is observed across the firms and the increasing free float rates cause deterioration in the financial structures of the firms. Likewise, diversifying shareholder structures and having managerial problems cause failure in reaching full efficiency level. The increasing debt/equity ratios, however, show that firms resorted to the use of external sources during the period 2010-2013 and this has resulted in increased borrowing costs for the firms due to changing interest rates. These increasing borrowing costs reduced the net profits each year and affected the net profit growth rates in a negative direction. Thus, it is an expected result to observe falls in the market values and per share profits of the firms taking part in the corporate governance index. For this reason, in order to strengthen their financial structures, firms should attain the optimal equity/assets and debt/equity ratio composition. In order to achieve stability, they should stabilize their free float rates. Additionally, when the average efficiency values of the periods are analysed, it is seen that 2012 is a more efficient year than 2013. As mentioned by Leaven and Valencia (2012), 2012 is the exit year from the crisis has an important effect on this situation, pointing to the probability that resources are used idly, maximum outputs are not obtained with the production factors used, or actual outputs could have been produced by using less of the production factors.

Table 4 represents the firms' Malmquist TFP index change values as well as their components. The Tfpch is the multiplication of the change in the technical efficiency (Effch) by technological change (Techch). The values greater than 1 for Effch and Techch show the advancement in technical efficiency and technology, and values less than 1 for Effch and Techch show the regress. In other words, having a value greater than 1 for a Effch index shows the effect of firm's catching up with its production limit, and having a value greater than 1 for technology advancement index shows that the firms are successful in moving their efficiency frontiers in an upward direction. The change in Effch, however, is the multiplication of change in pure efficiency (Pech) with the change in scale efficiency (Sech). The Pech shows the managerial efficiency while the Sech shows whether the firms operate in appropriate scale or not. It is concluded that the firms having Pech value greater than 1 have good management, and firms having a Pech value less than 1 are in poor managerial shape. In the same vein, it can be concluded that firms with a Sech value greater than 1 enjoy positive developments both in financial and human resources elements, that they attain the growth rate which can be qualified as the optimal, and that they achieve customer satisfaction. On the other hand, for the firms with less than 1 Sech, it can be said that they could be facing such problems as lack of qualified personnel and managers, low sales, high operative expenses, difficulty in collecting the payments, inefficient work, low quality production, and wrong enterprise location choice.

Table no.4. Changes in MTFP Index (2010-2013)

	Firms	Effch	Techch	Pech	Sech	Tfpch
Financial	Bank Asya	1.000	1.114	1.000	1.000	1.114
	İş Yatırım	0.977	1.063	0.990	0.987	1.038
	Şekerbank	0.980	1.064	1.000	0.980	1.043
	TSKB	1.011	1.072	1.011	1.000	1.083
	Y&Y Yatırım	0.997	0.967	1.000	0.997	0.964

	Firms	Effch	Techch	Pech	Sech	Tfpch
	Yapı Kredi	1.000	1.058	1.000	1.000	1.058
	Mean	0.994	1.056	1.000	0.994	1.050
Non-financial	Anadolu Efes	0.996	1.086	0.997	1.000	1.082
	Arçelik	0.996	0.973	0.993	1.004	0.969
	Aygaz	0.983	1.063	0.983	0.999	1.045
	Coca Cola	0.992	1.034	0.992	1.000	1.025
	OTOKAR	0.972	0.947	0.982	0.990	0.921
	Park Elektrik	0.973	1.148	0.989	0.984	1.117
	PETKİM	1.018	0.963	1.020	0.998	0.981
	Prysmain	1.000	1.037	1.000	1.000	1.037
	TAV Airport	1.011	1.036	1.018	0.993	1.047
	Tofaş	0.991	1.030	0.997	0.994	1.020
	TÜPRAŞ	1.000	1.110	1.000	1.000	1.110
	TURKAS	0.997	0.973	0.990	1.007	0.971
	Türk Telekom	0.989	1.074	0.989	1.000	1.062
	Türk Traktör	0.992	1.093	0.992	1.000	1.084
	Yazıcılar	1.000	1.065	1.000	1.000	1.065
	Mean	0.994	1.042	0.995	0.997	1.036
	Overall	0.994	1.049	0.997	0.997	1.043

It has been found that changes in the Effch of both financial and non-financial firms in the 2010-2013 periods have decreased by 0.6%. This means that the firms in the Corporate Governance Index could have produced their outputs by using 0.6% less inputs. Accordingly, value changes between debts and equity that constitute the liabilities side of the balance sheet of the firm do not have an effect on the results, i.e. our study has found no significant effect of increase in the indebtedness ratio or decrease in equity on the results, indicating that without changing the increasing indebtedness and decreasing equity ratios. The same results can be reached in the analysis period. Likewise, it renders that the efficiency levels reached with the increasing free float rate could actually be reached with lower free float rates. In the same period, both the change in the Pech and the change in the Sech are 99.7%; thus, firms are not being managed efficiently and they are making production at an unsuitable scale. The Pech value of the financial institutions is higher than those of non-financial ones. This means that financial institutions are managed better in this period.

Conversely, the Sech value of financial institutions is somewhat lower than that of non-finance firms, meaning that financial institutions experience somewhat more scale problems. According to Effch index, it has been found that out of the financial institutions only Industrial Development Bank of Turkey made progress, Bank Asya and Yapi Kredi Bank kept their positions as Is Invest, Sekerbank, and Y&Y Invest showed decline. The reason for these decline for Sekerbank and Y&Y Invest is the change in Sech, and for Is Invest is both the change in the Sech value and change in the Pech. However, it is observed that Industrial Development Bank of Turkey used its resources more efficiently and it had a good management. When the changes in the Effch index pertaining to non-finance firms are analyzed, it is seen that PETKİM and TAV Airport made progress. Prysmain, TUPRAS, and Yazicilar registered no change in the efficiency. In other firms, however, a decrease in efficiency is observed. The biggest decline has been observed with the Park Elektrik. The reason for the decline in Anadolu Efes, Arcelik, Coca Cola, TURKAS, Turk Telekom, and Turk Traktor has been determined to stem from the decline in the Pech change. For the rest of the firms, however, it has been observed that both the change in Sech and change in the Pech caused the decline.

Table 4 shows that firms operating in the finance sector performed better than firms in non-finance sectors. 4 of 5 indices analyzed, the finance sector firms are better, whereas the non-finance firms performed better in only one of the five indices. In the same period, the corporate governance rating point increase rates of the firms in the finance sector are better than those of non-finance sector firms. Likewise, in the market value comparison for the period of 2010-2013, average values of the finance sector firms seem better than non-finance sector firms.

In the same period and according to the Tech index, it is found that the firms in the Corporate Governance Index show annual average technological advancement rate of 4.9%. Here, an attention drawing observation is that the advancement in financial institutions, which is 5.6%, is higher than non-finance firms. Except for Y&Y Invest, there is a technological advancement in financial firms. For the non-finance firms, however, except 4 of them have technological advancement. In summary, in 76% of firms have technological advancement but others have technological decline. The Park Electric performs the highest advancement with 14.8%. Nevertheless, the biggest decline is OTOKAR's at a rate of 5.3%.

According to the Tfpch index and in the period of 2010-2013, annual efficiency rate of 4.3 % has been observed. In the period of 2010-2013, the first three firms with an efficiency increase are Park Elektrik (11.7%), Bank Asya (11.4%), and TUPRAS (11%). On the other hand, the three firms with the highest decline are OTOKAR (7.9%), Y&Y Invest (3.6%) and Arcelik (3.1%). Consequently, two of the financial firms are among the firms registering the highest efficiency increase. The lessening impact of the financial crisis,

starting from 2012, is one of the major reasons for this. In the same period, it can be said that the efficiency increase originates from an increase in Techch. The efficiency decline of the five firms having a decrease in their efficiencies is in the approximate range between 2%-8%. Out of these firms, decrease in the efficiency of the PETKIM arises from Techch while the efficiency decreases of the other four firms stem from both Techch and decrease in Effch.

Finally, the period with the highest progress with Tfpch is 2011-2012 with 12.8% with respect to Table 5 %. The source of this change is the 9.1% advancement in the technology. The decline period with 0.6% is, however, the period of 2012-2013. The reason for this decline is the decline in the Effch.

Tablano.5. Malmquist Index as to periods

Period	Effch	Techch	Pech	Sech	Tfpch
2010-2011	0.977	1.030	1.014	0.963	1.006
2011-2012	1.034	1.091	1.001	1.033	1.128
2012-2013	0.976	1.018	0.979	0.997	0.994

When assessed from the perspective of Tfpch components, the only period with progress in Effch is the period of 2011-2012 with 3.4%. In the periods of 2010-2011 and 2012-2013, however, declines of 2.3% and 2.4% respectively have been experienced. In the Techch, all three periods had advancements and the rates of these advancements have been 3%, 9.1% and 1.8%, respectively.

Finally, when the components of Effch are analyzed, it has been observed that Pech increased in the periods of 2010-2011 and 2011-2012 by 1.4% and 0.1%, respectively, but it decreased in the period of 2012-2013 by 2.1%. Accordingly, it can be said that firms are managed efficiently in the periods 2010-2011 and 2011-2012, but they lacked efficient management in the period of 2012-2013.

It is observed that Sech is increased by 3.3% only in the period of 2011-2012 but there are declines in all other periods. The period with the sharpest decline is the period of 2011-2012 with 3.7%. Hence, it can be resulted the firms operate in proper scales in the period of 2012-2013 but they are not in the other two periods.

6. Conclusion

Although the concept of corporate governance was first formed in the 1700s, its importance has become more evident since the financial scandals and crises experienced in the 2000s. In this study, the data from 2010 to 2013 of 21 firms trading on BIST have been taken into consideration and analyses have been developed. It has been observed that both the finance sector firms and non-finance sector firms did not operate at full efficiency during this period. Detailed analyses have revealed that finance sector firms were less efficient than non-finance sector firms due to the global financial crisis. The other important findings are that (i) firms in the Corporate Governance index could have produced their products by using less input, and (ii) that firms were not managed efficiently, and (iii) that they made their productions with unsuitable scales. From this perspective, financial institutions have been found to experience the scale problem more than non-finance firms.

Our study has some limitations. Due to the fact that the number of firms taking part in the Corporate Governance index, which started to be calculated first in 2007 in Turkey, was very small initially, (though increased in the following years), our study had to be limited to the period of 2010-2013. In future research, new studies can be made by expanding the analysis time frame. Another limitation of the study is that the comments made are related to Turkey, which is a developing country. In other words, the comments made may not apply to developed countries. In future studies, analyses and comparisons that include both developed countries and developing countries can be made.

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