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Factors Affecting the Capital Adequacy Ratio (CAR): A Case Study of Joint-Stock Commercial Banks in Vietnam

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Abstract - The commercial banks are constantly implementing capital adequacy to meet Basel standards, primarily through the issuance of bonds to increase tier 2 capital sources to ensure capital safety and mobilize capital. Long-term to meet the market's borrowing needs. For that reason, this article aims to study the factors affecting the capital adequacy ratio of joint-stock commercial banks in Vietnam to consider the impact of macroeconomic and internal factors. The author has conducted a study the Data from 20 joint-stock commercial banks in Vietnam from 2009 to 2019. The authors used traditional panel data analysis methods, including Pooled OLS, tissue Fixed effects (FEM), random effects (REM) model. The authors had obtained some main results as follows: both economic growth and inflation do not have a positive impact on CAR.
Keywords: Capital, Adequacy, Ratio, Commercial, Banks, BUH, and LHU.

1. Introduction

The banking system is the economy's lifeblood and is one of the essential factors contributing to economic development [1], [6]. The commercial bank is the most important financial intermediary in the financial system, contributing to promoting capital circulation from the redundant to the underdog, thereby improving the efficiency of capital use in the economy. As a financial intermediary specializing in business in the economic and monetary sector, the banking system is always "sensitive" to risks and affects all industries. Banks' risks are credit risk, market risk, operating risk, and other risks [3], [15]. Besides, the commercial banking system is susceptible to risks, so the banking system, if not well managed, may fall into a situation of rising bad debts, liquidity stress, loss, or even bankruptcy [8], [20]. Leading to

the collapse of the whole system, creating financial crises in the economy [16].

When ensuring the minimum capital adequacy ratio, banks will be able to withstand risks to develop sustainably. In that sense, the CAR coefficient and the factors affecting the CAR coefficient are always a topic of great interest in the world [14].

Vietnam is a developing country. The stock market has not yet developed strongly, so commercial banks play an essential role in Vietnam's financial system. Based on the above reasons, the authors give the research goal to determine the factors influencing and the degree of influence of each element on the CAR coefficient. They are proposing some recommendations to improve ensuring capital safety for Vietnam's commercial banking system.

2. Literature Review
2.1 Capital adequacy ratio (CAR)

Capital adequacy ratio (CAR) is understood as an indicator reflecting commercial banks' ability to resist risks through the relationship between their capital and regulated assets for the basic risks that banks must face. during operation [4], [28]. The minimum capital adequacy ratio following international practice is determined based on the Basel Treaty issued by the banking supervisory commission depending on each development stage [9], [24]. The capital adequacy ratio in commercial banks' operations is measured by dividing equity by total risk-adjusted assets [15], [26]. Equity capital, also known as a commercial bank's equity, is the monetary value that the bank has that belongs to the bank's ownership [10], [17].

2.2　　Rate of return on total assets (ROA)

Rate of return on total assets (ROA): Profitability is determined by the ratio of profit after tax to total assets, affecting the bank's capital adequacy ratio. More profitable banks tend to have more capital than assets [19]. The reason is that when there are retained earnings, the bank's equity capital is abundant, the bank has the opportunity to mobilize cheap capital and choose safer lending [20]. Therefore, with the representative variable reflecting the ability to generate profits to increase equity, the topic of expecting the relationship between ROA and CAR is a positive relationship [3].

Based on the concept mentioned above and studies, authors give hypothesis H1 following:

Hypothesis H1: Rate of return on total assets (ROA) positively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam.

2.3　　Deposit ratio (DEP)

Deposit ratio (DEP) is a variable measuring the bank's ability to mobilize capital, reflected in the deposits' ratio divided by its total assets [2]. The deposits raised from customers are often considered cheaper sources of funds than loans and similar financial instruments (such as issuing valuable papers or borrowing from other credit institutions) to banks [11]. If depositors cannot assess banks' financial stability, they require banks to pay higher deposit interest rates, forcing banks to raise lending rates for output loans [25]. This factor is the factor that causes banks to form higher-risk assets. Based on the concept mentioned above and studies, authors give hypothesis H2 following:

Hypothesis H2: Deposit ratio (DEP) negatively impacts joint-stock commercial banks' capital adequacy ratio in Vietnam.

2.4　　Liquidity ratio (LIQ)

Liquidity ratio (LIQ) reflects a bank's liquidity, measured by the amount of cash and cash equivalents divided by the bank's total assets. When the percentage of cash or cash equivalents increases, the bank's liquidity risk decreases, and vice versa, when the ratio of cash or cash equivalents decreases, the risk of liquidity Bank increases. A reduction in the risk of a bank's liquidity leads to increased risks in banking operations.

Research by Ahmet and Hasan (2011) also shows a positive relationship between liquidity ratio and CAR of commercial banks. Therefore, an increase in a bank's liquidity can have a positive effect on capital ratios. In other words, there exists a correlation between liquidity and the coefficient of safety which is a positive correlation. Based on the concept as mentioned earlier and studies, authors give hypothesis H3 following:

Hypothesis H3: Liquidity ratio (LIQ) positively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam.

2.5　　Loan ratio (LOA)

The variable-ratio of outstanding loans is to total assets. This factor is the ratio that reflects the structure of the bank's assets [5]. Most banks generate profits from lending, so the bank's lending rate measures its capacity to use and manage capital [7]. The higher this ratio, the higher the bank's risk, thus reducing the capital adequacy ratio. Based on the concept as mentioned above and studies, authors give hypothesis H4 following:

Hypothesis H4: Loan ratio (LOA) positively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam.

2.6　　Loan-loss reserve (LLR)

LLR is the ratio of the credit risk reserve to the bank's loan balance, contributing to the bank's credit quality [6]. Provisions for credit risks mean an amount of money set aside for possible losses caused by the credit institution's customers failing to fulfill their committed obligations [8], [9]. The risk reserve ratio is determined to be the cost of the risk provision against the bank's total outstanding balance in the balance sheet, representing the provision sufficient to cover the estimated loss in the portfolio, borrow. The risk reserve ratio is determined to be the cost of the risk provision against the bank's total outstanding balance sheet, representing the provision sufficient to cover the estimated loss in the portfolio. Borrow [24]. A negative impact of the provision for capital loss means that banks are facing financial difficulties, leading to difficulties in raising capital and ensuring safety in operations. Based on the concept mentioned above and studies, authors give hypothesis H5 following:

Hypothesis H5: Loan-loss reserve (LLR) negatively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam.

2.6　　Non-performing loan ratio (NPL)

NPL is the bad debt ratio, measured by taking the outstanding loans of groups 3, 4, and 5 divided by the bank's total outstanding loans [5]. These are high credit risk liabilities, partly reflecting the credit risk in risky assets that banks are holding. Bad debts are overdue for interest payments and principals of debts

unpaid for more than 90 days of group 3 or more [7], [12]. The bad debt ratio is determined by the rate of the total outstanding loans of group 3, group 4, group 5 with the total outstanding loans and is often used as a credit risk representative. An increase in credit risk causes the capital adequacy ratio to decrease. Based on the concept as mentioned above and studies, authors give hypothesis H6 following:

Hypothesis H6: Non-performing loan ratio (NPL) negatively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

2.7 Leverage ratio (LEV)

LEV is the leverage factor that reflects the bank's capital structure through the ratio of liabilities to the bank's total capital [8], [17]. The total debt determines the leverage ratio over the bank's total equity. Low or high leverage depends on different circumstances. When leverage increases, debt increases relative to the owner, risk increases, higher cost of capital increases risk, and potential for ineffective investments leads to a decrease in the coefficient. Capital safety has An increase in leverage will cause a bank's CAR to decrease [13]. Based on the concept as mentioned above and studies, authors give hypothesis H7 following:

Hypothesis H7: Leverage ratio (LEV) negatively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

2.8 Bank size (SIZE)

SIZE is the bank's total assets' size, calculated by the bank's total assets [11]. Most of the banks with total assets are large and risky loans. Besides, the significant increase in total assets but the increase in equity, not keeping up with the bank's development requirements, mainly depending on mobilized capital, will cause adverse effects on CAR. Research showed that large banks have low capital adequacy ratios. In other words, there is an inverse relationship between bank size and CAR [12], [15]. Based on the concept as mentioned above and studies, authors give hypothesis H8 following:

Hypothesis H8: Bank size (SIZE) negatively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

2.9 Board size (BoardS)

BoardS is a variable measured by the number of board members of commercial banks. The studies show that the Board of Directors plays an essential role in guiding the bank's stable development [12], [13]. Based on representation theory, a large board of directors will help better monitor the CEO's dominance and help protect the interests of shareholders [4]. A large number of board members will increase the bank's ability to supervise, inspect, and manage risk. Simultaneously, by performing well the supervisory function, the Board of Directors can increase business efficiency [18]. Based on the concept as mentioned above and studies, authors give hypothesis H9 following:

Hypothesis H9: Board size (BoardS) positively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

2.10 Independent members in the Board (IndepB)

The independent members in the Board of Directors_IndepB is a variable reflecting the proportion of independent members in the board of directors of the i commercial bank in year t, measured by the number of independent members divided by the total number of members of the board of directors [18], [20]. The independent members' role is to reduce conflicts of interest between parties and reduce issues of representation. They will help improve supervision quality to minimize risks for shareholders and the bank [9]. Based on the concept as mentioned above and studies, authors give hypothesis H10 following:

Hypothesis H10: Independent members in the Board (IndepB) positively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

2.11 Female members of the Board of Directors (FemaleB)

The variable for the percentage of female members of the Board of Directors_FemaleB is the variable reflecting the proportion of female members of the Board of Directors, measured by the number of female board members divided by the total number of board members [13], [25]. The gender diversification in the board of directors with a high proportion of women will help the bank operate more efficiently, as demonstrated in the study [5]. Based on the concept as mentioned above and studies, authors give hypothesis H11 following:

Hypothesis H11: Female members of the Board of Directors (FemaleB) positively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

2.12 The foreign member ratio in the Board (ForeignB)

The foreign member ratio variable in the Board of Directors_ForeignB is the variable determined by

dividing the number of foreign board members by the total number of board members of the bank [21]. Foreigners are expected to help improve board oversight through their experience and knowledge of foreign tenses, connectivity, and imposition. Apply new technology, management skills [27]. Based on the concept as mentioned above and studies, authors give hypothesis H12 following:

Hypothesis H12: The foreign member ratio in the Board (ForeignB) positively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

2.13 Educational attainment of the members of the Board (EduB)

The variable of educational attainment of the members of the Board of Directors_EduB is the variable reflecting the proportion of the board members with postgraduate degrees of the bank I in year t [22]. The variable is determined by dividing the quotient between the number of members with doctoral degrees divided by the total number of board members. This factor showed that the more Ph.D. degrees, the lower the risk-taking level [23]. This factor means that the higher the board members' qualifications, the safer the bank will operate, so the relationship between board qualifications is positively correlated with CAR [12]. Based on the concept as mentioned above and studies, authors give hypothesis H13 following:

Hypothesis H13: Educational attainment of the members of the Board (EduB) positively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

2.14 Consumer price index (CPI)

The consumer price index (CPI) index evaluates a country's inflation rate [16]. Inflation reflects a devaluation of a currency that will affect nominal interest rates, affecting borrowers and preventing customers from repaying their debts. In other words, high inflation can increase the bank's credit risk, as customers are more susceptible to default [21], [27]. This factor can negatively affect banks' capital ratios. Based on the concept as mentioned above and studies, authors give hypothesis H14 following:

Hypothesis H14: Consumer price index (CPI) negatively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

2.15 Gross domestic product (GDP)

GDP is the Economic growth rate is calculated by taking the difference between the size of the current period compared with the size of the economy in the previous period divided by the last period's economic size [14], [19]. The study also shows an inverse relationship between GDP and CAR ratio when analyzing CAR's factors at commercial banks [21]. Based on the concept as mentioned above and studies, authors give hypothesis H15 following:

Hypothesis H15: Gross domestic product (GDP) negatively impacts the capital adequacy ratio of joint-stock commercial banks in Vietnam

3. Methods of Research

The research paper collects, synthesizes, and analyzes data and assesses the capital adequacy situation in joint-stock commercial banks in Vietnam through Excel software [4]. The topic performed descriptive statistical analysis through absolute comparison methods, a relative comparison of variables in the research model to see the change of the research period's variables. We can see the relationship between the factors and the CAR coefficient [23].

The methods used in previous studies are panel data analysis methods, including random effects (REM) method, fixed effects method (FEM), pooled OLS method, FGLS method. It is a method based on Maximum Likelihood and uses p-value statistics to test research hypotheses. The use of p-value is in this study.

Pooled OLS is a regression model in which all coefficients are constant over time and, according to authors, will not consider the data set in terms of space and time. Still, only It is merely an estimation of an ordinary OLS model [23]. This method considers the effect of the individual's individuality to be the same. Although the OLS regression method is deemed an efficient, unbiased linear estimate, it is best (BLUE). Still, on the contrary, this method is also straightforward to violate the assumptions of the linear regression model, so the Pooled OLS method is no longer efficient and unreliable [24].

Unlike the Pooled OLS model, where the FEM regression model assumes that the effects of each individual's individual properties are different, the FEM model analyzes this correlation between the remainder of each unit and the variable. The explanatory variables control and separate the personal characteristics (time constant) from the explanatory variables from estimating the explanatory variable's actual effects on the dependent variable. This model's memorable moment is that

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individual features' coefficients are not correlated with other independent variables in the model [24].

The REM regression model considers the differences, unique characteristics, and different entity's starting points (company, enterprise, bank). These differences affect the independent variables, making each entity have coefficients for each independent variable in the model [25].

The authors had the difference between the REM and FEM models shown in the variation between the units. If the variation is correlated with the independent variable and the explanatory variable in the FEM model, in the REM model, the variation the inter-unit dynamics are assumed at random and are not correlated with the explanatory variables. Therefore, if the difference between the units affects the dependent variable, REM is more appropriate than FEM. The remainder of each entity (not correlated with the explanatory variable) is considered an explanatory variable. New [24].

It is these advantages that we can see that the FEM or REM estimation can bring many benefits and is more suitable than the Pooled OLS method, but FEM or REM all have limitations that are difficult to handle. Include:

(i) Using too many dummy variables as degrees of freedom and creating multicollinearity between variables makes the estimation results unreliable. (ii) Not mentioning the error component of the model, but assuming that the model's error obeys the classical assumptions, there is no control over the phenomenon of variable variance and the correlation of variables independent of error. (iii) Eliminate time-constant independent variables, if any, in the model [25].

4.   Research Results

The statistical results describe the variables in the research model following:

Table 1. The statistical results represent the variables in the research model

Variables	N	Minimum	Maximum	Mean	Standard deviation
CAR	308	0.0927	0.2053	0.1344172	0.033596
SIZE	308	6.6522437	9.173174	7.947384	0.5132203
ROA	308	0.01025	0.0840382	0.0511021	0.0114353
DEP	308	0.3648	0.8937174	0.6246238	0.1321483
LOA	308	0.1448259	0.8083796	0.537563	0.1278366
LEV	308	2.008499	33.11323	11.23389	4.787543
LIQ	308	0.0450184	0.610376	0.1903748	0.953187
LLR	308	0	0.540799	0.0105941	0.0081665
NPL	308	0.00195	0.1260667	0.0230161	0.0169028
BoardS	308	4	17	8.211039	2.299471
IndepB	308	0.2	0.4557162	0.3517905	0.1190307
FemaleB	308	0	0.8571429	0.3065174	0.1793507
ForeignB	308	0	0.5328	0.4336364	1.243286
EduB	308	0	0.8333333	0.3175739	0.1681782
GDP	308	5.03	7.08	6.197987	0.6949069
CPI	308	0.63	18.58	6.192597	4.786414

(Source: Researchers proposed by Excel)

Table 1 shows a summary of the variables in the model. According to the full data sheet criteria, with a sample of 28 commercial banks, including 308 observations in the period 2009-2019. The commercial banks in the model include state-owned commercial banks and commercial banks. There is no data on joint venture commercial banks and 100% foreign-owned commercial banks.

CAR of commercial banks in the lowest period is 0.0927, and the highest is 0.2453. The mean capital safety factor value in the sample is 0.1344, with a standard deviation of 0.034. This result showed that most banks had met the capital adequacy ratio regulation so as regulated by the State Bank.

Table 2. Regression results from three models

Variables	Pooled OLS		FEM		REM	
	Coe.	P-value	Coe.	P-value	Coe.	P-value
ROA	-0.4045404	0.010	-0.3039092	0.057	-0.3715615	0.016
SIZE	-0.0233421	0.000	-0.0506889	0.002	-0.0271494	0.000
DEP	0.0076819	0.723	-0.027055	0.291	-0.0010473	0.963
LOA	-0.0141825	0.519	-0.0105145	0.715	-0.0187733	0.423
LEV	-0.0006917	0.216	0.0006451	0.365	-0.0003608	0.535
LIQ	-0.0407475	0.131	-0.098257	0.003	-0.0642461	0.023
LLR	0.3332204	0.189	-0.0896935	0.756	0.1647609	0.530
NPL	-0.0624801	0.562	-0.0131269	0.902	-0.0389542	0.711
BoadS	0.0015617	0.158	0.0027251	0.078	0.0021485	0.073
IndepB	0.0037239	0.828	0.0032434	0.892	-0.0052242	0.761
FemaleB	0.0144872	0.278	0.0341736	0.081	0.0225553	0.128
ForeignB	-0.0007049	0.665	-0.0002487	0.931	-0.0009176	0.625
EduB	0.0338126	0.023	0.0529609	0.003	0.040694	0.009
GDP	0.0032546	0.296	0.0018828	0.583	0.002198	0.468
CPI	-0.0003783	0.487	-0.0004004	0.492	-0.0002945	0.583
cons	0.2938431	0.000	0.5160049	0.000	0.3334476	0.000

(Source: Data processed by SPSS 20.0, Amos)

According to the three estimation methods Pooled OLS, FEM, and REM, the regression model results are summarized in the regression results' estimation method.

5.   Conclusions

The study is designed to evaluate the CAR of commercial banks in Vietnam in the period 2009 - 2019. It is to ensure a complete set of table data, and the study collects numbers. Secondary data from independent audited financial statements of 28 Vietnamese commercial banks in the study period. The topic's research method is descriptive statistics, correlation matrix, and table data regression through OLS, FEM, and REM. The thesis shows that the CAR coefficient and the model's factors have many changes in the research period through descriptive statistical methods. There are factors similar to fluctuations with CAR coefficients. After testing, the quantitative research model shows that the bank's size influences Vietnamese commercial banks' CAR, return on total assets, liquidity, leverage factor, the board size, and members' qualifications. This result is an essential basis for the topic to propose governance implications related to CARs of commercial banks in Vietnam in the coming time.

6.   Policy implications

Banks should take the following recommended steps: The first step: Banks must develop capital-raising strategies that are appropriate for each stage and at the same time use capital effectively to accumulate capital and at the same time reduce dividend payments dramatically will cause confusion for shareholders.

The second step: The Bank needs to select strategic shareholders, diversify investment cooperation, and joint ventures with large foreign banks to raise capital effectively and at the same time learn how to use it. And effective management of strategic shareholders' capital. And to ensure the safety limit for the bank, in building strategies and implementing capital raising, Vietnamese commercial banks need to pay more attention to managing their financial leverage to achieve effectiveness, fruit, and safety. Commercial banks also need to consider increasing equity and reducing debt, which means expanding capital safety through different methods to increase their capital adequacy ratios. This policy means that once a bank has more significant equity, there will be no pressure to mobilize external capital to maintain its capital adequacy ratios or increase its desired capital adequacy ratio with spending levels. Deposit fees are lower than raising money by borrowing and at the same time reducing the risk of default.

On the other hand, Vietnamese commercial banks consider building a strategy that only has enough capital based on the minimum capital adequacy ratio and focuses on increasing prosperity following the growth rate. Increase the bank's assets during the period of stable economic development. Because with the results through research, the size of assets is opposite to the coefficient of capital adequacy. This result means that the factor of safety will decrease as the size of a bank's assets increases. Therefore, commercial banks always need to ensure the rate of increasing their assets appropriately.

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