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The Financial Performance of the Commercial Banks In Crisis Period: Evidence From Turkey As an Emerging Market

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Abstract

Emerging markets have been heavily affected by the global crisis due to integration with the global economy through trade and capital flows. For this reason, the findings in this paper are of great help and interest to international investors considering that Turkey is one of the major emerging markets in Europe with a linkage with international markets. The objective of this study is to identify the impacts of the financial crisis in the performances of the Turkish commercial banks by their ownership structures (private or public) over the years between 2005 and 2009 by using Grey Relation Analysis (GRA) method and to determine the financial ratios in their financial performances. The paper considers a five-year period encompassing the year of the crisis as well as two years before and after the financial turmoil. The banks, by their capital structures, are ranked based on their performances by use of the GRA method observing 14 financial ratios with respect to profitability, liquidity, active quality and capital sufficiency. Based on the findings in the paper, the performance ranking has been transformed from foreign-public-private banks before the crisis (2005-2006) to private-foreign-public banks during the crisis (2008-2009).

Keywords: Financial Crisis, Turkish Banking Sector, Capital Structure, Financial Performance, Financial Ratios, Grey Relation Analysis

1. Introduction

Banks, the key components of the financial sector, are defined as financial mediators accepting funds from the individual holders of saving accounts and lending these funds to the consumer or investors. The commercial banks that are collecting deposits and further distributing them as loans hold the greatest share in the banking sector in the world. Over the last 25 years, there have been crucial financial crises in the developing countries that caused large amount of financial and economic costs and affected the banks. Regardless of whether they partially or wholly affect the banking system, the problems in the system negatively influence the national economy. The countries experiencing systemic crises that spread through a strong mechanism attempt to identify the defects in the banking system to consolidate the financial structure. These attempts sometimes focus on provision of capital to the banks and sometimes on liquidation of the unsuccessful banks (Erdoğan, 2006:61). A similar practice was observed during a financial crisis in Turkish banking system in 2000 and 2001. A number of banks were taken over the states due to their poor performance in connection with their follow to act in conformity with the market rules; some were financially supported to make sure that they operate smoothly within the market while some were taken out of the system.

The financial crisis that erupted in the subprime mortgage markets in the US in 2007 undermined the element of trust after being transformed into a global liquidity and loan crisis. In addition, the bankruptcy of giant finance corporations led to new financial and banking crises and dramatic declines in the stock exchanges as well as visible increases in the currency rates. Introduction of additional measures in the Turkish banking sector and effective control over the saving banks alleviate the impact of global crisis (Apak and Aytac, 2009: 223-224). Even though the 2001 crisis was overcome by restructuring attempts, the Turkish Banking sector is likely to be affected by a global fiscal crisis in case of failure to introduce corporate measures due to the lack of an operating mortgage market in the

country.

The banks hold a special place in the overall national economy because of their function as a financial mediator that determine resource distribution; for this reason, additional measures are required to ensure that they are not affected by the economic and financial crises. To this end, it is fair to argue that the banking system occupies a crucially central place in the economic growth. Concepts like effectiveness and productivity in most competitive environments become equally important. The competition all around the world in the banking sectors requires the banks to use their resources more effectively. Like all other units in the economy, the banks need to take effective measures in order to minimize the loss caused in connection with the bitter competition and other peripheral factors. The efficiency and effectiveness of the banking segment whose share and weight in the Turkish fiscal system is increasingly becoming more important and visible deserves further attention and current research.

This paper analyzes the impact of the most recent financial crisis in Turkey on the performance of the commercial banks over the period between 2005 and 2009 by using the GRA technique. The study claims originality because of heavy focus on comparing the banks by sectors, its ability to analyze in reliance on less number of data by virtue of the sector average values and figures and consideration of the Turkish banking system. There is no standard on how to determine the financial ratios to be included in the analysis in the study of the performance of the banks by help of the financial ratios. The Camels classification where the financial indicators are grouped as profitability, liquidity, active quality and capital adequacy is considered in the study. For this reason, the research differs from other literature entries by focusing on inclusion of the different financial indicators in the analysis. The work should also regarded as a first used in the analysis of the performance of the Turkish banking system by reliance on the GRA considering that multi-variable statistical techniques display serious problems including failure to verify the hypothesis and the requirement to study so many variables.

This study seeks to achieve the following goals:

1. Use four financial indicators to classify 14 items of financial ratios into research variables and use the GRA to find significant financial ratio variables and financial indicators that affect the financial performance of commercial banks according to capital structures.

2. Sorting corresponding financial performances of commercial banks by capital structure and comparing them for pre-crisis (2005-2007), crisis year (2007) and post-crisis (2008-2009) periods.

3. Identify the effective financial indicators for each capital group bank in their financial achievements during the periods under review, ranking the four indicators for Turkish banking system and evaluating them in terms of financial crisis

1.1 Turkish Banking Sector during (2005-2009) Period

The 2007 financial crisis can be analyzed in three different stages encompassing the period between 2005 and 2009; the Turkish banking system displayed different features in each of these stages:

2005-2006: The Turkish banking sector that experienced a period of crisis in the aftermath of the 2001 financial crisis has survived the process because of bold reforms and tight measures. The number of banks which significantly declined after the crisis remained stable during the period between 2005 and 2006 when the impact of the crisis has become less visible whereas the number of branches and staff has increased during the same period. As a result of the recent monetary and fiscal policies, the inflation rate has declined and the accompanying state of trust also reduced the overall interest rates. In addition, the abundant liquidity enabled the state authorities to borrow at reasonable terms, allowing all economic actors to act confidently in external borrowing. Subsequent to the monetary substitution tendency and inflationist pressures in Turkish economy, in 2005 and 2006, the tendency was reversed as a form of interest in the Turkish currency after the 2001 crisis.
Decline in interest rates, tendency to switch to the Turkish currency and the reduction in the public borrowing need because of tight fiscal measures dramatically changed the structure of the banking sector. The relative contraction in the amount of the public shares, the crucial area of placement for the banks in times of high inflation rate took the banks to other sources of revenue. However, at the same time, a rapid increase was observed in the consumer loans because of the reduction in the interest rates. A structural change was observed in the active nature of the banking

sector where the movable asset weight declined and the share of the loans has increased. A limited change was observed in the passive side where the deposits remained the same and the size of the loans has expanded. The course of the interest rates is crucial because of its role to determine the costs in the banking sector. Reliance of the banks on loans as a source of revenue as well as the decline in the interest rates in the aftermath of the crisis enlarged the size of the loans. The share of the operational activity revenues has grown in the sector, attaining high level of growth and profitability.

The process of restructuring that started in 2004 in Turkey as part of the EU perspective. With the introduction of BASEL II, the need of the developed countries' banks for further capital has declined whereas the need for capital in the banks in the in the sector featuring foreign mergers and acquisitions is closely related to BASEL II as well as capital inflow developing countries has grown. This and the merger of the banks of the countries with a visible comparative advantage with the banks in the developing countries started a process of consolidation in form of acquisitions. Over the period between 2005 and 2006 in Turkey, capital strength, risk management and product diversity as well as other similar fields featured a visible increase in the frequency of the strategic partnerships with strong foreign banks (Ziraat Report, 2001).

2007: 2007, a year when a major financial crisis erupted in Turkey, has been fairly hectic in terms of political and economic developments. The primary reason for internal vibrancy has been the general election as well as presidency of the national assembly and presidential election. The international markets had to deal with mortgage crisis in the US and its major repercussions upon global economy and financial sector. All these developments negatively affected risk perceptions, creating an environment of uncertainty and limiting economic performance. The Turkish banking system has pursued a cautious policy in 2007. The banks have been particularly careful to remain in liquid form. International borrowing has been limited because of growing demand for foreign currency. Depending on the preference for increased liquidity and declining economic growth rate, the expansion of the loans has slowed down in the first half, regaining momentum in the second. The new practice has reduced the capital sufficiency ratio by two points. The competition in the banking sector has become particularly bitter (Bankalarimiz, 2007).

2008-2009: The primary factors affecting the economic performance in 2008 have been global economic instabilities and fluctuations, contraction of the financial sector and the decline of the trade volume and growth. Through the end of 2007, instability and contraction has become visible in the US which spread all over the world in 2008. A visible and rapid decline has been observed in the amount of borrowable sources in financial markets. Risk perception has changed significantly as financial conditions were becoming poorer. The developing as well as the developed countries were negatively affected by the outflow of net capital. During this period, what most worried the banks was uncertainty with respect to the management of the outstanding external debts. For this reason, the banks attempted to consolidate currency liquidity in an attempt to fulfill their short term obligations without any delay. Owing to the Central Bank's efforts, no liquidity issue has been observed despite decline in the liquidity of the Turkish currency. The Banking Supervision and Monitoring Agency (BSMA) asked the banks not to distribute their profits in 2008 (Bankalarımız, 2008).

In economic terms, the year 2009 has been pretty tough. The finance sector, amongst other, has been strongly affected by the global crisis. Economic activities have declined significantly in Turkey along with the inflation rate and the interest rates. However, the Turkish banking sector has survived the financial turmoil owing to its firm structure, fair distribution of the risks as well as effective public checks and successful risk management. As a result, the sector did not create any sort of burden over the state treasury and national economy. The banking sector even extended support to provide funds for economic activities. A number of countries introduced assurance for the deposits held at the banks, Turkish authorities did not follow suit, avoiding extreme guarantees without any change in the previous settings. The banking sector has been a success story of Turkish national economy in 2009. The primary reason for this success was the visible confidence in Turkish currency and strong balance structure. The growing size of equity capitals, healthy distribution of the active assets, high rate of liquidity, effective risk management and the declining interest rate positively affected the performance of the banks (Bankalarımız, 2009).

2. Literature Review

A number of academic studies have been made over the last decade on the effectiveness of the banks. While the

samples and the variables were significantly different in these cases, the common objective of these studies was to measure or determine the effectiveness and performance of the banks studied and reviewed. There are different studies in this field focusing on different aspects and countries by reliance on a set of diverse methods (Noulas,1997; Ayadi et al.,1998; Saha and Ravisankar,2000; Ben Naceur and Goaied,2001; Casu and Molyneux,2003).

The studies done on the Turkish Banking System have shown a similarity with international literature (Oral and Yolalan 1992; Aydoğan and Booth 1996; Jackson and Fethi 2000; Mercan and Yolalan 2001; Kaya 2001; Isik and Hassan 2002; Mercan et al. 2003; Emel et al. 2003; Isik and Hassan 2003; Demir and Astarcıoğlu 2007; Seçme et al. 2009). Eken (1997) uses risk-profitability approach to measure the performance of the banks. The first stage of the two-stage analytical method in the study picks the profitability rates of the banks as dependent variable and the standard deviation as independent variable to estimate the differences between the effectiveness of the banks. He finds that the foreign banks are more effective than the national banks. ,

Mercan et al (2003) investigated financial performances of Turkish banking sector by using DEA for 1989-1999 and observed the effects of scale of the mode of ownership on bank behavior. They found that foreign and privately owned Turkish commercial banks outperformed their state-owned competitors, and while the performance of small and medium scale banks deteriorated considerably after 1994, the relative performance of large banks was better. Kasman (2003) studies the efficiency of the banks during the periods of financial crisis (2001 and 2002). The study relies on Stochastic approach by using a dataset of 29 banks. The findings of the study relying on an efficiency analysis of 3 inputs and 2 outputs confirm that the average effectiveness of the public banks is better than the average effectiveness of private and foreign banks. Cihangir (2005) has done research on the performances of the Turkish banks by the size of their active assets. Çukur (2005) determines in reliance on the analysis of a model based on 3 inputs and 3 outputs for 33 banks during the period between 1997 and 2000 that foreign-capital commercial banks are the most effective.

Demir and Astarcıoğlu (2007), based on the data of the commercial banks affiliated with the Istanbul Stock Exchange (IMKB) during the period between 1999 and 2005 in Turkey, seek to estimate the performance of these banks for the year 2006 and test the effectiveness of these banks. Keçek and Cinser (2008) use the ratios compiled from the 2005 financial sheets of the Turkish commercial banks to classify the banks sharing similar aspects and features; in the study, they employ multi-variable cluster analysis. In an attempt to confirm the success of the classification done later and to accentuate the variables with greater values in this classification, they apply discriminant analysis to the cluster analysis.

Behdioğlu and Özcan (2009) employ Data Envelopment Analysis for the data of 29 commercial banks in Turkey for the period between 1999 and 2005. They conclude that the average effectiveness of the commercial banks during this period is 43.3 pct, with the foreign capital banks showing the highest performance. Girginer (2010) examined the effects of current financial crisis started in USA in 2007 on the performance of Turkish commercial banks for three years (pre-crisis, crisis and post-crisis period) by using Data Envelopment Analysis (DEA). The analysis finds that Ziraat Banki, a public bank, is effective in the DEA model, followed by Anadolu Bank that ranks second in the overall standing. It is interesting to note that the private banks have been heavily affected by the most recent financial crisis, compared to the public banks that were less influenced.

GRA has stood out as a widely used technique in the measurement of the performances of the banks. Cheng (2006) analyzes the Taiwanese commercial banks in terms of their performance, finding that there is a correlation between the customer features of the commercial banks and financial performance; he, relying on GRA method, also confirms that the profitability indicators hold the greatest share in financial performance. Ho and Wu (2006) measure the performance of three biggest banks in Austria by using GRA focused on financial ratios, concluding that the liquid assets hold the greatest role in the performances of the banks. Cheng et al (2010) evaluate the business performance of Wealth Management Banks in Taiwan by applying the analytic hierarchy process (AHP) and GRA.

As the literature review reveals, there is no single academic study comparing the financial performances of the Turkish capital banks by their capital structures and determining the most influential financial indicators in the success of these sectors by reliance on GRA method. In Turkey, there are a few of o study in which financial performances of commercial banks are compared based on their capital structures and determination of the financial indicators which are effective in financial success of these(for example, Isik and Hassan 2002; Isik and Hassan 2003), but none of them have used GRA in analyze. This study will be performed based on such a categorization in the Turkish Banking system and reveal findings based on the comparative analysis. These findings will be provide important information specifically for the banks comprising sub-sectors according to their capital structures in the

Turkish Banking system and also for banks with foreign capital planning to enter this study.

3. Methodology

Use of a diverse set of financial ratios is fairly commonplace in the evaluation of the performances of the banks. This allows stronger interpretations on the financial success and profitability of the banks as well as their economic and financial outlook, also enabling the analysts to have comparable data. In addition, analysis of the financial ratios by categories including profitability and liquidity facilitates the interpretation of the financial ratios based on the relations between these groups and categories.

There are some problems in the performance analysis based on the financial ratios in terms of methodology. Comparing each of the banks in an expanding sector relying on the same financial ratios makes the analysis and data retrieval more difficult. Therefore, the ability to compare the financial ratios based on the sector and sub-sector financial sectors and make an order of the sectors by their financial success will simplify the analysis and offer a better interpretation of the findings.

Yet another problem is concerned with the homogeneity of the data. There are a huge number of inputs and outputs in the banking sector. However, there is no commonly accepted standard or method on how to pick these inputs and outputs. Therefore, it is difficult to draw conclusions on the performance of a bank or the entire sector by relying on a single rate or ratio in a system with a number of inputs and outputs. Moreover, a variable picked as input by a certain approach may be considered as an output in another, leading to serious problems with the comparisons and interpretations compiled in reliance on these variables. Therefore, there is need for a comprehensive technique that will help the researchers evaluate heterogeneous variables in a single approach.

The techniques employed in the analysis also pose some problems with respect to the measurement of the financial performance of the banks. Most research methods on the relationship between attributes and financial performance and achievements of commercial banks used the traditional statistical methods such as factor analysis and regression analysis as well as mathematical models benchmarking the efficiency based on homogenous inputs and outputs such as DEA (Ferrier and Lovell, 1990; Yeh, 1996; Grifell and Lovell, 1997; Paradi and Schaffnit, 2004; Ravi et. al., (2008; Kao and Liu, 2009; Lin and Zhang, 2009). But, there are many limitations to using traditional statistical methods have needed to analyze a large amount of the data and the distribution of the data must be normal distribution. Under such conditions, the results generated by conventional statistical techniques may not be acceptable without sufficient data to achieve desired confidence levels. However, in a difficult situation, to obtain the interior data from commercial banks, it is good to use traditional multivariate statistical methods particularly if there is stable reliability for the research results. In contrast, grey system theory can be used to identify major correlations among factors of a system with a relatively small amount of data.

Deng (1982) introduced “The Grey System Theory” to supplement the limitations of using traditional statistical methods. Grey System Analysis (GRA) is useful for capturing the correlations between the reference factor and other factors which can be compared within a system (Deng, 1988; Huang, et al., 2008). One of the features of GRA is that both qualitative and quantitative relationship can be identified among complex factors with insufficient information (Cheng et al., 2010). Because of these features GRA has been extensively applied in many fields, such as financial institutions, hospitals, banks, airlines firms, etc.

3.1 Selection of Financial Ratios and Indicators

There are a wide range of financial ratios that could be used for financial performance of commercial banks. The Banks Association of Turkey has categorized the ratios used in the analysis of financial statements of banks based on the CAMELS[1] approach in performance evaluation of banks as; Capital Adequacy, Quality of Assets, Liquidity and Profitability. The Banks Association of Turkey’s CAMELS based categorization has been used in this study, too. The four categories the financial ratios were gathered under (capital adequacy, quality of assets, liquidity, and profitability) were taken as financial indicators and analysis was done based on average values calculated for each capital group for every year in 2005-2009 period. Financial categories used in this study and 14 financial ratios in total employed

[1] CAMELS evaluation system is generally used for on-site supervision. In this combined performance value used as a means of off-site and on-site supervision in order to guarantee organized and safe operation of banks, C means capital adequacy, A asset quality, M management adequacy, E earnings, L liquidity, and S is sensitivity to market risk.

in these categories are shown in Table1. The financial figures were retrieved from the official website of the Turkish Union of Banks (www. tbb.org.tr).

[Insert .Table 1 about here]

3.2 Determining financial performance of commercial banks with different capital structures by using GRA

The procedure for calculating the GRA is as follows:

3.2.1 Calculate the Grey Relation Grade

Let X_0 be the referential series with k entities (or criteria such as financial ratios in this study) of X_1, X_2,, …X_i, ….X_N (or N measurement criteria). Then

$X_0=\{x_0(1), x_0(2), \ldots, x_0(k)\}$,
$X_1=\{x_1(1), x_1(2), \ldots, x_1(k)\}$,
$X_i=\{x_i(1), x_i(2), \ldots, x_i(k)\}$,
$X_N=\{x_N(1), x_N(2), \ldots, x_N(k)\}$

The grey relation coefficient between the compared series X_i and the referential series of X_0 at the j-th entity is defined as:

$$\gamma_{0i}(j)=\frac{\Delta\min+\Delta\max}{\Delta_{0i}(j)+\Delta\max} \qquad (1)$$

Where $\Delta_{0i}(j)$ is the absolute value of difference between X_0 and X_i at the j-th entity, that is $\Delta_{0i}(j)=\left|x_0(j)-x_i(j)\right|$, and $\Delta_{\max}=Max_i \max_j \Delta_{0i}(j)$, $\Delta_{\min}=Min_i \min_j \Delta_{0i}(j)$
The grey relational grade (GRG) for series of X_i is given as:

$$\Gamma_{0i}=\sum_{j=1}^{K} w_j \gamma_{0i}(j) \qquad (2)$$

Where, w_j is the weight of j-th entity. If it is not necessary to apply the weight, take $\omega_j=\frac{1}{K}$ as an average.

3.2.2 Data Normalization (or Data Dimensionless)

Before calculating the grey relation coefficients, the data series can be treated, based on the following three kinds of situation and the linearity of data normalization, to avoid distorting the normalized data (Hsia and Wu, 1997).
These are:

a) Benefit target: Upper-bound effectiveness measuring (i.e. larger-the-better)

$$x_i^*(j)=\frac{x_i(j)-\min_j x_i(j)}{\max_j x_i(j)-\min_j x_i(j)} \qquad (3)$$

b) Cost Target: Lower bound effectiveness measuring (i.e. smaller-the-better)

$$x_i^*(j)=\frac{\max_j x_i(j)-x_i(j)}{\max_j x_i(j)-\min_j x_i(j)} \qquad (4)$$

c) Medium Target: Moderate effectiveness measuring (i.e. nominal-the- best)

If $\min_j x_i(j) \le x_{ob}(j) \le \max_j x_i(j)$, then

$$x_i^*(j) = \frac{\left|x_i(j) - x_{ob}(j)\right|}{\max_j x_i(j) - \min_j x_i(j)} \quad (5)$$

If $\max_j x_i(j) \le x_{ob}(j)$, then

$$x_i^*(j) = \frac{x_i(j) - \min_j x_i(j)}{x_{ob}(j) - \min_j x_i(j)} \quad (6)$$

If $x_{ob}(j) \le \min_j x_i(j)$, then

$$x_i^*(j) = \frac{\max_j x_i(j) - x_i(j)}{\max_j x_i(j) - x_{ob}(j)} \quad (7)$$

Where $x_{ob}(j)$ is the objective value of entity j.
The GRA calculation process explained above has been applied as shown below in steps in line with the purpose of the study

.

Step 1: Establishing decision making matrix
This decision making matrix is shown Table 2.

[Insert .Table 2 about here]

Step 2: Normalizing Data
After establishing a decision making matrix (Table 2), it is established referential series can be X_0 = {1.00, 1.00, 1.00, …, 1.00}. The commercial banks due to capital structures are X_1, X_2 and X_3.
Data are normalized for 14 criteria (financial ratios) by using equations (3) (for financial ratios other than FR10) and (4) (for only FR10). Table 3 summarizes normalization data.

[Insert .Table 3 about here]

Step 3: Computing absolute values [$\Delta_{0i}(j)$]
$\Delta_{0i}(j)$, is the absolute value of difference X_0 (differential series) and Xi at the j-th financial ratio. Computed $\Delta_{0i}(j)$ is displayed Table 4.

[Insert .Table 4 about here]

Step 4: Computing Grey Relation Coefficients [$\gamma_{0i}(j)$]
The relational coefficients, $\gamma_{0i}(j)$ of the compared series are computed using equation 3 (for extract FR10) and 4 (only for FR10). Table 5 presents the results.

[Insert .Table 5 about here]

Step 5: Computing Grey Relation Grade
Since equal weight was given to all financial ratios, weights take on value 1 in equation 2. Therefore, equation 2 has

been applied for each group of banks as the ratio of the sum of grey relation coefficients by the number of financial ratios.

[Insert .Table 6 about here]
[Insert .Table 7 about here]

4. Empirical Findings

This study used four financial indicators to classify 14 items of financial ratios into research parameters and used the whole Grey Relation Analysis to find the significant financial indicators for financial performance of commercial banks by their capital structures and to rank by their financial performances.
Research results could be summarized as follows separately for 2005-2009, pre-crisis (2005-2006), crisis year (2007) and post-crisis (2008-2009):

4.1 For 2005-2009

1. The ranking of the overall performances of the banks for the period under review (2005-2009) is as follows: public (68.19%)>foreign (67.89)> private (54.99%). (See T*able 6 and Table 7).*

Even though the public banks hold the first place in terms of performance for the five-year period, the order becomes as follows in terms of annual performances: for 2005, foreign banks (76.26%), for 2006, public banks (74.25%), for 2007, public banks (72.29%), for 2008, private (65.49%) and for 2009, private banks (66.59%).

2. When financial indicators, which are effective in performances of commercial banks by their capital compositions, are analyzed for 2005-2009 period; the ranking by their degree of relations is as follows:

3. Profitability > Liquidity > Quality of assets > Capital adequacy

4. Financial performance ranking by financial indicators, on the other hand, was found to be as follows (See Table 9):

- Performance ranking by profitability is; Pubic banks> foreign banks> private banks.

The high performance of state owned banks, especially in terms of profitability, is due to the fact that these banks make use of financial leverage quite significantly. State owned banks may be even more effective should they emphasize asset quality and liquidity. Foreign banks, on the other hand, may increase their profitability should they make use of financial leverage more.

- Performance ranking by liquidity; Public banks > Private banks > Foreign banks

In banks, liquidity risk is extremely important for continuation of the operation of banks. Since banks typically make use of financial leverage to a great extent, they are in position to invest a significant portion of their funds into liquid assets. It will be the right approach for banks with private and foreign capital to direct their extra liquidity towards fields which will create interest income for them.

- Performance ranking by quality of assets is; foreign banks> private banks > public banks.

Quality of assets shows that banks invest a significant portion of their assets in assets with returns. According to the above ranking, banks with foreign capital are more successful in doing so compared to other groups of banks. State owned banks may enhance their effectiveness in this area should they emphasize asset effectiveness a little bit more.

- Performance ranking by capital adequacy is; Foreign banks > Private banks > Public banks.

The capital adequacy standard ratios of banks are very close to each other. This ratio's being almost twice as big as Banking Regulation and Supervision Authority (BRSA) criterion is perceived as a positive situation in terms of capital adequacy of banks. However, the fact that the share of banks' shareholders' equity is low in asset financing indicates that banks opt for foreign funds in financing.

5. As a result of the analysis of how effective financial ratios are in financial performances of banks, the financial ratios in the top five are ranked as follows depending on degrees of relation: FR14>FR4 >FR1>FR3>FR9 (See Table 10).

4.2 For pre-crisis, crisis year and post-crisis periods

1. The performance ranking of the banks by their capital composition is given below in terms of change by the period before the crisis, during the crisis and after the crisis (See Table 8)

- For the period before the crisis (2005-2006), foreign > public > private

- During the crisis year, public > foreign > private
- During the two years after the crisis (2008-2009), private > foreign > public

[Insert .Table 8 about here]

2. The indicators influential in the overall performance appear to be as follows (See Table 9):

- Pre-crisis period, profitability > active quality > liquidity > capital adequacy
- During crisis, capital adequacy > active quality > profitability > liquidity
- Post-crisis period, capital adequacy > profitability > liquidity > active quality

[Insert .Table 9 about here]

3. The financial ratios that proved to be influential in the performance of the banks are as follows (See Table 10):

- Pre-crisis, FR1>FR3>FR4>FR10>FR9
- During the crisis, FR14>FR12>FR9>FR3>FR4
- Post-crisis, FR4>FR6>FR14>FR1>FR11

[Insert .Table 10 about here]

5. Discussions and Conclusions

The successful performance of the public banks during the period under review can be explained as follows: Three out of the five largest banks in terms of total amount of active assets in Turkey are public banks. Because their actives are tied to longer terms than the passives, and the interest rates are in decline, the public and private banks had the opportunity to make larger amounts of profits during the period under review. In addition, the public and private banks' ability to increase their service revenues, fees and commissions and the increased amount of the net interest revenues in connection with the growing amount of loans positively affected their profitability. The reason for the greater profitability of the public banks in times of crisis is the perception held by the deposit savers as well as the loan users that the public banks are actually safe havens. The reason for the lower profitability of the foreign banks is the reflexive response and reaction of the pre-crisis large sums of deficits and of the foreign capital to the changes in the economy. The fact that the loan stock has increased at a greater pace than the equity capitals of the public and private banks and that the rapid increases in the items with high-risk evaluation positively affected the active quality and capital adequacy of the foreign-capital banks. In 2008, the public banks, in response to the higher risk perception on the overall economy, kept increasing the amount of their currency assets and improving the quality of the loan stock. Their performance was negatively affected in terms of liquidity as a result of the stronger preference over liquid assets.

An assessment in terms of the impacts of the 2007 crisis by the financial categories reveals that tight measures and controls by the Central Bank and BSMA over the Turkish banks in respect to the capital adequacy preserved the banks from any potential harm in connection with the global financial crisis. In the period between 2008 and 2009 that was still featuring the impacts of the crisis, it was observed that the public and private banks were switched in the overall ranking in terms of overall performance by virtue of their focus on capital adequacy and profitability whereas the foreign banks preserved their 2nd place in the ranking. Likewise, in the post-crisis period, movable assets have become more important because of change in the size of liquid assets and risk perception depending on the growing salience of the currency liquidity and the amount of loans granted has declined as a result of the decline in the supply and demand. This negatively affected the active quality of the banks.

In sum, the banks have to pay attention to make sure that their capital adequacy rate is high in order to secure market confidence in times of crisis. Likewise, the move of the foreign capital banks to local deposits will positively affect their profitability during the same periods. In order to keep Turkish banks safe from any potential harm of global financial crisis, the Central Bank and BSMA should impose cleaver tight measures and controls over the Turkish banks in respect to the capital adequacy. The control and tight measures should not be in the way that limits the banks operation and growth. Since the greater profitability of the public banks in times of crisis is due to the perception held by the deposit savers as well as the loan users that the public banks are actually safe havens, the

public banks should keep this perception alive and promote it among the large number of the society. The banks should increase their service revenues, fees and commission and the interest rate to certain level that could provide customer satisfaction and profitability.

Future studies can use different categories of financial ratios to identify the performance of certain banks by using GRA method.

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APPENDIX

Table 1: The Financial Indicators and the Financial Ratios in This Study

Financial Indicators	Financial Ratio	Formula	Target
Profitability	FR1	Net profit (loss)/Total assets	Max
	FR2	Net profit (loss)/Shareholders' equity	Max
	FR3	Profit before taxes/Total assets	Max
	FR4	Net period profit (loss)/Paid-in capital	Max
Liquidity	FR5	Liquid assets/Total assets	Max
	FR6	Liquid assets/Short-term liabilities	Max
	FR7	Financial assets (net)/Total assets	Max

Quality of Assets	FR8	Total loans/Total assets	Max
	FR9	Total loans/Total deposits	Max
	FR10	Loans under surveillance (gross)/Total loans	Min
Capital Adequacy	FR11	Shareholders' Equity/Credit+Market+Amount subject to operational risk)	Max
	FR12	Shareholders' Equity/Total assets	Max
	FR13	(Shareholders' Equity – Non-Current Assets)/Total Assets	Max
	FR14	Shareholders' Equity/(Deposit+Non-Deposit Funds)	Max

Table 2: The Decision making matrix (2005-2009)

Banks		***Financial Ratios***													
		Profitability				Liquidity		Quality of Assets				Capital Adequacy			
		FR1	FR2	FR3	FR4	FR5	FR6	FR7	FR8	FR9	FR10	FR11	FR12	FR13	FR14
2005	Reference	*2.5*	*21.6*	*3.3*	*61.7*	*40.8*	*85.3*	*52.0*	*55.1*	*93.6*	*3.7*	*37.7*	*16.0*	*12.1*	*22.2*
	Public	2.3	21.6	3.3	61.7	39.2	85.3	52.0	25.3	33.0	8.0	37.7	10.6	7.8	12.6
	Private	0.6	4.7	1.3	12.4	40.8	69.0	30.0	43.6	70.9	4.2	17.2	12.4	5.5	16.4
	Foreign	2.5	15.3	3.3	54.4	35.0	60.3	17.9	55.1	93.6	3.7	16.0	16.0	12.1	22.2
2006	Reference	*2.6*	*25.1*	*3.4*	*62.5*	*44.3*	*71.0*	*50.6*	*58.1*	*91.2*	*2.7*	*29.1*	*11.8*	*8.7*	*14.9*
	Public	2.6	25.1	3.4	62.5	44.3	71.0	50.6	32.8	42.1	5.1	29.1	10.4	8.0	12.2
	Private	1.8	16.9	2.3	38.2	37.7	61.2	31.7	48.1	78.0	3.6	17.5	10.4	4.9	13.7
	Foreign	2.6	21.8	3.2	58.3	36.5	57.9	14.8	58.1	91.2	2.7	15.4	11.8	8.7	14.9
2007	Reference	*2.8*	*26.8*	*3.4*	*72.2*	*44.6*	*73.0*	*44.9*	*64.1*	*103.7*	*2.7*	*20.1*	*13.0*	*9.5*	*17.0*
	Public	2.8	26.8	3.4	72.2	44.6	73.0	44.9	38.6	49.4	4.1	20.1	10.3	8.0	12.2
	Private	2.4	19.9	3.0	53.6	35.2	57.4	28.5	52.1	86.2	3.6	17.2	12.2	7.0	16.9
	Foreign	2.0	15.4	2.5	32.0	28.1	47.7	18.0	64.1	103.7	2.7	13.9	13.0	9.5	17.0
2008	Reference	*1.9*	*22.5*	*2.4*	*62.5*	*28.3*	*48.0*	*42.5*	*63.2*	*109.6*	*3.5*	*16.4*	*12.4*	*9.0*	*16.2*
	Public	1.9	22.5	2.4	62.5	22.3	35.5	42.5	42.0	54.1	3.8	16.4	8.3	6.0	10.0
	Private	1.8	15.8	2.1	37.9	28.3	45.6	26.3	54.1	86.2	3.5	16.4	11.1	6.9	14.8
	Foreign	1.3	10.4	1.7	20.9	26.8	48.0	18.3	63.2	109.6	4.1	16.2	12.4	9.0	16.2
2009	Reference	2.6	27.2	3.2	102.3	34.9	57.2	44.3	60.8	99.2	4.5	19.7	14.3	10.5	18.8
	Public	2.6	27.2	3.2	102.3	29.7	44.8	44.3	41.5	55.4	4.5	18.4	9.4	7.2	11.9
	Private	2.4	18.5	3.0	56.9	34.9	56.7	34.6	47.6	77.1	5.4	19.7	13.0	8.8	18.3
	Foreign	1.9	12.9	2.1	28.1	32.3	57.2	21.7	60.8	9.92	7.9	18.2	14.3	10.5	18.8

Table 3: Summary of normalization data (2005-2009)

BANKS		***Financial Ratios*** $X_i^*(j), j=1,2,\ldots,14$													
		Profitability				Liquidity		Quality of Assets				Capital Adequacy			
		FR1	FR2	FR3	FR4	FR5	FR6	FR7	FR8	FR9	FR10	FR11	FR12	FR13	FR14
2005	Reference (i=0)	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
	Public (i=1)	0.895	1.00	1.00	1.00	0.724	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.348	0.00
	Private (i=2)	0.00	0.00	0.00	0.00	1.00	0.348	0.355	0.614	0.625	0.884	0.06	0.333	0.00	0.396
	Foreign (i=3)	1.00	0.627	1.00	0.852	0.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
2006	Reference (i=0)	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
	Public (i=1)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.816	0.00
	Private (i=2)	0.00	0.00	0.00	0.00	0.154	0.252	0.472	0.605	0.731	0.625	0.153	0.00	0.00	0.555
	Foreign (i=3)	1.00	0.597	0.818	0.827	0.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
2007	Reference (i=0)	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
	Public (i=1)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.400	0.00
	Private (i=2)	0.50	0.395	0.555	0.537	0.430	0.383	0.390	0.529	0.678	0.357	0.532	0.704	0.00	0.979
	Foreign (i=3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
2008	Reference (i=0)	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
	Public (i=1)	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.500	1.00	0.00	0.00	0.00
	Private (i=2)	0.833	0.446	0.571	0.409	1.00	0.808	0.331	0.571	0.578	1.00	1.00	0.683	0.300	0.774
	Foreign (i=3)	0.00	0.00	0.00	0.00	0.75	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00
2009	Reference (i=0)	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
	Public (i=1)	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.133	0.00	0.00	0.00
	Private (i=2)	0.714	0.392	0.818	0.388	1.00	0.959	0.571	0.316	0.495	0.735	1.00	0.735	0.485	0.928
	Foreign (i=3)	0.00	0.00	0.00	0.00	0.500	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00

Table 4: Absolute Values (2005-2009) $\Delta_{0i}(j)$

Banks		***Financial Ratios*** $X_i^*(j), j=1,2,\ldots,14$													
		Profitability				Liquidity		Quality of Assets				Capital Adequacy			
		FR1	FR2	FR3	FR4	FR5	FR6	FR7	FR8	FR9	FR10	FR11	FR12	FR13	FR14
200	Public (i=1)	0.105	0.00	0.00	0.00	0.276	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.652	1.00

	Private (i=2)	1.00	1.00	1.00	1.00	0.00	0.652	0.645	0.386	0.375	0.116	0.94	0.667	1.00	0.604
	Foreign (i=3)	0.00	0.373	0.00	0.148	1.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
2006	Public (i=1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.184	1.00
	Private (i=2)	1.00	1.00	1.00	1.00	0.846	0.748	0.528	0.395	0.269	0.375	0.847	1.00	1.00	0.445
	Foreign (i=3)	0.00	0.403	0.182	0.173	1.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
2007	Public (i=1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	0.600	1.00
	Private (i=2)	0.500	0.605	0.445	0.463	0.570	0.617	0.610	0.471	0.322	0.643	0.468	0.296	1.00	0.021
	Foreign (i=3)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
2008	Public (i=1)	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.500	0.00	1.00	1.00	1.00
	Private (i=2)	0.167	0.554	0.429	0.591	0.00	0.192	0.669	0.429	0.422	0.00	0.00	0.317	0.700	0.226
	Foreign (i=3)	1.00	1.00	1.00	1.00	0.250	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
2009	Public (i=1)	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.867	1.00	1.00	1.00
	Private (i=2)	0.286	0.608	0.182	0.612	0.00	0.041	0.429	0.684	0.505	0.265	0.00	0.265	0.515	0.072
	Foreign (i=3)	1.00	1.00	1.00	1.00	0.500	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00

Table 5: Grey Relation Coefficient (2005-2009) $\gamma_{0i}(j)$

Banks		***Financial Ratios*** ***$X_i^*(j)$, j=1,2,…,14***													
		Profitability				Liquidity		Quality of Assets				Capital Adequacy			
		FR1	FR2	FR3	FR4	FR5	FR6	FR7	FR8	FR9	FR10	FR11	FR12	FR13	FR14
200	Public (i=1)	0.826	1.00	1.00	1.00	0.772	1.00	1.00	0.333	0.333	0.333	1.00	0.333	0.434	0.333

	Private (i=2)	0.333	0.333	0.333	0.333	1.00	0.434	0.437	0.564	0.571	0.812	0.347	0.428	0.333	0.453
	Foreign (i=3)	1.00	0.573	1.00	0.771	0.333	0.333	0.333	1.00	1.00	1.00	0.333	1.00	1.00	1.00
2006	Public (i=1)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.333	0.333	0.333	1.00	0.333	0.731	0.333
	Private (i=2)	0.33	0.333	0.333	0.333	0.371	0.401	0.486	0.559	0.650	0.571	0.371	0.333	0.333	0.529
	Foreign (i=3)	1.00	0.554	0.733	0.743	0.333	0.333	0.333	1.00	1.00	1.00	0.333	1.00	1.00	1.00
2007	Public (i=1)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.333	0.333	0.333	1.00	0.333	0.455	0.333
	Private (i=2)	0.500	0.452	0.529	0.519	0.467	0.448	0.450	0.515	0.608	0.437	0.516	0.628	0.333	0.959
	Foreign (i=3)	0.333	0.333	0.333	0.333	0.333	0.333	0.333	1.00	1.00	1.00	0.333	1.00	1.00	1.00
2008	Public (i=1)	1.00	1.00	1.00	1.00	0.333	0.333	1.00	0.333	0.333	0.500	1.00	0.333	0.333	0.333
	Private (i=2)	0.750	0.474	0.538	0.458	1.00	0.723	0.428	0.538	0.542	1.00	1.00	0.612	0.417	0.689
	Foreign (i=3)	0.333	0.333	0.333	0.333	0.666	1.00	0.333	1.00	1.00	0.333	0.333	1.00	1.00	1.00
2009	Public (i=1)	1.00	1.00	1.00	1.00	0.333	0.333	1.00	0.333	0.333	1.00	0.365	0.333	0.333	0.333
	Private (i=2)	0.636	0.451	0.733	0.449	1.00	0.924	0.538	0.422	0.497	0.653	1.00	0.653	0.493	0.874
	Foreign (i=3)	0.333	0.333	0.333	0.333	0.500	1.00	0.333	1.00	1.00	0.333	0.333	1.00	1.00	1.00

Table 6: Results of the GRA (2005-2009) Γ_{0i}

Banks		Financial Indicators							
		Profitability		Liquidity		Quality of Assets		Capital Adequacy	
		Γ_{0i}	Rank	Γ_{0i}	Rank	Γ_{0i}	Rank	Γ_{0i}	Rank
2005	Public	*95.65%*	*1*	*88.6%*	*1*	*49.97%*	*3*	*52.5%*	*2*
	Private	33.33%	3	71.7%	2	59.6%	2	39.03%	3
	Foreign	83.6%	2	33.3%	3	83.32%	1	83.32%	1

2006	Public	*100%*	1	*100%*	1	*49.97%*	3	*59.92%*	2
	Private	*33.33%*	3	*38.6%*	2	*56.65%*	2	*39.15%*	3
	Foreign	*75.75%*	2	*33.33%*	3	*83.32%*	1	*83.32%*	1
2005-2006		*70.28%*	1	*60.92%*	3	*63.81%*	2	*59.54%*	4
2007	Public	*100%*	*1*	*100%*	*1*	*49.97%*	*3*	*53.02%*	*3*
	Private	50%	2	45.75%	2	50.25%	2	60.9%	2
	Foreign	33.33%	3	33.33%	3	83.32%	1	83.32%	1
2007		*61.10%*	*3*	*59.68%*	*4*	*61.18%*	*2*	*65.75%*	*1*
2008	Public	*100%*	1	*33.3%*	3	*54.15%*	3	*49.97%*	3
	Private	*55.5%*	2	*86.15%*	1	*62.7%*	2	*67.95%*	2
	Foreign	*33.3%*	3	*83.3%*	2	*66.65%*	1	*83.32%*	1
2009	Public	*100%*	*1*	*33.33%*	*3*	*66.65%*	*1-2*	*34.1%*	*3*
	Private	56.72%	2	96.2%	1	52.75%	3	75.5%	2
	Foreign	33.33%	3	75.0%	2	66.65%	1-2	83.32%	1
2008-2009		*63.14%*	*2*	*62.27%*	*3*	*61.59%*	*4*	*65.69%*	*1*

Table 7: Performances of Banks for (2005-2009)

Banks	2005		2006		2007		2008		2009	
	Γ_{0i}	Rank	Γ_{0i}	Rank	Γ_{0i}	Rank	Γ_{0i}	Rank	Γ_{0i}	Rank
Public	*69.26%*	*2*	*74.25%*	*1*	*72.29%*	*1*	*63.08%*	*3*	*62.11%*	*3*
Private	*47.93%*	3	*42.4%*	3	*52.58%*	3	*65.49%*	1	*66.59%*	1
Foreign	*76.26%*	1	*74.01%*	2	*61.88%*	2	*64.26%*	2	*63.08%*	2

Table 8: Performances of Banks for pre-crisis and post-crisis

Banks	Pre-Crisis (2005-2006)		Crisis year 2007		Post-crisis (2008-2009)		(2005-2009)	
	Γ_{0i}	Rank	Γ_{0i}	Rank	Γ_{0i}	Rank	Γ_{0i}	Rank
Public	*71.76%*	*2*	*72.29%*	*1*	*62.59%*	*3*	68.19%	1
Private	*45.17%*	3	*52.58%*	3	*66.04%*	1	54.99%	3
Foreign	*75.13%*	1	*61.88%*	2	*63.67%*	2	67.89%	2

Table 9: Effects of Financial Indicators on Banks' performances

Financial Indicators	Public		Private		Foreign)		Financial Indicators	
	Γ_{0i}	Rank	Γ_{0i}	Rank	Γ_{0i}	Rank	Γ_{0i}	Rank
Profitability	*99.13%*	*1*	*45.77%*	*4*	*51.86%*	*3*	65.58%	1
Liquidity	*71.04%*	2	*67.68%*	1	*51.64%*	4	63.45%	2
Quality of Assets	*54.14%*	*3*	*56.39%*	3	*76.65%*	2	62.39%	4
Capital Adequacy	*49.90%*	4	*56.50%*	2	*83.32%*	1	63.24%	3

Table 10: Effects of Financial Ratios on Banks' performances

Financial Ratios			2005-2006	2007	2008-2009	2005-2009
Profitability	FR1	Γ_{0i}	75.46%	61.1%	67.53%	68.03%
		Rank	**1**	8	4	3
	FR2	Γ_{0i}	63.22%	59.5%	59.8%	60.84%
		Rank	7	11	13	12
	FR3	Γ_{0i}	73.32%	62.07%	65.62%	67%
		Rank	2	4	6	4
	FR4	Γ_{0i}	69.67%	61.23%	0.7622	69.21%
		Rank	3	5	**1**	2
Liquidity	FR5	Γ_{0i}	57.93%	60%	63.87%	60.6%
		Rank	12	9	8	13
	FR6	Γ_{0i}	58.38%	59.37%	71.88%	63.21%
		Rank	11	13	2	7
Quality of Assets	FR7	Γ_{0i}	59.82%	59.43%	60.53%	59.93%
		Rank	10	12	11	14
	FR8	Γ_{0i}	63.15%	61.6%	60.43%	61.73%
		Rank	8	7	12	9
	FR9	Γ_{0i}	64.78%	64.7%	65.75%	63.74%
		Rank	5	3	10	5
	FR10	Γ_{0i}	67.48%	59%	63.65%	63.38%
		Rank	4	14	9	6
Capital Adequacy	FR11	Γ_{0i}	56.4%	61.63%	67.18%	61.71%
		Rank	14	6	5	10
	FR12	Γ_{0i}	57.12%	65.37%	65.52%	62.67%
		Rank	13	2	7	8
	FR13	Γ_{0i}	63.85%	59.6%	59.6%	61.02%
		Rank	6	10	14	11
	FR14	Γ_{0i}	60.8%	76.4%	70.43%	69.23%
		Rank	9	**1**	3	**1**

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