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The Determinants of Capital Adequacy Ratio: The Case of the Vietnamese Banking System in the Period 2011-2015

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Abstract: The analysis of a data set of observations for Vietnamese banks in the period 2011-2015 shows how the Capital Adequacy Ratio (CAR) is influenced by selected factors, namely: asset of the bank SIZE, loans in total assets LOA, leverage LEV, net interest margin NIM, loans lost reserve LLR, Cash and Precious Metals in total assets LIQ. Results indicate, based on data, that NIM and LIQ have significant effect on CAR. On the other hand, SIZE and LEV do not appear to have significant effect on CAR. Variables NIM, LIQ have positive effect on CAR, while variables LLR and LOA are negatively related with CAR.

Keywords: Capital adequacy ratio (CAR), Vietnamese banks, Basel, NIM, LIQ.

1. Introduction

Commercial banks (CBs) operate business in the finance monetary sector that is very sensitive to changes in the economic cycle, fiscal and corporation policy. Therefore, risk management and capital adequacy in the banking system are always in the top concerns of managers, the State Bank as well as government. In the world today, regulations for safety operations in general and capital adequacy in particular have been standardized by the CAMEL, PEARL model... These models codify operational areas in commercial banks: capital, assets, management and profitability... through qualitative and quantitative indicators. In the earlier periods, capital adequacy was assessed through how capital meets bank size and business activities by assets classification and CAR (Capital Adequacy Ratio) in Basel records. It's said that the study of the CAR ratio in commercial banks is very necessary.

In recent years, Vietnam has witnessed the development and completion of its banking system. However, the increase in terms size and diversity leads to high risk directly affecting the safety of the system. To prevent the collapse of banks and protect depositors, Vietnamese banking executives are interested in the importance of capital adequacy ratio (CAR) based on Basel standards. This is one of important indicators for the continuing safety in commercial banks. If a bank could guarantee CAR, that means it has a concrete cushion against financial shocks, protecting both themselves and depositors. Therefore, a rising question for bank executives is how to improve CAR. To answer this question, first of all, we need to determine the factors that influence CAR in the banking system.

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2. Literature review

2.1. Theoretical review

Capital structure has long been an interesting research area of finance. However, it has not reached a compromise. Finance still lacks a comprehensive theory that will explain how companies should set their capital base to make it adequate. The famous Miller and Modigliani theory only affirms that dividend and financing decisions have no influence on a firm's value under perfect market conditions, but this theory is flawed because it focuses on the effect of capital structure on firm value rather than explaining what makes the capital adequate for each firm. The Modigliani-Miller irrelevance theorem (M & M theory, 1958) is the basis for all other theories on capital. The theory avers that a firm's financing decision has no significant effect on its value - that it is irrelevant. This could mean that the value of the firm is determined by the income generated by its assets' composition, and not by how the assets are being financed or how the income from the asset utilisation is derived. This theory could only be applicable in a perfect world, that is, where there is asymmetry of information, no taxation, no bankruptcy costs, no transaction costs, where there is equivalence in borrowing costs for companies and investors, no agency costs and no effect of debt on firms' earnings and lots more. The theorem is considered inapplicable to a country like Nigeria where imperfect market conditions exist. This prompted the improvement on the theory in 1963 and some other theories to consider corporate taxes with the intention to enjoy tax shields. Also, static trade-off theory incorporates the influence of tax and the benefits of tax shields against bankruptcy costs among others. A bank is a very special firm, being the only financial institution which stands as an intermediary between the surplus and the deficit unit of an economy and it is commonly known for the receipt and issue of deposits. But being a firm, all capital structure related theories are applicable to banks as well.

Berger (1995) examines capital theory in financial institutions in detail and was able to give reasons for financial markets not being frictionless in detail. He enumerates some of the reasons as follows: (a) Taxes and cost of financial distress, (b) Transaction costs and (c) asymmetric information. He posits that in evaluating a bank's capital position, the bank must consider both the fixed costs attached with any capital gains and the variable costs attached with the process of changing it. All these costs are considered by the regulators setting adequate capital ratios. Banking sectors are similar to other sectors, in that they are committed to a number of non-regulatory costs associated with their capital adequacy level and bank regulators have long viewed the maintenance of adequate capital as a crucial element for maintaining banks' safety and soundness. Therefore, it is mandatory for all banks to adhere to the required ratio and the ones that violate the ratio should be liable to sanctions depending on the degree of the noncompliance. Among these penalties are: more frequent and longer examinations; moral suasion; denial of applications to acquire other banks, and formal agreements with the regulators to raise other capital or any other sanction.

The regulatory pressure on banks to maintain capital is asymmetric in that regulators only raise the alarm when capital ratios are too low, but often have little or no query when capital ratios are too high. Berger (1995) determines factors that affect the financing structure of all companies both financial and non-financial and he identifies a "safety cap" as a factor that is peculiar to the capital structure of all financial institutions. Financial institutions are different from non-financial because they are under a safety cap (such as a deposit insurance system, payment guarantees or liquidity window that they are liable to use on the occasion of sudden liquidity challenge and distress). This enables them to operate more soundly. It is important to note that a safety-cap can vary across financial institutions and industries due to discrepancy as to the

minimum required capital which could also be called "capital adequacy ratio" between financial institutions. Capital adequacy regulations are the most crucial quantitative measure used by supervisory authorities to solely protect customers' rights and to enhance financial system stability and as a result of this, these bodies are keener on the interest of the customers than the banking institution itself. They cover and minimize unexpected losses from the bank, increase credibility of the banking system, reduce systemic risk impact and create a competitive environment for the banking sector. Following this, the Basel Committee on Banking Supervision (BCBS), a sub-section of the Bank for International Settlements (BIS), evaluates the risks (both systematic and unsystematic) of banks that are active in the international financial market. They focus on the minimum capital ratio of a bank which is currently 8% capital ratio and 2.5% capital conservation buffer ratio so as to minimize the depositor's loss in case of bankruptcy, distress and liquidation. This regulation created room for international comparison of standards for capital adequacy.

2.2. Empirical review

Determinants of capital adequacy have been examined in various economies and this study finds it necessary to re-examine the factors in Nigeria's economy. Dreca (2013), using OLS regression, evaluated this subject-matter in Bosnian banks and found that loans, ROA, deposit, size, ROE and leverage significantly influence the capital adequacy ratio, while loan loss ratio and net interest margin were insignificant. Similarly, Allen, Nilapornkul and Powell (2013) using mixed factors found profitability, bad loans and GDP posing negative effects on leverage in Thai banks. Also, in the study of the Turkish banking sector, Buyuksalvarc and Abdioglu (2012) discovered the negative effect of loan to asset ratio; Return on Equity and leverage ratio on capital adequacy ratio. While Liquidity ratio and Return on Assets was found to be positive but significant, size, Deposit structure, Liquidity ratio and NIM have no significant effect on CAR. Alsabbagh (2004) examined capital adequacy determinants in Jordanian banks and found that most Jordanian banks had adhered to the required Basel I capital accord minimum of 8% capital ratio and also revealed that CAR was directly affected by ROA, loan to assets ratio, risky assets ratio and dividend payout ratio of the bank, while deposits assets ratio, loan provision ratio and size of bank negatively affect CAR. In 2008, Gropp and Heider use both internal and external factors and found that profitable banks possessed more equity and it was the major determinant of capital in the United States and European large banks. This finding was consistent with the postulations of the pecking order theory. Similarly, Kleff and Weber (2008) aver that the capital level of banks is positively correlated with the profit of banks, therefore, profit accumulation generates a higher level of growth in capital which is contrary to the findings of the study carried out by Aremu, Ekpo, Mustapha, and Adedoyin (2013) on the Nigerian banking sector in which they found profitability, growth and banks' risk level to pose a significant but indirect relationship with capital level. They also discovered the inverse relationship of tangibility and tax charged with capital, but dividend payout and size of the banks were found to be positively and significantly related to their capital. However, Ahmad, Ariff, and Michael (2008) also confirm in the Malaysian banking sector the negative effect of earnings on their capital ratio. Comparatively, Bokhari and Ali (2009) analyze the capital adequacy determinants of Pakistan banking sectors employing deposits, GDP, portfolio risks and profitability as bank-specific factors affecting capital ratio. They found that profitability proxied by Return on Asset was inversely related to capital ratio but highly significant. However, deposit, portfolio risk and GDP have a negative but significant effect on the capital adequacy ratio. Finally, Williams (2011) examined the impact of the macro-

economic variables on the capital base in Nigerian banks and discovered that macro-economic variables such as inflation, real exchange rate, return on investment, money supply and political stability are robust predictors of capital adequacy. He concludes that Inflation has a negative relationship with bank capital base and political instability also impedes financial health and stability in Nigeria which is the situation of the Nigerian banking sector as of today.

2.3. Research gap

There is therefore no gainsaying the fact that there are several researches that have provided evidence of Detriments of capital adequacy in other countries. However, there has been little research in this area in Vietnam. Therefore the problem here is to use the multiple regression model to investigate whether there is a significant relationship between the capital adequacy ratio and financial indicators in the Vietnamese banking industry. Furthermore, it has been observed that there has not been significant research on the relationship between capital adequacy and financial factors in Vietnam. Thus, this study is an attempt to fill the identified gaps. Against this backdrop, the purposes of the study are: to empirically investigate the relationship between financial ratios and the capital adequacy ratio; to analyze and evaluate the influential factors of the capital adequacy ratio; to investigate the components of bank's capital and to establish a capital adequacy forecasting pattern which will be beneficial to both authorities and the banking system in general for formulating informed courses of action.

3. Analytical framework and research variables

The effects of determinants on CAR as described in Figure 1.

Where:

CAR: Dependent variable, capital adequacy ratio

SIZE: Natural logarithm of the total assets

LEV: Leverage, ratio of equity to total liabilities

LLR: Loan loss reserves, ratio of loan loss provision to total loans

NIM: Ratio of net interest margin

LOA: Return on assets, ratio of loans to assets

LIQ: Return on assets, ratio of cash and precious metals

The linkage of CAR and 6 determinants are hypothesized as follows:

H1: Bank SIZE has significant impact on banks' capital adequacy ratio.

H2: LEV ratio has positive impact on banks' capital adequacy ratio.

H3: Loan loss reserve LLR has positive impact on banks' capital adequacy ratio.

H4: Net interest margin NIM has statistically significant impact on banks' capital adequacy ratio.

H5: Share of loan LOA has negative impact on banks' capital adequacy ratio.

H6: Liquidity LIQ has positive impact on banks' capital adequacy ratio.

From these hypotheses, an econometric model is mentioned as followed:

$$CAR_{it} = \alpha + \beta 1\ SIZE_{it} + \beta 2\ LEV_{it} + \beta 3\ LLR_{it} + \beta 4\ NIM_{it} + \beta 5\ LOA_{it} + + \beta 5\ LIQ_{it} + \varepsilon_{it}$$

4. Data collection

This study used data from "*Vietnamese Banks-A helicopter view Issue 11, Stoxplus"*. It is edited as cross-sectional data. The time of the study period is five years from 2011-2015 in 29 commercial banks in Vietnam including: An Binh Bank (ABB), Asia Commercial Bank (ACB), Bank for Investment and Development of Vietnam (BIDV), Bao Viet Bank (BVB), Vietnam Joint Stock Commercial Bank for Industry and Trade (CTG), Eximbank (EIB), Military Commercial Bank (MBB), Viet Capital Bank (GDB), HDBank (HDB), Kien Long Bank (KLB), LienViet Post Bank (LVB), MBBank (MBB), MaritimeBank (MSB), Nam A Bank (NAB), North Asia Bank (NASB),

National Citizen Bank (NVB), Oricombank (OCB), PGBank (PGB), PVcomBank (PVF), Saigon Commercial Bank (SCB), SeaBank (SEAB), SaigonBank (SGB), SH Bank (SHB), Sacombank (STB), Techcombank (TCB), Viet A Bank (VAB), Vietcombank (VCB), VIBBank (VIB), VPBank (VPB).

The methodology used is a fixed effects model (FEM) to estimate the parameters. In order to eliminate these problems, FEM Regression is applied for the rest of the study. Differently from the OLS, estimation of β coefficients with the FEM method employs a covariance matrix of errors. So as to increase efficiency and solve the problems resulting from the violation of the assumptions of homoscedastic variance and no serial correlation among error terms.

5. Model results

5.1. Variable statistics

Various descriptive statistics are calculated of the variables under study in order to describe the basic characteristics of these variables. Table 1 shows the descriptive statistics of the data containing sample means, standard deviations and minimum and maximum value.

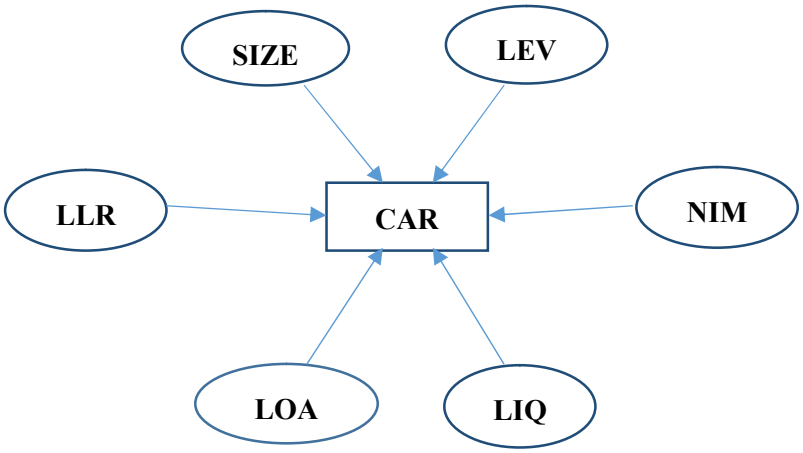

Figure 1. Research framework.

Table 1. Descriptive statistics of variables

Variable	Obs	Mean	Std.Dev	Min	Max
CAR	145	0.112290	0.088719	0.000000	0.420000
SIZE	145	11.26030	1.088320	7.979000	13.65378
LEV	145	0.127299	0.135694	0.008240	1.000000
LLR	145	0.020004	0.051766	0.000000	0.480000
LOA	145	0.545970	0.146606	0.139820	0.819800
NIM	145	0.030620	0.015539	-0.019850	0.070950
LIQ	145	0.012282	0.012299	6.00E-05	0.083820

Source: Author's calculation.

5.2. Regression model test failure

Table 2. Correlation matrix

Corr.	CAR	SIZE	LEV	LLR	DEP	ROA	ROE
CAR	1.000000	0.243218	-0.106017	-0.072746	0.143080	-0.159208	-0.156970
NIM	0.243218	1.000000	-0.145636	0.133341	0.193400	-0.061293	0.275155
SIZE	-0.106017	-0.145636	1.000000	0.109809	-0.137181	-0.106711	0.202629
LIQ	-0.072746	0.133341	0.109809	1.000000	-0.005453	0.001918	-0.047783
LEV	0.143080	0.193400	-0.137181	-0.005453	1.000000	0.027128	-0.039521
LLR	-0.159208	-0.061293	-0.106711	0.001918	0.027128	1.000000	-0.019306
LOA	-0.156970	0.275155	0.202629	-0.047783	-0.039521	-0.019306	1.000000

Source: Author's calculation.

The dependent and independent variables are tested for multicollinearity based on a simple correlation and covariance matrix. As depicted in Table 1 and Table 2, all of them have no collinearity problem.

From the Breusch-Godfrey Serial Correlation LM Test in Table 4, we can see that P (F > 1.519464) = 0.2225 > 0.05 and P (X2 > 3.170160) = 0.2049 > 0.05. Therefore, the model has no correlation problem.

P(t-Statistic > -12.68495) = 0.0000 < 1%, residual has no autocorrelation. The result from the Augmented Dickey-Fuller test statistic shows that the model has no seasonality (Table 5).

Continuously, we try to specify whether our basic model is a fixed effect or a pooled least square model. The null hypothesis, Ho: $\alpha i = 0$ and the alternative hypothesis, Ha: $\alpha i \neq 0$ are constructed under F-test with (N-1, NT-N-k) degrees of freedom. F-test statistics F(22, 133) = 1.47 with Prob > F = 0.0961 enables us to reject the null hypothesis implying a fixed effect model is more appropriate (Baltagi, 2008).

According to specification test results, an individual effect is discovered; however, it is required to decide whether to construct the model as a fixed or random effect model (Table 5).

Table 3. Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.519464	Prob. F(2,135)	**0.2225**
Obs*R-squared	3.170160	Prob. Chi-Square(2)	**0.2049**
Test Equation:			
Dependent Variable: RESID			
Method: Least Squares			
Sample: 2 145			
Included observations: 144			
Presample missing value lagged residuals set to zero.			

Source: Author's calculation.

Table 4. Null hypothesis

Null Hypothesis: RESID03 has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag = 13)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.68495	**0.0000**
Test critical values:	1% level	-3.476472	
	5% level	-2.881685	
	10% level	-2.577591	

Source: Author's calculation.

Table 5. Bank specific variable and predicted signs

Bank specific variable	Predicted sign
Bank size (SIZE)	+/-
Leverage (LEV)	+
Loan loss reserve (LLR)	+/-
Net interest margin (NIM)	+
Loans (LOA)	-
Liquity (LIQ)	+

Source: Author's calculation.

Table 4. The Hausman specification test result

Chi-Sq. statistic	Chi-Sq. d.f.	Probability
19.94	5	0.0013

Source: Author's calculation.

One common method for testing this assumption is to employ a Hausman (1978) test to compare the fixed and random effects estimates of coefficients (Baltagi, 2001; Wooldridge, 2002). The intention is to find out whether there is a significant correlation between the unobserved individual specific random effects (αi) and the regressors. The result of the Hausman test based on chi-squared statistics as reported in Table 5 suggested that the corresponding effects are statistically significant (P-value < 0.05), hence the null hypothesis is rejected by our data and the fixed effects model is preferred.

5.3. Hypothesis testing and measurement analysis

From calculations, the estimated regression line is as below*:*

CAR = -0.004332 SIZE - 0.065671 LEV - 0.244930 LLR + 1.423882 NIM - 0.109049 LOA - 1.565142 LIQ

Based on regression results, coefficient statistics are made in Table 7.

Table 6. Model results

	Fixed effect model
SIZE	-0.004332 (0.112)
LEV	-0.065671 (0.667)
LLR	-0.244930* (0.098)
NIM	1.423882*** (0.003)
LOA	-0.109049 ** (0.024)
LIQ	-1.565142 *** (0.008)
Test that all u_i = 0	1.47 (0.0961)

*, **, *** represent for 10%, 5%, 1% significance.
Source: Author's calculation.

Table 7. Coefficient statistics

Variable	Sign	Sigf.level
SIZE	-	-
LEV	-	-
LLR	-	10%
NIM	+	1%
LOA	-	5%
LIQ	-	1%

Source: Author's calculation.

There are 4 dependent variables that have effect on CAR at 1%, 5% and 10%. SIZE and LEV have no statistically significant effect.

Hypothesis # 1. The rationality lies in the fact that a larger SIZE can guarantee greater stability. It is based on the assumption "too-big to concrete". The general opinion is that asset size is not inversely related to capital adequacy. However, in this study, SIZE has no effect on CAR.

Hypothesis # 2. The financial leverage of the bank is calculated by dividing its total assets by stockholders' equity. In general, the relationship between LEV and the capital adequacy ratio is expected to be positive because if we increase stockholders' equity, we have to expect a higher capital adequacy ratio. But for the Vietnamese banking industry in the period 2011-2015, LEV did not impact on CAR.

Hypothesis # 3. The factor LLR has a coefficient of β= -0.244930 at a 10% level. This means that when LLR increases 1 unit, CAR will go down by -0.244930 units. In general, LLR is expected to have impact in the same direction with CAR. But it is not true in the Vietnamese banks in the model. So a raised question is: Does the Vietnamese banking industry have to abide by regulations about the loans lost reserve or not? And are there disadvantages in SBV's policies in this area?

Hypothesis # 4. The most significant factor is NIM with a coefficient of β = 1.423882 at 1%. The net interest margin (NIM) has a positive coefficient. The state-owned banks in Vietnam have been very profitable, retaining a lot of earnings. So high revenues allow the banks to raise additional capital through retained earnings and to give a positive signal to the value of the company. A high earnings or franchise value provides bank managers with easier access to equity capital and a self-regulatory incentive to minimize risk taking.

Hypothesis # 5. The Beta coefficient of LOA ratio is negative at -0.109049, showing a negative relationship between LOA ratio and CAR. The P -value is 0.0365 - smaller than 0.05. The negative sign of the beta coefficient shows that the increase of LOA ratio determines the reduction of CAR in the Vietnamese banking system. This conclusion is in contrast with other studies in this field showing that a higher LOA ratio leads to higher CAR.

Hypothesis # 6. The Beta coefficient of the LIQ ratio is positive at 1.565142, showing a positive relationship between the LIQ ratio and CAR. The P-value is 0.0072 that is also smaller than 0.05. In this model, we analyze LIQ as a lag variable for one year as LIQ(-1). Cash and precious metals in the previous year have effect on the CAR ratio in the following year.

Table 8. The results of hypotheses testing

Hypotheses	Result
H1. Bank SIZE has a statistically significant impact on banks' capital adequacy ratio	Not
H2. LEV ratio has a positive impact on banks' capital adequacy ratio.	Not
H3. Loan loss reserve LLR has a positive impact on banks' capital adequacy ratio.	Not
H4. Net interest margin NIM has a statistically significant impact on banks' capital adequacy ratio.	Supported
H5. Loans ratio LOA has a negative impact on banks' capital adequacy ratio.	Supported
H6. Liquidity ratio LIQ has a positive impact on banks' capital adequacy ratio.	Not

Source: Author's calculation.

6. Findings and conclusions

The aim of this paper was to determine the relationship between some internal banking factors such as: assets of the bank, loans in total asset, leverage, net interest margin, loans lost reserve, cash and precious metals in total assets and the capital adequacy ratio in the Vietnamese banking system which is used as independent variable. To test the relationship between the variables we use a linear regression analysis.

From the regression results we have come to the following conclusions:

- Bank size and Leverage have no impact on the capital adequacy ratio.
- Net interest margin and Liquidity have a significant positive impact on the capital adequacy ratio.
- Loans ratio is inversely related to the capital adequacy ratio in the Vietnamese banking system.

7. Limitations and future research

In this paper, the author uses 6 variables to indicate the effect on Capital Adequacy ratio. However, there are only 4 variables that have statistical meaning. So in fact, there may be more factors that could have influence on CAR that are not defined in this model. These variables can be other internal or banking variables as well as macroeconomic ones. That is a suggestion for future research. In the next research, a sample with more independent variables is needed in order to have a full understanding of the real factors that influence the capital adequacy ratio in the Vietnamese banking system.

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