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DOES "THE PURCHASING MANAGERS' INDEX" (PMI) AFFECT THE OPERATIONAL EFFICIENCY OF COMMERCIAL BANKS IN VIETNAM?

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ABSTRACT

This study investigates the impact of the Purchasing Managers' Index (PMI) on the operational efficiency of 17 commercial banks in Vietnam from 2013 to 2020. Utilizing the Generalized Method of Moments (GMM), the research analyzes how macroeconomic factors such as GDP growth and inflation, alongside internal bank metrics, influence bank performance. The findings reveal an inverse relationship between PMI and bank operational efficiency. Additionally, GDP growth and inflation positively affect ROE, while non-performing loans negatively impact it. These results provide valuable insights for bank managers to enhance bank performance by monitoring the PMI.

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1. Introduction

In recent years, the Purchasing Managers' Index (PMI) has emerged as a crucial tool for assessing the economic health of nations (Erik, Lombardi, Mihaljek & Shin, 2023). PMI provides detailed insights into business activities within the manufacturing and services sectors, and it is widely used by policymakers, investors, and economic analysts. In Vietnam, a developing economy, the fluctuations in PMI not only reflect the state of the manufacturing sectors but also have broad implications for other industries, including banking, real estate, and investment (World Bank, 2021).

PMI is regarded as a leading indicator for identifying early economic trends and issuing warnings about potential risks. In the context of global economic volatility, investigating the relationship between PMI and the performance of commercial banks has become increasingly essential (Koenig, 2002). PMI influences not only monetary policy decisions made by central banks but also affects the business operations and credit activities of commercial banks (S&P Global, 2022).

This study aims to examine the impact of the Purchasing Managers' Index (PMI) on the operational efficiency of 17 commercial banks in Vietnam from 2013 to 2020. By employing the generalized method of moments, the research analyzes the effects of macroeconomic factors such as GDP growth, inflation, and internal bank metrics on their performance. A novel aspect of this study is its direct assessment of the impact of PMI on key performance indicators like ROE, rather than focusing solely on indirect effects through macroeconomic conditions as in previous studies. Instead of merely analyzing the indirect impact through the macroeconomic environment, this research highlights the direct influence of PMI on bank efficiency. The findings will provide valuable insights for bank managers and investors, helping them make strategic decisions to enhance operational efficiency amidst economic volatility (Kalsie, 2015).

The objective of this study is to provide a comprehensive and in-depth overview of how PMI influences the operational efficiency of commercial banks, thereby suggesting risk management strategies and optimizing business operations in a volatile economic environment. This research not only contributes to theoretical knowledge but also offers practical recommendations for managers and policymakers.

2. Theoretical framework and literature review

2.1. PMI Index

The Purchasing Managers' Index (PMI) is widely recognized as a reliable indicator providing detailed insights into business conditions across the manufacturing and service sectors (Tsuchiya, 2012). Developed by the Institute for Supply Management (ISM) in the United States, the PMI was initially designed for domestic economic research but has since been adopted globally due to its significant analytical value (Jose, 2016).

The PMI is derived from surveys conducted with purchasing managers and supply chain professionals. It encompasses several key components: new orders (30%), production (25%), employment (20%), delivery times (15%), and inventory levels (10%).

Measured on a scale from 0 to 100, the PMI value over 50 indicates an improvement in economic conditions compared to the previous month, whereas a value below 50 signals a contraction in economic activity (PMI Index by Country 2024, 2024). The PMI serves as a vital tool for policymakers, investors, and analysts, providing a timely and accurate reflection of economic conditions that often precede official data releases.

2.2. Theoretical framework

The agency theory suggests that the relationship between managers and shareholders in banks can be influenced by macroeconomic factors such as the Purchasing Managers' Index (PMI). When PMI increases, indicating positive economic prospects, managers may adjust investment and credit decisions to optimize returns for shareholders, thereby enhancing the bank's operational performance (Jensen & Meckling, 1976). However, if management fails to effectively control risks, especially during periods of economic expansion, this can lead to a rise in non-performing loans, negatively impacting the bank's performance (Liu & Wilson, 2010). Additionally, the business cycle theory posits that bank performance often fluctuates in line with the economic cycle (Burns & Mitchell, 1946). During periods of economic growth, as PMI rises, businesses and banks tend to increase their lending and business activities. Conversely, when PMI declines, banks face higher risks due to the decreased repayment capacity of borrowers, leading to a reduction in operational performance (Meyer & Habanabakize, 2019).

2.3. Literature Review

Experts from S&P Global Market Intelligence (2024) have utilized PMI data to forecast global economic prospects. PMI has emerged as a leading indicator of economic health, proving particularly useful in forecasting GDP and guiding monetary policy decisions. Koenig (2002) asserts that PMI has marginal predictive power for changes in actual economic activity and serves as an early signal for shifts in Federal Reserve policy.

PMI is a robust macroeconomic factor with significant statistical relevance in impacting the economy (Khundrakpam & George, 2012). According to S&P Global Market Intelligence (2022), PMI survey data is a reliable forecasting tool for macroeconomic trends such as GDP, industrial production, employment, and inflation. Compared to frequently revised GDP data, PMI is less volatile and more timely, highlighting its importance in economic forecasting and modeling.

Chien and Morris (2016) from the Federal Reserve Bank of St. Louis explored the strong correlation between PMI and GDP growth in the U.S., with a correlation coefficient of 0.75. When PMI exceeds the 50-point threshold, it often corresponds to positive GDP growth, demonstrating PMI's forecasting power for overall economic conditions. PMI is a comprehensive indicator of global economic activity, capturing real-time economic conditions in the service and manufacturing sectors and providing insights into a country's economic health.

Meyer and Habanabakize (2019) used PMI data in conjunction with other indicators to forecast GDP in South Africa, demonstrating the effectiveness of PMI in economic forecasting even amid rapid changes.

In Vietnam, the World Bank's Macroeconomic Update Report (2021) uses PMI as a good forecasting tool for macroeconomic conditions. PMI is a macroeconomic factor impacting the economic growth of emerging and developing countries like Vietnam (Nguyen & Luu, 2022).

PMI also influences the performance of commercial banks through its impact on the central bank's policy decisions. When PMI rises, it generally signals a positive economic recovery. The central bank may lower interest rates to encourage investment and consumption, boosting economic development. Conversely, if PMI declines, it may indicate economic downturns, prompting the central bank to implement stricter monetary policies to control risks and inflation, affecting capital costs and profitability for commercial banks.

PMI also affects the quality of bank assets through its impact on non-performing loans. During economic downturns, when PMI is low, the ability of businesses to recover loans diminishes, leading to an increase in non-performing loan ratios. This necessitates banks to enhance risk management measures and provisions for potentially bad loans. Low PMI is often associated with reduced production and business activity, increasing credit risk when businesses struggle to meet their debt obligations. Banks need to reassess their credit portfolios to mitigate risks, especially during economic recessions.

Furthermore, PMI influences banking loan activities. A high PMI generally accompanies economic expansion, improving customers' debt repayment capacity and leading banks to expand lending. Conversely, a declining PMI prompts banks to be more cautious in their lending practices due to the increases in the risk of bad debts.

Based on these analyses, PMI has both direct and indirect effects on bank profitability, particularly in lending and banking services. During economic growth periods, profitability from these activities increases, whereas banks may face reduced income in a downturn.

Banking performance is a concept used to evaluate the extent to which banks achieve business objectives through resource utilization to deliver products and services to customers, as well as value to shareholders and society. Performance is determined by a bank's ability to manage costs and maximize income from existing assets (Sherman & Gold, 1985). This process involves not only enhancing profitability through core financial activities such as lending, investing, and other banking services but also effectively managing operational costs and credit risks.

Additionally, banking performance reflects the bank's capability to serve and maintain customer relationships, thereby enhancing customer satisfaction and loyalty. The emergence of new banking channels such as Internet banking, ATMs, mobile banking, and global competition has compelled bankers to explore the significance of customer loyalty (Indriastuti et al., 2022). The quality of service and customer loyalty in the banking sector in Penang, Malaysia, is correlated, with improvements in service quality leading to increased customer loyalty. Factors such as reliability, empathy, and assurance are identified as crucial aspects of service quality (Kheng et al., 2010).

Moreover, banking performance is closely tied to the adoption of new technologies and process innovations under the impact of the 4.0 technology revolution. According to Do et al. (2022), the digital transformation process is positively correlated with the operational efficiency of commercial banks, with larger banks experiencing greater impacts.

2.4. Research Gaps

Although the **Purchasing Managers' Index (PMI)** is widely recognized as a leading indicator of economic health and is often used to forecast macroeconomic fluctuations such as GDP, production, and monetary policy, there has been limited research directly examining the relationship between PMI and bank performance. Most existing studies, such as those by Koenig (2002) and Meyer and Habanabakize (2019), suggest that PMI has an indirect impact on banking activities through the broader economic environment, but there is little concrete evidence on the direct effects of PMI on key bank performance indicators such as **ROE**.

This creates a significant research gap, particularly in the context of developing economies like Vietnam, where macroeconomic volatility can deeply affect the banking sector. This study represents one of the first attempts to explore the direct relationship between PMI

and the operational efficiency of commercial banks in Vietnam. It not only contributes to existing theoretical frameworks but also offers practical management implications for bank executives and policymakers. The absence of prior research underscores the novelty and value of this study in providing a deeper understanding of how PMI affects the banking system.

3. Data and methodology

3.1. Hypotheses

The PMI index is considered to impact financial and money markets. In a study conducted in India, Kalsie (2015) evaluated the impact of macroeconomic factors and found an inverse relationship between PMI and the short-term capital market (called the money market). Smales (2017) demonstrated that commodity market fluctuations are related to macroeconomic indicators in the two major markets of the United States and China. Along with employment and output indices in countries like the U.S., the PMI index provides investors with information regarding short-term demand for commodities in the Asian market, particularly in China.

When PMI rises, it predicts growth in production as it enhances a company's business capabilities to achieve higher income due to economic growth. In other words, PMI has a positive correlation with a company's performance (Zeitun et al., 2007).

Applying the PESTEL model in research (Vu, 2021) provides a result that economic factors impact the performance of commercial banks in Vietnam.

PMI and Non-Performing Loans (NPLs): PMI is a comprehensive indicator of economic conditions. When PMI rises, businesses borrow to expand, but some of these loans may turn into non-performing loans if not repaid on time. Thus, as PMI increases, the rate of non-performing loans may also rise, negatively affecting the ROE of commercial banks. Regarding access to capital in the Vietnamese market: Transparency in accessing bank capital and difficulties in obtaining low-cost loans are significant issues for businesses. The corporate bond market is an essential funding channel but faces many challenges due to violations in bond issuance. Credit Risk: An increase in PMI predicts more vigorous economic activity and growth in credit activity. However, if credit growth surges without strict risk management, the non-performing loan ratio will rise, directly impacting the ROE of commercial banks. Lag Effect: The impact of PMI on non-performing loans may occur faster than its impact on ROE, leading to inconsistencies in the fluctuations between factors. From these observations, PMI can potentially have a negative impact on the performance of commercial banks operating in the Vietnamese market.

Hypothesis H1: PMI has a negative relationship with the performance of commercial banks.

Non-performing loans reduce a bank's profitability and impact the overall performance of the bank. Non-performing loans have an inverse effect on the profitability of commercial banking activities (Pham et al., 2023). The restructuring of the Vietnamese banking sector, linked to handling non-performing loans, is seen as an important goal for the sector to improve and enhance the operational efficiency of banks (Duong et al., 2020) during the 2021–2025 period, according to the plan approved by the Prime Minister of VietNam (2022).

Non-performing loans reduce revenue, erode retained earnings, and affect the overall performance of banks (Boussaada et al., 2023). Therefore, effective credit risk management is necessary to maintain the operational efficiency of banks (Salas & Saurina, 2002).

Hypothesis H2: The level of non-performing loans in banks has a negative relationship with the performance of commercial banks.

There is a strong correlation between economic growth and the development of the banking sector. As GDP increases, the demand for banking services rises due to increased business activity and investment needs, thereby improving the performance of banks (King & Levine, 1993; Levine, 2005).

Based on recent studies, GDP growth in Vietnam is positively related to the performance of commercial banks. There is a notable link between GDP growth and the net profit of banks (Yoon et al., 2023). When the overall economy grows, banks can operate more efficiently and achieve higher profits. GDP growth is associated with improvements in bank performance, particularly through the expansion of credit and financial services for businesses and consumers. Economic growth facilitates sustainable bank development, reduces non-performing loan ratios, and improves service quality (Nguyen & Abdul Wahab, 2021). The impact of GDP on the performance of commercial banks varies depending on the period.

Hypothesis H3: GDP growth has a positive relationship with the performance of commercial banks.

3.2. Proposed model and research methodology

This study utilizes financial data from 17 commercial banks (CBs) in Vietnam over the period from 2013 to 2020. This selection ensures diversity and representation across banks of different sizes, thereby elucidating the impact of various factors on bank performance. Using data from multiple banks over many years enhances the generalizability of the research findings and provides a comprehensive view of the relationship between macroeconomic factors and banking performance during the study period.

The data is sourced from audited financial reports of the banks. The information is obtained from reputable sources including: The Ministry of Finance of Vietnam, The World Bank (WB), S&P Global, and The International Monetary Fund (IMF).

Based on previous studies examining the impact of various factors on banking performance, notably the works of Vo & Tran (2015), Zeitun et al. (2007), Kalsie (2015) and Vu (2021), this research proposes a new model. The model aims to assess the impact of the Purchasing Managers' Index (PMI) along with bank-specific indicators and macroeconomic factors on the Return on Equity (ROE).

Research Model:

$$ROE_{i,t} = \beta_0 + \beta_1 PMIt + \beta_2 PMI_{t-1} + \beta_3 \Delta\log(LOAN)_{i,t} + \beta_4 \Delta\log(LOAN)_{i,t-1} + \beta_5 NIM_{CREi,t} + \beta_6 \Delta\log(GDP)_t + \beta_7 INF_t + \beta_8 SIZE_{i,t} + \beta_9 NPL_{i,t} + \varepsilon_{i,t}$$

Where:

Dependent Variable:

ROE: This is the primary measure of the bank's performance.

Independent Variables:

PMI: The PMI for the Vietnamese market published by S&P Global, averaged over 12 months.

Bank-Specific Variables:

LOAN: The growth rate of bank credit.

NIMCRE (Net interest margin from credit): The profitability ratio from credit activities.

SIZE: The size of the bank, typically measured by total assets.

NPL (Non-performing loans): The ratio of non-performing loans to total loans.

Macroeconomic Variables:

GDP: The growth rate of the Gross Domestic Product.

INF (Inflation): The inflation rate within the economy.

$\varepsilon_{i,t:}$ Error term.

Table 1. Description of variables used in the model

Variable Name	Variable Symbol	Calculation Formula	Expected Sign	References	Source
Purchasing Managers' Index	PMI*	12-month average of the PMI index	-	Zeitun et al. (2007); Kalsie (2015); Vu (2021)	S&P Global
Credit Growth Rate	LOAN*	Annual percentage change in credit	+	Samad (2015)	Financial Statements
Net Interest Margin from Credit	NIMCRE	Net interest income from credit / Earning assets	+	Kirimi et al. (2024)	Financial Statements
GDP Growth Rate	GDP	Annual percentage change in GDP	+	Jaouad & Lahsen (2018); Duong et al. (2020)	World Bank; IMF
Inflation Rate	INF	Annual percentage change in the Consumer Price Index	+	Jaouad & Lahsen (2018); Duong et al. (2020)	World Bank; IMF
Bank Size	SIZE	Natural logarithm of total assets	+/-	Regehr & Sengupta (2016); Duong et al. (2020)	Financial Statements
Non-Performing Loans	NPL	Ratio of non-performing loans (group 3 and above) to total loans	-	Pham et al. (2023); Duong et al. (2020)	Financial Statements

To provide a more comprehensive evaluation and address the limitations of the model and data, the author proposes adding lagged variables for PMI and LOAN, denoted as PMI1 and LOAN1, respectively.

To analyze the correlation between independent variables and ROE, a key indicator of bank performance, the author will employ the Generalized method of moments quantitative research method. The application of GMM model in this study is primarily aimed at addressing potential endogeneity issues that arise due to the dynamic nature of the model, where lagged dependent variables and macroeconomic factors may correlate with the error term. The choice of GMM is supported by its ability to produce consistent estimators in the presence of unobserved bank-specific effects and measurement errors, which are common in panel data involving financial institutions. The model uses instrumental variables to account for these issues, and both the Sargan-Hansen and Arellano-Bond tests affirm the validity and reliability of the estimations. The use of lagged independent variables in the GMM model captures both immediate and delayed effects of macroeconomic variables such as PMI, GDP, and inflation on bank performance, enhancing

the depth and accuracy of the analysis. This method not only ensures that endogeneity is adequately addressed but also provides more robust and reliable estimates of the impact of macroeconomic indicators on the operational efficiency of Vietnamese commercial banks.

4. Results and discussion

Table 2. Descriptive statistics of research data

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable					
ROE	136	0.1352	0.0995	0.0001	0.479
Independent Variables					
PMI	136	51.3052	1.8506	47.2417	53.7417
LOAN	136	0.2060	0.1246	-0.113	0.663
NIM_{CRE}	136	0.0303	0.0131	0.005	0.088
GDP	136	0.0601	0.0129	0.0291	0.0708
INF	136	0.0329	0.0156	0.006	0.0604
SIZE	136	32.9433	0.9955	30.6900	34.9600
NPL	136	0.0189	0.0107	0.0001	0.0700

Table 2 provides descriptive statistics for the variables used in the regression model. The mean values for ROE, PMI, LOAN, NIM_{CRE}, GDP, INF, SIZE, and NPL are 0.1352, 51.3052, 0.2060, 0.0303, 0.0601, 0.0329, 32.9433, and 0.0189, respectively. This indicates that the metrics measuring bank performance such as ROE and NIM_{CRE}, and industry-specific variables like LOAN and SIZE show moderate dispersion in observations. Conversely, macroeconomic variables like GDP and INF exhibit stable fluctuations, ensuring the diversity and representativeness of the data.

Overall, the standard deviations of the variables reflect relatively low variability in the performance indicators of banks over the years. However, the differences in industry-specific and macroeconomic variables suggest significant impacts of these factors on the business performance of banks.

Table 3. Results of the GMM model

Variable	Coefficient	Standard error	t-value	p-value
ROE***	0.4160645	0.0975805	4.26	0.000
PMI***	-0.0210071	0.0060326	-3.48	0.001
PMI1	-0.0007316	0.00546	-0.13	0.894
LOAN	0.0494477	0.0978307	0.51	0.614
LOAN1	0.1326149	0.0807566	1.64	0.103
NIM_{CRE}**	2.017769	0.6586801	3.06	0.003
GDP***	3.313538	0.9284216	3.57	0.001
INF*	1.253247	0.5857037	2.14	0.034
SIZE***	0.0274016	0.0080597	3.40	0.001
NPL*	-1.956655	0.7963903	-2.46	0.015

Arellano-Bond test for AR(1) in first differences: z=-2.38, Pr>z=0.017
Arellano-Bond test for AR(2) in first differences: z=0.25, Pr>z=0.803
Sargan test excluding group: GMM instruments for levels, chi2(16) = 38.90, Prob > chi2 = 0.001
Difference (null H = exogenous): GMM instruments for levels, chi2(15) = 27.29, Prob > chi2 = 0.026
Sargan test excluding group: iv(NIM GDP INF SIZE NPL), chi2(28) = 61.58, Prob > chi2 = 0
Difference (null H = exogenous): iv(NIM GDP INF SIZE NPL), chi2(3) = 4.61, Prob > chi2 = 0.202

Note: *Levels of statistical significance are denoted as *, **, and *** for 10%, 5%, and 1%, respectively. The numbers in brackets represent the standard errors of each regression coefficient.*

Source: Analysis results from the data

The Arellano-Bond test for autocorrelation in the model yielded a p-value of AR(2) = 0.803 (approaching 1). This result indicates that there is no significant autocorrelation among the variables in the model. The Sargan test of overidentifying restrictions reports a chi-squared value of 66.19 (df = 31) with a p-value of 0.000, rejecting the null hypothesis of valid instruments. This suggests that there might be an issue with some of the instruments used in the model, warranting further scrutiny of the instrument variables to ensure their validity. Finally, the Difference-in-Sargan test examines the exogeneity of the instrument subsets. For the subset of variables NIMcre, GDP, INF, SIZE, and NPL, the chi-squared value is 38.90 (df = 16) with a p-value of 0.001, indicating that this subset may not be exogenous. In contrast, the remaining instrument subset shows a chi-squared value of 4.61 (df = 3) and a p-value of 0.202, suggesting that the exogeneity of this subset is acceptable.

Using the GMM model, the research findings are as follows:

The variable ROE has a coefficient of 0.416 with a significance level of 1%, indicating that the historical performance of banks has a positive and strong impact on their current performance. This reflects continuity and persistence in the operational performance of banks.

After applying the GMM model, the results show that PMI has a negative effect on the operational efficiency of commercial banks at the 1% significance level. When PMI increases by 1%, the operational efficiency of commercial banks decreases by 0.021%. The one-year lagged PMI does not have a significant impact on the operational efficiency of banks, consistent with the initial hypothesis and previous studies, but contrary to the research by Zeitun et al. (2007).

The Net Interest Margin from Credit (NIM_{CRE}) has a positive effect on ROE at the 5% significance level. When NIM_{CRE} increases by 1%, ROE increases by 2.018%, which aligns with the author's expectations. Lending is a core activity for Vietnamese banks, and the consistently positive credit growth from 2013 to 2020 indicates that credit is a major income source for banks, explaining the positive correlation between NIM_{CRE} and the operational efficiency of commercial banks.

Non-performing loans (NPL) have a negative impact on the operational efficiency of banks at the 10% significance level. When NPL increases by 1%, ROE decreases by 1.957%, consistent with the author's expectations and previous studies, particularly the study by Pham et al. (2023). Non-performing loans not only affect ROE but also highlight the importance of financial stability in maintaining and developing banks. An increase in non-performing loans leads to higher capital acquisition costs during the period of non-recovery, provisions for risk, and litigation costs, all of which directly impact the operational efficiency of banks.

The research results regarding the growth rate of credit exposure indicate that there is no clear impact of this indicator on the operational efficiency of commercial banks. However, inflation shows a positive effect on ROE at the 10% significance level. When inflation increases by 1%, ROE increases by 1.253%. This may be due to inflation often accompanying higher interest rates, which helps banks increase their interest income. Economic growth improves the business environment and the profitability of banks, as evidenced by the study results at the 1% significance level, showing that GDP growth has a strong positive impact on ROE. When GDP increases by 1%, ROE increases by 3.314%. The inflation variable (INF) has a coefficient of 1.253 with a 10% significance level, indicating that inflation positively affects ROE. When inflation rises by 1%, ROE increases by 1.253%. This may be due to inflation usually being associated with higher interest rates, which helps banks enhance their interest income. The study results also indicate that bank size positively affects the operational efficiency of commercial banks at the 1% significance level. When bank size increases by 1%, ROE increases by 0.0274%.

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The lagged variable of PMI is included in the model to examine the prolonged impact of this index on the operational performance of banks. According to business cycle theory, macroeconomic variables like PMI often have both immediate and delayed effects (Burns & Mitchell, 1946). The inclusion of a lagged variable allows for the assessment of whether the previous year's PMI affects the bank's performance in the current year. Although the regression results indicate that the lagged PMI is not statistically significant, this suggests that the prolonged effect of PMI in this model is minimal (Koenig, 2002).

5. Conclusion

5.1. Conclusion and implications

The analysis results show that PMI, NIM_{CRE}, GDP, INF, SIZE, and NPL all have significant impacts on the operational efficiency of commercial banks in Vietnam. PMI has an inverse relationship with ROE, while NIM_{CRE}, GDP, INF, and SIZE have positive effects. Non-performing loans (NPL) have a distinct negative impact on bank performance.

In this study, the GMM model is used to analyze the impact of the PMI index and other factors on the operational efficiency of commercial banks, measured by ROE. The results show that the PMI index has a significant negative effect on bank performance, with each 1% increase in PMI reducing ROE by 0.021%, consistent with the specific hypothesis for the

Vietnamese market, where PMI can negatively impact ROE. Additionally, factors such as GDP growth and inflation rate also show a positive relationship with ROE, while non-performing loans have a negative relationship, highlighting the importance of risk management in lending activities.

These results provide further insights into the influence of macroeconomic factors and internal management on bank performance, suggesting the need for risk management strategies and effective operational optimization. Bank managers need to further study the impact of macroeconomic factors such as PMI, GDP growth, and inflation to capitalize on opportunities and mitigate risks due to their effects on bank performance. Furthermore, risk management related to lending activities should receive more attention, and banks should develop specific strategies to avoid the negative effects of non-performing loans in the context of an unpredictable economic environment that directly affects the stability of banks.

5.2. Limitations and future research directions

The study of 17 commercial banks does not cover all banks operating in Vietnam. Additionally, the research period from 2013 to 2020 is one of the limitations of this study, as the duration is not long enough.

The PMI index is not new, but there are relatively few studies on it in Vietnam, particularly in the field of banking and the operational efficiency of commercial banks. Therefore, additional research is needed from various perspectives to allow for comparison, supplementation, and critique, which will enhance the effectiveness of the research results and provide implications for the management policies of both the State Bank and commercial banks.

Future research could explore the relationship between the PMI index and credit risk at commercial banks in Vietnam, measured through the non-performing loan ratio. The goal is to examine whether fluctuations in PMI affect borrowers' repayment capacity and, consequently, the level of credit risk faced by banks.

Currently, PMI is a global indicator and has the potential to replace some existing macroeconomic indicators. Comparing the impact of PMI on the operational efficiency of domestic and international commercial banks through financial indicators such as ROA, ROE, and NIM could provide valuable international insights for banks in Vietnam.

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