

Evaluating Degrees of Efficiency and the Effects of Macroeconomic Variables on the Performance of Banks Active in the Stock Exchange During 2007-2015

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Abstract

The financial sector of the economy, and specifically the banking industry, plays an important role in promotion of investment and promoting economic growth, and hence, this sector has always been one of the main areas of government policy in order to achieve macro-economic objectives. Banks as financial intermediaries play a decisive role in achieving economic growth and development. As well as, the development of the banking industry and its performances can lead to long-term economic growth. In this paper, using the WDEA model, degrees of efficiency, as well as the effects of macroeconomic variables on the levels of performance of the banks is investigated. The results indicate that degrees of efficiency has been associated with increasing the dispersion and degrees of efficiency have had tendency to low degrees of efficiency, and at the macro level, the sanctions and their effects on the economy after 2011 had a negative effect on performance levels.

Keywords: Economy, Bank, Degrees of Efficiency, Performance, Macroeconomic Variables

I. INTRODUCTION

Today, monetary and financial institutions services have a significant and important impact on economic and manufacturing activities. Such services are provided by a variety of organizations and institutions, including banks, savings funds, insurance companies, etc. The largest share of described above be considered as belonging to the banks. Banks, in addition to providing financial services, have a special activity that distinguishes them from other financial institutions. Their special feature is the same as money-making, so that they are able to lend funds that they make. Undoubtedly, the financial sector and economic growth are severely affected each other. Services and assistance that flows through the financial system to whole economy, provides the blossoming of the economy, accelerates economic growth and reduces economic fluctuations. On the other hand, with economic growth, financial systems will be able to function effectively and provide a wider range of services. Also, in a developed economy, stronger monitoring and reducing risks to the financial system are provided. Developing countries to cross the stage of underdevelopment and to achieve development goals, should overcome obstacles and challenges in transition stage and provide appropriate substrates for productive growth of the national economy. Through, major challenges have developed against these countries and deepening financial markets have always been emphasized by economic experts as one of the difficult and costly requirements. On the other hand, the banks play a basic role in the country's development strategies, even in economies with developed financial markets, the banks at the heart of the financial and economic activities. In developing countries and economies in transition, which have less developed financial markets, banks are the only institutions that are able to engage in financial intermediation, and can help with a variety of ways to reduce the investment risk, and increase economic growth, therefore, from the macro perspective, the banking industry has been the focus of attention of governments, and from microeconomic perspective, these financial institutions need to become more efficient to succeed in international markets and survival in a competitive market by attracting more capital and the allocation of resources that is affecting the profitability of banks.

A. Background research

Louzis, Demetrius and, ANGELES (2015) in a study, with the help of dynamic panel data techniques, examined the profitability in the banking system of Greece from 2004 to 2011, the results show that interest revenues of all commercial banks studied in this study, severely have affected by market power, operating costs and portfolio diversification strategies of goods and services. Also non-interest revenues were more stable compared to interest revenue and had the least influence. Tan (2015), examined the effect of risk and competition on bank's profitability in China. Results of a study during 2003-2011 don't represent strong evidence of the effects of competition and risk on a bank's profitability, while financial variables, administrative costs, labor productivity and inflation have

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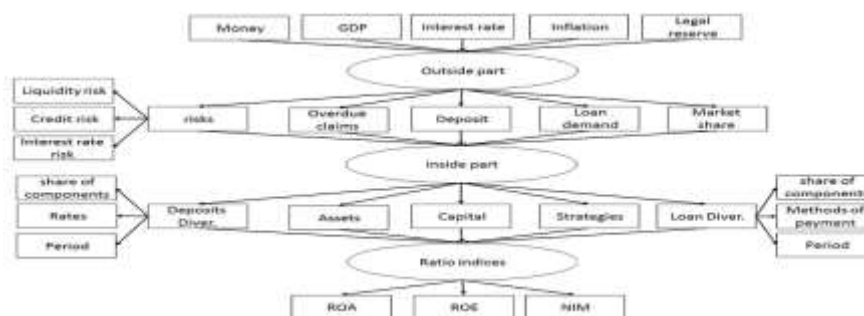
affected the profitability of the bank. Albuлесcu (2015) examined the determinants of profitability in the banks in Central and South America. The results using the monthly data and in form of constant effect model indicate the positive effect of capital and interest rate margin on the profitability. However, the non-interest expenses have a negative effect and liquidity of the bank has combined effects on bank profitability. Howe et al (2014) states that the market competitions have forced China's commercial banks improve their technical experience, skill and technical efficiency. Another finding was that technical efficiency is positively correlated with risk appetite. Credit risk and inflation variables determine only return on assets and capital and have been ineffective on the net interest margin. Results of Goddard et al (2013) indicate that banks are more efficient and have wide variety of activities and higher profitability. Another finding is that capital has the opposite effect on profitability. Results of Lee and Hashia (2013) show that commercial banks have the most reverse capital effect on the risk and banks in low-income countries have the higher profitability effect on the profitability. Also, banks in the Middle East have the highest positive effect on the profitability. About, the effect of capital on risk, banks in Far East and Central Asia had the largest reverse impact, while the lowest its value occurred in the banks in the Middle East countries. Kerala Polouce et al (2013), examined America's banking sector in the period 1984-2010. System model with standard errors corrected was used to estimate the model. The findings show the reverse effect of competition on the profitability, while, during the period of financial crisis, the profitability has been lasting.

Results of Zhang et al (2013), during the period 2003-2010 indicate that there is a negative correlation between market concentration and performance. Also, banks with lower levels of risk have been better. Another finding was that the financial crisis in 2007 and 2008 had a negative impact on the banking sector that China and Russia have had the minimum and maximum effectiveness respectively. Tan and Flores (2012) examined the effect of inflation on the Bank's profitability in China during the period 2003-2009. The results using GMM show that lower levels of diversity, administrative and financial costs have resulted in higher bank profitability. Another finding was that more developed banking market and the capital market with higher inflation has led to higher profitability. Andris et al (2012) examined the situation of the banks in Eastern and central Europe countries during the crisis and earlier. The results show that during the recent financial crisis, banks with more capital will have the best performance, and its main focus has been on traditional banking activities.

II. CONCEPTUAL MODEL

A. The conceptual model of research

To investigate the factors influencing bank performance (efficiency in this study), these factors are divided into two parts of internal and external factors. External factors include interest rate, loan interest rate, liquidity growth, inflation, economic growth and internal factors, include capital adequacy ratio, asset quality, liquidity assets, sensitivity to market risk, bad debt provision, the composition of deposits, the combination of facilities and the interest rate on deposit and credit. Each of these factors on the basis of theoretical studies have certain and known effects on the banks' performance. Some of the studies in this field have studied the factors affecting interest margins that are obtained from the difference between the rates of interest received from loans, and the interest rates for resource mobilization. Of this category of basic research, we can note to the study of Demirgüç-Kunt and Huizinga (1999), Claeys and Van der Vennet (2008). In this research, Demirgüç-Kunt and Huizinga examined data on 80 countries, and found that a large proportion of bank assets to GDP, as well as the small ratio of market concentration reduces bank interest margins and profits. Some studies on models of bank profitability, has been carried out emphasizing the shock test framework such as Geršl et al. (2012), which have estimated adjusted operating profit with the help of assessment models. In this research, it has been shown that, operating profit adjusted annual changes are directly affected by the growth of GDP. Since the purpose of this study is to find the relationship between the performance of the banking sector and macroeconomic data and bank internal variables using regression analysis, therefore, based on theoretical principles presented, the most important variables in the analysis of the factors affecting performance banks in the form of a conceptual model is presented below.



As can be seen in the above graph, the variables of liquidity, bank profits rate, and the rate of reserve have been identified as instruments of monetary policy, and changes in gross domestic production and inflation ratio have been identified as the country's macro-economic variables affecting the country monetary markets, and internal factors include capital adequacy ratio, asset quality, liquidity assets, sensitivity to market risk, bad debt provision, the composition of deposits, composition and interest rates on deposit and credit facilities, therefore, with the help of panel data, the effects of these variables was examined on the performance of the banks.

III. METHODOLOGY

A. Estimated degrees of efficiency using the WDEA model

In estimating degrees of efficiency, the moving average is used. As seen in the table, the degrees of efficiency are estimated in form of windows during 3 years. The first window includes the years 2007, 2008 and 2009. In the second window, 2007 has been removed, and 2010 has been added to the window. Since WDEA model uses moving average, when a new period is defined in the window, the first period is removed. Subsequently, estimates continue up to seven windows, then the mean degradations will be calculated for each year. This method can study the trend of performance changes in these years.

Table 1-4 Separation of Windows

			2009	2008	2007	window1
		2010	2009	2008		window2
		2011	2010	2009		window3
		2012	2011	2010		window4
	2013	2012	2011			window5
2014	2013	2012				window6
2015	2014	2013				window7

Source: Results of Research

B. Estimation of the effects of macroeconomic variables on the levels of performance of the banks

As mentioned, firstly, considering the specific conditions and characteristics of banking, performance values of the banks were obtained, and then, in order to control the conditions governing the bank environment in the second stage, by taking them, macroeconomic conditions were entered the model. Accordingly, using existing theoretical foundations and research background, of the estimated models, models specified in (4-1) was diagnosed to explain the degrees of efficiency of the banks. However, we first introduced and explained briefly the macroeconomic variables in the model, and then, the impact of macroeconomic variables on the performance of the banks in exchange was examined.

$$Efficiency_{it} = B_1 + B_2 * Gdp_{-1t} + B_3 * Liquidity_t + B_4 * Inf_t + B_5 * Exchange_t + B_6 * Dummy_t + residual_{it} \quad (1-4)$$

Efficiency: This variable is included in the model as the dependent variable. In this study, the type of efficiency used in the model is the efficiency with constant returns to scale. This type of efficiency is taken into consideration, because, overall performance levels are a combination of scale efficiency and efficiency with variable returns to scale.

Gdp₋₁: The variable is included in the model as an explanatory variable and is indicative of the growth rate of GDP in the previous period. GDP is used to reflect the level of public revenue. As shown in the figure, the Iranian economy over the period 2007-2014 has faced with a dramatic reduction in economic growth. Comparison of the performance of gross domestic product in various economic activities show that the negative growth of the agricultural sector and decrease in production and exports has provided the context for a substantial reduction in the growth rate of GDP in 2008. The dramatic and unprecedented negative mutation also occurred in 2012 which the most important reason may be errors at different levels of state policy, exchange rate fluctuations and increased international sanctions. Statistics show that real GDP in 2013 reached to the lowest during the last four years, ie 1973 thousand billion Rials. Negative mutation created in economic growth, in 2012 was to some extent, the growth rate of GDP to the base price from 3/4% in 2011 reached to 8/6% in 2012, and then slowed and in 2013, it reached to - 9.1 percent.

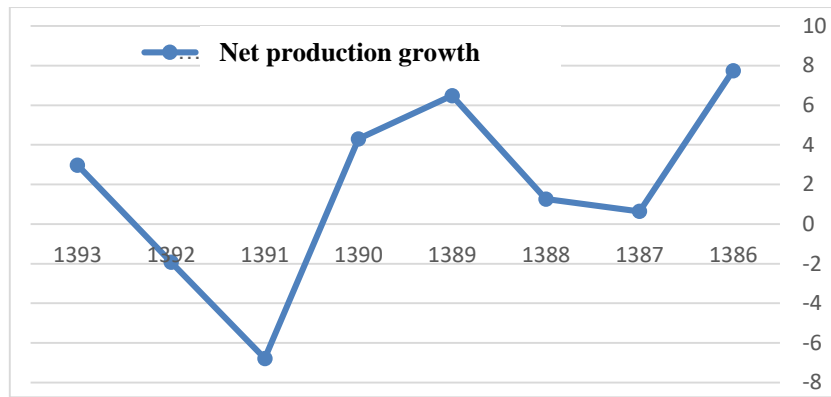


Figure 2-4- GDP growth (percent) (100 = 2004)

Liquidity: This variable is a monetary macroeconomics variable, which is entered in the model as an explanatory variable, and shows the liquidity growth rate. As seen in Figure 4-3, the lowest rate of growth of liquidity is related to 2008 and after that 2011, after them, there was an increasing rate of liquidity growth rate; however, this growth rate since 2011 (years 2012 and 2013) has been accompanied by a significant amount.

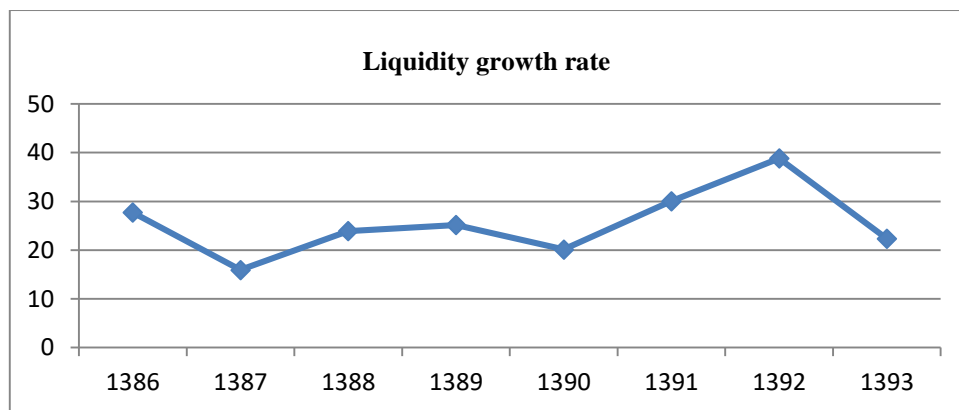


Figure 4-3- Liquidity growth rate in the period 2007-2014

Inf: Inflation is one of the most important macroeconomic variables which reflect the conditions of macroeconomic stability and is directly related to levels of interest rates, and thus has relationship with interest income and expenses. In the figure below, the changes have been exhibited. As can be seen in the graph, there are two relative maximum point of inflation during the period under study, one of them is related to 2008, and the other one is related to 2013, which its upward trend has started from 2010. According to the Central Bank of the Islamic Republic of Iran, its reason has been attributed to subsidies. Statistics indicate that by 2013, this trend continued economic because of increased exchange rate and establishing economic sanctions. In 2014, factors such as the stability of the currency market, reducing inflationary expectations, strengthen financial discipline and reducing the world price of basic goods caused inflation to fall sharply.

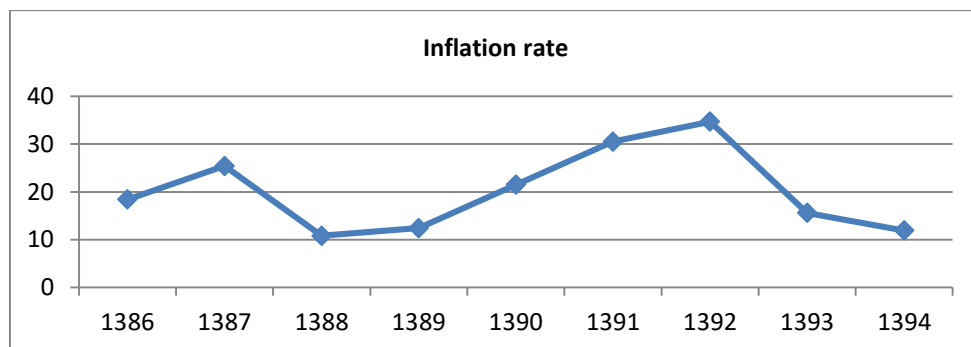


Figure 4-4 - The rate of inflation over the period 2007-2015

Exchange: Exchange growth rate (official) is another variable included in the model. Changes in exchange rates for banks with different portfolios of assets affect asset values, liabilities and the cost of providing foreign exchange resources. In the following figure, the official exchange rate values during the period 2008-2014 are presented. Statistics indicate that the growth rate of the currency, especially during the period 2012-2013 was associated with significant fluctuations.

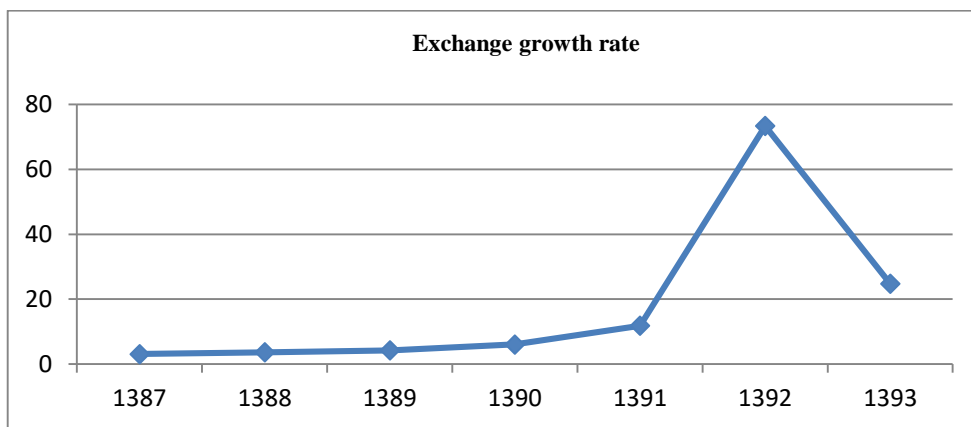


Figure 4-5 - the exchange rate (percent) over the period 2008-2013

Dummy: This variable is a dummy variable which intensified economic sanctions since 2012 has been considered. In general, sanctions on the Iranian economy have been reflected in three ways: (Rahmati, Karimi Rad and Madani Zadeh, 2015).

1. The sharp rise in the exchange rate: prices of imported goods needed by households and prices of imported capital and intermediate materials have increased.
2. The ban on trade: Many goods are on the sanctions list, and banking transactions is very difficult.
3. Oil embargo: that led to a sharp decline in oil exports and oil revenues.

However, given that as a result of these sanctions, a large part of the banking operations, including exchange transfers, opening of letters of credit and bank guarantees affected, it is necessary that the effects of these variables on bank performance to be examined. It should be noted that, in the definition of dummy variable during 2011-2015 which was accompanied by sanctions, 1 has been assigned and zero has been dedicated to the years 2007-2010.

IV. CONCLUSION

The results of estimating degrees of efficiency using the WDEA model, as can be seen in the figures, degrees of efficiency over the period 2007-2015 was associated with increased distribution, and degrees of efficiency tend to have low-grade efficiency.

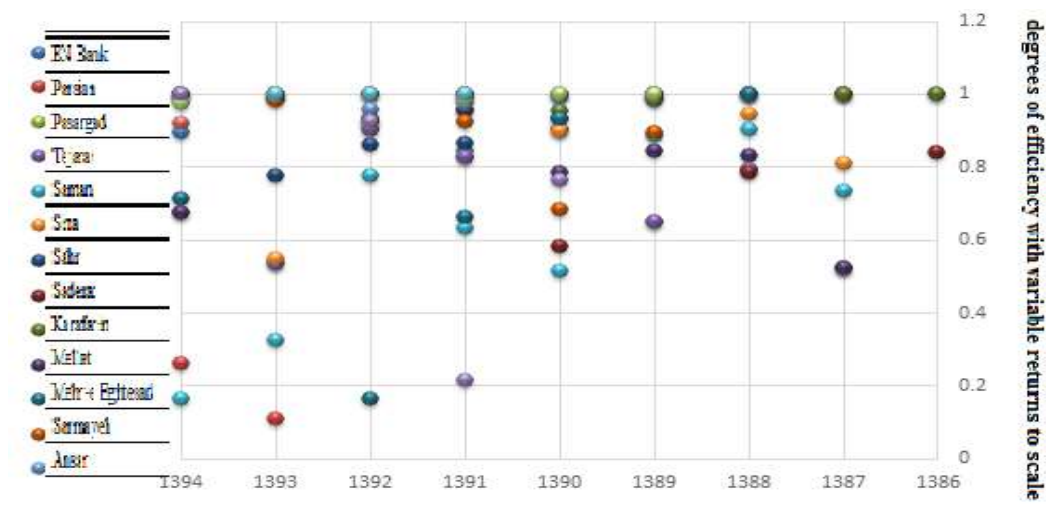


Figure 5-1: Output-oriented degrees of efficiency assuming variable returns to scale

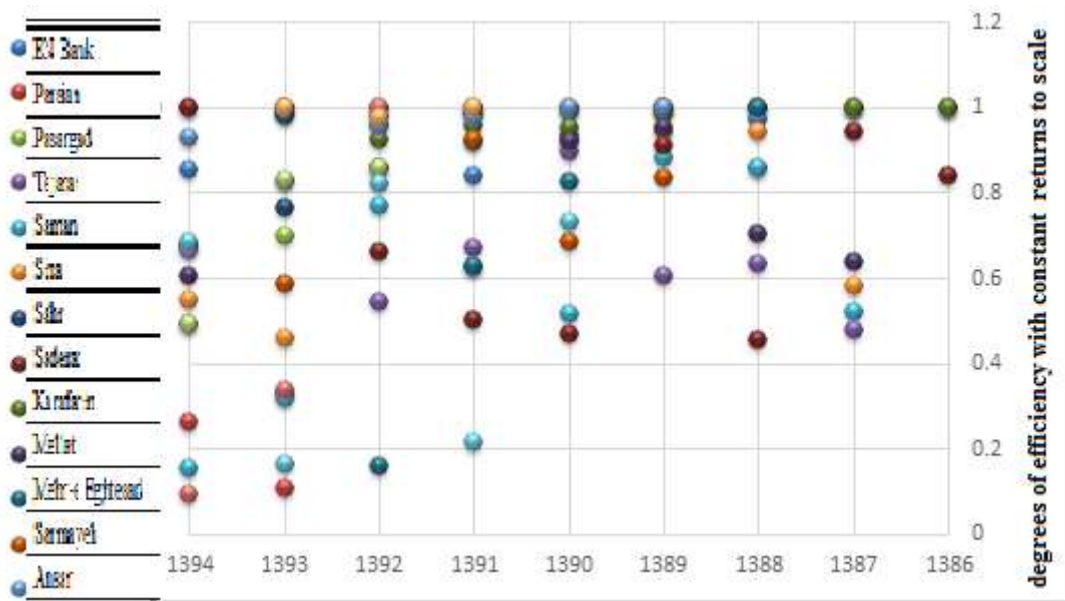


Figure 5-2: Output-oriented degrees of efficiency assuming constant returns to scale

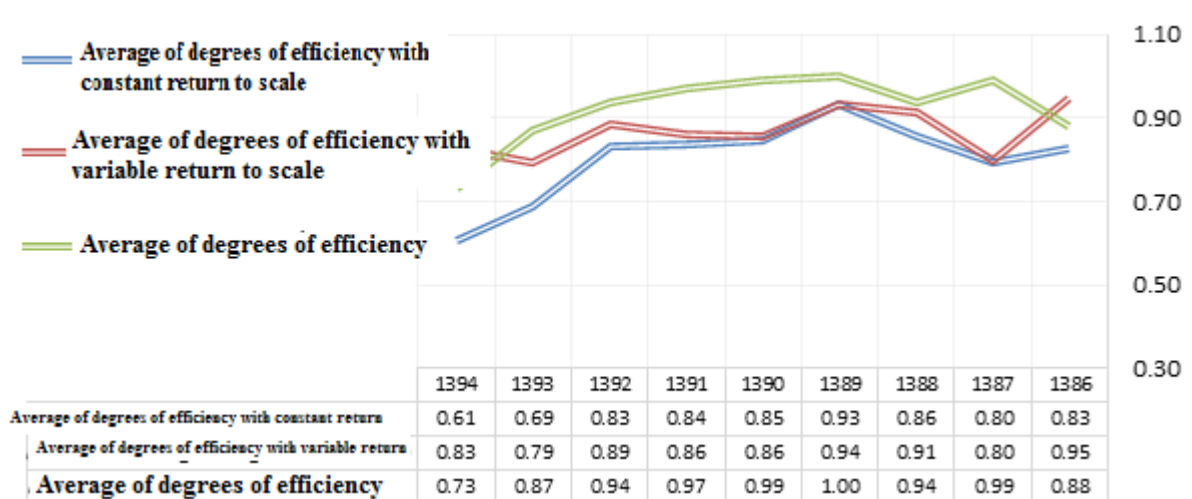


Figure 5-3: Variance of degrees of efficiency for banks studied over the period 2007-2015

As seen in Fig 4-4, banks active in the Stock Exchange has had a downward trend due to efficiency in both constant returns to scale and variable returns to scale, so that, respectively, their average value during 2007-2015 from 0.83 has reached to 0.61 and from 0.95 to 0.83. This is more palpable, also after 2010, which the maximum average efficiency in both has acceptable efficiency. This is true for the scale efficiency that during the period studied has more efficiency.

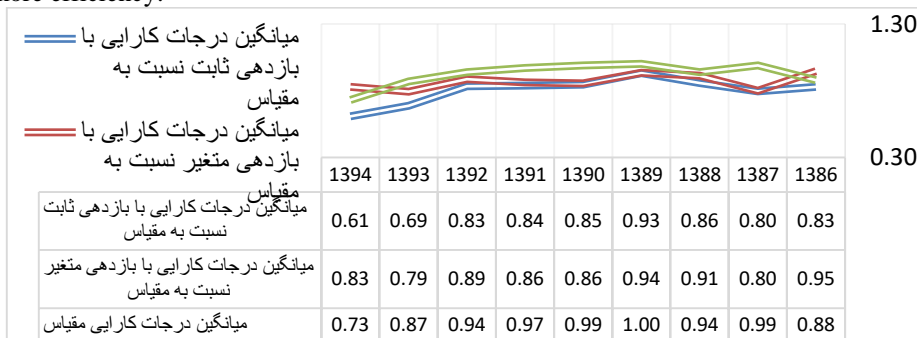


Figure 4-5 Average degree of efficiency for banks studied during 2007-2015

In Table (5-2), the results of data window envelopment analysis is classified. According to the table, we see that the average efficiency in terms of constant and variable to scale for banks studied is equal to 79/0 and 86/0. In the case of variable and constant returns to scale, respectively, 66/79 and 28/78 percent of all banks have technical efficiency higher than 60 percent. Also, the results of table (5-2) show that banks studied under conditions of constant returns to scale banks, in terms of technical efficiency, produces 79 percent of the production in the efficient conditions and can increase their outputs without increasing their inputs. Scale efficiency is (92%), and lack of efficiency scale is 8%, thus, eliminating inefficiencies of technical efficiency scale of banks can be increased from 79 percent to 86 percent. After estimation of efficiency for internal variables in banks, now, the main objective of the present study, study of the effects of macroeconomic conditions or external or exogenous variables, to be examined, which is estimated using Tobit regression (regression as random effects) on panel data.

The results of macroeconomic variables estimation on the levels of efficiency of the banks
Table 5-5 - Descriptive information of variables used in the model

Observations	the amount of maximum	the amount of minimum	Deviation Criterion	Average	The level used	Variable
N = 118	1	0.091	0.249	0.794	Overall	Degrees of efficiency with constant returns to scale conditions
n = 18	0.991	0.522	0.136		Inter-Group	
T-bar = 6/55	1	0.134	0.213		Intera-Group	
N = 162	7.34	10.8	80.104	20.13	General	Inflation
n = 18	-	-	0		Inter-Group	
T = 9	7.34	10.8	8.104		Intera-Group	
N = 126	73.35	3.112	23.74	18.12	General	Exchange growth rate
n = 18	-	-	0		Inter-Group	
T = 7	73.35	3.112	23.74		Intera-Group	
N = 144	7.744	-6.783	4.403	1.83	General	GDP growth rate in the previous period
n = 18	-	-	0		Inter-Group	
T = 8	7.744	-6.783	4.403		Intera-Group	
N = 144	38.823	15.916	6.508	25.51	General	Liquidity growth rate
n = 18	-	-	0		Inter-Group	
T = 8	38.823	15.916	6.508		Intera-Group	

Source: Results of Research

Table 5-6: Results of implementation of Tobit regression

Variables	Coefficients	Deviation Criterion	Statistics z	Possibility	Statistics Wald	Possibility
LGdp.	0.064	.0365	1.75	0.081	11.76	.0383
Liquidity.	.0274	.0116	2.35	0.019		
Inf	-0.0211	.0145	-1.46	0.145		
Dummy	-0.125	0.072	-1.74	0.082		
Exchange	0.008	0.007	1.21	0.227		
y-intercept	0.479	0.195	2.45	0.014		

Source: Results of Research

With the explanations provided, the effects of conditions prevailing macroeconomic in the country, including GDP growth rate in the previous period, liquidity growth rate, inflation, exchange growth rate and dummy variable

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which is defined based on sanctions is defined on the efficiency of the banks investigation is estimated that their interpretation will be discussed in the following. It is necessary to note that the slope coefficient directly gives the final impact of an independent variable on latent variable * Efficiency_{it}.

First, the overall interpretation of Wald statistic reported in this paper reveals that the model is significant at the 5% level. The results show that, variable rate of gross domestic product growth in the previous period is 0.064 which the effect is significant at the 10% level, and can be considered as one of the influential factors. This is consistent with the results of the research of Sadat (2012). The results of liquidity growth suggest that with an increase of one percent liquidity growth, the estimated value of the overall degrees of efficiency has increased about 0.027. This result is consistent with the results of research conducted by Albulescu (2015), Sophian H. (2009), Ghobadi (2014), Shhbazzadeh and Khiavi (2012). The results show that the exchange growth rate variable has a positive effect on the efficiency of the banking sector, and a percentage increase in the exchange rate growth will increase efficiency as much as 0.008. But given that, on the one hand, the z-statistic is greater than one, and on the other hand, in any of levels 1, 5 and 10 percent is not significant, the impact on overall efficiency levels estimated, is seen as weak. The results can be matched to a study conducted by Evans Ovamba Kiganda (2014). Inflation variable, is one of the most important variables in examining the effects of macroeconomic variables, this variable is significant at the 10% level. This may be due to the fact that, in Iran, inflation is determined as ordered by the Central Bank, which is probably due to the adverse impact of inflation on banking efficiency. The result of the effect of inflation on the efficiency of the banks is consistent with the results of studies of Hoshyari (2014), Sadat (2012), Ansari (2011) and Bagheri (2006). The last variable in the model which was significant at the 10% level is a dummy variable. Statistical results show that, this variable has a negative effect on estimated levels of efficiency. In other words, according to what was explained earlier, sanctions and the impacts that had on the economy after 2011, has had a negative effect on efficiency levels.

C. Summary

Basically, empirical studies have benefited from two competing approaches to investigate the performance of banks: trading approach and theoretical approach of a firm. Trading approach, first described by Ho and Saunders, 1981, and was later extended in 1985 by Mac Qin and Sharp. This approach considers the banks as dynamic traders, in the sense that, banks to meet the asymmetry in the demand for loans, deposits and delivery, try to adjust the interest rates related to them. Theoretical approach of a firm which was introduced by Klein and Monti, believe that supply and demand for loans and deposits simultaneously settle both the market. Although the trading approach includes the markets and the effects of institutions, but these factors can't be placed directly on the model. More recent studies have considered the effect of bank characteristics and macro economy (without market characteristics) On bank profitability (Sofian & Habibullah, 2012, p225)). This study evaluates degrees of the efficiency and effects of macro variables on the levels of bank's efficiency 2000-2015, using WDEA method for studying degrees of efficiency between banks, as well as, using panel the macroeconomic variables effect on efficiency levels is studied. In summary, the results showed that the degree of efficiency has been associated with an increased dispersion, and degrees of efficiency trend low degrees of efficiency, and at the macro level, the sanctions and their impacts on the economy after 2011 has had a negative effect on performance levels.

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- 27.

Attachment:

Table - Technical Distribution of Technical Performance of banks studied during the period 2007-2015

Range Degrees of efficiency	Constant Return		Variable Return		Performance of Scale	
	Number	Percent	Number	Percent	Number	Percent
Zero until 0.2	5	24/4	3	54/2	2	70/1
0.2 to 0.4	6	08/5	3	54/2	0	54/2
0.4 to 0.6	13	02/11	9	63/7	5	08/5
0.6 to 0.8	18	25/15	15	71/12	11	17/10
0.8 to 1	76	41/64	88	57/74	79	51/80
Total	118	100	118	100	118	100
Average Performance	79/0		86/0		92/0	

Table - Average degrees of efficiency in different banks

Banks	Performance Under Variable Returns To Scale	Performance At Constant Returns To Scale Conditions		Performance At Variable Returns To Scale Conditions
EN Bank	0.965744	0.954712		0.988356
Parsian	0.767276	0.767118		0.998539
Pasargad	0.766065	0.914435		0.959187
Tejarat	0.766065	0.644144		0.833311
Saman	0.659104	0.627051		0.952135
Sina	0.898139	0.80032		0.883427
Sahr	0.91937	0.912769		0.997142
Saderat	0.912212	0.753978		0.822557
Karafarin	0.943837	0.943108		0.999216
Mellat	0.816518	0.783091		0.98494
Mehr-e Eghtesad	0.779549	0.727399		0.928063
Sarmayeh	.8829	0.777495		0.89088
Ansar	0.98863	0.976948		0.988317
Iran Zamin	0.960404	0.746105		0.774675
Tourism	0.869504	0.607133		0.699163
Hekmat	0.981232	0.794169		0.814702
Ayandeh	0.779901	0.522423		0.738813
Day	1	0.99136		0.99136

Source: Research Findings