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Impact Of Business Cycle And Revenue Diversification On Capital Buffer And Bank Risk: Empirical Studies From Asean Countries

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ABSTRACT

The purpose of this research is to examine how business cycle and income diversification affect on capital buffer and banking risk in ASEAN from 2020 to 2022. The samples used in this research were 93 banks taken using purposive sampling techniques in the Philippines, Indonesia, Malaysia, Singapore, Thailand, and Vietnam. By using 2-SLS on panel data to analyze the data in the model being built. This research found that when the economy is in a contraction phase, banks will increase capital buffers. Then, if the bank's revenue streams become more diversified, this could potentially weaken its capital buffer reserves and decrease risk levels in the banking sector. Meanwhile, expansionary business cycles and revenue diversification provide in reducing bank risk to encourage economic growth. In addition, the correlation between the level adjustment of capital buffer and bank risk confirms a positive impact.

INTRODUCTION

International banking sector supervision began with the existence of financial minorities in several parts of the world. The banking crisis that occurred in 1973 was caused by the Bretton Woods system failing and resulting in losses on foreign exchange transactions. In response to these conditions, the Basel Committee on Banking Supervision was established as an international cooperation forum in the banking sector by central of G10 countries (McKinsey, 2010). Based on Bank for International Settlements (2023), the main reason for the financial crisis was triggered by excessive leverage conditions in the financial industry sector, especially banking. Financial Crises that have occurred in several parts of the world have illustrated the performance of supervision in the financial industry has many shortcomings that have an impact on the world economy. Specifically, this has an impact on economic shocks, resulting in banks

experiencing a decrease in liquidity and capital quality levels in response to increased risks in the banking industry (Budnik, 2020). Since the financial crisis in the world, several countries had a higher level of leverage than the United States, namely Britain, Spain, France, and South Korea. This demonstrates the quick expansion of the financial sector in the country, the advancement of globalization, and the low-interest rates applied. The main reason for the financial crisis was triggered by excessive leverage conditions in the financial industry sector, especially banking. In addition, this condition is driven by the procyclical process through various financial instruments and the complexity of transactions in the market (McKinsey, 2010).

McGregor et al (2018) stated that the Asian Financial Crisis (AFC) in 1997-1998 had a major impact on banks in the ASEAN region, where banks lost money and led to bankruptcy which resulted in fundamental changes in terms of technical operational monitoring. This condition also has an impact on banks in ASEAN in the process of implementing the Basel rule in the process of adjusting capital buffers and bank risks in each business cycle. Therefore, the implementation process of the regulation can be evaluated to create policies that support banking stability (Safitri, 2023). As a consequence of these conditions Rehbein & Ongena (2022) stated that the level of quality and adequacy of capital is a factor that must be considered for banks. These efforts have a very significant impact on the ASEAN banking sector because businesses can have good resilience in facing economic shocks like the Global Financial Crisis of 2007-2008 by focusing on system improvements and macro-prudential framework (Shimada &; Yang, 2010; Campos et al, 2019). The phenomenon of Global Financial Crisis (GFC) 2007-2008 is considered the worst crisis that has occurred in 60 years. However, several ASEAN countries were able to get through the crisis well due to the support of several policies including policy accuracy, accuracy of central bank reserves, and robust balance sheet and diversification (Laeven & Valencia, 2018; Dasuzhau, 2023; Nisar et al., 2018). The World Bank (2023) states that regulatory capital to risk-weighted assets in 2012-2020 has a fairly healthy and stable level in the range of 12%-24%. Meanwhile, the level of credit risk has decreased due to improvements that have been implemented.

LITERATURE REVIEW

Charter value theory of capital retention as an effort to increase security from the possibility of decreased stability and potential risk with capital buffers. Banks will potentially incur losses as a result of future bankruptcies inflicted on investors. Based on this assumption, banks tend to maximize the defense of capital availability beyond requirements (Marcus A.J., 1984). Contrary to the view in charter value theory, the too big to fail theory is a view when a big business will have an impact on the economy so that it will get help from regulators or governments when it is in a difficult period. In addition, the determination of capital levels is related to the revenue diversification of the portfolio concept. The most basic portfolio philosophy is "Don't put all your eggs in one basket" with the intention of not putting all your eggs in one basket, because if the basket falls then the potential for egg loss will be even greater (Markowitz H., 1952). This aims to increase profitability and reduce risk to encourage the intermediation function of banks as the dominant support in the economy (Gurley, 1956; Manda et al, 2020).

Empirical research has been conducted by producing countercyclical behavior where the level of capital buffer with the business cycle is inversely related to the actual level of GDP growth that occurs in several countries in the world (Tran & Nguyen, 2020). Shim (2013) conducted empirical research with United States banks from 1993-2011, where there was a tendency that the banking sector would reduce their capital reserves during expansion conditions and would increase capital buffer during recession conditions. Another study was conducted on the Asian continent in ASEAN countries in the period 1998-2018 which resulted in capital buffers and business cycles of negative relationships moderated by the quality of

regulations and competition faced by (Ovi et al., 2020). In contrast to the phenomenon in Europe and the United States, in canada there is a positive relationship between capital buffers and business cycles. Banks in Canada and Pakistan showed a positive correlation due to the strength of capital being good enough to have an impact on on raising capital buffers during an expansion as opposed to a recession (Guidara et al., 2013; Iftakhar, 2022). In addition, bank risk is influenced by macroeconomic conditions or business cycles that have a negative relationship (Natalia et al., 2016). When economic conditions are in the expansion phase, non-performing loan conditions will decline as a result of low bank risk. Another study conducted by Ngoc Nguyen (2019) states that income diversification is positively related because the risks posed are also higher. Based on these empirical facts, the following are the hypotheses on how the business cycle impacts banks' capital buffer and credit risk:

- H_1: The business cycle has a positive effect on the capital buffer
- H_2: The business cycle has a negative effect on the bank risk

The research will attempt to identify the effects of income diversification on capital buffer policies and risks for banks.) Income diversification indicators carried out by bank management have a significant impact on capital buffers and portfolio risk (Shim, 2013). In addition, Ovi et al., (2020) found that income diversification factors were negatively related to changes in capital buffers and credit risk and Nguyen (2018) explained that after experiencing the Asian Financial Crisis, banks implemented expansion strategies with diversification. Meanwhile Ferreira et al., (2019) show the impact of income diversification on bank risk in Brazil which indicates that non-interest income has a large role with a negative relationship with risk-adjusted return. In addition, the other research found a positive relationship between income diversification in the form of inefficiencies in cost allocation between segments and agency conflicts where management will tend to diversify according to preferences (Kurniawan & Siswanto, 2021; Hussain, 2021). Based on these empirical facts, the proposed hypotheses regarding the impact of revenue diversification on bank's capital buffers and credit risk as follows:

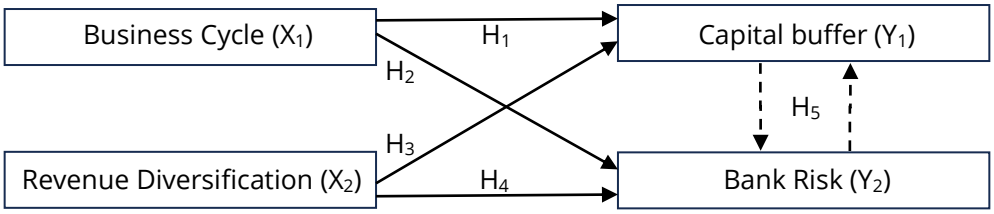
- H_3: Revenue diversification has a negative effect on the capital buffer
- H_4: Revenue diversification has a negative effect on the bank risk

We will also examine the variables of capital buffer levels and bank risk associated with business cycles diversification of income. Some previous literature has also tested the relationship between the two with results that affect each other (Christensen, 2022; Floreani et al., 2023; Shim, 2013;). This means that when businesses apply adjustments to capital-level decisions, banks will simultaneously determine the risk of being held according to business and economic conditions at that time. Another study examines the correlation between the level of capital adjustment and bank risk with the result that the business cycle weakens the risk adjustment to capital but does not weaken the impact of capital adjustment on risk (Lutfi et al., 2020). In addition, Jacques & Nigro (1994) states that there is a negative relationship between the two factors indicated by risk-based capital factors as a result of exploitation of insurance deposits.

- H_5: Capital buffer has a positive effect on the bank risk

The following figure 1 illustrates the conceptual model of this study

Figure 1 Research Framework



Notes:
——▶ : Partial Correlation
- - - - -▶ : Simultaneous Correlation

METHODS

This research uses secondary data that can be accessed from reliable sources such as the IMF, World Bank, Refinitiv, and several other sources during the period 2020-2022. This period was chosen for several reasons, specifically avoiding the impact of the financial crisis that happened in the world and resulting in many detailed regulatory changes related to banking in the previous period. In addition, the selection of periods is considered able to explain the effects of the global pandemic that has hit the entire world, including the ASEAN region which is considered capable of dealing with it well and also identifies banking policies as an effort to determine the level of capital buffers by the rules and directions of the Basel Committee.

The sample for this study was determined using purposive sampling, which selecting individuals based on certain criteria. Within this particular framework, samples are selected from officially and publicly registered banks traded on the largest exchanges in the Philippines, Indonesia, Malaysia, Singapore, Thailand, and Vietnam between 2020 and 2022. In addition, commercial banking category with complete data as needed with a capital buffer value greater than or equal to zero.

The selected sample can represent the good population and provide relevant information in the reserach. Data analysis was performed with panel data regression analysis methods using EViews 12 (Wulandari, 2020). Table 1 describes the sampling process.

Table 1 Criteria For Excluding Banking From The Sample

No.	Variable Name	Description
	Country Population	11
1	Countries that have been recorded as applying the Basel rule in the World Bank survey in 2019	(5)
	Country Sample	6
	Bank Population	121
1	Commercial category banks on the largest exchanges in the sample countries	(5)
2	Banks with a greater or zero capital buffer and complete data as needed	(23)
	Bank Sample	93
	Period	3
	Total Sample (93×3)	279

Source: Author's Research, 2024

This study used three types of variables: dependent variable, independent variable, and control variable. The following measurement serve as a basis for the measuring all variables as follows:

1. Dependent Variables
   Bank Capital Buffer (Δ*BUF*): The difference in the ratio of capital according to actual and minimum risk. Bank Credit Risk (Δ*RISK*): The ratio of non-performing loans against total loans.

2. Independent Variables
   Business cycle (*BCYCLE*): The GDP growth rate.Revenue Diversification (*RD*): The ratio of non-interest income against total income.

3. Control Variables
   The model takes into account a number of bank-specific variables such as bank size (*SIZE*), profitability (*ROA*), liquidity (*LIQ*), loan loss reserves (*LLR*), asset growth (*AG*), and country-specific form financial freedom (*FF*) (Shim, 2013).

Table 2 Variable Definition

Notation	Variable Name	Description
BUF	Capital Buffer	The difference between actual total risk-weighted and minimum capital is 8%
Δ*BUF*	Delta Capital buffer	Changes in capital buffers from year *t*-1 to year *t*
LBUF	Lag Capital buffer	Previous period of capital buffer
RISK	Credit Risk	Described as non-performing loans against total loans
Δ*RISK*	Delta Credit Risk	Changes in non-performing loans to total loans from year *t*-1 to year *t*
LRISK	Lag Credit Risk	Previous period of credit risk
BCYCLE	Business Cycle	GDP growth rate
RD	Revenue Diversification	Described as non-interest revenue against total revenue
SIZE	Bank Size	Total asset log value
ROA	Profitability	Described as Income against total assets
LIQ	Liquidity	Described as liquid assets against total assets
LLR	Loan Loss Reserve	Described as loan loss reserves against gross loans
AG	Asset Growth	Described as growth rate of total assets
FF	Financial Freedom	An index with a value between 0 and 90

Source: Author's Research, 2024

Many previous reserach used partial models to showed changes in a capital level. In our research, we have developed a partially adapted framework for studying capital buffer policies when the economy is improving or maintaining capital buffers at a certain level when the economy is weakening to absorb credit risk. There are also several influences of bank-specific characteristics in adjusting capital buffers and credit risk (Shim, 2013). Based on this, we can formulate a capital and risk buffer model as follows:

$$\Delta BUF_{i,t} = \alpha_0 + \alpha_1 BCYCLE_{i,t} + \alpha_2 RD_{i,t} + \alpha_3 \Delta RISK_{i,t} + \alpha_4 BUF_{i,t-1} + \Sigma\alpha_5 B_{i,t} + \Sigma\alpha_6 C_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$\Delta RISK_{i,t} = \beta_0 + \beta_1 BCYCLE_{i,t} + \beta_2 RD_{i,t} + \beta_3 \Delta BUF_{i,t} + \beta_4 RISK_{i,t-1} + \Sigma\beta_5 B_{i,t} + \Sigma\beta_6 C_{i,t} + \varepsilon_{i,t} \quad (2)$$

$\Delta BUF_{i,t}$ is the level of adjustment of capital buffers according to risk-weighted capital minus the minimum capital applied to banks *i* period *t* to period *t*-1. $\Delta RISK_{i,t}$ is the level of risk adjustment in the bank *i* period t against *t*-1. $BCYCLE_{i,t}$ is a business cycle proxy measured in

country *i* period *t*. $BUF_{i,t-1}$ and $RISK_{i,t-1}$ are capital buffer levels and risks in the bank i period *t*-1. $B_{i,t}$ is a bank control variable including size, profitability, liquidity, loan loss reserve, and asset growth in bank *i* period *t*. $C_{i,t}$ is a variable of state control including financial freedom. $\varepsilon_{i,t}$ is the error term for each equation. α_0 and β_0 are constants, α_1, α_2, α_3, α_4, α_5, α_6 and β_1, β_2, β_3, β_4, β_5, β_6 are regression coefficients.

RESULT

Descriptive Statistics

Table 2, Panel A presents the results of descriptive statistics for the variables used in this study. The mean (median) value of bank capital buffers in the sample is 0.142 (0.113). This means that the average bank in the ASEAN region maintains a risk-adjusted capital ratio of 14.2%, above the minimum requirement of 8%. The mean (median) change in capital buffers is positive 0.018 (0.414), indicating that ASEAN banks are expected to increase their capital buffers by 1.8% over the previous year. The mean (median) value of bank credit risk in the sample was 0.037 (0.030) indicating that the average bank in ASEAN has a non-performing loan ratio of 3.7%. Meanwhile, changes in credit risk show that banks can reduce non-performing loan margins by 0.4% annually. The business cycle variable resulted in an average value of 0.023, meaning that the ASEAN region recorded GDP growth of 2.3% per year over the sample period. The bank generates non-interest income up to 21.39% of total revenue. Additionally, the bank specific control variable such as bank size in ASEAN is 4%, earned a profit of 1.02% with liquidity of 30.53% in their asset portfolio and allocation of 3.67% of their revenue to reserve for loan losses. Moreover the growth rate of ASEAN banking assets is 7.55% and financial freedom in ASEAN countries is 66.47.

Table 3 Descriptive Statistical Results

Panel A: Descriptive Statistics						
	Obs.	**Mean**	**Std. Dev**	**Median**	**Max**	**Min**
LBUF	279	14.200	9.950	11.387	90.068	1.009
ΔBUF	279	1.815	7.203	0.414	52.572	-22.016
LRISK	279	3.765	3.282	3.001	28.223	0.071
ΔRISK	279	0.004	2.448	-0.046	12.835	-16.993
BCYCLE	279	2.356	4.710	3.300	8.900	-9.500
RD	279	21.393	13.110	20.816	64.135	-3.507
SIZE	279	4.009	0.757	4.079	5.744	2.423
ROA	279	1.026	2.081	1.162	8.857	-19.837
LIQ	279	30.539	12.230	29.897	83.785	6.099
LLR	279	3.673	3.059	2.872	21.680	0.394
AG	279	7.556	15.984	5.043	106.055	-40.683
FF	279	66.467	6.441	64.500	89.700	58.800
Panel B: Mean Values by County						
	LBUF	***ΔBUF***	***LRISK***	***ΔRISK***	***BCYCLE***	***RD***
Philippines	11.141	0.119	5.678	0.124	1.267	21.396
Indonesia	18.834	4.030	4.433	-0.264	2.297	17.508
Malaysia	10.842	0.185	2.019	-0.021	2.167	39.418
Singapore	10.742	0.098	1.473	-0.194	2.867	23.212
Thailand	10.452	0.169	3.612	0.009	-0.667	20.606
Vietnam	12.077	0.914	2.836	0.467	4.500	19.271
Average	14.199	1.815	3.765	0.003	2.356	21.393

Source: Data Processed, 2024

Panel B shows the average value of each variable in ASEAN countries. Indonesia has the highest delta capital ratio (Δ*BUF*) while Singapore has the lowest value, for delta credit risk (Δ*RISK*) the highest is in the Vietnam and the lowest in Indonesia. Vietnam has the highest *GDP* (*BCYCLE*) growth followed by Singapore, Indonesia, Malaysia, Philippines, and Thailand. The banks that diversified income prominently were in Malaysia, followed by Singapore, Philippines, Thailand, Vietnam, and Indonesia. This is due to differences in the amount of capital and assets at risk in each bank and the existence of several factors that include internal banks such as policies or human resources, external non-bank factors such as changes in macroeconomic factors, and the ability of debtors to fulfill their obligations in each bank. In addition, factors such as differences in population size and labor activity, natural resources, economic structure, level of technology and innovation, as well as economic policies both monetary and fiscal policies cause differences in the value of GDP in each country.

Model Of Panel Data Regression

The panel data regression estimation technique has three approaches where determining the selected model will be carried out with several tests with the results:

1. Chow Test
   Based on the Chow test, the significance value of the chi-square cross section on the capital buffer and bank risk equations is respectively 0.000 and 0.000 (smaller than 5%) so the estimate used is a fixed effect model.
2. Hausman Test
   Based on the Hausman test, the significance value of the random cross section on the capital buffer and bank risk equations is 0.000 and 0.000 respectively (smaller than 5%) so the estimate used is fixed effect model.
3. Lagrange Multiplier Test
   Lagrange multiplier test is performed if the model selected from the Hausman test is a random effect model. In the study, the two equations were not subjected to the lagrange multiplier test because the model used in the hausman test was a fixed effect model (Aprilianti et al, 2022).

Table 4 Chow Test Result

Equation I			
Effect Test	**Statistic**	**d.f**	**Prob.**
Cross-section F	1.437362	(92.176)	0.0206
Cross-section Chi-square	156.3477	92	0.0000
Equation I			
Effect Test	**Statistic**	**d.f**	**Prob.**
Cross-section F	3.531018	(92.176)	0.0000
Cross-section Chi-square	291.7865	92	0.0000

Source: Data Processed, 2024

Table 5 Hausman Test Result

Equation I			
Effect Test	**Statistic**	**d.f**	**Prob.**
Cross-section random	59.612699	10	0.0000
Equation II			
Effect Test	**Statistic**	**d.f**	**Prob.**
Cross-section random	161.660962	10	0.0000

Source: Data Processed, 2024

Based on the results, it showed that the selected model is the fixed effect model (Benbouzid et al., 2022). The next step is to determine the method for estimating the constructed equation. An equation that is categorized simultaneously will be tested for identification by applying the order condition of identification. According to the order condition, a structural equation is said to be identified if the number of exogenous variables that are not included in the equation, must be at least as many as the number of endogenous variables contained in the model minus one. Based on Table 6, we known that the equation is defined such that it can be estimated using the two stage least square (2SLS) method.

Table 6 Identify Equations

Equations	*K*	*k*	*K-k*	*M*	*M*-1	Description
Capital Buffer	12	10	2	2	1	Overidentified
Bank Risk	12	10	2	2	1	Overidentified

Source: Data Processed, 2024

Hausman specification test is used to determine whether there is a correlation involving the residuals and variables. If the probability value is less than the significance level, the research model has a simultaneous relationship (Ghozali, 2020). Based on the Hausman specification test, the probability value in both equations is 0.000 at a significance of 5%. This means that the residual variable capital buffer and bank risk are significant at the level of 5% so that there is simultaneity in both the equation and the two-stage least square method can be performed. In a system of simultaneous equations on capital buffer and bank risk data, the identification results show that both equations are overidentified so the next step is to estimate parameters using the Two Stage Least Square method (2SLS). Eviews 12 output results with simultaneous modeling using the 2SLS method on capital buffer and bank risk data are as follows in Table 7.

Table 7 Two Stage Least Square (2SLS) Regression Results

Dependent Variables	*ΔBUF*		*ΔRISK*	
Variables	**Coefficient**	**Prob.**	**Coefficient**	**Prob.**
Constant	53.748	0.294	35.310	0.308
BCYCLE	-0.069	0.000	-0.008	0.028
RD	-0.085	0.031	-0.087	0.000
ΔRISK	0.317	0.043		
LBUF	-0.808	0.000		
ΔBUF			0.609	0.013
LRISK			0.125	0.861
SIZE	-0.081	0.280	0.032	0.451
ROA	0.745	0.003	-0.874	0.189
LIQ	0.019	0.833	-0.340	0.000
LLR	0.413	0.291	0.945	0.274
AG	0.026	0.372	0.141	0.003
FF	0.012	0.921	0.431	0.442
Summary	**Equation I**		**Equation II**	
R-squared	0.706		0.765	
Adj R-squared	0.534		0.629	
S.E. of regression	4.919		1.492	
Sum squared resid	4233.881		391.581	
F-statistic	4.090		5.616	
Prob (F-statistic)	0.000		0.000	
Durbin-Watson stat	1.876		2.083	

Note: Significance at 5% levels
Source: Data Processed, 2024

Test Of Classical Assumptions

Evaluation of the model is necessary to ensure that the estimation of both equations yields valid values. The test equation model to be carried out includes:

1. Multicollinearity

   Tests are performed to see if there is a strong correlation between independent variables by analyzing a high correlation matrix (usually greater than 0.80) that indicates multicollinearity. Table 8 shows the correlation matrix on each variable that is useful in evaluating the model. The results of testing the correlation matrix show that there is no correlation value between independent variables greater than 0.80 in absolute terms. This shows that there are no independent variables influence each other, which shows that there is no multicollinearity phenomenon in the model.

Table 8 Pearson's Correlation Matrix

CORR	ΔBUF	ΔRISK	CYLE	RD	LBUF	LRISK	SIZE	ROA	LIQ	LLR	AG	FF
ΔBUF	1.00											
ΔRISK	0.08	1.00										
CYLE	0.24	-0.08	1.00									
RD	-0.06	0.02	-0.22	1.00								
LBUF	0.19	-0.23	0.35	-0.18	1.00							
LRISK	0.09	-0.46	0.17	-0.05	0.30	1.00						
SIZE	-0.10	-0.01	-0.22	0.36	-0.18	-0.20	1.00					
ROA	-0.24	0.05	-0.17	-0.06	0.01	-0.19	0.06	1.00				
LIQ	0.07	-0.13	0.16	0.14	0.30	0.37	0.02	0.03	1.00			
LLR	0.18	0.01	0.32	0.05	0.21	0.52	-0.09	-0.30	0.32	1.00		
AG	0.05	-0.08	0.02	-0.04	0.13	-0.04	-0.05	0.07	0.05	-0.25	1.00	
FF	-0.01	-0.03	-0.02	0.25	-0.07	-0.16	0.58	-0.07	-0.06	-0.06	-0.08	1.00

Source: Data Processed, 2024

2. Heteroscedasticity

   Tests are performed to find out if a model has the same or constant variance of observational residuals. To test the hypothesis as follows:

   - H_0 : No heterokedasticity occurs
   - H_1 : Heterokedasticity occurs

Table 9 Heteroscedasticity Test Result

Equations	p-value	Chi2	Description
Capital Buffer	0.05	0.3921	H_0 accepted
Bank Risk	0.05	0.9766	H_0 accepted

Source: Data Processed, 2024

Based on the results of the breusch pagan test the first equation showed a chi-square probability value 0.3921 > 0.05 while the second equation obtained a value of 0.9766 > 0.05. The chi2 in the capital buffer equation > 0.05 so that it can be concluded that H_0 is accepted, which means that in the capital buffer equation does not occur heteroskedasticity. Meanwhile, the chi2 in the bank risk equation < 0.05. Thus, it can be concluded that H_0 is

accepted which means it is not heteroskedasticity occurs. The conclusion is that the simultaneous model of two equations do not have heteroscedasticity.

3. Autocorrelation

Testing is performed to find out if a model has the same variance from the residual of one observation to another. Based on the Durbin-Watson test, the results of the *DW*-stat values in the first and second equations do not experience autocorrelation problems because the *DW*-stat values of 1.8762 and 2.0491 are between *dU* (1.8706) and 4-*dU* (2.1294). Thus, it can be said that the two research equations do not occur autocorrelation problem.

Table 10 Autocorrelation Test Result

Equations	*DW* Stat	*Du*	*dL*
Capital Buffer	1.8758	1.8706	1.7375
Bank Risk	2.0824	1.8706	1.7375

Source: Data Processed, 2024

Test Of Classical Assumptions

The equation for the relationship between variables is as follows:

- $\Delta BUF = 53.748 - 0.069BCYCLE - 0.085RD + 0.317\Delta RISK - 0.808LBUF - 0.081SIZE + 0.745ROA + 0.019LIQ + 0.413LLR + 0.026AG + 0.012FF$
- $\Delta RISK = 35.310 - 0.008BCYCLE - 0.087RD + 0.609\Delta BUF + 0.125LRISK + 0.032SIZE - 0.874ROA - 0.340LIQ + 0.945LLR + 0.141AG + 0.431FF$

In the capital buffer equation, the dependent variable will have a value of 53.748 when each independent variable is set equal to 0. The variable *BCYCLE* -0.069 indicates that *BCYCLE* and capital buffer are negatively correlated. This indicates that the capital buffer will decrease by -0.069 for every one-unit increase in the *BCYCLE* variable. The income diversification variable (*RD*) of -0.085 shows that income diversification and capital buffers are negatively correlated. This indicates that the capital buffer will decrease by 0.085 when the income diversification variable increases by one unit. While the variables *ROA*, *LIQ*, *LLR*, *AG*, and *FF* show a positive correlation. This shows that the capital buffer will increase by 0.745, 0.019, 0.413, 0.026, and 0.012 for each unit increase in the variables *ROA*, *LIQ*, *LLR*, *AG*, and *FF*. While the variables *LBUF* and *SIZE* show a negative correlation.

This indicates that the capital buffer will decrease by 0.808 and 0.081 for each unit increase in the *LBUF* and *SIZE* variables. In the bank risk equation, the dependent variable will have a value of 35.310 when each independent variable is set to zero. The variable *BCYCLE* of -0.008 indicates that *BCYCLE* and bank risk are negatively correlated. This shows that the bank risk will decrease by -0.008 for each unit increase in the *BCYCLE* variable. The income diversification variable (*RD*) of -0.069 shows that income diversification and bank risk have a negative correlation. This shows that the bank risk will decrease by 0.069 when the income diversification variable increases by one unit.

While the variables *LRISK*, *SIZE*, *LLR*, *AG*, and *FF* show a positive correlation. This indicates that the capital buffer will increase by 0.125, 0.032, 0.945, 0.141, and 0.431 for every one-unit increase in the variables *LRISK*, *SIZE*, *LLR*, *AG*, and *FF*. While the variables *ROA* and *LIQ* show a negative correlation. This indicates that the capital buffer will decrease by 0.874 and 0.340 for every one-unit increase in the *ROA* and *LIQ*.

Hypothesis Test

1. Determination coefficient
   Based on the simultaneous model of the capital buffer equation, it can be seen that the value of the coefficient of determination is 0.706, which means that the business cycle variable and income diversification variables that explain the capital buffer variable are 70.6%. The remaining 29.4% is explained by other variables not included in the equation. In the bank risk equation, we know the value of the coefficient of determination is 0.765 which shows that the independent variable can explain 76.5%, the rest of which is explained by other variables.

2. *F* test
   Test F is performed to find out whether all independent variables simultaneously affect the dependent variable. The *F* test has a hypothesis:
   - H_0 : Business cycle and revenue diversification variables together do not affect on capital buffer/bank risk
   - H_1 : Business cycle and revenue diversification variables together affect on capital buffer/bank risk.

   In test *F*, for the capital buffer equation, the estimated p-value of 0.000 < 5% so H_1 accepted, it can be concluded that business cycle variables and revenue diversification together have a significant effect on capital buffer variables. While in the bank risk equation, the estimated p-value of 0.000 < 5% so H_1 accepted, it can be concluded that business cycle variables and income diversification together have a significant effect on bank risk variables.

3. *t* test
   The *t*-test is carried out to determine whether or not there is an influence between each independent variable on the dependent variable partially by the following criteria:
   a. If the significance value < 0.05, there is a significant influence of each independent variable on the dependent variable partially.
   b. If the significance value > 0.05, there is no significant influence of each independent variable on the dependent variable partially.

In the *t*-test, the *BCYCLE* value is 0.000, which is less than 0.05, and a negative coefficient of -0.069 which gives a negative effect. Therefore, we can reject the H_1 in Equation 1 and *the BCYCLE* value is 0.028, which is less than 0.05 a negative coefficient of -0.008 so we can accept the H_2 in equation 2. In addition, the *RD* value is 0.031, which is less than 0.05, and a negative coefficient of -0.085 which gives a negative effect. Therefore, we can accept the H_3 in equation 1 and *the RD* value is 0.0000, which is less than 0.05 a negative coefficient of -0.087 so we can accept the H_4 in equation 2. Furthermore, the Δ*BUF* value is 0.043, which is less than 0.05 and a positive coefficient of 0.317 which gives a positive effect with Δ*RISK* so, we can accept the H_5.

DISCUSSION

Business Cycle With Capital Buffers And Bank Risk

In the capital buffer equation, the business cycle coefficient has a negative and significant impact at the 5% level (prob = 0.000 < 0.05) so H_1 is rejected. This indicates that there is a countercyclical relationship between the business cycle and the capital buffer to predict losses in the event of excessive credit growth or bank financing. In addition, it played a role in sustaining the massive impact caused by the global pandemic and mitigating the economic impact of the COVID-19 pandemic by tightening credit standards and reducing credit applications for many different loan types. This condition follows the theory of charter value that banks will hold capital

to provide additional protection against deterioration in stability and risk with capital buffers to support the bank's intermediary function.

In the bank risk equation, the business cycle coefficient has a negative and significant impact at the 5% level (prob = 0.028 < 0.05), so H_2 is accepted. This is due to the low non-performing loan ratio during periods of economic expansion phase and banks tend to increase lending and increase market share. Conversely, in the event of an unexpected economic shock, debtors will experience the possibility of default and this has implications for increased bank risk when the economy is experiencing a downturn. This condition originates from the figlewski model which states that macroeconomic factors are related to causing credit risk, including macroeconomic conditions of inflation, economic developments of in economic growth, and financial conditions of interest rates.

Revenue Diversification With Capital Buffers And Bank Risk

Futhermore, the income diversification coefficient has a negative and significant effect at the 5% level (prob = 0.031 < 0.05) so H_3 is accepted. This shows that when banks implement a diversification strategy, it will have the effect of increasing income in the form of capital savings derived from non-interest income, so banks tend to reduce their capital levels. The results of this study are consistent with the results of previous studies conducted by (Shim, 2013; Nguyen, 2018). This is follows the signaling theory that rising profits will play a role as a signals that banks are doing well due to changes in earnings which should be good news for investors. In addition, the income diversification coefficient has a negative and significant effect at the 5% level (prob = 0.000 < 0.05), so H_4 is accepted. The test results show that ASEAN banks benefit from diversification. The more diversified income, the more bank can reduce the level of banking risk measured by the non-performing loan ratio (Wang, 2017; Mehmood & De Luca, 2023). This follows portfolio theory where the goal of diversification is to increase profitability and reduce future banking risk.

Capital Buffer And Bank Risk

In the following result, the capital buffer adjustment level also has a positive impact on the bank risk adjustment level (prob = 0.000 < 0.05), so H_5 is accepted. This shows that there is a positive relationship with each other so that banks that face increased risk will increase capital buffers to anticipate these risks. This condition is in line with the theory of marginal risk aversion where bank managers who are agents of shareholders have incentives to minimize the risk of insolvency so that banks with high risk will increase capital buffers which increases protective cushions.

Regarding control variables, the study shows that several bank and state variables influence the creation of capital buffers and risk-taking decisions. In the capital buffer equation, the coefficients of *ROA, LIQ, LLR, AG,* and *FF* are positively signed, indicating that banks with increased profitability, high liquidity, large loss reserves, good asset growth, and financial freedom tend to have higher capital buffer changes**.**

Conversely, the coefficients on *LBUF* and *SIZE* are both negative, indicating that banks with high capital buffers in the previous year and large scale often tend to have low capital buffers. This result follows the too big to fail theory, which states that large banks tend to build lower capital buffers because they have a comparative advantage regarding information asymmetry and assistance from the government. Meanwhile, in the bank risk equation, the coefficients of *LRISK, SIZE, LLR, AG,* and *FF* are positive while the *ROA* and *LIQ* are negative. This suggests that banks with high risk levels over the past year, large bank scale, loss reserves, large asset growth, and financial freedom tend to have higher changes in credit risk. While banks with high profitability and liquidity will tend to experience lower credit risk changes.

CONCLUSION

This study aims to examine the effect of business cycle and income diversification on the level of adjustment of capital buffers and bank risk in the Philippines, Indonesia, Malaysia, Thailand, Singapore, and Vietnam. The results show that the business cycle is influential in determining capital policies and the level of credit risk in banks in the ASEAN region. Specifically, the business cycle shows a negative impact on the capital buffer, indicating that during contractionary conditions banks will limit lending to anticipate potential losses that can occur as a result of the global pandemic and the decline in various types of loans.

In addition, it was found that the business cycle has a negative influence on bank credit risk in ASEAN. This finding strengthens the argument that when the economy is in decline, the potential for debtors to default will be even greater, which has implications for increased bank risk. This is following the charter value theory where banks will hold capital as a safeguard from decreasing stability and risk through capital buffers to support the bank's intermediation function.

The study also found that income diversification has a negative influence on capital buffers and credit risk. After the AFC, banks in ASEAN have undergone many regulatory changes that encourage bank membership to diversify income by resorting to non-interest-earning activities. This is an effort made by the bank to reduce the need for excess capital buffers and potential credit risk. Banks with revenue diversification policies will have an impact on capital savings by reducing portfolio risk. In addition, changes in capital buffers and credit risk have several influences that must be considered on the basic characteristics of banks such as size, asset growth, profitability, loan loss reserves, and liquidity. In addition, the relationship between the adjustment rate of capital buffers and bank risk has a positive influence on each other. This shows that when businesses apply adjustments to capital-level decisions, banks will simultaneously determine risks according to current business and economic conditions.

SUGGESTION

Based on the research framework, the author has several recommendations:

1. Bank Management
   Bank management in ASEAN is expected to have the concept of forward-looking behavior as a strategy applied between adjusting the level of capital buffer and bank risk. In addition, bank management needs to pay attention to the implementation of income diversification strategies to obtain benefits for capital saving and reduce bank dependence on interest income. It is proven that diversification supported by an increase in non-interest income can lead to a decrease in bank risk. Decreasing bank risk will encourage capital-saving policies to increase returns for shareholders.
2. Bank Regulator
   Regulator need to continue to periodically supervise the determination of banking capital policies to anticipate shocks or economic crises that can occur. Although in recent years the policies implemented by banks in ASEAN have been quite good, the phenomenon of the global pandemic has also had an impact on capital policies and bank risks. In the aspect of income diversification, regulators have provided easier regulations in diversifying because the benefits of the strategy can reduce bank risk. However, the regulation must still be monitored in the interest of banking system stability. In addition, regulators can supervise banks with a high level of diversification because it will tend to lower the capital buffer held.
3. Academics
   This research is expected to be continued by further researchers by using more data and varied objects such as the use of non-listed banks with quarterly data. This is intended to be able to produce a more thorough description to get a more detailed picture of the research

variables. In addition, other variables can be included to be examined more deeply when looking at bank risk.

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