

FINANCIAL AND STRATEGIC  
OVERVIEW OF THE BANKING SYSTEM

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## Thesis Abstract

Ayşe Dilara Altıok Yılmaz, “Financial and Strategic Overview of the  
Banking System”

The aim of this study is to give a financial and strategic overview of the Banking System. In the first part the profitability of the banking system in emerging markets is analyzed. The determinants of bank profitability is analyzed with the data from 195 banks from 9 emerging countries between the years 2005-2010 by using the fixed effect panel data. In the second part Turkish Banking System is analyzed from two different perspectives. First the lending relationship between small and medium size enterprises and the banks is studied and then the efficiency of the Turkish banks is examined. The lending relationship between SMEs and banks is analyzed by using the survey data collected from 204 SMEs by using the OLS methodology. Finally the efficiency scores of the 30 commercial banks are measured by using Data Envelopment Analysis (DEA) between the years 2007-2010. The efficiency differences of domestic and foreign banks and the effects of 2008 financial are analyzed.

Keywords: Banking System, Bank Efficiency, Bank Profitability, Bank-SME Relations

## Tez Özeti

### Ayşe Dilara Altıok Yılmaz, “Bankacılık Sisteminin Finansal ve Stratejik İncelemesi”

Bu çalışmanın amacı Bankacılık sistemini finansal ve stratejik açıdan incelemektir. Birinci bölümde gelişmekte olan ülkelerdeki bankaların karlılık analizi yapılmıştır. Dokuz gelişmekte olan ülkeden 195 bankanın 2005-2010 yılları arasındaki verileri kullanılarak panel data metodu ile karlılığın belirleyicileri analiz edilmiştir. İkinci bölümde Türkiye’deki bankacılık sistemi iki farklı perspektiften incelenmiştir. Öncelikle bankalar ve KOBİ’ler arasındaki kredi ilişkisinin belirleyicileri incelenmiştir. 204 KOBİ ile yapılan anket çalışmasının sonuçları OLS regresyon metodu kullanılarak analiz edilmiştir. Son olarak da Türk bankacılık sisteminin verimliliği incelenmiştir. 30 ticari bankanın 2007-2010 yılları arası verimliliği veri zarflama analizi kullanılarak incelenmiştir. Bu analizde ayrıca 2008 krizinin banka verimliliklerine etkisi ve Türk ve yabancı bankalar arasındaki verimlilik farkları analiz edilmiştir.

Anahtar Kelimeler: Bankacılık Sistemi, Banka Verimliliği, Banka Karlılığı, Banka-KOBİ İlişkileri

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## ABBREVIATIONS

BAT:	Bank Association of Turkey
BCC:	Banker, Charnes and Cooper
BHC:	Bank Holding Companies
CAR:	Capital to Asset Ratio
CCR:	Charnes, Cooper and Rhodes
DEA:	Data Envelopment Analysis
DFA:	Distribution Free Approach
DMU:	Decision Making Unit
FDH:	Free Disposal Hull
GDP:	Gross Domestic Product
GLS:	Generalized Least Squares
GNP:	Gross National Product
GMM:	General Method of Moments
IMF:	International Monetary Fund
L/C:	Line of Credit
M&A:	Mergers and Acquisitions
MPI:	Malmquist Productivity Indices
NIM:	Net Interest Margin
NPL:	Non-Performing Loans
OCR:	Operating Cost Ratio
OLS:	Ordinary Least Squares
ROA:	Return on Assets
ROE:	Return on Equity
SBA:	US Small Business Administration
SBM:	Slack Based Measurement
SEE:	South Eastern European
SFA:	Stochastic Frontier Approach
SME:	Small and Medium Enterprise
STBL:	Survey of Terms of Business Lending
TFA:	Thick Frontier Approach
U.K.:	United Kingdom
US:	United States
VIF:	Variance Inflation Factor

## CHAPTER 1

### INTRODUCTION

Turkish Banking Sector has changed drastically in the last ten years. The impact of 2000 and 2001 crises on financial system especially on the Turkish Banking sector which occupies around seventy five percent of the financial system was extensive. Social and economic reforms have been introduced in many areas after the crises. Besides IMF policies, Turkish authorities have found themselves in a position to undertake some measures. In banking sector, restructuring of the state banks, resolution of the banks under control of SDIF, restructuring of private banks, enhancement of supervision and audit of banking system and new legal arrangements and resolution of non-performing loans were the basic policies of the restructuring program. The merger and acquisitions in the sector accelerated the change in the banking sector.

As a result of these regulations and restructuring policies the Turkish banking sector is one of the few to survive the 2008 global financial crisis without acquiring any financial backing from the government or requiring additional capital injection by its shareholders.

The aim of this dissertation is to present an financial and strategic overview of the Turkish Banking Sector in recent years after these restructuring processes and to make a cross-country analysis of bank profitability in emerging markets.

In this dissertation three different analysis will be conducted related to the banking sector. In the first part, the profitability of the emerging market banking

system and the determinants of bank profitability will be analyzed by using the panel data of 195 banks from nine advanced emerging countries between the years 2005-2010. Since a sound and profitable banking sector is better able to cope with negative shocks and better contribute to the stability of the financial system there is a considerable interest on the factors that determine bank profitability among the researchers.

Second part will be related to Turkish Banking System and will cover the strategic and financial overview of Turkish Banking System. Two different analysis will be conducted in second part. In the third chapter the lending relationship between Turkish SMEs and banks will be analyzed by survey methodology. In most theories SMEs are taken as the main agents of the economic growth. In Turkey SMEs constitute a major part of the Turkish economy. According to the most recent estimates of TUIK in 2010, the SME sector constitutes 99% of the total number of enterprises, 61% of total employment, 60% of total exports and 24% of bank credit. Therefore, while SMEs dominate the economy in terms of employment and exports, they receive only a marginal share of the funds mobilized by the banking sector. The capacity for Small and Medium sized Enterprises (SMEs) to fulfil their potential in an economy depends on the availability of finance and in Turkey the main source of finance is the banks. To better understand the lending relationship between SMEs and banks in the third chapter the determinants of lending conditions for SMEs are examined by using OLS regression.

Fourth chapter covers the efficiency analysis of Turkish Banking Sector between the years 2007-2010 by using the non-parametric technique Data Envelopment Analysis. The effects of 2008 financial crisis on the Turkish banking

system efficiency and the efficiency score differences of domestic and foreign bank subgroups operating in Turkey will also be examined in this chapter.

## CHAPTER 2

### PROFITABILITY OF BANKING SYSTEM: EVIDENCE FROM EMERGING MARKETS

Profitability is one of the main reasons for the existence of business enterprises, and business enterprises continue their operation by making profits. Banks are the business enterprises that aim to make profits similar to the others. In this regard, the profitability performance of the banks indicates the success of the banks' management. Hence it is one of the most important indicators for the investors. In this chapter the profitability of banks and its determinants in Turkey as well as in eight different emerging countries are investigated.

#### Literature Review

In the literature the determinants of profitability of the banking system has been widely discussed. Studies on the determinants of profitability have focused either on a particular country or on a set of countries in both developing and developed countries. In this literature review section the econometric model and results of the bank profitability studies will be presented. First the single country studies both in developing and developed countries will be discussed, then panel country studies which examine bank profitability in more than one will be given and finally the studies related to Turkey will be presented.

## Single Country Studies

In this part, a literature survey of single country studies conducted on both developed and emerging countries will be presented.

Ho and Saunders (1981) showed that NIM in a given country can be estimated using a theoretical model in which banks are risk-averse dealers in providing services to customers. The banks receive deposits at random intervals and later use these funds to satisfy stochastically received loan requests. The pure spread between loan and deposit rates is compensation for bank inventory risk arising from uncertainty about the arrival of loan and deposit transaction requests.

In empirical work, a two-stage regression method was used to study the determinants of NIM. In the first stage, NIM was regressed on bank-specific variables, such as the ratio of non-interest bearing assets to total assets, the equity ratio, and the ratio of non performing loans to total assets. The constant term obtained from the first stage regression is a measure of the “pure spread” for this country’s banking system (the part of the spread that is not attributable to bankspecific characteristics). In the second stage, the constant term captures the effect of market structure on the determination of the pure spread (the portion of the spread that is neither explained by bank specific characteristics nor interest rate volatility). Ho and Saunders showed that the pure spread depends on the size of banks’ transactions, the market structure of the banking industry, the volatility of interest rates, and the degree of managerial risk aversion.

Berger (1995) examined the relationship between the return on equity and the capital asset ratio for a sample of US banks for the 1983-1992 time period. He

showed that the return on equity and capital to asset ratio (CAR) tend to be positively related by using the Granger causality model.

Angbazo (1997) developed similar theoretical and empirical models employing data for different size classes of banks in US from 1989 to 1993 and includes credit risk in the basic firm theoretic NIM model. The empirical model for the net interest margin was postulated to be a function of the following variables: default risk, interest rate risk, an interaction between default and interest risk, liquidity risk, leverage, implicit interest payments, opportunity cost of non-interest bearing reserves, management efficiency, and a dummy for states with branch restrictions.

The model used by the author was:

$$NIM_{it} = F(S_{it} * (.), X_{it}, \epsilon_{it})$$

where NIM is the observed or reported net interest margins at time t. The function  $S_{it} * (.)$  is the desired interest rate spread, or the pure spread between loan and deposit rates,  $X_{it}$  is a vector of bank-specific characteristics which have an impact on the net interest margins, and the residual term  $\epsilon_{it}$  is included to reflect all other market imperfections and regulatory restrictions affecting NIM.

The author found that NIMs of U.S. commercial banks are also a function of default and interest rate risk premia. His data also showed that banks' OBS activities have helped create a more diversified, margin-generating asset base than deposit or equity financing. OBS exposure is related to cross sectional differences in interest rate risk and liquidity risk.

Saunders and Schumacher (2000), by using data for the period between 1988 and 1995 for six selected European countries, found that regulatory requirements in the form of interest rate restrictions on deposits, reserve requirements, and capital to asset ratios, in addition to interest rate volatility, have a significant impact on bank NIMs. Their results also indicated that the more segmented/restricted the banking system is, the larger the monopoly power of existing banks and the higher their spreads.

Ben Naceur and Goaid (2001) investigated the determinants of the Tunisian banks' performances during the period 1980-1995. The sample included 11 deposit banks in Tunisia. The variables used in this study are productivity, bank size, bank portfolio composition, bank capitalization, bank quotation and stock exchange reform. Return on assets (ROA) and return on equity (ROE) were the two alternative measures of performance used in the study.

The parameters of the following model have been estimated using the unbalanced panel data regression (fixed effects):

$$\text{Perf}_{ij,t} = f(\text{Prod}_{ij,t}, \text{Size}_{ij,t}, \text{Solv}_{j,t}, \text{Base}_{j,t}, \text{Quot}_{j,t}, \text{Fmark}_t)$$

where  $\text{Perf}_{ij,t}$  represents two alternative performance measures for the firm  $j$  during the period  $t$ ;  $\text{Prod}_{ij,t}$  represents two alternative productivity measures for the firm  $j$  during the period  $t$ ;  $\text{Size}_{ij,t}$  represents three alternative size measures for the firm  $j$  during the period  $t$ ;  $\text{Solv}_{j,t}$  is a measure of firm  $j$ 's capitalization;  $\text{Base}_{j,t}$  is a measure of firm  $j$ 's portfolio composition;  $\text{Quot}_{j,t}$  is a measure of whether the firm  $j$  is quoted in the Tunisian stock exchange or not during the period  $t$  and  $\text{Fmark}_t$  is a stock market reform measure during the

period  $t$ . The results indicated that the best performing banks are those who have struggled to improve labor and capital productivity, those who have maintained a high level of deposit accounts relative to their assets and those who have been able to reinforce their equity.

Drakos (2003) found significantly reduced NIMs for a group of East European countries after their transition to market-based economies. Further, he argued that state banks begin to set substantially lower margins, a sign that he claims to be evidence of former inefficiency.

Naceur (2003) analyzed the impact of banks' characteristics, financial structure and macroeconomic indicators on banks' net interest margins and profitability in the Tunisian banking industry for the 1980-2000 period. In this study he included macroeconomic and financial structure indicators which were not included in Ben Naceur and Goaid (2001).

The paper used panel data regression analysis with random effects to find the determinants of Tunisian banking industry performance. The model was:

$$\text{Per}_{ij,t} = f(\text{BC}_{ij,t} + M_t + \text{FS}_t)$$

where  $\text{Per}_{ij,t}$  represents two alternative performance measures for the firm  $j$  during the period  $t$ ;  $\text{BC}_{ij,t}$  are bank variables for bank  $j$  at time  $t$ ;  $M_t$  are macro-economic variables and indicators.  $\text{FS}_t$  are measures of financial structure indicators.

The empirical results indicated that the size has mostly negative and significant coefficients on the net interest margins suggesting that larger banks tend to lower margins and this is consistent with models that emphasize the negative role

of size arising from scale inefficiencies. Also the author stated that concentration is less beneficial to the Tunisian commercial banks than competition since they see that the concentration ratio has a negative and significant impact only on net interest margin. Lastly, stock market development was found to have a positive effect on bank profitability. According to the author this reflects the complementarities between bank and stock market growth.

De (2003) examined the effects of ownership on bank performance in India over the period 1997-2001. The measure of the profitability was return on assets (ROA). The measures of efficiency used are net interest margin (NIM) and operating cost ratio (OCR). The control variables included the logarithm of total assets, proportion of investment in Government of India securities, the proportion of loans made to the priority sector, the proportion of rural and semi-urban branches and the proportion of non-interest income in total income.

The model used was as follows:

$$(\text{Performance})_{it} = \mu + \delta' D + \beta' X_{it} + v_{it}$$

where  $(\text{Performance})_{it}$  is the performance measure for the  $i^{\text{th}}$  bank during the  $t^{\text{th}}$  period,  $D$  is a vector of dummy variables that characterize ownership,  $X_{it}$  is a vector of other control variables that might affect performance and  $v_{it}$  is a random error term.  $\delta$  and  $\beta$  are the column vectors of the coefficients to be estimated. The elements of  $\beta$  characterize the ownership effects.

A random effects model that controls for unobserved bank specific and time specific effects was used and the model was estimated using the technique of generalized least squares (GLS). The results of the study indicated that while

logarithm of total assets does not have any significant effect in the ROA regression, it was found to have negative but significant effects in both the NIM and OCR regressions. It was observed that proportion of investment in Government of India securities has a negative significant effect on ROA, indicating the dampening effect of the low returns on government securities on profitability. The author also stated that proportion of non-interest income in total income had a positive significant effect on ROA, confirming their earlier conjecture that non-interest income had a positive effect on profitability whereas it did not have any affect whatsoever on NIM and OCR.

Chirwa (2003) analyzed the relationship between market structure and profitability of commercial banks in Malawi using time series data between 1970 and 1994. He used time-series techniques of cointegration and error- correction mechanism to test the collusion hypothesis and determined whether a long-run relationship exists between profits of commercial banks and concentration in the banking industry. The results obtained from the study supported the traditional collusion hypothesis of a long-run positive relationship between concentration and performance. Chirwa (2003) stated that the dynamic shortrun analysis also shows a high speed of adjustment in profitability from disequilibrium and indicated a positive response in profitability to a negative deviation from a long-run equilibrium.

Jiang, Tang, Law and Sze (2003) investigated the determinants of the ratio of before tax profits to total assets using 14 Hong Kong banks' characteristics and macroeconomic variables over the period 1992-2002. Both fixed effects and random effects resulted for five different models are given in the study. Empirical analysis of the study revealed that both bank-specific and macroeconomic factors are important determinants of the profitability of banks. Among macroeconomic factors, real GDP

growth, inflation and real interest rates were found to have a positive impact. With regard to bank- specific variables, it was observed that operational efficiency and business diversification leads to returns on assets, after controlling for differences in the credit quality of loans.

Gerlach, Peng and Shu (2004) examined the determinants of banking performance in Hong Kong over the period 1994-2002. They focused on the affects of macroeconomic developments on the two important profitability measures, net interest margin (NIM) and non-performing loans (NPL). In their study Gerlach, Peng and Shu modelled NPL and NIM as follows:

$$NPL_{i,t} = f (MACRO_t , FIN_t , BANK_{i,t} ) + error_{i,t}$$

$$NIM_{i,t} = g (MACRO_t , FIN_t , BANK_{i,t} ) + error_{i,t}$$

where MACRO denotes a set of macroeconomic variables, FIN denotes a set of financial variables and BANK denotes bank specific variables. Five specifications for NPL and four specifications for NIM were estimated in this study. All equations were estimated twice, first with a common intercept and then allowing for fixed effects. According to the authors, results of the test for fixed or individual effects suggested that the fixed effects model should be chosen for estimation. Interaction between the determinants of profitability is allowed in some specifications.

Economic growth, inflation, interest rates and operating costs were found to be the most important determinants of NIM. The empirical results indicated that economic growth and inflation lead to higher NIMs. NIMs are affected more from the macroeconomic developments in smaller banks since when there is an economic upturn, leading to increased loan demand, smaller banks expand lending more

aggressively than larger banks and take more risk with higher returns. Also, operating costs were found to be positively related to NIMs and this is because banks may transfer the changes in operating costs to the customers by varying lending spreads or a higher NIM leads to a higher risk profile of loans that raises the operating costs related to the management of the risk. Lastly, it was found that changes in interest rates affected smaller banks more than larger ones and the authors explained this result with the higher capital base of the smaller banks.

Athanasoglou et al. (2005) investigated the bank-specific, industry specific and macroeconomic determinants of the Greek commercial banks' performances during the period 1985-2001. The group of the bank-specific determinants of profitability involved operating efficiency, financial risk and size. Industry concentration and the ownership status of the banks were examined in the group of industry specific determinants and cyclical output and expected inflation in the group of macroeconomic determinants.

In specifying the model, they accounted for profit persistence using a dynamic panel data estimation procedure. They estimated the model using the generalized method of moments (GMM) estimator. The results of the study showed that capital is important in explaining bank profitability and that increased exposure to credit risk lowers profits. Additionally, labor productivity growth has a positive and significant impact on profitability, while operating expenses are negatively and strongly related to it. They also stated that the size and ownership status of the banks are insignificant in explaining profitability. The empirical results also showed that concentration affects bank profitability negatively but insignificantly and finally, it is found that macroeconomic control variables, such as inflation and cyclical output, clearly affect the performance of the Greek commercial banks.

## Panel Country Studies

In this part of the literature review, the studies that is conducted with set of countries data will be presented.

Molyneux and Thornton (1992) were among the first researchers who examined the determinants of bank profitability on a number of countries. They used a sample of banks in 18 European countries for the time period between 1986-1989. They found a significant positive relationship between the return on equity and the level of interest rates in each country, bank concentration and government ownership. They also stated that capital, interest rates, personnel expenditures, concentration and government ownership have a positive relationship with return on assets whereas liquidity has a negative effect.

Claessens et al. (1998) studied the effect of foreign bank entry on the domestic banking sector and find that in less developed countries foreign banks tend to have greater profits, higher NIMs, and higher tax payments as compared to domestic banks. The reverse is true for advanced countries.

Demirgüç-Kunt and Huizinga (1999) analyzed the determinants of bank interest margins by using the bank data from 80 countries in the years between 1988-1995. The variables include accounting for bank characteristics, macroeconomic conditions, explicit and implicit bank taxation, deposit insurance regulation, overall financial structure, and underlying legal and institutional indicators. In this study, the regression model is described as:

$$I_{ijt} = \alpha_0 + \alpha_i B_{ijt} + \beta_j X_{jt} + \gamma_t T_t + \delta_j C_j + \varepsilon_{ijt}$$

where  $I_{ijt}$  is the dependent variable (either the net interest margin or before tax profits / total assets) for bank  $i$  in country  $j$  at time  $t$ ,  $B_{ijt}$  are characteristics of bank  $i$  in country  $j$  at time  $t$ ,  $X_{jt}$  are characteristics of country  $j$  at time  $t$ ,  $T_t$  and  $C_j$  are time and country dummy variables, and  $\varepsilon_{ijt}$  is a white-noise error term.

Their results suggest that, in addition to the usual bank characteristics, bank taxation and regulatory variables, financial structure variables, and legal and institutional variables are determinants of bank profits and margins.

On another paper, Demirgüç-Kunt and Huizinga (2001) presented evidence on the impact of financial development and structure on bank profitability using bank level data for a large number of developed and developing countries over the period 1990-1997.

The results revealed that financial development has a very important impact on bank performance. Specifically, the study reported that higher bank development is related to lower bank performance. Finally, the authors stated that stock market development on the other hand, leads to increased profits and margins for banks especially at lower levels of financial development, indicating complementarities between bank and stock market.

Brock and Suarez (2000) studied the determinants of NIM, applying various definitions of NIM for seven Latin American countries, and found that the level of non-performing loans and operating costs have a positive effect on NIM as well as reserve requirements. Further, loan losses and bank capital were significantly and negatively related to bank spreads for most countries in the sample, a result that contradicts with those from developed countries suggested by Ho and Saunders (1981) and Saunders and Schumacher (2000).

Bashir (2000) examined the determinants of Islamic banks' performance across eight Middle Eastern countries for 1993-1998 period. A number of internal and external factors were used to predict profitability and efficiencies. The study used capital ratios, leverage, overhead, loan and liquidity ratios, and foreign ownership as proxies for internal measures. Meanwhile, macroeconomic indicators, taxation, financial structure, and country dummies were used as external measures.

Although the primary focus of this paper was the relationship between performance and bank internal variables, the inclusion of macro variables, stock market variables, and the country dummies is meant to control for cyclical factors that might affect bank performance. Several specifications of the above model were estimated in this study. Controlling for macroeconomic environment, financial market situation and taxation, the results showed that higher leverage and large loans to asset ratios lead to higher profitability. The paper also reported that foreign-owned banks are more profitable than the domestic ones. There was also evidence that taxation impacts bank profitability negatively. Finally, it was observed that macroeconomic setting and stock market development have a positive impact on profitability.

Bashir and Hassan (2004) also studied the determinants of Islamic banking profitability between 1994 and 2001 for 21 countries. Their figures showed Islamic banks to have a better capital asset ratio compared to commercial banks which means that Islamic banks are well capitalized. Also, they used internal and external banks characteristics to determine profitability as well as economic measures, financial structure variables, and country variables. They used, net-non interest margin (NIM), which is non interest income to the bank such as, bank fees, service charges and foreign exchange to identify profitability. Other profitability indicators adopted were

before tax profit divided by total assets (BTP/TA), return on assets (ROA), and return on equity (ROE). They studied 43 Islamic banks.

Results were similar to that of Bashir (2000) which found a positive relationship between capital and profitability but a negative relationship between loans and profitability. Bashir and Hassan (2004) also found total assets to have a negative relationship with profitability which amazingly means that smaller banks are more profitable. In addition, during an economic boom, banks profitability seems to improve because there are fewer nonperforming loans. Inflation, on the other hand, does not have any effect on Islamic bank profitability. Finally, results also indicated that overhead expenses for Islamic banks have a positive relation with profitability which means if expenses increase, profitability also increases.

Abreu and Mendes (2002) studied the determinants of bank interest margins and profitability for some European countries for the period 1986-99. Three different variables were used as performance measure; NIM, ROA and ROE. The bank-specific variables used were market share, operating costs, capital to asset ratio and loan to asset ratio. Among the macroeconomic variables the inflation rate, the unemployment rate and the nominal effective exchange rate were used. Also, they used dummy variables to account for the range of permissible activities and existence of crises of the European Monetary System. They followed the methodology used by Demirgüç-Kunt and Huizinga (1999).

Gischer and Juttner (2004) studied the effect of global competition on banks' interest margins and profitability for a group of advanced countries and found that global competition reduces net interest rate margins and returns on assets. They also provided strong evidence of the negative relationship between the fee-to-income

ratio and interest rate margins. The fee-to-income ratio also negatively affects bank return on assets (ROA).

Athanasoglou, Delis and Staikouras (2006) used annual bank level and macroeconomic data from seven South Eastern European (SEE) countries (Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Romania and Serbia-Montenegro) over the period of 1988-2002. The ratio of loans to assets, the average loan loss provisions to total loans ratio, the average equity to assets ratio, the overheads efficiency ratio, average bank size and the foreign ownership were used as the bank-specific determinants. Concentration and EBRD index of banking system reform were the variables tested as industry related variables and inflation and real per capita income are tested as macroeconomic determinants.

To test the relationship between bank profitability and the bank-specific, industry related and macroeconomic determinants, they used an unbalanced panel data set of SEE credit institutions and estimated a one way error component model.

The empirical results indicated that the ratio of loans to assets is positively and insignificantly, whereas the average loan loss provisions to total loans ratio is negatively and significantly related to bank profitability. When ROA is used as the dependent variable, capital variable and the average bank size were found to have positive and significant coefficients. They stated that the operating expenses variable presents a negative and significant effect on profitability implying a lack of competence in expenses management. Their findings showed that foreign banks operating in SEE countries perform significantly better in terms of ROA and ROE than domestic banks. The empirical results of this study also showed that concentration affects only the ROA positively and that EBRD index suggests a negative and significant effect on profitability indicating that reform causes banks to

offer increasingly competitive margins on loans and deposits, which in turn lowers profitability.

### The Studies about Turkey

In this section, the studies that reveal the determinants of profitability performance of Turkish banking system is provided.

Kaya (2001) analyzed the determinants of net interest margin in Turkey. He found that under high inflation and high real interest rates, net interest margin is also high in Turkey. He stated that in terms of bank groups, private banks have higher interest spreads than state owned banks.

Kaya (2001) analyzed the determinants of net interest margin by OLS regression technique using monthly data. He stated that there is a positive relationship between banks securities / total assets and net interest margin. Regression results of this study also showed that there is a positive relationship between interest rate spreads and equities / total asset ratio and the sign of the taxes, duties, charges and premium payable / total assets is positive in net interest margin equation. Finally, it was found that there is a positive relationship between required reserve ratio and net interest margin.

Okumuş (2002) analyzed the effects of inflation on the financial statements of Turkish banks, and the corresponding effects on measures of profitability performance. He observed that after inflation adjustment the level of profitability in Turkish banking over the period 1989-1995, is lower with respect to profitability measures calculated using historical cost based financial statements. In addition to this, a significant change in ranking by bank group, according to profitability

performance was noted in this study. The results reflected the importance of considering the potential distorting effects of inflation on the financial statements of Turkish banks.

Duvan and Yurtoğlu (2004) investigated the determinants of banking provisions in the Turkish banking sector. In the Turkish case, it was found out that economic growth has a negative relationship with the loan-loss provisions. Provisions were also found to increase when TL/\$ exchange rate rises. Another main conclusion of the study was that bank-specific factors have no effect on provisions.

Tunay and Silpar (2006) used bank-specific variables, macroeconomic variables and financial structure variables in explaining the profitability determinants. The model reflected the effects of both sectoral and macro dynamics on profitability.

They grouped the determinants of the profitability of the banks as large and small sized. They used the variables of the ratio of loans to total assets, the ratio of non-interest income to total assets, the logarithm of total assets, inflation, real national income, the ratio of deposits to capitalization value of stock market, the ratio of capitalization value of stock market to national income and the ratio of total assets to national income. When the commercial banks were grouped as large, medium and small sized, they found consistent results with the two scale separation except from the ratio of capital to total assets and concentration ratio.

Bektaş (2007) used the panel data method to test for unit roots of profitability data and their persistency in the banking sector of an emerging country. According to the results of this study unit root hypothesis of data was rejected and the author concluded that in the long run persistency of profits does not exist.

Abbasoğlu, Aysan and Güneş (2007) examined the degree of concentration

and degree of competition in the market by applying Panzar and Rosse's approach using the data from the detailed balance sheets of the banks that operated in the years from 2001 to 2005. They also explored the existence of relationship between efficiency and profitability of the banks taking into account the internationalization of banking. Their results did not suggest the existence of relationship between concentration and competition. They ran random effect regression with panel data of 135 observations to analyze the relationship between efficiency and profitability. According to the results, there was also no robust relationship between efficiency and profitability.

When we look at the econometric models used in literature, we see that panel data regressions, multiple regressions and two-step approach are the most commonly used ones.

## Empirical Research

The aim of this chapter is to examine the relationship between profitability and the banking characteristics, after controlling for economic and financial structure indicators. The intention is to decide which, among the potential determinants of performance, appears to be important.

## Data

The sample includes 195 commercial banks from 9 emerging countries. These emerging countries are chosen according to FTSE Advanced Emerging Countries index. The list of the countries and the number of banks from each country used in

the analysis are given in Table 1. The time period chosen for the analysis is the years between 2005-2010. In sample selection any bank which operated in a country included in the FTSE Advances Emerging Countries Index in 2005 and was classified as a commercial, and has consistent data for each of the years 2005-2010 inclusive was selected. Extreme values or very large unexplained changes in the values of any of the variables were excluded. The bank level data of these 195 banks are derived from the balance sheet, income statement and ownership data as available from the EMIS database. The M&A activities are derived from the Dealwatch database.

Table 1: Sample Countries and Number of Banks

<u>Country</u>	<u>Number of banks</u>
Brazil	14
Czech Republic	28
Hungary	21
Malaysia	7
Mexico	28
Poland	32
South Africa	25
Taiwan	13
Turkey	27
<u>Total</u>	<u>195</u>

### Methodology

In the analysis, panel data analysis is employed in order to examine the relationship between profitability and the banking characteristics, after controlling for economic and financial structure indicators. Since our sample includes 195 banks from 9 emerging market countries over the period 2005-2010, the use of panel data makes more sense compared with either purely cross-sectional or purely time-series data.

The use of panel data has several major advantages over purely cross-sectional or purely time-series data. First of all, by pooling the data the panel analysis improves the accuracy of the parameter estimates and thus allows the estimation procedure to have more degrees of freedom and sample variability. Secondly, panel estimation procedure gives the opportunity to reduce estimation bias. Finally, it provides the specification of more complicated behavioral hypothesis. Furthermore, this model allows modeling the differences among the subjects, referred to 'heterogeneity'.

In this study, the countries in the sample differ in terms of their economic background, their financial institutions, their reforms, and their social and political facilities. Therefore, all of these country specific variables affect the variables to be estimated.

Time series data on some countries cannot be obtained. Thus each group in the data set has different numbers of observations due to missing values. Accordingly, unbalanced panel estimations with bank and period fixed effects are performed by using panel least square methods. Specifically, in an unbalanced panel data set, the total number of observations is not equal to  $N \times T$ .

A panel data regression differs from a regular time-series or cross-section regression in that it has a double subscript on its variables in both time-series dimension and cross-section dimension which can enhance the quality and quantity of data.

The panel data regression can be expressed as follows:

$$y_{it} = \alpha + \beta X_{it} + u_{it} \quad i = 1, 2, \dots, N; t = 1, 2, \dots, T$$

where  $i$  denotes subjects (households, individuals, firms or countries) as the crosssection dimension and  $t$  denotes time as the time-series dimension.  $\alpha$  is a scalar,  $\beta$  is  $K \times 1$  and  $X_{it}$  is the  $it$  th observation on  $K$  explanatory variables. The error component model for the disturbances is represented by

$$u_{it} = \mu_i + v_{it}$$

where  $\mu_i$  denotes the unobservable individual specific effects over time and  $v_{it}$  denotes the remainder disturbance,  $\mu_i$  is assumed to be identically and independently distributed,  $N(0, \sigma_\mu^2)$  and is independent of  $v_{it}$ .

In this study the empirical test is concerned with the determinants of interest margin and profitability of the emerging market deposit banks. The model formulated is:

$$P_{it} = \alpha_0 + \beta_1 LIQR_{it} + \beta_2 OEM_{it} + \beta_3 CAP_{it} + \beta_4 CR_{it} + \beta_5 SIZE_{it} + \beta_6 MNA_{it} + \beta_7 OWN_{it} + \beta_8 X_i + \varepsilon_{it}$$

where,

$P_{it}$  is the profitability of bank  $i$  at time  $t$ . Two proxies, namely ROA and Net Interest Margin, are used for profitability

$LIQR_{it}$  is the measure of liquidity risk for bank  $i$  at time  $t$

$OEM_{it}$  is the measure of operating expenses management for bank  $i$  at time  $t$

$CAP_{it}$  is the measure of capitalization for bank  $i$  at time  $t$

$CR_{it}$  is the measure of credit risk for bank  $i$  at time  $t$

$SIZE_{it}$  is the measure of bank size for bank  $i$  at time  $t$

$MNA_{it}$  is the measure of M&A variable for bank  $i$  at time  $t$

$OWN_{it}$  is the measure of ownership structure for bank  $i$  at time  $t$

$X_i$  is a set of control variables

$\beta$  is a vector of parameters to be estimated

$\varepsilon_{it}$  is the error term

In the literature, bank profitability, is generally measured by the return on assets (ROA) and/or the return on equity (ROE), and expressed as a function of internal and external determinants. Internal determinants are factors that are mainly influenced by a bank's management decisions and policy objectives. Such profitability determinants are the level of liquidity, capital adequacy, expenses management and bank size. On the other hand, the external determinants, both industry-related and macroeconomic, are variables that reflect the economic and legal environment where the credit institution operates.

The two dependent variables used in this study are return on assets (ROA) and net interest margin (NIM). Profit margin and spread are the other profit measures used in literature.

One of the performance measures used in this study is ROA. It is the ratio of net profit to total assets and it measures the profit earned per dollar of assets and reflects how well bank management use the bank's real investment resources to generate profits. In this study before tax profit is taken instead of net profit in order to minimize the effect of different tax policies in different countries.

Other performance measure used in this study is NIM. NIMs can be measured using ex ante and ex post spreads. The ex post spread is the actual difference between banks actual interest revenue and banks actual interest expenses. Ex ante spread is the difference between the contractual rate charged on loans and rates paid on credit (Huizinga et al., 1999). The authors highlight the superiority of

ex post over ex ante spread. A major advantage of ex post spreads is that, they account for loan defaults and risky credits by taking into account the actual interest paid and interest received whereas ex ante spreads do not account for these. In this study, the NIM variable is defined as the net interest income divided by total assets where the net interest income is calculated as the difference between the interest income and interest expense. NIM is focused on the profit earned on interest activities. The descriptive statistics for the dependent variables are as given in Table 2:

Table2: Descriptive Statistics for Dependent Variables

<u>Variable Name</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>N</u>
ROA	1.40%	1.20%	1154
NIM	7.60%	5.70%	1159

The mean value of return on asset for 195 banks in 6 years is 1.40 percent whereas the mean value of net interest margin is 7.60 percent.

Seven bank characteristics are used as the determinants of bank profitability. They are the ratio of bank loans to total assets namely liquidity risk (LIQR), the ratio of operating expenses to total assets (OEM), the ratio of equity to total assets (CAP), the ratio of non-performing loans to total loans namely credit risk (CR), natural logarithm of total assets namely bank size (SIZE), ownership structure dummy indicating whether the bank is foreign or domestic (OWN) and M&A dummy indicating whether the bank involved in M&A process or not (MNA). The definitions of the variables are given in Table 3.

Liquidity risk, arising from the possible inability of a bank to accommodate decreases in liabilities or to fund increases on the assets' side of the balance sheet, is

considered an important determinant of bank profitability. The loans market, especially credit to households and firms, is risky and has a greater expected return than other bank assets, such as government securities. Thus, one would expect a positive relationship between liquidity risk and profitability (Bourke, 1989; Eichengreen & Gibson, 2001).

Table 3: Definitions of the Variables

<u>Dependent Variables</u>	<u>Definition</u>
ROA	Before Tax Profits/Total Assets
NIM	Net Interest Income/Total Assets
<u>Independent Variables</u>	
LIQR	Bank Loans/Total Assets
OEM	Operating Expenses/Total Assets
CAP	Equity/Total Assets
CR	Non-Performing Loans/Total Loans
SIZE	LN(Total Assets)
MNA	M&A Activity Dummy
OWN	Ownership Structure Dummy
<u>Control Variables</u>	
CD	Country dummies
GDPGR	Annual GDP growth
INF	Annual Inflation

Changes in credit risk may reflect changes in the health of a bank's loan portfolio (Cooper et al., 2003), which may affect the performance of the institution. Duca and McLaughlin (1990), conclude that variations in bank profitability are largely attributable to variations in credit risk, since increased exposure to credit risk is normally associated with decreased profitability. This triggers a discussion concerning not the volume but the quality of loans made. In this direction, Miller and Noulas (1997) suggest that the more financial institutions are exposed to high-risk loans, the higher the accumulation of unpaid loans and the lower the profitability.

Most studies that use capital ratios as an explanatory variable of bank profitability (e.g. Bourke, 1989; Molyneux & Thornton; 1992; Goddard et al., 2004) observe a positive relationship.

The literature argues that reduced expenses improve the efficiency and hence raise the profitability of a financial institution, implying a negative relationship between an operating expenses ratio and profitability (Bourke, 1989). However, Molyneux and Thornton (1992) observed a positive relationship, suggesting that high profits earned by firms may be appropriated in the form of higher payroll expenditures paid to more productive human capital.

Bank size is generally used to capture potential economies or diseconomies of scale in the banking sector. This variable controls for cost differences and product and risk diversification according to the size of the credit institution. The first factor could lead to a positive relationship between size and bank profitability, if there are significant economies of scale (Akhavain et al. 1997; Bourke, 1989; Molyneux & Thornton, 1992; Bikker & Hu, 2002; Goddard et al., 2004), while the second to a negative one, if increased diversification leads to lower credit risk and thus lower returns. Other researchers, however, conclude that few cost savings can be achieved by increasing the size of a banking firm, especially as markets develop (Berger et al., 1987; Boyd & Runkle, 1993; Miller & Noulas, 1997; Athanasoglou et al., 2005). Eichengreen and Gibson (2001), suggested that the effect of a growing bank's size on profitability may be positive up to a certain limit. Beyond this point the effect of size could be negative due to bureaucratic and other reasons.

In addition to these financial characteristics of banks the effect of ownership structure and M&A activity on profitability also examined in this study. The available empirical evidence suggests that M&A operations in the US and European

banking industry have not had a positive influence on performance (DeLong & Deyoung, 2007; Amel, et al., 2004; Berger et al., 1999). Overall these studies provide mixed evidence and many fail to show a clear relationship between M&As and performance.

In terms of ownership structure, many recent studies take into account the large share of foreign bank assets in transition countries and include foreign ownership characteristic as one of the profitability determinants and it has been noticed that foreign banks in developed countries exhibit lower profitability than their domestic competitors, whereas the opposite is true for transition economies. (Bonin et al., 2005; Demirguc-Kunt & Huizinga, 1999; Majnoni et. al, 2003; Chmielewski & Krzesniak, 2003).

Two macro-economic variables and country dummies are used as control variables to isolate the effects of bank characteristics on performance. Inflation (INF) and GDP growth(GDPGR) have been proposed in the literature as possible determinants of profitability. Previous studies have reported a positive association between inflation and bank profitability. High inflation rates are generally associated with high loan interest rates, and therefore, high incomes. However, if inflation are not anticipated and banks are sluggish in adjusting their interest rates then there is a possibility that bank costs may increase faster than bank revenues and hence adversely affect bank profitability. The GDP growth is expected to have a positive impact on bank's performance according to the well documented literature on the association between economic growth and financial sector performance. The descriptive statistics for independent and control variables are given in Table 4:

Table 4: Descriptive Statistics for Independent and Control Variables

<u>Variable Name</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>N</u>
LIQR	0.586	0.105	1163
OEM	0.054	0.091	1152
CAP	0.079	0.037	1161
CR	0.023	0.014	1148
SIZE	13.1	1.2	1165
MNA	0.32		1170
OWN	0.56		1170
GDPGR	0.031	0.022	1170
INF	0.045	0.021	1170

The parameters of the panel data regression can be estimated by fixed effect and random effect models. Panel data models study fixed and/or random effects of subject (household, individual or country) or time.

In the context of a panel data regression, one intuitive way to account for individual and/or time differences is that some regression coefficients are assumed to vary across individuals and/or through time. Although the regression coefficients are not known specifically, the parameters are fixed. When these coefficients are allowed to change in one or two dimensions, this model is referred to as ‘fixed effect model’. In the context of this model, the intercept is allowed to vary across individuals (households, firms or countries), whereas the slope parameters and error variances are assumed to be constant in both individual and time dimensions.

In the random effect model, in contrast, the heterogeneity is modeled using random quantities instead of fixed parameters. These random quantities are known as random effects. This model assumes that the intercept and slope parameters do not vary whereas the error variances components are supposed to vary across individuals and/or times. When there are too many parameters in the fixed effects models or a fixed effect model leads to enormous loss of degrees of freedom, the random effect

model is a more appropriate specification. As mentioned in the studies of Judge et al. (1988) and Baltagi (2001) the random effect model is used when N individuals are drawn randomly from a large population.

The choice between the fixed effect and random effect model has been controversial issue among econometricians for many years. The selection of the appropriate model is dependent upon the assumptions made about the interrelationship of the exogenous variables, both cross-sectionally and across time, assumptions regarding the error term(s), and/or the researcher's desires to obtain either less bias or greater efficiency in the estimators.

Even though fixed effects model will generally have less efficiency, they are more likely to be unbiased and consistent. Fixed effects models are also generally less restrictive than the random effects model. The random effects model, considered as a special case of the fixed effects model, requires far more assumptions.

There are some basic differences between fixed effects and random effects models. The random effects model can produce coefficient estimates for time-invariant variables whereas fixed effects model does not produce coefficient estimates for them, it just controls for the time-invariant predictors. However, unlike the random effects model, the fixed effects model controls for all time-invariant variables, not just include in the regression model. Also, random effects model has the ability to allow for autoregressive and other covariance structures on the  $v_{it}$  disturbance term, if needed. Generally, while the random effects model has less sampling variability which results in more efficient estimators, if the assumptions cannot be met, it can easily lead to biased estimators. Fixed effects model is more favored because of its less restrictive nature and unbiased estimators. Random effects

model is necessarily used when the coefficient estimates are needed for time-invariant variables.

One important consideration is to determine which of these two models can best deal with missing or unbalanced data, such as in this study. Both the fixed effects and random effects model can handle unbalanced designs of the data, which generally preserve degrees of freedom compared to excluding observations to create a balanced data (Batalgi & Chang, 1994).

In this study, the fixed effects model is expected to be the appropriate method since we expect to observe the effect of 2008 global crisis on each bank in the sample. Also our estimating sample is identical to the population of interest and does not include time-invariant regressors. However, as it is common in the literature, the appropriate model that most fits the sample and the objective of the research must be selected. Hausman and Taylor (1981) test is used to determine whether to use random effects or fixed effects model. In Hausman Test, the correlation between individual effects and regressors is tested under the null hypothesis of there is no correlation between individual effects and regressors. The results of the Hausman Test for each of the models for different dependent variables are given in Table 5 and Table 6 respectively.

Table 5: Hausman Test (ROA dependent variable)

Correlated Random Effects - Hausman Test				
Equation: Untitled				
Test cross-section random effects				
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.	
Cross-section random	72.421789	6	0	

Table 6: Hausman Test (NIM dependent variable)

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.599917	6	0.0049

Hausman test indicates that the fixed effects model is more superior to the random effects model for these two equations since the results of both tests are significant. Therefore fixed-effect panel data regression is used in the analysis.

### Findings

This section provides empirical evidence on the determinants of bank profitability and interest margins in the banking sector of advanced emerging countries list of FTSE. The results of the unbalanced panel data regression of the return on asset and net interest margin variables are given in Table 7 and Table 8 respectively.

Table 7: Panel Data Regression Results for ROA Dependent Variable

Dependent Variable: ROA					
Method: Panel Least Squares					
Sample: 2005 2010					
Periods included: 6					
Cross-sections included: 195					
Total panel (unbalanced) observations: 1113					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
LIQR	1.046741	0.193871	5.399162	0	***
OEM	11.89276	2.347006	5.067205	0	***
CAP	16.49176	2.755742	5.984508	0	***
CR	-11.032102	1.30617	-8.446146	0	***
OWN	0.331057	0.738385	0.448353	0.649	
GDPGR	3.47946	3.55551	0.978611	0.2957	
MNA	-0.653028	0.765144	-0.853471	0.3936	
SIZE	0.1150523	0.028274	4.069234	0.0001	***
INF	11.15521	2.202132	5.065641	0	***
Effects Specification					
Period fixed (dummy variables)					
R-squared	0.396371				
Adjusted R-squared	0.388675				
F-statistic	51.49987				
Prob(F-statistic)	0				
Durbin-Watson stat	1.871146				

Table 8: Panel Data Regression Results for NIM Dependent Variable

Dependent Variable: NIM					
Method: Panel Least Squares					
Sample: 2005 2010					
Periods included: 6					
Cross-sections included: 195					
Total panel (unbalanced) observations: 1121					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
LIQ	1.8667	1.474894	1.265650277	0.2059	
OEM	22.97492	3.056837	7.51591269	0	***
CAP	21.76873	5.07638	4.288238863	0	***
CR	-14.30007	4.42783	-3.22958876	0.0027	***
OWN	1.723097	3.22783	0.533825201	0.5936	
GDPGR	8.80236	10.18603	0.864160031	0.4202	
MNA	-3.191161	1.416498	-2.252852457	0.0245	**
SIZE	0.5141472	0.2522902	2.037919824	0.0292	**
INF	5.473826	1.204728	4.543619805	0	***
	Effects Specification				
Period fixed (dummy variables)					
R-squared	0.482065				
Adjusted R-squared	0.475509				
F-statistic	73.52881				
Prob(F-statistic)	0				
Durbin-Watson stat	1.823729				

Durbin-Watson statistics is around 2 for both equations so autocorrelation is not a problem. Adjusted R-squared values are 0.38 for ROA and 0.47 for NIM which are in accordance with the literature. The F-test is significant in both equations .

The first bank-level variable is the liquidity risk variable which shows the ability of the bank to meet its liquidity needs for deposit outflows and loan increases. Thus, a large liquidity risk for a bank indicates a more risky bank. As expected the coefficient sign is positive for both ROA and NIM dependent variables, indicating that an increase in the liquidity risk results in an increase in the bank risk and profitability. The sign of this ratio is consistent with the results of similar studies

carried out in the most developed stock markets (Jahankhani & Lynge, 1980; Mansur et al., 1993). This variable is significant for ROA equation but not significant for NIM equation.

Empirical results of this study show that there is a positive and significant coefficient on the operating expenses to assets ratio variable (OEM) in both ROA and NIM equations. The negative relationship between OEM and profitability is expected as many empirical studies have reported that operational expenses and profitability are negatively related. (Demirgüç-Kunt and Huizinga, 1999; Bourke, 1989 and Athanasoglou, et al., 2006) reported that operational expenses and profitability are negatively related. The explanation for the positive sign could be that, the high expenditures may be used to increase the productivity which end up in high profitability (Molyneux & Thornton, 1992).

Another variable is the equity variable (CAP) described as the equity to total assets ratio. Berger (1995) and Demirgüç-Kunt and Huizinga (1999) find a positive relationship between bank performance and capitalization. Consistent with the previous evidence, the positive relationship is confirmed whether we use interest margin or return on assets as a dependent variable and in all specifications. This may indicate that well-capitalized banks support lower expected bankruptcy costs for themselves and their customers, which reduce their cost of capital.

As expected credit risk (CR) coefficient is negative and significant for both ROA and NIM equations implying increased exposure to credit risk is associated with decrease in profitability.

Ownership structure variable (OWN) indicating whether the bank is foreign or domestic is found insignificant for both ROA and NIM equations. It implies there is no relationship between ownership structure and profitability in sample banks.

M&A variable (MNA) coefficient is negative for both ROA and NIM implying that there is a decrease in the profitability of the banks which involve in M&A activity. M&A variable is significant for NIM equation whereas it is insignificant for ROA equation.

Some researchers find that little cost saving can be achieved by increasing the size of the banking firm (Berger et al., 1987) and others report significant scale economies for banks who have large asset size (Shaffer, 1985). In this study the size variable (SIZE) has positive and significant coefficients on the net interest margins and return on asset equations. This suggests that larger banks tend to have higher profitability.

Among the macroeconomic variables, inflation (INF) is found to be positively and significantly related to both ROA and NIM in this study. This implies that, with inflation, bank income increases more than bank costs. The results are parallel to Demirgüç-Kunt and Huizinga (1999), Kaya (2002) and Abreu and Mendes (2002) that reported positive relationships between inflation and NIM and ROA.

Other macroeconomic variable GDP growth (GDPGR) is found insignificant for both ROA and NIM.

## Conclusion and Limitations

In this chapter profitability and its determinants for nine emerging countries including Turkey is investigated by using fixed-effect panel data regression. 195 banks from 9 advanced emerging market countries are analyzed between the years 2005-2010. The results reveal that operating expenses management, capitalization,

credit risk, bank size and inflation are important determinants for both return on asset and net-interest margin dependent variables.

Our empirical results suggest that for the permanence of profitability, there should be a strong capital structure in the sector. Also for the improvement of the profitability of commercial banks the human resource and service quality should be developed and credit risk should be decreased.

This empirical study can be improved by testing for different variables to increase the explanatory power. Since there are limited number of banks in each country, more countries can be included in the analysis to increase the sample size. Also, longer time period can be analyzed to obtain more accurate results.

CHAPTER 3  
A SURVEY OF LENDING RELATIONSHIP BETWEEN  
SMEs AND BANKS

The aim of this chapter is to examine the lending relationships between banks and SMEs. Numerous authors have investigated the importance of banking relationships in lending to small businesses. A major issue is the relative difficulty in obtaining meaningful information and accurately assessing the credit worthiness of such borrowers. For this reason, many authors have examined the influence of this relationship on various aspects of line of credits made in different countries but up to date no studies has been conducted in lending relationship of SMEs with banks in Turkey. This may be because of the data insufficiency of SMEs. This research aims to fill that gap by looking at the determinants of SME lending conditions by using the survey results of SMEs.

Literature Review

The capacity for Small and Medium sized Enterprises (SMEs) to fulfil their potential in an economy depends on the availability of finance. Finance in general and credit in particular is especially important for SMEs, since they are unable to finance themselves through retained earnings or equity financing. Despite the fact that financing is a major factor for growth of SMEs, a number of studies and government enquiries have mentioned that SMEs face problems when accessing to bank finance,

due to a market failure in credit markets. Although, a considerable number of research papers and consultancy reports have mentioned that the access to finance has been a major problem in the SME sector, a survey of the literature dealing with this area indicates there is a significant gap in knowledge of the determinants of access to finance by the SMEs in developing countries.

### Theoretical Background

According to finance theorists' difficulty in access to credit (referred to as credit rationing) exists due to adverse selection, moral hazard and contract enforcement problems.

The adverse selection and moral hazard theory of credit markets originated with the paper by Stiglitz and Weiss (1981) in which they explained why the interest rate could not equate the supply and demand in the credit market. The main idea of this paper can be summarized as follows. There are asymmetric information problems in the credit market; adverse selection and moral hazard. Adverse selection is the problem of sorting potential borrowers in the reverse order. That is, as the loan rate gets higher, only riskier borrowers (less favorable borrowers to lenders) remain in the market. Moral hazard is the problem of affecting the actions of borrowers after they receive loans. In other words, higher loan rates encourage borrowers to choose riskier projects.

In this situation, those who are willing to pay high loan interest rates may be high risk borrowers. So with the rise in the loan rate, the average riskiness of the loans increases, possibly lowering the bank's expected profits. For this reason, the

expected return of the bank may increase less rapidly than the loan rate, and beyond a certain point, may actually decrease.

The third reason to cause credit rationing is the contract enforcement problems. Mushinski (1999) argued that credit market imperfections in developing countries derive not only from moral hazard and adverse selection problems but also from costly monitoring and contract enforcement. In contrast, countries characterised by well functioning legal systems, the problems are not as pronounced as in those where the mechanisms for enforcement of contracts, property verification and ownership are weak. Hence, the main reason for the contract enforcement problem is the poor development of property rights. Although this argument is not specifically drawn at SMEs, these problems are more associated with SMEs than large companies.

### Empirical Studies

There are few studies undertaken which investigated the determinants of bank credit and most of these studies are limited to one category of determinants and do not give an overall picture of determinants of access to credit. For example, several studies build upon human capital theory have looked at education, age, work experience and social background of the owner when accessing credit from banks (Cavalluzzo & Cavalluzzo,1998; Storey,2004). There are few other studies which investigated the firm characteristics such as size, age of the business, legal status and financial characteristics such as profit, fixed assets base etc. In this study we aim to test firm characteristics, ownership characteristics, relationship characteristics and bank characteristics together.

While Fischer (1990) presented a theoretical model illuminating the advantages of close lending relationships, he also provided some evidence that this model may not provide a good depiction of contemporary banking practices in Germany. Summarizing the results from 34 interviews with large banks and firms, Fischer suggested that commitment mechanisms have only little importance for bank finance in Germany. He noted that competition appears to be well at work in that market shares of individual banks are quite low, and that due to competition, banks have little discretion over interest rates. Intertemporal compensation is thus made impossible. Moreover, he argued that firms in good standing tend to maintain multiple banking relationships, and that banks prefer to share risks with other banks.

Petersen and Rajan (1994) used data from a detailed survey administered by the US Small Business Administration (SBA). They analyzed the financing of about 3400 US enterprises with fewer than 500 employees. The survey data included information on loan conditions (interest rates, maturity, collateral) and on other sources of funds such as trade credit, equity finance, leasing contracts, etc. Moreover, the data contained information on lending relationships, i.e. on the duration of bank-firm relationships, the number of financial institutions a firm is relying on, and the share of total bank funding coming from the particular lender. Petersen and Rajan (1994) analyzed the data with respect to interest rates and loan availability, using firm characteristics like size and age and characteristics of lending relationships as exogenous regressors. To separate groups of firms according to financing constraints, they use the extent of trade credit as an indicator. Since trade credit is presumably the most expensive external source of finance (Elliehausen and Wolken, 1993), this is a reasonable proxy variable for a debt-constrained financial regime in small

companies. They found that the extent of trade credit usage is negatively related to the age of the enterprise and the duration of existing lending relationships.

Berger and Udell (1995), using the same dataset as Petersen and Rajan (1994), concentrated on collateral requirements and interest rates for lines of credit (L/Cs). These authors argued that a study of L/Cs should be particularly revealing, since relationships are more likely to matter in this context than for mortgages or other types of loans. They also noted that the interest rate regressions in Petersen and Rajan (1994) combined various types of loans in one equation, and that focussing on one particular type of loan may yield cleaner results. Berger and Udell found that firms with longer lending relationships have to pledge collateral less frequently, and that interest on L/Cs decreases as a function of duration. Thus, contrary to the results reported by Petersen and Rajan (1994), they stated that the duration of a lending relationship may after all have some impact on credit price terms.

Petersen and Rajan (1995) in another study wanted to provide a framework of how important the extent of competition in credit markets is for the determination of the value of lending relationships. From their test results, they concluded that creditors smooth loan interest rates over the life cycle of the firm in a concentrated market, charging a lower rate when young and a higher one when old, so young firms in concentrated markets receive lower interest rate loans from financial institutions than do similar firms in competitive markets, but older firms receive higher loan rates in concentrated markets than in competitive ones.

Berger, et al, (2001) dealt with the general concern that the consolidating M&As of the banking industry might result in higher loan interest rates for small business borrowers by examining two different effects of bank size and banking

market concentration on the pricing of credit lines. The main finding of this paper is that banking market concentration is important to bank loan pricing and appears to affect prices more than bank size. Their empirical results showed that interest rates on small business credit lines are lower when large banks dominate a market than when small banks dominate, which suggested that banks compete differently in markets dominated by small banks than in markets dominated by large banks, and in particular that banks may compete less aggressively in markets dominated by small banks. They attributed these results with their other findings to the effect that small banks don't have a competitive pricing strategy in markets but large banks do especially in markets with high proportions of small banks.

Cavalluzzo and Cavalluzzo (1998), Blanchflower, Levine, and Zimmerman (2003), and Blanchard, Zhao, and Yinger (2008) addressed the issue of discrimination against minority-owned businesses in the small business loan market. However, their conclusions were different: Cavalluzzo and Cavalluzzo (1998) found no evidence that businesses owned by African-Americans, Asians, and Hispanics paid more for credit than firms owned by white males; Blanchflower et al (2003) found that African-American-owned firms pay higher interest rates than white-owned firms, but other minorities have non-consistent results among different models and different specifications; Blanchard et al (2008) found that businesses owned by African-Americans, Hispanics, and Asians all face significantly higher interest rates, but these differences disappear once controls are added.

Lastly, Vickery (2007) examined fixed-rate and variable-rate (or adjustable-rate, floating-rate) commercial loan contracts to study how small firms adjust their exposure to interest rate risk by using SSBF data sets (1988, 1993, and 1998) and time-series data of STBL (Survey of Terms of Business Lending). The main

conclusions in this paper were as follows; 1) fixed-rate loans are most popular among smaller firms, younger firms, firms switching from their primary lender, and firms with low cash flows or high investment opportunities because these firms tend to be facing financial constraints, 2) fixed-rate loans are less prevalent in sectors in which industry outputs co-vary positively with the interest rate because, in these industries (eg. coal mining, petroleum refining, and oil and gas extraction), firms have a natural hedge against shifts in short-term interest rates, 3) commercial banks are more likely to offer an adjustable rate loan than other types of lenders because banks are exposed more to rising interest rates than other lenders.

Taken together, these studies provide fairly strong support that the quality of lending relationships improves the availability of bank loans and in the case of interest rates in the US as studied by Berger and Udell also affect price conditions significantly. Moreover, it seems that enhanced competition between financial institutions (as measured by the number of institutions the firm borrows from) will lead to a reduction in the availability of loans. However, this result is not supported by the interview data described in Edwards and Fischer (1994) for the case of the German banking system. Finally, the empirical studies agree on the role of firm age and firm size. Relatively small firms and relatively young firms may have greater difficulties in obtaining funds than their larger and older counterparts. One would expect that this finding should not vary across countries, while the incidence and impact of long-term lending relationships need not be similar.

There are a lot more papers that deal with the issue of loan rate determination empirically in the US. These studies, by using survey data or financial data, analyze the structure of loan interest rates either from the viewpoint of some specific issue,

such as minority discrimination, risk structure, and indexation, or with respect to the relationship with other variables such as maturity or collateral.

As mentioned before there were no empirical evidence for Turkey for the determinants of lending conditions for SMEs.

## Empirical Research

The aim of this chapter is to analyze the lending relationship between the SMEs and the banks and to determine which factors are affecting the lending conditions.

### Data

The data used in this study is obtained from a questionnaire answered by 204 SMEs whose number of employees are between 10 and 250 and whose annual sales are below 25.000.000 TL in accordance with the KOSGEB definition of SME. On 18th March of 2005, KOSGEB declared a new SME definition. Before 2005 the KOSGEB definition was only based on the number of employees. The companies with the number of workers below 150 was accepted as SME. Definition by regarding only the number of persons employed was not adequate since the other criteria are also dominant on how a company manufactures and behaves in the market. On 2005, KOSGEB has announced that the enterprises should submit their information so that they could carry on using SME beneficiaries supported by the agent. The criteria new are the same with EU but the monetary terms were rebalanced according to the Turkish SME profile and economical conditions.

Table 9: The New SME Definition of KOSGEB

	Headcount	Annual Turnover		Annual Balance
Medium	<250	<25 Millions TL		<25 Millions TL
Small	<50	<5 Millions TL		<5 Millions TL
Micro	<10	<1 Millions TL	or	<1 Millions TL

The sample firms are selected from the ISO member companies which are incorporations or limited companies in İstanbul, Bursa, Tekirdag and Kocaeli region. From the 3000 firms in the target population group in the region, 500 firms were selected with the method of stratified random sampling. 275 firms accepted to answer the questionnaire but because of the missing data and extreme values in the answers 204 questionnaires were used in the analysis.

The surveys were conducted by a professional research company through face-to-face interviews. The interviewers and supervisors were given a full day of training by the research team, and the important points to be considered were explained thoroughly. The survey was conducted during February - June 2011.

In addition to firm characteristics (firm size, firm age, legal form, financial information) and contract terms (interest rate, credit line), the questionnaire inquired about firm management/owner characteristics. Moreover, a variety of questions related to the nature of the relationship between small and medium-sized firms and banks were included. Most questions were open-ended since the main objective of the questionnaire was to obtain the firm data from SMEs which is not available as a secondary data. The questions of the survey that were used to generate the variables are presented in Appendix A.

The secondary data about the bank characteristics are taken from the Banks Association of Turkey website.

Some frequency distributions of general information about the sample and about the answers of the questionnaire are given below.

Table 10: Sectoral Breakdown of the Sample Firms

<u>Sector</u>	<u>Number of SMEs</u>	<u>Percentage</u>
Service	69	33.82%
Manufacturing	135	66.18%
<u>Total</u>	<u>204</u>	<u>100.00%</u>

Sixty-nine firms which constitutes the 33.82% of the sample SMEs are in service sector and 135 SMEs which constitutes the 66.18% of the sample firms are in manufacturing sector.

Table 11: Industry of the Sample Firms

<u>Industry</u>	<u>Number of SMEs</u>	<u>Percentage</u>
Construction	34	16.67%
Automotive spare parts	12	5.88%
Textile	32	15.69%
Furniture	13	6.37%
Chemistry	9	4.41%
Food & Beverages	21	10.29%
Machinery	36	17.65%
Sanitaryware	17	8.33%
Communication	7	3.43%
Other	23	11.27%
<u>Total</u>	<u>204</u>	<u>100.00%</u>

Seventy firms in the sample are operating in machinery (17.65%) and construction (16.67%) industry. Number of firms operating in textile industry is 32 (15.69%), 21

(10.29) SMEs are operating in Food & Beverages industry. The least number of firms are operating in communication sector (3.43%).

Table 12: Location of the Headquarters of the Sample Firms

<u>Location</u>	<u>Number of SMEs</u>	<u>Percentage</u>
İstanbul	146	71.57%
Bursa	26	12.75%
Tekirdağ	12	5.88%
Kocaeli	20	9.80%
<u>Total</u>	<u>204</u>	<u>100.00%</u>

One hundred forty six firms (71.57%) in the sample have headquarters located in İstanbul. 26 firms (12.75%) are located in Bursa and 20 firms (9.80%) are located in Kocaeli region. Remaining 12 companies (5.88%) are located in Tekirdag region.

Table 13: Legal Form of the Sample Firms

<u>Legal Form</u>	<u>Number of SMEs</u>	<u>Percentage</u>
Incorporation	85	41.67%
Limited	119	58.33%
<u>Total</u>	<u>204</u>	<u>100.00%</u>

Eighty five firms (41.67%) in the sample are incorporations and 119 firms (58.33%) in the sample are limited companies.

Table 14: The Banks which the Sample Firms are Most Actively Working

<u>Bank Name</u>	<u>Number of SMEs</u>	<u>Percentage</u>
Garanti Bankası	48	23.53%
İş Bankası	28	13.73%
Yapı Kredi	27	13.24%
Halkbank	22	10.78%
Denizbank	17	8.33%
Akbank	11	5.39%
TEB	9	4.41%
Finansbank	8	3.92%
Albaraka Turk	5	2.45%
Vakıfbank	5	2.45%
HSBC	5	2.45%
Anadolubank	4	1.96%
ING	4	1.96%
Fortis	3	1.47%
Kuveyt Turk	3	1.47%
Ziraat Bankası	2	0.98%
Bank Asya	2	0.98%
Şekerbank	1	0.49%
<u>Total</u>	<u>204</u>	<u>100.00%</u>

Most of the sample firms (23.53%) are working with Garanti Bankası most actively.

The second bank which is most actively worked is İş Bankası with 13.73% of the sample firms and the third bank is Yapı Kredi Bankası with 13.24% of the SMEs.

Only 1 firm (0.49%) out of 204 firms is working with Şekerbank most actively.

Table 15: Type of the Credit the SMEs are Using Most

<u>Type of the Loan</u>	<u>Number of SMEs</u>	<u>Percentage</u>
Revolving Loan	51	25.00%
Spot Loan	86	42.16%
Discount Loan	38	18.63%
Project Loan	3	1.47%
Other	26	12.75%
<u>Total</u>	<u>204</u>	<u>100.00%</u>

SMEs mostly prefer to use spot loan which the interest rate is fixed for a certain time of the period and the firm pays back the credit and the interest back at the end of the term. 86 companies (42.16%) use spot credit whereas 51 companies (25%) prefer to use revolving credit.

Table 16: Type of the Collateral for the Credit SMEs are Using

<u>Collateral</u>	<u>Number of SMEs</u>	<u>Percentage</u>
Without any collateral	28	13.73%
With guarantee	36	17.65%
With mortgage	62	30.39%
With Cheque	78	38.24%
<u>Total</u>	<u>204</u>	<u>100.00%</u>

Most SMEs (38.24%) use cash loans against cheque and against mortgage (30.39%). 28 SMEs (13.73%) use cash loans without any collateral whereas 36 companies (17.65%) use loans against personal guarantee.

Table 17: Frequency of Interaction with Bank

<u>Frequency of Interaction</u>	<u>Number of SMEs</u>	<u>Percentage</u>
Everyday	149	73.04%
Once a two or three days	26	12.75%
Once a week	19	9.31%
Once a 15 days	3	1.47%
Once a month	5	2.45%
Less than once a month	2	0.98%
<u>Total</u>	<u>204</u>	<u>100.00%</u>

149 SMEs (73.04%) contact with their most actively worked bank everyday and 26 companies (12.75%) interact with the bank once a two or three days. Only 2 companies (0.98%) contact with the bank they are working most actively less than once a month.

Table 18: Education Level of Top Managers of SMEs

<u>Education</u>	<u>Number of SMEs</u>	<u>Percentage</u>
Primary School	3	1.47%
Secondary School	4	1.96%
High School	49	24.02%
Vocational School	26	12.75%
University	97	47.55%
Master	23	11.27%
PhD	2	0.98%
<u>Total</u>	<u>204</u>	<u>100.00%</u>

Most top managers (47.5%) are university graduate whereas only 2 (0.98%) top managers are PhD graduate.

### Hypotheses

This section formulates hypotheses derived from literature to test whether there are statistically significant relationship exists between the variables. These hypotheses focus on the determinant variables that have been identified in the previous literature which has been associated with access to credit. Based on the theoretical arguments and previous empirical evidence the following hypotheses will be tested.

H1: Lending conditions for small firms are more restrictive

H2: Lending conditions for young firms are more restrictive

H3: Lending conditions for financially distressed firms are more restrictive

H4: Lending conditions for limited companies are more restrictive compared to incorporations.

H5: Lending conditions for firms that are working with fewer number of banks are more restrictive.

H6: Lending conditions for firms having shorter duration of relationship with banks are more restrictive.

H7: Ownership characteristics of the firms tend to affect lending relationship.

H8: Lending conditions tend to be affected by the characteristics of the bank which the firm is working with.

### Methodology

In this study the empirical test is concerned with the determinants of lending conditions of SMEs. OLS regression analysis is used to test the following model.

$$\text{Lend\_Cond.}_i = \beta_0 + \sum_{k=1}^K \beta_k \text{BankCha.}_i^k + \sum_{l=1}^L \beta_l \text{FirmCha.}_i^l + \sum_{m=1}^M \beta_m \text{Rel.Cha.}_i^m + \sum_{n=1}^N \beta_n \text{Own.Cha.}_i^n + \beta_5 X_i + e_i$$

where,

$\text{Lend\_Cond.}_i$  is the measure of lending conditions for firm  $i$ . This dependent variable is measured by two proxies namely interest rate and credit line availability.

$\text{Bank Cha.}_i$  is the measure of bank characteristics that firm  $i$  is working with

$\text{Firm Cha.}_i$  is the measure of firm characteristics for firm  $i$

$\text{Rel. Cha.}_i$  is the measure of bank-firm relationship characteristics for firm  $i$

$\text{Own. Cha.}_i$  is the measure of management and ownership structure for firm  $i$

$X_i$  is the set of control variables

$\beta$  is a vector of parameters to be estimated

$e_i$  is the error term

To test our hypotheses, we used two different models for two different dependent variables.

First dependent variable to test the lending condition is the loan interest rate (INTEREST) taken from the bank the firm is working most actively. The reference day is 31 December 2010. Other dependent variable is the credit line volume (CRLINE) of the firm in the most actively worked bank. The descriptive statistics for the dependent variables are given in Table 19.

Table 19: Descriptive Statistics for Dependent Variables

<u>Variable Name</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>N</u>
CRLINE	2,057,661.29	1,266,289.51	204
INTEREST	9.57	1.23	204

The mean value of the credit line volume is 2,057,661.29 TL and the mean value of the interest rate for the loans used by the SMEs in Turkey is 9.57 as of 31 December 2010. In the regression analysis natural logarithm of credit line volume variable is used.

In the literature lending conditions are generally measured by credit interest rate, credit line availability and the collateral and expressed as function of firm characteristics, ownership characteristics and relationship characteristics. In this study characteristics of the bank which the firm works most actively is also included as an explanatory variable. The list of variable definitions are given in Table 20.

Table 20: Variable Definitions

<u>Variable</u>	<u>Definition</u>
<u>Dependent Variables</u>	
Credit Line Volume (CRLINE)	natural logarithm of volume of the credit line in most actively worked bank
Interest Rate (INTEREST)	interest rate for the credit taken from the most actively worked bank as of 31.12.2010
<u>Independent Variables</u>	
<u>Firm Characteristics</u>	
Firm Age (AGE)	natural logarithm of firm age (2011-the year firm was established)
Firm Size (FSIZE)	natural logarithm of firm assets
Financial Distress (DISTRESS)	dummy variable indicating whether firm was in financial distress within the last five years
Legal Form (LEGALF)	dummy indicating whether firm is a limited company or an incorporation
Return on Assets (ROA)	net profit/total assets
Profit Margin (PM)	net profit/sales
Leverage (LEV)	total debt/total assets
Asset Tangibility (AT)	tangible assets/total assets
<u>Management/ Owner Characteristics</u>	
Family-Owned Company (FAMILY)	dummy variable indicating whether more than 50% of shares are owned by the same family
Foreign Owner (FOREIGN)	dummy variable indicating whether at least one of owners is a foreigner
Owner-Managed Firm (OWNMAN)	dummy variable indicating whether at least one of the top managers is shareholder and engaged in management
Recent Change of Ownership (OWNCH)	dummy variable indicating whether a transfer of shares of 20% or more occurred within the last 5 years
<u>Relationship Variables</u>	
Duration of Lending Relationship (DURATION)	duration of lending relationship
Number of Lenders (LENDERS)	number of financing institutions from which the firm borrows
Mutual Trust (TRUST)	dummy variable indicating whether respondent thinks that there is a mutual trust between the firm and the bank it works most actively
<u>Bank Characteristics</u>	
Bank restructuring (MNA)	dummy variable indicating whether bank had an M&A in last 5 years
Bank Ownership (BANKOWN)	dummy variable indicating whether bank is foreign or domestic
Bank Size (BSIZE)	natural logarithm of bank assets
<u>Control Variables</u>	
Industry (IND)	Industry dummies
Location (LOC)	Dummy variable indicating whether the company is located in Istanbul or not

The first group of independent variables is firm characteristics, and includes variables such as the firm's financial and non-financial information.

Firm age (AGE) is the first independent variable in firm characteristics group.

Firm's age is taken as the natural logarithm because log transformation is expected to

enhance the linear relationship between the dependent variable and age. Age is defined as natural logarithm of 2011 minus the start-up year taken from the questionnaire. A number of studies have found that there is a correlation between firm age and access to credit. (Petersen and Rajan ,1994; Berger and Udell, 1995) Being in the business for many years suggests that the firms are at least competitive on average. Information required by the lenders to evaluate and process applications is readily available because these businesses have an established reputation or track record. The expected sign is negative for interest rate and positive for credit line volume.

Second independent variable is the firm size (FSIZE) defined as the natural logarithm of total assets. Natural logarithm is taken for the same reason as age. Firm size is one of the most important variables in literature related to lending relationship. This is true for both developed and developing countries. Numerous studies have discussed that small and medium enterprises are financially more constrained than large firms. For example, Calomiris & Hubbard (1990) noted that when the company is smaller, the restrictions on credit are greater.

As this study is focused on small and medium sized firms, it does not seem logical to consider size as a determinant of access to finance. However, even among the small and medium sized enterprises, there is still a large variation in size. Previous studies have mentioned several reasons for small firms to have less access to credit. Firstly, the small firms face with information opacity such as inability to provide financial information (Binks & Ennew 1996). When the firm is small, most of the time it is owned and managed by the entrepreneur himself and there is no such legal requirement to regularly report financial information and many firms do not maintain audited financial accounts. Second reason is that smaller firms have less

assets to offer as collateral. In order to reduce the anticipated risk and moral hazard associated with lending, the banks use collateral as one of the instrument. The collateral is an assurance to the bank in case of default and it also ensures the borrowers commitment to the loan repayments. Berger and Udell (1995) found smaller and younger firms are more likely to face higher cost of financing and they are required to offer collateral. The third reason is that smaller the firm, there is high risk involved because small firms have high failure rate compared to large firms. For example, Schiffer and Weder (2001) sampled firms across a number of countries and found that there was a negative relationship between the size of a business and the risk it might pose for a lender. So the expected sign for size is negative for interest rate and positive for credit line volume.

Another independent variable in firm characteristic group is financial distress (DISTRESS) defined as a dummy variable. Three questions are asked to the firm in the questionnaire related to financial distress and if the company answered yes to at least one of the questions, the firm is taken as financially distressed. The expected sign for financial distress is positive for interest rate and negative for credit line volume.

Legal form (LEGALF) indicating whether the firm is limited company or incorporation is another firm characteristic variable. The expected signs of coefficients on legal form variable is not obvious since in the literature the effect of legal form is insignificant (Harhoff and Korting, 1998)

The financial information of the firm is measured by ROA (net profit/total assets), Profit Margin (PM) (Net profit/Sales), leverage (LEV) (Total debt/total assets) and asset tangibility (AT) (tangible assets/total assets) in this study. Johnsen and McMahon (2005) stated that other factors held constant, firms with more

intangible assets need to borrow less, compared with firms with more tangible assets, because of collateral factor. Bennett and Donnelly (1993), used plant and machinery divided by total assets as a proxy for the securability of assets. SMEs have fewer collateralisable assets than large firms. A positive association between asset tangibility and credit line volume, and negative association between asset tangibility and interest rate is expected. The same results are expected for also ROA and profit margin. But the reverse is expected for leverage.

The second group is owner characteristics variables. These four variables are all dummy variables first one indicating whether the company is family-owned (FAMILY). Second one indicates whether at least one owner is a foreigner (FOREIGN), and the other one states whether the company is owner-managed (OWNMAN). The last variable in this group indicates whether there is an ownership change in last 5 years (OWNCH).

The third group of variables is relationship variables. The variables in this group are duration of relationship (DURATION) with bank and the company, number of financial institutions the company borrows from (LENDERS) and the mutual trust (TRUST) dummy variable indicating whether there is a mutual trust between the company and the bank. Two questions asked to measure the mutual trust in the questionnaire. First question directly asks whether there is a mutual trust or not and the second questions ask for a rating over 5 for mutual trust between bank and the company. There is a mutual trust if the rating is over 3 and answer to the first question is yes. Empirical studies of small business lending are often consistent with the importance of strong relationships. Stronger relationships, measured in various ways described above, are empirically associated with lower loan interest rates (Berger and Udell, 1995; Harhoff and Körting, 1998; Degryse and van Cayseele,

2000), and higher credit availability (Cole, 1998; Elsas and Krahenen, 1998; Machauer and Weber, 1998).

The last group of independent variables are bank characteristic variables. The variables related to the bank that the company is working most actively are size of the bank(BSIZE), ownership structure of the bank (BANKOWN) and bank restructuring (MNA) indicating whether the bank had an M&A in last 5 years. The descriptive statistics for the independent variables are given in Table 21.

Table 21: Descriptive Statistics for Independent Variables

<u>Variable Name</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>N</u>
AGE	20.38	1.25	204
FSIZE	18,439,861.73	7,679,244.67	204
DISTRESS	.1807		204
LEGALF	.4167		204
ROA	0.0756	0.04483	204
PM	0.1445	.09567	204
LEV	.4064	.41324	204
AT	.3493	.47577	204
DURATION	9.8855	5.27821	204
LENDERS	3.8554	2.72867	204
TRUST	.8458		204
FAMILY	.7771		204
FOREIGN	.0723		204
OWNMAN	.8398		204
OWNCH	.2771		204
BANKMNA	.6747		204
BANKOWN	.8253		204
BANKSIZE	72,321,000,000.00	37,163,657,886.10	204
LOC	.7157		204

The average age of the SMEs in the sample is 20.38 and the average of total assets of the companies is 18,439,861.73 TL. In the analysis the natural logarithm of the age and firm size is used. SMEs are working with the bank which they are working most actively for 9.88 years on average and the borrow from 3.85 banks on average. The

mean value of the Bank Assets is 72.321 million TL and the natural logarithm of the bank size is used in the regression.

The control variables tested in this study are industry dummies and location stating whether the company operates in İstanbul or not.

Also the interaction terms between the binary variable financial distress and all relationship variables namely duration of relationship, number of lenders and mutual trust are included. In the literature Fischer (1990) suggests that firms with close lending relationships should fare better in times of distress.

Before proceeding with our analysis we checked whether the variables are appropriate for the analysis. First normality assumptions were checked for each variable except the dummy variables. There were violations of normality in some variables. Since age, size and credit line volume variables were highly skewed natural logarithm of these variables are used in the analysis. Then multivariate normality was checked and proceeded.

Multicollinearity is the extent to which a variable can be explained by the other variables in the analysis. Existence of multicollinearity will result in unstable estimates for regression coefficients, therefore before proceeding with the estimations; several procedures to detect multicollinearity are performed. These include calculating variance inflation factor (VIF) and tolerance values, and checking the correlation matrix given in Table 22. Although no values in the matrix is greater than 0.70 we also checked for tolerance and VIF.

Table 22: Correlation Matrix

	<u>BANKMNA</u>	<u>BANKOWN</u>	<u>AGE</u>	<u>BANKSIZE</u>	<u>FSIZE</u>	<u>DISTRESS</u>	<u>LEGALF</u>	<u>OWNCH</u>	<u>LEV</u>	<u>AT</u>	<u>DURATION</u>	<u>LENDERS</u>	<u>PM</u>	<u>TRUST</u>	<u>FAMILY</u>	<u>FOREIGN</u>	<u>OWNMAN</u>	<u>LOC</u>
<u>BANKMNA</u>	1.000																	
<u>BANKOWN</u>	-.162	1.000																
<u>AGE</u>	-.100	.026	1.000															
<u>BANKSIZE</u>	-.068	.658	.096	1.000														
<u>FSIZE</u>	.040	-.113	.275	.042	1.000													
<u>DISTRESS</u>	-.082	-.074	.050	.031	-.051	1.000												
<u>LEGALF</u>	-.102	.081	.337	.113	.270	-.005	1.000											
<u>OWNCH</u>	-.024	.009	-.049	-.070	.023	.000	-.008	1.000										
<u>LEV</u>	.030	-.034	-.059	.032	-.083	.107	-.015	-.073	1.000									
<u>AT</u>	-.080	-.287	-.042	-.178	.008	.017	-.062	-.025	.083	1.000								
<u>DURATION</u>	-.054	.254	.351	.280	.094	-.164	.234	-.181	.000	-.042	1.000							
<u>LENDERS</u>	-.123	.018	.268	.164	.450	-.001	.216	-.069	-.027	.000	.138	1.000						
<u>PM</u>	-.066	.018	-.140	-.021	-.111	.039	-.097	.013	.200	-.042	-.077	-.108	1.000					
<u>TRUST</u>	.058	.096	.065	.030	.045	-.171	.095	-.090	-.182	.000	.132	.057	-.336	1.000				
<u>FAMILY</u>	-.098	.013	.121	-.011	-.068	.092	.044	.038	-.029	.019	.089	.033	.003	.000	1.000			
<u>FOREIGN</u>	-.002	-.051	.091	-.034	.249	.056	.140	.192	-.073	.016	-.102	.039	.043	-.036	-.187	1.000		
<u>OWNMAN</u>	-.016	-.118	-.096	-.193	-.185	-.084	-.144	-.014	.055	-.015	-.033	-.012	.116	-.060	.169	-.223	1.000	
<u>LOC</u>	.199	.079	.038	.164	.014	-.018	-.041	.043	.066	.062	.136	-.050	.010	.052	.108	-.125	.043	1.000

Tolerance is the amount of variability of the selected independent variable not explained by the other independent variables. Thus a tolerance close to 1 means there is minor multicollinearity, whereas a value close to 0 suggests that multicollinearity may be a threat.

The reciprocal of tolerance is known as the variance inflation factor (VIF). VIF shows how much of the variance of the coefficient estimate is being inflated by multicollinearity. A commonly given rule of thumb is that VIFs of 10 or higher may be a reason for concern.

Finally, as a rule of thumb, values higher than 0.7 in absolute value in the correlation matrix should be a reason for concern.

Using the above mentioned methods, no multicollinearity problem was detected among the variables.

## Findings

The results of the ordinary least squares (OLS) regression analysis are presented in this section. First by using all of the above mentioned variables these two models are tested.

Credit Interest rate = f1 (Constant, *ln(firm age)*, *ln(firm size)*, *financial distress*, *legal form*, *roa*, *profit margin*, *leverage*, *asset tangibility*, *family owned*, *foreign owned*, *owner-managed*, *recent change of ownership*, *duration of relationship*, *number of lenders*, *mutual trust*, *bank restructuring*, *bank ownership*, *bank size*, *industry*, *location*, u1)

Credit line volume = f2 (Constant, *ln(firm age)*, *ln(firm size)*, *financial distress*, *legal form*, *roa*, *profit margin*, *leverage*, *asset tangibility*, *family owned*, *foreign owned*, *owner-managed*, *recent change of ownership*, *duration of relationship*, *number of lenders*, *mutual trust*, *bank restructuring*, *bank ownership*, *bank size*, *industry*, *location*, u2)

The regression results for interest rate and credit line volume dependent variables are given in Table 23 and Table 24, respectively.

Table 23: OLS Regression Results for Loan Interest Rate as Dependent Variable

Dependent variable: interest rate			
	Coefficients	t	Sig.
(Constant)		9.539	***
AGE	-0.185	-2.134	**
FSIZE	-0.120	-1.338	
DISTRESS	0.228	2.950	***
LEGALF	-0.097	-1.164	
ROA	-0.084	-1.083	
PM	-0.049	-0.605	
LEV	0.000	0.003	
AT	-0.085	-1.078	
DURATION	-0.155	-1.785	*
LENDERS	-0.065	-0.718	
TRUST	-0.028	-0.352	
FAMILY	0.067	0.825	
FOREIGN	-0.065	-0.800	
OWNMAN	-0.060	-0.744	
OWNCH	0.149	1.932	*
BMNA	-0.014	-0.114	
BANKOWN	-0.034	-0.268	
BANKSIZE	-0.014	-0.132	
LOC	-0.157	-2.008	**
<u>R square</u>	0.358		
<u>Adjusted R Square</u>	0.298		
<u>F value</u>	2.159***		

\*, \*\*, \*\*\* Significance at the 10%, 5% and 1% level, respectively.

### Credit Interest Rate

The results for credit interest rate reveals that age, financial distress, duration of relationship, recent ownership change and location significantly affect the interest rate given by the most actively worked bank. Age consistent with our expectation has a negative sign. Older firms can use credit with lower interest rates. The results of the regression for credit line volume dependent variable reveals that there is no

relationship between the age of the firm and credit line volume. Possible reason for this could be that the average age of the firm in this survey is 21 years and prior research indicated that more mature firms are less likely to use debt than younger ones (Cole & Wolken, 1995).

Financial distress is a significant determinant of credit interest rate. Firms which have experienced financial distress in last five years face higher interest rate for the credits. Other firm-specific variables like firm size or legal form have no significant influence on loan pricing.

Consistent with Berger and Udell (1995), our results indicates that duration of the lending relationship affects loan interest rates negatively. Contrary to the Petersen and Rajan (1994) results, we find no effect of the number of lenders and mutual trust on interest rates.

Another significant independent variable for loan interest rate dependent variable is recent ownership change. Firms whose shares of 20% or more have been transferred in last 5 years faces with higher interest rates. Also firms operating outside İstanbul use credit with higher interest rates.

Results for the interest rate model is consistent with H2, H3, H6, H7 whereas inconsistent with H1, H4, H5 and H8.

Table 24: OLS Regression Results for Credit Line Volume as Dependent Variable

<b>Dependent variable: credit line</b>			
	Coefficients	t	Sig.
(Constant)		.455	
AGE	.114	1.520	
FSIZE	.338	4.345	***
DISTRESS	-.049	-.737	
LEGALF	.166	2.331	**
ROA	-.048	-.721	
PM	.049	.700	
LEV	-.084	-1.264	
AT	.053	.789	
DURATION	.080	1.076	
LENDERS	.161	2.041	**
TRUST	.015	.212	
FAMILY	-.106	-1.526	
FOREIGN	.123	1.766	*
OWNMAN	.051	.725	
OWNCH	.016	.245	
BANKMNA	.062	.574	
BANKOWN	-.153	-1.410	
BANKSIZE	.095	1.054	
LOC	-.090	-1.341	
<u>R square</u>	0.454		
<u>Adjusted R Square</u>	0.416		
<u>F value</u>	5.140***		

\*, \*\*, \*\*\* Significance at the 10%, 5% and 1% level, respectively.

### Credit Line Volume

As expected, firm size affects the credit line volume. Larger firms tend to have higher credit limits to use. Also incorporations compared to limited companies have higher credit lines. However contrary to interest rate results firm age and financial distress coefficients are not significant for credit line volume.

Number of lenders is positively significant for credit line volume in the most actively worked bank. The companies borrowing from more banks have more credit limits in the bank they work most actively.

Last significant variable for credit line volume model is the presence of foreign shareholder. Company having foreign shareholder have more limits.

Contrary to the results for the interest rate model, results for credit line volume is consistent with H1, H4, H5, H7 whereas inconsistent with H2, H3, H6 and H8.

The interaction effect coefficients between the distress variable and all relationship variables are insignificant. Also there were not any incremental change in Adjusted  $R^2$  so we could not found any support for Fischer (1990) hypothesis that weaker firms seek to establish particularly close relationships.

In the above mentioned models there are total of twenty independent and control variables. In order to eliminate, if any, redundant variables we checked for ANOVA and correlation results given in Table 25 and Table 26, respectively for the independent variables. With the significant variables we formed two new models and also tested them.

Table 25: ANOVA Results

	Mean		Sig.		Mean		Sig.
	0	1			0	1	
<u>Interest Rate</u>				<u>Credit Line</u>			
<u>Bank Characteristics</u>				<u>Bank Characteristics</u>			
BMNA	9.51	9.6		BMNA	6.10	5.60	
BANKOWN	9.477	9.588		BANKOWN	8.18	5.29	*
<u>Firm Characteristics</u>				<u>Firm Characteristics</u>			
DISTRESS	9.412	11.063	**	DISTRESS	6.05	4.72	
LEGALF	9.891	9.112	**	LEGALF	3.59	8.65	**
<u>Relationship Variables</u>				<u>Relationship Variables</u>			
TRUST	9.928	9.505		TRUST	5.41	5.83	
<u>Management/ Owner Characteristics</u>				<u>Management/ Owner Characteristics</u>			
FAMILY	9.394	9.563		FAMILY	7.21	5.42	
FOREIGN	9.562	8.983		FOREIGN	5.30	10.43	**
OWNMAN	9.399	9.533		OWNMAN	8.69	5.63	
OWNCH	9.447	9.751		OWNCH	5.61	6.38	
<u>Control Variables</u>				<u>Control Variables</u>			
LOC	9.875	9.498		LOC	7.52	5.67	

\*, \*\*, \*\*\* Significance at the 10%, 5% and 1% level, respectively.

Table 26: Pearson Correlations

<u>Interest Rate</u>			<u>Credit Line</u>		
<u>Bank Characteristics</u>	Pearson	Sig.	<u>Bank Characteristics</u>	Pearson	Sig.
BFSIZE	-0.035		BFSIZE	0.032	
<u>Firm Characteristics</u>			<u>Firm Characteristics</u>		
AGE	-0.278	**	AGE	0.342	**
FSIZE	-0.266	**	FSIZE	0.600	**
ROA	-0.096		ROA	0.077	
PM	-0.079		PM	0.104	
LEV	0.071		LEV	-0.142	*
AT	-0.07		AT	0.040	
<u>Relationship Variables</u>			<u>Relationship Variables</u>		
DURATION	-0.025		DURATION	0.130	*
LENDERS	-0.194	**	LENDERS	0.336	**

\*, \*\* Significance at the 5% and 1% level (2-tailed), respectively.

The two new models tested are:

Credit Interest rate = f1 (Constant,  $\ln(\text{firm age})$ ,  $\ln(\text{firm size})$ , financial distress, legal form, number of lenders, u1)

Credit line volume = f2 (Constant,  $\ln(\text{firm age})$ ,  $\ln(\text{firm size})$ , legal form, leverage, foreign owned, duration of relationship, number of lenders, bank ownership, u2)

The regression results for interest rate and credit line volume dependent variables are given in Table 27 and Table 28, respectively.

Table 27: OLS Regression Results for Loan Interest Rate as Dependent Variable

Dependent variable: interest rate	Coefficients	Sig.
DISTRESS	0.17	**
LEGALF	-0.127	*
AGE	-0.152	*
FSIZE	-0.139	*
LENDERS	-0.08	
R square	0.273	
Adjusted R Square	0.244	
F value	5.989***	

\*,\*\*,\*\*\* Significance at the 10%, 5% and 1% level, respectively.

Table 28: OLS Regression Results for Credit Line Volume as Dependent Variable

Dependent variable: credit line	Coefficients	Sig.
BANKOWN	0.077	
LEGALF	0.142	**
AGE	0.081	
FSIZE	0.424	***
LENDERS	0.135	**
DURATION	0.064	
LEV	-0.071	
FOREIGN	0.129	**
R square	0.429	
Adjusted R Square	0.401	
F value	15.668***	

\*,\*\*,\*\*\* Significance at the 10%, 5% and 1% level, respectively.

The results for interest rate reveals significant relationship for all variables except number of lenders. For interest rate as dependent variable legal form and size was not significant in the first model. All non-financial firm characteristics are found significant in the second model for interest rate.

The results for credit line volume reveals significant relationship for age, size, legal form, foreign shareholder and number of lenders but the coefficients for duration of relationship, leverage and bank ownership structure are found insignificant. In addition to the first credit line volume model age is found also significant in the second model.

Age and size are both significant for interest rate and credit volume consistent with the first and second hypothesis.

### Conclusion and Limitations

In this chapter by using the questionnaire conducted with 204 SMEs in Turkey, the lending relationship between the SMEs and the banks are examined by using ordinary least squares regression. The results reveal that firm age and firm size are the most important determinants of lending conditions. Also strong relationship variables increase the access to credit.

Our empirical results suggest that close and long-lasting relationship is desirable for firms. Firms with long-lasting bank relationships fare better than other enterprises in terms of interest rates, and credit availability.

This empirical study can be improved by increasing the sample size and by testing different relationship variables. Since according to our knowledge this study is the first research on lending relationship between banks and SMEs in Turkey there is much to improve. The main limitation of this study is there is no secondary data for the SMEs and the companies are not very eager to share their records. If data is obtained, time series analysis can also be conducted for lending relationship.

CHAPTER 4  
BANK EFFICIENCY ANALYSIS IN TURKISH  
BANKING SYSTEM

The efficiency of the banking system is one of the most important issues in the financial market because the efficiency of banks can affect the stability of the banking industry and thus the effectiveness of the whole monetary system. The aim of this chapter is to analyze the efficiency of banking system in Turkey between the years 2007-2010. The effects of 2008 financial crisis on the Turkish banking system efficiency and the efficiency score differences of domestic and foreign bank subgroups operating in Turkey will also be examined in this chapter.

Literature Review

Empirical evidence on performance evaluation and efficiency of the banking industry is much researched globally. Bank efficiency is measured by different methods. The earliest technique, used to measure performance changes is ratio analysis which examines the financial statements of individual firms and comparing them with a benchmark. However, this technique failed to take into account the fact that banks produce multiple outputs from multiple inputs and consistent aggregation was not possible (Smith, 1990). The shortcomings of such a descriptive and static analysis of the data are overcome by later researchers with the use of parametric and non-parametric techniques.

The parametric and non-parametric techniques differ mainly in how they handle random error and their assumptions regarding the shape of the efficient frontier. The three main parametric (or econometric) methodologies used by researchers to examine financial institutions include the stochastic frontier analysis (SFA), the thick frontier analysis (TFA), and the distribution free analysis (DFA). In general, the parametric approaches specify a functional form for the cost, profit, or production relationship among inputs, outputs and environmental factors, and allow for random error.

The two non-parametric (or mathematical programming) techniques used in the banking sector efficiency literature includes Data Envelopment Analysis (DEA) and Malmquist Productivity Indices (MPI). In general, a non-parametric technique does not require the specification of an a priori functional form and therefore is the most favored approach.

The literature examining the efficiency of financial institutions with parametric and/or nonparametric frontier techniques has expanded rapidly in recent times.

While, a large body of literature spanning a half-century exists on banking efficiency in the United States, more recent studies examine several other countries such as India, China, Hong Kong, Poland, Croatia and Japan etc. This section reviews some of those studies. In this study banking efficiency literature will be given in three broad categories. The first category is bank efficiency around the world including the studies with group of countries and studies with single country. The second category is bank efficiency studies which compare the efficiency of foreign banks with domestic banks and finally the third category is the bank efficiency studies in Turkey.

## Efficiency Studies Around the World

Resti (1994) used a sample consisting of 45 banks for the period of 1988-1991. He included the ratio of bad loans to total loans in the DEA model. He found that inefficient banks did not improve their score when the ratio of bad loans to total loans was included in the model. So, there was a negative correlation between the inefficiency level and bad loans on the total loans ratio.

Favero and Papi (1995) used a sample of 174 banks. They tried to determine which of the two DEA models was better: CRS or VRS), and they found that the VRS model was more appropriate to describe the efficiency level than the CRS model. They also regressed the efficiency level on a dummy which discriminated between banks located in the northern, in the central or in the southern part of Italy, and they found that the banks in southern Italy had the lowest level of efficiency.

Casu and Girardone (2002) used the data envelopment approach to study the efficiency of the Italian banking system. They compared banking groups and parent companies (the institutions leading the groups, taken individually). They found that the banking groups had a lower mean efficiency level than parent companies and subsidiaries taken individually. They also found that there was no evidence of scale economies either in the sample of groups or in the one composed by the parent and subsidiaries taken individually.

Berger and Humphrey (1997) reviewed 130 studies that relate the analysis of frontier efficiency to financial institutions in 21 countries. They covered studies of different types of financial institutions such as commercial banks, savings and loans institutions, credit unions, and firms in the insurance industry. The main goal of this

paper was to summarize and review empirical estimates of financial institution efficiency and to attempt to arrive at a consensus view.

The average of efficiency that Berger and Humphrey found was approximately 77% (median 82%), with a standard deviation of 13 percentage points. They found that the efficiency estimates from nonparametric studies (DEA and FDH) were mostly the same as those from parametric frontier models (the SFA, the DFA, and the TFA). They also found that the nonparametric methods generally yielded lower mean efficiency estimates and seemed to have a larger spread than the results of the parametric methods, probably because there is a different assumption about the error terms in both approaches. The authors found that the deregulation of financial institutions could either increase or decrease efficiency levels, depending on industry conditions before the deregulation. They concluded that the majority of the studies on banking efficiency focused on the banks of developed countries (about 95% and most of them in the U.S.), so they suggested that more research was needed in other countries.

Casu and Molyneux (2003) used the non-parametric DEA approach to investigate whether the efficiency degree of the European banking system (this study covered five European countries: France, Germany, Italy, Spain, and the United Kingdom) improved between 1993 and 1997. They also evaluated the determinants of the efficiency of European banking by using the Tobit regression model approach in order to analyze the influence of various countries' specific and environmental factors relating to bank efficiency. They used the intermediation approach to specify two outputs (total loans and other earning assets) and two inputs (total costs and total customers and shortterm funding) for their study.

Casu and Molyneux (2003) found that the DEA results showed low average efficiency levels during the period of study. They reported that there was a slight improvement in the average efficiency levels over the period 1993-1997 for all banking systems in the sample except Italy's banking system. They concluded that there was a difference in the efficiency level across European banking systems and that this difference was due to each country's specific factors relating to banking technology.

Bikker (1999) applied the stochastic cost frontier approach and production approach to some of the European banks to measure the X-efficiency of those banks. He measured the cost efficiency of banks in nine European countries by using the data for these banks from 1989 to 1997.

He found that the less efficient banks were Spanish banks, followed by French and Italian banks. Banks in Germany, the Netherlands, and the U.K. were in the middle level of efficiency. However, the most efficient banks were in Luxemburg, followed by banks in Belgium and Switzerland. He said that the banking systems in Luxemburg and Switzerland most likely benefited from the kind of favorable conditions that come from bank secrecy and tax regimes. He also estimated the cost levels and found that Spanish banks had a higher cost level of 33% above the European average, although the banks in Luxemburg were 34% below the European average. Finally, the author suggested that merging between banks was important to improve the banking industry in the European countries.

Maudos and Pastor (2001) analyzed profit efficiency and cost efficiency in a sample of 16 countries in the Organization for Economic Cooperation and Development (OECD), with 14 of them from the European Union, Japan, and the U.S. The sample they used in their study included the banking systems in Austria,

Belgium, Denmark, Finland, France, Germany, Greece, Holland, Italy, Luxembourg, Portugal, Spain, Sweden, the U.K., Japan, and the U.S. They used the SFA and employed three outputs (loans, other earning assets, and deposits) and two inputs (net income and profit before tax) in their study.

The evidence showed that the efficiency level of the banking sector in the U.S. improved from 1986 to 1995 and that the efficiency level of the banking sector in Japan decreased sharply from 1988 to 1995. The banking sector in Europe was stable during the period of study. Finally, Maosos and Pastor reported that the increase in the completion led to improving the profit efficiency in the U.S. and Europe but not in the Japanese banking system. They also said that efficiency was a very important source of improvement in profitability.

Pastor, Perez, and Quesada (1997) compared the productivity, efficiency, and differences in the technology of different European and U.S. banking systems for the year 1992. The sample they chose contained 168 banks in the U.S., 45 banks in Austria, 59 banks in Spain, 22 banks in Germany, 18 banks in the U.K., 31 banks in Italy, 17 banks in Belgium, and 67 banks in France. They used DEA and a non-parametric approach to estimate the efficiency level in their study. They chose three outputs (loans, other productive assets, and deposits) and two inputs (non-interest expenses and personal expenses) to estimate the efficiency level in their study.

Pastor, Perez, and Quesada (1997) found that there was a difference in the efficiency level of the banking systems among the countries in the sample. The most efficient banks were in France, Spain, and Belgium, while the less efficient banks were in the U.K., Austria, and Germany. They also found that the Austrian, German and U.S. banking systems showed evidence of scale inefficiencies. There was no trace of scale inefficiency in banking systems in France and the U.K.

Altunbas, Liu, Molyneux and Seth (2000) used the stochastic cost frontier methodology to evaluate scale and X-inefficiencies to examine the impact of risk and quality factors on bank costs in Japanese commercial banks between 1993 and 1996. They specified three outputs (total loans, total securities, and total off-balance sheet items) and three inputs (price of labor, price of funds, and price of physical capital) in their study by using the intermediation approach.

The authors found strong evidence of scale economies across a wide range of bank sizes, even for the largest firms. They also found that the financial capital influenced the scale efficiency estimates because of the reflection of the decline in capital strength of the banking system in Japan during the period of study. They reported that the X-inefficiency estimates varied between 5% and 7% and showed less response to risk and quality factors. In addition, they found that the scale efficiency estimates were more sensitive to risk and quality factors than the X-inefficiencies. Finally, they suggested that the largest banks could be more efficient in reducing costs by decreasing output rather than improving X-efficiency.

Chen, Skully and Brown (2005) examined the impact of bank deregulation on the cost, technical, and allocative efficiency of Chinese banks during the period between 1993 and 2000. They also investigated whether the efficiency of the banking system in China improved during the period of study and whether size played an important role in efficiency levels. They applied frontier analysis (X-efficiency) using DEA to evaluate the cost efficiency of Chinese banks. They used the intermediation approach to specify three outputs (loans, deposits, and non-interest income) and four inputs (price of deposits, interest expenses, non-interest expenses, and price of capital) in their study.

Chen et al. (2005) found that the deregulation initiated in 1995 had a positive impact on the efficiency of Chinese banks in the first and second years after deregulation. However, in the third and fourth year's post-deregulation, the efficiency level declined. They also found that large banks and small banks were most efficient. They concluded that the efficiency level of the Chinese banking system improved from the early 1990s until 1996 but that Chinese banking efficiency dropped gradually from 1997 to 2000 due to both international and domestic factors.

Fung (2006) used DEA in his study to measure the X-efficiency to see if less productive banks were catching up to more productive ones in the U.S. by examining the convergence of productivity among bank holding companies (BHCs). He specified two outputs (total loans and non-interest incomes) and three inputs (fixed assets, liquid assets, and labor input) to measure the efficiency level in his study.

He found that each BHC possessed its own steady-state productivity to which it was converging. In other words, differences in X-efficiency between BHCs could create permanent differences in productivity between them. The author concluded that all BHCs were converging to a minimum efficient scale; however, this scale was conditional on the level of X-efficiency. In addition, the BHCs reached the upper rank of X-efficiency because technological improvements, higher management incentives, and further specialized banking activities enlarged the minimum efficient scale.

Allen and Liu (2005) investigated cost efficiency and the economies of scale of the six largest banks in Canada using quarterly data from 1983 to 2003. They estimated four econometric models: a time-varying fixed-effects panel model, a stochastic costefficiency frontier model, a system of seemingly unrelated regressions model, and a time-varying fixed-effects model. They used the intermediation

approach to specify five outputs (consumer loans, non-mortgage loans, mortgage loans, security investment, and non-traditional banking activities) and three inputs (labor, capital, and deposits). The authors found that the changes in regulatory policies aided the reduction of the banks' production costs. They also found that the inefficiency of Canadian banks was approximately 10% and that the ranking of efficiency suggested that larger banks were more cost efficient than smaller banks.

Shanmugam and Das (2004) analyzed the technical efficiency of 94 banks in four different ownership groups in India (the State banks of India group, the nationalized banks group, the privately owned domestic group, and the foreign banks group). They applied the stochastic frontier function methodology, using panel data for the period between 1992 and 1999. They determined four outputs (net interest margin, noninterest income, credits, and investments) and four inputs (deposits, borrowings, labor, and fixed assets). They stated that there were variations in the efficiency among the sample banks for four outputs: interest margin, non-interest income, investment, and credit.

Their empirical results pointed out that the technical efficiency of raising interest margins varied widely across sample banks and was time-invariant. The results also noted that the banking sector in India showed an improvement in its efficiency level during the period of study due the increase of non-interest income, investments, and credits. Shanmugam and Das concluded that 50% of the banks had technical efficiency and also that the state bank group and private-foreign group banks were more efficient than other groups.

Luciano and Regis (2007) reviewed the most important empirical studies for the efficiency features of the Italian banking system during a 15-year period. They

found that two different techniques could be used to evaluate the efficiency level of banks: the SFA (parametric approach) and DEA (non-parametric approach).

Hahn (2005) applied the internal technical efficiency approach, focusing on environmental and non-controllable factors affecting banking efficiency. The sample consisted of 800 Austrian banks for the period from 1995 to 2002. He used a four-stage DEA methodology by employing a slacks-based DEA model in combination with a Tobit regression and then the Bootstrap method in order to eliminate the dependency problem in the DEA technique. He employed the profit-oriented approach by specifying three outputs (net interest revenue, net commission revenue, and other income) and three inputs (employee expenses, other non-interest expenses, and risk-weighted assets). He also applied the intermediation approach by using two outputs (total loans and other earnings) and two inputs (first, total cost covering interest expenses, noninterest expenses, and employee expenses, and second, total deposits).

Hahn (2005) reported that controlling for the impact of environmental factors raised the average efficiency and reduced the average range of volatility during the period of study. Also, he stated that a decomposition of the initial and environment-adjusted efficiency scores of the Austrian banking system yielded that the managerial efficiency of the commercial banks tended to be overrated because of favorable environmental factors. Finally, he found that saving banks and mortgage banks were unaffected by changing environmental conditions.

Kirkwood and Nahm (2006) applied DEA to estimate the efficiency of producing revenue-generating banking services and the efficiency of producing profit in Australian banks. This paper was the first paper analyzing Australian bank efficiency to consider efficiency in producing profit. They used a sample for 10

banks listed on the Australian Stock Exchange for the period of 1995 to 2002. They employed two models, the banking service efficiency model and the profit efficiency model. For the first, they specified two outputs (interest-bearing assets and non-interest income). The second model had two outputs as well (profit before tax and abnormal items). In both models they used the same inputs (number of full-time equivalent employees and property and interestbearing liabilities). For the first and the second models they applied the intermediation approach.

Kirkwood and Nahm stated that banking service and profit efficiency scores improved in the major banks because the banking service efficiency remained unchanged and the profit efficiency decreased for the regional banks. They also found that changes in profit efficiency were statistically significant in determining the stock return of banks.

#### Foreign vs. Domestic Bank Efficiency Studies

Berger et al. (2000) proposed two alternative hypotheses in their research to explain their results, they found that foreign-owned financial institutions to be less efficient than domestic institutions, the home field advantage hypothesis and the global advantage hypothesis. According to the first, the domestic institutions' efficiency advantage is sourced in costs borne by the foreign institution; these costs are often called the liability of foreignness.

The alternative global advantage hypothesis as suggested by Berger et al. (2000) has two forms: the general and the limited form. Under the general form, efficient foreign banks from a range of nations are able to offer superior efficiency compared to domestic banks, which has been rejected by the literature to date. Under

the limited form, foreign banks from a particular set of nations are more efficient than domestic banks. It proposes that some efficient foreign banks are able to master these costs include monitoring from a distance, staff turnover in overseas postings, diseconomies of operation in the retail sector, and barriers to entry such as language, culture, market structure and regulations.

Berger et al. (2000) considered both profit and cost efficiency and concluded that, while on average domestic banks have higher cost and profit efficiency, for three of the five host nations studied, foreign banks from the United States were on average more efficient than domestic banks. It was argued that these results were due to actual advantages rather than transfer pricing, supporting the limited global advantage hypothesis (Berger et al., 2000).

Green et al. (2003) and Naaborg (2003) are other studies analyzing the bank performance in the Central and Eastern Europe in the late 1990s. Green et al. found that, foreign banks are not significantly more efficient than domestic banks, either in terms of cost advantage or in terms of economies of scale/scope. However, Naaborg suggested that in spite of the superiority of foreign banks in terms of profitability, there is convergence in the performances.

Another study for the transition countries is Bonin et al. (2005) which examined the effect of ownership on bank efficiency over the period 1996-2000 using stochastic frontier estimation procedure. They found that government owned banks are not significantly less efficient than privately held banks, and that foreign owned banks are more efficient than other banks and provide better service. They suggested, therefore, that privatization on its own is not sufficient to enhance the efficiency of the banking sector.

Gilbert and Wilson (1998) analyzed the effects of deregulation and privatization on the productivity of Korean banking sector in the late 1980s, the productivity values are found to have increased during this period. They suggested the reason as Korean banks' altering their input & output mix during this period.

Havrylchuk (2006) analyzed the efficiency of the Polish banks from 1997 to 2001. The sample he used was the most comprehensive database on the Polish banking system compared to the other study because it covered approximately 95% of all banking assets. He used DEA in his study to estimate cost, allocative, technical, pure technical, and scale efficiency. Then, he compared the foreign versus the domestic banks' efficiency. He applied the intermediation approach, specifying three outputs (loans, government bonds, and off-balance sheet items) and three inputs (capital, labor, and deposits).

He found that the average efficiency was 52.92% for the domestic banks and 73.23% for the foreign banks. He also found that the efficiency in the banking system in Poland did not improve during the period of the study.

Jemric and Vujcic (2002) used the DEA approach to analyze the relative efficiency of banks in the Croatia banking system for the period between 1995 and 2000 according to size, ownership structure, date of establishment, and quality of assets. They applied both operation and intermediation approaches. For the operating approach, they used two outputs (interest and related revenues as well as non-interest revenues) and four inputs (interest and related costs, commissions for services and related costs, labor-related administrative costs, and capital-related administrative costs). For the intermediation approach, two outputs (total loans extended and short-term securities issued by official sectors) and three inputs (fixed assets, number of employees, and total deposits received) were employed.

The authors found that the foreign-owned banks were more efficient than their counterparts. They also reported that the new banks were more efficient than the old ones and large banks appeared to be locally efficient where smaller banks were globally efficient. They concluded that there was a strong equalization in terms of average efficiency in the Croatian banking system during the period of study.

Yıldırım and Philippatos (2007) evaluated the efficiency level of commercial banks in 12 central and eastern Europe (CEE) countries for the period between 1993 and 2000. The countries they considered in the study were the Czech Republic, Estonia, Croatia, Hungary, Latvia, Lithuania, FYR of Macedonia, Poland, Romania, Slovenia, the Slovak Republic, and the Russian Federation. They employed two techniques — the SFA and the DFA — to estimate cost and profit efficiency for a panel of 325 banks over an eightyear period for the 12 CEE countries. Then they regressed the efficiency level that they found to determine the factors upon which the efficiency levels depended. They determined three outputs (loans, investments, and deposits) and three inputs (borrowed funds, labor, and physical capital) in their analysis.

Yıldırım and Philippatos (2007) found that the average cost efficiency level for twelve countries was 72% with DEA and 77% with the SFA. Also, they found that the most costefficient countries were Poland and Slovenia and that the Russian Federation, Lithuania, Latvia, and Estonia were the least efficient countries. They reported that the cost efficiency levels were significantly higher than the profit efficiency levels. The authors concluded that foreign banks were more cost efficient and less profit efficient than domestic banks and that competition in banking markets was positively related to cost efficiency and negatively related to profit efficiency.

## Bank Efficiency Studies in Turkey

Zaim (1995) analyzed the effects of liberalization on the performance of the Turkish banks in terms of efficiency. The results indicated that the Turkish banks became more efficient during the post-liberalization era.

Işık and Hassan (2003) classified the source of productivity changes as efficiency change and/ or technological change during the 1992-1996 period. This study showed that DEA methodology could be utilized to analyze the performance of banks in transition countries. One finding was that following the 1994 crisis, productivity declined mainly due to technological regress, the most affected banking group being the foreign banks. They also looked at the relationship between productivity, bank size and crisis, and concluded that large banks were affected the least from the crisis. In Işık and Hassan (2003), the analysis was divided into two, one using the off-balance sheet items and the other not. Both groups of results indicated that the banking sector experienced productivity growth resulting not from technological improvement, but from efficiency increase, which, in turn, was mainly driven by the better resource management rather than the scale improvement. They found that it was foreign banks followed by private ones whose performance improved the most after the deregulation although the performances of public and private banks converged during the period.

Işık and Hassan (2002) examined the input and output efficiencies in the Turkish banking industry for the period 1988-1996, and tried to find a relationship between variables of size, ownership, control and governance and variables of profit, cost, allocative, technical, pure technical and scale efficiency. The intermediation approach was used in this study which is the first nonparametric efficiency study that

takes the off-balance sheet items into account. The results from the DEA analysis indicated that the cost and profit efficiencies of the banking industry increased over time. The main reason of inefficiency was found out to be the technical inefficiency rather than the allocative inefficiency. They found that the production efficiency in the industry fell over time, and that bank size and efficiency were negatively correlated. Private banks were found to be more efficient than public banks. Moreover, banks where the board and the management are independent are more efficient than banks where they are not. Furthermore, banks that operate under a holding company were found to be more efficient than the independent banks.

Yıldırım (2002) studied the efficiency of the Turkish commercial banks during the period 1988-1999. This study looked at the technical and scale efficiencies of the banks using the DEA methodology. Scale efficiency, which was the main source of inefficiency, and pure technical efficiency were found out to be very volatile during the period when there was instability in the Turkish economy. Moreover, efficient banks were found to be more profitable, and bank size is positively related to pure technical and scale efficiencies.

Kasman (2002) examined the cost and scale efficiencies, and technological improvement in the Turkish banking sector over the period 1988-1998 using Fourier flexible cost function. He found that the banking sector was inefficient in spite of the increase in efficiency. However, the sector was found out to be scale efficient, and there was technological improvement during 1988-1991 while technological regress during 1992-1998.

Gamal and Inanoğlu (2005) analyzed the efficiency of the Turkish banking sector during the 1990-2000 period using a parametric technique and suggested that although state banks were efficient in terms of generating loans, they were inefficient

in the sense of labor utilization, which was one reason behind the idea of privatization. Another finding of the paper was that special finance houses were relatively more efficient than conventional domestic banks.

A similar study for the same period of time was conducted by Özkan-Günay and Tektas (2006) by utilizing the nonparametric DEA methodology. The study revealed that the number of efficient banks in the sector and the mean efficiency values for different groups of banks declined over time. Moreover, they also looked at the sensitivity of the efficiency values to the choice of outputs, and found sensitivity especially for foreign banks.

## Empirical Research

### Research Questions

The aim of this chapter is to measure the efficiency of Turkish banking system and to answer the following research questions:

- 1) Which banks are more efficient in Turkey and why?
- 2) Is there a difference in efficiencies of the domestic and foreign banks operating in Turkey?
- 3) Did the global financial crisis of 2008 affect the efficiency of Turkish Banking System?

## Data

The sample includes 30 commercial banks including 3 state banks, 11 private banks and 16 foreign banks between the years 2007 and 2010. This period is chosen because there were many mergers and acquisitions and foreign takeovers especially between the years 2001-2007, so the number of domestic and foreign banks changed throughout the period. In 2001 Demirbank (now HSBC), in 2005 Türk Dış Ticaret Bankası (after Fortis and now TEB), in 2006 Denizbank and Finansbank and in 2007 OyakBank (now ING Bank), MNG Bank (now Turkland Bank) and Tefken Bank (now Eurobank Tefken) were sold and after these dates they were considered as foreign banks. From 2007 up until 2010 there weren't any foreign takeovers and changes in the number of domestic and foreign banks because of the 2008 global financial crisis. Contrary to 2001 financial crisis, the 2008 financial crisis was not a local financial crisis. This time foreign banks were a threat to the financial stability, rather than the Turkish banks. Major negative effects of the crisis in Turkey were the decrease in consumer demand and capital inflows and increase in unemployment, budget deficit and public debt stock.

The development and investment banks were not taken in the sample because of their different functions as well as their small market shares in the banking industry. Number of chosen 30 banks is sufficient for the analysis. For a healthy DEA; sufficient number of DMUs should be evaluated. In literature, this criterion is expressed differently by some analyzers. Norman and Stoker (1991), declared that DMUs should be more than twenty. Vassiloglu and Giokas (1990), expressed that DMUs should be threefold than the sum of inputs and outputs. In this analysis, since the sum of inputs and outputs is 6 the number of DMUs is higher than it is needed.

The secondary data used in bank efficiency study come from the bank balance sheets published by the Banks Association of Turkey (BAT) and the DEA analysis was made by using the DEAP software program.

In DEA analysis inputs and outputs should be carefully determined to find the proper efficiency scores. In this analysis three inputs and three outputs are defined by applying intermediation approach that is used in bank efficiency studies.

Intermediation approach accepts that the funds raised and the expenses incurred in the intermediation process are normally treated as inputs, whereas the funds loaned and income generated are regarded as outputs.

In this study the input variables will be:

- V1 Labor
- V2 Capital
- V3 Deposits

Labor is defined as the number of full time employees on the payroll while capital is the property and equipment. Deposits is the sum of deposits and marketable securities issued.

The output variables will be:

- Y1 Total credits
- Y3 Off balance sheet items
- Y4 Securities

Total credits include short- and long-term credits. Bad loans are deducted from the total credits. Off-balance sheet items are the sum of guarantees and warranties, commitments, foreign exchange and interest rate transactions as well as other off-balance sheet items. Securities include money market securities, banks and other financial institutions, investments held to maturity, securities available for sale and securities held for trading.

### Methodology

There are three main methods to evaluate the performance and efficiency of the banking system: ratio analysis, parametric methods and non-parametric methods. Each of those methods has its own advantages and disadvantages.

#### Ratio Analysis

Ratio analysis is the most practical and widely utilized method to evaluate the performance of banks. However, this method is not suitable to evaluate efficiency of a multi-input/output production unit. Hence, ratio analysis is not the most proper method to evaluate performance of banks, since a bank has more than one input and output. While the ratio analysis is good for quick capture of changes in efficiency, it can not capture efficiency changes in all variables at once. Hence, it is explanatory but does not provide enough information for strategic management decisions.

### Parametric Methods (Stochastic Frontier)

In parametric methods, a certain form for the production function has to be assumed, formulating the relationship of the efficient level of outputs to the level of inputs.

The three main parametric methods are stochastic frontier approach, distribution free approach and thick frontier approach. Parametric methods are criticized for their use as the method of evaluation for the efficiency of the banking industry for the following two reasons:

First it is not always possible to assume right form for the production function due to insufficient data, and second the parametric methods can only use one dependent variable, while employing several independent variables; which is not in line with the fact that the banking industry has multiple inputs and outputs.

### Non-Parametric Methods (Linear Programming)

The nonparametric method is a mathematical model, and it doesn't recognize the error term. It usually measures technical efficiency. When a non-parametric method is employed, no assumptions have to be made about the form of the production function. The frontier, however, can be estimated empirically using the observed inputs and outputs (Yıldırım, 2002). Non-parametric methods use optimization under constraints to measure the distance to the efficient border (linear programming) and allow the use of multiple inputs and outputs with constant or variable returns to scale.

For the nonparametric method, the literature emphasizes two main approaches: Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH).

The most frequent used non-parametric method is Data Envelopment Analysis (DEA). In this study in order to measure the efficiency scores of foreign and domestic banks operating in Turkey, Data Envelopment Analysis is used. DEA gives a systematic methodology for analyzing productive efficiency. In the relatively short span of 25 years, DEA has established itself as a popular analytical research instrument and practical decision-support tool.

DEA, compares the decision making units (DMU), banks in this case, which are assumed to be homogeneous. Each decision making unit is compared to the linear combination of the rest of the sample which is found to produce the maximum output(s) possible under constraint set for the input(s). The aim of DEA is to estimate relative efficiency among similar decision units that have the same technology (processing procedure) to pursue similar objectives (outputs) by using similar resources (inputs) (Angelidis and Lyroudi, 2006).

According to Berger and Humphrey (1997), DEA is a linear programming technique in which the set of frontier observations are decision-making units (DMUs) for which no other DMU produces as much or more of every output (given input) or uses as little or less of every input (given output). In other words, DEA is commonly used to evaluate the efficiency of a number of producers or DMUs. The production process for each producer is to take a set of inputs and produce a set of outputs. Each producer has a varying level of inputs and gives a varying level of outputs. The ratio of outputs to inputs is a commonly used measure of efficiency:

$$\text{Efficiency} = \text{output} / \text{input}$$

There are two main approaches in defining input and output variables, the “production” and the “intermediation” approaches.

The production approach suggests that inputs such as capital and labor are used in order to “produce” outputs which are defined as services to depositors and borrowers. The major shortcoming for this approach is the measurement of outputs. In this approach, number of the accounts and operations are usually used for output instead of their monetary value.

In this thesis the intermediation approach is used for analyzing the bank efficiency like many other bank efficiency studies in the literature (Zaim, 1995; Işık & Hassan, 2003, Işık & Reda, 2006).

The intermediation approach defines banks intermediating between the suppliers and the demanders of funds. Hence, funds supplied by depositors (deposits) are defined as inputs and the funds used by the credit customers (loans) are defined as output. In this approach banks aim to make profit from converting deposits into loans. (Işık & Reda, 2006; Tarım, 2001).

Production approach is generally used in studies which aim to find the cost efficiency of banks while the intermediation approach is preferred when the total cost of the whole banking sector and the competitive power of banks are concerned.

There are several DEA models used in measuring the efficiency. The first model is developed by Charnes, Cooper & Rhodes (1978), which is called the CCR model. There are also other DEA models in the literature including BCC (by Banker, Charnes & Cooper, 1984), Additive DEA models and Slack-Based Measurement (SBM) models (Tuncer, 2006).

The most widely used models are CCR and BCC and here these models will be analyzed.

## CCR Model

The most basic DEA model is the CCR, which was proposed by Charnes, Cooper, and Rhodes in 1978. The basic idea of the CCR model is the following: the efficiency of an observed DMU, which is the organization to be evaluated, can be measured by the ratio output per input, i.e., how well a DMU can convert its inputs into its outputs (Jahanshahloo, 2007).

Definition of the indices, parameters and variables used in the mathematical models are as follows:

Indices:

$j$  : the number of DMUs in the study,

$i$  : the number of inputs considered,

$r$  : the number of outputs considered.

Parameters:

$v_j$  : the weight for input  $j$  ( $j=1, \dots, m$ ),

$u_r$  : the weight for output  $i$  ( $i=1, \dots, s$ ).

Variables:

$x_{ij}$  : the value of output  $i$  for DMU  $j$ .,

$y_{rj}$  : the value of input  $r$  for DMU  $j$ .,

The objective of maximizing the ratio of virtual output to virtual input for a DMU can be expressed as:

Objective function

$$Max = \frac{\sum_{r=1}^n u_r y_r}{\sum_{i=1}^m v_i x_i} \quad (1.1)$$

Subject to:

$$(1.2)$$

$$\begin{aligned} \frac{\sum_{r=1}^n u_r y_r}{\sum_{i=1}^m v_i x_i} &\leq 1 \\ u_r &\geq 0 \\ v_i &\geq 0 \end{aligned} \quad (1.3)$$

The formula (1.1.) describes the objective function of DEA which has “m” inputs, “n” outputs. This function is aimed to maximize the ratio “between weighted sums of outputs to weighted sum of inputs that belongs DMUs. Formula (1.2.) describes the efficiency scores of DMUs should be lower than 1. This model creates some difficulties because of not being a linear model. By transformation of Charnes and Cooper this model becomes linear and linear model can be used as maximization or minimization model (Ulutaş, 2006).

Obviously, without constrains, the value for the above term is unbounded. To normalize the efficiency scores, the ratio of the virtual output to that of virtual input is restricted to be smaller than 1 (Tuncer, 2006).

In the DEA literature, there exist two approaches for the estimation of the

efficient frontier from these “n” observations. Input-oriented models find out the amount that the inputs are to be proportionally decreased given a certain amount of output while output-oriented models reveal the amount that the outputs are to be proportionately increased given a certain amount of input.

Objective function of input oriented CCR model aims to maximize the sum of weighted outputs of decision making unit. Formulas (1.4) and (1.5) are objective function and constraints of input oriented CCR.

$$Max \sum_{r=1}^n u_r y_r \quad (1.4)$$

$$\sum_{i=1}^m v_i x_i = 1$$

$$\sum_{r=1}^n u_r y_r - \sum_{i=1}^m v_i x_i \geq 0 \quad (1.5)$$

$$u_r, v_i \geq 0$$

Objective function of output oriented CCR model aims to minimize the sum of weighted inputs of decision making unit. Formulas (1.6) and (1.7) are objective function and constraints of output oriented CCR.

$$Max \sum_{i=1}^m v_i x_i \quad (1.6)$$

$$\sum_{r=1}^n u_r y_r = 1$$

$$-\sum_{r=1}^n u_r y_r + \sum_{i=1}^m v_i x_i \geq 0 \quad (1.7)$$

$$u_r, v_i \geq 0$$

In each model, a single set of weights is present. DMU can choose its weights in order to receive a score as high as possible. However, it should make its virtual input 1 and also virtual outputs of the other DMUs with these weights should not exceed their virtual inputs. Efficient DMUs which succeed to be on the frontier earn scores of 1, whereas inefficient DMUs' scores range from very small numbers to 1 (Tuncer, 2006).

### BCC Model

Banker, Charnes, and Cooper (1984) removed the strict constant returns to scale assumption imposed on the CCR model to allow for variable returns to scale (VRS) in their BCC model in 1984.

Variable returns to scale implies that an increase in inputs to a productive unit can result in a disproportionate increase or decrease in outputs. The main difference between the CCR and BCC formulations is that for BCC, there is a restriction of having all the intensity variables,  $\lambda_i$  sum to 1. This essentially removes the constraint that each DMU must be scale efficient (Chan, 2006).

When it is analyzed carefully BCC models are similar to CCR models but BCC models contains  $c_0$  variable. In addition sum of  $\lambda_j$  equals to 1. With these changes the structure of efficient frontier is changed. The frontier that passes from origin in CCR model does not have to pass from origin in BCC model (Ulutas, 2006).

Input oriented BCC model objective is to maximize the sum of weighted outputs of DMU. Formulas (1.8) and (1.9) are objective function and constraints of input oriented BCC.

Objective function,

$$\text{Max} \sum_{r=1}^n u_r y_r + c_0 \quad (1.8)$$

Constraints,

$$\sum_{i=1}^m v_i x_i = 1$$

$$\sum_{r=1}^n u_r y_r - \sum_{i=1}^m v_i x_i + c_0 \geq 0 \quad (1.9)$$

$$u_r, v_i \geq 0$$

Output oriented BCC model objective is to minimize the sum of weighted inputs of DMU. Formulas (1.10) and (1.11) are objective function and constraints of output oriented BCC.

$$\text{Max} \sum_{i=1}^m v_i x_i - c_0 \quad (1.10)$$

$$\sum_{r=1}^n u_r y_r = 1$$

$$-\sum_{r=1}^n u_r y_r + \sum_{i=1}^m v_i x_i - c_0 \geq 0 \quad (1.11)$$

$$u_r, v_i \geq 0$$

To review, the CCR model assumes that any increase in inputs will result in an equiproportional increase in outputs. The BCC model however, relaxes this constraint and allows an increase in inputs to result in a disproportional change in outputs (Chan, 2006).

In this dissertation, intermediation approach of nonparametric DEA is used to estimate bank efficiency in Turkey with both CCR and BCC model. The reason for choosing DEA is that DEA works well with a small sample size and does not necessitate the knowledge of any functional form of the frontier. That will help in the analysis due to the small sample size of Turkish banks.

### Findings

The efficiency change in the banking sector between 2007-2010 was examined by using intermediation approach and both CCR and BCC models. Both CCR and BCC results given in Table 29 and 30 indicate that domestic banks are more efficient than their foreign peers in all years. In previous research of Işık and Hassan (2003) foreign banks were found more efficient in Turkey. The reason behind the efficiency decrease in foreign banks between years 2007 and 2010 may be because of the global financial crisis.

Also another reason for domestic banks being more efficient is that state banks are the most efficient sub-group of banks compared to domestic private and foreign banks and they are included in the group of domestic banks. The reason for the increase in the efficiency of state banks is the restructuring programs helded especially for the state banks after 2001 crisis.

The 2001 financial crisis showed that budget deficit and populist government spending was harmful for both banking sector and real sector. Structurally weakened state banks that were controlling 40% of deposits was a threat to banking sector. High interest rates was causing a crowding out effect disabling private investment. The crisis showed that banking supervision was very poor. State banks and some of the small and medium sized private banks turned out to be structurally weak. The 2001 financial crisis triggered a liquidity crisis. Money markets seized functioning during crisis and trust in banking system was very low in the post-crisis era. State banks needed to be restructured, bankrupt banks needed to be liquidated by SDIF and supervision of the banking system needed to be strengthened.

Table 29: Turkish Bank Efficiency Scores (CCR Model)

<u>Domestic Banks</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
<u>State Banks</u>				
Ziraat Bankası	1,000	1,000	1,000	1,000
Halk Bankası	0,924	1,000	0,976	1,000
Vakıflar Bankası	1,000	1,000	1,000	1,000
<u>Private Banks</u>				
Adabank	0.865	0.897	0.735	0.902
Akbank	1.000	1.000	1.000	1.000
Alternatifbank	0.945	0.754	0.796	0.812
Anadolubank	0.923	0.845	0.855	0.914
Şekerbank	1.000	0.943	0.964	0.903
Tekstil Bankası	0.987	1.000	0.953	0.946
Turkish Bank	0.809	0.866	0.798	0.760
Türk Ekonomi Bankası	0.923	0.832	0.932	0.976
Türkiye Garanti Bankası	1.000	0.912	1.000	0.984
Türkiye İş Bankası	0.912	0.867	0.898	0.898
Yapı ve Kredi Bankası	1.000	0.894	0.926	0.972
<u>Mean Efficiency Score of Domestic Banks</u>	<u>0,949</u>	<u>0,915</u>	<u>0,917</u>	<u>0,933</u>
<u>Foreign Banks</u>				
Arap Türk Bankası	0,979	1,000	0,943	0,975
Bank Mellat	1,000	0,897	0,934	0,827
Citibank	1,000	1,000	1,000	1,000
Denizbank	1,000	0,956	1,000	1,000
Deutsche Bank	0,646	0,744	0,765	0,782
Eurobank Tekfen	0,632	0,791	0,834	0,717
Finansbank	0,856	0,934	1,000	1,000
Fortis	0,865	0,742	0,789	0,876
Habib Bank	0,908	0,912	0,809	0,878
HSBC Bank	0,832	1,000	0,897	0,965
ING Bank	1,000	0,965	0,896	1,000
JPMorgan Chase Bank	1,000	0,965	0,866	0,923
Societe Generale	0,765	0,897	0,754	0,866
The Royal Bank of Scotland	0,877	0,768	0,908	0,987
Turkland Bank	0,865	0,743	0,785	0,865
WestLB	1,000	0,894	1,000	0,922
<u>Mean Efficiency Score of Foreign Banks</u>	<u>0,889</u>	<u>0,888</u>	<u>0,886</u>	<u>0,911</u>

Table 30: Turkish Bank Efficiency Scores (BBC Model)

<u>Domestic Banks</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
<u>State Banks</u>				
Ziraat Bankası	1,000	1,000	1,000	1,000
Halk Bankası	0,936	1,000	1,000	1,000
Vakıflar Bankası	1,000	1,000	1,000	1,000
<u>Private Banks</u>				
Adabank	0,891	0,895	0,784	0,945
Akbank	1,000	1,000	1,000	1,000
Alternatifbank	1,000	0,796	0,832	0,834
Anadolubank	0,925	0,853	0,865	1,000
Şekerbank	1,000	0,954	1,000	0,932
Tekstil Bankası	1,000	1,000	0,978	1,000
Turkish Bank	0,832	0,866	0,804	0,767
Türk Ekonomi Bankası	0,987	0,876	0,935	1,000
Türkiye Garanti Bankası	1,000	0,965	1,000	1,000
Türkiye İş Bankası	0,913	0,894	0,843	0,898
Yapı ve Kredi Bankası	1,000	0,908	0,982	1,000
<u>Mean Efficiency Score of Domestic Banks</u>	<u>0,963</u>	<u>0,929</u>	<u>0,930</u>	<u>0,955</u>
<u>Foreign Banks</u>				
Arap Türk Bankası	1,000	1,000	0,954	0,983
Bank Mellat	1,000	0,893	1,000	0,843
Citibank	1,000	1,000	1,000	1,000
Denizbank	1,000	0,959	1,000	1,000
Deutsche Bank	0,675	0,767	0,786	0,798
Eurobank Tekfen	0,689	0,796	0,855	0,734
Finansbank	0,965	0,935	1,000	1,000
Fortis	0,876	0,754	0,794	0,879
Habib Bank	0,932	0,932	0,954	1,000
HSBC Bank	0,843	1,000	0,912	1,000
ING Bank	1,000	0,970	0,876	1,000
JPMorgan Chase Bank	1,000	0,967	0,876	0,954
Societe Generale	0,765	0,906	0,765	0,876
The Royal Bank of Scotland	0,880	0,771	0,923	1,000
Turkland Bank	0,868	0,767	0,789	0,878
WestLB	1,000	1,000	1,000	1,000
<u>Mean Efficiency Score of Foreign Banks</u>	<u>0,906</u>	<u>0,901</u>	<u>0,905</u>	<u>0,934</u>

Up until 2001, in previous studies foreign banks were found to be more efficient than domestic banks as suggested by Işık and Hassan (2002). After this year, however, state banks captured the first place in terms of efficiency. In fact, after the 2001 crisis, there was less political influence on the state banks leading to an improvement

in their performance. One other reason of increase in efficiency is that state banks would no longer make duty loss payments in the name of the state.

Provisions would be recorded in the balance sheet for the loans provided. State banks' accumulated duty losses, which amounted to more than twenty billion TL at that time, would be financed through government bonds issued by the Treasury.

In fact, accumulating the interest income from these bonds, Ziraat Bank and Halkbank became quite profitable. Additionally, there was a fall in the number of bank branches, labor and in operational expenses resulting from the restructuring of the state banks. As a result of this fall, there was an improvement in the asset size per branch and per labor (BRSA, 2003). The number of branches declined from 2494 in December 2000 to 1685 in December 2002 while the number of personnel declined from 61,601 in December 2000 to 30,399 in December 2002.

Asset size per branch increased from 13.9 million dollars at the end of 2001 to twenty million dollars at the end of 2002. On the other hand, asset size per labor increased from 0.7 million dollars to 1.1 million dollars during the same periods.

It can be seen that the efficiency scores of both domestic and foreign banks decreased in years 2008 and 2009 because of the 2008 global financial crisis and improved in post-crisis year 2010. While the 2008 global financial crisis created a risky business environment for Turkish banks, in 2010 the banking sector made unprecedented levels of profits due to increased demand for consumer loans, higher level of interest rate margins and increasing prices of securities due to falling interest rates.

## Conclusion and Limitations

In this chapter Turkish banking sector efficiency for the years between 2007 and 2010 was tested by using the non-parametric approach DEA. The results reveals that domestic banks are more efficient in all years contrary to the studies in Poland (Havrylchuk, 2006), Croatia (Jemric & Vujcic, 2002) and US (Berger, et al. 2000). This is mostly because of the high efficiency scores of the state banks which are highly restructured after the 2001 crisis. As mentioned following the 2001 crisis, state banks entered into a period in which there was less political pressure as compare to precrisis period. Moreover, these banks no longer made duty loss payments in the name of the state after 2001. The value of the real estate properties of these banks increased and the inflation accounting practice affected them the most. These facts justify state banks' having high efficiency values.

The effect of 2008 crisis can also be seen on the efficiency scores. The efficiency scores of both domestic and foreign banks decreased in years 2008 and 2009 because of the 2008 global financial crisis and improved in post-crisis year 2010.

This empirical study can be improved by analyzing the efficiency scores also by selecting different inputs and outputs. Including other factors and bank characteristics may result to give different insight to analysts. More importantly, longer time period can be analyzed to see the broader picture and not only country wise analysis but also comparative cross country analysis can be made to elaborate the effects of the crisis to efficiency in different countries.

## CHAPTER 5

### CONCLUSION

In this dissertation three different analysis is conducted related to the banking system. In the first part, the profitability of the emerging market banking system and the determinants of bank profitability is analyzed by using the panel data of 195 banks from nine advanced emerging countries between the years 2005-2010. The results reveal that operating expenses management, capitalization, credit risk, bank size and inflation are important determinants for both return on asset and net-interest margin dependent variables.

The empirical results suggest that for the permanence of profitability, there should be a strong capital structure in the sector. Also for the improvement of the profitability of commercial banks the human resource and service quality should be developed and credit risk should be decreased.

This empirical study can be improved by testing for different variables to increase the explanatory power. Since there are limited number of banks in each country, more countries can be included in the analysis to increase the sample size. Also, longer time period can be analyzed to obtain more accurate results.

Second part of this study is related to Turkish Banking System and includes the strategic and financial overview of Turkish Banking System. Two different analyses are conducted in second part. In the first chapter of Part II the lending relationship between Turkish SMEs and banks is analyzed by survey methodology. The determinants of lending conditions for SMEs are examined by using OLS regression.

The results reveal that firm age and firm size are the most important determinants of lending conditions. Also strong relationship variables increase the access to credit.

Our empirical results suggest that close and long-lasting relationship is desirable for firms. Firms with long-lasting bank relationships fare better than other enterprises in terms of interest rates, and credit availability.

This empirical study can be improved by increasing the sample size and by testing different relationship variables. Since according to our knowledge this study is the first research on lending relationship between banks and SMEs in Turkey there is much to improve. The main limitation of this study is there is no secondary data for the SMEs and the companies are not very eager to share their records. If data is obtained, time series analysis can also be conducted for lending relationship.

Finally, second chapter of Part II covers the efficiency analysis of Turkish Banking Sector between the years 2007-2010 by using the non-parametric technique Data Envelopment Analysis. The effects of 2008 financial crisis on the Turkish banking system efficiency and the efficiency score differences of domestic and foreign bank subgroups operating in Turkey is also examined in this chapter. The results reveals that domestic banks are more efficient in all years contrary to the studies in Poland (Havrylchyk, 2006), Croatia (Jemric & Vujcic, 2002) and US (Berger, et al. 2000). This is mostly because of the high efficiency scores of the state banks which are highly restructured after the 2001 crisis. The effect of 2008 crisis can also be seen on the efficiency scores.

This empirical study can be improved by analyzing the efficiency scores also by selecting different inputs and outputs. Including other factors and bank characteristics may result to give different insight to analysts. More importantly, longer time period can be analyzed to see the broader picture and not only country

wise analysis but also comparative cross country analysis can be made to elaborate the effects of the crisis to efficiency in different countries.

## APPENDIX: QUESTIONNAIRE

Firma Ünvanı:

Kuruluş Yılı:

Firmadaki Göreviniz:

1) Şirket merkeziniz nerede faaliyet göstermektedir?

- İstanbul
- Kocaeli
- Bursa
- Tekirdağ
- Diğer, lütfen belirtiniz.....

2) Firmanız hangi sektörde faaliyet göstermektedir?

- Oto yan sanayi
- Dokuma, giyim esyası ve deri sanayi
- Orman ürünleri ve mobilya sanayi
- Kağıt - kağıt ürünleri ve basım sanayi
- Kimya - petrol, kömür, kauçuk ve plastik sanayi
- Tas ve toprağa dayalı sanayi
- Gıda, içki ve tütün sanayi
- Metal eşya - makine, teçhizat, ulaşım aracı, ilmi ve mesleki ölçme aletleri sanayi
- Diğer, lütfen belirtiniz.....

3) Çalışan sayınız nedir?

.....

4) Çalışan sayınız geçen yıl ne kadar arttı?

Hiç artmadı  %10-%20  %21-%30  %31-%40  %41-%50  %51'den fazla

5) Firmanızın hukuki statüsü nedir?

- Şahıs Şirketi
- Kollektif Şirket
- Limited Şirket
- Anonim Şirket
- Kooperatif
- Diğer, lütfen belirtiniz.....

6) Kaç ortaklı bir sirketsiniz?

- 1 – 3
- 3 - 5
- 6 - 10
- 11 - 50
- 51 ve üzeri

7) Şirketinizin en büyük üç ortağının hisse yüzdeleri ne kadardır?

1.ortak: %.....

2.ortak: %.....

3.ortak: %.....

8) Ortaklar arasında yabancı uyruklu şahıs ya da şirket var mı?

Evet  Hayır

9) Şirketiniz bir aile şirketi mi? (Hisselerin %50'den fazlası tek aileye mi ait?)

Evet  Hayır

10) Son beş yılda şirket hisselerinin %20'den fazlası el değiştirdi mi?

Evet  Hayır

11) İşletmenizde üst düzey yöneticiler (CEO, Genel Müdür) ortaklar mı yoksa profesyonel yöneticiler mi?

- Ortaklar  
 Profesyonel yöneticiler  
 Hem ortaklar hem profesyonel yöneticiler

12) Şirketin üst düzey yönetiminden kaç kişi sorumludur?

1  2  3  4  5 veya daha

fazla

13) Üst düzey yönetimden sorumlu kişilerin kaçısı şirket ortağıdır?

1  2  3  4  5 veya daha

fazla

14) İşletmenizin üst düzey yönetiminden sorumlu kişinin eğitim durumu nedir?

- İlkokul
- Ortaokul
- Lise
- Meslek Yüksekokulu (Üniversite 2 yıllık)
- Üniversite (4 yıllık)
- Yüksek Lisans
- Doktora
- Diğer, lütfen belirtiniz.....

15) Geçen yılki (2010) cironuz ne kadardı?.....

16) 2011 yılı ciro tahmininiz ne kadar?.....

17) Geçen yılki (2010) net karınız ne kadardı?.....

18) Geçen yılki (2010) duran varlıklarınız ne kadardı?.....

19) Geçen yılki (2010) aktif toplamınız ne kadardı?.....

20) Geçen yılki (2010) borç toplamınız ne kadardı?.....

21) Geçen yılki (2010) finansman giderleriniz ne kadardı?.....

22) Tüm finansal işlemleriniz için kaç banka ile çalışmaktasınız?

1    2    3    4    5    6    7    7'den fazla

23) Bankalardan kredi kullanıyor musunuz?

Evet       Hayır

24) Kaç bankada kredi limitiniz bulunmaktadır?

1    2    3    4    5    6    7    7'den fazla

25) Lütfen kredi kullanırken en aktif çalıştığınız 3 bankayı sırasıyla işaretler misiniz?

Akbank .....

Anadolu Bankası .....

Denizbank .....

Finansbank .....

Fortis .....

Garanti Bankası .....

Halkbankası .....

HSBC .....

İş Bankası .....

Şekerbank .....

Tekstilbank .....

TEB - Türk Ekonomi Bankası .....

Turkish Bank .....

Vakıfbank .....

- Yapı Kredi .....
- Ziraat Bankası .....
- Bank Asya.....
- Kuveyt Türk.....
- Türkiye Finans.....
- Diğer, lütfen belirtiniz.....

26) Lütfen firmanıza en yüksek kredi limiti tahsis eden 3 bankayı sırasıyla işaretler misiniz?

- Akbank .....
- Anadolu Bankası .....
- Denizbank .....
- Finansbank .....
- Fortis .....
- Garanti Bankası .....
- Halkbankası .....
- HSBC .....
- İş Bankası .....
- Şekerbank .....
- Tekstilbank .....
- TEB - Türk Ekonomi Bankası .....
- Turkish Bank .....

- Vakıfbank .....
- Yapı Kredi .....
- Ziraat Bankası .....
- Bank Asya.....
- Kuveyt Türk.....
- Türkiye Finans.....
- Diğer, lütfen belirtiniz.....

27) En yüksek kredi limitiniz bulunan bankadaki limitiniz ne kadardır?.....

28) En aktif çalıştığınız bankadaki kredi limitiniz ne kadardır?.....

29) Bankalardaki toplam kredi limitiniz ne kadardır?.....

30) En yüksek kredi limitiniz bulunan banka ile hangi teminat şartları ile kredi kullanabiliyorsunuz?

- Teminatsız
- Kefalet
- İpotek
- Çek karşılığı
- Diğer, lütfen belirtiniz.....

31) En aktif olarak çalıştığınız banka ile hangi teminat şartları ile kredi kullanabiliyorsunuz?

- Teminatsız
- Kefalet
- İpotek
- Çek karşılığı
- Diğer, lütfen belirtiniz.....

32) 2010 yılı banka toplam borcunuz ne kadardı?.....

33) 2010 yılında en aktif çalıştığınız bankaya borcunuz ne kadardı?.....

34) Bankalardan hangi faiz oranı (kar marjı) ile nakit kredi kullanabiliyorsunuz?

TL.....

USD.....

Avro.....

35) En aktif çalıştığınız bankadan 31.12.2010'da aldığınız faiz oranı (kar marjı) nedir?

TL.....

USD.....

Avro.....

36) En aktif çalıştığınız banka ile kaç yıldır çalışmaktasınız?.....

37) En aktif çalıştığınız banka ile hangi sıklıkta görüşürsünüz?

- Hergün
- İki-üç günde bir
- Haftada bir
- Onbeş günde bir
- Ayda bir
- Ayda bir kereden az

38) En aktif çalıştığınız bankada sürekli görüştüğümüz şirketinizden sorumlu bir müşteri temsilciniz var mı?

- Evet
- Hayır

39) En aktif çalıştığınız banka ile aranızda karşılıklı güvene dayalı bir ilişkiniz var mı?

- Evet
- Hayır

40) En aktif çalıştığınız banka ile aranızda güven ilişkisini 5 üzerinden notlandırır mısınız?

- 0
- 1
- 2
- 3
- 4
- 5

41) Son beş yıl içerisinde borç geri ödeme sıkıntısı yaşadınız mı?

- Evet
- Hayır

42) Son beş yıl içerisinde kredi limitleriniz hiç donduruldu mu?

- Evet       Hayır

43) Son beş yıl içerisinde herhangi bir kredi talebiniz geri çevrildi mi?

- Evet       Hayır

44) Bankalardan ağırlıklı olarak hangi tür kredi kullanıyorsunuz?

- Nakit Kredi  
 Gayrinakdi Kredi  
 Her ikisi de eşit miktarda

45) Eğer nakit kredi kullanıyorsanız aşağıdakilerden hangi tür krediyi en çok tercih ediyorsunuz? (Eğer birden fazla ise lütfen sıralayınız)

- Değişken faizli kredi .....
- Sabit faizli spot kredi .....
- İskonto Kredisi.....
- İşletme Kredisi .....
- Diğer, lütfen belirtiniz.....

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