DOKUZ EYLÜL UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
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MASTER'S THESIS

THE PERFORMANCE OF BANKS IN KAZAKHSTAN

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ABSTRACT

Master's Thesis

The Performance of Banks in Kazakhstan

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After the collapse of the Soviet Union and declaration of its independence in 1991, Kazakhstan initiated the process of transformation - switching from planned economy system to market oriented economy. Consequently, the banking system of the country has gone through the process of significant structural reforms, followed by consolidation and intensive regulation. In this framework, the aim of this research is to assess efficiency and productivity of the banking sector in Kazakhstan. The sample contains yearly data on 30 Kazakhstani commercial banks for the period 2000 – 2013. Non-parametric approaches, namely the Data Envelopment Analysis and the Malmquist index, are employed to calculate technical efficiency and productivity. Furthermore, second-stage regression is estimated in order to identify the determinants of inefficiency. The results show that banks in Kazakhstan produce below their optimum levels with larger banks being more efficient than smaller ones. The results also indicate the presence of economies of scale for banks of all size. Efficiency of banks is found to be significantly and positively affected by performance and level of capitalization. The global financial crisis turned to have severely affected the banking sector of a country.

Keywords: Banking Sector, Data Envelopment Analysis, Efficiency, Kazakhstan, Productivity

ÖZET

Yüksek Lisans Tezi

Kazakistan Bankacılık Sektörünün Performansı

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Kazakistan, Sovyetler Birliği'nin çöküşünden ve kendi bağımsızlığının ilanından sonra planlı ekonomi sisteminden serbest piyasa ekonomisine gecmek üzere 1991 yılında dönüşüm sürecini başlatmıştır. Bunun üzerine ülkenin bankacılık sistemi de yoğun düzenleme ve birleşmeleri takip ederek önemli yapısal reformlar sürecine girmiştir. Bu bakış açısında araştırmanın amacı, Kazakistan'daki bankacılık sektörünün etkinliği ve verimliliğini değerlendirmektir. Örneklem, otuz Kazakistan ticari bankasının 2000 – 2013 yılları arasını kapsayan senelik datayı içermektedir. Parametrik olmayan yaklaşım, yani Veri Zarflama Analizi ve Malmquist endeksi, teknik etkinliği ve verimliliği hesaplamak için kullanılmaktadır. Dahası ikinci aşama regresyon, verimsizlik belirleyicilerin tespiti amacıyla tahminlenmektedir. Sonuçlar göstermektedir ki, Kazakistan'daki bankalar etkinlik seviyelerinin altında üretim yapmaktadır ve küçük bankalara oranla büyük bankalar, daha verimli sonuçlar almaktadır. Sonuçlar aynı zamanda tüm boyuttaki bankalar için ölçek ekonomilerinin var olduğunu da göstermektedir. Bankaların etkinliliği, anlamlı ve pozitif olarak sermaye oranı ve performansından etkilenmektedir. Üstelik küresel mali krizin ciddi anlamda ülkenin bankacılık sektörünü etkilediği görülmektedir.

Anahtar Kelimeler: Bankacılık Sektörü, Veri Zarflama Analizi, Etkinlik, Kazakistan, Verimlilik

THE PERFORMANCE OF BANKS IN KAZAKHSTAN

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ABBREVIATIONS

BIS	Bank of International Settlement
CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DMU	Decision Making Unit
GDP	Gross Domestic Product
GED	Gross External Debt
IAS	International Accounting System
IMF	International Monetary Fund
IPO	Initial Public Offering
KASE	Kazakhstan Stock Exchange
KZT	Kazakhstani Tenge
NBK	National Bank of Kazakhstan
NPL	Non-Performing Loans
ROA	Return on Assets
ROE	Return on Equity
SME	Small and Medium-sized Enterprises
TFP	Total Factor Productivity
VRS	Variable Returns to Scale
WTO	World Trade Organization

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INTRODUCTION

Effectively and properly functioning financial system is the cornerstone of prosperous economies. The main component of a financial system is a banking sector. Banks are vital to an economy, because they provide a major source of financial intermediation and their checkable deposit liabilities represent the bulk of a country`s money stock. Banks serves as intermediaries in economy by transferring resources from excess suppliers to the real sector. Given the significance of properly operating banking sector for the economy to booster economic growth and development, the efficiency and productivity of banks have become important issues. A considerable amount of empirical as well as theoretical studies have been conducted on the measurement of bank performance over the last two and a half decades. Different methods have been applied ranging from the simple financial ratio analysis exploiting data on single input and output to parametric and non-parametric approaches utilizing data on multiple inputs and outputs.

Following its independence in 1991, Kazakhstan undertook aggressive and carefully designed reforms in order to transform its economy from centrally planned to market-oriented one. This process started with general liberalization of the economy and country-wide privatization. Within the framework of this transformation the banking sector was given a relatively high priority by the government, and hence the structure of banking system has undergone significant changes during 1990s. Bank restructuring and privatization has been accompanied by consolidation, market entry of new foreign banks, an overhaul of the legal framework, and a strengthening of prudential regulation and supervision. Although the banking restructuring program was largely in place by the beginning of 2000s enhanced by a prolonged period of macroeconomic stability and economic growth, the global financial crisis of 2008 has significantly affected the economy of Kazakhstan and the banking system has flawed. Subsequently, it has become essential to analyze the performance of Kazakhstani banks during the last decade.

In this context, this research investigates the technical efficiency and productivity of commercial banks in Kazakhstan over the period 2000 – 2013. Non-parametric approach, namely Data Envelopment Analysis (DEA), is applied to

generate efficiency scores. This approach was preferred to conventional parametric approaches, such as Stochastic Frontier Analysis and Free Distribution Model, owing to some facts. Firstly, considering transition nature of Kazakhstan economy, free market competition concepts are not fully implemented, which is essential assumption for the specification of functional form for the frontier in econometric approach. Instead, data envelopment analysis being a linear programming model does not require assumptions about the market structure. It provides a piecewise linear frontier by enveloping the observed data points, and hence efficiency estimates are not functional form dependent. Thus, the performance of banks is evaluated numerically from the point of view of technical efficiency, that is, the ability of banks to operate close to or on the boundary of their production set. Moreover, the DEA method allows for multiple input and multiple output specifications, and is invariant to the differences in the units of measurement.

The analysis is extended further to identify possible determinants of inefficiency. The bank industry external factors were specified and regressed on the efficiency scores by applying Two-limit tobit model. The particular focus is made on examining the effect of financial crisis on the efficiency and productivity levels of banking sector.

This research contributes to the existing literature on efficiency and productivity of banking sector in developing and transition countries. Particularly, it enlarges the number of studies on Kazakh banking sector, which is quite limited. In addition, the present research is unique regarding its scope. It covers almost all banks in its sample, includes the period of financial crisis of 2008, examines its impacts over the banking sector`s efficiency and evaluates the policies.

The results indicate that the Kazakh banking system is not operating efficiently, however large banks show to be more efficient than smaller ones. Besides, large economies of scale exist for banks of all size. Foreign banks seem to be more efficient than domestic ones, however this difference was not found to be statistically significant. The performance and capitalization of second-tier banks significantly and positively influence the level of efficiency of banks, suggesting that more profits would be generated by banks with low efficiency. Thus, the capital could be increased through accumulated retained earnings. The growing portion of

non-performing loans in the loan portfolio of banks has adverse impact on the efficiency. This is related to the fact that with higher NPLs more provisions for impairment are required and these resources are taken away from production.

The effect of global financial crisis on efficiency is thoroughly examined, which is supported by the highly statistical significance of regression results. An extensive participation of Kazakhstani banks in the international financial markets and high volumes of their external debt made the domestic banking sector very vulnerable to changes occurring in those markets. Although the impact of the crisis was devastating for the banking sector, this situation forced the authorities to reassess the prudential norms and regulations established prior to crisis.

The productivity analysis shows that technical change was the main factor of productivity growth of banks in Kazakhstan during the last decade. This is quite obvious, since in the early 2000s institutional and regulation framework for bank functioning was already settled, so banks started to invest extensively in their capital to expand production. This took place through opening new branches, purchasing new hardware and software. Technological innovation, in the form of improvements in communications and data processing, contributed to a large extent to increased productivity of banks. Banks started to deliver many services through electronic means.

The present study proceeds as follows. The first chapter provides an overview of the Kazakhstani banking system and its development in historical perspective. The second chapter examines studies on bank performance with emphasis on transition countries. In chapter three main concepts are explained and the DEA methodology used to study efficiency and productivity is elaborated. Data description along with obtained empirical results are presented in the fourth chapter. The final chapter draws some tentative conclusions and provides policy evaluations.

CHAPTER ONE
HISTORICAL BACKGROUND OF THE KAZAKHSTANI BANKING SYSTEM

1.1. THE COLLAPSE OF SOVIET ECONOMY AND REFORMATION PERIOD (1989-1998)

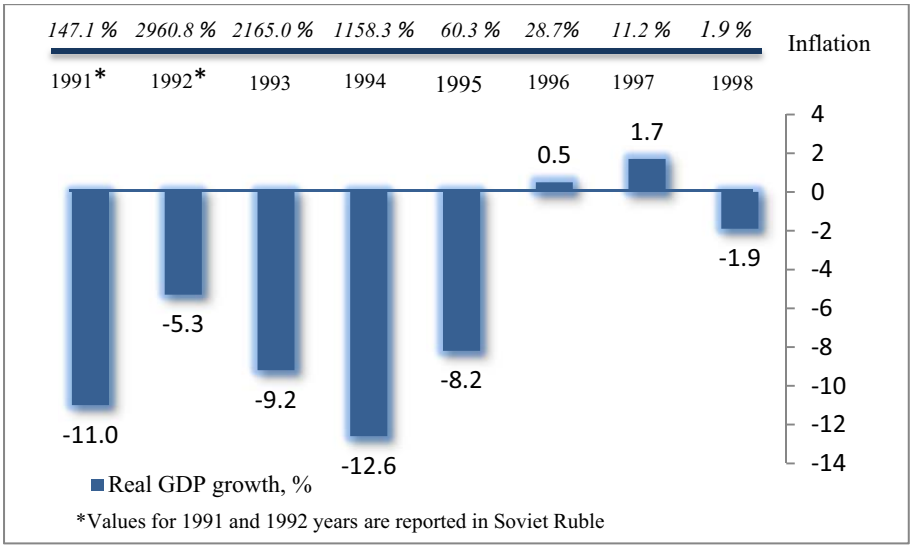
After the collapse of communist system, number of countries in Eastern and Central Europe as well as member countries of the Soviet Union started the process of transformation - switching from planned economy system to market-oriented economy. This process occurred in 3 main steps. At first, the breakdown of planned communist system took place. Secondly, the process of establishment of systemic base of market economy accompanied with macroeconomic stabilization and liberalization of economy started. These were followed by microeconomic and structural reforms (Dabrowski, 1996).

After declaring independence in 1991, Kazakhstan initiated the process of sound reformation of its political and socio-economic systems toward a market-oriented economy. In January 1992 most prices were liberalized. The newly founded Kazakh State Property Committee started work on a program of privatization (Pomfret, 1995). However, the stagnation of the Soviet economy since the late 1970s had negative impact on the economy of Kazakhstan, and the country as well as all the Soviet republics experienced a slowdown in growth at the end of the 1980s, which turned negative in the early 1990s. Agriculture, industry (mining and energy), construction, transport and communication dominated the structure of the output in pre-reform Kazakhstan, accounting for 42 percent, 21 percent, 16 percent and 10 percent, respectively, in 1990 (Akimov and Dollery, 2008: 82).

During the first five years of independence Kazakhstan underwent a period of severe macroeconomic instability. As can be seen in the Figure 1, the growth rate of GDP was constantly below zero level. The inflation rate reached 2165% in 1993 and production level decreased by 50% during 1991-1995 years. In order to prevent continued declining of production, enhanced by the collapse of the Soviet Union and the break of economic interrelations between member countries, the National Bank

actually served as a commercial bank. It issued loans directly to enterprises and was the only source of finance of budget deficits. Thus, reducing inflation and ceasing the fall of production level were among the main targets of the newly established Government and the National Bank.

Figure 1: Real GDP Growth and Inflation Rates



Source: Ministry of National Economy of the Republic of Kazakhstan Committee on Statistics, www.afn.kz

The banking system in Kazakhstan has undergone the process of tremendous expansion, contraction, consolidation and restructuring. In 1987 before the initiation of economic reforms, the banking system of Kazakhstan was represented by three banks: the Gosbank (State Bank), Stroibank (Construction Bank) and Vneshtorgbank (Foreign Trade Bank). The first banking law of the Republic of Kazakhstan, the Banks and Banking Activity Act, was passed by the Supreme Soviet of Kazakhstan in December 1990[1]. This Act permitted the establishment of private banks, created a central banking authority, defined the status of commercial banks, and established limits on the types of transactions that banks can conduct. However, despite the Act's important contributions to Kazakhstan's banking system, it rapidly proved inadequate

[1] Banks and Banking Activity Act dated 07.12.1990. Note that Kazakhstan did not declare its independence from the USSR until December 16, 1991. Therefore, the Banks and Banking Activity Act was passed by the Supreme Soviet of the Kazakh Soviet Socialist Republic. The Republic of Kazakhstan's Constitution was not adopted until January 28, 1993.

and was replaced with two separate statutes, the National Bank Act[2] and the Banks Act[3]. These statutes created the National Bank and represent the birth of Kazakhstan's current banking system (Kibatullin, 1995: 66-67).

At the time of independence in 1991, the banking system consisted of the National Bank of Kazakhstan (NBK), which had previously been a branch of the Soviet Gosbank, the five specialized state-owned banks and 72 commercial banks that had been licensed in 1988-1991 (Akimov and Dollery, 2007). As a result, two tier banking system has been developed in Kazakhstan. The National Bank is the central bank of the country and constitutes the upper level of the banking system. All other banks constitute the lower tier.

After 1991 in order to expand its banking system, Kazakhstan adopted a very liberal policy, which was represented by low capital adequacy requirements, flexible licensing policies, inadequate prudential regulation and absence of legal framework. Consequently, by the end of 1993 the number of banks tripled and reached 184. However, most of newly established banks were poorly capitalized and managed, and were created to serve the financial needs of their parent enterprises.

Table 1: Number of Commercial Banks and Branches

Year	State-owned	Joint-venture*1	Privately-owned	Total	Branches*2
1991	...	...	...	***72***	...
1992	...	...	...	***158***	*890*
1993	...	...	...	***184***	*952*
1994	*3*	*10*	*178*	***191***	*1,022*
1995	*3*	*7*	*120*	***130***	*1,036*
1996	*4*	*8*	*89*	***101***	*949*
1997	*4*	*8*	*71*	***83***	*583*
1998	*1*	*23*	*47*	***71***	*459*

*1- Foreign participation greater than 50 percent.
*2- Excluding the 4,480 offices of People`s Bank.

Source: Hoelscher, 1998: 11; Akimov and Dollery, 2007: 12.

Notwithstanding rapid expansion in the banking system, a severe financial disintermediation arose when the private money holdings denominated in the Russian ruble were converted into foreign currencies, and held outside the domestic

[2] The National Bank Act dated 13.04.1993.
[3] The Banks Act dated 14.04.1993.

banks to hedge against accelerated inflation. As a result, the deposit base fell dramatically from 96% of GDP in 1991 to 20% in 1993 (Bhatti, 2013: 274-275). Until the mid-1993, Kazakhstan remained within the ruble area and monetary policy remained primarily the responsibility of the Central Bank of the Russian Republic. The Central Bank of Russia provided the bulk of financial resources to the NBK, which, in turn, transferred the resources to the specialized banks for on-lending (Hoelscher, 1998: 10). Following the collapse of the ruble area in the mid-1993 and completion of the resource transfer from Russia, the new domestic currency "Tenge" was launched in November 1993. The National Bank of Kazakhstan (NBK) became fully independent to carry out the country's monetary policy, hence switching its stance from managing credit for state-owned enterprises to controlling the monetary aggregates and regulating the banking operations (Bhatti, 2013: 275).

The introduction of a national currency started more intensive reform period. The National Privatization Program (1993-95) launched the mass privatization of medium-sized enterprises. That same year, the first large enterprise was privatized by means of successful tender, a process that continued on a case-by-case basis. At the end of 1994, new legislation on foreign direct investment was introduced permitting the repatriation of profits. Kazakhstan achieved substantial trade liberalization by the first half of 1995, following the abolition of all export quotas and the elimination of most export and import licenses, according to the European Bank for Reconstruction and Development (Akimov and Dolley, 2008: 83).

However, a number of obstacles remained in the banking sector of the new country. One of the major problems facing the Kazakh banking sector since early independence lay in the large stock of non-performing loans, accumulated during the Soviet era by state-owned banks and enhanced by the increase of newly created private banks that had practiced imprudent loan policies. These loans constituted around 11% of GDP and because of remaining unclassified, they overstated the net worth of many banks (Bhatti, 2013). The lax licensing policy – low charter capital requirements and almost no professional requirements for managers of newly created banks - resulting in the establishment of undercapitalized and mostly nonviable banks was the second challenge. Third concern for the NBK consisted of the solvency of the state-owned banks (in which the majority of the deposits were held),

which created a great potential threat for a generalized collapse of the banking system. Another one laid in the absence of prudential regulations and supervision of the second-tier banks and insufficient number of skilled specialists.

In order to solve the aforementioned issues and to found sustainable financial system, a comprehensive financial reform program was initiated by the NBK. The first step in bank restructuring was taken in 1993, when the NBK tightened the existing, albeit inadequate, licensing regulations. The Banks Act of 1993 started the legislative reforms. The minimum legal capital requirement for the existing and new banks was increased from 5 million ruble for all banks to 200 million ruble (approximately US $200,000) and for a joint venture banks to US $1 million. In April 1994, to conduct general banking transactions the minimum capital requirement was set at US $500,000 and US $1.5 million to obtain a license for carrying out foreign currency transactions. Besides, strict actions were taken against poorly capitalized non-viable banks. As a consequence, of 130 registered banks 60 were liquidated, reducing the total number of banks to just 130 in 1995 and 83 in 1997. Moreover, of 130 registered banks only 37 banks were granted the license to conduct general banking transactions and 48 to conduct foreign currency transactions (Bhatti, 2013: 276).

During 1994 - 1995, the NBK introduced the first prudential regulations to ensure stability in banking sector. Bank of International Settlement (BIS) guidelines for prudential supervision were adopted, which included on-site and off-site inspections, compulsory asset classification and provisioning requirements. Regulations were established on liquidity, lending limits, insider transactions, and reserve requirements, and requirements for loan classification and loan loss provisions were set up (Akimov and Dollery, 2008). International standards on accounting and auditing and standardized reporting forms were introduced to make bank financial reports more informative.

Banks were required to resubmit their business plans, detailing their present financial condition, compliance with prudential standards and programs for meeting all prudential requirements within the next five years. In 1995, actions were taken against 37 banks engaged in unsound banking practices and as such 33 banks were liquidated with a paid-in capital of less than KZT 5 billion, with no loan loss

provisioning, and mergers were encouraged of weaker banks with stronger ones. Liquidation proceedings were initiated against the banks which failed to develop a satisfactory business plan, while those fulfilling the requirements were asked to shorten the transition period from five to three years to benefit from such incentives as having the privilege (i) to own stocks in investment companies, (ii) participate in the NBK's credit auctions, (iii) to conduct international operations (iv) to issue bonds, certificates and checks and (v) to act as a custodian of corporate securities (Bhatti, 2013: 277).

With regard to managing nonperforming loans, the NBK under the supervision of World Bank decided to adopt a centralized approach. In this approach a separate financial institution is created so as to take a certain portion of the bad credits from the commercial banks and thus, on one hand, help clean the bank balances, and on the other, create acceptable conditions for debtors (Jermakovich and Irishev, 1996). The state banks were unable to manage such loans, in part because the borrowers were severely handicapped by deteriorating economic conditions and in part because the banks lacked the experience of operating in a market economy. Furthermore, neither the NBK nor the government was able to recapitalize the entire banking system. Therefore, the stock of nonperforming loans was transferred to newly created debt resolution institutions: the Rehabilitation Bank, the Agricultural Fund Support and Exim Bank. Besides, the state banks were required to resolve any remaining financial problems themselves. The only resources provided by the public sector came from the NBK`s short-term lender-of-last-resort facility (Hoelscher, 1998).

All things considered, the initial phase of financial sector restructuring program was performed successfully and by the end of 1999 the regulatory and prudential environment was largely in place.

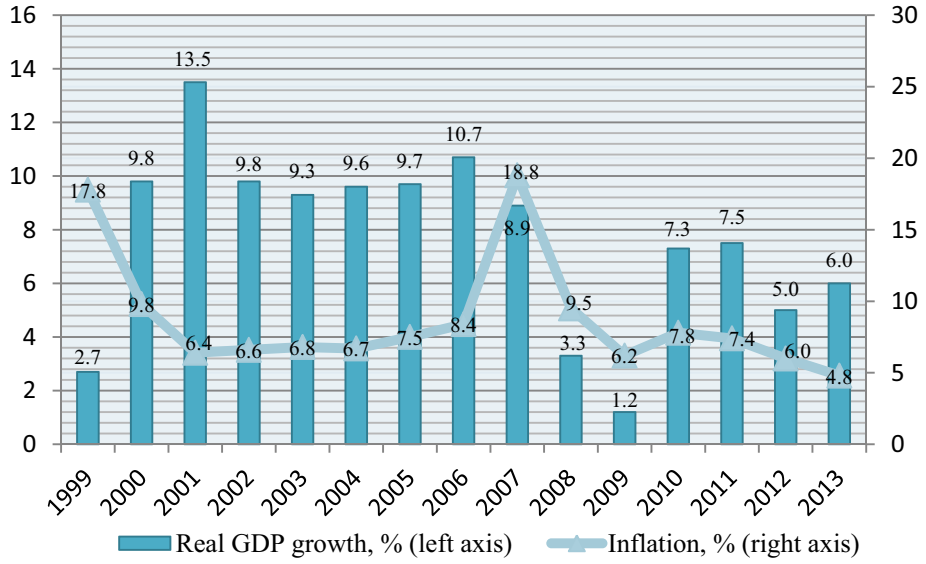
1.2. THE PERIOD OF MACROECONOMIC STABILITY (1999-2007) AND THE GLOBAL FINANCIAL CRISIS OF 2008

The period after 1996 could be called the period of stability except for 1999 when the economy of Kazakhstan was affected by the crisis in Russian banking

sector. Kazakhstan's economy has developed rapidly since the beginning of 2000s. Against the background of positive growth in production in many sectors of the economy, sustainable development of the financial market and the sustained growth of the resource base of banks significantly increased their lending capacity.

As can be seen in the figure below production levels increased following the rise in oil and gas exports. The GDP growth rate improved and averaged at 7.2 % annually for the period of 2000 - 2007. Inflation rate stabilized and was consistently below 10% level prior to the crisis.

Figure 2: Real GDP Growth and Inflation Rates 1999 – 2013



Source: Financial Supervision of the NBK, www.afn.kz, NBK, www.nationalbank.kz

In line with the improvements of macroeconomic conditions, the process of further recovering and restructuring of the banking system started by the end of 1999. Foundations for market-based banking system have been already laid by establishing the National Bank and reaching the necessary coordination in its functioning. Further, monetary policy instruments were defined, supervision of the second-tier banks was strengthened and actions for preparing skilled management and labor force were undertaken. Next steps of this reformation included the gradual capitalization of operating banks, increased inflow of customer deposits and deposits of citizens, restoring liquidity and profitability of the majority of credit institutions and the bankruptcy proceedings in respect of insolvent ones. Successive and

interrelated steps to reform and develop the banking system, as well as the implementation of a moderately tight monetary policy helped to curb inflation, stabilize the exchange rate of Tenge and reduce interest rates.

In 1999 the National Bank established the Deposit Insurance Fund providing significant stability of the banking system. The Fund prevents short-circuit runs on banks and bank panics by providing a safety net for depositors. At the same time, it provides support to domestic banks when they face runs. Relevant amendments were made to the legislation on bank supervision in 2001, which greatly contributed to improving the quality of supervision of large banks and the development of fair competition in the banking sector.

In 2003 with the Decree of the President of Kazakhstan a new entity named the Agency for Regulation and Supervision of Financial Markets and Financial Organizations was settled. Therefore, regulating and supervising functions of the National Bank were deputed to it. The NBK, according to the President's Decree was responsible for ensuring the internal and external stability of the national currency, price stability, drafts and implements the state monetary policy with the cooperation of the Ministry of Finance, controlling operations in foreign exchange market and protects the interests of bank depositors and creditors. Besides, Kazakhstan adopted the International Accounting Standards (IAS) in 2003 and the Basel II capital adequacy accord in 2005.

As a result of introduction of strict prudential regulations and licensing policies, the number of banks fell to 39 in 2000 and as depicted in the Table 2 below remained relatively the same during the following decade.

Table 2: Number of Banks and Branches 2004 – 2013

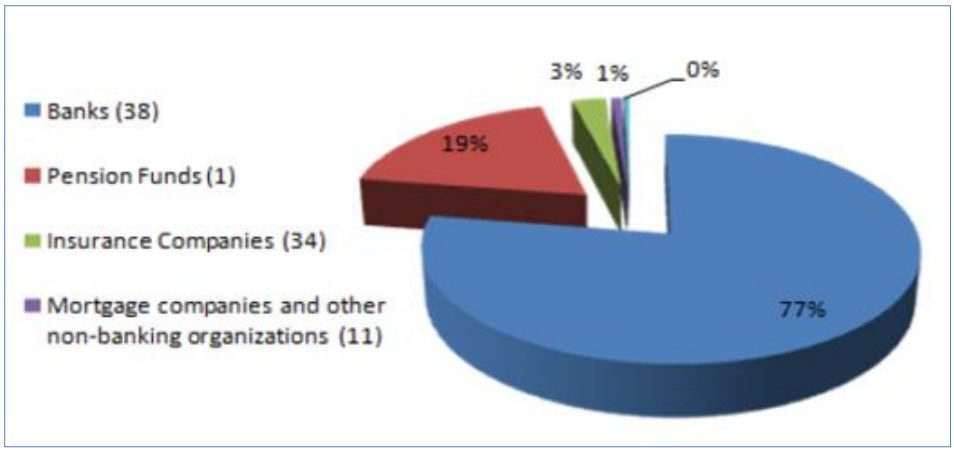
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Deposit Banks	***35***	***34***	***33***	***35***	***37***	***38***	***39***	***38***	***38***	***38***
State-owned	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Private	*19*	*19*	*18*	*18*	*19*	*20*	*20*	*18*	*19*	*18*
Foreign	*15*	*14*	*14*	*16*	*17*	*17*	*18*	*19*	*18*	*19*
Development Banks	***1***	***1***	***2***	***2***	***2***	***2***	***2***	***2***	***2***	***2***
TOTAL	**36**	**35**	**35**	**37**	**39**	**40**	**41**	**40**	**40**	**40**
Number of Branches	385	418	324	352	379	374	365	378	362	378

Source: Financial Supervision of the NBK www.afn.kz, NBK www.nationalbank.kz.

With privatization that started in 1995 and took place through auctions organized by the State Committee for Privatization most state banks were privatized[4]. The Halyk Bank (People`s Bank) was privatized in 2001 and Exim Bank which merged with Rehabilitation Bank was sold out in 2004. Privatization of banks aimed at strengthening their financial stability and preventing uncontrollable watering down of the state share of their charter capital (Jermakovich and Irishev, 1996). In 2003 the Government of Kazakhstan established a new state bank named House Construction and Savings Bank of Kazakhstan. The bank focuses on medium- and long-term crediting for housing construction. Its activities are based on the savings mortgage system, when one can get a mortgage loan for the remaining amount after he has accumulated 50 % of the cost of a house.

The banking sector comprises most of the financial system of the country. As presented in the Figure 3, it accounts for 77% of all financial assets (2013). Non-bank institutions are not well developed yet.

Figure 3: Structure of the Financial System of Kazakhstan
(Percent of Financial Assets, 2013)



Source: IMF Country Financial Assessment Report 2014: Kazakhstan

Note: Figures in parentheses indicate the number of institutions in each sector.

[4] The privatization of state-owned banks was initiated by the Government of the Republic of Kazakhstan with the Resolution No: 304 dated 20.03.1995 "On Measures to Rearrange State Stock in the Second Tier Banks".

There are two development banks in the country: Development Bank of Kazakhstan established in 2001 and Eurasian Bank of Development opened in 2006. The banks` activities are aimed at creating the conditions necessary for encouraging sustainable economic development, supporting investment projects with long-term loans, assisting in attracting foreign and domestic investment in the economy, appraising and structuring of major projects in the priority sectors of the economy. These banks make up for the lack of long-term investment resources in the economy and allow the implementation of projects which are characterized by high risk, long payback periods, low profitability and the need for substantial upfront investment. The main purpose of the bank is to increase the efficiency of government investments, develop industrial infrastructure, and assist in attracting domestic and foreign investment into the national economy.

The banking sector is mostly presented by privately-owned domestic banks and banks with foreign participation. Since early stages of formation of the banking system in Kazakhstan, people have been inclined to trust local banks more than foreign ones, which laid strong foundation for growth of the Kazakh local banks. Three local banks successfully held IPOs on the London Stock Exchange: the largest by asset value JSC “Kazkommertsbank”, the third largest JSC “Halyk Bank of Kazakhstan”, and the fourth largest JSC “Alliance Bank”. Two large local banks were purchased by international banks: the fifth largest JSC “ATF Bank” was acquired by UniCredit Group, and the sixth JSC “CenterCredit Bank” – by South-Korean group Kookmin. Also, some smaller banks were purchased: Texaka Bank was acquired by Sberbank, and MB Alma-Ata – by HomeCredit Bank.

Although the number of domestic and foreign banks is nearly the same (Table 2), the sector itself is characterized by moderately high concentration: Herfindahl-Hirschman index of 13.9% (Baimakhanov, 2009). Over the last ten years the top 5 banks, JSC "Kazkommertsbank", JSC "Halyk Bank", JSC "BTA Bank", JSC "Bank Center Credit" and JSC "ATF Bank" accounted for 71 % of total assets and 70% of all deposits on average in the sector. Before the 2008 crisis, the three largest banks, among which the most affected "BTA Bank", accumulated 44.6% of all deposits of individuals and 59.6% of total deposits of legal entities. Even though the share of aforementioned banks slightly decreased after the global financial crisis, it still

covers a huge portion of the market. The share of foreign participation in the banking sector in Kazakhstan is relatively small. About 20% of the entire banking system is owned by non-residents.

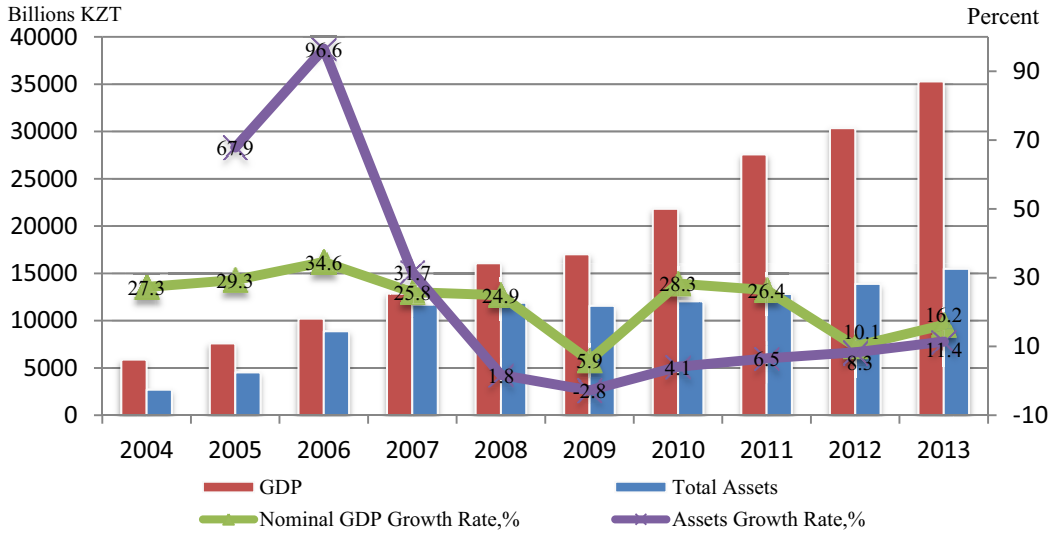
Table 3: Concentration of Banking Sector* (Percentage)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Largest three*										
Assets	*58.7*	*58.8*	*57.9*	*59.3*	*57.8*	*54.6*	*53.6*	*49.3*	*46.2*	*41.8*
Deposit	*66.1*	*68.1*	*58.9*	*64.5*	*61.9*	*55.4*	*51.2*	*46.6*	*43.1*	*38.8*
Loans	*62.4*	*60.7*	*58.3*	*67.5*	*61.8*	*63.0*	*57.5*	*55.0*	*51.4*	*49.4*
Largest five*										
Assets	*73.7*	*74.1*	*79.4*	*78.0*	*74.8*	*73.9*	*71.8*	*65.3*	*60.0*	*55.4*
Deposit	*76.9*	*78.8*	*79.5*	*79.4*	*74.5*	*71.7*	*69.8*	*62.2*	*57.5*	*53.6*
Loans	*77.1*	*74.9*	*79.5*	*87.6*	*78.0*	*78.8*	*74.8*	*70.9*	*65.3*	*62.1*

*In terms of Total Assets
Source: Financial Supervision of the NBK www.afn.kz and NBK www.nationalbank.kz

During the 10 year period of intensive economic growth before the 2008 crisis broke out, Kazakhstan managed to achieve amazing success in its economic development with the banking sector consistently showing two-digit annual growth rates of assets (Figure 4).

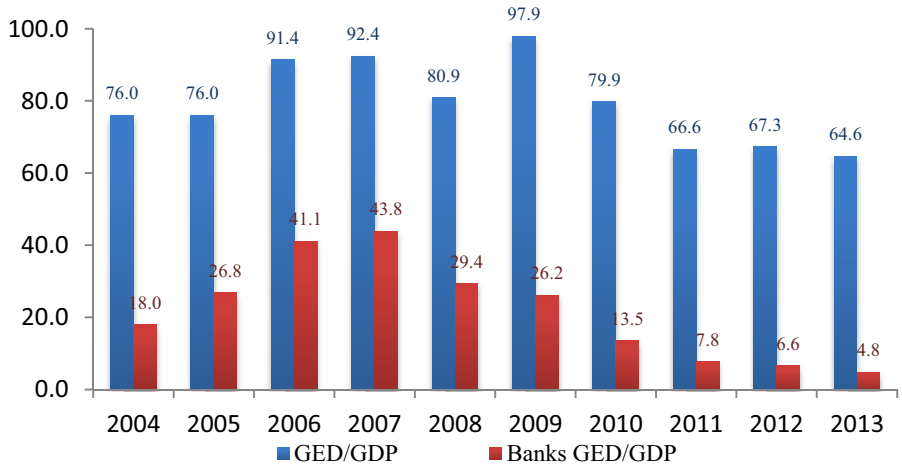
Figure 4: GDP and Assets of the Banking Sector



Source: Financial Supervision of the NBK, www.afn.kz

High economic growth rates since early 2000s demanded similar changes from the financial system of Kazakhstan. Gross foreign debt of banks increased from US $ 1.4 billion (6% of GDP) in 2002 to US $ 45.9 billion (45% of GDP) by the end of 2007, which constituted about half of the total external debt of Kazakhstan.

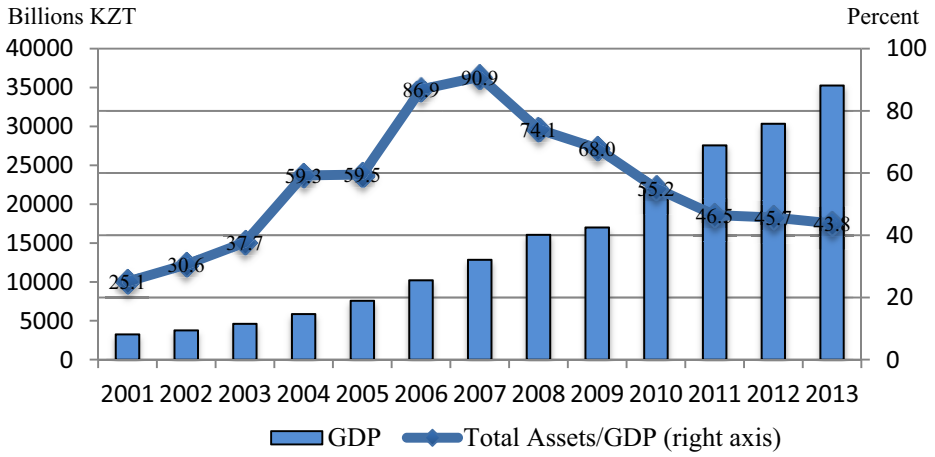
Figure 5: Gross External Debt (GED) and GDP (Percentage)



Source: Financial Supervision of the NBK, www.afn.kz

This model of "external expansion" of the banking sector was influenced by a number of factors: the growth of credit activity abroad and the abundance of cheap resources as well as low interest rates. Moreover, the National Bank of Kazakhstan practiced the policy of pegging exchange rate to US dollar. This, in turn, significantly reduced the risks of external accounts for banks. The growing economy and the prices of assets as collateral for foreign loans, primarily in the construction and oil sectors, decreased the risk for foreign creditors and expanded opportunities to attract loans for domestic borrowers.

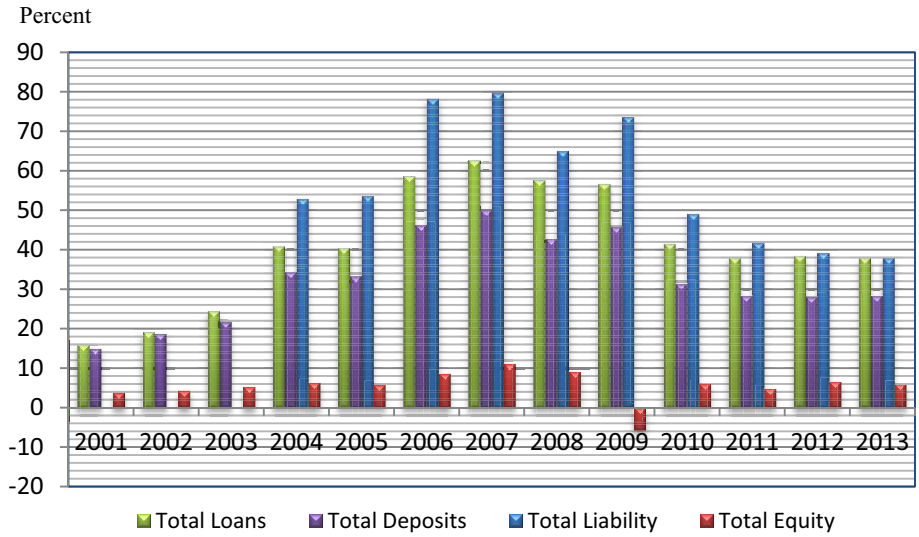
Figure 6: Total Assets (KZT billion, as percentage of GDP)



Source: Financial Supervision of the NBK, www.afn.kz and NBK, www.nationalbank.kz

As a result, only in 2005-2007 banking assets increased from 59% of GDP to 91% of GDP, while in 2002 they accounted for only 25% of GDP. The share of the banking sector in GDP increased from 3.4% of GDP in 2000 to 5.9% of GDP in 2007. Lending volumes increased at an average rate of 74% per year over the period 2005-2007. At the same time, real interest rates were positive in Tenge until mid-2008. Deposits grow rapidly and peaked at 50.1 % of GDP at the end of 2007. Banks were actively participating in currency transactions. Currency deposits accounted for 32% of all deposits by the end of 2007, while loans in foreign currency composed 50% of all loans to non-financial corporations and 37% of loans to households. Despite increasing levels of deposits, which reflects growing confidence among population to banks, the level of loans was rising quickly. By the end of 2007 the ratio of loans to deposits reached 130%.

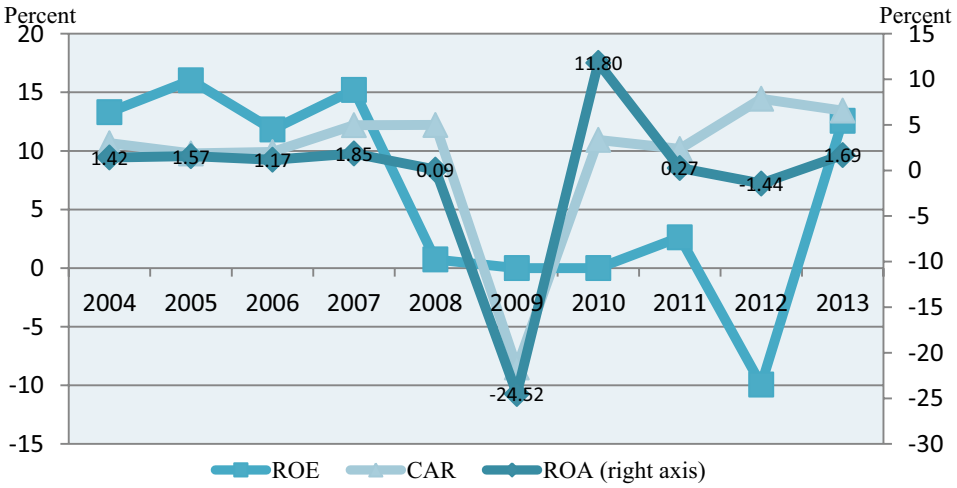
Figure 7: Main Balance Sheet Items of Banks (as percentage of GDP)



Source: Financial Supervision of the NBK, www.afn.kz and NBK, www.nationalbank.kz

The first signs of crisis began to appear already in 2006. Firstly, the percentage of bank assets to GDP increased from 60% in the beginning of 2006 to 91% in 2007. The non-tradable sector, particularly construction recorded unsustainably high growth rates fueled by a credit boom financed through wholesale borrowing, mainly from Europe. Between 2005 and 2007, Kazakhstan's banks borrowed from abroad the equivalent of 44 percent of GDP and loaned a substantial part of those funds to non-tradable sectors. As financial conditions tightened with the onset of the global financial crisis, banks lost access to foreign financing and were forced to deleverage aggressively, triggering a decline in stock and real estate prices and a strong deceleration in non-oil economic activity, particularly in the construction sector. The situation was deteriorated by the aggressive policy carried on by almost all banks in Kazakhstan. It included the high interest rate on deposits, which attracted a lot of customers. In addition to this a procedure of issuance of loans was very easy: it required a minimum of documents and little time, so the problem of adverse selection and moral hazard was widespread because not all clients had the possibility to pay off a loan.

Figure 8: Profitability Ratios and Capital Adequacy Ratio



Source: Financial Supervision of the NBK, www.afn.kz and NBK, www.nationalbank.kz

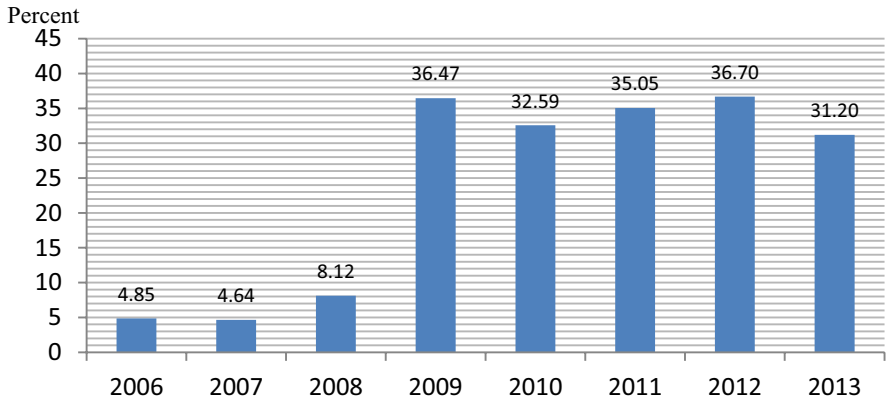
The profitability ratios (ROA and ROE) and capital adequacy ratio (CAR) show the banking sector reaching "the deep" (Figure 8). They turned negative in 2009 and even in recent years remain low reflecting both low earnings and loan-loss charges. The devaluation of national currency by 25% in 2009 worsened the banks' external debt servicing problems, prompting the government acquisition of majority stakes in three large banks (JSC "Alliance Bank", JSC "Temirbank", and JSC "BTA Bank") and minority stakes in another two (JSC "Kazkommertsbank" and JSC "Halyk Bank"). The government nationalized three of the largest banks and restructured their external obligations, thus preventing a collapse of the banking system. In order to stabilize financial sector total of 480 billion Tenge (US $3.5 billion) has been allocated.

In order to restore the economy of a country after crisis, the government established the JSC Sovereign Wealth Fund "Samruk-Kazyna" in 2008. The purpose of the Fund is to enhance competitiveness and sustainability of national economy and prevent any potential negative impact of changes in the world markets on economic growth of the country. Although the Fund helped the banks with unsound performance to handle their liabilities, improving efficiency still remains the issue of concern due to high level of NPLs.

Among other measures to improve the supervision and regulation of the financial sector, the government decided to implement the counter-cyclical principle, which involves establishing provisioning, increasing equity, reserves and liquidity in the period of economic growth and their use during the recession. Moreover, refinancing of mortgage loans was supported by the government. By the end of 2009 the total amount of aid summing 120 billion KZT (US $0.81 billion) was utilized. Despite the restructuring of these banks' external liabilities in subsequent years, banks continued to face difficulties as the deceleration in growth, the collapse of real estate prices, and the devaluation led to a significant build up of non-performing loans (NPLs).

Although the increase of non-performing loans was triggered by the overheated real estate market that collapsed in 2007, the percentage of non-performing loans in loan portfolio remains to be high despite all measures taken by the National Bank. They currently constitute to about 30% sector-wide (Figure 9).

Figure 9: Non-Performing Loans to Total Loans (Percentage)



Source: Financial Supervision of the NBK, www.afn.kz

The current situation in the banking sector in Kazakhstan remains difficult. Banks' asset quality continues to deteriorate, albeit slow down the pace and volume of bad loans remains at a very high level. This imposes restrictions on the expansion of credit activity that inhibits the growth of the economy.

CHAPTER TWO
LITERATURE REVIEW

Since the publication of papers on efficient frontier estimation and related efficiency concepts by Debreu (1951), Koopmans (1951), Shephard (1953, 1970) and Farrell (1957), the topic of measuring efficiency in different service sectors, notably in financial profit-seeking organizations, has been investigated extensively. As a result of developments in computer and communications technology together with the introduction of new financial instruments, during the past few decades the banking industry around the world has undergone significant regulatory and technological changes. Hence, the technology of bank production has been thoroughly modified. In this regard, the question of improvements in bank efficiency has become one of the main topics of analysis for scholars, researchers and practitioners. Moreover, the increased availability of data and introduction of sophisticated computer packages made cross-country comparisons possible.

The papers on bank efficiency measurement and its determinants could be summarized according to methods applied and types of countries being examined. Berger and Humphrey (1997) conducted a comprehensive survey of 130 studies that applied frontier efficiency analysis to financial institutions in 21 countries. They compared various efficiency methods and came to conclusion that these methods do not necessarily produce consistent results. Thus they made recommendations on the aforementioned methods to bring more accurate, consistent and useful outcomes.

Efficiency is commonly estimated by employing parametric method, such as Stochastic Frontier Approach, or non-parametric method, the most popular of which is Data Envelopment Analysis. Although the latter is supposed to be sensitive to data problems or other measurement errors, the DEA approach has been widely applied in studies of the banking industry in developed market economies. Referring to Berger and Humphrey (1997) on U.S. data alone the method was used in more than 30 published articles. The method was also applied for cases in Norway, Spain, U.K. and several other countries and used for inter-countries comparisons.

Notwithstanding a vast literature on measurement of bank efficiency, most of existed studies were devoted to financial intermediaries of developed countries. These countries have financial systems that have much greater depth and breadth,

hedging instruments are available, insurance markets are very sophisticated, deposit insurance is required by law and information and full disclosure facilitate risk assessment. However, with profound developments of emerging economies and establishment of new countries after the collapse of communist bloc in the late 1980s, which started the process of transforming their economies from planned to competitive one, the interest to banking sectors of these countries has gained a momentum.

2.1. EMPIRICAL EVIDENCE ON BANK PERFORMANCE IN DEVELOPING AND EMERGING COUNTRIES

Carvallo and Kasman (2005) estimated a common cost frontier with country-specific environmental variables for a panel of 481 banks from 16 Latin American countries. Their results suggest a wide range of inefficiency levels across countries. Very small and very large banks found to be most inefficient. Regarding sources of inefficiency, authors conclude that banks operating above the optimum frontier tend to be small, undercapitalized, present poor performance, dependent on non-interest income and more prone to engage in risky financial policies.

Productive efficiency of banks in India was investigated by Sathye (2003), who applied DEA method. The results indicate that efficiency of Indian banks compares well with the world efficiency score and the efficiency of private sector commercial banks as a group is lower than that of public sector banks and foreign banks in India.

Yin *et.al*. (2013) examined the Chinese bank efficiency after the WTO accession and observed a favorable impact of the latter on the efficiency. For the largest banks with substantial state ownership the improvement of bank efficiency is most prominent, however, bank efficiency decreases with bank size at the lower end.

Isik and Hasan (2003) examined the productivity growth, efficiency change, and technical progress in Turkish commercial banks during the deregulation of financial markets in Turkey by applying DEA-type TFP change index. They found that all forms of Turkish banks, although in different magnitudes, have recorded significant productivity gains driven mostly by efficiency increases rather than

technical progress. Improved resource management practices rather than improved scales were the main source of efficiency increases.

2.2. EMPIRICAL EVIDENCE ON BANK PERFORMANCE IN TRANSITION COUNTRIES

The empirical literature on transition countries includes countries of Eastern Europe and countries being parts of the former Soviet Union.

Bonin et al. (2005) dealt with banks in eleven European transition countries during 1996-2000. They found that government-owned banks were not appreciably less efficient than domestic private banks. Foreign-owned banks were determined to be more cost-efficient and provide better service than other banks.

Hasan and Marton (2003) examined the development of the Hungarian banking sector between 1993-1997, using a Fourier-flexible approach to estimate 6 profit and cost inefficiencies. The establishment of a two-tier banking sector, privatization and the entry of foreign banks were the most significant factors in strengthening the banking system in the country. Moreover, banks with foreign involvement were found to be less profit and cost inefficient than their domestic counterparts. Ownership is important as the higher foreign share in the banks with foreign investors appear to be highly correlated with lower inefficiency.

Weill (2003) conducted a comparative analysis of the performance of foreign owned and domestic-owned banks operating in the Czech Republic and Poland. He applied the stochastic frontier approach to measure efficiency scores and found that on average foreign banks are more efficient than domestic banks.

Nazin (2010) investigated the change in the efficiency of Russian banks during the crisis period and exposure of different categories of banks to external shocks. He applied data envelopment analysis to derive efficiency scores and used bootstrap method for statistical inferences. He concludes that foreign banks perform better than domestic banks, however he found no difference between the efficiency levels of banks located in Moscow and regional banks. The crisis turns to further exacerbate the difference between the banking groups.

Mertens and Urga (2001) used stochastic frontier approach to evaluate the performance of Ukrainian commercial banks. They found that small banks operate more efficiently in terms of cost but less efficiently in terms of profit. Also large banks show significant diseconomies of scale while small ones show significant scale economies.

Ibrahimov (2009) analyzed the efficiency performance of Azerbaijan banking system between 2002 and 2007 by using DEA approach. He found that overall and pure technical efficiency scores show a great variation, which means banks have scale problems. Ibrahimov (2009) suggests that negative effects on efficiency caused by structural changes and reforms would persist in the short run, but in the long run efficiency would improve. State banks turn to be managed better than private banks.

2.3. EMPIRICAL EVIDENCE ON BANK PERFORMANCE IN KAZAKHSTAN

Given the excessive interest to emerging market economies during the last decade and problems experienced by the Kazakh financial system after the global financial crisis in recent years, surprisingly little academic research has been undertaken into the costs and efficiency of Kazakh banks.

One of the pioneered works in this field is an article published by Grigorian and Manole (2002). They examine the performance of commercial banks in 17 transition countries for 1995 – 1998 period. They apply the DEA method and demonstrate that this method could be successfully applied to the banking systems of such economies [5]. They observe that bank cost efficiency is significantly and positively correlated with GDP per capita and weakly and positively associated with a measure of progress in institutional reform. Also foreign ownership enhances commercial bank efficiency and consolidation is likely to improve efficiency of bank operations.

[5] Some problems existed with transition-specific data, particularly for the period before 2000s. Accounting standards for reporting were not universal among countries as well as banks in one country. However, Grigorian and Manole (2002) pointed out that limitations were common in all transition countries, the analysis was unlikely to be significantly affected.

With reference to the performance of banks in Kazakhstan, Grigorian and Manole (2002) find moderate efficiency levels (average 0.593) compared to other countries. However, Kazakhstan exhibits the highest efficiency scores in its subgroup of CIS countries during the investigated time period. This may be related to the fact that right after declaring independence in 1991 the new government took seriously steps in restructuring financial system of a country by initiating privatization and new legislations.

Another contribution to the literature is made by Fries and Taci (2005). They examine the cost efficiency of 289 banks in 15 post-communist countries during the period 1994-2001 by using stochastic frontier approach. Apart from twelve transition economies of Eastern Europe, the authors also include three post-soviet countries, namely Russia, Ukraine and Kazakhstan. They state that private banks are more efficient than state-owned banks, but there are differences among private banks. Privatized banks with majority foreign ownership are the most efficient and those with domestic ownership are the least. They find the relationship between country`s progress in banking reform and cost efficiency to be non-linear. Early stages of reform are associated with cost reductions, while costs tend to rise at more advanced stages (Fries and Taci, 2005). This relationship is supposed to reflect the transition by banks from defensive restructuring (that is, cost cutting) to deeper restructuring that increases the quality and value added of banking services (that is, innovation).

In reference to country-based results, authors state that such countries as Estonia, Kazakhstan, Latvia, Lithuania, Slovakia, and Slovenia are the most efficient. The average efficiency scores of 10 Kazakh banks with and without country-level factors range from 0.78 to 0.83 respectively, whereas those of 48 Russian banks range from 0.46 and 0.70. This implies that the Kazakh banks are much more efficient than Russian banks during the time period under study.

However, the results obtained by Fries and Taci (2005) fall in contrast with the findings of Peresetsky (2010), who performed comparative analysis of bank cost efficiencies of Kazakhstan and Russia. Due to differences in reporting standards of two countries[6], Peresetsky (2010) uses the data on audited IAS balance sheets of

[6] Kazakhstani banks started publishing financial reports in accordance with International Accounting Standards since 2003, while most Russian banks continue to publish their statements under the Russian Accounting System with some banks providing dual versions of their balance sheets.

banks from Moody`s Rating database. These data complies with a single set of rules, but the sample lack homogeneity and is biased towards large banks interested in having a rating to gain access to the international financial markets (Peresetsky, 2010:10). Therefore, he uses 16 Kazakhstani and 78 Russian banks over 2002-2006 with total of 460 observations. Peresetsky (2010) finds no significant difference for the average cost efficiency scores of banks for the two countries. The rank of banks for efficiency depends upon the chosen model (input and output sets), which he uses in his analysis. He also points out that most banks in both countries are below optimal size. As mentioned above this outcome contradicts the findings of Fries and Taci (2005). The differences can be attributed to the different time periods chosen by the two researches, since the banking systems of both Kazakhstan and Russia evolved after 2001. Alternatively, specification of the cost functions used by used by Fries and Taci (2005) does not distinguish between deposits and borrowings, which were especially higher during the crisis period and affected favorably the efficiency estimates.

Kumbhakar and Peresetsky (2013) yield the same results for comparison of banking systems of Russia and Kazakhstan. By applying stochastic frontier approach to a panel data of banks for 2002 - 2006, they find no significant difference in the cost efficiency of the banks of the two countries. The results remain quite robust across several alternative and competing models.

Djalilov and Piesse (2011) examin the progress of the developments of banking sector in Central Asian countries during 2003 – 2006 by applying non-parametric approach to productivity and efficiency measurement. The authors aimed at investigating whether the total factor productivity of banks in the region concerned was improving, worsening or static during the period of reform. TFP was further decomposed into technical efficiency and technical progress. The sample consisted of 21 banks from Kazakhstan, 3 from Kyrgyz Republic and 6 from Uzbekistan. The limitation of banks was primarily related to the lack of data available. In regards to input-output determination of bank activity the asset approach, which considers banks as financial intermediaries, was used. Hence, loans and net income were selected as outputs, while inputs included non-earning assets, deposits and short-term funding, overhead, fixed assets and equity. The bank level efficiencies are then

aggregated to provide an overview of the status of the banking sector by country. According to the results, total factor productivity has improved by 27% over the research period. Decomposition of the Malmquist Index into the changes in technical efficiency and technical progress shows the main source of improvement. Authors found that technical efficiency improved in 2004, but was followed by a sharp decline in 2005 and the overall technical efficiency became 9% less efficient at the end of the period. However, technical progress improved by 39% from 2003 to 2006, which appeared to have been the major reason for the overall total productivity improvements. Similar to the results above, technical efficiency appeared to have worsened over the period. Thus, the authors conclude that the major driver of improved banking productivity during the period under study was technical progress, while the low levels of technical efficiency were a barrier to growth in the sector. Much of the transition programs were supported by the international community and the provision of electronic banking systems and software has improved the productivity of these banks. However, the managerial expertise and credit assessment practices were part of the knowledge transfer that would take some time to trickle down to the individual institutions. Thus, it is no surprise that the frontier moves forward, but the banking expertise lags behind (Djalilov and Piesse, 2011: 11).

Djalilov and Piesse (2011) also examine the productivity of banks on individual basis and performed inter-bank and inter-temporal comparisons. They find that 6 of Kazakh banks, namely JSC “Astana Finance”, JSC “Bank Centre Credit”, JSC “BTA Bank”, JSC “KazAgroFinance”, JSC “Kazkommertsbank” and JSC “Temirbank” had stable improvements in the productivity index, while the remaining banks experienced a volatile trend in total productivity. One Kazakh bank (JSC “TAIB Kazakh bank”) had a downward trend over the whole period, becoming 92% more technically inefficient in 2006 as compared to the base year of 2003. The authors further examined financial statements of banks with low productivity scores so as to identify the reasons for this pattern. The analysis of the financial ratios of the banks showed that the profitability ratio of “TAIB Kazak Bank” was decreasing toward the end of the data period 2003-2006, which could account for this significant drop in the efficiency scores as the bank could have changed its scale of operation. However, this may be attributed to the errors in the reported data, which was

common feature for Central Asian banks. On the overall, the authors come to conclusion that for banking in Central Asia removing barriers to foreign entry and attracting foreign investors may be the best option for improving competition and ensuring economic growth. But at the moment, the remaining presence of specialized state owned banks is still hindering improvements in banking competition (Djalilov and Piesse, 2011).

More recent research, which focused on the performance of banks in Kazakhstan, is done by Bhatti (2013). He examines the technical efficiency of 20 Kazakhstani banks during the period of 2007-2011, which covers the impact of global financial crisis on the sector and economy as a whole. Bhatti (2013) constructs three input - three output model and uses non-parametric approach to estimate efficiency scores. In his model interest expense, non-interest expense and deposits compose inputs, while interest income, non-interest income and loans form outputs. According to outcome the Kazakh banking sector can be characterized as more technical efficient. He finds that 5 of 20 Kazakhstani banks, namely JSC ATF Bank, JSC Citibank, JSC HSBC Bank, JSC KazInvest Bank and JSC Exim Bank are the most efficient banks during the period of investigation with efficiency score consistently equaling to unity, even during the crisis period. The remaining banks turn to be less efficient, but still have relatively high efficiency scores ranging between 0.86 and 0.98. The study indicates that the banking sector in general has been affected by the crisis and banks deteriorated considerably with efficiency scores dropping to 0.40 in 2009. Bhatti (2013) also points out that foreign banks perform relatively better than domestic banks, the evidence which is consistent with previous researches.

The present thesis contributes to the existing literature in several respects. The period it covers is characterized by established legislative base of financial system, improved supervisory and regulatory functions of the NBK as well as high economic growth until the crisis. In that respect the study allows to examine the effects of recent developments and financial reforms of 1990s on bank performance. The research covers 14-year period and captures almost all banks in the sector. In this context, it allows to investigate the impact of global financial crisis of late 2000s over the banking sector and evaluate the recovery measures undertaken by

authorities. Moreover, the study identifies the sources of inefficiency and proposes the policy implications.

CHAPTER THREE
METHODOLOGY

3.1. MAIN CONCEPTS

3.1.1. Efficiency

In a world of scarce resources the topic of production efficiency has attracted enormous attention among economists. As was mentioned above, a rigorous analytical approach to the measurement of efficiency in production originated with the work of Koopmans (1951) and Debreu (1951). Farrell's (1957) seminal work gave rise to a considerable amount of empirical studies of efficiency concept.

While expressing the ratio between outputs and inputs, efficiency can be described as a distance between the quantity of input and output, and the quantity of input and output that defines a frontier, the best possible frontier for a firm in its cluster (industry) (Daraio and Simar, 2007: 14).

Lovell (1993) defines the efficiency of a production unit in terms of a comparison between observed and optimal values of its output and input. The comparison can take the form of the ratio of observed to maximum potential output obtainable from the given input, or the ratio of minimum potential to observed input required to produce the given output. In these two comparisons the optimum is defined in terms of production possibilities, and *efficiency is technical*.

Koopmans (1951) provided a definition of what is referred to as *technical efficiency*: an input-output vector is technically efficient if, and only if, increasing any output or decreasing any input is possible only by decreasing some other output or increasing some other input.

Debreu (1951) offered the first measure of *productive efficiency* with his *coefficient of resource utilization*. Debreu's measure is a radial measure of technical efficiency. Radial measures focus on the maximum feasible equiproportionate reduction in all variable inputs, or the maximum feasible equiproportionate expansion of all outputs. They are independent of unit of measurement.

Farrell (1957) extended the work initiated by Koopmans and Debreu and defined a simple measure of firm efficiency that could account for multiple inputs.

Farrell (1957) proposed that the efficiency of a firm consists of two components: *technical efficiency,* which reflects the ability of a firm to obtain maximal output from a given set of inputs, and *allocative efficiency,* which reflects the ability of a firm to select the "right" technically efficient input-output vector in light of prevailing input and output prices and the production technology. These two measures are then combined to provide a measure of total *economic efficiency or overall cost efficiency.*

One more concept regarding efficiency is worth considering. The *scale efficiency* relates to the optimal size of the production. A firm is said to be scale efficient when its size of operations is optimal so that any modifications on its size will render the unit less efficient. The concept of scale efficiency has been developed in three different ways. Farrell (1957) used the most restrictive technology having constant returns to scale (CRS) and exhibiting strong disposability of inputs. This model has been developed in a linear programming framework by Charnes, Cooper and Rhodes (1978). Banker, Charnes and Cooper (1984) have shown that the CRS measure of efficiency can be expressed as the product of a technical efficiency measure and a scale efficiency measure. A third method of scale uses nonlinear specification of the production function such as Cobb-Douglas or a translog function, from which the scale measure can be directly computed (Daraio and Simar, 2007).

Due to the inconsistency of data on number of branches and employees of Kazakhstani banks, the present analysis was focused on measuring technical and scale efficiencies of the banks. The measurement of allocative and economic efficiency of banks was left for the future researches, when the aforementioned data would be available.

3.1.2. Productivity

According to a classic definition *productivity* is the *ratio* between an output and the factors that made it possible. In the same way, Lovell (1993) defines the *productivity* of a production unit as the ratio of its output to its input.

Efficiency and productivity, anyway, are two cooperating concepts. The measures of efficiency are more accurate than those of productivity in the sense that

they involve a comparison with the most efficient frontier, and for that they can complete those of productivity, based on the ratio of outputs on inputs (Daraio and Simar, 2007).

3.1.3. Theoretical Approaches To The Nature Of Bank Services Input-Output Determination

As far as services of commercial banks are concerned, a big disagreement arises in the literature over which services of bank to define as outputs and inputs. Three most commonly applied methods to bank production include the asset approach, user-cost approach and value-added approach.

Under the *asset approach* banks are considered only as financial intermediaries between liability holders and those who receive bank funds. Loans and other assets are considered to be bank outputs, while deposits and other liabilities are inputs to the intermediation process. While this approach seems to be appropriate for large banks that purchase their funds (with interest payments) in big portion from other banks and large depositors and turn these funds into loans, it may not be so for the majority of banks. For the smaller banks this method fails to account for transaction services delivered by the latter to their depositors, and therefore underestimates the overall value added of banking activities.

The *user-cost approach* determines whether a financial product is an input or output on the basis of its net contribution to bank revenue. If the financial returns on an asset exceed the opportunity cost of funds or if the financial costs of a liability are less than the opportunity cost, then the instrument is considered to be a financial output. Otherwise, it is considered to be a financial input (Berger and Humphrey, 1997). Accordingly, demand deposits would be classified as outputs while time deposits would be classified as inputs. However, there are problems with this approach. First of all, as interest rates fluctuate, so does the user cost. An item which is considered to be an output in one period can turn into an input in the next period if the sign of its user cost changes. Secondly, it is difficult to measure marginal revenues and costs for each individual liability item. Thus the answer to the question

whether an item is an input or output becomes a subject of significant measurement error and is sensitive to changes in data over time (Grigorian and Manole, 2002: 11).

The last approach considers both liability and asset categories to have some output characteristics. Nevertheless, only those categories that have substantial value added are treated as outputs while the others are treated as either inputs or intermediate products depending on the specific attributes of each category. Major categories of produced deposits and loans are identified as outputs, because they are responsible for the great majority of value added. Purchased fund are treated as financial inputs, because they require very small amounts of physical inputs (labor and capital). The *value added approach* differs from the user cost approach in that it is based on actual operating cost data rather than determining these costs explicitly. This approach has been widely used in studies of the banking industry (Berger and Humphrey, 1997).

In the current research the asset approach was applied to the input-output definition of bank services. Banks combine deposits together with purchased funds to produce financial services and products. It was assumed that a bank being a competitive and efficient institution would minimize its cost. Hence, interest expenses and general operating expenses form up two input variables, and outputs are comprised of interest income and non-interest income.

3.2. MEASURING EFFICIENCY – DATA ENVELOPMENT ANALYSIS (DEA) APPROACH

The topic of production efficiency has attracted attention since Adam Smith's pin factory and even before (Daraio and Simar, 2007). However, the estimation of efficiency has become possible after the empirical application of Farrell (1957) was published. Following his work, several different approaches for efficient frontier estimation and efficiency score calculation have been developed.

The basic idea of efficiency analysis is to make a comparison among a group of firms or branches in order to evaluate how the resources (or inputs) are used to obtain (produce) the products (services or outputs). Although many different methods have been used, two main approaches have been extensively popular among

researchers in academic studies of costs and efficiency measures. These are parametric approach (Stochastic Frontier Approach and Distribution Free Approach) and non-parametric approach (Data Envelopment Analysis and Free Disposal Hull). Both approaches are based on the transformation function, particularly that which describes a production technology at a micro level. However, the nonparametric approach has received a considerable amount of interest, both from a theoretical and an applied perspective. This vogue is owed to the fact that this approach does not require many assumptions, particularly because it does not need the specification of a functional form for the frontier (inputs-outputs relation) and a distributional form for the inefficiency term. Instead, the non-parametric approach provides a piecewise linear frontier by enveloping the observed data points, and hence efficiency estimates are not functional form dependent. In contrast, the accuracy of the efficiency estimates in the parametric approach are conditional on the accuracy of the chosen functional forms - approximation to the cost or production function.

3.2.1. Data Envelopment Analysis – Theoretical Background

The DEA frontier is formed as the piecewise linear combination that connects the set of these best practice observations, yielding a convex production possibility set. The DEA provides a computational analysis of relative efficiency for multiple input/output situations by evaluating each *Decision Making Unit* (*DMU*) and measuring its performance relative to an envelopment surface composed of best practice units. Units that do not lie on the surface are termed inefficient. Thus this method provides a measure of relative efficiency.

By enveloping data points with linear segments, the programming approach reveals the structure of frontier technology without imposing a specific functional form on either technology or deviations from it. Frontier technology provides a simple means of computing the distance to the frontier - as a maximum feasible radial contraction or expansion of an observed activity. This means of measuring the distance to the frontier yields an interpretation of performance or efficiency as maximal-minimal proportionate feasible changes in an activity given technology.

Hence, it is necessary to estimate frontiers, which envelop data, rather than functions, which intersect data (Daraio and Simar, 2007).

Data Envelopment Analysis was first introduced by Charnes, Cooper, and Rhodes in 1978 (Charnes *et.al.*, 1978) as an extension of Farrell's (1957) idea of estimating technical efficiency with respect to a production frontier. The resulting CCR model, named after the three authors allows for the calculation of the relative *technical efficiency* of similar decision making units in the analysis on a constant returns to scale (CRS) basis. This is achieved by constructing the ratio of a weighted sum of outputs to a weighted sum of inputs, where the weights for both the inputs and outputs are selected so that the relative efficiencies of the DMUs are maximized with the constraint that no DMU can have a relative efficiency score greater than one (Simak, 1997: 18).

A brief description of the underlying linear programming model is as follows[7]:

Assume that there are K inputs and M outputs for every DMU. For the i^{th} DMU the inputs and outputs are represented by vectors x_i and y_i, respectively. For each DMU we intend to obtain a measure of the ratio of all outputs over all inputs, such as $u_i'y_i/v_i'x_i$, where u_i and v_i are vectors of weights. To select the optimal weights, the following problem is proposed:

$$\max_{u_{ik},v_{im}} \frac{u_i`y_i}{v_i`x_i} \qquad (1)$$

$$\text{s.t. } \frac{u_i`y_j}{v_i`x_j} \leq 1$$

$$u_{ik}, v_{im} \geq 0,\ i,j = 1,2,\ldots N$$

$$k = 1,2,\ldots K$$

$$m = 1,2,\ldots M$$

A problem with this formulation is that it has an infinite number of solutions. This can be avoided by introducing a constraint $v'x_i = 1$, and obtain the multiplier form of the linear programming problem:

[7] This brief theoretical explanation of the DEA model is based on Grigorian and Manole (2002). More comprehensive description of the model works of Farrell (1957) can be found in Charnes *et.al.*(1978) and Coelli *et al.* (1998).

$$\max_{\mu_{ik},\sigma_{im}} \mu_i `y_i \quad (2)$$

$$s.t.\ \sigma_i `x_{i=1}$$

$$\mu_i `y_j - \sigma_i `x_j \leq 0$$

$$u_{ik}, v_{im} \geq 0,\ i,j = 1,2,\ldots N$$

$$k = 1,2,\ldots K$$

$$m = 1,2,\ldots M$$

where u's and v's are replaced with μ's and σ's. Using the duality property of this linear programming problem, one can derive an equivalent envelopment form:

$$\min_{\theta,\lambda} \theta_i \quad (3)$$

$$\text{s.t. } -y_{i\,k} + Y\lambda \geq 0$$

$$\theta_i x_{i\,m} - X\lambda \geq 0$$

$$\lambda_i \geq 0$$

where l is an N by 1 vector of constants and θ, a scalar, is the efficiency score for the i^{th} DMU. X = $[x_1,\ldots,x_N]$ is an K by N input matrix with columns x_i and Y = $[y_1,\ldots,y_N]$ is an M by N output matrix with columns y_i. Note that $\theta_i \leq 1$, with $\theta_i = 1$ implying a DMU which is located on the efficiency frontier. Due to a fewer number of constraints, this formulation is usually used for computations.

However, the CRS assumption is only appropriate when all banks are operating at an optimal scale. Factors that may cause banks not to operate at an optimal scale include imperfect competition, leverage concerns and certain prudential requirements. The fact that banks face non-constant returns to scale has been documented empirically by, among others, McAllister and McManus (1993), and Wheelock and Wilson (1997). This phenomenon led Banker, Charnes and Cooper (1984) to relax the CRS assumption and suggest an extension of the CRS DEA model to account for a variable return to scale (VRS). This model came to be known as BCC model, named after the three authors as the previous one.

In order to account for VRS when not all firms operate at an optimal scale, Banker *et.al.* (1984) added a convexity constraint to the CCR model (Equation 3):

$N1'\lambda = 1,$

where N1 is a N by 1vector of ones. This condition ensures that an inefficient bank is "benchmarked" against similar sized banks. Subsequently, VRS technology envelops the data more closely than CRS technology, and thus VRS technical efficiency scores are greater than or equal to CRS technical efficiency scores. The advantages of the VRS model outweigh the increase in computational power necessary to solve the model, which allowed the VRS to gain popularity over the CRS method (Grigorian and Manole, 2002: 8).

Moreover, this model allows for the separation of the two efficiency measures. The scale efficiency measurement indicates whether a DMU is operating at the most efficient scale, while technical efficiency is a measure of how well the DMU is allocating its resources to maximize its output generation (Simak, 1997: 18).

DEA requires the following conditions to be met in order produce meaningful results (Ibrahimov, 2009: 96-97):

1. The DMUs must operate in the same cultural environment.

2. The model must contain suitable inputs and outputs.

3. Each DMU must have a complete set of accurate data for all variables in the model.

4. There must be a minimum number of units to study in order to maintain sufficient degrees of freedom. A general rule to determine the minimum number of DMUs (n) is:

$$n \geq \max \{m \times s, 3(m + s)\},$$

where n= minimum number of DMUs

m= number of inputs

s= number of outputs

3.2.2. Input-orientated versus Output-orientated Measures in DEA

Farrell's original ideas were illustrated in input/input space and, hence, had an input reducing focus. These are usually termed *input-orientated* measures. This method aims at reducing the input amounts by as much as possible while keeping at

least the present output levels. This is also called "input-saving" approach to stress the fact that the outputs level remains unchanged and input quantities are reduced proportionately till the frontier is reached. This is a framework generally adopted when the *decision maker* can control the inputs but has not the control of the outputs (Daraio and Simar, 2007).

Alternatively, a firm can focus on maximizing output levels without altering the input quantities used. The *output oriented* framework, also known as "output-augmenting" approach, holds the input bundle unchanged and expands the output level till the frontier is reached. In practice, whether the input or output-oriented measure is more appropriate would depend on whether input conservation is more important than output augmentation (Daraio and Simar, 2007).

In the present research the input-orientated framework was selected as essential. The choice of input orientation is based on the assumption that during periods of regulatory changes and introduction of competition, which Kazakhstani banks faced after implementation of structural reforms, they strategically focused on cutting costs. Taking into account the inadequate development of financial markets compared to developed economies enhanced by low confidence among population to alternative banking instruments except deposits could impose obstacles for banks to target the output levels. Therefore, changes in inputs use would be expected to be closely associated with the changes in market structure. Moreover, the existing literature has traditionally focused on the estimation of input or cost based efficiency, assuming the bank management has more control over costs rather than over outputs (Casu *et.al.*, 2004). However, for the purpose of comparison, the results of output-orientation approach are presented in the Appendices as well.

3.2.3. Advantages and Limitations of DEA

The advantages of using DEA can be summarized as follows. First of all, it gives a single measure of performance which can take into account all dimensions of corporate activity. DEA has the ability to simultaneously handle multiple inputs and outputs without making judgments on their relative importance. DEA also ensures that companies being examined will only be compared to firms, which are aiming to secure similar objectives as indicated by their financial data. In this way, problems

can be identified, and highlighted by measuring the subject firm's performance against its peers. The method has the ability to simultaneously handle multiple inputs and outputs without making judgments on their relative importance.

Hence, it does not require the specification of a functional form for input-output correspondence. Moreover, DEA provides a set of targets for performance improvements that managers can utilize to improve the firm`s performance. Finally, the method allows flexibility to determine what the most important factors are in the firms' operations, so management can concentrate on them (Simak, 1997).

Non-parametric approaches possess the drawback of not allowing for random error caused by luck, data problems or other measurement errors. This makes them very sensitive to the data quality, including outliers and measurement problems. If highly efficient unit is not included to the study, so units in this study will appear relatively more efficient than they really are. DEA requires a minimum number of units in order to guarantee the necessary degrees of freedom in the model. Analysis containing less than 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. Since DEA is a non-parametric technique, statistical hypothesis tests are difficult, and are the focus of ongoing research (Ibrahimov, 2009: 99).

In choosing the appropriate method one should consider all factors, such as uncertainty in economic environment, market structure and sources, and consistency of data of the decision making units under investigation.

3.2.4. Why Choosing DEA Method for Examining Efficiency of Kazakhstani Banks?

The analysis of the efficiency of Kazakhstani banks was based on the DEA approach. Besides, the advantages of DEA, which were mentioned above, the structure of banking system of Kazakhstan was taken into account. Being a country with transition economy, characteristics of market economy are not yet well established. Therefore, the lack of assumptions of perfectly competitive markets and profit maximization in banking sector, which are crucial for econometric estimation, made this approach inappropriate. However, linear programming does not require assumptions about the market and is more suitable for a study of a state regulated

industry. Furthermore, shortcoming of the DEA method expressed in inconsistency of the data and probability of measurement errors were overcame by using robust data sources, which will be discussed in detail in the next section. The survey of existing literature also proved that non-parametric approach was successfully applied for analysis of production efficiency in countries with transition economies.

3.3. MEASURING TOTAL FACTOR PRODUCTIVITY – DEA MALMQUIST TFP INDEX

Productivity change, the process of changing of an index of outputs at a different rate than an index of inputs, can be calculated by using index number techniques to construct a Fisher (1922) or Tornqvist (1936) productivity index. However, both these indices require quantity and price information, as well as assumptions concerning the structure of technology and the behavior of producers. Productivity change can also be calculated using nonparametric techniques to construct a Malmquist (1953) productivity index. These latter techniques do not require price information or technological and behavioral assumptions, but they require the estimation of a representation of production technology. Nonparametric techniques are able not only to calculate productivity change, but also to identify the sources of measured productivity change (Coelli, 1996).

The Malmquist TFP Index measures the overall efficiency progress (or regress) over the period of the data. In addition the productivity score is further decomposed into sub-scores, which provide evidence for whether overall efficiency improvements were due to changes in technical efficiency or technical progress. This is useful for banks to set future strategies to achieve both efficiency and productivity improvements. The inter-temporal comparison of growth rates, the Malmquist TFP Index, is based on year-on-year changes. Then the Malmquist Index is constructed year-on-year relative to the base year 2000. Following Thirtle et al. (1996), each value of the index and its decomposition to the previous observation is calculated starting from the base value of 1.00 (or 100%).

To measure productivity growth, two time periods, *t* and *t*+1 are considered[8]. In period *t*, a bank produces output y^t by using input x^t, whereas in period *t*+1, quantities are y^{t+1} and x^{t+1}, respectively. To avoid an arbitrary choice of reference technology, the input-orientated Malmquist productivity index is defined as the geometric mean of *M*:

$$M\left(x^{t+1}, y^{t+1}, x^t, y^t\right) = \left[\frac{D^t(x^t,y^t)}{D^t(x^{t+1},y^{t+1})} \times \frac{D^{t+1}(x^t,y^t)}{D^{t+1}(x^{t+1},y^{t+1})}\right]^{0.5} \quad (4)$$

where $x^t, x^{t+1}, y^t, y^{t+1}$ denotes vectors of inputs and outputs in period *t* and *t*+1, respectively; *M*(x) and D^{t+1}(x) denotes the Malmquist productivity index and distance from the period *t* observation to the period *t*+1 technology or efficiency frontier, respectively. A value of *M* greater than unity will indicate positive TFP growth from the periods *t* to *t+1*, while a value less than unity indicates a TFP decline. No change in TFP occurs if value of index equals 1. Note that the Malmquist TFP index is, in fact, the geometric mean of two TFP indices. The first is measured with respect to period *t* technology and the second with respect to period *t+1* technology.

This Malmquist TFP index can be decomposed into two components representing technical efficiency change (*EFFCH*) and technical change (*TECHCH*). Efficiency change shows the catching-up effect, that is how much closer a bank gets to the efficient frontier, while technical change gives insight about technical innovation in the bank, how much the benchmark production frontier shifts at each bank`s observed input mix (Kasman *et al.*, 2013: 34). An equivalent way of writing this TPF index is (Fare *et al.*, 1994):

$$M\left(x^{t+1}, y^{t+1}, x^t, y^t\right) = \underbrace{\frac{D^t(x^t,y^t)}{D^{t+1}(x^{t+1},y^{t+1})}}_{(EFFCH)} \underbrace{\left[\frac{D^{t+1}(x^t,y^t)}{D^t(x^t,y^t)} \times \frac{D^{t+1}(x^{t+1},y^{t+1})}{D^t(x^{t+1},y^{t+1})}\right]^{0.5}}_{(TECHCH)} \quad (5)$$

The ratio outside the square brackets is defined as the technical efficiency change between the periods *t* and *t+1*. That is equivalent to the ratio of the technical efficiency in the period *t+1* to the technical efficiency in the period *t*. The remaining part is defined as the technical change between period *t* and *t*+1 (under constant

[8] The following discussion is based on Kasman *et.al.* (2013). More detailed description can be found in Färe *et al*. (1994).

returns to scale, CRS, technology). It is the geometric mean of the shift in technology between the two periods, evaluated at x^{t+1} and at x^t as well. It reflects the improvement or deterioration of best practice banks.

In the case of CRS production technology, there are only two sources of productivity growth: technical efficiency change and technical change. However, if the production technology exhibits variable returns to scale (VRS), there are two additional sources of productivity growth: pure technical change (PE) and scale efficiency change (SE).

$$\text{PE} = \frac{D^t(x^t, y^t | \text{VRS})}{D^{t+1}(x^{t+1}, y^{t+1} | \text{VRS})} \tag{6}$$

$$\text{SE} = \left[\frac{D^t(x^t, y^t)}{D^t(x^t, y^t | \text{VRS})} \times \frac{D^{t+1}(x^{t+1}, y^{t+1} | \text{VRS})}{D^{t+1}(x^{t+1}, y^{t+1})}\right]^{0.5} \tag{7}$$

where $D(\cdot|\text{VRS})$ represents distance functions calculated under the assumptions of variable returns to scale. Improvements in scale efficiency occur if SE>1 (Kasman *et. al.*, 2013: 34).

3.4. ESTIMATION OF EFFICIENCY CORRELATES – THE TWO – LIMIT TOBIT MODEL

After estimating efficiency scores of the banks, it comes to identify the reasons and conditions for banks that produce below their optimum level. Lovell (1993) distinguishes the inputs/outputs of the production process as "variables under the control of the decision maker during the time period under consideration", from explanatory variables that are "variables over which the decision maker has no control during the time period under consideration". These explanatory or environmental variables contain indicators of economic, structural and financial situation. The evaluation of the influence of external-environmental factors on the efficiency of banks is a relevant issue related to the explanations of efficiency, the identification of economic conditions that create inefficiency, and finally to the improvement of managerial performance.

The most-often encountered approach to modeling the DEA scores against exogenous variables is tobit regression, which is suitable when the dependent

variables are either censored or corner solution outcomes, of which DEA scores falls within the second category. A corner solution variable is continuous and limited from above or below or both and takes on the value of one or both of the boundaries with a positive probability. As DEA efficiency scores are continuous on the interval [0; 1], and takes on the value 1 with positive probability, it seems reasonable to use a two-limit tobit technique for modelling the scores as a function of the exogenous variables. Tobit has been adopted as the natural 'choice' for modelling DEA scores in second stage evaluations (Hoff, 2007).

The second stage regression model, which examines the impact of environmental variables on efficiency, is specified as follows:

$$EFF_{it} = f(ROA_{it}, EQ_{it}, TL_{it}, DEP_{it}, LnTA_{it}, PLL_{it}, FINVEST_{it}, LIQUID_{it}, D1_{it}, D2_{it}) + \varepsilon_{it} \quad (8)$$

where EFF_{it} represents the efficiency score of bank *i* at time *t*; ROA_{it} – return on assets of bank *i* at time *t* measured by the ratio of net income over total assets, EQ_{it} – the ratio of book value of stockholders` equity over total assets of bank *i* at time *t*; TL_{it} – the ratio of total loans over total assets of bank *i* at time *t*; DEP_{it} – the ratio of total deposits to total assets of bank *i* at time *t*; $LnTA_{it}$ – indicates the size of bank *i* at time *t* and is measured by the natural logarithm of total assets; PLL_{it} – the ratio of impairment for loan losses to total loans of bank *i* at time *t*; $FINVEST_{it}$ – the ratio of total investment securities to total assets of bank *i* at time *t*; $LIQUID_{it}$ – the ratio of total liquid assets (except securities) to total assets of bank *i* at time *t*; D1 – the ownership type dummy variable that takes value of "1" if the bank *i* is foreign at time *t*, and "0" otherwise. D2 – dummy variable that controls for crisis effect. It takes value of "1" for the years 2009 and 2010, and "0" value for other years; ε = the error term.

The detailed explanation of independent variables is presented in the Data and Empirical Results section below. DEAP Version 2.1 computer software developed by Tim Coelli of University of New England was used to calculate efficiency scores and TFP Malmquist index, while for regression analysis, Eviews 5.1 was used.

CHAPTER FOUR
DATA AND EMPIRICAL RESULTS

4.1. DATA

4.1.1. Sample and Sample Period

The data for the empirical analysis were taken from the balance sheets and income statements of 30 second-tier commercial banks operating in Kazakhstan. These are selected out of 38 banks and account for 96% of total bank assets in the country[9]. All banks in the sample undertake general banking activity, such as accepting deposits from legal entities and individuals, granting loans, providing broker/dealer and custodial services and other banking services for their commercial and retail customers.

JSC "House Construction Savings Bank of Kazakhstan" and JSC "Eximbank" were not included in the sample due to their specific functions. The former bank aims to improving the housing conditions of particularly middle and below middle class groups by collecting deposits and then issuing mortgage loans. 100% of its shares are owned by the government and it is the only state-owned bank in the country. The latter bank was established as a government agency to effectively utilize state investment policies and promote export-import relations. Although the bank was privatized later and started providing general banking services, it was not included in the sample because for most of time period covered by the research it served as investment-enhancing bank. Other banks are excluded from the sample due to a limited access to their financial data or due to being newly-established. As a result of absence of financial reports for particular years of some banks, the data for analysis can be classified as unbalanced panel data.

The sample is based on the bank data obtained from yearly consolidated financial statements, which were audited by special agencies and approved on the shareholders` meeting. As a result the sample contains the robust data available. The

[9] Based on 2013 data from banking sector performance reports published by the National Bank of Kazakhstan, www.nationalbank.kz, (25.10.2014).

financial reports were obtained from the official websites of the banks and Kazakhstan Stock Exchange (KASE). The sample covers period from 2000 to 2013, which was especially chosen. Early 2000s indicate the period of competitive banking sector formation when reforms and regulations of 1990s were largely in place. Moreover, the sample period covers the global financial crisis of 2008, so the effects of the latter on the Kazakhstani banks can be examined.

4.1.2. Variables for Efficiency Estimation

As was mentioned above this research considers banks as financial intermediaries, which collect funds from units in surplus and then transform these resources into loans, investments and other assets. Subsequently, interest income and non-interest income comprise bank`s output, while total costs are presented by interest expenses and general operating expenses.

Interest expenses exhibit costs a bank meets for using leveraged funds, which include customer and inter-bank deposits, expenses for purchase and sale of securities and the interest on demand notes and other borrowed money. However, bank dividend payments are excluded from the measure of total cost, so the return to bank equity is not included in the measure. General operating expenses (non-interest expenses) account for other essential inputs to commercial bank operations, namely labor and fixed assets. These include expenses on personnel and management, expenses associated with premises and fixed assets, which also captures the extensiveness of a bank's branch network, taxes and other expenses.

Two outputs of the banking "production process" are specified. One is interest income and the second other operating income. Interest income expresses remuneration for issued loans to non-bank entities and loans to other banks, lease-financing receivables, interest and dividend income on securities. Operating income or non-interest income comprises net commission income, gains and losses from trading securities and foreign exchange transactions. These outputs represent the banks` revenues and major business activities. Table 4 presents the sample statistics of the main variables employed in the estimation of efficiency and its correlates.

Table 4: Descriptive Statistics of Bank Level Variables for 2000-2013

Variable	N	Mean	Standard Deviation	Coefficient of Variation
Output[*1]				
y_1 = *Interest Income*	339	159.408	393.150	2.466
y_2 = *Non-Interest Income*	339	34.115	79.565	2.332
Input[*1]				
x_1 = *Interest Expense*	339	88.292	222.534	2.520
x_2 = *Non-Interest Expense*	339	41.522	80.077	1.929
Correlates of Efficiency[*2]				
ROA	339	0.017	0.072	4.283
EQ	339	0.277	0.276	0.998
TL	339	0.576	0.195	0.339
DEP	339	0.516	0.217	0.421
LnTA	339	5.920	2.103	0.118
PLL	339	0.087	0.113	1.307
FINVEST	339	0.117	0.100	0.857
LIQUID	339	0.223	0.173	0.778

*1-Variables are presented in millions of U.S. Dollars.

*2-Correlates variables are presented in ratios, except for *LnTA,* which states for natural logarithm of Total Assets expressed in millions of U.S. Dollars.

4.1.3. Explanatory Variables – Correlates of Inefficiency

The measurement of productive efficiency is only a first step of an efficiency study. A natural complement is the investigation on explanatory variables of the distribution of efficiency scores. Put it in another way, it is important to know and measure in what extent external – environmental variables affect the performance of the DMUs under consideration. (Daraio and Simar, 2007).

The meaning and the economic role played by external-environmental variables are strictly linked to the economic field firms are operating in. Accordingly, the choice of the environmental variables was done by taking into account the production process characteristics and the economic field of application. The set of variables that characterize the structure of banking industry, may affect banking technology and service quality and, thus influence the bank efficiency. The description of each variable and its expected effect on efficiency is as follows:

- ***ROA*** – net income after taxes/total assets.

This variable measures the performance of a bank. It gives an idea as to how efficient management is at using its assets to generate earnings. This indicator of bank *profitability* is intended to measure deposit takers' efficiency in using their assets. ROA is expected to be inversely related to inefficiency.

- ***EQ*** – book value of stockholders` equity/total assets.

This ratio is a proxy to *capital adequacy ratio.* Generally, it is calculated by dividing the bank's core capital by the total risk-weighted assets. However, due to data limitations, the most important of which is the value of risk-weighted assets, the proxy is employed. The ratio represents the capitalization of a bank or the capability of banks to maintain solvency. It indicates the extent to which assets are funded by other than own funds. Capital allows banks to grow and maintain confidence that they can cover losses that emerge unexpectedly due to unidentified risk. Higher bank capitalization may affect bank efficiency through a greater incentive for sound banking and efficiency and less of an incentive for risk-taking in lending decisions (Fries and Taci, 2005). This ratio should be inversely related to inefficiency on the grounds that banks with low inefficiency will have higher profits and hence will be able to retain more earnings as capital.

- ***TL*** – total loans/total assets.

This leverage ratio shows the portfolio composition. It controls the structure of banks` assets and accounts for banks` lending behaviour. The higher value of this ratio indicates a bank is loaned up and its liquidity is low. A larger percentage of loans out of total bank assets leads to a higher credit risk exposure.

- ***DEP*** – total deposits/total assets.

This ratio controls for the structure of banks` liabilities. Bank deposits are considered as the primary source of funds for traditional commercial banking. Loan financing through deposits reduce the banks` liquidity risk and, hence, positively affect bank efficiency by reducing costs associated with risk management.

- ***lnTA*** – the natural logarithm of total assets

Logarithm of total assets is used to control for the banks` size. The relationship between the banks size in terms of total assets and efficiency is ambiguous. Many empirical applications found smaller banks to be more efficient, while others stated

the reverse relation. Mostly, the results depend on the sample of the dataset, the level of development of relevant banking sector and whether a single-country or cross-country comparison is undertaken. Subsequently, the precise direction of the effect of bank`s size on its efficiency is not expected a priori.

- ***FINVEST*** – total investment securities/total assets

This ratio indicates to what extent a bank participate in the market for financial instruments and derivatives. It also shows the fraction of investment securities portfolio in total assets. Kasman (2003) found significant negative correlation between investment securities and inefficiency for Turkish banks. He suggests that banks that invested more in government papers (treasury bills, government bonds and other securities) tend to operate more efficiently.

- ***LIQUID*** – total liquid assets (minus securities)/total assets

This is a liquid asset ratio, which provides an indication of the liquidity available to meet expected and unexpected demands for cash. The level of liquidity indicates the ability of the deposit-taking sector to withstand shocks to their balance sheet. The ratio also evaluates the capability of banks to meet their short-term obligations, thereby it controls for liquidity risk of a bank.

- ***PLL*** – impairment for loan losses/total loans.

This ratio is used as a proxy to the ratio of non-performing loans (NPLs) over total loans. It represents the portion of overdue loans and loans being close to default in total loan portfolio. This ratio is quite important as it shows the asset quality and is intended to identify problems with asset quality in the loan portfolio. It enables the control for variation in risk-taking strategies among banks and indicates the degree of quality in bank management to finance projects with lower risk. PLL is included to control for output quality. The relationship between PLL and efficiency is supposed to be negative.

- ***Dummy 1 - Ownership structure***

The ownership structure may influence the level of bank efficiency. A bulk of empirical investigations on bank efficiency found foreign-majority banks to be more efficient than their domestic peers (Fries and Taci, 2005; Grigorian and Manole, 2002). The score “1” is assigned if more than 50% of the bank`s share owned by foreigners at the time *t*, and “0” means otherwise.

- ***Dummy 2 – Impact of Global Financial Crisis***

To explore the effects of global financial crisis of 2008 over the banking sector of Kazakhstan, the dummy 2 is added. To properly cover the crisis impact with regards to lags it could take, the dummy is constructed as sum of 2009 and 2010. It takes value of "1" for these years for every bank in the sample, and "0" for others. The coefficient of Dummy 2 is anticipated to have a negative sign.

One macroeconomic variable, namely per capita GDP measured in U.S. dollars, is included in the model to serves as a proxy measure for the overall level of development, including the quality of state institutions and the level of skills. Costs may decrease with overall development because of corresponding improvements in the quality of state institutions.

4.2. EMPIRICAL RESULTS[10]

4.2.1. Efficiency Scores

Table 5: Average Technical Efficiency and Scale Efficiency Scores by Year

	TECHNICAL EFFICIENCY			*SCALE EFFICIENCY*		
	Mean	**Standard Deviation**	**Coefficient of Variation**	**Mean**	**Standard Deviation**	**Coefficient of Variation**
2000	0.985	0.033	0.033	0.966	0.067	0.069
2001	0.861	0.155	0.179	0.955	0.053	0.056
2002	0.865	0.158	0.182	0.909	0.081	0.089
2003	0.868	0.166	0.191	0.943	0.067	0.071
2004	0.866	0.159	0.184	0.927	0.066	0.071
2005	0.863	0.159	0.185	0.948	0.059	0.063
2006	0.885	0.139	0.157	0.965	0.047	0.049
2007	0.901	0.140	0.155	0.904	0.146	0.161
2008	0.841	0.169	0.202	0.917	0.130	0.142
2009	0.772	0.196	0.254	0.843	0.152	0.181
2010	0.711	0.291	0.410	0.795	0.208	0.261
2011	0.734	0.247	0.337	0.841	0.164	0.196
2012	0.792	0.220	0.278	0.832	0.176	0.211
2013	0.794	0.204	0.257	0.809	0.142	0.175
Overall Efficiency	***0.838***	***0.072***	***0.086***	***0.897***	***0.060***	***0.067***

[10] Estimation results for correlates of efficiency scores are presented based on Input-orientated method. For comparison purpose output-orientated method results can be found in Appendices.

Table 5 reports summary statistics for efficiency scores for the whole sample during the sample period. The overall mean technical efficiency for the sample equals 0.838 with a standard deviation of 0.072. This implies that on the average a bank could decrease its costs by 16.2% to perform at the technically efficient level. The mean and standard deviation of technical efficiency scores exhibits quite high values during the period before the global financial crisis with reaching the peak of 90% efficiency in 2007. However, the situation deteriorates notably after 2008 with overall efficiency fall of nearly 20%. The lowest technical efficiency for the banks under research was committed in 2010 with 0.711 score. This result is supported by the fact that at the end of 2009 and during 2010 three of five biggest (in terms of total assets) Kazakh banks defaulted on their liabilities and the restructuring programs were initiated by the government. For the period after the crisis the average technical efficiency equals to 0.761 and technical efficiency scores display very slight direction for improvement. This indicates that the anti-crisis/stabilization programs started by the government were not successive enough to improve the situation in the banking sector. This is also resembled by high portion of non-performing loans (about 30%) in the total loan portfolio, which negatively affects the overall efficiency of banks through high loan loss provision requirements.

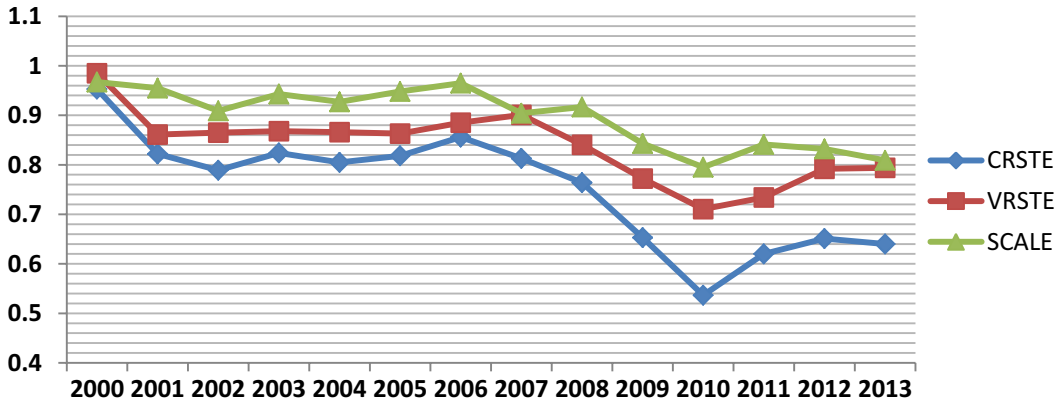
The performed *t*-test for providing statistical inference about the difference of efficiency scores between two sub-periods proves to be statistically significant with p-value equals 0.000. This suggests that the impact of the global financial crisis over the banking sector of Kazakhstan was considerable. The outcome was once more proved by the analysis of the determinants of inefficiency in the second-stage regression model.

Table 5 also reports the average scale efficiencies of banks and allows to draw conclusions about economies of scale for banks in the sample. The overall scale efficiency is 0.897 and the scores of the entire sample during the period under consideration suggest that the banks in the sample, on average, have economies of scale. The measure of overall economies of scale follows the same pattern as technical efficiency with the fall in 2010 and further improvements[11].

[11] The efficiency scores of individual banks in the sample are provided in the Appendices. An interested reader can refer to Appendix 7 for cross-bank comparisons.

Inefficiency can result from inefficient operation and disadvantageous conditions under which banks operate. In order to determine the source of inefficiency it is important to note the difference between CRS and VRS technical efficiency scores. Figure 10 depicts the evolution of mean technical and scale efficiencies over the sample period. A comparison of the results shows that there are scale problems (disadvantageous condition) and it had a significant impact on downward efficiency trend.

Figure 10: Trend of Average Technical and Scale Efficiencies



All efficiency scores follow the same pattern. Until 2007 the efficiencies exhibit relatively constant movement and fluctuate within a narrow range. However, between 2007 and 2010 the scores show a downward trend with reaching the minimum points in 2010. This sharp decrease confirms the assumptions of negative impacts of global financial crisis over the Kazakhstani banking sector. Although the efficiency levels of banks have not reached the pre-crisis scores, they exhibit the signs of improvement in recent years.

Although banks in Kazakh banking system have similar organizational structure and objectives, they vary considerably in size. In order to examine efficiency of banks of different sizes, the banks in sample were divided into groups according to the value of their total assets calculated in millions of U.S. dollars. Therefore, 5 category groups were identified. Size A represents banks with the largest share of total assets, while Size E comprises the smallest banks. Table 6 shows the results of efficiency scores according to each asset size category.

Table 6: Technical Efficiency and Scale Efficiency Scores by Asset Size

		TECHNICAL EFFICIENCY			*SCALE EFFICIENCY*		
Asset Size Category	**Number of Banks**	**Mean**	**Standard Deviation**	**Coefficient of Variation**	**Mean**	**Standard Deviation**	**Coefficient of Variation**
Size A	***3***	0.961	0.133	0.138	0.897	0.1218	0.136
Size B	***5***	0.821	0.129	0.158	0.880	0.097	0.111
Size C	***9***	0.822	0.174	0.212	0.912	0.115	0.126
Size D	***5***	0.789	0.222	0.282	0.903	0.105	0.116
Size E	***8***	0.794	0.263	0.331	0.843	0.211	0.251

Note: Size groups of the banks are based on the 2013 Asset size values. Asset size values are presented in millions of US Dollars. Size A: 10000+, Size B: 5000 - 10000, Size C: 1000 - 5000, Size D: 500 - 1000, Size E: 0 - 500.

As far as technical efficiency is concerned, the largest banks (those with asset size greater than $10 billion) turned to be the most efficient ones with mean efficiency of 0.961. The less efficient banks were banks in the lower-middle category (asset size $0.5-1 billion) followed by the smallest banks of category E (asset size less than $0.5 billion), which performed a little better. Medium-sized and upper-medium sized banks showed almost the same scores of technical efficiency. Consequently, there seems to be a clear relationship between size and technical efficiency.

With regards to scale efficiency, the results suggest that scale economies exist at every production scale. Hence, banks in each category of asset size in the sample exhibit increasing returns to scale and can reduce cost by expanding production. This contradicts the findings of other empirical studies where larger banks were usually seen to be facing scale diseconomies or decreasing scale economies (Berger *et al*., 1997).

According to the results of most papers on efficiency analysis, foreign banks prove to utilize their resources to produce output in more efficient way than their domestic counterparts. To examine the validity of this evidence for Kazakh banks, all banks in the sample were categorized according to their ownership type. The efficiency results are reported in Table 7.

Table 7: Technical Efficiency and Scale Efficiency Scores by Ownership Type

		TECHNICAL EFFICIENCY			*SCALE EFFICIENCY*		
Ownership Type	**Number of Banks**	**Mean**	**Standard Deviation**	**Coefficient of Variation**	**Mean**	**Standard Deviation**	**Coefficient of Variation**
Domestic	***18***	0.819	0.194	0.237	0.904	0.111	0.123
Foreign	***12***	0.841	0.209	0.248	0.855	0.182	0.213

In line with previous findings banks with foreign ownership turned to be more technically efficient than domestic ones. However, the difference between the scores is not large accounting for only 2.2% better performance of foreign banks. The results further indicate that both foreign and domestic banks exhibit economies of scale.

4.2.2. Correlates of Inefficiency Scores

The results of the second-stage regression model are reported in Table 8. These show the coefficients of correlates of variable returns to scale (VRS) technical efficiency scores and allow to identify factors that could influence efficiency level of banks. The table presents the results for input- and output-orientation. However, these are mostly consistent, except for statistical significance of LIQUID coefficient in output-orientated framework. The inferences would be based on input-orientated results.

Table 8: Second Stage Regression Results

VARIABLE	*INPUT - ORIENTATED RESULTS*		*OUTPUT - ORIENTATED RESULTS*	
	Coefficient	**Standard Error**	**Coefficient**	**Standard Error**
C	0.245	0.1846	0.298(***)	0.1760
ROA	0.669(*)	0.1495	0.603(*)	0.1413
EQ	0.168(**)	0.0753	0.166(**)	0.0711
TL	0.189	0.1417	0.132	0.1341
DEP	-0.105	0.0692	-0.090	0.0658
LnTA	0.024(*)	0.0074	0.024(*)	0.0071
PLL	-0.283(*)	0.1066	-0.262(*)	0.1023
FINVEST	0.359(**)	0.1598	0.278(***)	0.1518
LIQUID	0.271(***)	0.1520	0.217	0.1442
D1	0.028	0.0231	0.027	0.0219
D2	-0.092(*)	0.0291	-0.074(*)	0.0266

Note: *, ** and *** in parentheses denotes statistical significance at 1%, 5% and 10% levels, respectively. VRS Technical Efficiency Scores were used for the regression estimation.

Return on asset (ROA) turned to be significantly and positively related to efficiency, suggesting that banks with higher efficiency tend to be more profitable. This outcome is consistent with findings by Kasman (2003) for Turkish banks and Girardone *et.al*. (2004) for Italian banking sector.

The proxy coefficient for bank capitalization has significantly positive correlation with efficiency, proving that more efficient banks tend to have higher levels of equity. This supports the finding by Fries and Taci (2005), who examined the performance of banking sectors of transition countries including Kazakhstan. On the one hand, this is quite predictable since banks with low inefficiency will tend to have more profits as they will be able (holding dividends constant) to retain earning as capital. However, this result should not be interpreted as saying that if a bank increases its capita/assets ratio then its inefficiency will decrease. This could also be explained as an indicator that higher capital ratios may prevent moral hazard both for bank and its managers (Girardone *et al*., 2004).

The coefficient for the level of non-performing loans (PLL) is negatively correlated with bank efficiency. The coefficient turned to be highly statistically significant. This may suggest that riskier banks are more inefficient. This estimator is quite important for Kazakhstani banking system. As a result of financial crisis the

portion of overdue loans in the loan portfolio of second-tier banks shrank threefold composing about 30% of total loans. The worst is that most of these loans are accounted for by the largest banks in the sector with substantial market share (JSC "BTA Bank", JSC "Alliance Bank"). This leads to the inefficiency of not only separated banks but to the inefficiency of the sector as a whole.

With regard to the relationship of total assets size and bank efficiency, it can be stated that the former has significantly positive effect on the latter. This implies that larger banks tend to be more efficient than smaller ones and, hence consolidation of small banks may lead to improving cost structure.

Surprisingly, but the first dummy denoting the difference in efficiency between foreign and domestic banks occurred to be positive but statistically insignificant. The positive sign justifies the aforementioned outcome that foreign banks tend to operate more effectively than their domestic counterparts. This finding is in line with most researches in the efficiency field for most countries involving Kazakhstan. Fries and Taci (2005), Grigorian and Manole (2002), Djalilov and Piesse (2011) revealed the same evidence. In general this result is obvious, since foreign banks may benefit from their parental companies abroad (headquarters) in terms of transferring new banking technologies, financial innovations, managerial and organizational structure, which were successfully utilized in other branches. These may lower total costs for foreign bank and make them more efficient. Moreover, higher efficiency of foreign-majority banks may be associated with the extent of competitive pressure they face.

Banks with foreign capital in Kazakhstan can be notionally divided into three groups. The first group includes banks that provide services to trading representative offices of companies co-residents in the bank's country (region), provide customers with services on trade financing, letters of credit, guarantees, credit lines, and representing their interests in the local market. This group includes SB JSC "Commercial and Industrial Bank of China", SB JSC "Alfabank", SB JSC "Shinkhanbank". The market share of banks in this group is very limited. The second group is represented by few banks "with name" that provide unique services on international transactions, international custodial services, attraction of financing (venture, note); this group is represented by SB JSC "Citibank", SB JSC "HSBC",

SB JSC “RBS”. Even though the market share of this group`s banks is not significant, the financial crisis has brought some adjustments to their functioning. Due to default of the largest domestic banks following the crisis and the increase in the value of non-performing loans of other large domestic banks, their creditworthiness and financial stability have shattered, which adversely affected the level of depositors’ trust. More conservative depositors, who made “reliability” the corner-stone, started to give preferences to foreign banks “with name”, who seem to have greater financial stability than their domestic peers. The third group is represented by local banks, that changed the ownership structure for the benefit of foreign participation and that provide a complete range of financial services to a wide group of customers: consumer lending, mortgage lending, SME lending, trade financing, etc. This group includes JSC “ATF Bank”, JSC “CenterCredit Bank”, SB JSC “Home Credit Bank”, SB JSC “Sberbank”.

The second dummy variable, that is responsible for the effect of global financial crisis, found to be significantly and negatively related to the efficiency indicating that global financial crisis had inversely affected banking sector of the country. Being one of the countries in Central Asia that had actively participated in the international financial markets, the country has been severely affected by the crisis. However, the negative impacts over the economy occurred with a lag, as main downturn of the banking system happened at the end of 2009 and during 2010.

As was pointed out before, the government undertook decisive actions to stabilize the banking sector. However, bank nationalization was not followed by a coherent divestiture plan. In addition, the large stock of non-performing loans (NPLs) that emerged during the crisis has not been resolved. High NPLs depress bank profitability and render banks quite vulnerable to further deteriorations in credit quality. They also limit banks’ ability to increase capital in order to meet the envisaged tightening of capital requirements. (IMF, Financial System Stability Assessment, 2014).

In 2012 the “Troubled Asset Fund” (later renamed as “Fund of Non-performing Loans”) under the supervision of NBK was established which aims at enhancing the post-crisis recovery of second-tier banks by improving the quality of loan portfolios. The Fund focuses on purchasing bad and 5^{th} category doubtful loans

not related to real estate from the banks. The Fund is responsible for raising funds through the issuance of bonds, making an assessment of distressed assets, buying them, managing collateral, selling, receiving income. Moreover, for the purpose of improving the system of risk management, BASEL III principles are planned to be introduced. This may positively affect the efficiency of banks, yet the results will not show up in the short-run. It is worth mentioning that that the financial market crisis forces the authorities of Kazakhstan to revise the requirements to banks, making emphasis on the quality, not the growth. Increased capital adequacy requirements and introduction of other prudential constraints on risk taking combined with private ownership of banks and an objective of profitability may strengthen the incentive of banks for efficiency improvements.

4.2.3. Total Factor Productivity Change

Since the seminal work of Solow (1957), total factor productivity—defined as the efficiency with which firms turn inputs into outputs—has been considered as the major factor in generating growth. The productivity growth of the banking sector is as much important as that of real sector, since commercial banks provide a major source of financial intermediation in the economy.

The results of conducted Malmquist total factor productivity (TFP) change analysis on the production levels of Kazakhstani banks for the period 2001 – 2013 are reported in Table 8. They indicate that banks in Kazakhstan seem to have experience a positive productivity growth over the sample period. The overall TFP index equals 1.021 or, stated differently, productivity has grown on the average by 2.1 % during the time period considered.

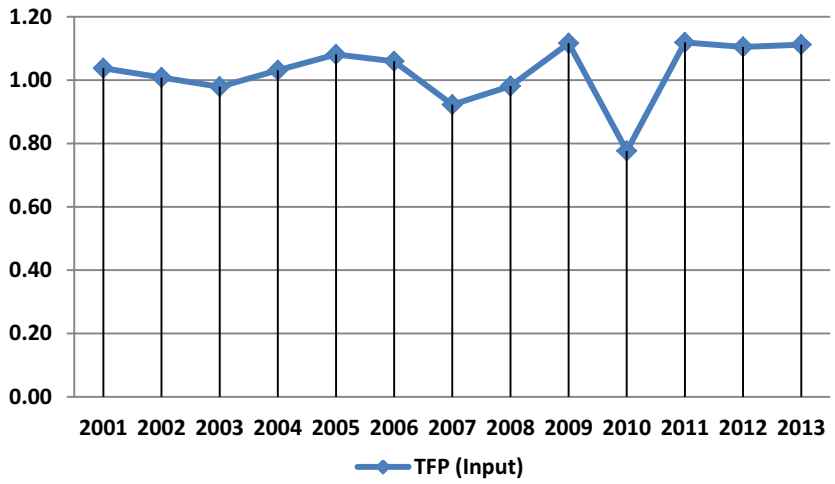
Table 9: Total Factor Productivity

	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	Overall
Efficiency change	0.824	0.951	1.057	0.983	1.005	1.050	0.983	0.962	0.828	0.779	1.169	1.091	0.993	**0.969**
Technical change	1.260	1.060	0.927	1.048	1.076	1.009	0.939	1.020	1.349	0.997	0.957	1.013	1.120	**1.054**
Pure efficiency change	0.847	0.987	1.017	1.004	0.982	1.045	1.016	0.980	0.904	0.823	1.089	1.103	1.010	**0.982**
Scale efficiency change	0.973	0.964	1.040	0.980	1.023	1.004	0.967	0.981	0.916	0.947	1.074	0.989	0.983	**0.987**
TFP change	***1.038***	***1.008***	***0.979***	***1.031***	***1.081***	***1.059***	***0.923***	***0.981***	***1.117***	***0.776***	***1.119***	***1.105***	***1.112***	***1.021***

From the analysis of decomposition of the Malmquist index, productivity growth in Kazakh banking system seem to have been brought about mainly by a positive technical change. It has grown on average by 5.4% and constitutes the largest portion in the decomposition of the overall TFP change. These results are consistent with findings by Casu *et al*. (2004) and Kasman *et al*. (2013), who examined productivity of banks in EU member countries. They also found that technical change is found to derive productivity growth. This high technical change as a composition of productivity growth is attributed to the extensive level of investment in capital by Kazakh banks. On one side, the period between 2000 – 2007 can characterized by high growth of the economy, which demanded more banking services, and therefore banks extended their branches around the country to provide services faster. This led banks to increase their investment spending on acquisition of new buildings (or rental expenses), hardware, software and hiring more personnel. On the other hand, rapid developments and availability of information technology have resulted in many new financial products and services, such as bank credit and debit cards, electronic banking, junk bonds, commercial paper market, securitization. In order to stay competitive in the market banks had to invest heavily in acquiring the new technology and setting up electronic banking facilities during the last decade. Although improving technological progress, this increased the fixed costs of banks and time is required for fully utilized advanced technology to enhance efficiency of the banks. It is expected that banks would significantly improve their cost structures

and raise efficiency in the near future as the costs of telecommunications continuously decrease and marginal costs of electronic operations are quite low.

Figure 11: Evolution of TFP Change



As far as the trend of mean TFP change is concerned (Figure 11), it can be concluded that despite a relatively stable productivity change during the period before 2007, the pattern significantly alter after. The maximum productivity growth of 11.7% has been reached between 2008 and 2009, however followed by sharply fall of the rate in 2009 – 2010. The decrease accounts for almost 30%. This outcome correlates with the pattern of average efficiency scores of the banks, and once more confirms the negative impact of global financial crisis over banking sector and the economy of the country as a whole. Notwithstanding, the total factor productivity change has been improving and during 2011 – 2013 period has already exceeded the pre-crisis level of growth.

CONCLUSION

Banking system of Kazakhstan has its own peculiarities, its development path. It has undergone structural transformation from being planned to market-oriented one. In the early years of independence because of the lack of effective regulation and proper law in licensing, number of commercial banks rapidly increased. However, gradually with establishment of NBK and proper actions undertaken by NBK and the government, the banking sector became modern and competitive. In this context measurement of performance of banks in order to evaluate the impacts of reforms, prudential requirement and economic factors on the sector is highly important.

In this thesis an empirical investigation of efficiency and productivity of Kazakhstani commercial banks was conducted. The results indicate that the banking system in Kazakhstan is not operating efficiently. The overall mean technical efficiency level is 0.838, suggesting that banks in the sample have to increase their efficiency level by 16.2 % to be able to operate on efficiency frontier. The source of the overall inefficiency lays in the excess use of resources and output shortfalls.

The results point out that large banks seem to be more efficient than smaller ones. Taking into consideration the existence of economies of scale for all bank size categories, a greater consolidation of small and medium-size banks would bring more cost advantages to the sector. Last decade in the Kazakh commercial banking history was not characterized by merger activity among private banks. It could be suggested that increasing the scale of operations of banks, which would would improve banks` efficiency, should take place in form of extending production levels by mergers of smaller banks or acquisition of smaller banks by bigger ones. This supports the current policy of the Central Bank of Kazakhstan on promoting further consolidation in the sector. Moreover, with regards to the impact of increased market power on bank stability, Pak and Nurmahanova (2013) found that increased market power has a significant positive impact on bank stability in Kazakhstan.

Foreign banks were found to allocate their resources more efficiently as compared to domestic banks. Hence, the entry of foreign banks shoud be enhanced. This can improve the performance of banks in several ways. By providing a wider

range of financial services and increasing competition in the sector, branches of foreign banks help improve the quality, pricing and availability of financial products. Foreign banks possess more sophisticated systems for evaluating and managing risks, more experience in the use of derivative products and benefit from knowledge transfer through high skilled human capital. The global financial crisis also indicated that branches of foreign banks in Kazakhstan performed well relative to their local counterparts. While all three banks, which defaulted on their obligations during the crisis, were domestic-majority owned, foreign banks managed to overcome the crisis with good key indicators and succeded to maintain their NPL ratios at low levels[12].

Naaborg (2007) suggests that foreign bank presence may also lead to improvements in bank regulation and supervision, since these banks may demand improved systems of regulation and supervision from the regulatory authorities in the recipient countries. This may contribute to improving the quality of banking operations of domestic banks.

The positive correlation between performance and efficiency reveals that banks, which use resources effectively in producing products and services, will be able to generate higher profits from these services, that is, be more profitable. The same relation was found for capitalization. More efficient banks would have more profits through retaining more earnings as capital. The negative correlation of the coefficient for the level of NPLs with efficiency shows that, banks should apply more strict requirements to creditors for loan issuing. However, the market for financial markets and derivatives in Kazakhstan is not well developed and thus, the loans remain the main source of assets for a bank. Although providing interest income, high ratio of loans on the assets side of the balance sheets leads to higher operating cost related to managing and monitoring loans as well as high costs of dealing with collateral in case of overdue or defaults. In this case the authorities should support the further development of domestic stock market, where banks would be able to raise funds. This also will solve the issue of high external borrowing by second-tier banks, which remains on the agenda since the crisis period.

The lessons from financial crisis should be taken into account. A high dependence of domestic banks on foreign financing prior to crisis led to severe

[12] Current State of the Banking Sector of Kazakhstan as of January 1, 2014. http://www.afn.kz/?switch=eng&docid=475, (20.11.2014).

consequences for domestic financial sector and the government had to intervene to prevent the collapse of the whole system. Three of the sector`s largest banks were bailed out by the government and part of the liabilities of the other two were restructured. This forced NBK to further strengthen the prudential regulations and started the transition of second tier banks to Basel III in January 2015[13]. In this framework, banks in the sector are expected to increase the capitalization and their capabilities to withstand different external shocks. Furthermore, this policy would improve efficiency of the banks. This result is supported by the findings of the thesis, which showed positive correlation between efficiency and capitalization.

With regard productivity, technological change would not only increase productivity but improve efficiency of banks. Improvements in communication and data processing as well as introduction of online banking during last decade gave banks opportunities to dramatically raise productivity and begin delivering many services through electronic means. Even the smallest banks are automating more and more of their operations, and banks and nonbank firms of all sizes are finding cost-effective ways to introduce new products and compete more directly with each other. All of these trends suggest that cost control must be a central objective of bankers and that utilizing resources in an efficient and effective manner will be of paramount importance to banking success.

In conclusion, it should be mentioned that the process of consolidation of banks in Kazakhstan has started at the end of 2013 along with improvement in the levels of NPLs. The effects of these changes over the performance of banks could be the topic for further research.

[13] http://en.tengrinews.kz/companies/Kazakhstan-banks-to-start-transition-to-Basel-III-in-2015-24791/, (20.11.2014).

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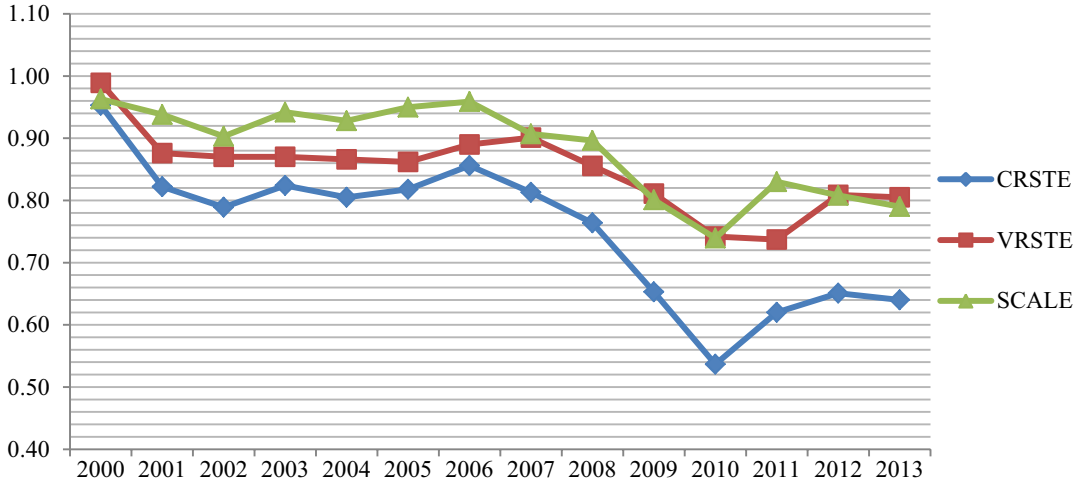
APPENDICES

APPENDIX 1: Average Technical Efficiency and Scale Efficiency Scores by Year

	TECHNICAL EFFICIENCY			SCALE EFFICIENCY		
	Mean	**Standard Deviation**	**Coefficient of Variation**	**Mean**	**Standard Deviation**	**Coefficient of Variation**
Trend						
2000	0.989	0.025	0.026	0.963	0.074	0.077
2001	0.876	0.145	0.165	0.938	0.070	0.075
2002	0.870	0.149	0.172	0.903	0.087	0.096
2003	0.870	0.164	0.189	0.942	0.087	0.092
2004	0.866	0.161	0.186	0.928	0.068	0.074
2005	0.862	0.164	0.191	0.950	0.058	0.061
2006	0.890	0.135	0.151	0.959	0.057	0.059
2007	0.901	0.151	0.168	0.907	0.141	0.155
2008	0.855	0.154	0.180	0.896	0.125	0.140
2009	0.811	0.171	0.211	0.801	0.175	0.218
2010	0.742	0.259	0.349	0.739	0.209	0.283
2011	0.737	0.239	0.325	0.830	0.148	0.178
2012	0.809	0.205	0.254	0.808	0.172	0.213
2013	0.805	0.187	0.233	0.790	0.137	0.173
Overall Efficiency	***0.849***	***0.065***	***0.077***	***0.882***	***0.074***	***0.084***

APPENDIX 2: Trend of Average Technical and Scale Efficiencies



APPENDIX 3: Technical Efficiency and Scale Efficiency Scores by Asset Size (millions of U.S. Dollars)

		TECHNICAL EFFICIENCY			SCALE EFFICIENCY		
Size	**Number of Banks**	**Mean**	**Standard Deviation**	**Coefficient of Variation**	**Mean**	**Standard Deviation**	**Coefficient of Variation**
Size A	***3***	0.971	0.097	0.100	0.884	0.142	0.161
Size B	***5***	0.831	0.123	0.148	0.869	0.100	0.115
Size C	***9***	0.834	0.163	0.196	0.896	0.121	0.136
Size D	***5***	0.808	0.203	0.251	0.880	0.143	0.162
Size E	***8***	0.800	0.252	0.314	0.827	0.206	0.249

Note: Size groups of the banks are based on the 2013 Asset size values. Size A: 10000+, Size B: 5000 - 10000, Size C: 1000 - 5000, Size D: 500 - 1000, Size E: 0 - 500. Asset size values are presented in millions of US Dollars.

APPENDIX 4: Technical Efficiency and Scale Efficiency Scores by Ownership Type

		TECHNICAL EFFICIENCY			SCALE EFFICIENCY		
Ownership	**Number of Banks**	**Mean**	**Standard Deviation**	**Coefficient of Variation**	**Mean**	**Standard Deviation**	**Coefficient of Variation**
Domestic	***18***	0.830	0.183	0.220	0.888	0.116	0.130
Foreign	***12***	0.853	0.194	0.228	0.840	0.192	0.229

APPENDIX 5: Total Factor Productivity (Output-Orientated Results)

	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	Overall
Efficiency change	0.824	0.951	1.057	0.983	1.005	1.050	0.983	0.962	0.828	0.779	1.166	1.091	0.993	**0.969**
Technical change	1.260	1.060	0.927	1.048	1.076	1.009	0.939	1.020	1.349	0.997	0.955	1.013	1.120	**1.053**
Pure efficiency change	0.860	0.983	1.027	0.991	0.977	1.046	1.020	0.990	0.933	0.845	1.006	1.131	1.002	**0.983**
Scale efficiency change	0.958	0.968	1.029	0.992	1.028	1.004	0.964	0.971	0.887	0.922	1.159	0.965	0.990	**0.986**
TFP change	***1.038***	***1.008***	***0.979***	***1.031***	***1.081***	***1.059***	***0.923***	***0.981***	***1.117***	***0.776***	***1.114***	***1.105***	***1.112***	***1.020***

APPENDIX 6: Correlates of CRS Technical Efficiency Scores and Logistic Regression Parameter Estimates

VARIABLE	INPUT / OUTPUT - ORIENTATED RESULTS	
	Coefficient	**Standard Error**
C	0.450(**)	0.2414
ROA	0.377(**)	0.1819
EQ	0.035	0.1083
TL	0.400(**)	0.1560
DEP	-0.209(*)	0.0758
LnTA	0.004	0.0096
PLL	-0.382(*)	0.1148
FINVEST	0.600(*)	0.1819
LIQUID	0.306(***)	0.1787
D1	-0.023	0.0256
D2	-0.152(*)	0.0316

Note: * , ** and *** for values significantly different from zero at 1%, 5% and 10% levels, respectively. CRS Technical Efficiency Scores were used for calculations.

APPENDIX 7: Average Technical Efficiency and Scale Efficiency Scores for Individual Banks over 2000 – 2013

		Input-orientated			Output-orientated		
Id No	*Bank Name*	*CRS TE*	*VRS TE*	*Scale*	*CRS TE*	*VRS TE*	*Scale*
1	JSC Kazkommertsbank	0.998	1.000	0.998	0.998	1.000	0.998
2	JSC BTA Bank	0.752	0.876	0.847	0.752	0.908	0.808
3	JSC Alliance Bank	0.751	0.812	0.923	0.751	0.819	0.914
4	JSC Temirbank	0.668	0.737	0.897	0.668	0.760	0.869
5	JSC ATF Bank	0.746	0.820	0.909	0.746	0.826	0.902
6	Halyk Bank of Kazakhstan	0.835	0.995	0.839	0.835	0.997	0.837
7	JCS Bank CenterCredit	0.720	0.805	0.896	0.720	0.812	0.888
8	JSC Kaspi Bank	0.781	0.896	0.872	0.781	0.902	0.866
9	JCS Eurasian Bank	0.736	0.827	0.884	0.736	0.843	0.866
10	JSC Tsesnabank	0.640	0.723	0.884	0.640	0.748	0.854
11	Alfa Bank OJSC	0.862	0.896	0.958	0.862	0.903	0.949
12	JSC Delta Bank	0.686	0.736	0.932	0.686	0.738	0.928
13	JSC Kazinvestbank	0.631	0.679	0.928	0.631	0.699	0.901
14	JSC Nurbank	0.731	0.801	0.908	0.731	0.812	0.894
15	Zaman Bank	0.982	1.000	0.982	0.982	1.000	0.982
16	KZI Bank-Kaz Ziraat International Bank	0.890	0.955	0.928	0.890	0.968	0.916
17	SB JSC 'Sberbank of Russia'	0.710	0.863	0.838	0.710	0.868	0.834
18	JSC Asia Credit Bank	0.806	0.848	0.938	0.806	0.864	0.918
19	Qazaq Banki (former Senym-Bank)	0.676	0.748	0.900	0.676	0.753	0.888
20	SB JSC Punjab National Bank Kazakhstan	0.541	0.666	0.824	0.541	0.587	0.934
21	JSC Bank RBK	0.787	0.809	0.965	0.787	0.831	0.931
22	Citibank Kazakhstan	0.906	0.959	0.946	0.906	0.964	0.940
23	SB JSC HSBC Bank Kazakhstan	0.669	0.874	0.783	0.669	0.898	0.754
24	Bank Pozitiv (BHI Global Banking)	0.527	0.709	0.797	0.527	0.789	0.659
25	JSC RBS Kazakhstan	0.418	0.839	0.534	0.418	0.902	0.464
26	Home Credit Bank	0.721	0.933	0.769	0.721	0.910	0.809
27	JSC Capital Bank(former TAIB Kazakh Bank)	0.488	0.774	0.709	0.488	0.713	0.744
28	***SB JSC Bank of China***	***1.000***	***1.000***	***1.000***	***1.000***	***1.000***	***1.000***
29	Fortebank JSC (former Metrokombank)	0.365	0.418	0.867	0.365	0.482	0.750
30	Subsidiary JSC Bank VTB (Kazakhstan)	0.360	0.449	0.797	0.360	0.560	0.649