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Can Capital Adequacy Ratio Specify Banks' Profitability? A Case Study of Iran

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Abstract
This paper applies sample selection method to examine the relationship between profitability and capital adequacy ratio of Iranian banks. The reason why sample selection model estimation is assumed to be utilized would be banks which do not comply with the minimum capital adequacy ratio requirement would not denote their actual profitability in the profit/loss statement. Even though this information is reflected in their annual financial statement, given the relationship among the financial statement variables, it could not be justified that banks which are profitable would be able to comply with the capital adequacy ratio. In other words, the bank which does not meet the capital adequacy requirement would not be profitable. Based on the accounting and economic rules which are transparently depicted and applied in the Basel Accords, loss of the banks results in a sudden decrease in banks' equity. Applying a sample selection model illustrates that there are two decision and selection equations. Main covariates such as demand deposit to total assets, loans to total assets, saving deposits to total deposits and nonperforming loans to total assets prove to be negatively significant.
Key words: Capital Adequacy Ratio, Sample Selection, Profitability
JEL Classification: G21, G32
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Introduction

What can be expressed as a percentage of risk weighted credit exposures in banking industry is called Capital adequacy ratio which is a measure of the amount of a bank's capital. The minimum capital adequacy ratio is recommends as an international standard which has been developed to ensure banks can absorb a reasonable level of losses before becoming insolvent. If banks comply with the minimum capital adequacy ratio requirement, on the one hand, the stability and efficiency of the financial system would be promoted and on the other hand, they protect depositors. Two types of capital are measured - tier one capital which can absorb losses without a bank being required to cease trading, e.g., ordinary share capital, and tier two capital which can absorb losses in the event of a winding-up and so provides a lesser degree of protection to depositors, e.g., subordinated debt. Making adjustments is required to be measured for credit exposures to the amount of assets shown on a banks' balance sheet. Banking system in Iran has been evidently hampered by the persistent-procyclical monetary policy, lending rate ceiling, and negative real interest rate which consequently raise NPLs and consequently imposes high cost on the bank via provisions which as a result lower the profitability of the banks. The minimum capital adequacy ratios that apply are: tier one capital to total risk weighted credit exposures to be not less than 4 percent; total capital (tier one plus tier two less certain deductions) to total risk weighted credit exposures to be not less than 8 percent.The central bank of Iran started banking system restructuring at the institutional, market and instrumental levels through privatization of the state-owned banks, partial liberalization of the inter-bank market as well as implementation of the more prudent supervisory regulations. In this context, several regulatory steps have been gradually taken via introducing some new measures for capital and provision requirements, large exposures, connected lending, off- balance sheet articles as well as liquidity requirements. Iran banking sector has continuously moved toward a more competitive environment since 2001 when State-owned banks were considered malfunctioning mainly because of the rationing facilities, lending ceiling and deposit interest rates as well as mandatory subsidized facilities. The key question in this paper is "Can capital adequacy ratios regulate banks' profitability?"The paper applies sample selection method to analyze the impact of capital adequacy ratio on the profitability in Iran's banking system. According to figure 1, the more the banks intend to comply with the minimum capital adequacy requirement (8%), the more the probability of profitability in these banks will increase. In other words, the figure approves that profitable banks comply with the minimum capital adequacy requirement.

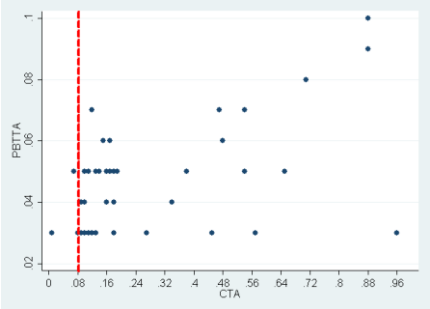

Figure 1- Profitability and Capital Adequacy Ratio

Note: The above scatter plot depicts profit before tax (vertical axis) and capital adequacy ratio (horizontal axis). The vertical line specifies threshold of 0.08 for capital adequacy ratio as a decision criterion for banks' performance analysis.The recent economic recession and the following downturns in line with a jump in nonperforming loans in the banking system have caused the banks to trigger loans extension. In addition, banks nonperforming loans' moratorium was put into action. Hence, this situation is exacerbated with the central bank's regulation and government budget act in 2010-11. Nonetheless, regulatory actions in line with the economic recession have led to a sudden leap in nonperforming loans and a transformation of nonperforming loans titles which has consequently brought about great impacts on banks' profitability. Thus, the main objective of this paper is streamlined in the assumptions that banks which do not have the capability of meeting the minimum capital adequacy requirement have experienced weak financial transparency in accordance with profitability. Hence, it is assumed in this paper that the amount of banks' profitability is unknown. The rest of the paper is structured into four sections: Section two observes the literature review, section three centers on the research methodology and model, section four focuses on the estimations and results while section five concentrates on concluding remarks.

Literature Review

Lot of researches has been conducted on the widespread issues of banking activities. At first step there are bank specific determinants, then macroeconomic variables, and at last the regulatory framework. As our main emphasis in this paper, in bank specific factors, total loans, and credit policy are important. There is no global standard to define non-performing loans at the practical level. A non-performing loan (NPL) is defined as a sum of borrowed money upon which the debtor has not made his or her scheduled payments for at least 90 days. A nonperforming loan is either in default or close to being in default. Once a loan is nonperforming, the probability of the loans to be repaid in full is considered to be substantially lower. If the debtor starts making payments again on a nonperforming loan, it becomes a re-performing loan, even if the debtor has not caught up on all the missed payments (Saba et al, 2012).In 1988, the Basel Committee on Banking Supervision introduced a capital measurement system for banks (commonly referred to as the Basel Accord). The system provided the implementation of a credit risk measurement framework for a minimum capital standard of 8 percent of risk-weighted assets (on balance sheet and off balance sheet equivalents) by the end of 1992. Since 1988, the framework has been progressively introduced not only in member countries of the Basel Committee, but also in virtually all countries with active international banks although they are not required to do so by any formal international agreement. In recent years, there has been an increasing interest in non-performing loans and their determinants because a lot of published papers at bank, country, and aggregate banking system level have been encountered. Several studies have been conducted on problem loans, the NPL and the similar default rate. The results reveal valuable insights about the quality of loan portfolios and generally the fragility of banks. Many researchers consider NPL as "financial pollution" with harmful effects for both economic development and social welfare (e.g. Brenda Gonzales- Hermosillo 1999; Levon Barseghyan 2010; Shihong Zeng 2011). Using the NPL as the key unity to measure loan losses, William R. Keeton and Charles Morris (1987) examined a sample of 2,470 insured commercial banks in the United States (US) for the period 1978-1985. They found that local economic conditions in combination with the low performance of various economic sectors are responsible for differences in loan losses recorded by different banks. Therefore, the banking institutions that undertake greater risk show greater losses (Makri et al, 2013).In Europe, Fernandez de Lis, Martinez Pagés, and Saurina (2000) econometrically identified loan losses through various bank-specific factors, using a panel data of Spanish commercial and savings banks for the period 1985-1997. This study showed that several bank-specific variables during recession have negative effect on problem loans.Sofolis and Eftychia (2011) used univariate regression to measure the impact on nonperforming loans in Romanian banking system and concluded that asset and liabilities factors in line with country's (Greek) crises specific variables influence the credit risk of banking system.

Saad and Kamran (2012) concluded outcomes of their study covering the period from 1996 till 2011 by using generalized autoregressive conditional heteroskedasticity that interest rate along with some bank-specific determinants volatility significantly affect on nonperforming loans to rise.

Methodology and Model

Twenty nine banks in Iranian banking system are selected to analyze the relationship between capital adequacy ratio and banks' profitability as asset–liability management indicators during 2007-12. This was augmented by the regression analysis (Sample Selection Model) to investigate whether capital adequacy ratio can regulate banks' Profitability and determine the magnitude of effect of asset-liability variables in line with capital adequacy on the profitability of the banking system. In sample selection approach, it is assumed that central bank of Iran is going to rank Iranian banks based on their capital adequacy (Basel II) provided that their performance is acceptable. Therefore, ***y2i*** and ***y1i*** are, respectively, the capital adequacy and the profitability ratios of the banks. Hence, the ***selection*** equation is the capital adequacy equation as in (1) and the ***decision*** equation is the profitability equation as in (2).

$$y_{2i} = \begin{cases} 1 & \text{if} \quad y_{2i}^{*} > 0 \\ 0 & \text{if} \quad y_{2i}^{*} \le 0 \end{cases} \qquad \textbf{(1)}$$

If ***y2i*** means capital adequacy of banks is approved, then central bank will analyze their capital adequacy ratio. Otherwise, it means ***y2i<0.08*** and they will not participate in ranking according to their profitability.

$$y_{1i} = \begin{cases} y_{1i}^{*} & \text{if} \quad y_{2i}^{*} > 0 \\ - & \text{if} \quad y_{2i}^{*} \le 0 \end{cases} \qquad \textbf{(2)}$$

Models (3) and (4) indicate the selection and decision equations as follow:

$$CTA = \begin{cases} 0 & \text{if} \quad CTA^{*} \ge 0.08 \\ 1 & \text{if} \quad CTA^{*} < 0.08 \end{cases} \qquad \textbf{(3)}$$

$$PBTTA = \begin{cases} PBTTA & CTA^{*} \ge 0.08 \\ - & CTA^{*} < 0.08 \end{cases} \qquad \textbf{(4)}$$

CTAit = β0 + β1TDAit + β2STDit + β3NPLAit + β4LTAit +β5ITAit + β6LTDit + Uit **(5)**

Where:
CTA: Capital Adequacy Ratio
TDA: Time Deposits to total Assets
STD: Saving Deposits to total Deposits
NPLA: Nonperforming loans to total Assets
LTA: Loans to total Assets
ITA: Investments to total Assets
LTD: Loans to total Deposits
And the decision equation is as follows:

PBTTAit =β0 + β1DDAit + β2TDAit +β3NAit + β4LTAit +β5ITAit + β6STDit + β7OSTDit + β8LTDit + β9NPLAit + Uit **(6)**

Where:
PBTTA: Profit before Tax to Total Assets
DDA: Demand Deposit to total Assets
TDA: Time Deposit to total Assets
NA: Number of Branches to total Assets
LTA: Loans to total Assets
ITA: Investments to total Assets
STD: Saving Deposits to total Assets
OSTD: Other savings to total Deposits
LTD: Loans to Deposits
NPLA: Nonperforming loans to total Assets

Results

The main objective of the sample selection model estimation is that with the two main variables ***y1i*** and ***y2i,*** there is no information for the ***y1i*** variable. However, regarding some of the independent variables, its behavior can be examined. In the modeling implemented for Iran's banking system, it is assumed that banks which do not follow the minimum capital adequacy ratio (***y2i>0.08***) will not denote their actual profitability in the profit/loss statement. Hence, there is no information regarding ***y1i***. Even though this information is reflected in their annual financial statement, but with the relationship among the financial statement variables, it could not be justified that banks which are not profitable would not be able to comply with the capital adequacy ratio. In other words, the bank which does not meet the capital adequacy requirement will not be profitable. Based on the accounting and economic rules which are transparently depicted and applied in Basel accords, loss of the banks results in a sudden decrease in banks' equity.Table 1 illustrates the sample selection model estimation in which there are two decision and selection equations. Main covariates such as demand deposit to total assets (DDA), loans to total assets (LTA), saving deposits to total deposits (STD) and nonperforming loans to total assets (NPLA) are negatively significant. Also, the statistics calculated for likelihood function is zero at the significance of 5% and this shows that there is no selection bias in the estimation. The demand deposit to total assets ratio (DDA) as the cheap resources of banks' liability has a negative-significant impact on profitability ratio (PBTTA) as the decision variable. Besides, the impact of the number of branches over total assets ratio (N/A) and investment ratio (ITA) and other deposits ratio (OSTD) are positively significant. Furthermore, the impact of nonperforming loans on profitability proved to be negative. Moreover, estimating the selection equation reflects the banks which do not comply with the capital adequacy ratio and reveals that, first, the only significant variable is the loans to total assets ratio (LTA) which has an effective big amount of coefficient (4.9). Second, the more the amount of this ratio increase, its impact and the probability of complying with the minimum capital adequacy ratio by banks decreases.

Table 1- Sample Selection Regression

	Coef.	Std. Err.	Z	P>z
		Pbtta		
dda	-0.067	0.022	-3.040	0.002
tda	0.008	0.011	0.790	0.429
na	0.393	0.159	2.470	0.014
lta	0.006	0.006	0.990	0.320
ita	0.438	0.159	2.760	0.006
std	-0.007	0.019	-0.370	0.710
ostd	0.110	0.051	2.170	0.030
ltd	-0.006	0.008	-0.750	0.453
npla	-0.0002	0.0001	-1.490	0.135
_cons	0.014	0.029	0.490	0.626
		Cta		
tda	0.897	2.226	0.400	0.687
std	0.806	2.074	0.390	0.698
npla	0.039	0.057	0.680	0.496
lta	4.941	1.842	2.680	0.007
ita	-32.163	24.941	-1.290	0.197
ltd	-1.229	0.909	-1.350	0.177
ostd	-14.473	11.726	-1.230	0.217
_cons	-2.167	2.067	-1.050	0.294
/athrho	-15.599	325.274	-0.050	0.962
/lnsigma	-5.442	0.190	-28.610	0.000
rho	-1.000	0.000		
sigma	0.004	0.001		
lambda	-0.004	0.001		

Source: Authors' Calculations

Concluding Remarks

Applying a sample selection model illustrates that there are two decision and selection equations explaining the information reflected in their annual financial statement as well as the relationship among the financial statement variables. This model implies that it could not be justified that banks which are not profitable would not be able to comply with the capital adequacy ratio which means the bank that does not meet the capital adequacy requirement will not be profitable. The reason why sample selection model estimation is assumed to be utilized would be banks which do not comply with the minimum capital adequacy ratio requirement would not denote their actual profitability in the profit/loss statement. The selection equation is the minimum 0.08 and the decision equation explains the evaluation of banks' profitability subject to capital adequacy requirement. It seems as if banks which have not been able to meet the minimum capital adequacy criterion are not able to maintain the minimum profitability. This can work as an incentive for utilizing extensions to loans which are deferred or doubted. Because with an inaccessibility and lock of loans, banks have to accept higher credit risks as a result a decrease in minimum capital adequacy. The significant coefficients of Main covariates in profitability equation are demand deposit to total assets ratio, number of branches, and nonperforming loans ratio (lower significance). In the capital adequacy equation, loans to total assets ratio leads to an increase in the probability of not complying with the minimum capital adequacy requirement where its coefficient is proved to be outstanding and significant.
What can be studied further in future studies is forecasting capital position and numerous scenarios testing should be carried out. The main advantage of such studies could be the help for banks to understand the underlining processes and dynamism of its industry as regards to its capital needs.

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Appendix

Heckman selection model
(regression model with sample selection)

Number of obs	26
Censored obs	12
Uncensored obs	14
Wald chi2(9)	106.83
Prob > chi2	0.0000

Log likelihood = 52.5912

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
pbtta						
dda	-.0667063	.0219148	-3.04	0.002	-.1096584	-.0237541
tda	.008319	.0105178	0.79	0.429	-.0122955	.0289335
na	.3928823	.1593635	2.47	0.014	.0805356	.7052291
lta	.0062707	.0063029	0.99	0.320	-.0060829	.0186242
ita	.4380973	.1588686	2.76	0.006	.1267206	.7494739
std	-.0068896	.0185239	-0.37	0.710	-.0431958	.0294166
ostd	.1098175	.0505965	2.17	0.030	.0106501	.2089848
ltd	-.005729	.0076286	-0.75	0.453	-.0206807	.0092228
npla	-.0002159	.0001444	-1.49	0.135	-.000499	.0000672
_cons	.0140154	.0287747	0.49	0.626	-.0423819	.0704127
ctagreen						
tda	.8974192	2.226204	0.40	0.687	-3.465861	5.2607
std	.8058244	2.074138	0.39	0.698	-3.259411	4.87106
npla	.039032	.0573272	0.68	0.496	-.0733273	.1513912
lta	4.940536	1.842011	2.68	0.007	1.330261	8.55081
ita	-32.16274	24.94057	-1.29	0.197	-81.04536	16.71989
ltd	-1.228607	.9091219	-1.35	0.177	-3.010453	.5532392
ostd	-14.47262	11.72628	-1.23	0.217	-37.4557	8.510465
_cons	-2.166757	2.066623	-1.05	0.294	-6.217263	1.88375
/athrho	-15.59921	325.2744	-0.05	0.962	-653.1253	621.9269
/lnsigma	-5.442229	.1902423	-28.61	0.000	-5.815097	-5.069361
rho	-1	3.66e-11			-1	1
sigma	.0043298	.0008237			.0029822	.0062864
lambda	-.0043298	.0008237			-.0059443	-.0027154

LR test of indep. eqns. (rho = 0): chi2(1) = 8.61 Prob > chi2 = 0.0033

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