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PERFORMANCE MEASURMENT OF STATE-OWNED BANKS IN TURKISH BANKING SECTOR WITH GREY RELATIONAL ANALYSIS METHOD

Abstract:

Banking sector has a considerable impact on the development and growth of the national economy. Increase in the performance of this sector having an important place in the financial system of country, means to positive effects on the general economy. Today, importance of globalization and private capitalis increasing. But State-owned banks in Turkish Banking Sector have an important share of 30%. The main goal of private banks is profitability, so they don't support the activities with low return, even though the people need. For these reasons state-owned banks were selected, in this study for measuring their performance. Performance measurement involves the process of assessing and reporting of the business activities in terms of success, effectiveness and timing. Sustainability in Performance Measurement provides a significant instrument for feedback of business for the planning in the next period. Business might develop their own service and product quality and they progress strategies to increase the performances of employees, revise their goals and make some revisions in the budget if it needs.Thus, an increase will be supplied in the efficiency and effectiveness of business. In this study, The Performances of State-owned banks in Turkish Banking Sector are analyzed with grey relational analysis method.In the analysis, four years of financial data is used related with banks between 2010-213 years. These data were analyzed by 15 ration which determine; capital adequacy, liquidity, asset quality and profitability criteria.

Keywords:

Banking Sector, Performance In Banks, Performance Measurement, Grey Relational Analyze Method, State-Owned Banks

JEL Classification: C67, G21, G29

INTRODUCTION

Banks play a mediation role between savers and the ones who demand for funds. They disseminate the funds collected under the name of bank deposit to the needers who require credit. The most important factor in this sector is confidence. Depending on the confidence of the banking sector, an increase is ensured for the funds invested by the account owners. Competitive capacity and sustainability of the banks play a significant role in creating environment of confidence.

As in every sector, the most important element which enables the establishments to survive is their competitive capacity. Increasing their competitive capacity depends on the establishments' ability to observe the changes in the sector and keep up with these changes. Performance measurement is one of the methods used for measuring their level of change in banking sector, identifying their weaknesses and strengths.

Performance measurement gives clues for making their future plans in terms of liquidity, productivity, profitability. Productivity, return on assets and capital adequacy indictors are key points for measuring performances of banks. Credit rating agencies use these key indicators to evaluate the banks.

Thanks to the performance measurement, the managers make right decisions and manage the resources at hand in a more efficient manner. The managers working both at private and state sector acquire the information to increase competitive capacity and productivity via performance measurement (Osborne and Gaebler 1992, p.64). Furthermore, the strategic plans prepared by the managers could be analyzed through performance measurement. Therefore, not only the banks but also shareholders have information about the success of the managers, monitoring the success of the plans, their measurement and evaluation. Especially, the data related with productivity play a pivotal role in measuring the success of these plans (Poister 2003, p.162).

In the light of the information acquired via performance measurement, both corporations and all workers could be evaluated. Not only the managers' efficiency in the corporation increase but also the deficiencies of the plans could be overcome thanks to a performance measurement system which is well-prepared and applied; therefore, an increase in the performance of the corporation could be ensured (Diamond 2005, p. 28).

The most important difference between state and private sector is while private sector acts for profitability, state sector care for the public's welfare before making profit. It is valid for banking sector as well. Particularly, whereas the banks with private equity ignore the funding need in areas with low profit margin or non-profit margin state sector, the banks with state capital provide service in order to increase welfare in these areas. The presence of the banks with state capital supports the economic environment by assuring the citizens especially in crisis periods. Moreover, it could be said that the presence of these banks protect the public by preventing the unnecessary increases in service expenses and monopolization of private banks in this sector (Miccoet al. 2004, p.48).

Therefore, banks with state capital are discussed in our study. Despite the privatization in banking sector, state banks have a significant market share in Turkey as in other countries. In Turkish banking sector, 31 banks operate as deposit banks since June, 2014. While three of them are banks with state equity, they are 27% of the

branches in the sector.In spite of their 16.31% sector average; they leave the other banks behind with their 18.44% capital adequacy. Considering as deposit, they have a 32% share in the market (Banking regulation and supervision agency-BDDK).

LITERATURE REVIEW

Grey Relational Analysis has been used in designing airway networks (Hsu and Wen 2000, p.52), comparative studies concerning financial indicators of corporations (Feng and Wang 2000, p.250), sales forecasting (Lin and Hsu 2002, p.26) and many other sectors. This section summarizes the comparative studies of financial indicators using GRA. In his study, Chang (2006) investigated the relationship between business perception and financial performance in 15 banks in Taiwan and benefitted from GIA. In the study, the author used the liquidity, profitability, growth and capital structure ratios of the banks. In a study comparing three banks, Ho and Wu (2006) used 53 ratios among liquidity, profitability, financial leverage, growth, active usage and stock performance. They compared GIA and financial situation analysis in the analyses and showed that GIA provided the best results.Benefiting from 23 financial ratios, Ho and Wu (2006) compared three banks operating in Australia by using GIA. The results of the study suggested that the banks which had better liquidity had better performance. Yuan (2007) compared the performances of 6 corporations using ratios of liquidity and profitability. As a result of this study using 10 financial ratios and GRA, Yuan found that the most important factor in measuring corporation performance is profitability ratios.Wang (2009) measured financial performances of corporations operating in transportation sector in Taiwan using GRA. Uçkun and Girginer (2011) conducted a study, aiming to determine financial performances of both state and private banks through the help of these banks' financial ratios via GIA. In the study, three states, 10 private underwent GIA with regards to 14 financial ratios, and they were ordered within the group in terms of their financial performances. As a result of GIA, "ZiraatBankası" came first among state banks and "Anadolu Bank" was the first among private banks concerning financial performance.Girginer and Uçkun (2012) used GIA approach in a study in which the effects of financial crisis on Turkish banks. According to the findings, the banks were ranked as state, foreign, and private during the period of 2005-2009. Elitaş et al. (2012) determined financial performances of insurance companies which are traded in ISE in the years 2010-2011 by using GIA. 10 financial ratios have been used in the study and performance measurement has been carried out with the help of liquidity, leverage and profitability ratios. On the other hand, Doğan (2013) evaluated the performances of 10 banks in Istanbul Stock Exchange (IMKB) by using GIA. The results showed that "Akbank" was the forerunner whereas "YapıKrediBankası" was the last. Ecer (2013) compared the financial performances of the Turkish private banks during the period of 2008-2011 by using Grey Relation Analysis (GRA) approach. He found that the most important financial indicators in financial achievement are active quality for private banks. In their study, Altan and Candoğan (2014) investigated the applications on participation banks operating in Turkey.

GREY RELATIONAL ANALYSIS

Grey System Theory which involves Grey Relational Analysis was developed by Julong Deng in 1982. Grey System Theory makes it easy to decide in situations when there is an unclear, deficient or no information (Deng, 1989). In this system, colour white refers to the situation which is fully acknowledged, black denotes to the fact that there is no information whatsoever, and grey describes the situation in between. The

aim of this system is to convey information to the system in order to change the colour black situation in which there is no information into the colour grey (Feng and Wang 2000, p.136).

Grey relational analysis is one of the multi-criteria decision-making methods. Easier solutions could be found in comparison with mathematical solutions when it comes to atmosphere of uncertainty (Üstünışık 2007, p.56).

The calculation steps of grey relational analysis method are given below (Wen 2004, p.52):

Step 1: The Formation Of Decision Matrix:

$$X_i = \begin{bmatrix} x_1(1) & x_1(2) & \cdots & x_1(n) \\ x_2(1) & x_2(2) & \cdots & x_2(n) \\ \vdots & \vdots & \ddots & \vdots \\ x_n(1) & x_n(2) & \cdots & x_n(n) \end{bmatrix}$$

Step 2: The Formation Of Reference Series:

Reference series $= (x_0(1), x_0(2),...,x_0(j),...,x_0(n))$

This series is stated as given above. The criterion of 0x (j) , j. refers to the biggest value within the criteria's normalized values. Reference matrix is acquired by writing it in the first line of reference series.

Step 3: Operation Of Normalization And Forming Normalization Matrix:

In this step, data set is normalized and three possible situations are encountered:

I. Utility status: If the purpose is to obtain a better or higher value, number 2 formula is used. Number 2 formula is:

$$x_i^* = \frac{x_i(j) - \min_j x_i(j)}{\max_j x_i(j) - \min_j x_i(j)|}$$

II. Cost status: If the purpose is to obtain a smaller or less value, number 3 formula is used. Number 3 formula is:

$$x_i^* = \frac{\max_j x_i(j) - x_i(j)}{\max_j x_i(j) - \min_j x_i(j)}$$

III. Optimal status:If the purpose is to acquire an optimal value, number 4 formula is used. Number 4 formula is:

$$x_i^* = \frac{\left|x_i(j) - x_{0b}(j)\right|}{\max_j x_i(j) - x_{0b}(j)}$$

In this formula$X_{ob}(j)$,j is the target value of the criteria and takes place within the range of: $\max_j x_i(j) \geq x_{0b}(j) \geq \min_j x_i(j)$

After these operations, the decision matrix in number (1) becomes as shown below: Number 5 formula is:

$$X_i^* = \begin{bmatrix} x_1^*(1) & x_1^*(2) & \cdots & x_1^*(n) \\ x_2^*(1) & x_2^*(2) & \cdots & x_2^*(n) \\ \vdots & \vdots & \ddots & \vdots \\ x_n^*(1) & x_n^*(2) & \cdots & x_n^*(n) \end{bmatrix}$$

Step 4: The Formation Of Absolute Value Table:Number 6 formula is:

The absolute value $\Delta_{oi}(j)$between x_0^* and x_i^* is acquired as below:

$$\Delta_{0i}(j) = \left|x_0^*(j) - x_i^*(j)\right| = \begin{bmatrix} \Delta_{01}(1) & \Delta_{01}(2) & \cdots & \Delta_{01}(n) \\ \Delta_{02}(1) & \Delta_{02}(2) & \cdots & \Delta_{02}(n) \\ \vdots & \vdots & \ddots & \vdots \\ \Delta_{0m}(1) & \Delta_{0m}(2) & \cdots & \Delta_{0m}(n) \end{bmatrix}$$

Step 5: The Formation Of Grey Relational Coefficient Matrix: Number 7 formula is:

$$\gamma_{0i}(j) = \frac{\Delta\min + \xi\Delta\max}{\Delta_{0i}(j) + \xi\Delta\max}$$

In this formula $\xi$is distinguishing coefficient and gets a value in the range of [0,1], yet it is advised to take it as 0.5 in operations. Moreover, it is calculated as:

$$\Delta\max = \max_i \max_j \Delta_{oi}(j) \qquad \Delta\min = \min_i \min_j \Delta_{oi}(j)$$

Step 6: The Calculation Of Degree Of Relation:Number 8 formula is:

$$\Gamma_{oi} = \frac{1}{n}\sum_{j=1}^{n} \gamma_{oi}(j)$$

In this formulaT_{oi},i.illustrates the degree of grey relation of the element and is used when criteria are accepted to be equally important.If different weights of criteria are in question, number 9 formula is used:

$$\Gamma_{oi} = \sum_{j=1}^{n} [W_i(j)\gamma_{oi}(j)]$$

DATA SET AND METHODOLOGY

In this study, the performances of state banks in Turkish banking system was analyzed by using Grey Relational Analysis, being one of the performance measurement methods. There are three banks with state capital in Turkish banking sector. Four-year financial data were used during 2010-2013 period in the analysis. 15 financial ratios which showed capital adequacy, liquidity, active quality, profitability criteria were used to analyze the data. 15 financial ratios used in this analysis are shown below:

Table 1: Financial Ratios Used In Grey Relational Analysis Method

s1	Shareholder's equity / (Credit + Market+ Operational risk-based amount)
s2	Shareholder's equity / Total assets
s3	(Shareholder's equity – Fixed assets) / Total assets
s4	Net Balance Position / Shareholder's equity
a1	Financial assets (net) / Total assets
a2	Total Credits andDebt / Total assets
a3	Total Credits and Debt / Total funds collected
a4	Non-performing loan (gross) / Total Credits and Debt
l1	Liquid assets / Total assets
l2	Liquid assets / Short-term liabilities
l3	TP Liquid assets / Total assets
l4	TP Liquid assets / Shareholder's equity
k1	Net Profit (loss) / Total assets
k2	Net Profit (loss) / Shareholder's equity
k3	Continuing operations Pretax Profit (Loss) / Total assets

In this table **s** for capital adequacy, **a**for active quality, **l** for liquidity, and **k** is used for profitability.

Step 1: The Formation of Decision Matrix: There are financial ratios of the banks in Table 2 below.

Table 2: Financial Ratios by Years

	CAPITAL ADEQUACY				**ASSET QUALITY**				**LIQUIDITY**				**PROFITABILITY**		
2013	**s1**	**s2**	**s3**	**s4**	**a1**	**a2**	**a3**	**a4**	**l1**	**l2**	**l3**	**l4**	**k1**	**k2**	**k3**
ZİRAAT BANKASI	0,21	0,12	0,11	7,13	0,25	0,57	0,87	0,02	0,34	0,51	0,023	0,19	0,013	0,14	0,02

HALKBANK	0,22	0,15	0,14	5,51	0,1	0,66	1,01	0,03	0,23	0,61	0,028	0,18	0,015	0,15	0,02
VAKIFBANK	0,18	0,14	0,13	6,07	0,15	0,72	1,09	0,05	0,27	0,49	0,017	0,12	0,009	0,09	0,01
	CAPITAL ADEQUACY				**ASSET QUALITY**				**LIQUIDITY**				**PROFITABILITY**		
2012	**s1**	**s2**	**s3**	**s4**	**a1**	**a2**	**a3**	**a4**	**l1**	**l2**	**l3**	**l4**	**k1**	**k2**	**k3**
ZİRAAT BANKASI	0,24	0,12	0,12	6,83	0,25	0,49	0,69	0,03	0,37	0,94	0,046	0,36	0,016	0,16	0,02
HALKBANK	0,24	0,16	0,14	5,08	0,11	0,64	0,88	0,04	0,22	0,5	0,024	0,15	0,023	0,21	0,04
VAKIFBANK	0,2	0,08	0,14	5,33	0,14	0,71	1,03	0,05	0,27	0,87	0,032	0,2	0,014	0,12	0,02
	CAPITAL ADEQUACY				**ASSET QUALITY**				**LIQUIDITY**				**PROFITABILITY**		
2011	**s1**	**s2**	**s3**	**s4**	**a1**	**a2**	**a3**	**a4**	**l1**	**l2**	**l3**	**l4**	**k1**	**k2**	**k3**
ZİRAAT BANKASI	0,19	0,09	0,09	9,23	0,25	0,47	0,72	0,01	0,33	1,91	0,047	0,49	0,013	0,15	0,01
HALKBANK	0,24	0,14	0,12	6,05	0,12	0,6	0,87	0,04	0,19	0,9	0,04	0,28	0,022	0,22	0,04
VAKIFBANK	0,22	0,15	0,13	5,45	0,17	0,66	0,9	0,05	0,25	1,04	0,035	0,23	0,013	0,13	0,02
	CAPITAL ADEQUACY				**ASSET QUALITY**				**LIQUIDITY**				**PROFITABILITY**		
2010	**s1**	**s2**	**s3**	**s4**	**a1**	**a2**	**a3**	**a4**	**l1**	**l2**	**l3**	**l4**	**k1**	**k2**	**k3**
ZİRAAT BANKASI	0,25	0,1	0,09	8,79	0,27	0,39	0,5	0,01	0,36	1,63	0,059	0,58	0,024	0,27	0,03
HALKBANK	0,22	0,13	0,12	6,25	0,1	0,59	0,81	0,05	0,18	1,19	0,052	0,38	0,027	0,26	0,04
VAKIFBANK	0,24	0,15	0,13	5,4	0,21	0,59	0,89	0,07	0,29	1,73	0,05	0,32	0,015	0,13	0,02

As can be seen from Table 2 Halkbank has the highest capital adequacy in 2013. Concerning active quality Vakıfbank is in a better situation in comparison with other banks. When liquidity values are evaluated, the values of ZiraatBankası and Halkbank are higher than other banks. When profitability rates are investigated, Halkbank has the highest rates as in capital adequacy values.

In 2012, Halkbank has the highest rate in terms of capital adequacy. Viewed from a general perspective, active quality, Halkbank is again better than the other banks. ZiraatBankası is better than the others when its liquidity rates are compared. When profitability rates are concerned, Halkbank has the highest values.

In 2011, Halkbank has the highest rate with regards to capital adequacy. When its active quality is seen from a general perspective, Vakıfbank is better than the other banks. As to the liquidity rates, ZiraatBankası is of the highest rates. When profitability rates are evaluated, Halkbank has the highest values among others.

In 2010, ZiraatBankası and Vakıfbank are of the highest capital adequacy rates. When its active quality is viewed from a general aspect, Vakıfbank is superior to the other banks. ZiraatBankası is better than the others when its liquidity rates are compared. In terms of profitability rates, Halkbank has the highest values in comparison with other state banks.

Table 3: Decision Matrix:

	CAPITAL ADEQUACY				**ASSET QUALITY**				**LIQUIDITY**				**PROFITABILITY**		
AVERAGE	**s1**	**s2**	**s3**	**s4**	**a1**	**a2**	**a3**	**a4**	**l1**	**l2**	**l3**	**l4**	**k1**	**k2**	**k3**
ZİRAAT BANKASI	0,22	0,10	0,10	7,99	0,25	0,48	0,69	0,02	0,35	1,25	0,044	0,41	0,016	0,18	0,02
HALKBANK	0,23	0,14	0,13	5,72	0,10	0,62	0,89	0,04	0,20	0,8	0,036	0,25	0,022	0,21	0,04

VAKIFBANK	0,21	0,13	0,133	5,56	0,16	0,67	0,97	0,05	0,27	1,03	0,033	0,22	0,012	0,12	0,02

As can be inferred from the table, Halkbank has the highest values for capital adequacy. Viewed from a general perspective, Vakıfbank is in superior position to the other banks concerning active quality. Liquidity rates are concerned, ZiraatBankası and Halkbank are of the highest values. When the profitability rates are evaluated, Halkbank has the highest values.

Step 2: The Formation of Reference Matrix

Table 4: Reference Matrix

	s1	**s2**	**s3**	**s4**	**a1**	**a2**	**a3**	**a4**	**l1**	**l2**	**l3**	**l4**	**k1**	**k2**	**k3**
REFERANS	**0,23**	**0,14**	**0,133**	**7,99**	**0,25**	**0,67**	**0,97**	**0,05**	**0,35**	**1,25**	**0,044**	**0,41**	**0,02**	**0,21**	**0,04**
ZİRAAT BANKASI	0,22	0,10	0,10	7,99	0,25	0,48	0,69	0,02	0,35	1,25	0,044	0,41	0,02	0,18	0,02
HALKBANK	0,23	0,14	0,130	5,72	0,10	0,62	0,89	0,04	0,20	0,8	0,036	0,25	0,02	0,21	0,04
VAKIFBANK	0,21	0,13	0,133	5,56	0,16	0,67	0,97	0,05	0,27	1,03	0,033	0,22	0,01	0,12	0,02

Reference matrix was formed by using the highest ratios as reference.

Step 3: Operation of Normalization and Formation of Normalization Matrix

Table 5: Normalized Matrix

	s1	**s2**	**s3**	**s4**	**a1**	**a2**	**a3**	**a4**	**l1**	**l2**	**l3**	**l4**	**k1**	**k2**	**k3**
ZİRAAT BANKASI	0,50	0,00	0,00	1,00	1,00	0,00	0,00	0,00	1,00	1,00	1,00	1,00	1,00	0,66	0,00
HALKBANK	1,00	1,00	0,91	0,06	0,00	0,73	0,71	0,66	0,00	0,00	0,27	0,16	1,00	1,00	1,00
VAKIFBANK	0,00	0,75	1,00	0,00	0,40	1,00	1,00	1,00	0,46	0,51	0,00	0,00	0,00	0,00	0,00

Normalized matrix was formed by using reference values for ratios.

Step 4: The Formation of Absolute Values

Table 6: Absolute Values Table

	s1	**s2**	**s3**	**s4**	**a1**	**a2**	**a3**	**a4**	**l1**	**l2**	**l3**	**l4**	**k1**	**k2**	**k3**
ZİRAAT	0,50	1,00	1,00	0,00	0,00	1,00	1,00	1,00	0,00	0,00	0,00	0,00	0,00	0,34	1,00
HALKBANK	0,00	0,00	0,09	0,94	1,00	0,27	0,29	0,34	1,00	1,00	0,73	0,84	0,00	0,00	0,00
VAKIFBANK	1,00	0,25	0,00	1,00	0,60	0,00	0,00	0,00	0,54	0,49	1,00	1,00	1,00	1,00	1,00

Absolute Values Table was formed by using number 6 Formula.

Step 5: The Formation of Grey Relational Coefficient Matrix:

Table 7: Grey Relational Coefficient Matrix

	s1	**s2**	**s3**	**s4**	**a1**	**a2**	**a3**	**a4**	**l1**	**l2**	**l3**	**l4**	**k1**	**k2**	**k3**
ZİRAAT BANKASI	0,50	0,33	0,33	1,00	1,00	0,33	0,33	0,33	1,00	1,00	1,00	1,00	1,00	0,59	0,33

HALKBANK	1,00	1,00	0,85	0,34	0,33	0,64	0,63	0,59	0,33	0,33	0,41	0,37	1,00	1,00	1,00
VAKIFBANK	0,33	0,66	1,00	0,33	0,45	1,00	1,00	1,00	0,48	0,51	0,33	0,33	0,33	0,33	0,33

Grey Relational Coefficient Matrix was formed by using number 7 Formula.

Step 6: The Degree of Relation Calculation

Table 8: The Degree of Relation

	CAPITAL ADEQUACY		ASSET QUALITY		LIQUIDITY		PROFITABILITY		DEGREE OF RELATION	
	Degree	**Rank**	**Degree**	**Rank**	**Degree**	**Rank**	**Degree**	**Rank**	**Degree**	**Rank**
ZİRAAT BANKASI	0,54	**3**	0,49	**3**	1,00	**1**	0,48	**2**	0,63	**2**
HALKBANK	0,80	**1**	0,54	**2**	0,36	**3**	1,00	**1**	0,68	**1**
VAKIFBANK	0,58	**2**	0,86	**1**	0,41	**2**	0,33	**3**	0,55	**3**

As can be understood from Table 8, among three banks Halkbank is ranked as 1st, ZiraatBankası is 2nd and Vakıfbank is ranked as 3rd according to Grey Relational Analysis method.

CONCLUSION

Performance measurement is a crucial feedback source for establishments. Along with these results, efficiency and productivity of establishments, employers and managers are evaluated.Therefore, the things to improve an establishment's performance arise by revealing the weak and strong aspects of the strategic plans applied by the managers. As in every sector, productivity and efficiency are of central importance for banking sector, being one of the milestones of national economy, too. The environment of confidence which is provided by banking sector in the society will lead to much more savings to the national economy. That the banks with state capital pay more attention to public welfare and keep profit motive in the background forms the basic difference between the state and private banks.

In particular, the presence of banks with state capital during crisis periods decreases contingent panic situation in the society. Therefore, increasing the productivity and efficiency of the banks comes into prominence. In this study, the performances of banks with state capital in Turkey were investigated via Grey Relational method. While applying Grey Relational Analysis, 15 financial ratios were used in order to investigate the capital adequacy, active quality, liquidity, and productivity of ZiraatBankası, Halkbank, and Vakıfbank, being the banks with state capital in Turkey. The analysis comprised of the years between 2010 and 2013. As a result of the analysis, Halkbank is ranked as 1st, ZiraatBankası 2nd and Vakıfbank is ranked as 3rdwith regards to performance in accordance with Grey Relational Analysis method.

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