

INSPECTING THE EFFECTIVENESS OF LIQUIDITY RISK ON BANKS PROFITABILITY

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Abstract

Banking system is the beating heart of every economical system and many factors affect its performance; liquidity risk variables are among most important these factors. Some of the variables are NPL (Non-Performing loans) ratios, liquidity ratios, liquidity gap ratio, capital ratio, and bank size. In this paper, it is attempted to examine the relation between these variables and Iranian banking system performance factors including profitability factors as ROE and ROA. Also, the impact of microeconomic factors on Iranian banking system performance is assessed. Using a four-step econometric model and GMM linear forecasting model, it was concluded that there is a significant relation between mentioned factors (dependent variables) and the profitability ones (independent variables).

Keywords: Bank profitability, Liquidity risk, Effectiveness, Banks Profitability

Introduction

The power of banking system is a key component to ensure economic stability and growth. The weaknesses in the banking system of a country (whether the country is developed or developing) can threaten the financial stability both within that country and in the international arena. Banks are the main components of financial sector in the economy and play valuable role in both sides of their balance sheets. In fact, they are institutions which convert short-term obligations into long-term assets. Through equipping small and big savings and leading them to productive and commercial enterprises, banks firstly convert non-productive assets to productive factors and secondly push production factors (which have low productivity or are idle due to the lack of capital) toward full employment or high productivity. Actually, banks accelerate cash flows and the process of lending funds to requiring sectors on the right-hand side of their balance sheets and create liquidity for savings owners on the left-hand side. According to the defining characteristic of banks, loans granted to businesses and customers are their major investments and deposit accounts are their main obligations. Such as investors, banks main goal is to adapt the assets risk with obligations and obtain a lucrative gap between lending and borrowing rates. Banks also

facilitate the process of payment and settlement and create the slow process of transferring goods and services. Finally, banks as an important factor in the implementation of monetary policies perform the economic decisions of central bank. This diverse operational nature of banks subjects them to various risks in their daily operations. The risks are divided into four groups: 1- financial risks, 2- operational risks, 3- business risks, and 4- risks of various events. The financial risks include two main groups as follows:

A) Net risks that include liquidity risk, credit risk, and bankruptcy risk that their mismanagement leads to irreparable damages.

B) Risks of speculation which are shaped based on financial arbitrages. These risks include interest rate risk, exchange rate risk, and market conditions risk.

The financial risks due to complicated banking dependencies (in economic system) increase the overall risk of banks. The present paper studies the liquidity risk and the factors affecting it as well as the impact of the risk on profitability of banking system in Iran.

The literature review

In a study as “liquidity risk and the performance of banking system”, Arif and Anees (2012) investigated the liquidity risk and its effect on banks profitability in Pakistan. The results of this study show that there is a significant relationship between the volume of deposits, liquidity reserves, liquidity gap, saving the deferred loans, and profitability of banks. They used the multiple regression method to estimate the results. In another study as “the impact of information quality on liquidity risk”, Ng. (2011) investigated whether the information quality due to the incidence of liquidity risk affect the cost of shareholders’ equity or not? Ng. defines the liquidity risk as sensitivity of stock returns to unexpected changes in market liquidity. To prove this, Ng. points out the recent literature on assets pricing that emphasize the importance of this systemic risk. Acharya and Naqvi (2012) in a study as “the seeds of a crisis: the theory of banks risk appetite in the business cycle” investigated the issue how speculative bubbles are formed in assets while the banking sector has sufficient access to liquidity. According to this study, in banking system, a compensation system based on granted facilities is considered for staff granting facilities to increase their efficiency. This compensation system is based on the volume of granted facilities and in addition to increasing the risk levels in banks, it can cause severe liquidity fraction of banks due to disengagement of officials granting loans. Outside the banking system, investors reduce their direct investment levels and mostly deposit their money in banks when macro-economic risks occur. In such circumstances, banks face balance surplus of liquidity that it leads to the reduction of bankers’ balance of payments and the emergence of speculative bubbles in assets. Thus, according to Acharya and Naqvi (2012), the seeds of a crisis are sown and give fruits.

There is another study done by Rostamiyan and Haji B. (2009) as “measuring the liquidity risk of banks using value at risk model (the case study of Saman Bank-Iran)” in which they define the liquidity management as a bank’s ability to perform its financial obligations over time. They believe that liquidity management needs to identify the risks that are exposed to liquidity as well as the changes caused by environmental variables. Liquidity management can be carried out at different levels and managers can use liquidity risk as an index to

control and manage liquidity. In this study, liquidity risk is measured and analyzed as a case study of Saman Bank-Iran. In another study done by Saeidi and Shabani M. (2010) as “liquidity risk in banking industry using Emery’s Lambda index”, it is stated that banks should evaluate their liquidity at specified intervals to manage their daily liquidity based on the conditions. Therefore, each bank should create a process to continuously monitor and measure its needed funds. Emery’s Lambda model is a model which evaluates the sufficiency of banks’ funds using random processes. The main purpose of this study has been to introduce a liquidity risk measurement method using Emery’s Lambda model as well as find the best conditions for a correct prediction of daily cash using the model. There is another study done by Amery N. (2010) as “the factors affecting banks’ accrued receivables in Iran” in which the main purpose of study has been stated as evaluating the internal and external factors causing banks’ accrued receivables and providing solutions to prevent them. The hypotheses of this study have been tested using a simple linear regression function model in which the dependent variable “accrued receivables with a one-year delay and loss” is on the right-hand and the ratio of “accrued receivables” to “bank-specific and macro-economic variables” has been assessed over a period of 10 years (1999-2008). In this study, the generalized moment method has been used to estimate the model. Samety et al. (2011) studied the impact of macroeconomic instability on lending behaviors of commercial banks in Iran using data from commercial banks in the period of 1974-2008. Based on method of cointegration and vector error correction model, the results of this study show that there is a long-term relationship between lending behaviors of commercial banks and macroeconomic instability; in other words, changes, the increase, in macroeconomic instability index can reduce the lending of banks in the long term. On the other hand, the increase in the natural logarithm of commercial banks’ assets, which is an approximation of bank size, shows its significant effect on lending behaviors of commercial banks. Also, in this study, the estimated results obtained from the error correction model and the significance of error correction coefficient prove that 27% of imbalanced lending behaviors of commercial banks in the previous period are corrected in the current period. Darabi and Molayi (2011) used the methods of correlation and regression analysis to study the impact of liquidity, inflation, capital preservation, and GDP (gross domestic production) on profitability of Bank Mellat- Iran. In this regard, they proposed four hypotheses and claimed that there is a significant relationship between the mentioned independent variables and the dependent variable “profitability of Bank Mellat- Iran”. The first hypothesis of this study investigates the relationship between liquidity and profitability of Bank Mellat that the results indicate a significant relationship between them. The rejection or confirmation of the second and third hypotheses is not investigated, but the fourth hypothesis which examines the significant relationship between inflation and the profitability of Bank Mellat is explicitly rejected.

Research Methodology

This research is a correlational descriptive-analytical study. The main purpose of such a study is to provide an objective, actual, and systematic description about the characteristics of a situation or an issue, identify the relationship between variables and the causes of an event, and finally use the results practically in making decisions and policies as well as planning.

The spatial and temporal scope of the study

In terms of the spatial and temporal scope of this study, the banking system of Iran during the years 2005-2011 has been assessed. The statistical population of research consists of 18 banks based on the spatial and temporal scope. Only the banks including all of the following characteristics have been assessed:

- The banks' financial year end is on March 20 (end of the financial year in Iran).
- Holding, insurance, investment, and financial intermediation companies are not among the sample members (no information of consolidated financial statements has been used).
- The banks should have started to work before 2005 and be active during the years 2005 to 2011.
- During the period of study, the operational interruption of banks should not be more than 5 months.
- The required information about the banks should be available.

According to the above conditions, the statistical population of research consists of 18 banks including Bank Melli, Bank Sepah, Bank Saderat, Bank Tejarat, Bank Mellat, Bank Refah, Post Bank, Agricultural Bank, Bank Maskan, Export Development Bank, Karafarin Bank, Saman Bank, Parsian Bank, EN Bank, Bank Pasargad, Sarmayeh Bank, and Sina Bank. The data of this study are collected through reviewing relevant documents according to the study period (the time span between 2005 and 2011), referring to economic time series data contained in the site of Central Bank of Iran, the World Bank, and the banking time series published by the Monetary and Banking Research Institute.

Methods of data analysis

In the stage of data analysis, a researcher attempts to examine data using various methods and relying on rational criteria in order to test hypotheses. In this stage, what matters is that the researcher should analyze the data in line with the research objective and try to answer the research questions, and evaluate the research hypotheses (Hafezniya, 2008).

In the present research, considering the nature of model (in which the panel data have been used) and the dependent variable on the right-hand side of equation, dynamic panel data model has been used to analyze the data. One of the advantages of panel data is that the researcher can understand the dynamism of data very well. In the following, types of statistical data, estimation of the model using panel data, linear dynamic panel data model, and GMM linear estimator are introduced.

Linear dynamic panel data model

In this model, it is emphasized on "first-order autoregressive error-components" model with a cross-section dimension of N and a time dimension of T so that N is bigger than T. The base model of dynamic panel data is as follows:

$$Y_{i,t} = \alpha_1 Y_{i,t-1} + X_{i,t} \beta + \varepsilon_{i,t}$$

Here, $i = 1, 2, \dots, N$ and $t = 1, 2, \dots, T$ and the autoregressive parameter α_1 (which is a scalar parameter and estimated in the model) satisfies $|\alpha_1| < 1$. Also, $X_{i,t}$ and β are respectively a “1-of-K” vector of regressors and a “1-of-K” coefficient (which should be estimated). “ $\varepsilon_{i,t}$ ” is the unobservable error term. In this model, “ $Y_{i,t-1}$ ” is also the lag of dependent variable that is inserted as an independent variable on the right-hand side of the equation (Zarvaki, 2012).

The GMM linear estimator

The GMM linear estimator was firstly introduced in the economics literature by Hansen and Singleton (1982). It was rapidly known as one of the most widely used econometric techniques, both in sectional estimation and in estimating panel data. In fact, this technique is very flexible and requires only weak assumptions. The GMM estimator is a common IV estimator and is particularly very useful when the model is over-identified. In this model, the lag of dependent variable is inserted as an independent variable on the right-hand side of the equation. Thus, there is the possibility of re-parameterizing the model using dynamic panel data method. This makes it possible to estimate the short-run elasticities. It should be noted when in panel data model, lagged dependent variables are inserted on the right-hand side of the equation, the QLS (ordinary least squares) estimators cannot be used anymore (Hishao, Arlano, Bond, and Baltaci, 1995) and two-stage estimation methods (Anderson and Hishao) such as 2SLS (two-stage least squares) or the generalized moment method (GMM) of Arlano and Bond (1991) should be applied. As Matias and Suster pointed out 2SLS estimator may result in great variances for the coefficients due to the problems in choosing the instruments and the estimations would not be meaningful statistically. Thus, generalized moment method (GMM) of Arlano and Bond was proposed to solve the problem. This estimator increases estimation consistency through the reduction of sample (Tabibi, Karami, and Sariri, 2011).

The core of the GMM estimation is to formulate the meaningful moment condition that allows the parameters of the model to be consistently estimated. Using the analogy principle, it is possible to switch from the population moment condition to the sample moment condition and use it to estimate the parameters of the model (Zarvaki, 2012).

The estimation technique of GMM is in fact an expansion of moment methods, which is generalized to other models beyond the linear regression. The moment method is an estimation technique by which unknown parameters are estimated through adapting population moments (which are functions of the unknown parameters) with appropriate sample moments (Talakesh, 2007).

The consistency of GMM estimator depends on the validation of this assumption that there is no serial correlation of error terms and instruments. This can be examined by two tests stipulated by Arlano and Bond (1991), Arlano and Bover (1995), and Blundell and Bond

(1998). The first test is the Sargan test which tests the validity of instruments; the second test is M_2 statistics which tests the second-order serial correlation in differential error terms of the first order. If the null hypothesis is not rejected in both tests, there will be no serial correlation of error terms and instruments (Tabibi, Karami, and Sariri, 2011).

The research model

In the present study, due to the dynamic panel data, the generalized moment technique has been used to estimate the model and test the linear relations between independent and dependent variables. In previous studies conducted in this regard in Iran, the GMM technique has been not comprehensively used to examine the linear relations between independent and dependent variables and only there is a study in which 5 commercial banks were examined in a period of 10 years to investigate the factors affecting banks' accrued receivables in Iran. Considering the issue that in this study the dependent variables include return on equity (ROE) and return on assets (ROA), the following models are used in this research:

$$ROE = \alpha_1(ROE_{t-1}) + \alpha_2(LTA) + \alpha_3(DTA) + \alpha_4(IDTSD) + \alpha_5(NPL1) + \alpha_6(NPL2) + \alpha_7(NPL3) + \alpha_8(LIQ\ GAP) + \alpha_9(CR) + \alpha_{10}(GDP) + \alpha_{11}(IR) + \varepsilon$$

$$ROA = \alpha_1(ROA_{t-1}) + \alpha_2(LTA) + \alpha_3(DTA) + \alpha_4(IDTSD) + \alpha_5(NPL1) + \alpha_6(NPL2) + \alpha_7(NPL3) + \alpha_8(LIQ\ GAP) + \alpha_9(BS) + \alpha_{10}(GDP) + \alpha_{11}(IR) + \varepsilon$$

The description of variables used in above equations is as follows:

Profitability criteria: these criteria focus on organizations' profits. To facilitate the comparison of organizations' profits, the total profit is expressed based on every invested dollar. The return on equity (ROE) and the return on assets (ROA) are related to each other; however, the relation between them is affected by the financial policies of an organization. Thus, the analyst who interprets the previous behaviors of equity should carefully consider the mix of debt to equity (the financial leverages of the organization) and the interest rate of the company (Bodie Kane Marcus, 2012).

The model estimation method

The analysis of data related to various commercial and specialized banks usually needs to use panel regression models in which the banking system behavior is dynamically assessed during a period of time. The banking system behavior is affected by many variables which are usually divided into groups: banking specific variables and macroeconomic variables. In applied studies, the common panel models are not considered as dynamic models (Damodar Gujarati, 1995). This leads to neglecting the dependence between the states of previous years, but these dependencies have been taken into account in this study; therefore, a lagged response variable has been considered in each model to analyze the data. Totally, a four-step econometric process has been used in this section to find the casual relation between independent variables (the effective elements on liquidity risk) and dependent ones (profitability indices). In the first step, panel unit root tests have been used to examine the research data steadiness. In the second step, using the differential methods, the data with a high degree of cointegration are stipulated. In the third step, the size and the type of relation

between independent and dependent variables are estimated using the generalized moment method. Finally, using the Sargan test, the validity of matrix of assessment instruments has been tested in different stipulations of research models.

Diagnostics test on the data

Before using time series data to estimate the economic relations, the properties of time series data should be assessed using unit root tests. In fact, without considering the unit root tests, modeling and estimating the relations using time series data will be invalid, because a large number of economic time series are non-stationary and the regressions between them are generally fake or spurious (Granger and Newbold, 1974). A spurious regression is defined as a situation in which despite the high coefficient of determination, there is no significant relation between variables. Over the past two decades, cointegration techniques have been widely used in applied and econometric studies. Due to some problems such as long-term time series as well as low-power unit root tests such as Dickey Fuller, generalized Dickey Fuller, Peron, and so on, economists expanded and generalized root and cointegration tests to panel data. Among the studies conducted in the field of generalizing linear unit root models to unit root models of panel data, it can be pointed to the works of Kovah (1994), Levin et al. (2002), and Levin et al. (2003). These studies which are done on the unit root all indicate that the unit root tests based on panel data are more accurate and robust tests compared to unit root tests for time series. The most important methods of unit root test resulted from generalizing unit root tests to panel data are as follows:

- The LLC (Levin, Lin, Chu) test
- Bertung's test (2000)
- The test of Im et al. (2003)
- Fisher's tests (ADF, PP)
- Hadri's test

Totally, the tests mentioned above assess the cointegration status of the variables. In fact, the cointegrated variables move together over time, so that short-term disturbances can be corrected in the long term. Granger believes that the first-order cointegrated time series can be converted into stationary data after once differentiation.

In this study, using the tests of LLC, Im et al., and Fisher, the variables have been assessed in terms of being cointegrated. Table 1 shows the results of this test for Iran's banking system in 2005-2011. Since the final significance levels for all variables in all unit root tests is smaller than 0.1, it is concluded that all variables are stationary.

The results of model estimation

Since the present study has two models for estimating the relations between independent and dependent variables, the findings have been provided as two tables under six stipulations. In the first and second tables (table 2 and 3), the results of estimating the effects of independent variables on ROE and ROA have been respectively presented. Also, the Sargan test has been used to assess the validity of instruments matrix. It should be noted that

the Sargan statistics (1958) applies predefined restrictions to determine the type of any correlation between instruments and errors. The validity of instruments depends on the correlation between instruments and error terms; the instruments will be valid if there is no correlation between instruments and error terms. In this study, the research main hypothesis (null hypothesis) is that the instruments are valid as long as they are not correlated with the errors in the first-order differential equation. If the hypothesis is not rejected, the instruments will be valid; in other words, the instrumental variables are not correlated with the residuals and it can be concluded that the instruments used to estimate the model are sufficiently valid (Tabibi, Karami, and Sariri, 2011).

The estimation results of the first and second models obtained by (GMM) generalized method of moments have been shown in tables 2 and 3 as three separate stipulations with different combinations of dependent variables. As it observed, the value of Sargan statistics is lower than 0.5 ($P\text{-Value} < 0.5$) so there is no correlation between instruments matrix and disturbances. Thus, it is concluded that the instruments used in all stipulations are valid enough to appropriately estimate the model.

Conclusion

Considering the coefficients obtained in all stipulations of the first model, it is concluded that there is a positive and significant relation between the lagged variable of ROE (return on equity) and the dependent variable of model (the return on equity without lag). In other words, the increase in ROE in the previous period directly and positively affected ROE in the current period. In fact, inappropriate performance of banking system management in the field of equity can justify this direct and positive relationship, because if the performance was appropriate, there would no correlation between returns on investment of successive years. It is not easy to comment about the lagged variable of the second model. The concept received from the model coefficients is that there is no positive relation between the dependent variable and the lagged variable of ROA. On the contrary, these coefficients (in all three stipulations) indicate a negative and significant relationship between the lagged variable and the dependent variable of ROA. The relation is interpreted in this way that the increase in ROA in the previous period has no effect on ROA in the current period; however, it does not mean the appropriate performance of banking management in the field of assets. The reason for this negative and significant relation should be investigated in the reports of Iran' Central Bank which indicate a decline in the value of bank's assets. In fact, according to the reports of this bank, the value of banking system assets has been significantly reduced so that Iran's banks could not preserve the value of their assets based on the inflation.

The next variable is the ratio of liquidity (the ratio of cash assets to total assets). According to the definitions and interpretations of economic literature and banking sciences, the amount of liquidity in a society should always counterbalance goods and services at the society level. The increase in liquidity can lead to the shortage of goods and services, but the result will be inflation in the society. As previously mentioned, one of the biggest challenges is to manage liquidity in the banking system. The liquidity should be managed in a way that its amount is always sufficient, because the shortage of liquidity causes banks not to be able

to fulfill their obligations and as a result, they encounter the risk of liquidity and bankruptcy. On the other hand, the excess liquidity in banks means inefficient allocation of resources that it can lead to the reduction of banks returns. In general, attracting and creating liquidity should be in line with increasing the rates of productive investment and cause the economic system to move towards growth and development. The monetary and banking experiences show that the increase in liquidity or the excess liquidity can lead to undesirable effects such as inflation and depreciation of the money if it is not accompanied by increasing GDP.

Considering all mentioned issues, it is expected to observe the reduction of return rates for banks as a result of increasing the liquidity of them, but this hypothesis is rejected based on the results of models estimations. In the first stipulation of table 2, the hypothesis is confirmed due to its negative coefficient and being significance. The other reason for proving this relationship is the increase in costs arising from holding cash, especially the costs resulted from stagnant funds in the time of inflation. These costs directly reduce the banks' profitability and return on assets so they indicate the low performance of resource management to earn profits.

In the third stipulation of table 3, a positive and significant relation is observed between the variables of liquidity ratio and ROA ratio that it is contrary to previous expectations and the literature of banking system. The relationship can be justified in this way that the liquidity ratio is a criterion showing an entity's ability to convert assets to cash and pay off banking liabilities when the signs of liquidity crisis are emerged; on the other hand, the increase of liquidity in institutions leads to more cash dividends which has an additive effect on calculation of return that it causes the price per share and ultimately return per share to increase. Also, even if the cash dividends are not distributed, again the increase of liquidity can increase the amount of investment as much as undistributed dividends that it results in increasing banks' lending power and value creation.

The other important issue which is not reflected by the liquidity ratio is the concept of its numerator. In fact, the numerator of this ratio is the total cash assets of a bank. Regardless of the liquidity degree of bank's assets in cash and their quality and nature, this number is reflected in the numerator as the sum of some items. According to researchers of financial sciences, there is a concept in the nature of this sum that causes a paradox and contrast regarding the effect of this ratio on profitability ratios. As a result, the researchers of financial sciences have set aside the traditional liquidity ratios and use the calculations of new ones. These new ratios can provide a more accurate interpretation of liquidity ratios through calculating the weight of items inserted in the numerator of liquidity ratio.

The next variable (the ratio of core deposits to total assets) is considered as the main factor in liquidity risk. In fact, there is a direct and significant relation between this ratio and ROE. As previously mentioned, this ratio shows the amount of cash which has been applied with high stability to finance the assets. According to the second and third stipulations of table 2 and the second stipulation of table 3, the increase in this ratio can increase ROE and ROA; in other words, the increase of this ratio leads to an increase in banks' power for providing services that it subsequently results in increasing banks' interest incomes and finally creating value from banks' assets for institutional shareholders. However, it should be noted that the reliance on deposits and failure to take advantage of various financial instruments

causes banks to be faced with resource constraints. The reduction of main deposits in banks' debt portfolio causes the banks to be faced with liquidity deficit and the increase of liquidity risk. Although the increase of main deposits also leads to undesirable increase in banks' interest expenses, banks generally make money through the gap between the interest rates paid on deposits and interest received from facilities recipients. Therefore, the increase in banking deposits can lead to increase in banks' profitability power.

The next variable is the ratio of investment deposits to volatile deposits. The increase of this ratio shows the reduction of banks' reliance on volatile deposits. In other words, relying on investment deposits can reduce the liquidity risk in banks and as a result increase their success in liquidity management. In fact, the increase of investment deposits shows the increase of long-term financial resources that in addition to reducing the liquidity risk, it can increase the lending power of banks due to providing longer-term sources compared to volatile deposits. Although relying on volatile deposits can prevent large cash withdrawal (as interest expense) from bank in a period, it can lead to a significant decrease in banks' incomes in the long term. This decrease in revenue directly affects banks' profitability. The results of the first and second stipulations in table 2 and the second and third stipulations in table 3 confirm above conclusions.

The next variable is the ratios of accrued, past due, and doubtful receivables to total assets. As might be expected, there is an inverse and significant relationship between these ratios and dependent variables of ROE and ROA. The increase of these ratios shows mismanagement of banks on their sources and uses. In other words, banks' difficulty in collecting granted facilities at the deadline indicates the incorrect application of resources to expand economic activities. The increase of such receivables prevents proper circulation of money in the banking system of a country. On the other hand, banks finance the granted credits from deposits and they are required to pay guaranteed profits to depositors; therefore, failure to obtain the profits of granted credits (due to accrued receivables) leads to the reduction of banks' profitability. A more accurate reason for explaining this negative relationship is related to the calculation of accounting profit. In Iran, according to the approval of the Money and Credit Council in February 23, 2009, banks can consider respectively 10%, 20%, 50%-100% reserves for past due, accrued, and doubtful receivables at the end of each year and transfer these reserves to the account of doubtful receivables expense and reflect them in their profits calculations in the numerator of income. This causes the amount of profit to be reduced in this numerator and as a result it leads to the reduction of banks' profitability ratios. The results obtained from the effects of mentioned ratios on profitability ratios have been shown in tables 2 and 3 that all confirm the fourth, fifth, and sixth hypotheses of this study.

The relative liquidity gap (the ratio of liquidity gap to total assets) is the other variable identically affecting the profitability indices. In fact, there is an inverse and significant relation between this variable and the ratios of ROE and ROA. The increase of this ratio by a factor of 0.4 and a factor of 0.17 respectively has an inverse effect on ROE and ROA. The reason for such an effect can be explained by the method of calculating this ratio. The liquidity gap can be defined as follows:

$$\text{LIQUIDITY GAP} = (\text{TOTAL ASSETS} - \text{TOTAL LIABILITIES}) - (\text{FIXED ASSETS} - \text{EQUITY})$$

In above equation, the difference between total assets and total liabilities is the equity and any increase in it means the increase in equity financing. On the other hand, equity financing prevents organizations and institutions from using tax shield resulted from debt financing. In addition, the decrease in this part of the equation means the increase in liabilities and subsequently the increase in financial leverage. However, the increase in financial leverage can increase banks' profitability in the long term in the case of using a favorable financial leverage.

The second part of above equation proves that the increase of investment in fixed assets can reduce the amount of facilities provided by banks that it can also reduce the amount of income-generating assets of them. The simultaneous rise of these two parts leads to the exclusion of banks from the tax shield and income-generating assets, which it spontaneously leads to the reduction of ROA and ROE.

The next variables are the size of banks and the ratio of capital. Since there is no relation between the independent variable of banks' size and the dependent variable of ROE as well as no relation between the independent variable of capital ratio and the dependent variable of ROA, it is concluded that the impact of these independent variables should be assessed only on those dependent variables which are affected by them. So here, the impact of banks' size on ROA and the impact of capital ratio on ROE are assessed. Firstly, the variables are defined. The size of a bank is defined as natural logarithm of bank assets; ROA is also defined as the ratio of net profit (after tax) on the total assets. It is expected that the increase in banks' size leads to the reduction of the ratio due to increasing the denominator value. The coefficients of first and second stipulations in table 3 also confirm this conclusion; however, in the literature of banking sciences, it is explained that the banks with higher assets include higher capacity of lending; so the increase of banks' size should lead to the increase of their return. In other words, it is expected that the increase in natural logarithm of bank assets (which is a proxy of the bank size) causes banks to experience the increase of profitability. However, the results of this study show something different. The reason for this difference is related to the rate of increase in the volatility of macroeconomic indices. In fact, increase in the volatility of macroeconomic indices leads to the reduction of banks' lending. Among macroeconomic indices, it should be pointed to inflation rate. According to the reports of Iran's Central Bank, the increase of inflation rate has caused the value of assets to be reduced in the entire banking network. The decrease in value of banking assets can be justified in this way that despite the apparent increase in the amount of bank assets in 2005-2011, the variable has inversely affected ROA. In other words, the size of banks has been increased in terms of book value, but banks have not been able to preserve the value of their assets due to the increase of inflation rate. The second and third stipulations in table 3 show that this variable has an inverse and negative effect on ROA by an approximate factor of 0.04.

Here, the impact of capital ratio on ROE is assessed considering the nature of this ratio. According to the definition of capital ratio, it is obtained through dividing shareholders' equity by total assets. So, logically it affects ROE. According to the coefficient of second

stipulation in table 2, there is an inverse and significant relation between capital ratio and ROE so that capital ratio affects ROE by a factor of 0.08. This negative relation can be explained by the following equation:

$$ROE = FL * ROA$$

According to the above equation, ROE is obtained through multiplying financial leverage by ROA. The financial leverage is calculated in different ways. A common way is to divide the total debt by equity:

$$FL = \text{TOTAL DEBT} / \text{EQUITY}$$

It is observed that the increase in equity (as the denominator value) leads to the reduction of financial leverage; in other words, the increase in the favorable financial leverage can increase ROE. So, the reason for a negative relation between capital ratio and ROE is related to both the equity financing costs and the reduction of financial leverage degree.

Inflation rate and the rate of GDP growth are two macroeconomic variables which are assessed here as the last variables in the linear model. According to the reports of Iran's Central Bank, the banking system's share of the GDP growth rate is over 50 percent. In other words, due to the poor performance of Iran's capital market, the financial market plays the most important role in financing production and improvement of economic growth. Therefore, it is natural that there is a positive and significant relation between GDP growth rate and "ROE and ROA". In other words, any crisis in the banking system such as liquidity or credit crisis causes the banking system not to be able to play its intermediation role properly that it makes investment and production difficult. The results of the first and third stipulations in table 2 as well as the second stipulation in table 3 confirm the above conclusion.

According to the second and third stipulations in table 2 and the first and third stipulations in table 3, the inflation rate can moderate ROE and ROA ratios. To explain this effect, it should be considered that the increase in inflation rate can moderate banks' return ratios in two ways: first, the increase in inflation rate reduces the power of banks' financial resources to create value; also, it reduces the value of banks' cash assets. This can cause banks to be faced with liquidity crisis. Second, the real return of financial resources obtained from banks' investment portfolio depends on the real interest rate which is equal to nominal interest rate minus the inflation rate. Thus, the increase of inflation rate can automatically reduce banks' return on investment.

Suggestions

The results obtained from the linear models of this study emphasize on the issue that the reduction of accrued receivables can increase the profitability of banks; therefore, before any action, the causes of such receivables should be firstly identified and eliminated. Then, it is necessary to seek solutions to reduce the accrued receivables. In this regard, the following suggestions are provided:

First, it is suggested that at the micro level, banks consider the process of macroeconomic variables in technical and economic evaluation of projects for granting facilities so that the resources and the profits expected from facilities are returnable based on the predictions.

Second, to grant loans to companies, banks should examine their financial strength and this is only possible through analysis of companies' audited financial statements. Hence, it is suggested that banks create a database of their clients using data from their financial statements. This can reduce the adverse consequences associated with credit risk in addition to reducing the liquidity risk resulted from the decrease in banks' accrued receivables.

Third, as the banking network is decentralized and there is no enough inquiry to understand the situation of a client in other banks, it is possible that a client simultaneously receives different funds (as loans or facilities) from several banks, but does not fulfill the obligations or uses the facilities of a bank to liquidate another bank's loan. The lack of a centralized database of clients' credit status not only reduces the profitability of banking system, but also increases such ethical hazards. Also, it should be noted that such a database can reduce the problems related to liquidity risk. Therefore, it is suggested to provide a centralized database containing all information associated with the clients of banking system. So banks can use the database to make decision about granting facilities to their clients.

Fourth, regarding the liquidity management, it is suggested to create a model to predict banks' liquidity requirements daily. Since the present study has not discovered any relationship between "the ratio of cash assets to total assets" and "ratios of banks' profitability", the best solution is to create a liquidity model which predicts the liquidity requirements of banks so that they can be faced with liquidity risk and its problems and issues within a reasonable tolerance. At least, the model should be able to estimate the optimal amount of required liquidity daily.

Actually, the main functions of banks are based on the funds received from customers as deposits and usually banks play no role in determining the rate and amount of each deposit. In other words, banks have no direct manipulation on the type of accounts opened by them. Therefore, it is suggested to insure the investment deposits and their profits when the amount of volatile deposits becomes higher than investment ones. This ensures the clients that their deposits and profits will always be reversible. Hence, it is suggested that banks insure their investment deposits, because it can play the role of a shield against liquidity risk.

Table 1: Unit root test results for the all variables of this study

variables	PP-Fisher Chi-square		ADF-Fisher Chi-square		Im, Pesaran & Shin W-stat		Levin, Lin & Chu t^*	
	Probability level	calculated statistics	Probability level	calculated statistics	Probability level	calculated statistics	Probability level	calculated statistics
ROA first difference	0.0000	-24.4287	0.0000	-14.358	0.0000	83.1192	0.0000	136.7990
ROE level	0.0000	-9.27526	0.0709	-0.39439	0.0768	48.7065	0.0000	80.4111

CR level	0.0000	-9.73257	0.0774	-1.42246	0.0106	58.3721	0.0000	93.4578
Cta level	0.0000	-154.384	0.0000	-15.2153	0.0208	55.314	0.0000	80.4709
Bank size first difference	0.0000	-16.9264	0.0000	-13.0966	0.0000	113.677	0.0000	85.4880
DTA level	0.0000	-128.133	0.0000	-59.1729	0.0000	89.313	0.0000	140.0600
LIQ gap first difference	0.0739	-0.06355	0.0000	-6.90707	0.0000	93.7105	0.0000	93.3760
Npl1 first difference	0.0000	-19.021	0.0009	-3.10942	0.0492	51.077	0.0000	91.2658
Npl2 level	0.0000	-7.35763	0.0410	-1.73974	0.0082	59.5065	0.0000	83.7979
Npl3 first difference	0.0000	-43.0136	0.0000	-8.54956	0.0064	60.5535	0.0418	51.9184
Idtsd first difference	0.0000	-50.9479	0.0000	-18.6625	0.0000	127.281	0.0000	81.4913
Ir level	0.0000	-25.967	0.0000	-6.97457	0.0000	125.256	0.0007	69.1190
GDP first difference	0.0000	-23.9963	0.0000	-5.80868	0.0000	83.2274	0.0000	80.8294

Source: the research findings

Table 2: the results of estimating the impact of independent variables on the dependent variable of ROE

Stipulation	The first stipulation			The second stipulation			The third stipulation		
variables	coefficient	t-statistic	Prob.	coefficient	t-statistic	Prob.	coefficient	t-statistic	Prob.
ROE (-1)	0.141523	4.737601	0.0000	0.136982	5.289943	0.0000	0.106887	2.42186	0.0176
Capital Ratio	-	-	-	-0.799887	3.5427748	0.0006	-	-	-
Deposit Ratio	-	-	-	0.081714538	1.692963	0.0607	0.089721	1.858841	0.0666
GDP Growth	0.002659	2.938338	0.0043	-	-	-	0.004494	3.002853	0.0035
IDTSD Ratio	0.002785	1.919259	0.0583	0.003071	2.293439	0.0243	-	-	-
Inflation	-	-	-	-	-1.76497	0.047	-	-	0.053

Rate				0.00081461 8		9	0.000905	1.960794	2
LIQ Gap Ratio	-0.41155	- 3.11482 3	0.0025	-	-	-	-	-	-
Liquidity Ratio	-	-	-	-	-	-	0.03742	11.95638	0.000 0
NPL1 Ratio	-1.083531	- 3.17184 1	0.0021	-	-	-	-	-	-
NPL2 Ratio	-3.373128	- 4.72670 4	0.0000	-	-	-	- 4.550044	- 3.703544	0.000 4
NPL3 Ratio	-	-	-	-0.587383	- 1.77764 5	0.079 1	-	-	-
J-statistic	14.68775			14.95028			14.09753		
Instrument Rank	18			18			18		
Scalar pval	0.25895			0.244146			0.294523		

Source: the research findings

Table 3: the results of estimating the impact of independent variables on the dependent variable of ROA

Stipulation	The first stipulation			The second stipulation			The third stipulation		
variables	coefficient	t- statistic	Prob.	coefficient	t- statistic	Prob.	coefficie nt	t-statistic	Prob.
ROA (-1)	-0.509245	- 10.8442 2	0.0000	-0.498418	- 46.0682 9	0.000 0	- 0.540117	- 22.41444	0.000 0
Bank Size	-0.044017	- 4.42381 2	0.0000	-	-	-	-0.04101	- 10.57978	0.000 0
Deposit Ratio	-	-	-	0.016554	2.86074	0.005 7	-	-	-
GDP Growth	-	-	-	0.001266	3.65861 1	0.000 5	-	-	-
IDTSD Ratio	-	-	-	0.000385	2.58179 5	0.012 1	0.001097	3.921067	0.000 2
Inflation Rate	-0.000161	- 1.83771 6	0.0706	-	-	-	-0.25503	- 4.839084	0.000 0
LIQ Gap Ratio	-	-	-	-	-	-	- 0.175937	- 2.679436	0.009 3
Liquidity Ratio	-0.067549	- 2.04266 5	0.0451	-	-	-	-	-	-
NPL1 Ratio	-	-	-	-0.081592	- 2.58367 9	0.012 0	- 0.219857	-3.91668	0.000 2
NPL2 Ratio	-0.169228	- 2.04726 5	0.0446	-0.158806	- 3.80665 8	0.000 3	-	-	-

NPL3 Ratio	-0.249878	-1.67349	0.0990	-	-	-	-	-	-
J-statistic	12.66726			11.40791			12.33931		
Instrument Rank	16			15			16		
Scalar pval	0.242875			0.24878			0.262989		

Source: the research findings

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