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YÜKSEK LİSANS TEZİ

**PERFORMANCE MEASUREMENT BY USING DATA
ENVELOPMENT ANALYSIS IN BANKING INDUSTRY:
AN APPLICATION**

Saygın İBİŞ

Danışman
Prof. Dr. Tülay YÜCEL

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YEMİN METNİ

Yüksek Lisans Tezi olarak sunduğum “**Performance Measurement by Using Data Envelopment Analysis In Banking Industry: An Application**” adlı çalışmanın, tarafımdan, bilimsel ahlak ve geleneklere aykırı düşecek bir yardıma başvurmaksızın yazıldığını ve yararlandığım eserlerin kaynakçada gösterilenlerden oluştuğunu, bunlara atıf yapılarak yararlanılmış olduğunu belirtir ve bunu onurumla doğrularım.

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ÖZET
Yüksek Lisans Tezi
Bankacılık Sektöründe Veri Zarflama Analizi Kullanarak
Performans Ölçümü: Bir Uygulama
Saygın İBİŞ

Dokuz Eylül Üniversitesi
Sosyal Bilimler Enstitüsü
İngilizce İşletme Anabilim Dalı
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Bu tez çalışmasında Türkiye bankacılık sektörüne tarihinden bugüne geliş sürecine; özelliklerinden temel sorunlarına; ve BASEL, yabancı girişleri gibi güncel konulara değinilmeye çalışılmıştır. Ayrıca çalışmada verimlilik, verimlilik çeşitleri ve verimlilik değerlendirme modellerinden bahsedildikten sonra Türkiye Bankalar Birliği' nin sınıflamasına göre 2007 yılı için ticari banka bazında etkinlik puanlarının bulunması amaçlanmıştır.

Türk bankacılık sektörünün etkinliği son zamanlarda önem kazanan “Veri Zarflama Analizi“ (VZA) adı verilen bir metodla değerlendirilmiştir. Uygulama bölümünde girdiye yönelik CCR - VZA modeli tercih edilmiştir. Uygulama bölümü sırasında etkinlik skorları ve potensiyel iyileştirmeler bulunurken VZA Çözücü LV. programı kullanılmıştır.

Anahtar Kelimeler: Etkinlik, Veri Zarflama Analizi (VZA), Türkiye’de Bankacılık Sektörü.

ABSTRACT

Master Thesis

Performance Measurement by Using Data Envelopment Analysis

In Banking Industry: An Application

Saygın İBİŞ

Dokuz Eylül University

Institute of Social Sciences

Department of Business Administration

Master of Business Administration Program

In this thesis it is tried to touch on banking industry in Turkey from its history to process while coming nowadays; specifications to fundamental problems; and actual issues like BASEL, foreign entry. In addition, after mentioning about productivity, productivity types, and productivity evaluation models; the study is supported with an efficiency research aimed to find the efficiency scores of commercial banks for the year 2007 according to classification in The Banks Association of Turkey.

The efficiency study of Turkish banking industry is evaluated by a method called Data Envelopment Analysis (DEA) which is coming into prominence recently. In the application part DEA- input oriented CCR model is preferred. During the analysis part, DEA Solver LV. program is used for finding the efficiency scores and potential improvements.

Key Words: Efficiency, Data Envelopment Analysis (DEA), Turkish Banking Industry.

**PERFORMANCE MEASUREMENT BY USING
DATA ENVELOPMENT ANALYSIS IN BANKING INDUSTRY:
AN APPLICATION**

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1. INTRODUCTION

In a rapidly changing financial market worldwide, bank regulators, managers, and investors are concerned about how efficiently banks transform their expensive inputs into various financial products and services (Isik and Hassan, 2002, Technical).

Increased competition and external shocks in recent years caused one third of the banking industry to fail, weeding out the weakest and least efficient banks. Thus, the importance of running banks efficiently and productively has become now more critical than ever. Significant number of branch closings and costs saving campaigns aimed at reducing payrolls indicate that efforts to improve bank productivity and efficiency further are still underway. As deregulation and liberalization continues together with globalization, the increased competitive pressures will be forcing existent banks to operate more efficiently.

Examining banking performance has been a common practice among banking and finance researchers for a number of years. The main reason for continued interest in this area of research is the ever-changing banking business environment throughout the world (Sufian, 2007).

Turkish banking sector is fastened and established the roots of today's banking during 1920s. Large numbers of foreign banks responded the governments' call for financing the newly developing economy due to insufficient domestic capital with the hope of earning high interest rates. As a reaction to the increased role and power of foreigners in banking, the national banking movement that emerged during these years. However, these domestic banks were mostly local and too small to finance the newly developing economy (Isik and Uysal, 2006).

After 1980, foreign entries are started participating in Turkish banking industry. This market penetration brought many new services, and new application to the market. State-owned bank leadership started to pass foreign and privately-owned banks. Having many banks in the sector fired the hard competition in this sector. Banks are trying to

find out new customers by servicing more quality and developing new campaign near the operations at cost minimization, profitability, and productivity.

In this thesis study, after giving information about banking and bank types, focus on Turkish banking industry history, its fundamental problems and recent issues are going to be handled; at the second part productivity term; performance analysis methods are going to be touched on. In addition, at the second part Data Envelopment Analysis and its methodology, application steps are going to be told in detail because Data Envelopment Analysis is the method that is used in the application part. The third part, where the Data Envelopment Analysis method is used, consists from the analyses for evaluating the performance of commercial banks in Turkey for the year 2007. Evaluating the performance of the commercial types is going to give an idea about the efficiency situation of the banking industry. As a result; efficient and inefficient commercial banks are going to be found and the projection for the inefficient banks is going to be given for their improvement. .

CHAPTER ONE

BANKING INDUSTRY IN TURKEY

1.1. WHAT IS BANK?

In today's economies banks are indispensable financial institutions in money and credit politics. In each country, banks are under control of laws parallel to economical structure and requirements of the country where they activate in. Activates that they play in development of the economy made them peculiar financial institution both in international and national area.

Before making the description of bank; it is better to look where it is coming from. Bank is coming from "banco" which means bench, table. In history first banking activities are made by Lombardic bankers (Parasiz, 2000).

Bank has many descriptions in literature; bank can be defined as the institutions which sell money in order to gain money. Also banks can be described as commercial institutions which care with money and credit trade.

Banks are the corporation that deals with money and whole other disbursement equipments represents money. With other words banks are the entrepreneurs or establishments that are intended to gather unused, idle money from public in order to gain money.

Bank accepts the money which public does not spend; and increases the amount of that money by crediting and also services as intermediary in payments, money transfer. A bank is a subset of financial intermediaries in general. That is it secures funds from surplus spending units and transmits them to deficits spending units.

1.2. FUNCTIONS OF BANKS

Banks are handling with different services so it will be conflict to evaluate them in same group like homogenous units. Due to this inhomogeneous structure; the functions of banks will differ.

The economic functions of banks include:

1) Issue of money: They issue money in the form of banknotes and current accounts subject to cheque or payment at the customer's order. These claims on banks can act as money because they are negotiable and/or repayable on demand, and hence valued at par and effectively transferable by mere delivery in the case of banknotes, or by drawing a cheque, delivering it to the payee to bank or cash (Levine, 2006).

2) Netting and settlement of payments: Banks act both as collection agent and paying agents for customers, and participate in inter-bank clearing and settlement systems to collect, present, and payment instruments. In other words, banks work as a bridge between the savers and fund demanders by giving a bunch of diversified financing activities which fulfill all the customers' needs and effectively help provide the necessary finance to the various economic sector. In addition, banks help people to keep their short term, idle money in safe (Basar and Coskun, 2006).

3) Credit quality improvement: One of the differences of banks from other financial institutions is presenting loan products. Banks lend money to ordinary commercial and personal borrowers (ordinary credit quality). By gathering little funds together, banks can be high quality lenders. Banks provide a substantial proportion of external finance to enterprises around the globe (Levine, 2006).

4) Maturity transformation: They bring together deposits, banknotes; maintain reserves of cash, invest in marketable securities that can be readily converted to cash if it is needed; or raise replacement funds as needed from various sources like wholesale

cash markets and securities markets because they have a high and more known credit quality than most other borrowers (Basar and Coskun, 2006).

5) Generating services: Bank services generally works in collective mentality; every service fulfills each other. Account holders usually use these services. Banks give these services free although facing extra service costs. When the bank management thinks to abandon these free services; bank may lose customers (Cankaya and Oz, 2001).

1.3. BANK TYPES

Economical changes, social structure and legal regulations forced banks to differentiate in their organizational behavior. Banks service in a broad area, it is the reason that we cannot classify the banks in certain groups.

Classifying criteria are changing according to their capitals, activities, ownership origins, purposes and functions. For that reason, a bank can be in different categories at the same time.

For example, if the classification is done according to activities; Ziraat Bankasi is in the same group with Akbank but on the other if classification is made according to capital; a state owned bank Ziraat Bankasi is not at the same group with Akbank (Arslan and Hotamisli, 2007).

A) Legal Procedure Classification:

A1) Family banks

Family banks or individual owned banks are not servicing in today's economy. Family banks are founded especially in XIX. century by rich families. These kinds of banks are prevented to role because the importance of a bank is increasing in economy and society.

Family banks helped other banks to reform themselves. In our country, laws expresses that banks have to be founded as Stock Corporation (Basar and Coskun, 2006).

A2) Capital banks

Nowadays, many of the banks are founded as capital banks. The capitals of these banks are generally limited liability partnerships. By this way, public welfare and state are protected at the same time because banks should be strong, invulnerable. They should be trustworthy in public relations (Basar and Coskun, 2006).

A3) Banks founded by private laws

In a country some industries have special importance in the development of the country although these sectors are not profitable. To support these industries some bank activities are regulated by law. For example agricultural, popular, mining banks are all founded by private laws (Basar and Coskun, 2006).

B) Ownership Classification:

Classification is can be done according to ownership type of the banking firm. This classification consist four types of ownership.

B1) State-owned banks

State-owned banks' capital is directly related with public, treasury or other national juridical person. State banks are the banks in which the state held at least a 51% share; roles as a main shareholder. State-owned banks can exist by expropriating foreign banks and private banks or established as a state bank. In Turkey, Vakifbank, Ziraat bank and Halk bank are the state banks.

B2) Private banks

Capital is positioned by a person and private foundation. Private banks are generally formed as investment or commercial banks. Private banks are usually service in countries that have free market economies.

B3) Foreign banks

Foreign banks are the banks whose capital is handled by foreign person or foreign enterprises. In a country foreign banks can service by opening an agency where its centre is in abroad or this kind of banks can exist as a direct investment. To operate in a new foreign market, foreign banks should fulfill some regulations. By globalization, the shares of foreign banks are increasing in banking industry in some countries. As it is happened in other industries; after economic crises the numbers of foreign banks are increasing faster. If we look to shares of foreign banks in Turkey after 2001 crises; we can easily realize the change. In 2001, the share of foreign banks among Turkish banking industry is 29.5 % while it is 33.3 % in 2002 because of economic crises effect. As a note; first foreign bank entrance is with Citibank by opening branch in Turkey. In Turkish banking industry 18 foreign banks are operating today.

4) Public-Private banks

Capital is shared between public and private establishment-person. Public-private bank generally exist after public bank sells its share to private. The advantage of these banks is getting benefit from dynamic part of private; experiment and supporting part of public.

C) Classification due to Branch Numbers

C1) Single Branch

Activities and services are operated from a centre in single branched banks. This kind of banks is common in USA because of legal provisions. In 1993, the banks in USA were

40 % single branched. This reduces the chance of risk distribution while increases experienced management.

C2) Multi Branches

Lots of bank branches are giving services all around the country bounded to one centre as a subsidiary. As we mentioned above, single branch banks are common in USA while multi branched banks are common in Europe. Banks prefer having multi branches because trade is increasing and spreading all around the country at the same time. In addition, increase in population and rapid development in urbanization force banks to be multi branched. Due to these developments, banks want to lower the risk and give better service conditions to their customers in competition.

D) Classification due to Organization Area

D1) Local Banks

Local banks were important at the beginning of banking industry but they lost their attractiveness today. These banks are operating in a limited area (Coskun and Basar, 2006).

D2) Regional Banks

Regional banks provide services in a certain region. In some regions, these banks are charged to develop this region. There were many regional banks in our country: Milli Aydin Bank, Bagcilar Bank, Tutunbank-Yasarbank, Tarisbank, EGS Bank (Dogan, 2006). These banks have branch networks around their headquarters; and they function as the main financial service providers in the regions.

Besides the function of accepting deposits and financing, they also provide payment services to their customers' through nationwide networks with ATM and fund transfer (Regional Banks Association of Japan, 2007).

D3) National and International Banks

National banks are the most common bank type. They function nearly all around the country. International banks are the banks that operate more than one country. The main factors extensity of international banks are increase in goods and capital transferring, transportation, technological developments, new market penetrations in economy, different capital entrances from foreign countries. International Bank for Reconstruction and Development (IBRD), Bank Islam, European Investment Bank (EIB) are some examples of international banks.

D4) Off-shore Banks

A substantial “offshore” international banking sector, often called the “Eurocurrency” market, grew up in the 1960s and 1970s. Its key characteristic is being transacted in outside the country in whose currency business is denominated. Offshore banking arose to avoid a variety of banking regulations. Offshore banks that deal in Eurodollars avoid reserve requirements on deposits, Federal Deposit Insurance Corporation (FDIC) assessments and U.S. imposed interest rate ceilings (Chrystal, 1984).

Offshore banks are differentiated from other banks in some points. First, they work with different currency from the country’s registered currency. As it is mentioned; they are out of regulations which other financial institutions are responsible from. Offshore banks are applying keeping secret principle in banking intensively. In 1994, Roberts identified five major world clusters of offshore finance including Caribbean (Cayman Islands, Bahamas, Panama); Europe (Isle of Man, Jersey, Luxembourg, Liechtenstein, Andorra, San Marino); the Middle East (Cyprus, Lebanon, Bahrain); Southeast Asia (Hong Kong, Singapore); and the South Pacific (Vanuatu) (Warf, 2002).

E) Classification according to Bank Activity

Banks can be classified according to their customer profiles and activity areas. Specialized banks, retail banks are the choices of banks in banking activities.

E1) Specialized Banks

Specialized banks involved in such a variety of economical activities. Large sized firms look up financial intermediaries to meet their high amount of financial needs recently. These kind of specialized banks give financial services in central areas because they have not many branches. Specialized banks are trying to meet high amounts of fund demands, give rapid response to their customers' requests, have very close relationship, and try to make snap and clever decisions. In addition, they can be established with some legal arrangements in order to service as an agriculture, mining, development bank. Somehow, specialized banks begin to service at other banking activities after a while (Basar and Coskun, 2006).

E2) Retail Banking

Retail banks are organized to give all kind of banking services directly to ultimate consumers, rather than corporations. By minimizing the risk of operations; these kinds of banks become successful and their business policy become agile.

In recent years, there is a retail banking trend after decreasing profit margins in specialized banking while retail banks are trying to centralize due to incorrect branch expansion managements. Retail banking is a typical mass market banking where individual customers use local branches for larger commercial banks (<http://investor.cisco.com/glossary.cfm?FirstLetter=r>, 25.10.2008).

F) Classification due to Economical Functions

F1) Agricultural Banks

The definition of an agricultural bank is rather arbitrary. Generally, an agricultural bank is identified as a commercial bank whose ratio of agricultural loans (real estate and production loans) to total loans is greater than all commercial banks (Kliesen and Gilbert, 1996)

Agriculture banks are established to support farming industry, to help farming industry workers in finding solutions for the problems they face in this industry. Agricultural banks are trying to create funds for demanders from farming, and give economical, technical information about agriculture. The leading functions of these banks are increasing welfare of country with a better organized farm industry. Agricultural banks should be funded by the help of state in order to give high long term credits with low interests. In our country, T.C. Ziraat Bank was established as an agricultural bank but later it broadened its services. Recently, T.C. Ziraat Bank has opened a new agricultural banking agency called “TOBI” in order to give agricultural banking services to farmers in Antalya and Adana (Boyacıoğlu, 2008).

F2) Mine Banks

Mine banks are charged to finance natural resources to economy as a driving force of industrialization. In addition, mine banks can manage these natural sources to add value for the economy if it is needed. Etibank was established to utilize natural resources with financial capabilities as a leading power of industrialization and modernization of our country by directives of great leader Ataturk with his broad view and understanding in 1935. After restriction and remodeling, it has gained a structure under name Eti Mine Works General Management (www.etimaden.gov.tr/tr0_sayfa_ortak_ortak_Sayfa.asp?hangisayfa=1_sayfa_br, 25.10.2008).

F3) Mortgage and Real Estate Banks

Mortgage banks are the banks which mortgage the real properties as a guarantee to give consumers medium or long term credits. Real estate banks are subgroup of mortgage banks that are specialized in construction affairs. Mortgage banks like agricultural banks should have supported by state in order to provide long term credits with low interest (Basar and Coskun, 2006). Emlak Bankasi is established by Ataturk in Turkey for encouraging the construction investment of public in 1926.

F4) Popular Banks

People working with elbow grease like tradesman need medium term credits to develop their jobs, increase the efficiency of their organizations. Popular banks work from cooperative system because tradesmen have small capital and they do not have real estate to mortgage (Cosar and Coskun, 2006).

Halkbank was the first institution in the Turkish banking industry to focus on the needs of tradesmen, artisans and representatives of the middle class, small businesses that are backbone of the national economy of Turkey.

F5) Commercial and Deposit Banks

They collect funds from the public. These banks become expert in short term credits and funds. All commercial banks have two common functions as lending and borrowing. Borrowing generally exists by deposits on the other hand lending exists by discount so that these banks are sometimes called as lending and borrowing banks. The most important function of commercial banks is creating bank money for markets.

Bank money exists after decreasing legal discount from the deposits. Bank money especially takes important role in systems which checks are used mostly (Basar and Coskun, 2006). In our country there were 37 commercial banks in 2008.

F6) Development Banks

Development banks are operating by using the community's money which they do not use in short and long term by directing them to finance industry's and trade's long term investment. Some functions of development banks are given respectively (BAT Presentation, 2008).

- **Providing medium and long term domestic credits:** Investment banks can supply funds by lending money or by being a partner to an entrepreneurship. By this way, it can manage sources efficiently.
- **Encouraging capital market:** Development banks are helping to develop capital market by selling their own bond and stocks to investors. Structuring portfolios to increase stock exchange transactions.
- **Supporting entrepreneurships and development:** After search for feasible investment projects; these banks consult technical and managerial issues during the application of project. In addition, they coordinate relations between government, investments and planning authorities.
- **Assisting economical development plans:** In developing economies, following suitable investment politics due to encouragement politics and they contribute to realize development plans.

Development banks find their sources from international development institutions, domestic and foreign banks, and state funds (BAT Presentation, 2008).

F7) Investment Banks

Investment banking is part of the financial services industry and offers an increasingly important range of services to corporations throughout the world. The range of products and services is increasing rapidly and it is difficult to distinguish the most important services because investment banks offer their services in different ways and forms. However, two basic functions are raising capital and giving advice on mergers and acquisitions. All other services are largely supported or developed from these two functions; examples include corporate securities for fund-raising and handling mergers and acquisitions. The function of investment banking is to create and mediate the flow of assets between “issuers” and “investors”. Issuers include companies and other entities that sell assets, such as stocks, bonds and even parts or all of the company itself.

Investment banks have a very active role in “creating issuers”, for example, spotting companies that could be a takeover target. Investors include investment banks (merchant banking), companies, institutions and people who buy these assets (Moustakatos and Turnbull, 1996).

Some functions of investments banks are:

- Doing intermediation between companies who will issue stock exchange and saver institutions,
- Giving guarantee to companies to get their principal and interest on time about bonds that they take,
- Protecting customers’ benefits who bought the stock exchanges that are exported by their intermediation,
- Consulting the companies that will issue new stocks and will achieve public offering. They will work on regulating, pricing, offering issues.
- Helping companies to obtain middle or long term credits from commercial banks (Basar and Coskun, 2006).

In our country some examples of investment banks are TAIB Investment Bank, and Çalık Investment Bank.

F8) Central Bank

Central banks are the regulators of banking and money structure. Central banks are taken over some other responsibilities like controlling credit structure and adjusting emission volume.

Central banks are under control of state generally. Main responsibility of central banks is adjusting fund and credit volume according to economical conditions and policy that is followed by state.

On the other hand, central banks are also organizing state's treasury transactions, preserving deposit provisions and cash needs, following bartering and lending and borrowing transactions between banks, intermediating international payments, preserving foreign currency and gold requirement of the country (Basar and Coskun, 2006).

F9) Participation Banks

Participation banks deliver the profit or loss to savers which these banks gather the funds from trade and industry investments parallel to interest free finance. Some people from different countries of world avoid from interest earnings. At this point, a noteworthy fund becomes idle because of avoiding from classical banks. Participation banks collect this fund and bring idle fund into economy.

In our country participation banks are Türkiye Finans Bank, Kuveyt Turk, Albaraka Turk, and Bank Asya.

1.4. BANKING SYSTEM IN TURKEY

1.4.1. History of Banking in Turkey

It is possible to analyze Turkish banking industry in two periods due to republic: Turkish banking industry before the republic and after the republic.

1.4.1.1. Period Before The Republic

It is obvious that the economical situation is directly related with banking industry activities in a country. The industrialization development, occurred in 18th-19th centuries in Europe, can not be followed by Ottoman Empire simultaneously. This adaptation process caused instability in trade and industry.

First bank at Ottoman Empire is founded in 1847 by Galata bankers in order to protect the values of bonds which the empire has issued for financing external loans. This banks' name is "Banque de Constantinople" (Istanbul Bank). After five years Bank Istanbul was closed (Gunal, 2001).

The second bank at Ottoman Empire was founded in 1856 under the name of Ottoman Bank. Ottoman Bank activated as a central bank in the empire. Between the years 1856-1875, some foreign banks were founded to finance the external loan of the empire (Ocal and Colak, 1991).

First state-owned bank is Ziraat Bank founded in 1863. The origin of this bank goes to "Memleket Sandiklari" whose principle is to finance farmers (Uyar, 2003).

Banking industry in Ottoman Empire fastened during World War I. Founding national bank programs were suggested and some of the programs were realized. At these years, between 1908 and 1923, 24 banks were founded in Ottoman Empire whose 11 are in Istanbul (Yuzgun, 1982).

1.4.1.2. Period After The Republic

After the declaration of the republic in 1923, Izmir Economic Congress showed the way for Turkish banking industry. In this congress, it was mentioned that the development of Turkish economy is depended to development in banking industry. It was expressed that state should help founding bank. If not; Turkish economy will be crashed under the foreign capital. These give clues about the ideas, projects of state about the future of banking industry in Turkey (Banking Workshop Group, 1992).

After Izmir congress, some banks were found to finance Turkish trade and industry. Turkey Isbank, Turkey Industry and Mine Bank, Estate and Orphan Bank, restructured Ziraat Bank, and Central Bank. In these years, another important point is founding many local banks. Nearly 29 local banks started their services (Ozcelik and Tuncer, 2008).

In 1923, collected deposits were 59.7 % from national bank; 40.3 % was from foreign banks. When it was 1932, collected deposit were 94.6 % from national banks and 5.4 % from foreign banks (Ayan, 2006). These show how national banking was developed at those years. In 1931, the government prepared first five year development plan for supporting investments. This plan also encouraged some private banks Denizbank, T. Halk Bank, Etibank, Sümerbank to be found (Eren, 1996).

During World War II, the state increased internal and external loans by the intermediation of banks in order to meet increasing defense expenses. Near the loans to Central Banks; credits that government use also increased during these years (Artun, 1980).

After Second World War, both external and internal recovery in banking industry showed itself in increasing number of banks. Totally, thirty new banks were founded which three of them were Yapi Kredi Bank, Turkey Industrial and Development Bank, and Akbank. In 1952, Denizcilik Bank, Vakiflar Bank and Ogretmenler Bank were founded by private laws. In addition, branch banking was increased in those years parallel to increase in number of banks in the country. On the other hand, in order to regulate the competition in fair, improve banking industry and ensure cooperation; The Banks Association of Turkey was founded in 1958. In spite of rapid developments in banking; 30 new banks were founded while 14 of them were sold off (Gunal, 2001).

Numbers of banks were dropped to 44 at the end of 1980; in spite of they were 59 in 1960. Despite the decrease in quantity of banks; the number of branches was increased 235 % in 1980 as it is compared to 1960 (Akguc, 1989).

In 1980, The Turkish Government realized upon a series of reforms aimed to accomplish: remove price controls and subsidies, lessen the role of the public sector in commerce, emphasize growth in the private sector, stimulate private investments and savings, liberalize foreign trade, reduce tariffs, ease capital transfer exchange controls,

and reform the taxation system. The three major objectives of these new policies and programs were:

- Minimize state intervention,
- Establish a free market economy,
- Integrate the Turkish economy with the world economic system (Etkin et al., 2000).

Since the mid-1980s, international investors have been taking an apparent part in the Turkish economy. All fields opened to private sector, foreign participation and investment without any limitation (Etkin et al., 2000).

In 1981, two new applications became valid which private sector has expected. Central bank started to announce daily foreign exchange rates and Capital Markets Board of Turkey was founded. Challenge between banks and bankers became hotter because of free deposits and credit interest rates (Tokgoz, 1999). Eight leader banks signed a contract in order to stable interest rates at 50%. It became very hard to receive loans. The rate of interest was not attractive for investment because rate of interest was lower than inflation rate. As a result, investors directed their investments to bankers. Challenge between bankers and banks composed some changes in the market. Interest rates are started to regulate by Central Bank from 1983 to 1987. By this way, deposits passed to state owned banks from private banks because investors found state owned banks more reliable (Uyar, 2003). In 1986, Interbank money market was founded to facilitate banks in borrowing excess fund each other who need short-term fund.

After liberalization process in legislations, foreign banks increased and many commercial banks are founded in Turkish banking industry. Between the years 1980-1990, nineteen commercial banks were founded which 8 of them were foreign. Eight development and investment banks were established which 4 of them was foreign. 1984 and 1989 regulations let Turkish citizens to account currency deposits.

Deficiency in public accounts, high domestic interest boundaries, fast short-term capital entrances, low rate of exchanges made economy more depended to “hot money” (Kibritcioglu, 2001).

Central Bank of Turkey began to apply first fund program in 1990. This program included the control of advances that are given to Treasury, and aimed to control balance sheet of the banks. Gulf Crisis was also one of the factors that affected banking industry in 1991. With this crisis, many TL and foreign currency deposits were drew from banks. Central Bank of Turkey provided the sufficient capital to banks at crisis time so the affects of the crisis has disappeared easier (Parasiz, 1998).

At the end of 1993, government changed the undervalued exchange and high interest rate policy in economical program and tried to decrease these rates. This strategy made currency overvalued across the TL nearly 53% one year later (Uyar, 2003). Government prevented the crises in May 1995 by giving 100% assurance to deposit accounts.

Giving 100 % assurance to deposit accounts just could be a solution just for a while. Many banks collected foreign currency and TL deposits by giving high interest rates which they can not handle. Problem showed itself in coming years because in this system the profit belonged to investors individually while the loss is shared in collective manner (Karacan, 1997).

After 1995, Turkish economy lived rapid development in all industries. These positive improvements also affected banking industry by the additions of short lived governments until 1998. Uncertainty in economical conditions, unstructured preventions, and public deficiencies increased risks for banks.

Russia crises impacted on Turkish economy in 1998 worse than Asia crises in 1997. Russia crises affected both reel and financial industry negatively. Foreign capital ran away from Russia and at the same time from Turkey.

Central bank tried to stop foreign capital transfer by increasing interest rates. After Russia crises, Brazil crises narrowed the borrowing ability of Turkish banking industry in 1999. During Brazil crises, banks accepted loans with high interest rates by trusting 100% assurance to deposits. Yasarbank, Esbank, Egebank, Sumerbank, Yurtbank abrogated their activations in banking industry and hand over to Savings Deposit Insurance Fund. Besides, Interbank and Bank Express also have hand over to Savings Deposit Insurance Fund in 1998. As a result, SDIF took the control of 8 banks at the end of 1999 (Gunal, 2001).

2000 and 2001 years are the “Black Years” of Turkish economy and banking industry consequently. High interest rates increased the fund losses; values of stock exchanges in portfolios were decreased. Turkish Lira undervalued against foreign currencies after passing floating exchange rates in February 2001 and banks faced with huge exchange losses (BRSA, 2001).

At first half of 2003, banking industry reached a better asset-liability structure and presented a better profitability performance although the negative effects of refusing Iraq memorandum and uncertainty of Iraq war (BRSA, 2004).

In 2003, one of the key factors of banking crisis, giving 100 % assurance to deposits, was abandoned. Assurance limit was determined as 50 thousand Turkish Liras (BAT, 2004).

Foreign interest to Turkish banking industry is distinctive. Italian capital UniCredito Italiano SPA bought the 50% shares of Koc Financial Services which was the main participant of Kocbank. French capital BNP bought the 50% shares of TEB Financial Services which was the main participant of Turkey Economy Bank. In addition, Fortis Bank NV-SA took the 89.3% shares of Turk Dış Ticaret Bank in June 2005 (BAT, 2005).

Lastly, in March 2007 BRSA approved taking over the 33.98 % shares of Sekerbank by Bank Turan Alem (BTA) Group which is a Kazakh company.

As it is showed at Table 1, Turkish banking industry was always in a fluctuation. Unstable economical conditions, political chaos, managerial mistakes are the naughty players of Turkish banking industry. These factors affected directly to the structure of banks in Turkey. Number of banks can be a clue how a changing environment surrounds the industry.

Table 1: Number of banks in Turkey between 1980 and 2008

BANKS IN TURKEY							
Banks and Years	1980	1985	1990	1995	2000	2005	2008
Deposit Banks	40	47	56	55	50	34	33
State Owned	12	12	8	5	4	3	3
Private	24	20	25	32	28	17	11
Foreign	4	15	23	18	18	13	18
Dep. Ins. Fund	0	0	0	0	0	1	1
Dev. And Inv. Banks	3	3	10	13	18	13	13
TOTAL	43	50	66	68	68	47	46

Source: The Banks Association of Turkey

1.5. SPECIFICATIONS OF TURKISH BANKING SYSTEM

Structure of Turkish banking system is analyzed under the topic of bank and branch numbers, employment, asset structure, net profits, credits, deposits, and shareholders' equity.

1.5.1. Structure of Market

Bank and branch numbers of all bank types will be described in this part. The changes in the structure of banks will be expressed by giving examples. First, all banks are classified in two bank types: deposit and non deposit banks. Secondly, these banks are grouped as state owned, private, and foreign.

Bank and Branch Numbers

Number of banks in Turkey increased from 1990 to 2003. After 2003, the number of banks in our country started to decrease especially in private deposits banks. The number of foreign banks increased in banking industry both in deposit and non deposit banks. The three state owned banks are Vakifbank, Ziraat Bank and, Halk Bank. The Banks Association of Turkey last report shows that there are 46 banks in Turkey and 33 of them are deposit banks in 2008.

Table 2: Bank and branch numbers between 2003 and 2008

Bank and Branch* Numbers												
Banks - Years	2003		2004		2005		2006		2007		07.2008	
Deposit Bank	36	6,399	35	6,390	34	6,497	33	6,809	33	7,570	33	8,077
State-Owned	3	2,245	3	2,252	3	2,134	3	2,148	3	2,203	3	2,270
Private	18	3,770	18	3,928	17	3,969	14	3,588	11	3,625	11	3,912
Dep. Ins Fund	2	175	1	1	1	1	1	1	1	1	1	1
Foreign	13	209	13	209	13	393	15	1,072	18	1,741	18	1,894
Dev. & Inv.	14	36	13	36	13	36	13	45	13	47	13	53
State Owned	3	22	3	22	3	22	3	22	3	23	3	23
Private	8	11	8	12	8	12	6	11	6	11	6	13
Foreign	3	3	2	2	2	2	4	12	4	13	4	17
TOTAL	50	6,435	48	6,426	47	6,533	46	6,854	46	7,617	46	8,130

Source: The Banks Association of Turkey, 2003-2008.

*Branch numbers include branches in abroad.

Branch numbers of the industry increased more than 25 % recent five years. Branch numbers of foreign banks increased their branches 800 % from 209 to 1894 where other banks' branches were stable.

Denizbank's % 75 shares passed to Dexia Participation Belgique and 46 % of Finansbank shares were passed to National Bank of Greece in 2006; ownership of these two banks became foreign bank. These changes increased the branch number of foreign banks in a short time. In addition, Kocbank hand over to Yapı Kredi Bank in 2005 (Bankalarimiz, 2005). In 2006, Bank Pozitif Investment and Development Bank's 58 % and Tat Investment Bank's 99 % shares were bought by Bank Hapoalim BM Bank,

Merril Lynch European Asset Holdings Inc. respectively. As a result, these two investments and development banks became foreign investment and development bank (Bankalarimiz, 2006). The attention of foreign to Turkish banking industry continued in 2007. Tekfen Bank 70% shares were sold to Eurobank EFG Holding, 91 % shares of MNG Bank were sold to Arab Bank PLC and at last, Oyak Bank was sold to ING Bank N.V.. Thus, these banks changed their ownership structure from private bank to foreign bank (Bankalarimiz, 2007).

1.5.2. Structure of Employment

The year 2003 is a milestone year in banking industry employment. Recession in employment recovered itself after 2003. Up to 2003; the employment decreased in banking industry and pulled the employment level to 1980s values. Between 2000 and 2002, personnel who works in banking industry is decreased nearly 50717.

Number of banks, branch and personnel went back to their worst level at 1985, 1980 and 1977 respectively after the end of 2003. Banks whose financial structure is not strong hand over to Savings Deposit Insurance Fund. SDIF applied low recruitment strategy so that employment in the banking industry got into recession (Bankalarimiz, 2003).

Table 3: Employment In Banking

Employment in Banking					
Bank Types –Years	2003	2004	2005	2006	2007
Deposit Banks	118607	122630	127857	138570	153237
State Owned	37994	39467	38046	39223	41056
Private	70614	76880	78806	73220	75149
Foreign	5481	5880	10610	25794	36707
Dep. Ins. Fund	4518	403	395	333	325
Dev. And Inv. Banks	4642	4533	4401	4573	5322
State Owned	3882	3800	3657	3728	4273
Private	683	681	697	596	687
Foreign	77	52	47	249	362
TOTAL	123249	127163	132258	143143	158559

Source: Bankalarimiz 2003-2007.

From 2003 to 2007, employment in banking industry started to increase. Deposit banks had the 97 % portion of employment whereas investment and development banks have 3 %. The half of the employment in deposit banks is at private banks.

Table 4: Employment per a Bank

Employment Per a Bank					
Bank Types – Years	2003	2004	2005	2006	2007
Deposit Banks	3294.6	3503.7	3760.5	4199.1	4643.5
State Owned	12664.7	13155.7	12682.0	13074.3	13685.3
Private	3923.0	4271.1	4635.6	5230.0	6831.7
Foreign	421.6	452.3	816.2	1719.6	2039.3
Dep. Ins. Fund	2259.0	403.0	395.0	333.0	325.0
Dev. And Inv. Banks	331.6	348.7	338.5	351.8	409.4
State Owned	1294.0	1266.7	1219.0	1242.7	1424.3
Private	85.4	85.1	87.1	99.3	114.5
Foreign	25.7	26.0	23.5	62.3	90.5
TOTAL	2465.0	2649.2	2814.0	3111.8	3446.9

Source: Calculated from Bankalarimiz 2003 – 2007.

Table that is given above shows average employments for all of banks. For example, a state owned deposit bank has 13686 employees on average.

1.5.3. Total Assets of Banks

Total assets of all banks are given at Table 5 according to years. As it is seen from table; total assets of banks show increase year by year. Assets became 560.459.079 thousand TL from 249.749.773 billion TL by increasing 224 %. Private banks have the biggest share of assets among deposit banks.

Table 5: Total Assets of Banks

Total Assets (*billion TL) (**thousand YTL)					
Bank Type- Years	2003*	2004*	2005*	2006**	2007**
State Owned	83134383	106902774	124485923	143362423	163585241
Private	142270851	175936582	237043151	265614996	293529719
Foreign	6943398	10346884	20715900	59323609	84335416
Dep. Ins. Fund	7136470	1938400	1858478	1215345	129949
Non-deposit Banks	10264671	11326925	12866607	15340889	18878754
Deposit Banks	239485102	295124640	384103452	469516373	541580325
TOTAL	249749773	306451565	396970059	484857262	560459079

Source: Bankalarimiz 2003-2007

Table 6 shows the shares of assets in banking industry; it is clear that private banks' asset shares are more than double of state owned banks. More than half of the assets shares are held by private banks in the industry.

Table 6: Shares of Assets

Shares of Assets (%)					
Bank Type- Years	2003	2004	2005	2006	2007
State Owned	33.3	34.9	31.4	29.6	29.2
Private	57.0	57.4	59.7	54.8	52.4
Foreign	2.8	3.4	5.2	12.2	15.0
Dep. Ins. Fund	2.9	0.6	0.5	0.3	0.0
Non-deposit Banks	4.1	3.7	3.2	3.2	3.4
Deposit Banks	95.9	96.3	96.8	96.8	96.6
TOTAL	100.0	100.0	100.0	100.0	100.0

Source: Calculated from Bankalarimiz 2003-2007

The important point is that: State owned deposit banks' assets are increasing in Table 5 but the shares of state owned banks' assets are decreasing as the years pass.

1.5.4. Net Profits of Banks

Net profit structure of deposit banking industry lived its golden years between 2006 and 2007. Unfortunately, the same description is not valid for non deposit banks. In 2007, state owned banks increased their net profit nearly three times from 2003. Private banks have the biggest net profit in the industry.

Table 7: Net Profits of Banks

Net Profit Structure (*billion TL) (**thousand YTL)					
Bank Type- Years	2003*	2004*	2005**	2006**	2007**
State Owned	1790361	2682316	2869057	3733230	4512830
Private	2917036	2825399	1390516	4657440	7154752
Foreign	186243	246878	513100	1460579	1696053
Dep. Ins. Fund	274026	386341	259445	391503	104305
Non-deposit Banks	442614	315145	682624	738646	863539
Deposit Banks	5167666	6140934	5032118	10242752	13469947
TOTAL	5610280	6456079	5714742	10981398	14331479

Source: Bankalarimiz 2003-2007

Table 8 gives clues about the shares of profits about the profit distribution. State owned bank shares are going down in last 5 years although their net profit value increase. In 2007, private banks' profits nearly catch the same values with 2003. Half of the profits are gained by private banks. Non deposit banks' profits have the lowest profits in last three years. If we look for analyze of last two years; only private bank profits increased.

Table 8: Shares of Profits

Shares of Profits (%)					
Bank Type- Years	2003	2004	2005	2006	2007
State Owned	32	42	50	34	31
Private	52	44	24	42	50
Foreign	3	4	9	13	12
Dep. Ins. Fund	5	6	5	4	1
Non-deposit Banks	8	5	12	7	6
Deposit Banks	92	95	88	93	94
TOTAL	100	100	100	100	100

Source: Bankalarimiz 2003-2007

1.5.5. Credits of Banks

Credits volume of the banking industry increased in last five years. As it is given at Table 9, the private deposit banks have the biggest credit volume; nearly more than double state owned deposit bank credits.

Table 9: Credits of Banks

Credit Structure (*billion TL) (**thousand YTL)					
Bank Type- Years	2003*	2004*	2005*	2006**	2007**
State Owned	12731939	21537540	31548884	47060279	63195215
Private	46962693	69622046	103304662	127700545	153041168
Foreign	2772263	4790020	10473002	33393982	52774641
Dep. Ins. Fund	916900	26554	17873	20013	17850
Non-deposit Banks	6606353	7264985	7714631	9889106	11424217
Deposit Banks	63383795	95976160	145344421	208174819	269028874
TOTAL	69990148	103241145	153059052	218063925	280453091

Source: Bankalarimiz 2003-2007

Private deposit banks have the most of the industry shares where the share of these banks was the lowest share in 2007. On the other hand; state owned banks increased their shares five point from 18 % to 23 % in last 5 years. The most attractive point is that: foreign banks' credit volume grew four times in last five years.

Table 10: Shares of Credits

Industry Shares of Credits (%)					
Bank Type- Years	2003	2004	2005	2006	2007
State Owned	18	21	21	22	23
Private	67	67	67	59	55
Foreign	4	5	7	15	19
Dep. Ins. Fund	1	0	0	0	0
Non-deposit Banks	9	7	5	5	4
Deposit Banks	91	93	95	95	96
TOTAL	100	100	100	100	100

Source: Bankalarimiz 2003-2007 data

1.5.6. Deposits of Banks

Deposit structure of Turkish banking system is given below. Deposits increased 500% from 2003 to 2006 but after 2006, state owned deposit banks have a huge decrease in 2007. When we analyze other bank types; all other banks increased their deposits every year.

Table 11: Deposits of Banks

Deposits of Banks (*billion TL) (**thousand YTL)					
Bank & Years	2003*	2004*	2005*	2006**	2007**
State Owned	60371670	82419988	95621708	312832244	127953191
Private	92086694	108617427	145659908	163678966	177527514
Foreign	3545181	6201928	12242551	37420195	51467026
Dep. Ins. Fund	4808705	154519	54752	50157	36013
Non-dep. Banks	0	0	0	0	0
Deposit Banks	160812250	197393862	253578919	513981562	356983744
TOTAL	160812250	197393862	253578919	513981562	356983744

Source: Bankalarimiz 2003-2007

State owned banks nearly lost half of their shares between 2006 and 2007 years. Private banks have half of the deposits market.

Table 12: Shares of Deposits

Shares of Deposits (%)					
Bank Type- Years	2003	2004	2005	2006	2007
State Owned	37.5	41.8	37.7	60.9	35.8
Private	57.3	55.0	57.4	31.8	49.7
Foreign	2.2	3.1	4.8	7.3	14.4
Dep. Ins. Fund	3.0	0.1	0.0	0.0	0.0
Non-deposit Banks	0.0	0.0	0.0	0.0	0.0
Deposit Banks	100	100	100	100	100
TOTAL	100	100	100	100	100

Source: Calculated from Bankalarimiz 2003-2007 data

Sum of the state owned banks and foreign banks can catch the industry share of private banks. Private and foreign deposit banks are the leaders in deposit shares.

1.5.7. Shareholders' Equity of Banks

Shareholders' equity of banking industry performs an increase in recent years. In last five years, this value is grown more than 100%.

Leading contributors to the growth in shareholders' equity were the increases in paid-in capital, profit of the period and the reserves. Decrease in the loss of previous period was another factor contributing to the high growth in shareholders' equity (Bankalarimiz, 2006). Increase in period profits stimulated the improvement in shareholders' equity.

Table 13: Shareholders' Equity of Banks

Shareholders' Equity (*billion TL) (**thousand YTL)					
Banks and Years	2003*	2004*	2005*	2006**	2007**
Deposit Banks	31,349,780	40,822,704	47,482,231	50,409,209	64,533,482
State Owned	9,573,955	10,067,906	13,253,924	14,846,677	16,827,458
Private	20,958,180	27,399,353	29,396,020	27,586,310	35,896,051
Foreign	1,665,655	2,082,882	3,300,279	7,114,070	11,144,793
Dep. Ins. Fund	-848,010	1,272,563	1,532,008	862,152	665,180
Dev. & Inv.	4,188,105	5,139,954	6,253,813	7,568,322	8,952,449
TOTAL	35537885	45962658	53736044	57977531	73485931

Source: Bankalarimiz 2003-2007

1.6. FUNDAMENTAL PROBLEMS IN TURKISH BANKING

Today Turkish banking industry reached a respectful point both in financial and institutional structure. In spite of these positive developments; it is real that there are some negative conditions affect to this positive development conditions (Yildirim, 2002). There are some chronic fundamental problems in Turkish banking industry like instability in economy, insufficient capital structure, insufficient auditing, management mistakes, high assurance for deposits, credits given for partnerships, high source and operational costs. On the other hand, in addition to chronic problems there are also some actual issues like BASEL, foreign entries, capital inadequacy.

1.6.1. Instability in Economy

Fundamental reason of financial imbalance in banking industry is macroeconomic instabilities. A crisis which occur in industry bring about increase in emission, shrinking in credit volume, increase in interest rates, decrease in demand and consumption, decrease in production, savings and investments, negative effects to public finance (Karacan, 1996).

Company profits become variable in countries whose growth rates are not steady; this influences the payback ratio. Banks should be careful in these periods and elaborate their financial statements because companies demand credits from various banks. If they do not use their credit in an effective way; those companies will get into financial difficulties and lose their ability to pay the credits back. Consequently, banks are going to be influenced by this situation and they will try to collect deposit by offering higher interest in order to overcome this gap (Uyar, 2003).

Inflation, one of the most important indicators of our economical instability; as the biggest problem of our economy affects social, political, and economical relations in many dimensions. After the second half of 1970s; Turkish economy faced with high inflation syndrome. Sometimes inflation seems as an stimulating factor for growth but it is apparently known that it breaks down the economical balances, changes source and income distribution negatively (Eken, 1994). Inflation affects negatively to growth and as a result this narrows the banking industry.

1.6.2. Economic Crises

Economic crises are headaches of Turkish banking industry. Crises in the countries affect the economies negatively. The number of banks at crises years easily shows the affect of economic crises to banking industry. Before focusing the reasons of the crises, it will be more logical to understand the “crises” term. Crises are the unexpected price or quantity fluctuations that pass to exterior part of the accepted boundaries in any product,

service or currency market. After 1980, low return from asset and stocks in developed countries directed investors to developing countries. Capital flow to developing countries which bring high returns but these return come with high risk at the same time. Crises come up with speculative balloons about the country conditions that do not show the reality in mostly cases. In fact there are some common factors cause crises:

- Overvalued money,
- High budget deficiencies,
- Short term capital flow,
- Damaged financial structures of financial institutions,
- Speculators attacks,
- High growing rates, and structural problems,
- Growing short term external debts of private sector,
- Ethical problems,
- Lack of knowledge (Cosar and Coskun, 2006).

Financial crises generally examined as banks crises, fund crises, and external loans crises. External loan crises occur when public and private sector can not pay the external loans. Banking crises appear when public authority interferes to conditions where bankruptcy and insufficiency of banks prevent them to accomplish the given promises, responsibilities. Banking crises will threat all the economy when it is not possible to overcome and will become a systemic financial crisis. Fund crisis appear when speculative attacks happened to national currency and causes Central Banks to lose reserves because of national currency volatility (Uyar, 2003).

In literature, these three crises have common points and they have distinctive differences at the same time. Banking crises last longer than fund crises. Averagely, fund crises last in 1-2 years whereas banking crisis last in 3 years (Aloglu, 2005).

Macroeconomic shocks like fluctuations in interest rates, negativities in real estate industry, risky activities, high competition, management mistakes, financial liberalization causes banking crises (Cosar and Coskun, 2006).

Problems in the banking industry can spread in a very short time and influence whole economical system. Effects to economy can show itself as cutting down the credits, driving prices up, and calling the credits back before its maturity (Sivasligil, 1999).

Banking crises affects can be very serious for the economy. Some banking crises' affects are:

- Increase in emission,
- Decrease in credit volume,
- Increase in interest rates,
- Decrease in demand and consumption,
- Employment decrease nearly in every industry,
- Decrease in investments,
- Public finance will be affected negatively due to low economic conditions (Aloglu, 2005).

Some precautions can be taken for banking crises by strengthening the confidence of depositors in order to prevent depositors to withdraw their deposits from banks, preventing liquidation of assets in panic, avoiding monetary fluctuations, protecting banks which lost their solvency and the creditors, minimizing the costs which will be paid by state budget because of banking crises (Cosar and Coskun, 2006).

1.6.3. Insufficient Capital Structure

Small sized banks are insufficient in shareholders' equity and assets. Their fund source is just from international financial markets and Interbank. For this reason, small sized banks have not got enough power to compete in international market and domestic

market. Alliances among small sized banks can be an option for increasing shareholders' equity by strengthening assets and liability structure (Parasiz, 2000).

Unorganized, unplanned investments to partnerships and fixed assets can cause insufficient shareholders' equity. Funds that are invested to partnerships sometimes do not bring adequate return. At the past, banks contribute to industrialization process by some participation to real sector intensively because of lack in capital accumulation.

But now, participation means heavy responsibility for many banks. The only way to get out of this responsibility is disposing these unvalued participations (Ozkan, 1999).

1.6.4. Insufficient Auditing

In the traditional discourse, auditing is usually understood as the external intervention that verifies an institution's actual procedures against statutory requirements, reconciles debits / credits, scrutinizes balance sheets, and in general inspects ongoing activities (Espejo, Bula, and Zarama, 2001).

Auditing has been defined by the American Accounting Association as a systematic process of objectively obtaining and evaluating evidence regarding assertions about economic actions and events to ascertain the degree of correspondence between those assertions and established criteria and communicating the results to interested users (Gillett, 2000)

Every system which is not checked exactly will lose its efficiency at the end. This auditing process should be in banking system intensively to prevent mistakes. If auditing is followed correctly then the crises, risks, and bribery can be prevented on time. Disobeying some accepted accounting principles, without auditing financial statements by independent auditing firms doubt transparency of statements. Strong, sufficient auditing system should have qualified auditors, equipments, databases for auditing and legal regulations for an easier control. If a cheating is understood after auditing; there should be high punishments (Demir and Toprak, 2004).

Deficiency in alert mechanism for evaluating risks and banking transactions make financial crises to occur easier.

1.6.5. Management Mistakes

Banks are the financial institutions that face with many intensive risks as their work necessity. Banking industry risks can appear in any other country in any period of time. Because as financial markets exist; risk element always will be somewhere in the system. However, the important point is defining the risks and managing them accurately. Top management of the banks should have more knowledge about the risks and the systems to manage. Thus, damages of risks to banking industry will be lower and the loss of risks will be at minimum level (Yildirim, 2002).

The quality of management is very important for better performance in every institution. However, management quality in public banks generally is not as good as it is in private and foreign banks. The appointment of CEOs and board members of public banks are made on political grounds and these positions are not always given to the most qualified bankers in Turkey. Promotion is done according to seniority more than ability in those banks. In addition, there is also a total lack of continuity at the top level in these banks, as new appointees are assigned in every government change and these appointees bring their own trusted team of senior executives (Isik, 2007).

1.6.6. High Assurance for Deposits

After 1994 crises, assurance for deposits became unlimited like at other countries in crises times. Providing high assurances to deposits damage economy and banking industry because this situation encourages banks to activate in risky conditions and break down the market discipline. After a period of time, assurances that are given to deposits get valid for credits and the cost of funds get higher. Besides, high assurance increased the moral hazard (Boyacioglu, 2003).

1.6.7. Credits Given for Partnerships

Banks give credits and run funds to companies who are in the same participation with themselves. It is obvious that if the companies will be unsuccessful; the banks that run funds or credits will be unsuccessful at the same time. Then, if a bank collapse; the banking system will be brought to impasse. So there should be some limitations to prevent banks (Uyar, 2003).

1.6.8. High Source and Operational Costs

Deposits are the most important fund source for banks. For long term credits, increase in deposit interest rates with inflation rates causes increase in the costs of deposits (Yildirim, 2003).

The concept of fund cost includes deposits, repo, and the credits used, the sources provided from Interbank money market and other liabilities. One of the main criticisms for Turkish banking system is high cost of financial intermediation. When it is evaluated; in order to decrease the cost of funds, the macroeconomic stability must be provided. Moreover, when the other cost items are considered, the government should decrease fiscal and quasi-fiscal responsibilities and other requirements on the banking sector transactions; even should abolish some of them. Lastly, it is essential that banks should be reorganized in order to increase their revenue, and should make provisions to decrease operational expenses (Eroglu, 2001).

1.6.9. Technological Innovations

Foreign banks generally use more state of art technology, newer equipment and buildings than the domestic counterparts. National banks are relatively old banks and they might still be working with their old buildings and equipment. The domestic traditional banks might also be slower to adopt new technology and make investments in the automation (Isik and Hassan, 2002, Technical).

Turkish banking industry become to serve financial services like leasing, factoring, forfeiting; risk management products like swap, forward, future, options and internet banking services with high developments in technology and integration with world finance markets. New applications are not only in financial area; also in technical conditions industry begin to renew themselves (Parasiz, 2000).

Starting electronic banking activities fastened banking transactions and increased market shares of banks with changes in transaction volumes which give new products to customers. Rapid and easy service to customers and data basing for crediting customers are now administrated by internet connection in bank branches. Phone and internet banking decreased the workload of bank employees and give chance to customers for doing their businesses out of working hours (Yildirim, 2002).

Banks started to bring solutions to their problems about planning, information, accounting in a short time with technological developments and they started to see some changes in risk, profit, liquidity conditions from some indicators (Berk, 1998).

Developments in technology strengthened competitive pressure because new distribution channels come into open. These new channels can increase the costs but on the other hand this means loyalty of customers and increase in demand (Tuncsiper et. al, 2007).

1.7. ACTUAL ISSUES IN BANKING

Two main topics are highlight issues in banking industry nowadays. Increasing foreign entries into industry and changing risk management with Basel.

1.7.1. Foreign Entries

The introduction of the euro and the globalization of financial markets are shaping the future of the banking industry in Europe. Both tend to increase competitive pressure on

incumbent banks, to trigger mergers and acquisitions in the financial services industry, and to be a driving force behind foreign activities of banks.

Generally, banks have the option to solely service their home market, to export services to foreign markets, or to establish a presence in that market (Buch, 2000).

There were two major reasons for foreign bank entry. First, Turkey liberalized its economy in the 1980s, foreign trade was small, exports were about US\$2.9 billion and imports were US\$7 billion. Since then, Turkey's exports and imports grew rapidly to US\$26 billion and US\$48 billion in 1997; and US\$105.9 billion and US\$170 billion in 2007 respectively. The new and open trade regime required more sophisticated financial services and foreign trade financing. In the early 1980s, foreign banks entered to market and quickly established themselves serving that niche. They anticipated the needs of Turkish and foreign companies and saw it as a profitable activity which would generate fee-based income. The second reason is that Turkey pressed ahead with liberal policies, opening its capital account in 1989 and there was no policy reversal. Finally, the expectation that Turkey would sign a customs union with European Union in 1995 reinforced market perceptions. Turkey would maintain a liberal policy environment in general. In addition, rapid economic growth and Turkey's gateway position with respect to the Commonwealth of Independent States (CIS) countries stimulated foreign entries (Denizer, 2000).

As the competition increases in banking industry; services that are given by banks increase too. After foreign entries, Turkish banks realized the importance of individual banking and started to give more qualified services. State owned banks started to renew their technological subsystems, give cheaper services, new financial services. The most important point is that foreign entries brought new recruitment systems. Low employment- high technology rate become the recruitment strategy of banks. Another positive point is that foreign banks link local markets to international markets so it is critical for developing countries which need funds (Aksoy, 1998).

In her assessment of foreign entry during the 1980-1990 period; Pehlivanli reports that foreign banks contributed to the quality of bank management in at least three ways:

(i) Planning; (ii) Credit evaluation and marketing, and (iii) Recruitment. She points out that financial and operations planning were not a standard and serious process in Turkey before the 1980s. Foreign banks had a strong impact on credit evaluation and marketing. Previously, credit evaluation was based on personal information of credit officers and what was provided by the borrowers. There was little attempt to systematically investigate the borrower across the banking sector. Most of the banks did not have intelligence units before 1980. Commercial banks were not servicing financial product marketing and services in the pre-liberalization period. Recruitment and staff quality increased significantly after 1980. Foreign banks offered higher salaries and other incentives to attract well-trained college graduates. They developed training programs and often sent locally recruited staff to their training centers abroad (Denizer, 2000).

On the other point, foreign entries have negative impacts near their benefits. Foreign banks can take some market shares of national owned banks even though foreign banks should have low shares in the industry. In addition, foreign banks has positive affects to balance of payment but foreign bank can take the profit away to their own national market and can fire the crises at the crises time (Çakar, 2003).

1.7.2. BASEL REGULATIONS

In recent years, risk management has come to the fore that determines the financial institutions existence. Operational risk has become the most important issue in risk management especially after high losses during 1990's. Operational risks are the oldest risk but at the same time the least known risk that has the highest loss potential (Mazıbaş, 2005).

The Basel Committee on Banking Supervision (BCBS) which is constituted by the authorities coming from central banks of developed countries and banking supervisor authorities issued a standard named Basel-I in order to make valid capital adequacy calculation methods in different countries in 1988.

Basel-I is firstly accepted and being applied as capital adequacy calculation method in G-10 countries and now it is used by more than 100 countries in the world. Basel-I also started to be applied in 1989 after three years transition period in Turkey (Mazıbaş, 2005).

After Basel I that just takes the credit risks in care, it is understood that the subject market risk is very important for bank's financial structures. Basel Committee on Banking Supervision has taken consideration of new developments and adequacies from Basel-I risk mentality. After three consultative papers issued in 1999, 2001 and 2003 respectively; finally Basel-II is declared by BCBS in June 2004 (BCBS, 2005).

In Basel-II, market risks are included to capital adequacy measurements with the regulations named Evaluating and Measuring Capital Sufficiency of Banks in February 2001 (BRSA, 2005).

Basel Committee on Banking Supervision (the Committee or the BCBS) with the new Basel Capital Accord (the Basel II) introduces an overall treatment of operational risk with the aim of enhancing banks' risk management capabilities, effectively managing all material risks and holding capital against unexpected losses (Mazıbas, 2005).

Basel-II is a chance for banking industry to have more durable and effective structure. Some affirmative expectations from Basel can be described like:

- Increasing risk management of banks,
- Making intermediary functions more effectively,

- Capital structure should be parallel to bank risks,
- Increasing market discipline,
- Improvements in companies corporate management structures,
- More investment to human resources because need of technical support (BRSA, 2005).

CHAPTER TWO

PRODUCTIVITY and DATA ENVELOPMENT ANALYSIS

Productivity is an essential issue in banking industry. In literature there are many methods for analyzing performances of organizations. Before the application part of the study; other performance measurement techniques and more information about Data Envelopment Analysis will be given in this chapter.

Productivity is defined in many ways in literature. Prokopenko, who is a senior consultant in ILO Management Development Branch, described this term as the relationship between output generated from a production or service system and the input provided to create this output. Thus productivity is defined as the efficient use of sources like labor, capital, technology, land, energy, information in the production of various services and goods. Higher productivity means that accomplishing more with the same amount of resources or achieving higher output in terms of volume and quality for the same input (Prokopenko, 1987).

All these explanations reach to the ratio which is given below:

$$\text{Productivity} = \text{Output} / \text{Input}$$

Productivity can also be defined as the relationship between results and the time it takes to accomplish them. Time is often a good denominator since it is a universal measurement, and it is beyond human control. The less time taken to achieve the desired result makes that system more productive.

ILO has for many years promoted an advanced view of productivity which refers to the effective and efficient utilization of all resources, capital, land, material, time in addition to labor.

Productivity could be considered as a comprehensive measure of how organizations satisfy their objectives, effectiveness and efficiency. At this point productivity becomes a useful tool for managers, industrial engineers, economists and politicians

because having the power to indicate accurate performance of the units or whole organizations (Prokopenko, 1987).

With being productive it is aimed to get maximum output from a certain input. Productivity targets making activities in an economic, accurate way.

2.1. PRODUCTIVITY MEASUREMENT

Productivity measurement is another important point for organizations in order to compare themselves with other organizations. By doing this measurement the organization understand the place where they are. Productivity measurement is the first step of productivity improvement process.

Generally three productivity measurements are defined in literature; these are static, dynamic and surrogate productivity measure (Oyeranti, 2000).

Static productivity ratios are concerned with what happened in a given period. Dynamic productivity ratios show the productivity changes for the periods that follows each other or up to a certain period. In the case of surrogate indexes, they measure terms that are highly correlated with productivity such as customer satisfaction, profits, effectiveness, quality, and efficiency among others.

Static productivity = Output in a certain period / Input in a certain period

Dynamic productivity = (Output in period A / Input in period A) / (Output in period B / Input in period B)

There is not a complex, hard way to find productivity in one input one output organizations. By dividing output to its input value we can find the productivity. Situation becomes harder due to complexity in measuring outputs and inputs when the number of input and output is more than one (Kahya, 2001).

2.2. PRODUCTIVITY TYPES

As mentioned before there are few productivity types that engineers, economists, managers can use. (Icoz, 2004):

a) Physical and monetary productivity:

Physical productivity is the quantity of output produced by one unit of production input in a unit of time.

b) Marginal productivity:

Ratio between the changes in a certain period's output to changes in that period's input is called marginal productivity.

c) Micro and macro productivity:

This productivity type is described according to size of perspective. Micro productivity inside an organization (small size) called micro productivity; macro productivity looks from wider perspective like for a country's economical productivity.

d) Partial and total productivity:

Total productivity can be found by dividing total outputs to total inputs in a period. Partial productivity is, as understood from its name, showing changes depended to some inputs for an output. There is a critical point in partial productivity. There must not be a change in other inputs except the input which we handle.

e) Total factor productivity:

Total factor productivity, as indicated by its name, is more general in that it encompasses all factors of production, rather than just one of them. It turns out that total factor productivity is an essential component of the average productivity of labor. In the production function context, it can be defined as the increase in output that is not explained by increases in input quantities.

Put differently, it is the increase in output made possible by technological change, holding all inputs constant (Kohli, 2004).

Total factor productivity, captures the contribution to output of everything except labor and capital: innovation, managerial skill, organization, and randomness (Balakrishnan et al, 2004).

f) Multi factor productivity:

Whereas labor productivity measures the output per unit of labor input, multifactor productivity looks at a combination of production inputs (or factors): labor, materials, and capital. In theory, it's a more comprehensive measure than labor productivity, but it's also more difficult to calculate.

$$\text{Multifactor Productivity} = \text{Output} / (\text{KLEMS})$$

“Multifactor productivity growth is the rate of growth in output relative to the rate of growth of all production inputs. “KLEMS” represents all production inputs: K is capital services; L is labor services; E, energy; M, materials; and S refers to purchased services; business services, for example. It is a complicated index number; here the idea is to get a measure of the change in output relative to the change in all of the inputs (www.bos.frb.org/education/ledger/ledger04/winter/whatisprod.htm, 25.10.2008).

2.3. PRODUCTIVITY EVALUATION MODELS

It is important to have appropriate methods for assessing how efficiently banks are operating. In the context of bank activities, the word “operating” represents all the relevant branch activities which transform a set of resources, or inputs, into a set of services, outputs.

Two major types of methodology used in the past bank performance literature: ratio analysis and frontier analysis. Both of these methodologies will be explored in detail below.

2.3.1. Ratio Analysis

It is usual to measure the performance of banks using financial ratios. Ratios measure the relationship between any two variables chosen to provide insight to specific aspect of bank's complex operations. Commonly used ratios focus on issues such as liquidity, profitability, efficiency, and risk management. Ratio analysis can be useful for analyst seeking to asses a bank's performance by comparing the ratios with past and present so that it can be understood if there is an improvement. Also by comparing the ratios with other organizations (competitors) which are in the same sector the situation of the organization can be positioned (Smith, 1990).

Many managers are keen on these ratios because of their quick, easy to calculate and understand. While ratio analysis technique is valid and useful; these benchmarks could be arbitrary and may mislead an analyst. In addition Sherman and Gold (1985) note that financial ratios do not capture the long-term performance, and aggregate many aspects of performance such as operations, marketing and financing. Also Yeh notes that the major demerit of this approach is: its reliance on benchmark ratios (Sathye M., 2002).

They focus only on one specific facet of the organization's activities, without weighing all other potentially influential processes. These simple, easy ratios are not strong enough to handle multiple outputs of a bank are simultaneously produced by its multiple inputs. Ratios only give a measure from one pair of input and output (Sherman, 1985).

It is evident that a more sophisticated model can overcome the various limitations of ratio analysis is needed in order to more accurately and objectively evaluate bank performance.

2.3.2. Frontier Efficiency Methodologies

In recent years there is a trend towards measuring bank performance using one of the frontier analysis methods. In frontier analysis, the institutions that perform better relative to a particular standard are separated from those that perform poorly. Such separation is done either by applying a *non-parametric* or *parametric frontier analysis* to firms within the financial services industry. In both methodologies, the efficiency of specific decision making units (DMU) are measured relative to “a best practice frontier”, which is estimated based on the empirical data. Put more simply, frontier analysis is a sophisticated way to benchmark the relative performance of production units (Berger and Humprey, 1997).

In other words, these groups are differentiated based on their assumptions regarding random error allocation and frontier form. Parametric approaches also known as econometric approaches require the specification of a function as well as assumptions about error terms.

No consensus has been reached about the appropriate estimation methodology. Researchers can choose one or both of the techniques in their studies. Half of the studies use Data Envelopment Analysis like Grigorian and Manole, 2002; Rezvanian and Mehdian, 2002; Denizet et al., 2000, whereas others – Stochastic Frontier Analysis Bonin et al., 2005; Hasan and Marton, 2003; Kraft and Tirtiroglu, 1998; Mertens and Urga, 2001 or the Distribution Free Approach Hardy and Bonaccorsi di Patti, 2001; Opiela, 2001. There are also studies that used both, parametric and non-parametric, approaches to check for the robustness of results Isik and Hassan, 2002; Rezvanian and Mehdian, 2002 (Havrylchyk O., 2005).

The parametric approach includes stochastic frontier analysis, thick frontier approach (TFA), the distribution free approaches, while the non-parametric approach is data envelopment analysis (Sathye, 2002).

2.3.2.1. Parametric Frontier Analysis

The three main parametric methodologies include the stochastic frontier approach (SFA), the thick frontier approach (TFA), and the distribution-free approach (DFA) (Barr, 2002).

In general, parametric approaches specify a functional form for the cost, profit, or production relationship among inputs, outputs, and environmental factors, and allow for random error.

2.3.2.1.1. Stochastic Frontier Analysis (SFA)

The most used parametric frontier analysis method is Stochastic Frontier Analysis (SFA). This technique is proposed by Aigner, Lovell, Schmidt, Meeusen, and Van den Broeck in 1977. This method is used for the systems which has single output-multiple input or single input-multiple output scenarios.

The most difficult way of applying SFA is somewhat arbitrary distributional assumptions that are assigned to the error and efficiency components (Berger, 1993).

SFA is used by Ferrier and Lovell (1990), Kraft and Titiroglu (1998), Lang and Welzel (1999) in their bank performance evaluation studies.

2.3.2.1.2. Distribution Free Approach (DFA)

Another approach in parametric frontier analysis is Distribution Free Approach (DFA). DFA is developed by Schmidt and Sickles; and Berger. Like SFA, DFA specifies a functional form of the frontier.

However, DFA assumes that random error averages out to zero over time, while efficiency remains stable over time (Bauer, 1993).

DFA provides an alternative procedure for estimating relative firm inefficiency that does not require a specific assumption about the distributional form of the inefficiency component.

2.3.2.1.3. Thick Frontier Approach (TFA)

Thick frontier approach is the least used method because of it measures overall efficiency rather than efficiency for individual units. Measuring a general level of overall efficiency rather than point estimates for individual firms is done for reducing the effects of extreme points in the data (Clark, 1996).

2.3.2.2. Non-parametric Frontier Analysis

In many situations, the functional form of the production function is not known or it is difficult to estimate. Farrell's method of computing the facets of the efficient function from a set of observations was the foundation for non-parametric approaches in measuring efficiency and productivity. In the non-parametric approach, no assumptions are made about the form of the production function. Instead, a best practice function is built empirically from the observed inputs and outputs (Sowlati, 2005).

Parametric and non-parametric frontier analysis differs from each other in two points: no specification of the frontier form is needed, and random error is assumed not to exist. Non parametric techniques allow identifying the best practice branches within a group or institution without a lot of knowledge about the activities of the institutions. No information about the input and output is necessary so that the analysts do not have to make assumptions about the process.

Apart from the production assumptions, DEA also imposes minimal prior assumptions about firm behavior. In this respect, DEA differs strongly from the 'nonparametric approach to production analysis' (NPA), which originated from the work by Afriat (1972), Hanoch and Rothschild (1972), Diewert and Parkan (1983) and Varian (1984). There is another conflict about this technique. We assume that there is not a random error so if there is a random error in variable measurement the efficiency score will not be accurate.

Other disadvantage is that one outlier can shift the frontier because this approach is sensitive to outliers (Cooper, 2000). The main nonparametric approach is data envelopment analysis.

2.3.2.2.1. Data Envelopment Analysis (DEA)

Data Envelopment Analysis 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. An increasing number of applications are evidence of its popularity among researchers in Economics, Econometrics and Operations Research Management Science, as well as practitioners in the business community and in government institutions (Cherchye, 2003).

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).

2.4. HISTORY of DEA

The story of data envelopment analysis (DEA) begins with Edwardo Rhodes dissertation research at Carnegie Mellon University's School of Urban and Public Affairs. Under the supervision of W. W. Cooper, Edwardo Rhodes was evaluating the educational program for disadvantaged students (mainly black or Hispanic) undertaken in U.S. public schools with support from Federal Government. The analysis involved comparing the performance of a matched set of school districts that were participating and not participating in Program Follow Through (Charnes, Cooper, Lewin, Seiford, 1993).

Program Follow Through recorded the performance of schools in terms of outputs such as "increased self-esteem in a disadvantaged child" (as measured by psychological tests) and inputs such as "time spent by mothering reading with her child."

It was the challenge of estimating the relative “technical efficiency” of the schools involving multiple outputs and inputs, without the usual information on prices, that resulted in the formulation of the Charnes, Cooper, and Rhodes ratio form of DEA and the publication of the first paper introducing DEA in the European Journal of Operational Research in 1978. CCR used the optimization method of mathematical programming to generalize the Farrells’ single-output/input technical efficiency measure to the multiple-output/multiple-input case by constructing “virtual” output and “virtual” input relative efficiency measure. Thus DEA began as a new Management Science tool for technical efficiency analyses of public sector decision making units (DMUs) (Charnes, Cooper, Lewin, Seiford, 1993).

In this regard, the emergence of DEA was an extension of the historical focus of OR/MS methodologies on the development and application of heuristic and optimization techniques to resource allocation problems (Charnes, Cooper, Lewin, Seiford, 1993).

2.5. DEA SPECIFICATIONS

Homogeneity of DMUs: DEA studies should have homogenous decision making units. Homogenous means the similarity between units. It is important because DEA allows the model to choose individual weights for inputs and outputs so it is a must for DMUs to be from the similar environment.

Positivity Property: Positivity property states that inputs and outputs should be greater than zero. Traditionally negative data is handled in efficiency applications through some data transformation so that all negative data is turned into positive data. Such transformation of the data may have implications for the solution, classification, or ordering of the DEA results. The standard additive model is the main efficiency assessment tool that has been used in these cases, because of its translation invariant properties (Thanassoulis, 2003).

Isotonicity Property: Charnes proved that the functions relating inputs to outputs in DEA models require the mathematical property of isotonicity. This means an increase in any input must result in a perceivable increase in output(s), but cannot result in any decrease in output(s).

Number of DMUs: Number of DMU is essential for catching the significant degrees of freedom in the model in order to provide meaningful analysis. An inadequate number of DMUs will reduce the discriminatory power of the analysis. As the number of the decision making units' increase; the probability of reaching efficient frontier increases and for that reason the frontier constructed by DEA approaches true frontier as the number of units increases in the study (Banker, 1989).

Control of Weights: The weights λ_i used in the DEA model formulation are unique to each DMU and weightings generally imposed by the management.

2.6. DEA TERMINOLOGY

Decision-making unit (DMU): The designation of the unit of assessment as "decision making" implies that it has control over the process it employs to convert its inputs into outputs, DMUs are also referred to as a production unit or a firm.

Efficiency: The efficiency of a production unit, or DMU, is a comparison between the observed and optimal values of its outputs and inputs. In other words, efficiency measures how well a unit can transform inputs into outputs.

Productivity: Productivity of a unit is commonly defined as the ratio of outputs to inputs and is thus inherently related to efficiency of production. More specifically, productivity measures the extent to which the unit's actual input consumption exceeds the minimum inputs necessary to produce the output levels. DEA isolates the efficiency component and measures its contribution to productivity.

Technology: Technology is a physical concept that is closely related to productivity. The technology of production is a complete specification of the inputs and operations to be performed on them for production of outputs at the desired quality.

Production Possibility Set: The production possibility set represents the set of all possible input-output correspondences which are deemed feasible in principle within the given transformation process being assessed.

Production Function: The production function describes the optimal relationship between input and output variables with the objective of maximizing outputs for the given inputs. In DEA, the estimated production function is often referred to as the efficiency frontier.

Efficiency Frontier: The efficiency frontier in DEA is the piecewise linear combination of 'best-practice' or 'best-performing' units from the given data set which excel at transforming their inputs into outputs. The units that make up the efficiency frontier are considered to be fully (100%) efficient, while any unit not on the frontier is considered inefficient (<100%). Since the efficiency frontier in DEA is an estimate of the true (unobservable) production frontier, it is also referred to as the empirical production function, empirical production envelope or envelopment surface.

Efficiency Score: DEA gives an efficiency score for each DMU. This score is from 0 to 1. If DMU has 1 efficient score; this shows that DMU is efficient.

Technical Efficiency: Technical efficiency is a measure of a unit's ability to utilize minimal inputs to produce a given set of outputs, or to obtain maximal outputs from a given set of inputs. Put differently, full technical efficiency exists if no more of one output can be produced without the increase of at least one other input (of reduction of another output).

Allocative Efficiency: Allocative efficiency is a measure of how well a firm is able to allocate its resources (inputs) to create the most optimal mix of outputs.

Cost Efficiency: Cost efficiency means the ratio of minimum cost to real cost.

Constant Returns to Scale: If the amount of increase in input makes same amount of increase in output that means this is constant returns to scale.

2.7. DEA MODELS

Besides the first model by Charnes, Cooper and Rhodes (1978), which is called the CCR model, there are several related DEA models in the literature. One can see Cooper, Seiford, Tone (2000) for different DEA models including CCR, BCC (by Banker, Charnes and Cooper), Additive DEA models and Slack-Based Measurement (SBM) models (Tuncer, 2006).

Here just CCR and BCC models will be analyzed.

2.7.1. 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).

Before we provide the mathematical model; let define the indices, parameters and variables.

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 .,

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

Objective function:

$$Max \frac{\sum_{r=1}^s u_r y_{r0}}{\sum_{i=1}^m v_i x_{i0}} \quad (1.1.)$$

St.

$$\frac{\sum_{r=1}^s u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}} \leq 1; \quad j = 1, \dots, n \quad (1.2.)$$

$$u_r, v_i \geq 0, \quad r = 1, \dots, s, \quad i = 1, \dots, m \quad (1.3.)$$

(1.1.) describes the objective function of DEA which has “m” inputs, “s” outputs. This function is aimed to maximize the ratio “between weighted sums of outputs to weighted sum of inputs belongs DMUs. (1.2.) describes the efficiency scores of DMUs should be lower than 1. The highest efficiency can be 1 by this strict. (1.3.) shows the positivity of the weights. 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 (Ulutas, 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).

Objective function of input oriented CCR model aims to maximize the sum of weighted outputs of decision making unit.

Input oriented CCR model:

Objective:
$$Max \sum_{r=1}^s u_r y_{rj_0}$$

St.
$$\sum_{r=1}^s u_r y_{rj} - \sum_{i=1}^m v_i x_{ij} \leq 0 \quad j = 1, \dots, n;$$

$$\sum_{i=1}^m v_i x_{ij_0} = 1$$

$$u_r, v_i \geq 0$$

$$r = 1, \dots, s$$

$$i = 1, \dots, m$$

Objective function of output oriented CCR model aims to minimize the sum of weighted inputs of decision making unit.

Output oriented CCR model:

Objective:
$$Min \sum_{i=1}^m v_i x_{ij_0}$$

St.
$$-\sum_{r=1}^s u_r y_{rj} + \sum_{i=1}^m v_i x_{ij} \geq 0 \quad ; j = 1, \dots, n;$$

$$\sum_{r=1}^s u_r y_{rj_0} = 1$$

$$u_r, v_i \geq 0$$

$$r = 1, \dots, s$$

$$i = 1, \dots, m$$

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).

2.7.2. BCC Model

Banker, Charnes, and Cooper 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, λ_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 λ_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.

The input oriented BCC model:

Objective function:

$$Max \sum_{r=1}^s u_r y_{rj_0} + c_0$$

St.

$$\sum_{r=1}^s u_r y_{rj} - \sum_{i=1}^m v_i x_{ij} + C_0 \leq 0 \quad ; j = 1, \dots, n$$

$$\sum_{i=1}^m v_i x_{ij_0} = 1$$

$$u_r, v_i \geq 0$$

$$r = 1, \dots, s; i = 1, \dots, m; c_0 = \text{free}$$

Output oriented BCC model objective is to minimize the sum of weighted inputs of DMU.

The output oriented BCC model:

Objective function:

$$\text{Min} \sum_{i=1}^m v_i x_{ij_0} - c_0$$

St.

$$-\sum_{r=1}^s u_r y_{rj} + \sum_{i=1}^m v_i x_{ij} - C_0 \geq 0 \quad ; j= 1, \dots, n;$$

$$\sum_{r=1}^s u_r y_{ij_0} = 1$$

$$u_r, v_i \geq 0$$

$$r = 1, \dots, s; i = 1, \dots, m; c_0 \text{ free}$$

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).

2.8. DEA APPLICATIONS

The technique has been used successfully in such environments as hospitals, universities, airports, farms, military and government. There are also other applications from different areas like education, banking, insurance, trade, service, health, logistics, quality, energy and other various industries.

Education: First application of DEA is from education industry. This efficiency study is done by Charnes in 1978 to find out the efficiency of private education program. Al-Faraj and Alidi have used DEA in 1991 to find the efficiency of academic staff in U.A.E. In finding efficiency of 23 university libraries in Taipei is also measured with DEA by Chen in 1997. In 1998 Soterio used DEA model in order to find efficiency scores of secondary school in Cyprus.

Insurance and trade: Seiford and Zhu are studied on the efficiency profitability and market shares of commercial banks in USA in 1999. Ozcan and McCue get benefited from DEA while measuring financial performance indexes in 1996. In insurance industry there is an efficiency study done by Cummins et al. among Spanish insurance companies in 2004. In our country DEA is used in evaluating the ports of State Railways (TCDD) in 2004 by Baysal et al. In addition to these; Ulucan tried to find the performances of financial intermediaries in 2000 by using data envelopment analysis.

Health: In 1999, Magnussen analyzed efficiency scores Norwadian hospitals by using datas from 1989 to 1991. Junoy also analyzed the intensive care units technical efficiency in 1997.

Quality: Mathiyalakan and Chung analyzed the efficiency of quality chambers in 1996. Madu and Kuei tried to find the performance of small family companies from quality management perspective by using data envelopment analysis in 1998.

Banking: Sherman and Gold studied the overall efficiency of 14 branches of a US savings. This is the first application analyzed efficiencies of different branches of a single bank in 1985. DEA results showed that six branches were operating inefficiently compared to the others. Similar study by Parkan in 1987 suggested that eleven branches out of 35 were relatively inefficient (Sufian, 2007).

Previous studies of financial institution efficiency have examined efficiency and performance from several different perspectives. These include the effects of mergers and acquisitions institution failure, and deregulation among many others (Barr, 2002).

There have been a few studies on Turkish banking efficiency. Oral and Yolalan used DEA in 1990 by measuring operating efficiency and profitability of branch offices of a major domestic commercial bank. Zaim performed DEA frontier study investigates the impact of the financial reforms introduced in the early 1980s on Turkish bank efficiency in 1995. His results suggest that Turkish banks experienced improved efficiency in a more liberalized banking environment, which resulted in improved technical and allocative efficiencies in 1990 with respect to those in 1981 (Isik and Hassan, 2002, Cost and Profit Efficiency).

Kabir Hassans' and Ihsan Isik's study in which they have employed a non-parametric approach along with a parametric approach, they estimate the efficiency of Turkish banks over the 1988–1996 periods. Results also indicate that the dominant source of inefficiency in Turkish banking is due to technical inefficiency rather than allocative inefficiency, which is mainly attributed to diseconomies in scale (Isik and Ihsan, 2002, Technical Efficiency).

In 1999, Yildirim analyzed the relative financial performance of commercial banks for the years between 1988 and 1996. Deposits and expenses are used as inputs whereas loans and incomes are defined as outputs. He concludes that efficient banks are more profitable. He also finds that state banks are less profitable but more efficient than the bank groups, which contradicts the results of the other studies.

Yolalan defines variables as ratios for the period of 1988-1995 in 1996. Variables are defined as the ratios of total assets. Inputs are given as nonperforming loans and noninterest expenses, where outputs are defined as shareholders equity plus net income, fees and commission paid, and liquid assets. The results provide an efficiency ranking of different bank groups where the foreign banks have the highest efficiency scores, followed by the private banks and public banks, respectively. The findings in the literature indicate that the choice of a variable as output or input can lead to different conclusions about the efficiency scores and rankings. The study of Jackson and colleagues for the period 1992-96 finds similar results to those of Yolalan in 1996. The analysis of Mercan and Yolalan in 2000 for the 1989-1998 periods uses variables similar to the study of Yolalan in 1996.

The financial performance of the banks improves after the liberalization of capital movements but starts deteriorating after the 1994 crisis (Gunay and Tektas, 2006).

DEA analysis is studied in finance both in branch and bank level. Here some studies given according to their country, date and authors.

Canada: Parkan 1987; Schaffnit et al. 1997,

Cyprus: Zenios, Agathocleous, and Soteriou 1996,

Denmark: Bukkh 1994,

Finland: Kuussaari 1993; Vesela and Kuussaari in 1995,

Greece: Vassiloglou and Giokas 1990; Giokas 1991,

India: Bhattacharya, Lovell and Sahay 1997,

Italy: Ferriei and Hirschberg 1994; Favero and Papi 1995,

Japan: Fukuyama 1993 and 1995,

Norway: Berg Forsund and Jnasen 1991; Berg 1992,

Saudi Arabia: Al-Faraj, Alidi and Bu-Bshait 1993,

Spain: Perezand Quesada 1994; Pastor 1995; Pastor and Lovell 1997,

Sweden: Hartman and Storbeck 1995,

Switzerland: Sheldon and Haegler 1993,

Turkey: Oral and Yolalan 1990; Zaim 1995,

U.K.: Athanassopoulos 1995 and 1997,

U.S.: Sherman and Gold 1985; Ferrier and Lovell 1990; Aly, Grabowski, Pasurka and Rangan 1990; Elyasiani and Mehdian 1992; Barr, Seiford, Sierns 1994; Bauer, Berger, Ferrier and Humprey 1995; Devaney and Weber 1995; Thompson, Dharmapala, Humprey, Taylor and Thrall 1996 (Humprey and Berger, 1997).

Service: Lien and Peng look into the performances of search engines in 1999 by using data envelopment analysis. They found Alta Vista, Excite, Hotbot, Lycos, Infoseek, Opentext are performing better than others. In 2003 Sigala searched informatics technologies of three stars hotel in England by using DEA.

2.9. DEA METHODOLOGY

In this section the steps in application of DEA will be defined from the first step - choosing decision making units- to last step -result analysis-.

2.9.1. Obtaining Decision Making Units (DMU)

Decision making units can be any system that translates inputs to outputs. DMUs are chosen according to the study area. DMU can be selected by two principles (Kurkcuoglu, 2004):

- a) Every DMU should be defined responsibly from its inputs and outputs.
- b) For reaching accurate efficiency results the number of DMUs should be enough as it is mentioned in part 2.5.

In addition to these principles, it is important for DMU to be in similar environment and they should work with same inputs to process same outputs.

2.9.2. Obtaining Inputs and Outputs

It has already been stated that the main strength of DEA is that it allows management to nominate the inputs and outputs entering the analysis. However, this is not an open invitation for the analyst to produce DEA models that would not stand up to scrutiny of their rationale. While it is possible to select variables based on various managerial focuses, a good starting point is to identify the key business drivers critical to success of the bank (Avkiran, 1999).

The choice of inputs and outputs has to reflect the objective of the bank. For example, if the bank is assumed to maximize profit, then all types of costs should be treated as inputs and all types of revenues as outputs. On the other hand, in the case an efficient service management is viewed as the main objective, then the volume of services will become a relevant output and the cost to produce those services an appropriate input (Bergendahl, 1998).

The definition and measurement of inputs and outputs in the banking function remains a contentious issue among researchers. To determine what constitutes inputs and outputs of banks, one should first decide on the nature of banking as it is stated above.

In the banking theory literature, Sealey and Lindley described two main approaches: the **production and intermediation approaches** in 1977 (Sufian, 2007).

Production approach:

Under the production approach, the objective of banks is to minimize the consumption of resources in providing various products and services, or maximize products and services for given levels of resources. Hence, the essence of production modeling is to identify those resource inputs that are keys to produce the main outputs, where outputs are usually measured in number of accounts or transactions rather than dollars (Avkiran, 1999).

In production approach, some inputs can be number of employees, equipment expenses, and non-interest expenses whereas outputs can be number of demand deposits, number of time deposits, number of real estate loans, and number of commercial loans.

Intermediation approach:

Under the intermediation approach, as the name suggests, banks are regarded as intermediaries in raising funds in the form of deposits and other funds and lending them in the form of loans and other assets (such as insurance investments) to generate earnings. In this asset approach, 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 (Avkiran, 1999).

In intermediation approach inputs can be deposit, debentures, number of employees, physical capital, non-interest expenses whereas outputs can be loans, securities, and noninterest income.

Loading lots of input and output prevent DEA to differentiate efficient and inefficient units. As Sherman stated in order to increase the number of inputs and outputs it is recommended to increase the number of DMUs. In addition, he advised an equation.

If n = number of DMU, m = number of input and n = number of outputs then $n \geq \ln(m+s; 3(m+n))$.

2.9.3. Data Gathering and Reliability

In DEA analysis after obtaining DMUs and related inputs, outputs; data analysis should be done. This step is very critical because every input and data values must be collected for each DMU significantly. If not; first another inputs and outputs should be looked up; secondly that DMU must be excluded from the study because this lack of data will affect the related DMUs' efficiency and other DMUs' efficiency.

2.9.4. Measuring Relative Efficiency with DEA

This efficient frontier is determined by the most efficient DMUs under study, based on the notion of Pareto optimality. This concept states that a specific DMU is efficient if there is no other DMU, or combinations of other DMUs, which can produce at least the same amounts of all outputs, with less of some resource input and no more of any other resource. Conversely, a DMU is said to be Pareto inefficient if another DMU, or combination of other DMUs, can produce at least the same amounts of all outputs, with less of some resource input and no more of any other resource. DEA then calculates the efficiency of each DMU relative to this efficient frontier. In this manner, DEA develops a measure of relative efficiency for each of the DMUs (Weber, 1996).

2.9.5. Efficiency Scores and Efficient Frontier

From some observation that is called DMU can be formed as convex and concave by using the ratios between inputs and outputs. Efficient frontier is the subset of this production possibility set. Inside this possible production set efficient DMUs created

the efficiency frontier by their efficiency scores. Efficient frontier is the frontier that carries the DMUS whose efficiency scores is better and defined as efficient. Efficient frontier shows the DMU which uses their input in a better way in order to create output.

2.9.6. Peer Groups (Reference Set)

The set of efficient unit to which an inefficient unit is compared to. Each inefficient DMU is referenced at least one DMU that lies on the efficient frontier. It is compared against those units most similar to itself. Management from an inefficient unit should seek guidance from efficient identified in its peer group. It is believed that inefficient unit management should apply the same method in order to be like efficient unit but this is not valid in every case. This is because if the same input and output relation is obtained; better efficient scores can be reached as it is compared to efficient units.

2.9.7. Non-efficient DMU Analysis

DEA construct a reachable efficient point for inefficient DMUs to improve their performances. Generally this reachable point is the weighted average of peer points of inefficient DMU.

2.9.8. Result Analysis

By analyzing the inputs and outputs of a set of similar units, DEA determines:

- The efficient frontier consisting of best practice units,
- An efficient score for each DMU that corresponding its distance from the frontier,
- A peer group for each inefficient DMU that consists of the efficient units that are most similar to it (also referred to as a best practice reference set),
- Efficiency targets for each inefficient DMU,
- Input slack for each inefficient DMU (the quantity of excess resources used by the inefficient unit),

- Output slack for each inefficient DMU (the amount of excess capacity given the current input levels) (Ho, 2004).

If we want to comment the results, maximum efficiency score will be less than or equal to 1 by virtue of the constraints. A value of efficient = 1 represents full efficiency and it follows that unit is a best practice unit. When efficient < 1; then some level of inefficiency is present. These efficiency values provide not only a way to benchmark productive efficiency, but also make it possible to identify the sources and amounts of inefficiency in each input and output for every unit being evaluated (Barr, 2002).

2.10. STRONG AND WEAK POINTS OF DEA

DEA is a powerful technique when used wisely. It has several strengths over other analytical tools. These characteristics that make it powerful include:

- Its flexibility in choosing inputs and outputs, this is an advantage of DEA since it opens the door to what-if analysis,
- It optimizes the DMUs performance by assigning weights to them individually,
- DMUs are directly compared against a peer or combination of peers,
- DEA's ability to simultaneously handle multiple input and multiple output model,
- Inputs and outputs can have different units, and do not require a priori tradeoffs between them,
- It does not require any assumption of a functional form relating inputs to outputs, no knowledge of the production process is necessary (Tochaie, 2003).
- Variables in the model can use different units of measure (Ho, 2004).

DEA evaluates the performance of each firm by relating its input and output combinations to a common efficient frontier. DEA has the advantage of being able to handle multiple inputs and outputs stated in different measurement units.

It also focuses on a best-practice frontier, rather than population central tendencies and does not require a functional form to be imposed relating inputs to outputs.

Banks can also employ such models internally to benchmark their own processes, finding potential areas for improvement in an industry increasingly characterized by accelerating change and competition. Finally, industry analysts and policymakers can use DEA as a powerful tool for increasing understanding of institutions and markets in this rapidly changing and increasingly complex industry (Barr, 2002).

As with any tool, DEA is not a perfect tool. There also some limitations that should be considered:

- DEA does not account for random error. All deviations from the efficient frontier are assumed to be due to inefficiency. Errors in measurement and random noise can misrepresent real relative efficiency (Ho, 2004).
- DEA measures the relative efficiency. Therefore, the units that are highly efficient are not included in the study, and units in the study will appear relatively more efficient than they really are. DEA cannot measure the theoretical frontier (Ho, 2004).
- The technique requires a minimum number of units in order to guarantee the necessary degrees of freedom in the model. Analysis containing less than the minimum number of units will yield higher efficiency scores and more units on the frontier, and hence give a more favorable picture than is the case (Ho, 2004).
- Since DEA is a nonparametric technique; statistical hypotheses are difficult.
- Since a standard formulation of DEA creates a separate linear program for each DMU, large problems can be computationally intensive (Onaran, 2006).

In this chapter, the productivity topic and performance analyses methods are handled. Especially Data Envelopment and its methodology are given in detail because in the next chapter Data Envelopment Analysis will be the method for evaluating the efficiency scores of the Turkish commercial banks for the year 2007.

CHAPTER THREE
AN ANALYSIS: MEASURING EFFICIENCY OF
TURKISH COMMERCIAL BANKS IN 2007

Starting in early 1980s, a large number of countries liberalized their financial sectors through deregulation of interest rates and removal of entry restrictions in order to improve efficiency performance. After a decade or so, most of these countries liberalized their capital accounts, which in turn set the stage for financial integration process across national markets. Today, financial institutions face a fast paced, dynamic, and competitive environment on a global scale. Such a competitive environment forced these institutions to examine their performance because their survival will, to a large extent, depend upon their productive efficiencies. Some earlier studies Berger and Humphrey showed that, particularly in banking sector, inefficiencies are more important than scale and scope issues. Hence, in response, firms have been trying to adapt and to adjust themselves to improve their productive efficiencies in this changing social and economic environment (Denizer, Dinc and Tarimcilar, 2000).

Some structural changes like increasing foreign consistency are occurring in Turkey like it is in other countries all over the world. Foreign investments and their positive-negative affects are a debate in every country. For having an opinion about the efficiency affect of the foreign investments to banking industry it is better to look to the situation of the banks in a country. In this application part, the relationship between the ownership type of the commercial banks and their efficiency scores are studied for the year 2007. Finding efficiency scores of the all commercial banks according to ownership type is going to give information about how foreign commercial banks are efficient in the industry. This study will give the latest efficiency scores of Turkish commercial banks.

3.1. METHODOLOGY

In the application part of the study, Data Envelopment Analysis which is a non parametric approach is used to evaluate efficiency scores of the commercial banks in 2007 at Turkey.

3.1.1. Model, Input, Output Choice and Data Collection

DEA model, CCR, is used which is proposed by Charnes, Cooper and Rhodes. Input oriented CCR model is applied to data in order to maximize the sum of weighted outputs of decision making unit in the study.

Input and outputs are should be carefully determined to find the proper efficiency scores in DEA analysis. In this analysis three inputs and two 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.

The same inputs and outputs are used in this study like Barr and Siems' study. In their study, Barr and Siems conducts a survey to twelve bank examiners in Federal Reserve Bank of Dallas regarding their knowledge of factors that are important in judging quality of bank management. From the survey it is found that the most important inputs are salary expenses, interest expenses and fixed assets, outputs are loans and interest income. In addition, these inputs and outputs are theoretically defined by ARD office studies of BRSA.

Inputs: Fixed assets, interest expenses, salary expenses.

Outputs: Interest income, loans.

In our application part, it is aimed to find the efficiency scores of commercial banks in 2007. Commercial banks are handled in this application because all banks should be evaluated and benchmarked among same bank types according to homogeneity rule in DEA specifications. Investment and development banks are excluded for this reason. Our data is collected from The Banks Association of Turkey for each

commercial bank's financial statements. In 2007, there were 32 commercial banks but analysis is done with 29 commercial banks because banks whose inputs and outputs are zero should be excluded according to positivity property in DEA specifications. Among the sample size; there are three state-owned banks, ten privately owned deposit banks, sixteen foreign banks. Number of 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 declare DMUs should be more than twenty (Norman and Stoker, 1991). Vassiloglu and Giokas express that DMUs should be threefold than the sum of inputs and outputs (Vassiloglu and Giokas, 1990). In our analysis, number of DMUs is higher than it is needed. Inputs and outputs are gathered from 2007 financial statements of each bank at the BAT internet site; and inputs, outputs are all measured in thousand YTL.

3.1.2. Results and Interpretation

Data is evaluated by DEA Solver LV program for enhancing efficiency scores and potential improvements, projections. All commercial banks' efficiency scores and potential improvement guide is given below from higher to lower scores.

Table 14: Efficiency Scores of Commercial Banks in 2007

DMU	Score	DMU	Score	DMU	Score
Akbank	1,0000	Finansbank	0,9460	TEB	0,7714
Alternatif	1,0000	Halk bank	0,9148	Isbank	0,7708
Ziraatbank	1,0000	Anadolu	0,9124	Seker	0,7441
Bank Mellat	1,0000	Oyak bank	0,9089	Fortis	0,7151
Habibbank	1,0000	Vakifbank	0,8852	Turkish	0,6250
Millenium	1,0000	Deniz bank	0,8678	ABN	0,6078
Turkland	1,0000	HSBC	0,8669	Arapturk	0,5891
Westlb	1,0000	Tekstil	0,8064	S. Generale	0,5567
Garanti bank	0,9913	E. Tefken	0,8021	Deutsche	0,3764
Citibank	0,9759	Yapikredi	0,8020		

According to results of efficiency scores, eight commercial banks are efficient in 2007. Akbank, Alternatif bank, Ziraat bank, Bank Mellat, Habibbank, Millenium bank, Turkland, and Westlb are the efficient banks. Garanti bank follows these eight efficient commercial banks with 0,9913 efficiency score. Among the efficient commercial banks; Ziraat bank is the only state owned commercial bank, Akbank and Alternatif bank are efficient privately owned commercial banks, and Bank Mellat, Habibbank, Millenium bank, Turkland, and Westlb are efficient foreign owned commercial banks. More than half of the efficient commercial banks are foreign owned commercial banks.

Among state owned commercial banks are 33.3 percent of them, 20 percent of the privately owned commercial banks, and 31,25 percent of the foreign owned commercial banks are found as efficient.

When we benchmark the means of the efficiency scores of the commercial banks; the mean of state owned commercial bank's efficiency scores is 0,933; the mean of privately owned commercial bank's efficiency scores is 0,842 and the mean of foreign owned commercial bank's efficiency scores is 0,825.

Deutsche bank is at the end of the list with 0,3764 efficiency score. The lowest efficiency score among the state owned commercial banks is Vakifbank with 0,8851. The lowest efficiency score among privately owned commercial banks is Turkish Bank with 0,625 and the lowest efficiency score among foreign owned commercial banks is Deutsche bank with 0,3764.

One of the strengths of DEA is its ability to provide information about sources of inefficiency in both the input and the output side. This information is extremely useful for managers in improving organizational performance. This indicates an excess use of resources, output shortfalls, or some combination of the two. Inefficient banks (lower than 1,00 efficiency score) can become an efficient commercial bank by optimizing their inputs and outputs. DEA Solver LV. program gives a chance to analyzers for observing these improvement values.

Improvement values (projection) of all commercial banks are given at Table 15. At the table, projection column shows the purposed value of the inputs and outputs for an inefficient DMU; the difference column expresses the subtraction of realized value of inputs and outputs from the projection value, and % column shows the increase or decrease of the realized input and output values as percentage.

Table 15: Projection for Commercial Banks in 2007

DMU & I/O	Eff. Score	Projection	Difference	%
AKBANK	1			
Salary Expenses	615950	615950	0	0,000
Fixed Assets	1519280	1519280	0	0,000
Interest Expenses	5239865	5239865	0	0,000
Loans	37015783	37015783	0	0,000
Interest Income	8481572	8481572	0	0,000
ALTERNATIF	1			
Salary Expenses	45454	45454	0	0,000
Fixed Assets	59654	59654	0	0,000
Interest Expenses	170802	170802	0	0,000
Loans	1863638	1863638	0	0,000
Interest Income	324945	324945	0	0,000
ANADOLU	0,9123			
Salary Expenses	72172	65847	-6325	-0,088
Fixed Assets	58734	53587	-5147	-0,088
Interest Expenses	233237	212797	-20440	-0,088
Loans	1764279	1764279	0	0,000
Interest Income	419624	419624	0	0,000
SEKER	0,7441			
Salary Expenses	164693	122551	-42142	-0,256
Fixed Assets	268248	199608	-68640	-0,256
Interest Expenses	475569	353880	-121689	-0,256
Loans	3614433	3614433	0	0,000
Interest Income	914782	914782	0	0,000
TEKSTIL	0,8064			
Salary Expenses	64461	51984	-12477	-0,194
Fixed Assets	131439	105997	-25442	-0,194
Interest Expenses	225539	181883	-43656	-0,194
Loans	2082976	2082976	0	0,000
Interest Income	372803	372803	0	0,000

TURKISH	0,625			
Salary Expenses	11042	6902	-4140	-0,375
Fixed Assets	38847	12660	-26187	-0,674
Interest Expenses	42499	26563	-15936	-0,375
Loans	129024	218407	89383	0,693
Interest Income	62527	62527	0	0,000
TEB	0,7714			
Salary Expenses	241012	185919	-55093	-0,229
Fixed Assets	371490	286571	-84919	-0,229
Interest Expenses	894144	689750	-204394	-0,229
Loans	6864427	6864427	0	0,000
Interest Income	1453194	1453194	0	0,000
GARANTI	0,9912			
Salary Expenses	699515	693395	-6120	-0,009
Fixed Assets	2045429	2027533	-17896	-0,009
Interest Expenses	4412503	4373897	-38606	-0,009
Loans	37217886	37217886	0	0,000
Interest Income	7216606	7507219	290613	0,040
IS	0,7708			
Salary Expenses	1085006	836326	-248680	-0,229
Fixed Assets	6794468	1743094	-5051374	-0,744
Interest Expenses	6173858	4758830	-1415028	-0,229
Loans	33979841	35871494	1891653	0,056
Interest Income	9134079	9134079	0	0,000
YAPIKREDI	0,802			
Salary Expenses	788343	632290	-156053	-0,198
Fixed Assets	4178474	1733130	-2445344	-0,585
Interest Expenses	3936467	3157239	-779228	-0,198
Loans	28508881	28508881	0	0,000
Interest Income	6059185	6059185	0	0,000
HALK	0,9147			
Salary Expenses	448691	410450	-38241	-0,085
Fixed Assets	1109434	892937	-216497	-0,195
Interest Expenses	3955928	3618775	-337153	-0,085
Loans	18121078	20936105	2815027	0,155
Interest Income	5708181	5708181	0	0,000
VAKIF	0,8851			
Salary Expenses	457156	404655	-52501	-0,115
Fixed Assets	1440354	1007550	-432804	-0,301
Interest Expenses	3676639	3254402	-422237	-0,115
Loans	23470003	23470003	0	0,000

Interest Income	5352473	5352473	0	0,000
ZIRAAT	1			
Salary Expenses	782966	782966	0	0,000
Fixed Assets	1116185	1116185	0	0,000
Interest Expenses	7527730	7527730	0	0,000
Loans	21604134	21604134	0	0,000
Interest Income	11165614	11165614	0	0,000
ABN	0,6078			
Salary Expenses	32401	18856	-13545	-0,418
Fixed Assets	26963	16389	-10574	-0,392
Interest Expenses	70678	42960	-27718	-0,392
Loans	292116	292116	0	0,000
Interest Income	118329	118329	0	0,000
ARAP TURK	0,5891			
Salary Expenses	14750	8690	-6060	-0,411
Fixed Assets	47383	13403	-33980	-0,717
Interest Expenses	13886	8181	-5705	-0,411
Loans	128359	128359	0	0,000
Interest Income	27169	52425	25256	0,930
BANKMELLAT	1			
Salary Expenses	2369	2369	0	0,000
Fixed Assets	9099	9099	0	0,000
Interest Expenses	6939	6939	0	0,000
Loans	105021	105021	0	0,000
Interest Income	14998	14998	0	0,000
CITIBANK	0,9758			
Salary Expenses	147423	109473	-37950	-0,257
Fixed Assets	66495	64891	-1604	-0,024
Interest Expenses	337061	328932	-8129	-0,024
Loans	1952276	1952276	0	0,000
Interest Income	689604	689604	0	0,000
DENIZ	0,8678			
Salary Expenses	306291	265807	-40484	-0,132
Fixed Assets	583175	506093	-77082	-0,132
Interest Expenses	979934	850410	-129524	-0,132
Loans	10405011	10405011	0	0,000
Interest Income	1725389	1725389	0	0,000
DEUTSCHE	0,3764			
Salary Expenses	26729	10061	-16668	-0,624
Fixed Assets	152554	20008	-132546	-0,869
Interest Expenses	133272	50165	-83107	-0,624

Loans	171826	388268	216442	1,260
Interest Income	102720	102720	0	0,000
E. TEKFEN	0,8021			
Salary Expenses	25751	20656	-5095	-0,198
Fixed Assets	162150	49568	-112582	-0,694
Interest Expenses	206389	165550	-40839	-0,198
Loans	881735	1179217	297482	0,337
Interest Income	274146	274146	0	0,000
FINANS	0,9459			
Salary Expenses	390090	369023	-21067	-0,054
Fixed Assets	752280	711652	-40628	-0,054
Interest Expenses	1388719	1313719	-75000	-0,054
Loans	14174414	14174414	0	0,000
Interest Income	2765076	2765076	0	0,000
FORTIS	0,715			
Salary Expenses	272193	194643	-77550	-0,285
Fixed Assets	360646	257894	-102752	-0,285
Interest Expenses	730919	522673	-208246	-0,285
Loans	5528093	5528093	0	0,000
Interest Income	1334105	1334105	0	0,000
HABIB BANK	1			
Salary Expenses	885	885	0	0,000
Fixed Assets	1262	1262	0	0,000
Interest Expenses	744	744	0	0,000
Loans	11747	11747	0	0,000
Interest Income	5326	5326	0	0,000
HSBC	0,8669			
Salary Expenses	333576	289189	-44387	-0,133
Fixed Assets	449218	389444	-59774	-0,133
Interest Expenses	852290	738882	-113408	-0,133
Loans	9345446	9345446	0	0,000
Interest Income	1635644	1635644	0	0,000
MILLENIUM	1			
Salary Expenses	24549	24549	0	0,000
Fixed Assets	22145	22145	0	0,000
Interest Expenses	57555	57555	0	0,000
Loans	736203	736203	0	0,000
Interest Income	123674	123674	0	0,000
OYAK	0,9089			
Salary Expenses	267967	243561	-24406	-0,091
Fixed Assets	292989	266304	-26685	-0,091

Interest Expenses	1137352	1033762	-103590	-0,091
Loans	8510653	8510653	0	0,000
Interest Income	1749837	1749837	0	0,000
S. GENERALE	0,5566			
Salary Expenses	11434	6365	-5069	-0,443
Fixed Assets	4905	2730	-2175	-0,443
Interest Expenses	64728	35000	-29728	-0,459
Loans	72218	72218	0	0,000
Interest Income	59751	59751	0	0,000
TURKLAND	1			
Salary Expenses	19121	19121	0	0,000
Fixed Assets	7568	7568	0	0,000
Interest Expenses	50974	50974	0	0,000
Loans	418905	418905	0	0,000
Interest Income	77145	77145	0	0,000
WESTLB	1			
Salary Expenses	9165	9165	0	0,000
Fixed Assets	499	499	0	0,000
Interest Expenses	38803	38803	0	0,000
Loans	40618	40618	0	0,000
Interest Income	71917	71917	0	0,000

From the projection, it is easy to say that greater inefficiencies are on the input side; Turkish banks performed better in the outputs. Nearly all the commercial banks used excessive amounts of sources for all their inputs in the study period. Among the inefficient banks; the greater inefficiency is generally at fixed assets. Fixed assets excessive amounts are changing between 0,024 and 0,869 percentages. Deutsche bank has the greatest inefficiency in fixed assets with 0,869 percentages.

On the output side, the results show that banks performed relatively well in loans and interest income. When inefficient banks are examined, the inefficiency is generally caused by loans. Deutsche Bank has the greatest inefficiency in loans; Deutsche bank should have had 1,26 percentage greater loans. On the other output (interest income) Arapturk bank should have had 0,93 percentage greater loans.

Projection table shows the improvement values according to input and outputs for each inefficient commercial bank. For example: Due to the projections; the most inefficient bank Deutsche bank should decrease its salary expenses 0,624 percentage, fixed assets 0,869 percentage, and interest expenses 0,624 percentage; and Deutsche bank should increase its loans 1,26 percentage.

Data envelopment analysis calculates all the potential improvement values from the reference sets (peer groups) of each DMU. Table 16 gives the reference sets of each inefficient DMU.

Table 16: Reference Sets (Peer Groups)

DMU	REFERENCE SET(S)
AKBANK	AKBANK
ALTERNATIF	ALTERNATIF BANK
ANADOLU	ALTERNATIF HABIBBANK MILLENIUM WESTLB
SEKER	AKBANK ALTERNATIF BANK MELLAT HABIBBANK
TEKSTIL	AKBANK ALTERNATIF BANK MELLAT HABIBBANK
TURKISH	AKBANK HABIBBANK
TEB	AKBANK ALTERNATIF BANK MELLAT HABIBBANK
GARANTI	AKBANK ALTERNATIF BANK MELLAT
IS	AKBANK HABIBBANK
YAPIKREDI	AKBANK BANK MELLAT HABIBBANK
HALK	AKBANK ZIRAAT BANK
VAKIF	AKBANK BANK MELLAT HABIB BANK
ZIRAAT	ZIRAAT BANK
ABN	HABIB BANK MILLENIUM BANK WESTLB
ARAP TURK	BANK MELLAT HABIB BANK
B. MELLAT	BANK MELLAT
CITIBANK	HABIB BANK MILLENIUM BANK WESTLB
DENIZ	ALTERNATIF BNK MELLAT HABIBBNK MILLENIUM
DEUTSCHE	AKBANK HABIB BANK
E. TEKFEN	AKBANK HABIB BANK
FINANS	AKBANK ALTERNATIF BANK MELLAT HABIBBANK
FORTIS	AKBANK ALTERNATIF HABIB BANK WESTLB
HABIB BNK	HABIB BANK
HSBC	ALTERNATIF BANKMELLAT HABIBBANK MILLENIUM
MILLENIUM	MILLENIUM BANK
OYAK	AKBANK ALTERNATIF TURKLAND WESTLB
SOC. GENER.	AKBANK ZIRAAT BANK WESTLB
TURKLAND	TURKLAND BANK
WESTLB	WESTLB BANK

These reference banks show the distance of inefficient banks from efficient frontier. Due to Table 16; Fortis bank's improvement values are found by using the input and output values of Akbank, Alternatif Bank, Habibbank, and Bank Westlb; Citibank's improvement values are calculated according to Habibbank, Millenium Bank, and Bank Westlb inputs and outputs. As it is seen at Table 16, Akbank is the most referenced bank for the improvement value calculation. Many banks are going to benchmark themselves with privately owned Akbank.

Briefly, foreign owned commercial banks seem more efficient than privately owned commercial banks, and state owned commercial banks because five of the eight efficient commercial banks are foreign owned commercial banks. The efficient commercial banks are Akbank, Alternatifbank, Ziraatbank, Habibbank, Bank Mellat, Millenium bank, Turkland, and Westlb bank. The most inefficient bank is a foreign owned one: Deutsche bank. The inefficiencies are generally caused by an input: fixed assets. On the other hand, inefficiency is caused by loans at the output side. All inefficient commercial banks can improve themselves if their managements consider the projection guide values.

CONCLUSION

Efficiency should be an indispensable indicator for all organizations at their each activity all around the world. All activities should be calculated deeply before taking a step to operation. Decision makers (management) who give ultimate decision to take a step to an operation should seek for the best alternative. Actually taking a step is the easiest part of an activity because the important is taking the best step. Evaluating and using right quantity of sources like time, person, capital, equipment etc. will determine the quality of the step. If the management will discover the right combination of sources, this will turn to organization as a valuable output.

Banks, the main players of the economy, should be operated efficiently in order to live while accomplishing their functions and services to the customers. In this competitive industry, nearly all type of bank's main and permanent objective of the banks is making profit from generated services. This profit arose from the correctly used sources. Managements of the banks will utilize from the efficient operations during the hard conditions of the industry like crises.

Turkish banking industry lived many tough conditions in the history. Before the Republic; Ottoman Bank and a few foreign banks met the demands in Ottoman Empire. Number of local banks is fastened during World War I. After the Republic; Turkish banking industry welcomed many local and foreign banks after Izmir congress and World War II by the need of capital for development and financing the war expenses. In 1980, the structure of the banking industry is changed in many aspects by the reforms that are realized by the government. After the reforms, the interest of the foreign capital showed itself in banking industry. Foreign capital got benefit from the black years of Turkish banking industry. In 2003 many foreign capital is invested to banking industry with the act of shares buying from private banks. From 2003 to 2008; foreign banks' branch expansion increased 800 %.

Foreign investments are still a discussion point in Turkish banking industry. Although the negative opinions in foreign capital; new services, new technologies, different recruitment policies are the main benefits of foreign investments. Briefly, foreign banks changed the way of doing business in Turkish banking industry.

Banks especially in Europe are passing through a hard economical test all over the world in those days after shocks in American mortgage banking industry. Many banks which are leaders in their industry are nationalized after their bankruptcy declaration.

From this point; although it is declared by many analysts, Turkish banking industry is stronger than many other countries' banking industry because of crises experiment in the past; our banks should activate carefully for not going back to black years where many banks nationalized between 2000 and 2005. The fundamental problems of the banking industry should be eliminated before facing a new trouble. Current issues like BASEL should be applied just in time by interested organizations after last delaying operation.

The application part of the study focuses on the Turkish banking industry and evaluating commercial banks from efficiency perspective by Data Envelopment Analysis (DEA). Data Envelopment Analysis is one of the techniques which is a non-parametric frontier analysis shows us how efficiently our organizations are doing their activities by the chosen inputs and outputs. DEA can be used to benchmark the organizations from different kind of industries like health, insurance, banking, education etc. by using one of the models (CCR or BCC) depending to input or output maximization. In addition, DEA gives an efficiency score to decision maker in order to evaluate the performance of the analyzed organizations.

In the application study 29 commercial banks are used from Turkish banking industry. Among these 29 commercial banks; eight banks are analyzed as efficient. These banks are Akbank, Alternatif bank, Ziraatbank, Bank Mellat, Habib Bank, Bank Millenium, Turkland, and Bank Westlb.

Mostly foreign owned commercial banks are efficient among the efficient banks. State owned banks seem efficient enough whereas the most efficient state owned bank is Ziraat Bank with 1,00 efficiency score. The least efficient commercial banks are Arapturk, Societe Generale, and Deutsche Bank. Inefficiencies are generally caused by inputs and especially fixed assets.

At the end of the application part of the study; the projection table is given for the inefficient bank managements. Inefficient bank management can benchmark their own bank with other bank and improve their commercial banks. Inefficient banks whose efficiency score is lower than 1,00 should perform better to be at the top in the classification. It should be never forgotten that for a strong economy; each bank should share the responsibility and tend to be higher performers and safer institutions.

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